STORMWATER MANAGEMENT DESIGN STUDY

FOR

I-77 EXIT 26 INTERCHANGE – SCOUT MOTORS

PROJECT ID P042443

Hydraulic Design Reference is the 2009 Edition of SCDOT's

"Requirements for Hydraulic Design Studies"

CONCEPTUAL PLANS

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SCDOT
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REVISED

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1. INTRODUCTION

1.1 Overview

The purpose of this project is for the South Carolina Department of Transportation (SCDOT) to install a new service interchange on I-77 near mile marker 26 in Richland County. The purpose of the project is to provide access for the proposed Scout Motors Plant to I-77 and the surrounding developments. Neel-Schaffer was hired by SCDOT to provide a conceptual drainage design for the interchange as part of this project and provide this Conceptual Drainage Report to use for guidance during the future design-build process. The purpose of this report is to document the analysis methodology and design criteria used to develop the project's stormwater management design. The design criteria and analysis methodologies for the project follow the *2009 Edition of SCDOT's Requirements for Hydraulic Design Studies*.

Ultimately, the project will disturb approximately 84.07 acres of land. The disturbed area consists of the construction of the new interchange, bridge, drainage design, and erosion control.

Pipe gradients range from 0.338 to 7.918 percent, and roadway gradients range from 0.34 to 5.48 percent with elevations ranging from 426.85 feet to 490.48 feet. The total combined area of all the watersheds studied is approximately 1073.70 acres of study area.

1.2 Hydrology

The proposed interchange is located within the Beasley Creek Watershed. The project site drains to Beasley Creek which is a tributary to the Broad River. The project site is approximately 1 mile upstream of the confluence.

The project is located in Richland County. The proposed interchange project site is primarily located in mostly Group A and B soils, with trace amounts of other soil types. These are well drained to moderately well drained soils composed of sandy clay loam. This soil information was obtained from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) web soil survey. For more detailed information on the specific soil groups throughout the project reference the online web soil survey. A soil map of the project site can be found in Appendix A.3.

The existing land uses within the Beasley Creek Watershed consist of mostly undeveloped areas with approximately twenty percent developed according to National Land Cover Database 2006 from StreamStats. The developed area totals 46.23 acres. The impervious area totals approximately 49.98 acres. The land use also consists of undeveloped areas, including over fifty percent forest. The proposed interchange project site crosses 5 types of land use areas.

In the area of the proposed interchange, there are twenty crossline structures, in the form of box culverts and pipes. The minimum pipe size for this project is 18". All box culverts are designed in accordance with the SCDOT Supplemental Technical Specification SC-M-714. The crossings are described in the table below.

Table 1: Crossline Pipe Locations

Alignment	Station	Site No.	Existing Structure	Condition (Recommendation)	Headwater / Depth Value	Design Storm	Proposed Structure	Proposed Length (ft)
I-77	1764+00.00	1	6’ x 6’ RCBC	Retain/Extend	0.47	50-year	-	324
I-77	1755+82.65	2	48” RCP	Line/Extend	0.85	50-year	-	298
Connector Road	111+77.00	3	DBL. 6’x6’ RCBC	-	0.60	25-year	-	62
Community Road	113+00.00	8	None	-	0.52	25-year	30” RCP	215
Community Road	94+70.00	12	36” RCP	Remove/Replace	1.15	25-year	36” RCP	152
I-77	1710+50.00	13	10’ x 10’ RCBC	Retain/Extend	0.35	50-year	-	280
I-77	1704+50.00	14	6’ x 6’ RCBC	Retain	0.92	50-year	-	300
Connector Road	160+50.00	15	None	-	0.27	25-year	DBL 6’ x 5’ RCBC	290
Connector Road	164+00.00	16	None	-	0.22	25-year	DBL 6’ x 5’ RCBC	200
Connector Road	170+50.00	17	None	-	0.21	25-year	DBL 8’ x 6’ RCBC	175
US 21	709+50.00	18	None	-	0.84	50-year	6’ x 4’ RCBC	165

Alignment	Station	Site No.	Existing Structure	Condition (Recommendation)	Headwater / Depth Value	Design Storm	Proposed Structure	Proposed Length (ft)
US 21	704+80.00	19	None	-	0.29	50-year	DBL 10’ x 7’ RCBC	265
US 21	690+93.00	20	None	-	0.81	50-year	48” RCP	130
CONRPA	1744+80.00	5	None	-	0.79	25-year	36” RCP	98
CONRPBA	1739+60	6	None	-	0.74	25-year	36” RCP	256
CONLPA	1736+80	7	None	-	0.84	25-year	18” RCP	98
CONRPD	1726+40	10	None	-	0.47	25-year	36” RCP	104
CONRPD	1721+30.00	11	None	-	0.37	25-year	18” RCP	103
Farrow Road	363+13.70	21	None	-	0.92	25-year	24” RCP	110
I-77	1760+00	22	30” RCP	Remove/Replace	1.13	50-year	36” RCP	295

1.3 Calculations Methodology

Rational Method was used for hydrology and HY-8 was used in conjunction with GEOPAK Drainage for hydraulics to address watersheds less than 100-acres, where storage was not a factor in the existing or proposed conditions. For watersheds greater than 100 acres but less than 640 acres, the SCS Curve Number Method was used. A detailed discussion of these methodologies can be found in the sections below. See Appendix B.2 for Storm Drainage calculations and Appendix B.9 for storm drainage profiles.

Design Criteria

Stormwater pipes were designed with the following hydrologic criteria from the SCDOT's *Requirements for Hydraulic Design Studies:*

Table 2: Hydrologic Design Criteria

Type of Conveyance	Drainage Area Size	Road Classification	Design Storm
Side-line Storm Pipe, Driveway Pipe, or Ditch Channel	DA < 40 acres	N/A	10 Year
	40 acres < DA < 500 acres	N/A	25 Year
	DA > 500 acres	N/A	50 Year
Cross-line	N/A	Primary or Interstate	50 Year
		Secondary or Local	25 Year

Drainage Areas

Drainage areas were delineated using field survey, field observations, USGS quad maps, and DEM's (digital elevation model) generated from LiDAR data, provided by the South Carolina Department of Natural Resources.

Storm Drainage Calculation Methodology (Rational Method)

The Rational Method is used to calculate peak discharges for all systems with drainage areas up to 100 acres.

$$Q = C * I * A * C_f$$

Where:

Q = Peak discharge [cfs].

C = Runoff coefficient.

I = Rainfall Intensity [in/hr].

A = Drainage Area (DA) [acres].

C_f = Peaking factor that varies with the recurrence interval.

Table 3: Peaking Factor for Rational Method

Recurrence Interval (years)	C_f
2	1
10	1
25	1.1
50	1.2
100	1.25

Runoff coefficients (C) are defined by Table 4 below. Rainfall intensities (I) were determined using the SCDOT intensity duration frequency (IDF) curves found on the Department's website (https://www.scdot.org/business/technicalPDFs/hydraulic/rainfall_intensity.pdf).

$$I = a \div (b + t_c)^C$$

Table 4: Runoff Coefficients for Rational Method.

Landuse	**Terrain**		
	Flat	**Rolling**	**Hilly**
	0% - 2%	2% - 10%	Over 10%
Pavements & Roofs	0.90	0.90	0.90
Earth shoulders	0.50	0.50	0.50
Drives & Walks	0.75	0.80	0.85
Gravel Pavements	0.50	0.55	0.60
City Business Areas	0.80	0.85	0.85
Dense Residential Sections	0.60	0.65	0.70
Lawns, Sandy Soils	0.10	0.15	0.20
Grass Shoulders	0.25	0.25	0.25
Side Slopes, Earth	0.60	0.60	0.60
Side Slopes, Turf	0.30	0.30	0.30
Median Areas, Turf	0.25	0.30	0.30
Cultivated Land, Sand & Gravel	0.25	0.30	0.35
Industrial Areas, Light	0.50	0.70	0.80
Industrial Areas, Heavy	0.60	0.80	0.90
Parks & Cemeteries	0.10	0.15	0.25
Woodland & Forest	0.10	0.15	0.20
Meadows & Pastureland	0.25	0.30	0.35
Unimproved Areas	0.10	0.20	0.30
Rail Yards	0.25	0.30	NA
Expressways & Freeways	0.60	0.70	0.75

Where:

Tc= Time of concentration (5-minute min), calculated using the velocity method from TR-55.

a, b, & c = IDF curve coefficients defined by Table 5 found on the Department's website (https://www.scdot.org/business/technicalPDFs/hydraulic/rainfall_intensity.pdf)

Table 5: Rainfall Intensities for Rational Method.

Richland County								
Frequency (years)	a	b	c	i (tc=5)	i (tc=10)	i (tc=15)	i (tc=30)	i (tc=60)
2	63.59	11.32	0.8350	6.18	4.94	4.14	2.84	1.80
10	50.08	8.669	0.7047	7.93	6.37	5.39	3.81	2.54
25	41.54	6.699	0.6264	8.90	7.12	6.04	4.35	2.99
50	37.55	5.433	0.5759	9.73	7.77	6.61	4.81	3.38
100	34.07	4.226	0.5297	10.50	8.35	7.12	5.24	3.76

Storm Drainage Calculation Methodology (SCS Method)

The SCS Method is used to calculate peak discharges for all systems with drainage areas between 100 – 640 acres.

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

Where:

Q = runoff (in)

P = 2-year, 24-hour rainfall (in)

S = potential maximum retention after runoff begins

Ia = initial abstractions

The equations for S and Ia are described below.

$$I_a = 0.2S$$

$$S = \frac{1000}{CN} - 10$$

Curve numbers (CN) are defined by Table 6 below.

Table 6: Curve Numbers for SCS Method

Land Use	Description	Hydrologic Condition	CN by Hydrologic Soil Group			
			A	B	C	D
Fallow	Bare Soil	--	77	86	91	94
	Crop Residue (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Pasture, grassland, or range-continuous forage for grazing		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
meadow-continuous grass, protected from grazing and generally mowed for hay		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	43	65	76	82
		Good	32	58	72	79
Open Space	grass cover < 50%	Poor	68	79	86	89
	grass cover 50% to 75%	Fair	49	69	79	84
	grass cover > 75%	Good	39	61	74	80
Impervious Area	Paved parking, roofs, driveways		98	98	98	98
Urban Districts	Commercial and Business		89	92	94	95
	Industrial		81	88	91	93
Land Use	Description	Hydrologic Condition	CN by Hydrologic Soil Group			
			A	B	C	D
Residential districts by lot size	1/8 acre of less (town houses)		77	85	90	92
	1/4 acre		61	75	83	87
	1/3 acre		57	72	81	86
	1/2 acre		54	70	80	85
	1 acre		51	68	79	84
	2 acres		46	65	77	82

1.4 Open Channel Hydraulics

Design Criteria

The minimum ditch grade should be 0.30% for non-BMP roadside channels to maintain a self-cleaning minimum velocity of 3 ft/s. The controlling factor is velocity rather than grade. The maximum allowable shear stress in a channel receiving concentrated flow is 3 lbs/ft^2 for vegetative channel lining, as defined in HEC-15. Vegetative channel linings consist of planted or sodden grasses placed in and along the drainage. Maximum allowable shear stress without temporary erosion control blanket (ECB) is 1.75 lbs/ft^2 per SC-M-815-9. Shear stresses above these values will require permanent turf reinforcement matting (PTRM).

Preferred channel lining materials are specified in accordance with the latest SCDOT Supplemental Technical Specifications, and the order of preference is:

1) Grass lining, 2) Erosion control blanket, 3) Turf reinforcement mat, 4) Riprap

No modifications will be made to natural watercourses under jurisdiction of the US Army Corps of Engineers (USACE) unless to prevent scour or erosion, accommodate highway drainage structures, or to provide positive drainage. Outfall channels that are constructed channels will be designed for the upstream roadway design storm.

At the design discharge, it is required that the calculated design headwater be a minimum of 1.0-feet below the subgrade of the road.

Calculations for riprap pads at pipe ends and outfalls can be found in Appendix B.7 of this report.

Methodology

Calculations following HEC-15 and HEC-11 were used to calculate uniform depth and design a stable channel for independent roadside channels and outfall channels. Manning's equation was used to calculate uniform depth in the channel. Shear stress was calculated with the following formula.

$$\tau = \gamma * d * s$$

Where:

τ = shear stress, Pa (lb/ft^2)

γ = unit weight of water, (62.4 lb/ft^3)

d = depth of flow, (ft)

S = energy gradient/channel slope, (ft/ft)

Channel calculations were performed using the FHWA's Hydraulic Toolbox software and can be seen in Appendix B.5.

Summary of Calculated Ditch Depths and Velocities

Ditch calculations were prepared to ensure depths and velocities do not exceed the maximum allowable per the 2009 SCDOT *Requirements for Hydraulic Design Studies* due to the construction of the Project. 10-year design storm peak runoff discharges were used for the analysis. Below is a summary of the ditch depths and velocities. See Appendix B.6 for additional details.

Table 8: Ditch Calculation Summary

Ditch Calculations							
Ditch Name	Station Range	Ditch Type	Peak Discharge (cfs)	Velocity (ft/s)	Flow depth (ft)	Ditch Depth (ft)	Max Shear Stress (lb/ft^2)
DITCH-1-1	1804+04.58-1777+74	TRIANGULAR	23.051	3.34	1.314	5.33	0.936
DITCH-1-2	1777+74-1764+72	TRIANGULAR	44.282	5.928	1.578	5.33	2.845
DITCH-1-3	97+86-97+96	TRIANGULAR	4.889	3.593	0.736	15.7	1.376
DITCH-1-4	1769+39-1763+08	TRIANGULAR	16.824	4.74	1.192	15.7	2.041
DITCH-1-5	1769+39-1759+65	TRIANGULAR	84.965	8.003	2.304	15.66	4.908
DITCH-1-6	1759+65-1756+20	TRAPEZOIDAL	109.56	7.59	1.456	14	2.659
DITCH-1-7	1756+20-1756+37	TRIANGULAR	129.095	6.011	3.277	6	2.462
DITCH-1-11	1751+52-1755+50	TRIANGULAR	7.184	3.938	0.675	5.33	1.624
DITCH-1-12	1784+80-1778+41	TRIANGULAR	6.612	2.539	0.51	2.72	0.708
DITCH-1-13	1776+42-1769+90	TRIANGULAR	0.998	1.853	0.245	3	0.483
DITCH-1-14	1767+99-1760+22	TRIANGULAR	1.513	2.133	0.266	2.84	0.621
DITCH-1-15	1758+43-1760+22	TRIANGULAR	2.517	2.081	0.348	2.64	0.541
DITCH-2-5	1743+83-1746+67	TRIANGULAR	16.463	3.473	1.089	3	1.077
DITCH-2-6	1746+67-1748+10	TRIANGULAR	18.855	3.398	1.178	3	1.005
DITCH-2-7	1742+58-1744+45	TRIANGULAR	10.001	1.949	1.013	3	0.339
DITCH-3-1	1736+48-1733+95	TRIANGULAR	3.775	2.306	0.739	1.5	0.555
DITCH-3-2	1733+95-1731+57	TRIANGULAR	4.588	2.643	0.761	1.5	0.721
DITCH-3-3	1731+57-1731+13	TRIANGULAR	19.542	7.895	1.112	3	1.118

Ditch Name	Station Range	Ditch Type	Peak Discharge (cfs)	Velocity (ft/s)	Flow depth (ft)	Ditch Depth (ft)	Max Shear Stress (lb/ft^2)
DITCH-4-1	113+16-119+37	TRIANGULAR	9.446	4.276	0.858	2.5	1.813
DITCH-5-1	1718+77-1718+83	TRIANGULAR	10.038	5.877	0.663	2	3.658
DITCH-5-2	1722+27-1720+63	TRIANGULAR	8.888	3.894	0.872	2	1.496
DITCH-5-3	1720+63-1718+83	TRIANGULAR	11.257	3.417	1.048	3	1.084
DITCH-6-2	1721+04-1719+01	TRIANGULAR	13.392	3.9	0.927	5	1.433
DITCH-6-3	1719+01-1718_20	TRIANGULAR	13.856	4.438	0.884	5	1.886
DITCH-6-4	1716+51-1714+99	TRIANGULAR	15.865	3.331	1.091	5.33	0.99
DITCH-6-5	1714+99-1711+13	TRIANGULAR	16.312	7.451	1.046	2.6	5.536
DITCH-6-6	1720+10-1721+64	TRIANGULAR	1.038	1.662	0.323	0.66	0.358
DITCH-7-1	1695+03-1703+87	TRIANGULAR	25.111	4.82	1.141	11	2.043
DITCH-8-1	363+67-365+08	TRIANGULAR	13.04	1.97	1.286	2.5	0.324
DITCH-8-3	690+93-696+88	TRAPEZOIDAL	35.109	3.636	1.278	2	0.672
DITCH-8-4	696+88-698+88	TRAPEZOIDAL	36.275	4.231	1.169	2	0.916
DITCH-9-1	708+99-710+02	TRAPEZOIDAL	8.116	4.03	0.353	1.5	0.961
DITCH-9-3	708+90-707+61	TRIANGULAR	100.32	6.359	2.293	3.5	2.89
DITCH-9-4	707+61-705+82	TRIANGULAR	100.956	7.974	2.516	3.5	4.732
TIE TO EXIST	679+50-684+50 LT	TRIANGULAR	5.645	1.507	1.334	2	.125
TIE TO EXIST	679+50-684+50 RT	TRIANGULAR	12.787	1.514	0.81	1.3	.152
TIE TO EXIST	350+50-356+00	TRIANGULAR	1.066	1.094	0.60	0.60	0.178

Ditch Name	Station Range	Ditch Type	Peak Discharge (cfs)	Velocity (ft/s)	Flow depth (ft)	Ditch Depth (ft)	Max Shear Stress (lb/ft^2)
TIE TO EXIST	356+00-357+50	TRIANGULAR	6.612	2.321	0.98	0.98	0.669
TIE TO EXIST	357+50-360+00	TRIANGULAR	5.531	1.651	1.10	1.10	0.33

Outfall Analysis

The project contains twelve (12) outfalls that discharge into an existing natural watercourse outside the right-of-way limits within the study area consisting of Sites 3, 4, 10, 12, 13, 14, 15, 16,17, 18 19, and 20. Below is a summary of each outfall. See Appendix A.4 for Drainage Maps showing the outfall locations and Appendix B.6 for outfall analysis ditch calculations.

Site 3 utilizes existing median ditches and cross line pipes. Starting at I-77 Station 1806+00, water is conveyed through a series of side and median ditches. It flows under I-77 in three locations, once in an existing 6' x 6' reinforced concrete box, once in an existing 30" RCP, and once in an existing 48" RCP. All three crossline structures are being extended. After these crosslines, water follows a singular path to an existing 6' x 6' reinforced concrete box underneath Community Road, where it discharges to an unnamed tributary.

Site 4 utilizes the existing 36" crossline pipe at I-77 Station 1749+00. At the upstream end, a pipe crosses under both Connector Loop A and Ramp BA before flowing into the crossline pipe via side ditches. Discharge is also collected from the area between the connector road and I-77 via an open throat catch basin at connector Station 120+82. Median drainage is also collected via a series of drop inlets in between Connector Ramp BA and I-77 starting at I-77 Station 1747+50. After the water is collected into the existing crossline pipe, it flows through a series of Type 125 catch basins along the edge of Connector Road, before it discharges through a proposed 48" RCP at Connector Road Station 114+50.

Site 10 is composed of a single proposed 36" RCP under CONRPD at Station 1726+00. It serves to help remove water trapped between I-77 and the ramp.

Site 12 discharges near the Norfolk Southern railroad bridge. At the upstream end, I-77 Station 1730+00, the water enters a completely closed system of Type 125 DIs that convey the water through a series of pipes that follow the proposed retaining wall. Water flows briefly through a ditch before reentering the outfall pipe, located at Community Road Station 94+12. Water is also conveyed from offsite into roadway ditch along Community Road and entered a pipe network system that goes between the Norfolk Southern railroad piers and Community Road. This system is also discharged into the same outfall location.

Site 13 is composed of a series of proposed pipes and ditches. Water trapped between I-77 and the northbound off ramp is conveyed under the ramp via a proposed 18" pipe. It flows through a series of ditches until it reaches the RR bridge. Here, the water flows through three pipes, similar to network 5A. After flowing past the bridge, the water flows briefly through a ditch before entering an existing 10' x 10' reinforced concrete box that goes under I-77. This outlet is at the location between I-77 SB and Community Road. The ultimate outfall is an existing 10' x 10' reinforced concrete box under Community Road at I-77 Station 1710+00.

Site 14 is composed of an existing 18" pipe at I-77 Station 1694+00. After collecting water from the median, it is discharged into a proposed ditch. Downstream, it flows into an existing single 6' x 6' reinforced concrete box culvert that briefly outlet between I-77 SB at I-77 Station 1705+00 and Community Road and entered an existing single 6'x6' reinforced concrete box culvert under Community Road which is ultimately outfall into the existing watercourse.

Site 15 is a completely new system that will convey water from within Loop A to an outfall point outside of the ramp configuration. Proposed 36" RCP, with an inlet at between Loop A and Ramp A Station 1742+50, drain the water into the outside ditch of Ramp A, which ultimately discharges at Connector Road Station 160+50 with a proposed double 6'x5' RCBC.

Site 16 is composed of a proposed double 6'x5' RCBC under Connector Road at Station 164+00. It serves to convey water from one side of alignment to the other.

Site 17 is composed of a proposed double 8'x6' RCBC under Connector Road at Station 170+50. It serves to convey water from one side of alignment to the other.

Site 18 is composed of a single proposed 6'x4' RCBC under US-21 at Station 709+50. It serves to convey water from one side of US-21 realignment to the other.

Site 19 is a completely new system located on US 21. Starting at US 21 Station 709+00, water flows into a proposed 6'x4' box culvert via a ditch, then follows another proposed ditch downstream to a proposed double 10' x 7' reinforced concrete box before it discharges at US 21 Station 703+70.

Site 20 is a completely new system located on Farrow Road and US 21. Starting at Farrow Road Station 17+70, water is conveyed through a series of crossline pipes and side ditches, before reaching the outfall point at US 21 Station 699+00.

Sites 13, 14, 15, 16, 17, 18 and 19 were reinforced concrete box culverts that were modeled in HEC-RAS. See Appendix B.11 for analysis.

1.5 Pre vs. Post Construction Peak Runoff

The receiving water body for this project is Beasley Creek, which ultimately discharges into the Atlantic Ocean via the Broad River.

The project outfalls were analyzed in both pre-development and post-development conditions using peak discharges from 10-, 25-, 50-, and 100-year storm events to analyze any potential impacts at the outfall points and downstream areas. The supporting calculations can be found in Appendix B.1 of this report.

The results of the pre-post analysis can be found in Appendix B.1.

Methodology

Rational Method was used for drainage areas less than 100-acres to estimate Pre-construction and Post-construction system runoff. The SCS method was used for drainage areas greater than 100 acres but less than 640 acres.

1.6 Inlet Spacing

Inlet Spacing has been designed per the 2009 SCDOT *Requirements for Hydraulic Design Studies.* Inlet Spacing Tables were used to determine maximum spacing for Type 125 drop inlets. Refer to Appendix B.3 for Inlet Spacing Tables/Spread Calculations.

1.7 Bridge Deck Drain Analysis

A bridge deck drainage analysis has been completed for the conceptual Connector Road overpass bridge over I-77, Ramp BA overpass bridge over I-77, and US-21 overpass bridge over Norfolk Southern railroad. The analysis was completed based on the conceptual bridge plans as seen in Appendix B.5. See below for table of bridge geometry summary and Appendix B.4 for deck drain calculations.

Table 7: Bridge geometry summary

Bridge Location	Length (ft)	Width (ft)	Approach Slab Width (ft)	Spans	Crest Station
Connector Road over I-77	360	122'-5" at End Bent 1 178' at Bent 2 and 3 110' at Bent 4 108'-3" at End Bent 5	20	1@96'-4", 1@59'-6", 1@85'-4", 1@118'-10"	147+55.00
US-21 over Norfolk Southern Railroad	135	78'-3"	20	1@135'	700+03.53
Ramp BA over I-77	138	40'-3"	20	1@155'-0", 1@163'-0"	1741+60.23

All 3 conceptual bridges have a high point on the bridge. Spread analysis was evaluated at every 10-foot interval from high point to end of approach slab stations. The Connector Road and US-21 bridges have a cross slope of 2.0% from grade point elevation (see bridge plans for typical section). Ramp BA over I-77 bridge has a cross slope of 7.2%. Per SCDOT guidelines, width of bridge was analyzed to the outside edge of bridge.

The deck drains were analyzed for 6-inch circular scuppers with 30% blockage and 60% inlet efficiency. The spread was analyzed using the 10-year storm event intensity for Richland County with a minimum time of concentration of 5 minutes.

Per conceptual bridge plans, the southwest corner of Connector Road drains along the barrier wall toward Ramp C and drains west from the beginning of bridge along Connector Road. The results of the deck drain analysis for this southwest corner determined that bridge deck drains will be required with a recommended maximum spacing of approximate 4-ft on center from station 146+99 to 147+19 on the right side. Deck drains will require an underdrain system suspended from the bottom of the bridge with proposed outlet into the roadside ditch at the location under Ramp C near bent 7 and Connector Road bent 2 (refer to structure section of the RFP for more details).

The results also determined that bridge deck drains will be required with a recommended maximum spacing of 4-ft on center from station 147+34 to 147+70 on left side of Connector Road between bent 2 and bent 3 (see Appendix B.5). Deck drains will discharge directly into the roadside ditch between Community Road and I-77 SB.

The results determined that deck drains are not required for US-21 bridge and Ramp BA bridge.

1.8 FEMA Flood Hazard Zones

The proposed interchange was designed to avoid impacts to flood hazard zones identified on the effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs). No FEMA Report or FEMA coordination is required unless it is determined during final design that impacts to flood zones are unavoidable. The effective FEMA FIRMs are map number 45079C0128L with an effective date of 12/21/2017 and 45079C0136L with an effective date of 12/21/2017 and can be found in Appendix A.5.

Coordination between Neel-Schaffer's design team and Scout Motors' design team was conducted. Scout Motors' engineers applied for a Conditional Letter of Map Revision (CLOMR) from FEMA as part of the

Scout Motors development. The CLOMR has not been approved by FEMA as of the date of this report. Proposed HEC-RAS models utilized for the CLOMR application for Beasley Creek and its tributaries were provided from Scout Motors' engineers. Results were evaluated by Neel-Schaffer's design team, and the proposed conceptual SCDOT I-77 interchange was designed to avoid the proposed conditions floodplain elevations and inundation areas shown in the provided proposed conditions Scout Motors HEC-RAS model.

It is the design-build team's responsibility to provide a roadway/embankment design for the I-77 interchange that meets a No-Rise/No-Impact condition for Beasley Creek and its Tributaries. If it is determined during final design that the design-builder cannot avoid floodplain impacts in the final interchange design, the design-builder shall coordinate with the Richland County Floodplain Administrator to determine if an additional MT-2 application will be necessary before or after construction.

1.9 Sediment, Erosion Control and Water Quality

Design Criteria

Construction sediment and erosion control BMPs were selected and designed in accordance with SCDOT Standard Drawings and the SCDOT *Stormwater Quality Design Manual.* A C-SWPPP must be prepared for any project that disturbs more than 1-acre in a coastal zone.

The C-SWPPP must demonstrate that the Project does not allow temporary or permanent stormwater discharges from the Project that will contribute to the violations of the water quality standards to the maximum extent practical (MEP).

Methodology

Potential major erosion control issues are not anticipated during this construction process. Erosion control methods for this project include temporary and permanent seeding, silt fences, sediment tubes along the ditches, sediment dams at the crossline pipes, temporary erosion control blanketing, permanent turf reinforcement matting and pipe outlet protection.

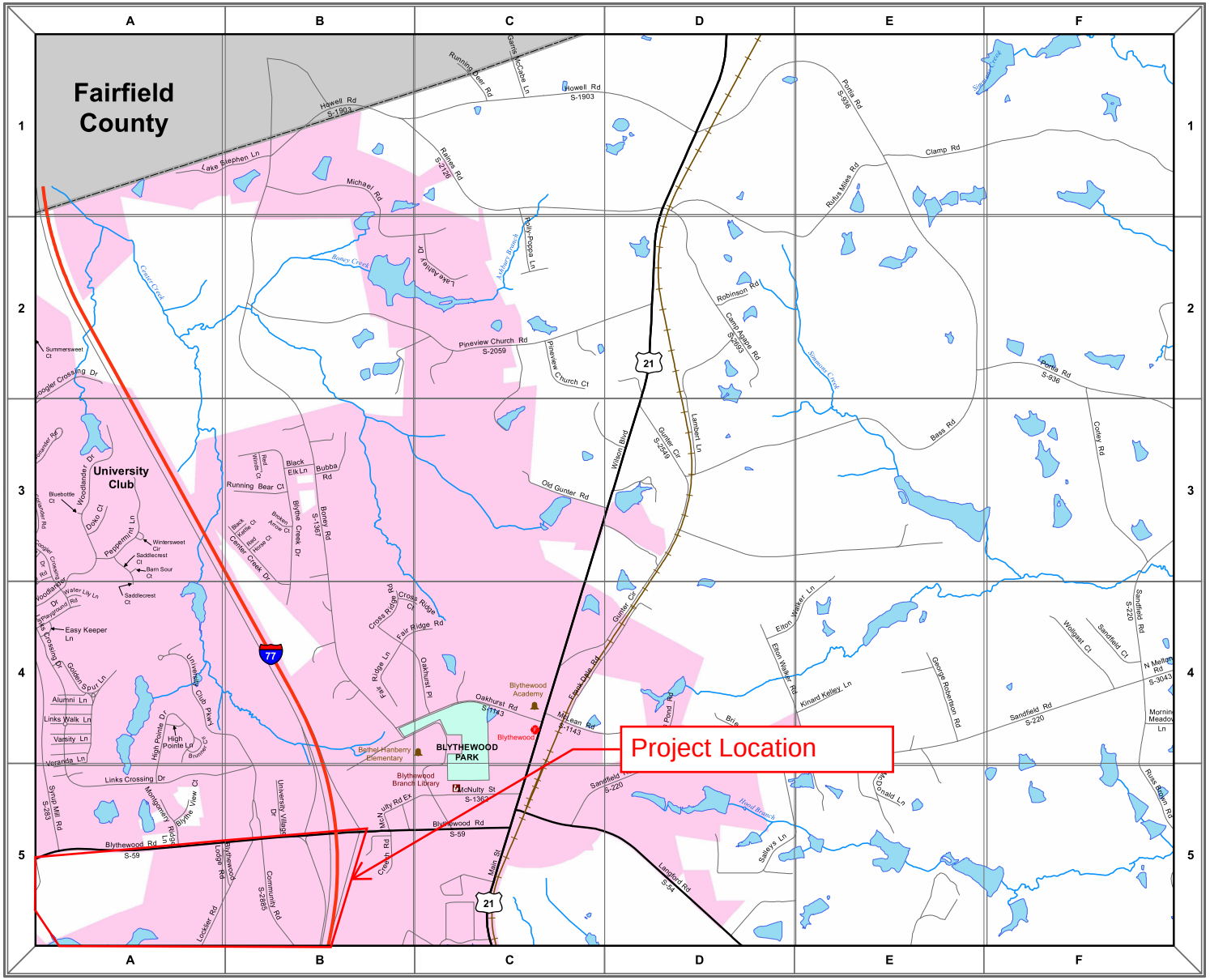
The ultimate receiving water for this project is the Broad River. Construction runoff from this project is not anticipated to impact fecal concentrations, therefore standard erosion control design practices are utilized for this project. Extensive post-construction permanent BMP's are not anticipated to be required.

See the Erosion Control Data Sheet in Appendix B.12 for recommended erosion control devices.

See Appendix B.10 for the Water Quality Report.

APPENDIX A: Mapping

Appendix A.1: Project Location Map



Richland County Map Book

Last Update: Apr 08, 2013

N
W
E
S

0 0.2 0.4 0.8 Miles

- Schools
- Libraries
- Fire Stations
- Police Stations
- Railroads
- Streams
- Lakes
- Colleges
- Hospitals
- Golf Courses
- Parks
- Federal Land
- County Boundary

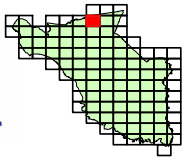
Roads

- Final
- Proposed
- Under Construction
- Arterial Roads
- Interstates

Municipalities

- Arcadia Lakes
- Blythewood
- Columbia
- Eastover
- Forest Acres
- Irmo

RC GEO
www.richlandmaps.com



FAIRFIELD	30	41
21	31	42
22	32	43

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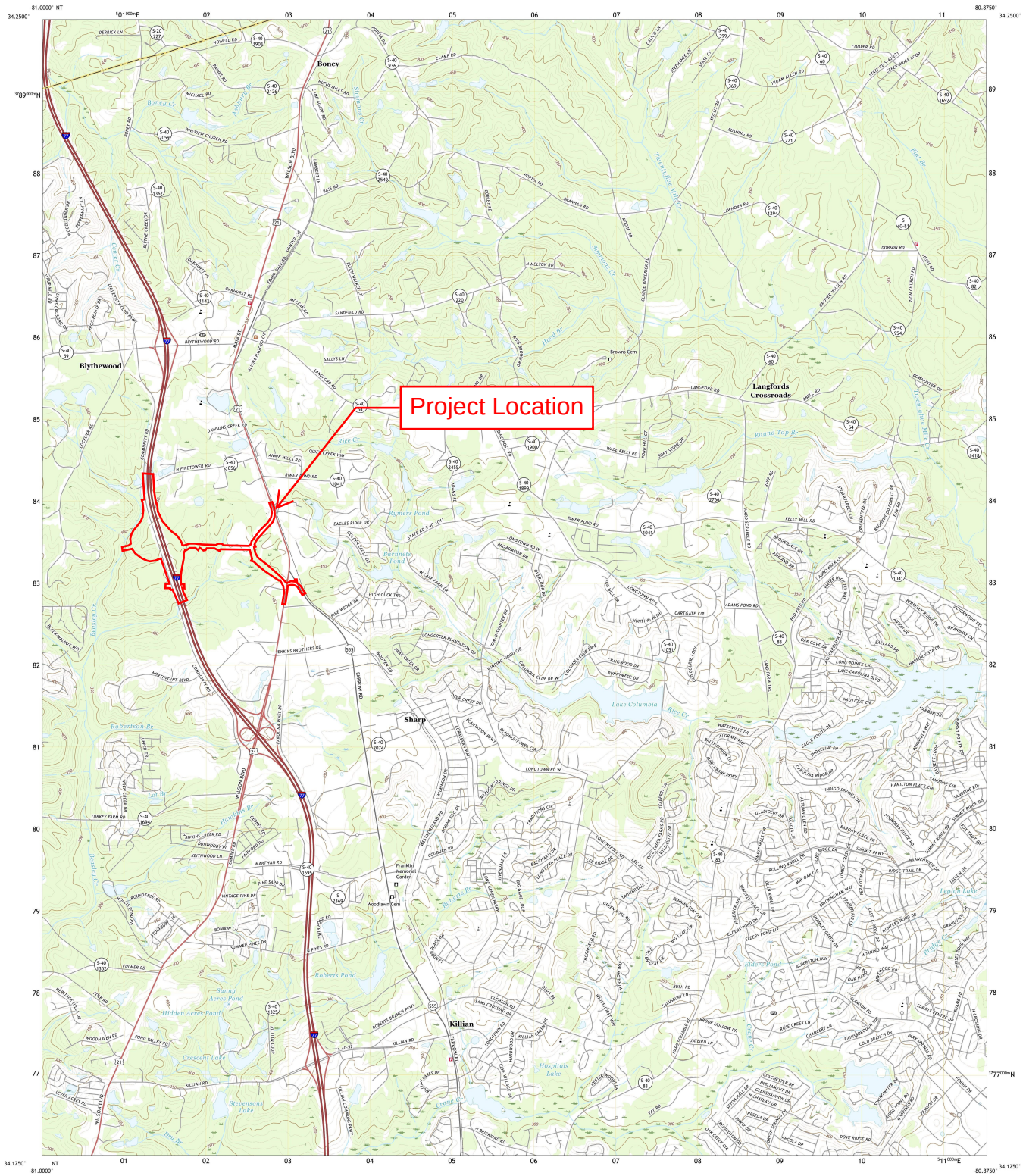
Appendix A.2: USGS Topographic Map

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

BLYTHEWOOD QUADRANGLE
SOUTH CAROLINA
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 17S
This map is not a legal document. Boundaries may be
generalized for this map scale. Private lands within government
reservations may not be shown. Obtain permission before
entering private lands.

Imagery.....NAIP, July 2017 - December 2017
Roads.....U.S. Census Bureau, 2017
Names.....GNIS, 1980 - 2020
Hydrography.....National Hydrography Dataset, 2002 - 2018
Contours.....National Elevation Dataset, 2009 - 2012
Boundaries.....multiple sources; see metadata file 2018 - 2019

Wetlands.....FWS National Wetlands Inventory 1989

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

ADJOINING QUADRANGLES

1 Winnsboro Mills
2 Ridgeway
3 Longtown
4 Irmo NE
5 Elgin
6 Columbia North
7 Fort Jackson North
8 Messers Pond

ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

BLYTHEWOOD, SC
2020

ISBN 978-1-4113-4621-0
MGA REF NO. USGS-X24621

Appendix A.3: Soils Map

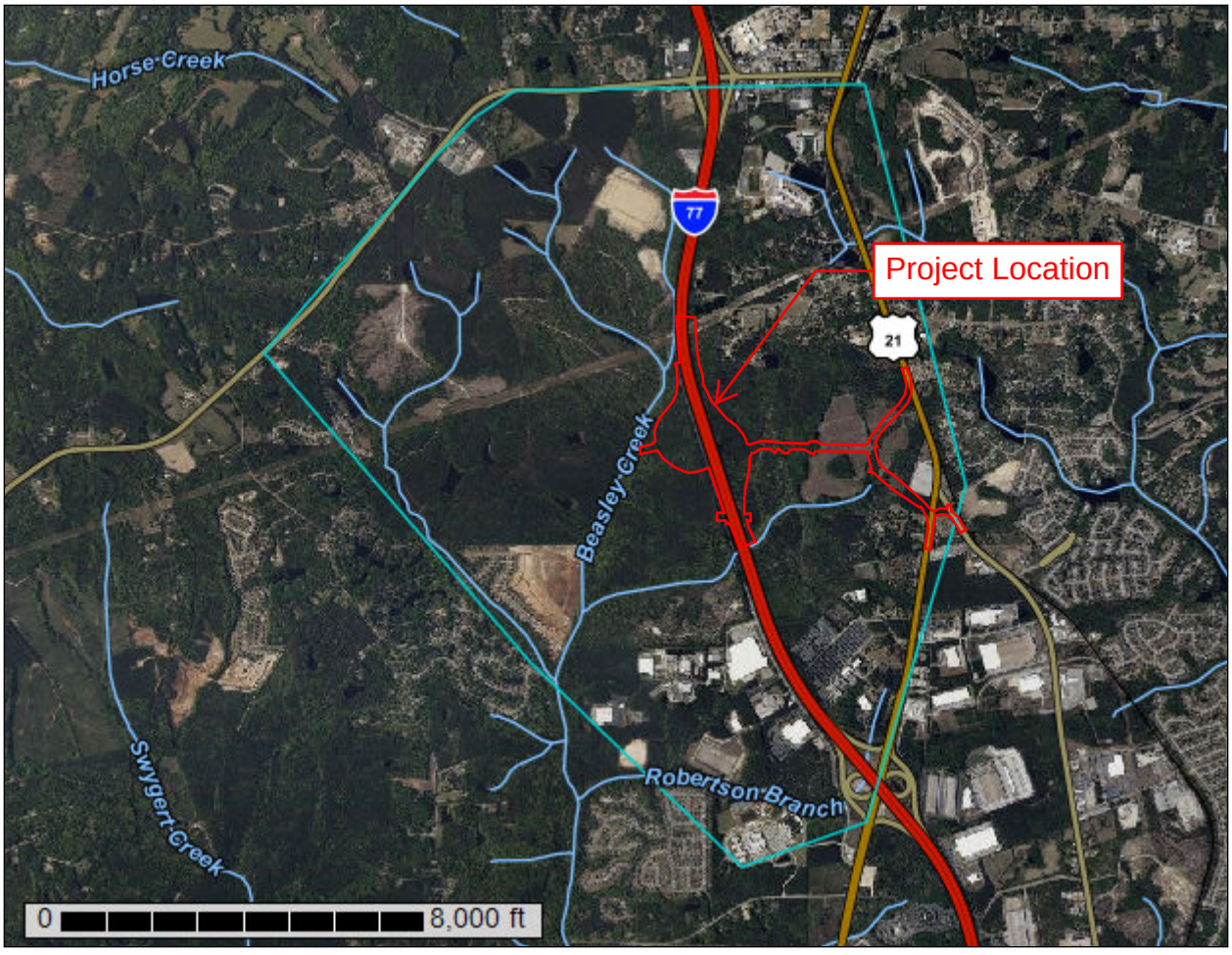
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Richland County, South Carolina



December 22, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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PeD—Pelion loamy sand, 6 to 15 percent slopes.....37
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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

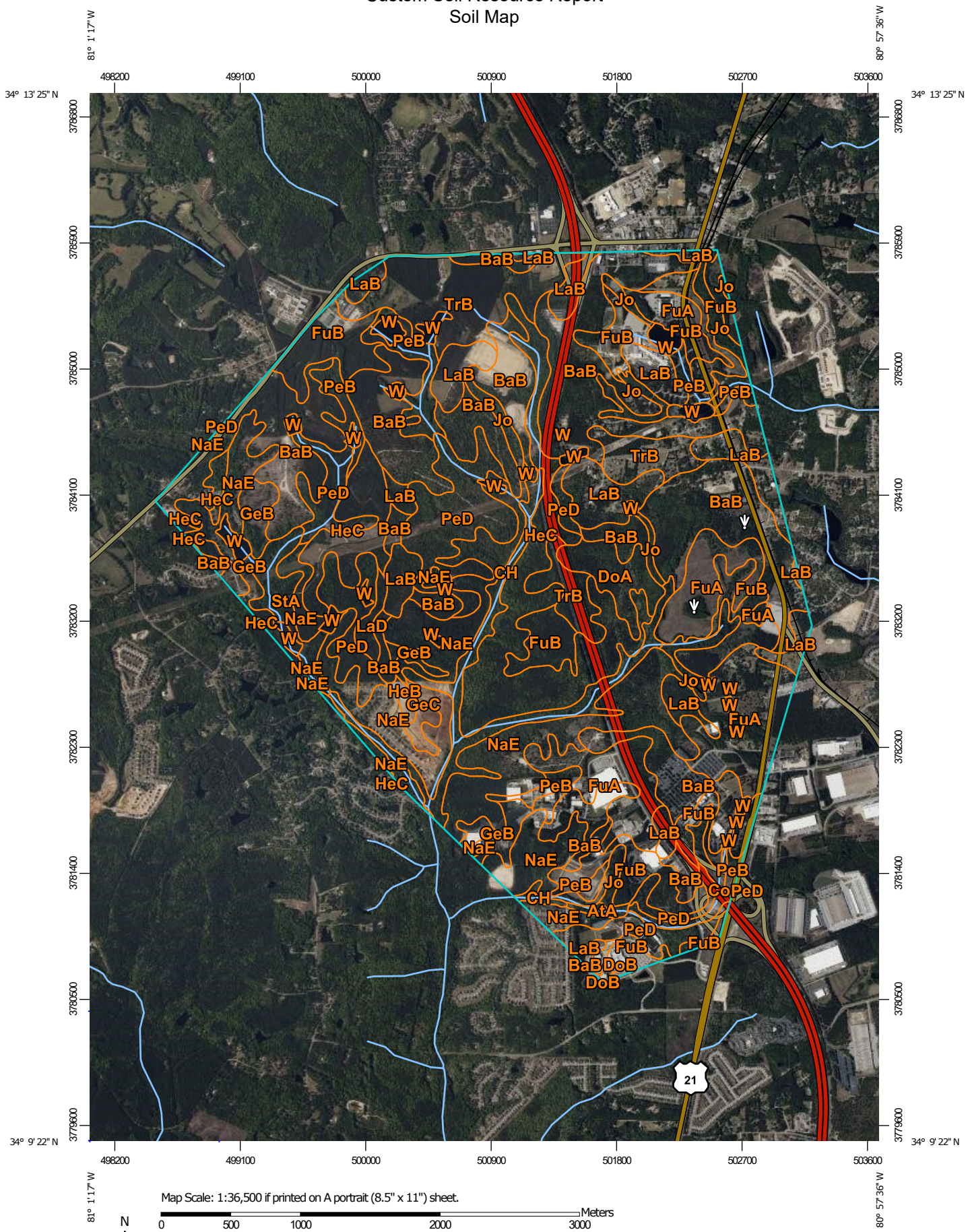
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


81° 1' 17" W
80° 57' 36" W
34° 13' 25" N
34° 9' 22" N
498200
499100
500000
500900
501800
502700
503600
3786800
3785900
3785000
3784100
3783200
3782300
3781400
3780500
3779600
21
Map Scale: 1:36,500 if printed on A portrait (8.5" x 11") sheet.
N
Meters
0 500 1000 2000 3000
Feet
0 1500 3000 6000 9000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Richland County, South Carolina
Survey Area Data: Version 26, Sep 5, 2023

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

Date(s) aerial images were photographed: Apr 15, 2022—May 10, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AtA	Altavista silt loam, 0 to 2 percent slopes	7.1	0.2%
BaB	Blanton sand, 0 to 6 percent slopes	924.5	23.5%
CH	Chewacla soils	121.1	3.1%
Co	Congaree loam	25.2	0.6%
DoA	Dothan loamy sand, 0 to 2 percent slopes	55.8	1.4%
DoB	Dothan loamy sand, 2 to 6 percent slopes	1.3	0.0%
FuA	Fuquay sand, 0 to 2 percent slopes	338.6	8.6%
FuB	Fuquay sand, 2 to 6 percent slopes	340.0	8.6%
GeB	Georgeville silt loam, 2 to 6 percent slopes	74.7	1.9%
GeC	Georgeville silt loam, 6 to 10 percent slopes	13.3	0.3%
HeB	Herndon silt loam, 2 to 6 percent slopes	7.8	0.2%
HeC	Herndon silt loam, 6 to 10 percent slopes	330.4	8.4%
Jo	Johnston loam	101.4	2.6%
KrB	Kirksey loam, 2 to 6 percent slopes	0.0	0.0%
LaB	Lakeland sand, 2 to 6 percent slopes	271.7	6.9%
LaD	Lakeland sand, 10 to 15 percent slopes	15.1	0.4%
NaE	Nanford silt loam, 10 to 30 percent slopes	537.5	13.6%
PeB	Pelion loamy sand, 2 to 6 percent slopes	104.1	2.6%
PeD	Pelion loamy sand, 6 to 15 percent slopes	293.6	7.5%
StA	State sandy loam, 0 to 2 percent slopes	50.9	1.3%
TrB	Troup sand, 0 to 6 percent slopes, Carolina and Georgia Sand Hills	243.9	6.2%
W	Water	81.2	2.1%
Totals for Area of Interest		**3,939.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas

shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Richland County, South Carolina

AtA—Altavista silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4ddf
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Altavista and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Altavista

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy marine deposits

Typical profile

Ap - 0 to 7 inches: silt loam
Bt1 - 7 to 24 inches: silt loam
Bt2 - 24 to 46 inches: loam
C - 46 to 49 inches: loam
Cr - 49 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 49 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: About 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A/D
Ecological site: F136XY660NC - High terraces, very rare Inundation
Hydric soil rating: No

BaB—Blanton sand, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 4ddg
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Not prime farmland

Map Unit Composition

Blanton and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Blanton

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and loamy marine deposits

Typical profile

A - 0 to 9 inches: sand
E - 9 to 50 inches: sand
Bt - 50 to 96 inches: sandy clay loam

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F137XY060GA - Loamy Upland Woodland, Thick Sandy Surface
Hydric soil rating: No

CH—Chewacla soils

Map Unit Setting

National map unit symbol: 4ddl
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Chewacla and similar soils: 80 percent
Minor components: 7 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chewacla

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy alluvium

Typical profile

Ap - 0 to 7 inches: loam
Bw1 - 7 to 20 inches: clay loam
Bw2 - 20 to 50 inches: loam
BC - 50 to 58 inches: clay loam
C - 58 to 75 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F136XY610GA - Flood plain forest, wet
Hydric soil rating: No

Minor Components

Chastain

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Johnston

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Co—Congaree loam

Map Unit Setting

National map unit symbol: 4ddn
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Prime farmland if protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Tawcaw and similar soils: 85 percent
Minor components: 4 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tawcaw

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Clayey alluvium

Typical profile

A - 0 to 4 inches: silty clay loam
B1 - 4 to 22 inches: silty clay
B2 - 22 to 61 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained

Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: About 18 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: F133AY003NC - Atlantic Coastal Plain Small Brownwater River Floodplain - PROVISIONAL, F136XY610GA - Flood plain forest, wet
Hydric soil rating: No

Minor Components

Congaree

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F133AY003NC - Atlantic Coastal Plain Small Brownwater River Floodplain - PROVISIONAL, F136XY620GA - Flood plain forest, moist
Hydric soil rating: No

Chastain

Percent of map unit: 2 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F133AY003NC - Atlantic Coastal Plain Small Brownwater River Floodplain - PROVISIONAL, F136XY600NC - Flood plain forest, very wet
Hydric soil rating: Yes

DoA—Dothan loamy sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2wb8x
Elevation: 50 to 660 feet
Mean annual precipitation: 40 to 69 inches
Mean annual air temperature: 55 to 70 degrees F
Frost-free period: 190 to 310 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Dothan and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dothan

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy marine deposits

Typical profile

Ap - 0 to 7 inches: loamy sand
E - 7 to 13 inches: loamy sand
Bt - 13 to 40 inches: sandy clay loam
Btv - 40 to 79 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 36 to 59 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Forage suitability group: Loamy and clayey soils on rises and knolls of mesic uplands (G133AA321FL)
Other vegetative classification: Loamy and clayey soils on rises and knolls of mesic uplands (G133AA321FL)
Hydric soil rating: No

Minor Components

Norfolk

Percent of map unit: 7 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Fuquay

Percent of map unit: 4 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex

Across-slope shape: Linear
Hydric soil rating: No

Goldsboro

Percent of map unit: 4 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

DoB—Dothan loamy sand, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2wb94
Elevation: 50 to 660 feet
Mean annual precipitation: 40 to 69 inches
Mean annual air temperature: 55 to 70 degrees F
Frost-free period: 190 to 310 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Dothan and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dothan

Setting

Landform: Interfluves
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loamy marine deposits

Typical profile

Ap - 0 to 7 inches: loamy sand
E - 7 to 13 inches: loamy sand
Bt - 13 to 40 inches: sandy clay loam
Btv - 40 to 79 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 36 to 59 inches
Frequency of flooding: None

Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Forage suitability group: Loamy and clayey soils on rises and knolls of mesic uplands (G133AA321FL)
Other vegetative classification: Loamy and clayey soils on rises and knolls of mesic uplands (G133AA321FL)
Hydric soil rating: No

Minor Components

Norfolk

Percent of map unit: 8 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Fuquay

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Orangeburg

Percent of map unit: 5 percent
Landform: Marine terraces
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear, convex
Hydric soil rating: No

FuA—Fuquay sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2wb9h
Elevation: 100 to 640 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 220 to 280 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Fuquay and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fuquay

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits over loamy marine deposits

Typical profile

Ap - 0 to 8 inches: sand
E - 8 to 35 inches: sand
Bt - 35 to 44 inches: sandy clay loam
Btv1 - 44 to 48 inches: sandy clay loam
Btv2 - 48 to 80 inches: sandy clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 44 to 60 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Forage suitability group: Sandy over loamy soils on rises, knolls, and ridges of mesic uplands (G133AA221FL)
Other vegetative classification: Sandy over loamy soils on rises, knolls, and ridges of mesic uplands (G133AA221FL)
Hydric soil rating: No

Minor Components

Dothan

Percent of map unit: 8 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear

Other vegetative classification: Loamy and clayey soils on rises and knolls of mesic uplands (G133AA321FL)
Hydric soil rating: No

Troup

Percent of map unit: 4 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

FuB—Fuquay sand, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2wb9m
Elevation: 100 to 640 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Fuquay and similar soils: 88 percent
Minor components: 12 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fuquay

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Sandy marine deposits over loamy marine deposits

Typical profile

Ap - 0 to 8 inches: sand
E - 8 to 35 inches: sand
Bt - 35 to 44 inches: sandy clay loam
Btv1 - 44 to 48 inches: sandy clay loam
Btv2 - 48 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: About 44 to 60 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Forage suitability group: Sandy over loamy soils on rises, knolls, and ridges of mesic uplands (G133AA221FL)
Other vegetative classification: Sandy over loamy soils on rises, knolls, and ridges of mesic uplands (G133AA221FL)
Hydric soil rating: No

Minor Components

Dothan

Percent of map unit: 8 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Loamy and clayey soils on rises and knolls of mesic uplands (G133AA321FL)
Hydric soil rating: No

Troup

Percent of map unit: 4 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

GeB—Georgeville silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2sclx
Elevation: 330 to 630 feet
Mean annual precipitation: 40 to 69 inches
Mean annual air temperature: 50 to 66 degrees F
Frost-free period: 180 to 280 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Georgeville and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Georgeville

Setting

Landform: Ridges, interfluves
Landform position (two-dimensional): Backslope, summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from metavolcanics and/or residuum weathered from metasedimentary rock and/or residuum weathered from slate

Typical profile

A - 0 to 6 inches: silt loam
Bt1 - 6 to 42 inches: clay
Bt2 - 42 to 53 inches: silty clay
C - 53 to 80 inches: silt loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

Minor Components

Badin, moderately eroded

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Tatum

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Nason

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Kirksey

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

GeC—Georgeville silt loam, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 2wb8s
Elevation: 160 to 640 feet
Mean annual precipitation: 40 to 69 inches
Mean annual air temperature: 50 to 66 degrees F
Frost-free period: 180 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Georgeville and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Georgeville

Setting

Landform: Interfluves, ridges
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Residuum weathered from metavolcanics and/or residuum weathered from metasedimentary rock and/or residuum weathered from slate

Typical profile

Ap - 0 to 6 inches: silt loam

Bt - 6 to 45 inches: clay
BC - 45 to 50 inches: silty clay loam
C - 50 to 80 inches: silty clay loam

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

Minor Components

Badin

Percent of map unit: 5 percent
Landform: Ridges, interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Tarrus

Percent of map unit: 3 percent
Landform: Ridges, interfluves
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Goldston

Percent of map unit: 2 percent
Landform: Interfluves, ridges
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

HeB—Herndon silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2rkjn
Elevation: 70 to 980 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Herndon and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Herndon

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from phyllite

Typical profile

Ap - 0 to 8 inches: silt loam
Bt1 - 8 to 12 inches: silty clay loam
Bt2 - 12 to 44 inches: clay
C - 44 to 80 inches: silt loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

Minor Components

Nanford

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Lignum

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

HeC—Herndon silt loam, 6 to 10 percent slopes

Map Unit Setting

National map unit symbol: 4df4
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Herndon and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Herndon

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Clayey residuum weathered from slate

Typical profile

A - 0 to 2 inches: silt loam
E - 2 to 9 inches: loam
Bt - 9 to 38 inches: silty clay
BC - 38 to 52 inches: silty clay loam
C - 52 to 62 inches: silt loam

Cr - 62 to 75 inches: bedrock

Properties and qualities

Slope: 6 to 10 percent
Depth to restrictive feature: 62 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

Jo—Johnston loam

Map Unit Setting

National map unit symbol: 4df6
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Not prime farmland

Map Unit Composition

Johnston and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Johnston

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A1 - 0 to 9 inches: loam
A2 - 9 to 38 inches: mucky loam
Cg - 38 to 66 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.8 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A/D
Ecological site: F137XY010SC - Flood Plains And Seepage Swamps
Hydric soil rating: Yes

KrB—Kirksey loam, 2 to 6 percent slopes

Map Unit Setting
National map unit symbol: 4df8
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Kirksey and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kirksey

Setting
Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Fine-silty residuum weathered from slate

Typical profile
A - 0 to 6 inches: loam
E - 6 to 9 inches: loam
Bt - 9 to 21 inches: silty clay loam
BC - 21 to 41 inches: silt loam
C - 41 to 75 inches: bedrock

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: 41 inches to paralithic bedrock
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)

Depth to water table: About 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F136XY810SC - Acidic upland forest, seasonally wet
Hydric soil rating: No

LaB—Lakeland sand, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 4df9
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Not prime farmland

Map Unit Composition

Lakeland and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lakeland

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy marine deposits

Typical profile

A - 0 to 29 inches: sand
C - 29 to 99 inches: sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F137XY070SC - Dry Sandy Upland Woodland
Hydric soil rating: No

LaD—Lakeland sand, 10 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2th08
Elevation: 90 to 670 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Lakeland and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lakeland

Setting

Landform: Dunes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Eolian sands

Typical profile

A - 0 to 5 inches: sand
C1 - 5 to 44 inches: sand
C2 - 44 to 84 inches: sand

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: F137XY080SC - Dry Sandy Backslope Woodland
Hydric soil rating: No

Minor Components

Lucknow

Percent of map unit: 3 percent
Landform: Dunes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F137XY060GA - Loamy Upland Woodland, Thick Sandy Surface
Hydric soil rating: No

Troup

Percent of map unit: 2 percent
Landform: Dunes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F137XY060GA - Loamy Upland Woodland, Thick Sandy Surface
Hydric soil rating: No

NaE—Nanford silt loam, 10 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2yclt
Elevation: 160 to 550 feet
Mean annual precipitation: 40 to 64 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 200 to 260 days
Farmland classification: Not prime farmland

Map Unit Composition

Nanford and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nanford

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Clayey residuum weathered from slate

Typical profile

A - 0 to 5 inches: silt loam
E - 5 to 11 inches: silt loam

Bt - 11 to 41 inches: silty clay
R - 41 to 80 inches: bedrock

Properties and qualities

Slope: 10 to 30 percent
Depth to restrictive feature: 15 to 49 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

Minor Components

Georgeville

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Callison

Percent of map unit: 5 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

PeB—Pelion loamy sand, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 4dfv
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Pelion and similar soils: 90 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pelion

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Typical profile

A - 0 to 5 inches: loamy sand
E - 5 to 7 inches: loamy sand
Bt1 - 7 to 26 inches: sandy clay loam
Bt2 - 26 to 57 inches: sandy clay loam
BCg - 57 to 58 inches: sandy clay loam
Cg - 58 to 75 inches: loamy sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: About 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Ecological site: F137XY030SC - Seasonally Wet Lowland and Valley Slope
Hydric soil rating: No

Minor Components

Rains

Percent of map unit: 2 percent
Landform: Marine terraces, flats, depressions
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: F137XY020SC - Hillside Seep
Hydric soil rating: Yes

Johnston

Percent of map unit: 1 percent
Landform: Flood plains
Down-slope shape: Linear

Across-slope shape: Linear
Ecological site: F137XY010SC - Flood Plains And Seepage Swamps
Hydric soil rating: Yes

PeD—Pelion loamy sand, 6 to 15 percent slopes

Map Unit Setting

National map unit symbol: 4dfw
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Not prime farmland

Map Unit Composition

Pelion and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pelion

Setting

Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy marine deposits

Typical profile

A - 0 to 5 inches: loamy sand
E - 5 to 7 inches: loamy sand
Bt1 - 7 to 26 inches: sandy clay loam
Bt2 - 26 to 57 inches: sandy clay loam
BCg - 57 to 58 inches: sandy clay loam
Cg - 58 to 75 inches: loamy sand

Properties and qualities

Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.57 in/hr)
Depth to water table: About 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: C/D

Ecological site: F137XY030SC - Seasonally Wet Lowland and Valley Slope
Hydric soil rating: No

StA—State sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4dg1
Elevation: 80 to 550 feet
Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Wickham and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wickham

Setting

Landform: Stream terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy fluviomarine deposits

Typical profile

Ap - 0 to 5 inches: sandy loam
E - 5 to 9 inches: sandy loam
Bt1 - 9 to 25 inches: sandy clay loam
Bt2 - 25 to 48 inches: clay loam
C1 - 48 to 68 inches: silty clay loam
C2 - 68 to 78 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

TrB—Troup sand, 0 to 6 percent slopes, Carolina and Georgia Sand Hills

Map Unit Setting

National map unit symbol: 2tzkn
Elevation: 80 to 630 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 59 to 66 degrees F
Frost-free period: 220 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Troup and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Troup

Setting

Landform: Marine terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Loamy fluviomarine deposits

Typical profile

Ap - 0 to 10 inches: sand
E - 10 to 54 inches: sand
Bt - 54 to 80 inches: sandy clay loam

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F137XY060GA - Loamy Upland Woodland, Thick Sandy Surface
Hydric soil rating: No

Minor Components

Blanton

Percent of map unit: 5 percent

Landform: Marine terraces
Landform position (two-dimensional): Summit, shoulder, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F137XY060GA - Loamy Upland Woodland, Thick Sandy Surface
Hydric soil rating: No

Lakeland

Percent of map unit: 3 percent
Landform: Dunes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F137XY070SC - Dry Sandy Upland Woodland
Hydric soil rating: No

Fuquay

Percent of map unit: 3 percent
Landform: Marine terraces
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F137XY040SC - Loamy Summit Woodland
Hydric soil rating: No

Wagram

Percent of map unit: 2 percent
Landform: Marine terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Lucy

Percent of map unit: 2 percent
Landform: Marine terraces
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

W—Water

Map Unit Setting

National map unit symbol: 4dg9
Elevation: 80 to 550 feet

Mean annual precipitation: 44 to 55 inches
Mean annual air temperature: 61 to 70 degrees F
Frost-free period: 230 to 265 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: Unranked

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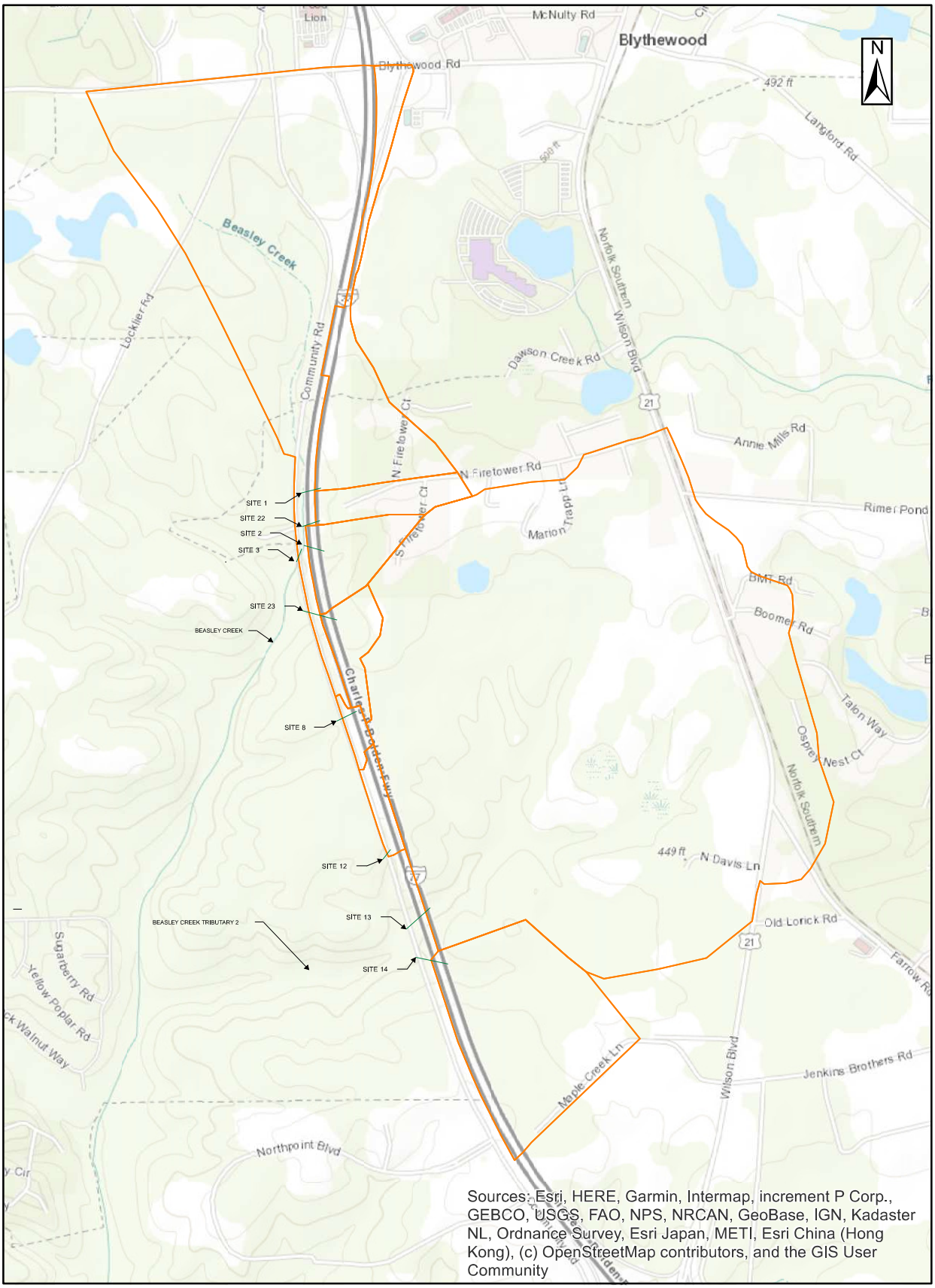
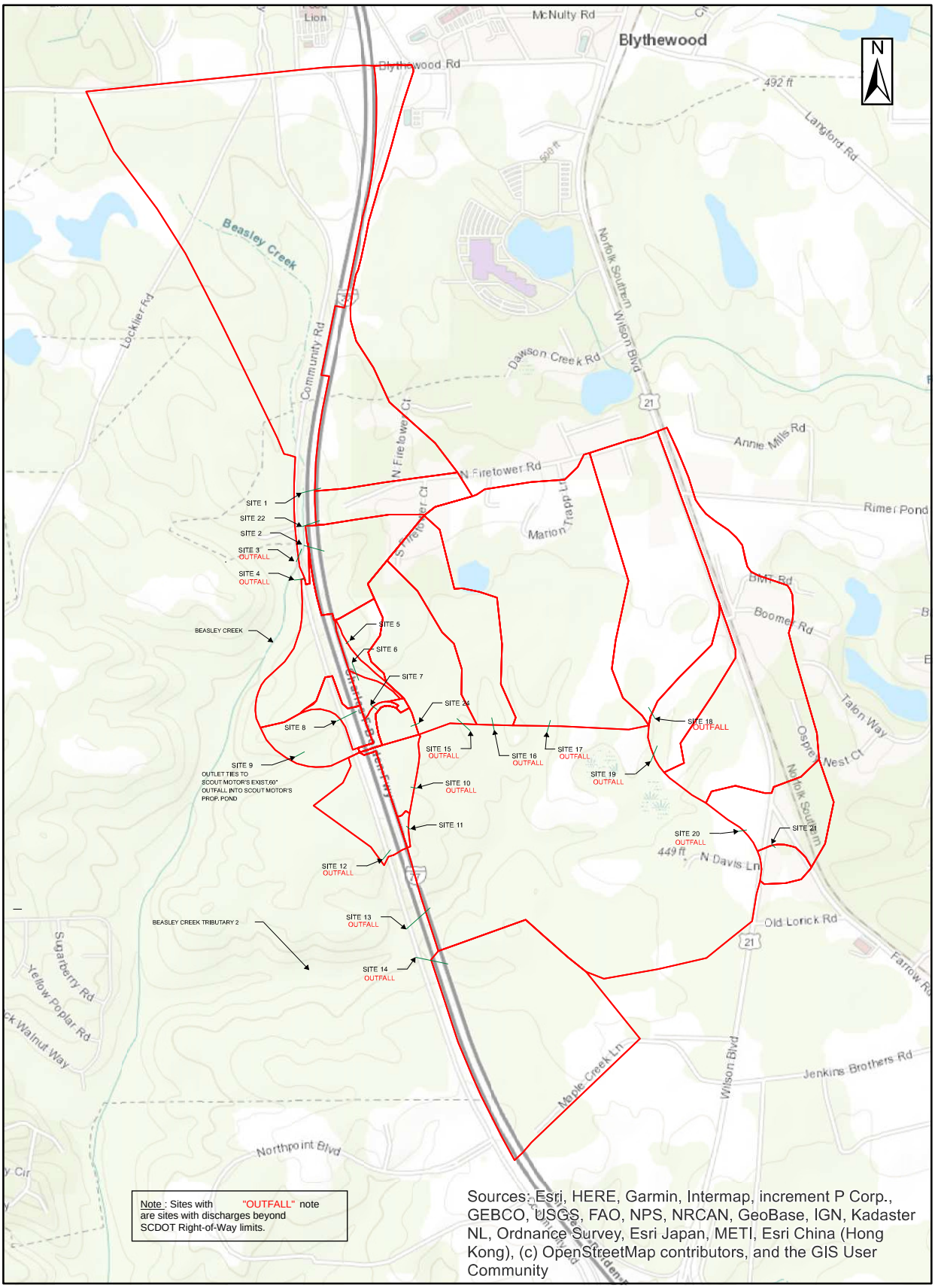
Appendix A.4: Drainage Maps



I-77 Scout Interchange
Pre-Development Drainage Map

Richland County, SC
December 2023



I-77 Scout Interchange
Post-Development Drainage Map

Richland County, SC
December 2023

Appendix A.5: FEMA Map

81°W 34°13'14.11"N

80°58'7.08"W 34°11'8.44"N

FLOOD HAZARD INFORMATION

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

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **12/22/2023 3:58 PM** 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. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88

For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

0 50 100 200 300 400 Meters

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **128** OF **650**

Panel Contains:

COMMUNITY	NUMBER	PANEL
TOWN OF BLYTHEWOOD	450258	0128
RICHLAND COUNTY	450170	0128

MAP NUMBER
45079C0128L
EFFECTIVE DATE
December 21, 2017

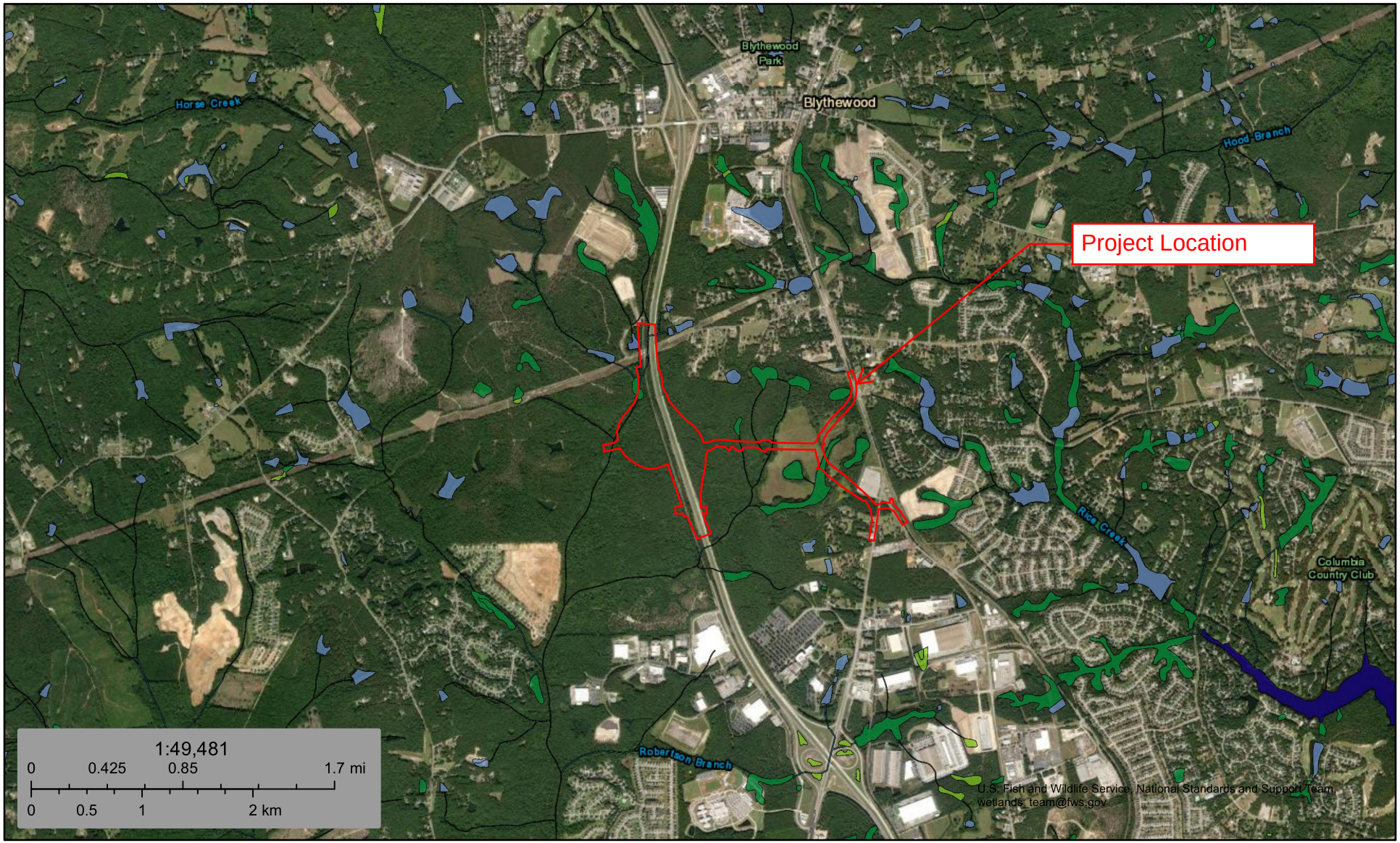
81°W 34°11'21.61"N

Richland County
Unincorporated Areas
450170
Town of Blythewood
450258
Richland County
Unincorporated Areas
450170
AREA OF MINIMAL FLOOD HAZARD
Zone X
Richland County
Unincorporated Areas
450170
AREA OF MINIMAL FLOOD HAZARD
Zone X
FLOODWAY
Zone AE
Zone AE
Zone AE

Appendix A.6: Wetlands

U.S. Fish and Wildlife Service
National Wetlands Inventory

I-77 Scout Interchange NWI Wetlands Map



December 22, 2023

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

APPENDIX B: Hydraulic Calculations

Appendix B.1: Watershed Area Calculations

I-77 Scout Interchange Pre-Development Rational Method Calculations

	IDF COEFFICIENT		
YEAR	a	b	c
2	63.59	11.32	0.835
10	50.08	8.669	0.7047
25	41.54	6.699	0.6264
50	37.55	5.433	0.5759
100	34.07	4.226	0.5297

Site 1							hrs						Intensity					Flow Rate				
	Total Area	2406382	55.243	acres	Tc	Tsheet, hr		0.19	Tshallow	0.71	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	5114.35	r	0.447227	1.95	2.72	3.18	3.58	3.97	33.95	47.43	61.03	74.94	86.46
Impervious area	175354.677	0.90				S	0.00561		S	0.01540	s	0.01155									na	na
City Business Area	24587.0143	0.85				n	0.1		v	2.00	v	0.62										
Residential : 10,000 ft ^{2} Lot	143957.2872	0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	343898.9785																					
Unimproved Forest	2062483.446	0.25					hrs	minutes			L	0										
Composite C	0.32					Tc	0.89	53.68														

Site 22							hrs						Intensity					Flow Rate				
	Total Area	738253.1	16.948	acres	Tc	Tsheet, hr		0.19	Tshallow	0.25	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	1777.19	r	0.447227	3.10	4.12	4.68	5.17	5.61	20.53	27.29	34.09	41.01	46.40
Impervious area	51536.7298	0.90				S	0.00561		S	0.01540	s	0.01155									na	na
City Business Area		0.85				n	0.1		v	2.00	v	0.62										
Residential : 10,000 ft ^{2} Lot	350775.2355	0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Rail		0.3																				
Total	402311.9653																					
Unimproved Forest	335941.134	0.25					hrs	minutes			L	0										
Composite C	0.39					Tc	0.43	25.90														

Site 23							hrs						Intensity					Flow Rate				
	Total Area	636016.9	14.601	acres	Tc	Tsheet, hr		0.15	Tshallow	0.22	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	1304.44	r	0.447227	3.42	4.51	5.10	5.60	6.06	15.18	20.00	24.87	29.81	33.62
Impervious area	52651.3419	0.90				S	0.00980		S	0.01090	s	0.01155									na	na
City Business Area		0.85				n	0.1		v	1.68	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	52651.3419																					
Unimproved Forest	583365.517	0.25					hrs	minutes			L	0										
Composite C	0.30					Tc	0.36	21.79														

Site 8							hrs						Intensity					Flow Rate				
	Total Area	176544.6	4.053	acres	Tc	Tsheet, hr	0.20	Tshallow	0.27	Tchannel	0.00		I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100	L	1555.44	r	0.447227		2.96	3.95	4.50	4.97	5.41	6.23	8.31	10.41	12.55	14.22
Impervious area	73164.3184	0.90				S	0.00460	S	0.01000	s	0.01155										na	na
City Business Area		0.85				n	0.1	v	1.61	v	0.62											
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6			n	0.15											
Residential: 12,000 ft ^{2} Lot		0.42								area ft^2	2											
Industrial		0.6								p	4.472											
Parks		0.2																				
Total	73164.3184																					
Unimproved Forest	103380.299	0.25					hrs	minutes				L	0									
Composite C	0.52					Tc	0.47	28.09														

Site 12							hrs						Intensity					Flow Rate				
	Total Area	299531.5	6.876	acres	Tc	Tsheet, hr	0.10	Tshallow	0.18	Tchannel	0.00		I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100	L	1397.33	r	0.447227		3.93	5.12	5.76	6.30	6.80	13.55	17.68	21.85	26.09	29.32
Impervious area	116081.5275	0.90				S	0.02620	S	0.01800	s	0.01155										na	na
City Business Area		0.85				n	0.1	v	2.16	v	0.62											
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6			n	0.15											
Residential: 12,000 ft ^{2} Lot		0.42								area ft^2	2											
Industrial		0.6								p	4.472											
Parks		0.2																				
Total	116081.5275																					
Unimproved Forest	183449.928	0.25					hrs	minutes				L	0									
Composite C	0.50					Tc	0.28	16.75														

Site 3
SEE GEOPAK DRAINAGE.
DRAINAGE AREA = 327 AC
Q10=198.818 CFS

Site 14							hrs						Intensity					Flow Rate				
	Total Area	3529536	81.027	acres	Tc	Tsheet, hr	0.12	Tshallow	0.40	Tchannel	0.00		I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100	L	2789.46	r	0.447227		2.78	3.74	4.27	4.73	5.16	94.03	126.27	158.69	191.71	217.79
Impervious area	905213.8476	0.90				S	0.01656	S	0.01460	s	0.01155										na	na
City Business Area		0.85				n	0.1	v	1.95	v	0.62											
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6			n	0.15											
Residential: 12,000 ft ^{2} Lot		0.42								area ft^2	2											
Industrial		0.6								p	4.472											
Parks		0.2																				
Total	905213.8476	0.9																				
Unimproved Forest	2624322.272	0.25					hrs	minutes				L	0									
Composite C	0.42					Tc	0.52	31.05														

I-77 Scout Interchange Pre-Development SCS Method Calculations

| Site 17- SCS CN Method | | |

This spreadsheet computes the 50-, 20-, 10-, 4-, 2-, 1-, 0.5-, and 0.2-percent chance exceedance flows for an ungaged site in Georgia, South Carolina, and North Carolina. The spreasheet also includes the 95-percent prediction intervals, the minus and plus standard error of prediction intervals, and the average standard error of prediction. To use the spreadsheet, enter requested information in the yellow cells below.

Enter a site-description name: Site 13

Enter the explanatory variables:

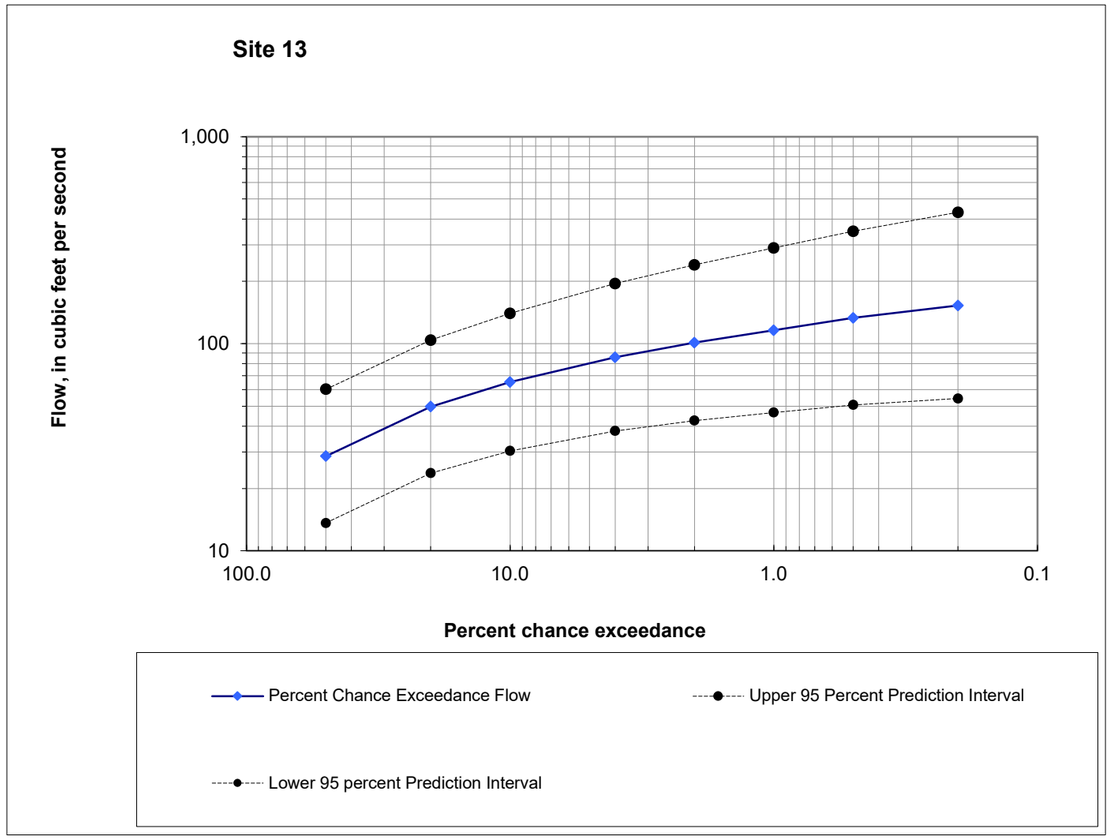
Drainage area, in square miles	1.15
Percent of basin in Hydrologic Region 1	0
Percent of basin in Hydrologic Region 2	0
Percent of basin in Hydrologic Region 3	100
Percent of basin in Hydrologic Region 4	0
Percent of basin in Hydrologic Region 5	0

Applicable range of draingage area is 1 to 9,000 square miles.
Hydrologic Region 1 corresponds to the USEPA Level III Ridge and Valley and Piedmont ecoregions
Hydrologic Region 2 corresponds to the USEPA Level III Blue Ridge ecoregion
Hydrologic Region 3 corresponds to the USEPA Level IV Sand Hills ecoregion
Hydrologic Region 4 corresponds to the USEPA Level III Southeastern, Middle Atlantic Coastal, and Southern Coastal Plain ecoregions
Hydrologic Region 5 corresponds to the lower portion of the USEPA Level IV Tifton Uplands ecoregion.

Sum of region percentages	100

Drainage area check
DRAINAGE AREA WITHIN APPLICABLE LIMITS.

Percent chance exceedance	Percent chance exceedance flow, in ft^3/s	Lower 95 percent prediction interval flow, in ft^3/s	Upper 95 percent prediction interval flow, in ft^3/s	$-S_{P,i}$ (percent)	$+S_{P,i}$ (percent)	Average $S_{p,i}$ (percent)
50	29	14	60	-31.6	46.1	39.3
20	50	24	104	-31.4	45.8	39.1
10	65	30	140	-32.4	47.8	40.6
4	86	38	195	-34.2	51.9	43.7
2	101	43	240	-35.7	55.6	46.4
1	116	47	290	-37.3	59.5	49.3
0.5	133	51	349	-38.9	63.7	52.4
0.2	153	54	431	-41.0	69.5	56.7



I-77 Scout Interchange Post-Development Rational Method Calculations

	IDF COEFFICIENT		
YEAR	a	b	c
2	63.59	11.32	0.835
10	50.08	8.669	0.7047
25	41.54	6.699	0.6264
50	37.55	5.433	0.5759
100	34.07	4.226	0.5297

Site 1

							hrs					Intensity					Flow Rate				
	Total Area	2406382	55.243	acres	Tc	Tsheet, hr	0.19	Tshallow	0.71	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100	L	5114.35	r	0.447227	1.95	2.72	3.18	3.58	3.97	35.75	49.95	64.27	78.92	91.05
Impervious area	237369.0534	0.90				S	0.00561	S	0.01540	s	0.01155									na	na
City Business Area	24587.0143	0.85				n	0.1	v	2.00	v	0.62										
Residential : 10,000 ft ^{2} Lot	143957.2872	0.45				2 YR depth	3.6			n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42								area ft^2	2										
Industrial		0.6								p	4.472										
Parks		0.2																			
Total	405913.3549																				
Unimproved Forest	2000469.069	0.25					hrs	minutes													
Composite C	0.33					Tc	0.89	53.68													

Site 22

							hrs					Intensity					Flow Rate				
	Total Area	738253.1	16.948	acres	Tc	Tsheet, hr	0.19	Tshallow	0.25	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100	L	1777.19	r	0.447227	3.10	4.12	4.68	5.17	5.61	21.07	28.01	34.98	42.09	47.62
Impervious area	63169.4497	0.90				S	0.00561	S	0.01540	s	0.01155									na	na
City Business Area		0.85				n	0.1	v	2.00	v	0.62										
Residential : 10,000 ft ^{2} Lot	350775.2355	0.45				2 YR depth	3.6			n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42								area ft^2	2										
Industrial		0.6								p	4.472										
Parks		0.2																			
Total	413944.6852																				
Unimproved Forest	324308.414	0.25					hrs	minutes													
Composite C	0.40					Tc	0.43	25.90													

Site 3
SEE GEOPAK DRAINAGE.
DRAINAGE AREA = 327 AC
Q10=198.818 CFS

Site 5							hrs						Intensity					Flow Rate				
	Total Area	339019.5	7.783	acres	Tc	Tsheet, hr	0.09	Tshallow	0.05	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100	L	474.306	r	0.447227	5.27	6.78	7.58	8.27	8.89	16.27	20.91	25.73	30.61	34.28
Impervious area	76422.1855	0.90				S	0.03165	S	0.02940	s	0.01155									na	na
City Business Area		0.85				n	0.1	v	2.77	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6			n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42								area ft^2	2										
Industrial		0.6								p	4.472										
Parks		0.2																			
Total	76422.1855																				
Unimproved Forest	262597.360	0.25					hrs	minutes				L	0								
Composite C	0.40					Tc	0.14	8.42													

Site 6							hrs						Intensity					Flow Rate				
	Total Area	227841.5	5.231	acres	Tc	Tsheet, hr	0.13	Tshallow	0.05	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100	L	765.88	r	0.447227	4.73	6.11	6.83	7.46	8.02	12.05	15.55	19.14	22.78	25.51
Impervious area	83019.8659	0.90				S	0.01290	S	0.06210	s	0.01155									na	na
City Business Area		0.85				n	0.1	v	4.02	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6			n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42								area ft^2	2										
Industrial		0.6								p	4.472										
Parks		0.2																			
Total	83019.8659																				
Unimproved Forest	144821.586	0.25					hrs	minutes				L	0								
Composite C	0.49					Tc	0.19	11.13													

Site 7							hrs						Intensity					Flow Rate				
	Total Area	77467.9	1.778	acres	Tc	Tsheet, hr	0.12	Tshallow	0.08	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100	L	540	r	0.447227	4.55	5.89	6.59	7.19	7.74	3.18	4.11	5.07	6.03	6.76
Impervious area	17037.06	0.90				S	0.01510	S	0.01400	s	0.01155									na	na
City Business Area		0.85				n	0.1	v	1.91	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6			n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42								area ft^2	2										
Industrial		0.6								p	4.472										
Parks		0.2																			
Total	17037.06																				
Unimproved Forest	60430.842	0.25					hrs	minutes				L	0								
Composite C	0.39					Tc	0.20	12.19													

Site 8							hrs						Intensity					Flow Rate				
	Total Area	242027.4	5.556	acres	Tc	Tsheet, hr	0.17	Tshallow	0.59	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100	L	2881.96	r	0.447227	2.17	3.00	3.48	3.90	4.29	4.73	6.53	8.34	10.18	11.69
Impervious area	52863.75	0.90				S	0.00730	S	0.00696	s	0.01155									na	na
City Business Area		0.85				n	0.1	v	1.35	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6			n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42								area ft^2	2										
Industrial		0.6								p	4.472										
Parks		0.2																			
Total	52863.75																				
Unimproved Forest	189163.649	0.25					hrs	minutes				L	0								
Composite C	0.39					Tc	0.76	45.68													

Site 10							hrs						Intensity					Flow Rate				
	Total Area	795090.7	4.795	acres	Tc	Tsheet, hr	0.09		Tshallow	0.05	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	474.306	r	0.447227	5.27	6.78	7.58	8.27	8.89	6.95	8.94	11.00	13.08	14.65
Impervious area	30628	0.90				S	0.03165		S	0.02940	s	0.01155									na	na
City Business Area		0.85				n	0.1		v	2.77	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.5				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	30628	0.9																				
Unimproved Forest	764462.749	0.25					hrs	minutes			L	0										
Composite C	0.28					Tc	0.14	8.42														

Site 11							hrs						Intensity					Flow Rate				
	Total Area	6882.48	0.158	acres	Tc	Tsheet, hr	#DIV/0!		Tshallow	#DIV/0!	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L		r	0.447227	6.18	7.93	8.90	9.73	10.50	0.81	1.03	1.28	1.52	1.71
Impervious area	6091.63	0.90				S			S		s	0.01155									na	na
City Business Area		0.85				n	0.1		v	0.00	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	6091.63																					
Unimproved Forest	790.850	0.25					hrs	minutes			L	0										
Composite C	0.83					Tc	#DIV/0!	5.00														

Site 12							hrs						Intensity					Flow Rate				
	Total Area	309363.1	7.102	acres	Tc	Tsheet, hr	0.11		Tshallow	0.10	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	1187	r	0.447227	4.50	5.82	6.52	7.12	7.66	18.38	23.78	29.30	34.88	39.09
Impervious area	154681.56	0.90				S	0.02270		S	0.03950	s	0.01155									na	na
City Business Area		0.85				n	0.1		v	3.21	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	154681.56																					
Unimproved Forest	154681.560	0.25					hrs	minutes			L	0										
Composite C	0.58					Tc	0.21	12.52														

Site 14							hrs						Intensity					Flow Rate				
	Total Area	3529536	81.027	acres	Tc	Tsheet, hr		0.12	Tshallow	0.40	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	2789.46	r	0.447227	FALSE	3.74	4.27	4.73	5.16	0.00	126.27	158.69	191.71	217.79
Impervious area	905213.8476	0.90				S	0.01656		S	0.01460	s	0.01155									na	na
City Business Area		0.85				n	0.1		v	1.95	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	905213.8476	0.9																				
Unimproved Forest	2624322.272	0.25					hrs	minutes			L	0										
Composite C	0.42					Tc	0.52	31.05														

Site 18							hrs						Intensity					Flow Rate				
	Total Area	3106972	71.326	acres	Tc	Tsheet, hr		0.24	Tshallow	0.54	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	3185.34	r	0.447227	2.13	2.94	3.42	3.84	4.23	59.06	81.66	104.40	127.64	146.66
Impervious area	72981.6407	0.90				S	0.00280		S	0.01030	s	0.01155									na	na
City Business Area	395095.3812	0.85				n	0.1		v	1.64	v	0.62										
Residential : 10,000 ft ^{2} Lot	733029.7554	0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	1201106.777																					
Unimproved Forest	1905864.930	0.25					hrs	minutes			L	0										
Composite C	0.39					Tc	0.78	47.08														

Site 20							hrs						Intensity					Flow Rate				
	Total Area	1040060	23.876	acres	Tc	Tsheet, hr		0.45	Tshallow	0.20	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	1153.38	r	0.447227	2.41	3.28	3.79	4.22	4.63	22.58	30.79	39.04	47.46	54.23
Impervious area	76035.015	0.90				S	0.00060		S	0.00995	s	0.01155									na	na
City Business Area	69750.4989	0.85				n	0.1		v	1.61	v	0.62										
Residential : 10,000 ft ^{2} Lot		0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial	158857.3479	0.6									p	4.472										
Rail	29527.8503	0.3																				
Total	334170.7121																					
Unimproved Forest	705888.833	0.25					hrs	minutes			L	0										
Composite C	0.39					Tc	0.65	39.10														

Site 21							hrs						Intensity					Flow Rate				
	Total Area	241089.6	5.535	acres	Tc	Tsheet, hr		0.45	Tshallow	0.08	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	469.44	r	0.447227	2.73	3.68	4.21	4.66	5.09	6.18	8.31	10.46	12.64	14.37
Impervious area	34640.2275	0.90				S	0.00060		S	0.01000	s	0.01155									na	na
City Business Area		0.85				n	0.1		v	1.61	v	0.62										
Residential : 10,000 ft ^{2} Lot	78249.0562	0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Rail		0.3																				
Total	112889.2837																					
Unimproved Forest	128200.304	0.25					hrs	minutes			L	0										
Composite C	0.41					Tc	0.53	32.00														

Site 15							hrs						Intensity					Flow Rate				
	Total Area	1477555	33.920	acres	Tc	Tsheet, hr		0.19	Tshallow	0.26	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	2096	r	0.447227	3.01	4.01	4.56	5.04	5.48	29.69	39.57	49.51	59.63	67.54
Impervious area	22675	0.90				S	0.03020		S	0.01864	s	0.01155									na	na
City Business Area		0.85				n	0.24		v	2.20	v	0.62										
Residential : 10,000 ft ^{2} Lot	181597	0.5				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	204272	0.544402																				
Unimproved Forest	1273283.200	0.25					hrs	minutes			L	0										
Composite C	0.29					Tc	0.45	27.27														

Site 16							hrs						Intensity					Flow Rate				
	Total Area	1512665	34.726	acres	Tc	Tsheet, hr		0.32	Tshallow	0.31	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	2601	r	0.447227	2.44	3.33	3.83	4.27	4.68	21.75	29.61	37.51	45.56	52.04
Impervious area	14427	0.90				S	0.02210		S	0.02053	s	0.01155									na	na
City Business Area		0.85				n	0.4		v	2.31	v	0.62										
Residential : 10,000 ft ^{2} Lot	0	0.5				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	14427	0.9																				
Unimproved Forest	1498237.560	0.25					hrs	minutes			L	0										
Composite C	0.26					Tc	0.64	38.20														

Site 19							hrs						Intensity					Flow Rate				
	Total Area	3893278	89.377	acres	Tc	Tsheet, hr		0.24	Tshallow	0.92	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	4961	r	0.447227	1.62	2.31	2.75	3.12	3.49	53.81	76.93	100.35	124.38	144.76
Impervious area	139334.3361	0.90				S	0.00280		S	0.00837	s	0.01155									na	na
City Business Area	395095.3812	0.85				n	0.1		v	1.50	v	0.62										
Residential : 10,000 ft ^{2} Lot	733029.7554	0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	1267459.473	0.624158																				
Unimproved Forest	2625818.527	0.25					hrs	minutes			L	0										
Composite C	0.37					Tc	1.16	69.79														

Site 2							hrs						Intensity					Flow Rate				
	Total Area	994081.1	22.821	acres	Tc	Tsheet, hr		0.15	Tshallow	0.09	Tchannel	0.00	I2	I10	I25	I50	I100	Q2	Q10	Q25	Q50	Q100
	area,S.F.	*C*				L	100		L	1112.6	r	0.447227	4.28	5.56	6.23	6.80	7.33	33.29	43.18	53.25	63.46	71.16
Impervious area	109854.3551	0.90				S	0.01010		S	0.04880	s	0.01155									na	na
City Business Area		0.85				n	0.1		v	3.56	v	0.62										
Residential : 10,000 ft ^{2} Lot	92988.7251	0.45				2 YR depth	3.6				n	0.15										
Residential: 12,000 ft ^{2} Lot		0.42									area ft^2	2										
Industrial		0.6									p	4.472										
Parks		0.2																				
Total	202843.0802																					
Unimproved Forest	791238.032	0.25					hrs	minutes			L	0										
Composite C	0.34					Tc	0.23	13.98														

I-77 Scout Interchange Post-Development SCS Method Calculations

Site 17- SCS CN Method

CN Calculation								Time of Concentration		SCS Calculations																														
			A	B	C	D	Total Area	Composite	Tc, hours	1.921084	S	11.89535	Rainfall Depth, 24-HR							Runoff Volume, Q							Qu, Unit Peak Discharge							**Qp, Peak Discharge, cfs**						
	Commerical	CN by HSG	89	92	94	95			low length,	2722	Ia	2.379071	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
		Area (ft2)	761140.1				761140.1	89	Slope1	0.019112			3.58	4.48	5.23	6.34	7.27	8.29	11.1	0.110125	0.315363	0.551176	0.989448	1.425044	1.962178	3.689056	100	118	136.9465	170.396	190.5571	207.4681	237.9811	**3.401286**	**11.4934**	**23.31297**	**52.07248**	**83.87058**	**125.732**	**271.1526**
	Forest	CN by HSG	30	55	70	77			slope2	0.026216		Ia/P	0.664545	0.531043	0.454889	0.375248	0.327245	0.286981	0.214331																					
		Area (ft2)	4735445				4735445	30	slope3	0.010094																															
	Grass/Pasture	CN by HSG	39	61	74	80			slope4	0.009479																														
		Area (ft2)	120735.6	1182029			1302765	58.96112	slope5	0.052215																														
Land Use	Fallow	CN by HSG	77	85	90	92			Y	0.023423																														
		Area (ft2)					0	#DIV/0!	%	2.34232																															
	Impervious Surface	CN by HSG	98	98	98	98																																		
		Area (ft2)	175454.2	25416.16			200870.4	98																																
	Residential- 1/2 acre	CN by HSG	54	70	80	85																																		
		Area (ft2)	1610193				1610193	54																																
	High Density Residential	CN by HSG	77	85	90	92																																		
		Area (ft2)					0	#DIV/0!	sq miles	0.308856																															
Total Composite CN							8610413	45.67179	Acres	197.6679																															

Site 3- SCS CN Method

CN Calculation										SCS Calculations																														
										S	7.497813	Rainfall Depth, 24-HR							Runoff Volume, Q							Qu, Unit Peak Discharge							**Qp, Peak Discharge, cfs**						
										Ia	1.499563	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
												3.58	4.48	5.23	6.34	7.27	8.29	11.1	0.110125	0.315363	0.551176	0.989448	1.425044	1.962178	3.689056	100	118	136.9465	170.396	190.5571	207.4681	237.9811	**3.401286**	**11.4934**	**23.31297**	**52.07248**	**83.87058**	**125.732**	**271.1526**
											Ia/P	0.664545	0.531043	0.454889	0.375248	0.327245	0.286981	0.214331																					
									sq miles	0.510938																															
Total Composite CN (From QGIS)							57.15		Acres	327																															

Appendix B.2: Storm Pipe/Node Calculations

AREA DATA					
Area- ID	Tc Used	Discharge	Intensity	Composite C Value	Composite Area
DI-1-1	14.38	13.807	5.488	0.42	5.99
DI-1-2	12.18	2.762	5.89	0.36	1.303
DI-1-3	11.71	8.357	5.985	0.57	2.449
DI-1-4	6.77	3.303	7.279	0.53	0.856
DI-1-5	8.76	3.029	6.683	0.51	0.889
DI-1-6	11.12	3.994	6.11	0.41	1.594
DI-2-1	17.52	6.803	5.016	0.5	2.713
DI-2-2	6.56	4.926	7.349	0.4	1.676
DI-2-5	19.02	23.66	4.822	0.33	14.867
DI-2-6	6.02	2.763	7.538	0.41	0.894
DI-2-7	6.73	3.39	7.292	0.48	0.969
DI-2-8	5	1.376	7.931	0.9	0.193
DI-2-9	5	1.705	7.931	0.9	0.239
DI-3-1	11.06	3.607	6.124	0.47	1.253
DI-4-1	24.41	2.678	4.254	0.53	1.188
DI-5-1	17.77	9.693	4.982	0.6	3.243
DI-5-2	15.1	1.789	5.37	0.9	0.37
DI-5-3	6.97	1.902	7.213	0.9	0.293
DI-5-4	6.32	1.146	7.432	0.9	0.171
DI-5-5	19.6	0.768	4.753	0.68	0.238
DI-5-6	21.85	1.151	4.503	0.9	0.284
DI-5-7	9.13	1.321	6.584	0.9	0.223
DI-5-8	7.25	0.905	7.123	0.9	0.141
DI-5-9	5	1.587	7.931	0.9	0.222
DI-7-1	8.81	9.768	6.669	0.53	2.764
DI-7-2	7.93	9.054	6.916	0.53	2.47
DN-1-1	18.09	10.622	4.94	0.4	5.375
DN-1-2	29.78	30.021	3.826	0.33	23.775
DN-1-3	20.77	50.09	4.619	0.31	34.984
DN-1-4	16.53	3.822	5.154	0.37	2.004
DN-1-5	34.09	24.081	3.55	0.4	16.956
DN-1-6	13.62	2.595	5.619	0.41	1.126
DN-1-7	13.98	26.4	5.556	0.32	14.849
DN-1-9	10.37	3.153	6.279	0.43	1.168
DN-2-1	13.36	12.631	5.666	0.43	5.184
DN-2-2	5.14	2.485	7.874	0.39	0.809
DN-2-3	5.68	2.991	7.664	0.58	0.673
DN-2-6	13.28	4.715	5.68	0.26	3.193
DN-2-7	5.83	2.856	7.608	0.28	1.341
DN-2-8	5.93	3.249	7.571	0.37	1.16
DN-3-1	11.37	7.985	6.057	0.43	3.066

Area- ID	Tc Used	Discharge	Intensity	Composite C Value	Composite Area
DN-3-2	14.27	1.096	5.506	0.48	0.415
DN-3-3	10.76	3.775	6.19	0.29	2.103
DN-3-4	9.82	1.163	6.41	0.37	0.49
DN-4-1	10.74	9.934	6.195	0.4	4.009
DN-4-3	6.75	31.849	7.285	0.39	11.209
DN-5-1	6.87	0.597	7.246	0.44	0.187
DN-5-2	7.48	1.405	7.052	0.56	0.356
DN-5-3	12.5	14.997	5.827	0.28	9.192
DN-5-4	5	0.582	7.931	0.62	0.118
DN-5-5	5.37	1.191	7.783	0.57	0.269
DN-6-1	5	2.131	7.931	0.41	0.656
DN-6-2	9.19	0.933	6.569	0.4	0.355
DN-6-3	5	1.081	7.931	0.54	0.252
DN-6-4	5	1.716	7.931	0.52	0.416
DN-6-5	12.21	1.035	5.884	0.49	0.359
DN-6-7	10.48	4.831	6.254	0.54	1.431
DN-6-8	10.34	3.086	6.286	0.32	1.534
DN-6-9	9.19	11.023	6.569	0.35	4.795
DN-7-1	11.12	16.161	6.11	0.47	5.627
DN-7-3	30.04	11.615	3.808	0.41	7.439
DN-7-4	9.08	3.167	6.597	0.44	1.091
DN-8-1	27.04	9.573	4.031	0.44	5.397
DN-8-2	33.43	4.516	3.59	0.37	3.4
DN-8-3	41.03	6.917	3.193	0.55	3.938
DN-8-4	17.56	18.084	5.01	0.45	8.021
DN-8-5	15.76	9.675	5.268	0.3	6.123
DN-8-6	26.04	3.425	4.113	0.26	3.203
DN-8-7	44.13	1.186	3.06	0.28	1.384
DN-8-8	12.46	1.415	5.835	0.28	0.866
DN-8-9	19.93	0.915	4.714	0.3	0.647
DN-9-1	20.22	8.116	4.68	0.36	4.817
DN-9-3	47.08	82.288	2.945	0.39	71.644
DN-9-4	21.07	10.708	4.586	0.35	6.672
DN-9-5	5	1.369	7.931	0.44	0.392
DI-11-1	5	3.326	7.931	0.9	0.466
DI-12-1	5	12.006	7.931	0.55	2.753
DI-2-10	7.2	2.698	7.139	0.43	0.879
DI-2-11	5	0.628	7.931	0.25	0.317
DI-2-12	5	0.767	7.931	0.9	0.107
DI-5-10	5	1.606	7.931	0.9	0.225
DI-5-11	5	1.63	7.931	0.9	0.228
DI-5-12	5	0.888	7.931	0.9	0.124

Area- ID	Tc Used	Discharge	Intensity	Composite C Value	Composite Area
DI-5-13	5	1.334	7.931	0.9	0.187
DN-1-11	23.36	13.342	4.352	0.39	7.86
DN-1-12	10.37	364.782	6.279	0.3	193.648
DN-1-15	10.59	11.88	6.228	0.34	5.61
DN-1-16	45.68	6.612	2.998	0.39	5.655
DN-1-17	8.28	0.998	6.815	0.37	0.396
DN-1-18	7.78	1.513	6.961	0.47	0.462
DN-1-19	7.28	2.517	7.114	0.53	0.668
DN-2-13	5	2.483	7.931	0.33	0.949
DN-6-10	9.78	10.949	6.42	0.44	3.876
DN-6-11	5	1.038	7.931	0.83	0.158
DN-8-10	19.59	1.399	4.754	0.36	0.818
DN-8-11	6.88	1.141	7.242	0.38	0.415
DN-8-12	16.78	1.603	5.118	0.38	0.824

NODE DATA																
Node - ID	Description	Node Type	Node Library Item Name	Node Reference PGL	Station	Offset	Reference Elevation	Node Elevation	Node Depth	Junction Loss	Tc Used	Cumulative Tc	Cumulative Discharge	Cumulative Area	Cumulative C Value	Cumulative Intensity
OP-1	Outfall 1	Outlet	OP	CONNECT_PP	111+80.4716	5.85	470.617	470.617	50.417	0.012	0	53.987	0	133.971	0.358	0
OP-2	Outfall 2	Outlet	OP	CONNECT_PP	114+19.8201	85.434	431.966	431.966	9.966	0.159	0	20.574	0	33.783	0.373	0
OP-3	Outfall 3	Outlet	OP	CONNECT_PP	159+48.4249	-89.961	456.478	456.478	10.478	1.46	0	16.081	0	8.842	0.401	0
OP-4	Outfall 4	Outlet	OP	CONNECT_PP	138+13.2657	106.271	470.785	470.785	55.785	0.303	0	27.606	0	16.406	0.403	0
OP-5	Outfall 5	Outlet	OP	COMM_PP	94+13.0573	-50.601	420	420	-3	0.346	0	25.027	0	6.88	0.703	0
OP-6	Outfall 6	Outlet	OP	COMM_EP	1710+90.3635	174.473	390.09	390.09	0	0.346	0	13.118	0	6.072	0.457	0
OP-7	Outfall 7	Outlet	OP	COMM_EP	90+00.0000	347.545	414.7	414.7	13.98	0.346	0	14.168	0	8.391	0.49	0
OP-8	Outfall 8	Outlet	OP	US21_PP	698+88.1223	-231.919	480.182	480.182	59.182	0.346	0	46.487	0	30.082	0.401	0
OP-9	Outfall 9	Outlet	OP	US21_PP	705+82.1181	76.266	465.275	465.275	27.275	0.346	0	21.811	0	11.881	0.357	0
OP-10	Outfall 10	Outlet	OP	CONRPD_PP	1726+37.4281	47.641	453.353	453.353	16.353	0.261	0	9.374	0	4.795	0.35	0
OP-11	Outfall 11	Outlet	OP	I77NBOUT	1742+93.1425	117.362	449.831	449.831	8.096	0.437	0	5.102	0	0.466	0.9	0
OP-12	Outfall 12	Outlet	OP	I77SBIN	1708+97.6294	-155.876	392.6	392.6	0	0.854	0	5.211	0	2.753	0.55	0
OP-2A	Outfall 2A	Outlet	OP	CONLPA_PP	1736+70.6299	-54.001	451.392	451.392	0.592	0.02	0	5.405	0	0.949	0.33	0
OP-5A	Outfall 5A	Outlet	OP	COMM_PP	94+13.0573	-50.601	420	420	0	0.346	0	12.817	0	9.192	0.28	0
DI-1-1	D.I. 24"X24"	Other	D.I. 24"X24"	I77NBOUT	1805+87.5327	108.936	512.155	512.155	5.429	0.448	14.38	14.38	13.807	5.99	0.42	5.488
DI-1-2	D.I. 24"X24"	Other	D.I. 24"X24"	I77NBIN	1778+40.7018	2.452	487.403	487.403	12.543	0.35	47.564	47.564	7.828	6.957	0.384	2.927
DI-1-3	D.I. 24"X24"	Other	D.I. 24"X24"	I77NBIN	1760+22.4074	1.547	450.806	450.806	17.806	0.349	34.293	34.293	30.962	20.536	0.426	3.539
DI-1-4	D.I. 24"X24"	Other	D.I. 24"X24"	I77NBIN	1755+83.0580	1.89	442.841	442.841	12.671	0.745	14.134	14.134	41.836	22.204	0.341	5.529
DI-1-5	D.I. 24"X24"	Other	D.I. 24"X24"	I77NBIN	1752+58.6511	2.516	440.895	440.895	4.5	0.211	8.76	8.76	3.029	0.889	0.51	6.683
DI-1-6	D.I. 24"X24"	Other	D.I. 24"X24"	I77NBIN	1769+90.0856	2.374	470.36	470.36	13.89	0.328	11.12	11.12	4.889	1.99	0.402	6.11
DI-2-1	D.I. 24"X24"	Other	D.I. 24"X24"	I77NBIN	1748+95.5695	-2.629	443.272	443.272	9.172	0.038	17.627	17.627	27.591	14.121	0.391	5.001
DI-2-2	D.I. 24"X24"	Other	D.I. 24"X24"	CONNECT_PP	118+32.8213	-162.305	441	441	10.52	2.178	19.521	19.521	54.451	31.558	0.362	4.762
DI-2-5	D.I. 24"X24"	Other	D.I. 24"X24"	CONNECT_PP	120+81.6097	-96.484	445.92	445.92	4.42	0.854	19.02	19.02	23.538	14.867	0.328	4.822
DI-2-6	D.I. 24"X24"	Other	D.I. 24"X24"	CONNECT_PP	119+91.4962	-212.908	443.39	443.39	5	1.406	19.303	19.303	25.125	15.761	0.333	4.788
DI-2-7	D.I. 24"X24"	Other	D.I. 24"X24"	CONRPBA_PP	1750+88.8054	67.325	438.54	438.54	10.33	0.069	19.738	19.738	56.36	32.527	0.366	4.736
DI-2-8	D.I. 24"X24"	Other	D.I. 24"X24"	CONRPBA_PP	1752+93.5513	45.259	442.32	442.32	16.59	1.208	20.018	20.018	56.787	32.719	0.369	4.704
DI-2-9	D.I. TYPE 125	Other	D.I. TYPE 112	CONNECT_PP	114+25.3899	-45.689	432.095	432.095	9.595	0.053	20.312	20.312	58.921	33.783	0.373	4.67
DI-3-1	D.I. 24"X24"	Other	D.I. 24"X24"	CONRPA_PP	1731+52.6471	-107.51	468.694	468.694	15.194	0.165	11.849	11.849	15.242	5.834	0.439	5.957
DI-4-1	D.I. 24"X24"	Other	D.I. 24"X24"	I77NBIN	1736+94.9879	-2.239	455.829	455.829	14.829	0.199	24.41	24.41	2.678	1.188	0.53	4.254
DI-5-1	D.I. 24"X24"	Other	D.I. 24"X24"	I77NBIN	1718+96.5960	2.192	438.667	438.667	8.867	0.41	17.77	17.77	9.693	3.243	0.6	4.982
DI-5-2	D.I. TYPE 125	Other	D.I. TYPE 125	COMM_PP	103+97.1227	39.5	456.529	456.529	8.529	0.081	15.1	15.1	1.789	0.37	0.9	5.37
DI-5-3	D.I. TYPE 125	Other	D.I. TYPE 125	COMM_PP	100+97.6664	39.5	448.131	448.131	10.131	0.036	15.838	15.838	3.137	0.663	0.9	5.256
DI-5-4	D.I. TYPE 125	Other	D.I. TYPE 125	COMM_PP	99+23.3616	39.5	443.233	443.233	10.233	0.082	16.224	16.224	3.905	0.835	0.9	5.198
DI-5-5	D.I. TYPE 125	Other	D.I. TYPE 125	COMM_PP	99+24.5121	47.47	443.265	443.265	10.385	0.164	19.6	19.6	8.561	2.06	0.875	4.753
DI-5-6	D.I. TYPE 125	Other	D.I. TYPE 125	I77SBOUT	1726+99.2444	-80	455.521	455.521	12.521	0.07	21.85	21.85	1.151	0.284	0.9	4.503
DI-5-7	D.I. TYPE 125	Other	D.I. TYPE 125	I77SBOUT	1723+44.5592	-80	449.02	449.02	14.02	0.027	22.985	22.985	2.002	0.507	0.9	4.388
DI-5-8	D.I. TYPE 125	Other	D.I. TYPE 125	I77SBOUT	1721+11.9973	-80	443.805	443.805	14.095	0.111	23.621	23.621	2.524	0.648	0.9	4.327
DI-5-9	D.I. TYPE 125	Other	D.I. TYPE 125	I77SBOUT	1722+93.3030	-141.203	447.832	447.832	14.319	0.165	6.834	6.834	6.448	0.987	0.9	7.257
DI-7-1	D.I. 24"X24"	Other	D.I. 24"X24"	I77SBIN	1694+02.9524	2.841	434.666	434.666	7.026	0.617	8.81	8.81	9.768	2.764	0.53	6.669
DN-1-1	DUMMY JOINT	Other	DUMMY JOINT	BLYRPD_PP	1804+04.5839	38.652	510.572	510.572	4.622	0.059	18.09	18.09	23.051	11.366	0.411	4.94
DN-1-2	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1777+74.1319	123.22	486.205	486.205	13.205	0.727	47.868	47.868	44.284	42.098	0.361	2.916
DN-1-3	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1764+59.0135	112.869	458.584	458.584	14.704	0.541	51.848	51.848	72.355	77.083	0.338	2.78
DN-1-4	DUMMY JOINT	Other	DUMMY JOINT	I77SBOUT	1763+08.9269	-148.097	458.85	458.85	21.54	0.917	52.207	52.207	153.567	88.937	0.344	2.768
DN-1-5	DUMMY JOINT	Other	DUMMY JOINT	I77NBIN	1760+82.5913	136.817	444.23	444.23	0	0.589	34.09	34.09	24.081	16.956	0.4	3.55
DN-1-6	DUMMY JOINT	Other	DUMMY JOINT	I77SBOUT	1759+64.6568	-131.659	452.052	452.052	18.052	0.956	53.255	53.255	177.746	110.599	0.36	2.735
DN-1-7	DUMMY JOINT	Other	DUMMY JOINT	I77NBIN	1755+50.0711	137.314	442.488	442.488	7.778	0.798	13.98	13.98	36.997	20.459	0.325	5.556
DN-1-8	DUMMY JOINT	Other	DUMMY JOINT	I77SBOUT	1756+19.9700	-151.572	445.68	445.68	22.096	0.235	14.134	14.289	41.836	22.204	0.341	5.529
DN-1-9	DUMMY JOINT	Other	DUMMY JOINT	CONNECT_PP	111+49.5836	-48.247	427.682	427.682	5.832	0.389	53.928	53.928	198.818	133.971	0.358	2.714

Node - ID	Description	Node Type	Node Library Item Name	Node Reference PGL	Station	Offset	Reference Elevation	Node Elevation	Node Depth	Junction Loss	Tc Used	Cumulative Tc	Cumulative Discharge	Cumulative Area	Cumulative C Value	Cumulative Intensity
DN-2-1	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1740+01.9210	125.622	452.7	452.7	8.3	0.371	13.36	13.36	10.312	4.233	0.43	5.666
DN-2-2	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1742+58.4566	126.279	450.219	450.219	8.319	0.02	13.955	13.955	11.875	5.042	0.424	5.56
DN-2-3	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1744+44.9177	120.909	448.697	448.697	7.577	0.687	15.646	15.646	13.349	5.715	0.442	5.285
DN-2-6	DUMMY JOINT	Other	DUMMY JOINT	CONRPA_PP	1745+02.1092	39.872	441.03	441.03	1.13	0.286	15.841	15.841	17.636	8.907	0.377	5.255
DN-2-7	DUMMY JOINT	Other	DUMMY JOINT	CONRPA_PP	1746+67.2441	26.955	440.2	440.2	2.87	0.024	16.604	16.604	19.19	10.248	0.364	5.143
DN-2-8	DUMMY JOINT	Other	DUMMY JOINT	CONRPA_PP	1748+09.5971	36.147	441.438	441.438	6.018	0.459	17.288	17.288	20.999	11.408	0.365	5.047
DN-3-1	DUMMY JOINT	Other	DUMMY JOINT	CONLPA_PP	1742+80.8159	73.579	468.087	468.087	14.087	0.398	11.37	11.37	11.93	4.581	0.43	6.057
DN-3-2	DUMMY JOINT	Other	DUMMY JOINT	CONRPA_PP	1731+57.1791	44.283	468.737	468.737	15.937	0.606	14.27	14.27	19.542	8.842	0.401	5.506
DN-3-3	DUMMY JOINT	Other	DUMMY JOINT	CONRPA_PP	1736+48.3591	26.182	468.14	468.14	8.036	0.083	10.76	10.76	3.775	2.103	0.29	6.19
DN-3-4	DUMMY JOINT	Other	DUMMY JOINT	CONRPA_PP	1733+94.7930	32.423	469.495	469.495	12.545	0.02	12.653	12.653	4.588	2.593	0.305	5.798
DN-4-1	DUMMY JOINT	Other	DUMMY JOINT	I77SBOUT	1737+08.1111	-106.346	456.118	456.118	17.118	0.176	24.68	24.68	9.446	5.197	0.43	4.23
DN-4-2	DUMMY JOINT	Other	DUMMY JOINT	COMM_PP	113+16.1095	-76.887	459.139	459.139	24.139	0.044	24.68	25.079	9.446	5.197	0.43	4.23
DN-4-3	DUMMY JOINT	Other	DUMMY JOINT	COMM_PP	119+37.7778	-420.231	465.214	465.214	47.214	0.191	27.036	27.036	26.627	16.406	0.403	4.031
DN-5-1	DUMMY JOINT	Other	DUMMY JOINT	I77SBOUT	1718+77.1147	-145.239	438.668	438.668	12.168	0.102	18.016	18.016	10.038	3.43	0.591	4.95
DN-5-2	DUMMY JOINT	Other	DUMMY JOINT	COMM_PP	95+27.4147	48.62	431.156	431.156	6.656	0.608	24.739	24.739	20.44	6.88	0.703	4.225
DN-5-3	DUMMY JOINT	Other	DUMMY JOINT	COMM_PP	95+91.3728	-61.002	432.026	432.026	5.026	0.612	12.5	12.5	14.997	9.192	0.28	5.827
DN-5-4	DUMMY JOINT	Other	DUMMY JOINT	I77SBOUT	1722+27.1825	-155.735	446.358	446.358	14.358	0.058	19.705	19.705	8.886	2.178	0.861	4.74
DN-5-5	DUMMY JOINT	Other	DUMMY JOINT	I77SBOUT	1720+63.5023	-156.556	443.781	443.781	16.281	1.813	23.856	23.856	11.241	3.094	0.844	4.305
DN-6-1	DUMMY JOINT	Other	DUMMY JOINT	CONRPD_PP	1721+03.6628	40.428	441.278	441.278	6.528	0.216	9.92	9.92	13.443	4.689	0.449	6.386
DN-6-2	DUMMY JOINT	Other	DUMMY JOINT	CONRPD_PP	1719+01.3867	35.44	436.832	436.832	5.662	0.026	10.867	10.867	13.856	5.044	0.445	6.166
DN-6-3	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1718+20.2993	153.719	428.67	428.67	0	0.479	11.142	11.142	14.552	5.297	0.45	6.106
DN-6-4	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1716+51.2662	127.903	434.251	434.251	9.071	0.075	11.486	11.486	15.682	5.713	0.455	6.032
DN-6-5	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1714+99.9290	142.294	429.777	429.777	6.807	0.094	12.25	12.25	16.31	6.072	0.457	5.876
DN-6-9	DUMMY JOINT	Other	DUMMY JOINT	CONRPD_PP	1726+36.8845	-55.482	453.339	453.339	14.339	0.386	9.19	9.19	11.023	4.795	0.35	6.569
DN-7-1	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1695+03.0830	104.27	436.93	436.93	10.93	0.43	11.12	11.12	25.111	8.391	0.49	6.11
DN-8-1	DUMMY JOINT	Other	DUMMY JOINT	FARROW_PP	17+69.1940	-47.41	449.533	449.533	11.748	0.319	27.04	27.04	9.573	5.397	0.44	4.031
DN-8-2	DUMMY JOINT	Other	DUMMY JOINT	FARROW_PP	18+23.1685	47.253	449.707	449.707	12.303	0.071	33.43	33.43	13.04	8.797	0.413	3.59
DN-8-3	DUMMY JOINT	Other	DUMMY JOINT	FARROW_PP	19+64.0420	52.932	450.992	450.992	14.172	0.192	41.03	41.03	18.517	12.735	0.455	3.193
DN-8-4	DUMMY JOINT	Other	DUMMY JOINT	US21_PP	690+94.7387	57.481	451.82	451.82	21.82	0.967	42.458	42.458	29.45	20.756	0.453	3.13
DN-8-5	DUMMY JOINT	Other	DUMMY JOINT	US21_PP	690+93.6448	-47.317	451.794	451.794	22.794	0.311	42.645	42.645	35.109	26.879	0.418	3.122
DN-8-6	DUMMY JOINT	Other	DUMMY JOINT	US21_PP	696+88.3517	-100.867	475.612	475.612	51.612	0.079	45.546	45.546	36.275	30.082	0.401	3.003
DN-9-1	DUMMY JOINT	Other	DUMMY JOINT	US21_PP	708+99.4880	-56.434	455.773	455.773	4.773	0.18	20.22	20.22	8.116	4.817	0.36	4.68
DN-9-3	DUMMY JOINT	Other	DUMMY JOINT	US21_PP	710+01.9261	-55.708	454.563	454.563	8.383	0.509	20.677	20.677	89.686	4.817	0.36	4.629
DN-9-4	DUMMY JOINT	Other	DUMMY JOINT	US21_PP	708+90.2585	64.219	455.927	455.927	10.427	0.331	21.071	21.071	100.32	11.488	0.354	4.586
DN-9-5	DUMMY JOINT	Other	DUMMY JOINT	US21_PP	707+60.9940	41.509	449.761	449.761	6.721	0.14	21.41	21.41	100.956	11.881	0.357	4.549
JB-5-1	JUNCT BOX	Junction	JUNCT BOX	CONNECT_PP	146+19.7589	1253.025	430.5	430.5	7	0.183	12.5	12.572	14.997	9.192	0.28	5.827
JB-5-2	JUNCT BOX	Junction	JUNCT BOX	CONNECT_PP	146+19.0947	1335.381	429.1	429.1	8.5	0.05	12.5	12.675	14.997	9.192	0.28	5.827
JB-6-1	JUNCT BOX	Junction	JUNCT BOX	CONNECT_PP	149+77.3703	1371.049	434	434	6.36	0.276	11.142	11.225	14.552	5.297	0.45	6.106
JB-6-2	JUNCT BOX	Junction	JUNCT BOX	CONNECT_PP	149+72.0945	1432.153	433.5	433.5	7.04	0.064	11.142	11.322	14.552	5.297	0.45	6.106
DI-11-1	D.I. TYPE 125	Other	D.I. TYPE 125	I77NBOUT	1742+77.7507	94.836	450.012	450.012	8.012	0.251	5	5	3.326	0.466	0.9	7.931
DI-12-1	D.I. TYPE 125	Other	D.I. TYPE 125	I77SBIN	1708+01.7175	-2.57	418.261	418.261	6.951	0.717	5	5	12.006	2.753	0.55	7.931
DI-2-10	D.I. TYPE 125	Other	D.I. TYPE 125	CONNECT_PP	114+25.5834	-53.65	434.27	434.27	11.27	1.174	20.301	20.301	58.614	33.706	0.372	4.671
DI-2-11	D.I. TYPE 125	Other	D.I. TYPE 125	CONNECT_PP	120+72.5707	-46.074	449.3	449.3	6.3	0.002	5	5	0.628	0.317	0.25	7.931
DI-2-12	D.I. TYPE 125	Other	D.I. TYPE 125	CONNECT_PP	114+99.6730	-52.841	438.52	438.52	15.06	0.608	20.174	20.174	57.024	32.827	0.371	4.686
DI-5-10	D.I. TYPE 125	Other	D.I. TYPE 125	I77SBOUT	1724+96.2215	-141.443	452.176	452.176	14.029	0.038	6.4	6.4	5.096	0.765	0.9	7.404
DI-5-11	D.I. TYPE 125	Other	D.I. TYPE 125	I77SBOUT	1726+98.9256	-141.073	455.516	455.516	12.74	0.038	5.923	5.923	3.679	0.54	0.9	7.574
DI-5-12	D.I. TYPE 125	Other	D.I. TYPE 125	I77SBOUT	1729+04.3247	-141.188	457.962	457.962	10.494	0.021	5.359	5.359	2.182	0.311	0.9	7.787
DI-5-13	D.I. TYPE 125	Other	D.I. TYPE 125	CONRPC_PP	1730+17.7009	-25.2	483.579	483.579	33.579	0.078	5	5	1.334	0.187	0.9	7.931
DN-1-10	DUMMY JOINT	Other	DUMMY JOINT	CONNECT_EP	102+12.3717	-112.877	457.797	457.797	5.197	0.039	11.12	11.357	4.889	1.99	0.402	6.11

Node - ID	Description	Node Type	Node Library Item Name	Node Reference PGL	Station	Offset	Reference Elevation	Node Elevation	Node Depth	Junction Loss	Tc Used	Cumulative Tc	Cumulative Discharge	Cumulative Area	Cumulative C Value	Cumulative Intensity
DN-1-11	DUMMY JOINT	Other	DUMMY JOINT	CONNECT_EP	102+12.3717	-85.096	457.797	457.797	9.401	0.369	23.36	23.36	16.824	9.85	0.392	4.352
DN-1-12	DUMMY JOINT	Other	DUMMY JOINT	CONNECT_PP	102+12.3717	4.091	470.241	470.241	23.391	0.799	0	0	68.76	0	0	0
DN-1-15	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1754+51.1450	137.979	440.647	440.647	3.107	0.249	10.59	10.59	11.88	5.61	0.34	6.228
DN-1-16	DUMMY JOINT	Other	DUMMY JOINT	I77NBIN	1784+80.4225	1.806	495.626	495.626	6.536	0.086	45.68	45.68	6.612	5.655	0.39	2.998
DN-1-17	DUMMY JOINT	Other	DUMMY JOINT	I77NBIN	1776+41.9389	-3.418	483.606	483.606	0.61	0.018	8.28	8.28	0.998	0.396	0.37	6.815
DN-1-18	DUMMY JOINT	Other	DUMMY JOINT	I77NBIN	1767+99.2252	-12.804	466.399	466.399	-1.966	0.021	7.78	7.78	1.513	0.462	0.47	6.961
DN-1-19	DUMMY JOINT	Other	DUMMY JOINT	I77NBIN	1758+43.1544	-14.419	447.211	447.211	5.64	0.038	7.28	7.28	2.517	0.668	0.53	7.114
DN-1-20	DUMMY JOINT	Other	DUMMY JOINT	I77SBOUT	1756+33.4312	-159.3	445.872	445.872	23.872	0.147	53.863	53.863	197.549	132.803	0.357	2.716
DN-1-21	DUMMY JOINT	Other	DUMMY JOINT	CONNECT_PP	102+12.3717	-84.422	470.24	470.24	24.91	0.609	23.426	23.426	85.559	9.85	0.392	4.346
DN-1-22	DUMMY JOINT	Other	DUMMY JOINT	CONNECT_PP	102+12.3717	-68.82	479.736	479.736	34.406	0.021	0	0.103	68.76	0	0	0
DN-2-10	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1742+58.1316	126.152	450.221	450.221	n/a	1.46	0	0	0	0	0	0
DN-2-11	DUMMY JOINT	Other	DUMMY JOINT	I77NBOUT	1743+94.9330	122.889	448.701	448.701	n/a	1.46	0	0	0	0	0	0
DN-2-13	DUMMY JOINT	Other	DUMMY JOINT	CONLPA_PP	1737+01.2251	38.427	451.282	451.282	0.002	0.223	5	5	2.483	0.949	0.33	7.931
DN-6-10	DUMMY JOINT	Other	DUMMY JOINT	CONRPD_PP	1721+64.2656	-43.03	438.3	438.3	0	1.431	9.78	9.78	11.789	4.034	0.455	6.42
DN-6-11	DUMMY JOINT	Other	DUMMY JOINT	CONRPD_PP	1720+10.0597	-30.944	439.13	440.126	0.996	0.002	5	5	1.038	0.158	0.83	7.931
JB-12-1	JUNCT BOX	Junction	JUNCT BOX	I77SBIN	1708+83.8064	-134.688	404.358	404.358	11.058	0.039	5	5.17	12.006	2.753	0.55	7.931

LINK DATA																					
Link- ID	US Node	DS Node	Shape	Material	# of Barrels	Rise	Actual Length	Slope	Q (cfs)	Capacity	Uniform Depth	Uniform Velocity	US Soffit	US HGL	DS Soffit	DS HGL	US Invert	DS Invert	Actual Vel. DS	Actual Vel. US	Actual Depth US	Actual Depth DS
EP-1-1	DI-1-6	DN-1-10	Circular	Concrete	1	1.5	129.609	2.986	4.889	21.153	0.509	9.24	457.97	457.708	454.1	453.111	456.47	452.6	3.133	9.19	1.238	0.511
EP-1-2	DI-1-5	DI-1-4	Circular	Concrete	1	1.5	322.44	1.155	3.029	13.158	0.509	5.736	437.895	437.351	434.17	433.179	436.395	432.67	2.548	5.731	0.956	0.509
EP-1-3	DI-1-2	DN-1-2	Circular	Concrete	1	2	138.338	1.345	7.828	30.569	0.719	7.707	476.86	476.233	475	473.719	474.86	473	3.405	7.696	1.373	0.719
EP-4-1	DI-4-1	DN-4-1	Circular	Concrete	1	1.5	105.426	1.897	2.678	16.86	0.419	6.625	442.5	441.886	440.5	439.42	441	439	2.466	6.604	0.886	0.42
EP-5-1	DI-5-1	DN-5-1	Circular	Concrete	1	2	144.253	2.288	9.693	39.874	0.699	9.92	431.8	431.473	428.5	427.202	429.8	426.5	3.453	9.847	1.673	0.702
EP-7-1	DI-7-1	DN-7-1	Circular	Concrete	1	1.5	142.378	1.152	9.768	13.138	1.012	7.701	429.14	429.853	427.5	427.016	427.64	426	5.528	7.667	1.5	1.016
NP-1-1	DI-1-1	DN-1-1	Circular	Concrete	1	2	210.261	0.369	13.807	16.016	1.525	5.37	508.726	508.845	507.95	507.3	506.726	505.95	4.395	6.119	2	1.35
NP-1-2	DN-1-5	DI-1-3	Circular	Concrete	1	3	148.218	2.233	24.081	116.154	0.963	12.304	447.23	446.585	443.92	441.904	444.23	440.92	4.046	11.94	2.355	0.984
NP-1-3	DI-1-3	DN-1-6	Circular	Concrete	1	3	142.352	0.506	30.962	55.278	1.672	7.646	437.9	437.62	437.18	437.146	434.9	434.18	4.597	4.389	2.72	2.966
NP-1-4	DN-1-3	DN-1-4	Box	Concrete	1	6	301.255	2.181	72.355	1032.295	0.861	13.999	449.88	446.075	443.31	438.177	443.88	437.31	5.495	13.903	2.195	0.867
NP-1-5	DN-1-7	DI-1-4	Circular	Concrete	1	4	139.775	3.162	36.997	297.671	0.988	15.314	438.71	437.383	434.29	431.317	434.71	430.29	4.145	14.499	2.673	1.027
NP-1-6	DI-1-4	DN-1-8	Circular	Concrete	1	4	153.587	3.692	41.836	321.629	1.01	16.787	434.17	432.922	428.5	425.55	430.17	424.5	4.539	15.907	2.752	1.05
NP-1-7	DN-1-9	OP-1	Box	Concrete	1	6	62.159	2.655	198.818	2981.391	0.943	17.577	427.85	424.283	426.2	421.393	421.85	420.2	6.81	13.883	2.433	1.193
NP-1-8	DN-1-12	DN-1-22	Box	Concrete	1	6	80.873	1.879	68.76	958.317	0.876	13.083	452.85	449.607	451.33	446.305	446.85	445.33	4.156	11.752	2.757	0.975
NP-2-1	DN-2-1	DN-2-2	Circular	Concrete	1	3	256.536	0.975	10.312	76.73	0.77	7.19	447.4	445.788	444.9	442.671	444.4	441.9	3.224	7.171	1.388	0.771
NP-2-2	DN-2-3	DN-2-6	Circular	Concrete	1	3	98.473	1.239	13.349	86.515	0.828	8.41	444.12	442.969	442.9	440.742	441.12	439.9	2.92	8.208	1.849	0.842
NP-2-3	DN-2-8	DI-2-1	Circular	Concrete	1	3	164.128	0.804	20.999	69.705	1.177	8.161	438.42	437.368	437.1	435.28	435.42	434.1	4.323	8.131	1.948	1.18
NP-2-4	DI-2-1	DI-2-2	Circular	Concrete	1	4	126.415	0.119	27.591	57.662	1.995	4.406	438.1	436.013	437.95	435.505	434.1	433.95	4.649	6.106	1.913	1.555
NP-2-5	DI-2-11	DI-2-5	Circular	Concrete	1	2	42.501	1.882	0.628	36.169	0.19	4.152	445	444.12	444.2	444.118	443	442.2	0.347	0.203	1.12	1.918
NP-2-7	DI-2-5	DI-2-6	Circular	Concrete	1	2	151.413	1.063	23.538	27.185	1.525	9.155	443.5	444.118	441.89	441.421	441.5	439.89	7.492	9.12	2	1.531
NP-2-8	DI-2-6	DI-2-2	Circular	Concrete	1	2	184.674	3.2	25.125	47.161	1.085	14.429	440.39	441.689	434.48	433.579	438.39	432.48	7.998	14.207	2	1.099
NP-2-9	DI-2-2	DI-2-7	Circular	Concrete	1	4	162.508	1.397	54.451	197.841	1.489	12.78	434.48	434.933	432.21	429.755	430.48	428.21	4.333	12.162	4	1.545
NP-3-1	DN-3-1	DI-3-1	Circular	Concrete	1	3	145.874	0.343	11.93	45.506	1.089	5.149	457	455.523	456.5	454.589	454	453.5	3.312	5.149	1.523	1.089
NP-3-2	DI-3-1	DN-3-2	Circular	Concrete	1	3	147.362	0.475	15.242	53.571	1.144	6.154	456.5	454.92	455.8	453.944	453.5	452.8	4.626	6.154	1.42	1.144
NP-4-1	DN-4-1	DN-4-2	Circular	Concrete	1	2.5	214.931	1.861	9.446	65.208	0.667	8.985	441.5	440.202	437.5	435.669	439	435	4.049	8.954	1.202	0.669
NP-4-2	DN-4-3	OP-4	Circular	Concrete	1	5	306.21	0.98	26.627	300.412	1.045	8.943	423	419.621	420	416.045	418	415	4.829	8.943	1.621	1.045
NP-5-1	DN-5-2	OP-5	Circular	Concrete	1	3	151.401	0.991	20.44	77.366	1.095	8.762	427.5	426.56	426	424.105	424.5	423	3.95	8.653	2.06	1.105
NP-5-2	DN-5-3	JB-5-1	Circular	Concrete	1	2	37.546	1.332	14.997	30.423	1.034	9.151	429	429.258	428.5	427.607	427	426.5	4.774	8.405	2	1.107
NP-5-3	DI-5-2	DI-5-3	Circular	Concrete	1	2	296.327	3.308	1.789	47.947	0.274	6.921	450	448.676	440	438.274	448	438	1.915	6.921	0.676	0.274
NP-5-4	DI-5-3	DI-5-4	Circular	Concrete	1	2	169.74	2.845	3.137	44.464	0.373	7.75	440	438.768	435	433.373	438	433	2.822	7.75	0.768	0.373
NP-5-5	DI-5-4	DI-5-5	Circular	Concrete	1	2	4.133	1.148	3.905	28.244	0.521	6.005	435	434.316	434.88	434.244	433	432.88	1.782	1.711	1.316	1.364
NP-5-6	DI-5-5	DN-5-4	Circular	Concrete	1	2	50.24	1.847	8.561	35.824	0.691	8.888	435	434.244	434	432.721	433	432	4.167	8.387	1.244	0.721
NP-5-7	DI-5-6	DI-5-7	Circular	Concrete	1	2	350.685	2.243	1.151	39.481	0.243	5.295	445	443.528	437	435.243	443	435	1.733	5.295	0.528	0.243
NP-5-9	DI-5-7	DI-5-8	Circular	Concrete	1	2	228.562	2.255	2.002	39.59	0.317	6.251	437	435.609	431.71	430.027	435	429.71	2.474	6.251	0.609	0.317
NP-6-1	DN-6-9	OP-10	Circular	Concrete	1	3	103.125	1.939	11.023	108.244	0.671	9.337	442	440.447	440	437.681	439	437	3.265	9.139	1.447	0.681
NP-6-2	DN-6-10	DN-6-1	Circular	Concrete	1	1.5	103.155	3.441	11.789	22.709	0.802	12.268	439.8	441.037	436.25	435.569	438.3	434.75	6.671	11.953	1.5	0.819
NP-6-3	DN-6-3	JB-6-1	Circular	Concrete	1	2.5	50.215	2.051	14.552	68.458	0.814	10.5	431.17	430.476	430.14	428.518	428.67	427.64	3.833	9.466	1.806	0.878
NP-6-4	JB-6-1	JB-6-2	Circular	Concrete	1	2.5	57.347	2.058	14.552	68.566	0.811	10.541	430.14	429.284	428.96	427.325	427.64	426.46	4.253	9.661	1.644	0.865
NP-6-5	JB-6-2	DN-6-4	Circular	Concrete	1	2.5	88.759	1.442	14.552	57.401	0.894	9.234	428.96	427.838	427.68	426.097	426.46	425.18	5.246	8.923	1.378	0.917
NP-8-1	DN-8-1	DN-8-2	Circular	Concrete	1	2	108.722	0.351	9.573	15.613	1.188	4.923	439.785	439.445	439.403	438.907	437.785	437.403	3.433	3.778	1.66	1.504
NP-8-2	DN-8-4	DN-8-5	Circular	Concrete	1	4	104.805	0.954	29.45	163.512	1.195	9.338	434	432.576	433	430.23	430	429	3.443	8.977	2.576	1.23
NP-9-1	DN-9-3	DN-9-4	Box	Concrete	1	4	163.063	0.417	89.686	542.745	1.083	6.902	450.18	448.381	449.5	447.912	446.18	445.5	3.395	3.098	2.201	2.412
NP-11-1	DI-11-1	OP-11	Circular	Concrete	1	1.5	30.475	0.87	3.326	11.415	0.578	5.303	443.5	443.013	443.235	442.321	442	441.735	2.62	5.206	1.013	0.586
NP-12-1	DI-12-1	JB-12-1	Circular	Concrete	1	1.5	152.161	6.119	12.006	30.279	0.684	15.298	412.81	414.134	403.5	402.689	411.31	402	6.794	15.169	1.5	0.689
NP-12-2	JB-12-1	OP-12	Circular	Concrete	1	1.5	25.719	2.722	12.006	20.195	0.872	11.269	394.8	394.708	394.1	393.585	393.3	392.6	6.969	9.764	1.408	0.985
NP-2-10	DN-2-13	OP-2A	Circular	Concrete	1	1.5	97.483	0.492	2.483	8.59	0.572	4.011	452.78	452.125	452.3	451.372	451.28	450.8	2.422	4.011	0.845	0.572
NP-2-12	DI-2-10	DI-2-9	Circular	Concrete	1	4	3.964	1.261	58.614	188.001	1.599	12.5	427.05	426.58	427	425.054	423.05	423	4.993	9.02	3.53	2.054
NP-2-13	DI-2-9	OP-2	Circular	Concrete	1	4	126.746	0.394	58.921	105.137	2.229	8.185	426.5	424.873	426	424.24	422.5	422	7.588	8.137	2.373	2.24
NP-2-15	DI-2-7	DI-2-8	Circular	Concrete	1	4	201.969	1.228	56.36	185.491	1.577	12.245	432.21	430.587	429.73	427.338	428.21	425.73	7.242	11.928	2.377	1.608
NP-2-16	DI-2-8	DI-2-12	Circular	Concrete	1	4	70.82	0.383	56.787	103.603	2.2	8.018	429.731	429.223	429.46	427.67	425.731	425.46	4.88	7.974	3.491	2.21
NP-2-17	DI-2-12	DI-2-10	Circular	Concrete	1	4	70.355	0.654	57.024	135.354	1.892	9.745	427.46	427.178	427	426.58	423.46	423	4.683	4.806	3.718	3.58
NP-5-10	DI-5-8	DN-5-5	Circular	Concrete	1	2	91.046	2.356	2.524	40.465	0.351	6.805	431.71	430.421	429.5	427.852	429.71	427.5	2.523	6.783	0.711	0.352
NP-5-11	JB-5-1	JB-5-2	Circular	Concrete	1	2	78.359	3.701	14.997	50.716	0.776	13.323	425.5	425.227	422.6	421.413	423.5	420.6	5.201	12.509	1.727	0.813

Link- ID	US Node	DS Node	Shape	Material	# of Barrels	Rise	Actual Length	Slope	Q (cfs)	Capacity	Uniform Depth	Uniform Velocity	US Soffit	US HGL	DS Soffit	DS HGL	US Invert	DS Invert	Actual Vel. DS	Actual Vel. US	Actual Depth US	Actual Depth DS
NP-5-12	JB-5-2	OP-5A	Circular	Concrete	1	2	65.511	0.916	14.997	25.23	1.159	7.948	422.6	422.064	422	421.181	420.6	420	6.085	7.768	1.464	1.181
NP-5-13	DI-5-9	DI-5-5	Circular	Concrete	1	2.5	29.469	1.589	6.448	60.25	0.573	7.599	436.013	434.583	435.5	433.606	433.513	433	3.215	7.018	1.07	0.606
NP-5-14	DI-5-10	DI-5-9	Circular	Concrete	1	2.5	202.919	2.261	5.096	71.879	0.468	8.029	440.647	439.02	436.013	433.98	438.147	433.513	3.338	8.025	0.873	0.468
NP-5-15	DI-5-11	DI-5-10	Circular	Concrete	1	2.5	198.704	2.261	3.679	71.876	0.399	7.29	445.276	443.534	440.647	438.546	442.776	438.147	2.928	7.289	0.758	0.399
NP-5-16	DI-5-12	DI-5-11	Circular	Concrete	1	2.5	201.399	2.262	2.182	71.892	0.309	6.252	449.967	448.061	445.276	443.085	447.467	442.776	2.448	6.252	0.593	0.309
NP-5-17	DI-5-13	DI-5-12	Circular	Concrete	1	2	108.708	2.207	1.334	39.169	0.262	5.505	452	450.567	449.467	447.73	450	447.467	1.821	5.486	0.567	0.262
DITCH-1-1	DN-1-1	DN-1-2	n/a	n/a	1	5.33	2627.221	1.254	23.051	1011.877	1.291	3.458	511.28	507.3	478.33	475.411	505.95	473	3.161	0.992	1.35	2.411
DITCH-1-2	DN-1-2	DN-1-3	n/a	n/a	1	5.33	1290.817	2.256	44.284	1004.974	1.653	5.405	478.33	475.411	449.21	445.533	473	443.88	2.54	5.405	2.411	1.653
DITCH-1-3	DN-1-10	DN-1-11	n/a	n/a	1	15.7	28.776	2.989	4.889	17002.84	0.738	3.592	468.3	453.389	467.44	452.478	452.6	451.74	3.141	3.592	0.789	0.738
DITCH-1-4	DN-1-21	DN-1-4	n/a	n/a	1	15.7	615.588	1.303	85.559	11226.02	2.522	5.38	461.03	448.461	453.01	441.714	445.33	437.31	3.492	1.765	3.131	4.404
DITCH-1-5	DN-1-4	DN-1-6	n/a	n/a	1	15.66	353.004	0.938	153.567	8418.569	3.487	5.614	452.97	441.714	449.66	437.146	437.31	434	3.52	6.898	4.404	3.146
DITCH-1-6	DN-1-6	DN-1-20	n/a	n/a	1	14.02	340.711	3.522	177.746	14389.63	1.797	9.337	448.02	437.146	436.02	423.797	434	422	4.252	9.337	3.146	1.797
DITCH-1-7	DN-1-8	DN-1-20	n/a	n/a	1	6	15.839	10	41.836	1866.641	1.444	10.032	429.584	425.755	428	423.476	423.584	422	4.437	9.601	2.171	1.476
DITCH-2-5	DN-2-6	DN-2-7	n/a	n/a	1	3	162.037	1.586	17.636	245.749	1.116	3.539	442.9	441.302	440.33	438.54	439.9	437.33	2.243	3.01	1.402	1.21
DITCH-2-6	DN-2-7	DN-2-8	n/a	n/a	1	3	139.728	1.367	19.19	228.144	1.187	3.408	440.33	438.54	438.42	437.368	437.33	435.42	3.275	1.264	1.21	1.948
DITCH-2-7	DN-2-2	DN-2-3	n/a	n/a	1	3	186.538	0.418	11.875	159.706	1.137	1.838	444.9	443.166	444.12	442.969	441.9	441.12	1.483	0.695	1.266	1.849
DITCH-3-1	DN-3-3	DN-3-4	n/a	n/a	1	1.5	262.214	1.203	3.775	24.961	0.738	2.309	461.604	460.926	458.45	457.73	460.104	456.95	1.866	2.067	0.821	0.78
DITCH-3-2	DN-3-4	DN-3-2	n/a	n/a	1	1.5	243.452	1.52	4.588	28.056	0.76	2.646	458.45	457.73	454.75	454.701	456.95	453.25	2.511	0.726	0.78	1.451
DITCH-3-3	DN-3-2	OP-3	n/a	n/a	1	3	422.185	1.611	19.542	183.391	1.295	3.885	455.8	454.701	449	447.214	452.8	446	1.803	4.419	1.901	1.214
DITCH-4-1	DN-4-2	DN-4-3	n/a	n/a	1	2.5	501.995	3.386	9.446	163.531	0.858	4.276	437.5	435.952	420.5	418.858	435	418	3.476	4.276	0.952	0.858
DITCH-5-1	DN-5-1	DN-5-2	n/a	n/a	1	2	22.337	8.97	10.038	198.226	0.653	5.879	428.504	427.435	426.5	425.154	426.504	424.5	2.895	5.868	0.931	0.654
DITCH-5-2	DN-5-4	DN-5-5	n/a	n/a	1	2	163.682	2.749	8.886	81.265	0.872	3.895	434	432.943	429.5	428.372	432	427.5	3.328	3.895	0.943	0.872
DITCH-5-3	DN-5-5	DN-5-2	n/a	n/a	1	3	181.007	1.657	11.241	186.032	1.047	3.416	430.5	430.36	427.5	426.56	427.5	424.5	0.458	0.883	2.86	2.06
DITCH-6-2	DN-6-1	DN-6-2	n/a	n/a	1	5	197.282	1.815	13.443	1026.425	0.984	3.472	439.75	435.95	436.17	432.139	434.75	431.17	2.334	3.582	1.2	0.969
DITCH-6-3	DN-6-2	DN-6-3	n/a	n/a	1	5	73.086	3.421	13.856	1409.227	0.884	4.435	436.17	432.139	433.67	429.554	431.17	428.67	3.692	4.435	0.969	0.884
DITCH-6-4	DN-6-4	DN-6-5	n/a	n/a	1	5.33	152.02	1.454	15.682	1089.417	1.088	3.313	430.51	426.343	428.3	424.392	425.18	422.97	2.899	1.938	1.163	1.422
DITCH-6-5	DN-6-5	OP-6	n/a	n/a	1	2.6	387.717	8.48	16.31	184.84	1.046	7.452	425.57	424.392	392.69	391.136	422.97	390.09	4.032	7.452	1.422	1.046
DITCH-6-6	DN-6-11	DN-6-10	n/a	n/a	1	0.66	158.259	0.524	1.038	3.803	0.405	1.056	439.79	441.101	438.96	441.037	439.13	438.3	0.397	0.397	0.66	0.66
DITCH-7-1	DN-7-1	OP-7	n/a	n/a	1	11	881.409	2.868	25.111	10564.68	1.141	4.819	437	427.626	411.72	401.861	426	400.72	2.374	4.819	1.626	1.141
DITCH-8-1	DN-8-2	DN-8-3	n/a	n/a	1	2.5	144.279	0.404	13.04	56.512	1.445	2.081	439.903	438.907	439.32	438	437.403	436.82	1.922	3.12	1.504	1.18
DITCH-8-2	DN-8-3	DN-8-4	n/a	n/a	1	2.5	324.591	2.101	18.517	220.156	0.989	3.788	439.32	438	432.5	432.576	436.82	430	2.658	0.593	1.18	2.5
DITCH-8-3	DN-8-5	DN-8-6	n/a	n/a	1	2	592.773	0.843	35.109	99.102	1.199	3.405	431	430.51	426	425.247	429	424	2.439	3.222	1.51	1.247
DITCH-8-4	DN-8-6	OP-8	n/a	n/a	1	2	238.921	1.256	36.275	101.525	1.168	4.234	426	425.247	423	422.021	424	421	3.883	5.046	1.247	1.021
DITCH-9-1	DN-9-1	DN-9-3	n/a	n/a	1	1.5	110.423	4.365	8.116	108.206	0.353	4.029	452.5	451.59	447.68	446.533	451	446.18	2.227	4.029	0.59	0.353
DITCH-9-3	DN-9-4	DN-9-5	n/a	n/a	1	3.5	121.61	2.02	100.32	418.298	2.051	5.963	449	447.912	446.544	445.095	445.5	443.044	4.31	5.963	2.412	2.051
DITCH-9-4	DN-9-5	OP-9	n/a	n/a	1	3.5	167.222	3.014	100.956	511.006	1.906	6.951	446.54	445.267	441.5	439.906	443.04	438	5.087	6.951	2.227	1.906
DITCH-1-10	DN-1-11	DN-1-21	n/a	n/a	1	15.7	30.655	10	16.824	31101.68	0.935	7.697	464.095	449.995	461.03	446.266	448.395	445.33	2.631	7.682	1.599	0.936
DITCH-1-11	DN-1-15	DN-1-7	n/a	n/a	1	5.33	96.551	2.931	11.88	1145.532	0.96	4.294	442.87	438.784	440.04	435.67	437.54	434.71	2.56	4.294	1.244	0.96
DITCH-1-12	DN-1-16	DI-1-2	n/a	n/a	1	2.72	639.721	2.224	6.612	1671.734	0.341	5.676	491.81	489.706	477.58	475.201	489.09	474.86	1.74	5.676	0.616	0.341
DITCH-1-13	DN-1-17	DI-1-6	n/a	n/a	1	3	651.601	4.071	0.998	2641.074	0.156	4.544	485.995	483.334	459.47	456.626	482.995	456.47	0.965	4.544	0.339	0.156
DITCH-1-14	DN-1-18	DI-1-3	n/a	n/a	1	2.84	779.242	4.538	1.513	2679.237	0.172	5.117	471.205	468.747	435.84	433.172	468.365	433	1.04	5.117	0.381	0.172
DITCH-1-15	DN-1-19	DI-1-3	n/a	n/a	1	2.64	180.12	3.504	2.517	664.301	0.326	2.366	444.211	442.01	437.9	435.586	441.571	435.26	1.306	2.366	0.439	0.326
DITCH-1-16	DN-1-22	DN-1-21	n/a	n/a	1	15.7	16.175	0.4	68.76	7532.31	1.962	3.213	461.095	448.49	461.03	448.461	445.395	445.33	1.617	1.588	3.095	3.131
DITCH-1-6A	DN-1-20	DN-1-9	n/a	n/a	1	14.02	20.831	0.72	197.549	6506.472	2.875	5.389	436.02	424.829	435.87	424.283	422	421.85	5.516	6.844	2.829	2.433

Appendix B.3: Inlet Spacing Tables/Spread Calculations

SCDOT Type 25 Inlet Spacing

	Assumptions:		**Project information:**			
	Road cross-slope	0.02	Road:	I-77	Sheet No:	1/4
	Shoulder cross-slope	0.04	Roadside (RT/LT):	LT	Project ID:	P042443
	Design frequency:	10 Year	Storm Sewer System:	NET5	Project:	Scout Motors
	Design spread (ft):	Shoulder	Receiving Stream/Outfall:	Unnamed Trib	Engineer:	Mackensie Barbee
			Drainage start station [ft]:	173170.00	Date:	12/20/2023
			County:	Richland		

Note: User fills in GREEN cells only

		Discharge									Cross section and spread					Output for inlet						
CB no.	Station (ft)	Spacing between inlets, L (ft)	Width of the drainage area, W (ft)	Drainage area, A (acre)	Runoff coeff. Cw	Conc. time, tc (min)	Rainfall intensity, I (in/hr)	Flow rate, Q (ft3/s)	Previous bypass flow (ft3/s)	Total flow (ft3/s)	Roadway width (ft)	Shoulder width (ft)	Longitudinal slope (ft/ft)	Water depth at curb, d (in)	Efficiency, E (%)	Spread, T (ft)	Design spread, Tmax (ft)	Gutter velocity, V (ft/s)	Side flow interception (ft3/s)	Front flow interception (ft3/s)	Total Flow interception (ft3/s)	Bypass flow (ft3/s)
5-6	172699.24	470.76	56.00	0.61	0.90	5.00	7.93	4.32	0.00	4.32	42.00	10.00	0.023	3.02	0.79	6.10	10.00	5.30	0.28	3.03	3.31	1.01
5-7	172344.56	354.69	56.00	0.46	0.90	5.00	7.93	3.25	1.01	4.26	42.00	10.00	0.023	3.00	0.79	6.06	10.00	5.28	0.28	3.00	3.28	0.99
5-8	172112.00	232.56	56.00	0.30	0.90	5.00	7.93	2.13	0.99	3.12	42.00	10.00	0.023	2.68	0.86	5.36	10.00	4.78	0.20	2.36	2.57	0.55

SCDOT Type 25 Inlet Spacing

	Assumptions:		**Project information:**			
	Road cross-slope	0.02	Road:	COMMUNITY	Sheet No:	2/4
	Shoulder cross-slope	0.04	Roadside (RT/LT):	RT	Project ID:	P042443
	Design frequency:	10 Year	Storm Sewer System:	NET5	Project:	Scout Motors
	Design spread (ft):	Shoulder	Receiving Stream/Outfall:	Unnamed Trib	Engineer:	Mackensie Barbee
			Drainage start station [ft]:	10782.82	Date:	12/20/2023
			County:	Richland		

Note: User fills in GREEN cells only

		Discharge									Cross section and spread					Output for inlet						
CB no.	Station (ft)	Spacing between inlets, L (ft)	Width of the drainage area, W (ft)	Drainage area, A (acre)	Runoff coeff. Cw	Conc. time, tc (min)	Rainfall intensity, I (in/hr)	Flow rate, Q (ft3/s)	Previous bypass flow (ft3/s)	Total flow (ft3/s)	Roadway width (ft)	Shoulder width (ft)	Longitudinal slope (ft/ft)	Water depth at curb, d (in)	Efficiency, E (%)	Spread, T (ft)	Design spread, Tmax (ft)	Gutter velocity, V (ft/s)	Side flow interception (ft3/s)	Front flow interception (ft3/s)	Total Flow interception (ft3/s)	Bypass flow (ft3/s)
5-2	10397.12	385.70	39.50	0.35	0.90	5.00	7.93	2.50	0.00	2.50	63.00	7.50	0.025	2.42	0.90	4.81	7.50	4.67	0.14	2.01	2.16	0.34
5-3	10097.67	299.46	39.50	0.27	0.90	5.00	7.93	1.94	0.34	2.28	63.00	7.50	0.025	2.34	0.92	4.65	7.50	4.57	0.13	1.88	2.00	0.27
5-4	9923.36	174.30	39.50	0.16	0.90	5.00	7.93	1.13	0.27	1.40	63.00	7.50	0.025	1.96	0.97	3.91	7.50	4.16	0.07	1.28	1.34	0.06

SCDOT Type 25 Inlet Spacing

	Assumptions:		**Project information:**			
	Road cross-slope	0.02	Road:	CONNECT	Sheet No:	3/4
	Shoulder cross-slope	0.04	Roadside (RT/LT):	RT	Project ID:	P042443
	Design frequency:	10 Year	Storm Sewer System:	NET5	Project:	Scout Motors
	Design spread (ft):	Shoulder	Receiving Stream/Outfall:	Unnamed Trib	Engineer:	Mackensie Barbee
			Drainage start station [ft]:	12071.89	Date:	12/20/2023
			County:	Richland		

Note: User fills in GREEN cells only

		Discharge									Cross section and spread					Output for inlet						
CB no.	Station (ft)	Spacing between inlets, L (ft)	Width of the drainage area, W (ft)	Drainage area, A (acre)	Runoff coeff. Cw	Conc. time, tc (min)	Rainfall intensity, I (in/hr)	Flow rate, Q (ft3/s)	Previous bypass flow (ft3/s)	Total flow (ft3/s)	Roadway width (ft)	Shoulder width (ft)	Longitudinal slope (ft/ft)	Water depth at curb, d (in)	Efficiency, E (%)	Spread, T (ft)	Design spread, Tmax (ft)	Gutter velocity, V (ft/s)	Side flow interception (ft3/s)	Front flow interception (ft3/s)	Total Flow interception (ft3/s)	Bypass flow (ft3/s)
1-12	11499.66	572.23	39.50	0.52	0.90	5.00	7.93	3.70	0.00	3.70	48.00	7.50	0.025	2.79	0.83	5.60	7.50	5.24	0.22	2.73	2.96	0.75
2-9	11425.38	74.28	39.50	0.07	0.90	5.00	7.93	0.48	0.75	1.23	63.00	7.50	0.025	1.85	0.98	3.71	7.50	4.08	0.05	1.13	1.18	0.04

SCDOT Type 25 Inlet Spacing

	Assumptions:		**Project information:**			
	Road cross-slope	0.02	Road:	CONRPC	Sheet No:	4/4
	Shoulder cross-slope	0.04	Roadside (RT/LT):	RT	Project ID:	P042443
	Design frequency:	10 Year	Storm Sewer System:	NET5	Project:	Scout Motors
	Design spread (ft):	Shoulder	Receiving Stream/Outfall:	Unnamed Trib	Engineer:	Mackensie Barbee
			Drainage start station [ft]:	173170.67	Date:	12/20/2023
			County:	Richland		

Note: User fills in GREEN cells only

		Discharge									Cross section and spread					Output for inlet						
CB no.	Station (ft)	Spacing between inlets, L (ft)	Width of the drainage area, W (ft)	Drainage area, A (acre)	Runoff coeff. Cw	Conc. time, tc (min)	Rainfall intensity, I (in/hr)	Flow rate, Q (ft3/s)	Previous bypass flow (ft3/s)	Total flow (ft3/s)	Roadway width (ft)	Shoulder width (ft)	Longitudinal slope (ft/ft)	Water depth at curb, d (in)	Efficiency, E (%)	Spread, T (ft)	Design spread, Tmax (ft)	Gutter velocity, V (ft/s)	Side flow interception (ft3/s)	Front flow interception (ft3/s)	Total Flow interception (ft3/s)	Bypass flow (ft3/s)
5-13	173017.70	152.97	34.00	0.12	0.90	5.00	7.93	0.85	0.00	0.85	24.00	10.00	0.025	1.64	0.98	3.21	10.00	3.41	0.04	0.78	0.82	0.03
5-12	172904.32	113.38	34.00	0.09	0.90	5.00	7.93	0.63	0.03	0.67	24.00	10.00	0.025	1.52	0.99	2.97	10.00	3.21	0.03	0.62	0.65	0.02
5-11	172698.93	205.40	34.00	0.16	0.90	5.00	7.93	1.14	0.02	1.16	24.00	10.00	0.025	1.84	0.97	3.61	10.00	3.76	0.06	1.05	1.10	0.06
5-10	172496.22	202.70	34.00	0.16	0.90	5.00	7.93	1.13	0.06	1.19	24.00	10.00	0.025	1.85	0.97	3.65	10.00	3.79	0.06	1.07	1.13	0.06
5-9	172293.30	202.92	34.00	0.16	0.90	5.00	7.93	1.13	0.06	1.19	24.00	10.00	0.025	1.85	0.97	3.65	10.00	3.79	0.06	1.07	1.13	0.06

Appendix B.4: Bridge Deck Drainage Analysis

PROJECT: **I-77** **Reference HEC 21 May 93, pg 59**
DATE: 12/22/2023 n=.013
DESIGNER: Melanie Nguyen

Provide 30% Blockage
Note: 30% decrease of a 6" (.5' D) hole results in a .42' D hole.
USE "D"= 0.42 FT FOR A 6" DIAMETER DRAIN

CONNECTOR ROAD

Station	D. A. Width (feet)	D. A. Length (feet)	D.A. (Acres)	"C" Value	I (In/hr)	Q (cfs)	Q Bypass	Total Q (cfs)	Longitudinal Slope (ft/ft)	Cross Slope (ft/ft)	Spread (feet)	D/T	E (from HEC 21)	Q in (cfs)	Q bypass (cfs)
Deck Spread- from Crest to end of bridge Left															
147+55.			0.000	0.9	7.93	0.00	0	0.000	0.00001	0.020	0.00	#DIV/0!	0.60	0.00	0.00
147+58.	59.125	3	0.004	0.9	7.93	0.03	0.00	0.029	0.001188	0.020	2.86	0.15	0.60	0.02	0.01
147+62.	59.125	4	0.005	0.9	7.93	0.04	0.01	0.050	0.002376	0.020	3.09	0.14	0.60	0.03	0.02
147+66.	59.125	4	0.005	0.9	7.93	0.04	0.02	0.059	0.003564	0.020	3.03	0.14	0.60	0.04	0.02
147+70.	59.125	4	0.005	0.9	7.93	0.04	0.02	0.062	0.004752	0.020	2.94	0.14	0.60	0.04	0.02
147+75.	59.125	5	0.007	0.9	7.93	0.05	0.02	0.073	0.002376	0.020	3.55	0.12	0.00	0.00	0.07
147+85.	59.125	10	0.014	0.9	7.93	0.10	0.07	0.170	0.003564	0.020	4.52	0.09	0.00	0.00	0.17
147+95.	59.125	10	0.014	0.9	7.93	0.10	0.17	0.267	0.004752	0.020	5.07	0.08	0.00	0.00	0.27
148+05.	59.125	10	0.014	0.9	7.93	0.10	0.27	0.364	0.005941	0.020	5.45	0.08	0.00	0.00	0.36
148+15.	59.125	10	0.014	0.9	7.93	0.10	0.36	0.461	0.007129	0.020	5.76	0.07	0.00	0.00	0.46
148+25.	59.125	10	0.014	0.9	7.93	0.10	0.46	0.558	0.008317	0.020	6.01	0.07	0.00	0.00	0.56
148+35.	59.125	10	0.014	0.9	7.93	0.10	0.56	0.655	0.009505	0.020	6.22	0.07	0.00	0.00	0.65
148+45.	59.125	10	0.014	0.9	7.93	0.10	0.65	0.751	0.010693	0.020	6.41	0.07	0.00	0.00	0.75
148+55.	59.125	10	0.014	0.9	7.93	0.10	0.75	0.848	0.011881	0.020	6.58	0.06	0.00	0.00	0.85
148+65.	59.125	10	0.014	0.9	7.93	0.10	0.85	0.945	0.013069	0.020	6.73	0.06	0.00	0.00	0.95
148+75.	59.125	10	0.014	0.9	7.93	0.10	0.95	1.042	0.014257	0.020	6.87	0.06	0.00	0.00	1.04
148+85.	59.125	10	0.014	0.9	7.93	0.10	1.04	1.139	0.015446	0.020	6.99	0.06	0.00	0.00	1.14
148+95.	59.125	10	0.014	0.9	7.93	0.10	1.14	1.236	0.016634	0.020	7.11	0.06	0.00	0.00	1.24
149+05.	59.125	10	0.014	0.9	7.93	0.10	1.24	1.333	0.017822	0.020	7.22	0.06	0.00	0.00	1.33
149+15.	59.125	10	0.014	0.9	7.93	0.10	1.33	1.430	0.01901	0.020	7.32	0.06	0.00	0.00	1.43
149+25.	59.125	10	0.014	0.9	7.93	0.10	1.43	1.526	0.020198	0.020	7.42	0.06	0.00	0.00	1.53
149+35.	59.125	10	0.014	0.9	7.93	0.10	1.53	1.623	0.021386	0.020	7.51	0.06	0.00	0.00	1.62
149+45.	59.125	10	0.014	0.9	7.93	0.10	1.62	1.720	0.022574	0.020	7.60	0.06	0.00	0.00	1.72
149+55.	59.125	10	0.014	0.9	7.93	0.10	1.72	1.817	0.023762	0.020	7.68	0.05	0.00	0.00	1.82
149+65.	59.125	10	0.014	0.9	7.93	0.10	1.72	1.817	0.02495	0.020	7.61	0.06	0.00	0.00	1.82
149+75.	59.125	10	0.014	0.9	7.93	0.10	1.82	1.914	0.026139	0.020	7.70	0.05	0.00	0.00	1.91
149+87.	59.125	12	0.016	0.9	7.93	0.12	1.82	1.933	0.027564	0.020	7.65	0.05	0.00	0.00	1.93
150+07.	59.125	20	0.027	0.9	7.93	0.19	1.91	2.108	0.029941	0.020	7.78	0.05	0.00	0.00	2.11
end of approach slab Left 150+07.4357													**Maximum allowable spread = 8'**		

PROJECT: **I-77**
DATE: 12/22/2023
DESIGNER: Melanie Nguyen

Reference HEC 21 May 93, pg 59
n=.013

Provide 30% Blockage
Note: 30% decrease of a 6" (.5' D) hole results in a .42' D hole.
USE "D"= 0.42 FT FOR A 6" DIAMETER DRAIN

CONNECTOR ROAD

Deck Spread- from Crest to beginning of bridge Left															
147+55.			0.000	0.9	7.93	0.00	0	0.000	0.00001	0.020	0.00	#DIV/0!	0.60	0.00	0.00
147+54.	59.125	1	0.001	0.9	7.93	0.01	0.00	0.010	0.000119	0.020	2.92	0.14	0.60	0.01	0.00
147+50.	59.125	4	0.005	0.9	7.93	0.04	0.00	0.043	0.000594	0.020	3.76	0.11	0.60	0.03	0.02
147+46.	59.125	4	0.005	0.9	7.93	0.04	0.02	0.056	0.001188	0.020	3.65	0.11	0.60	0.03	0.02
147+42.	59.125	4	0.005	0.9	7.93	0.04	0.02	0.061	0.001545	0.020	3.60	0.12	0.60	0.04	0.02
147+38.	59.125	4	0.005	0.9	7.93	0.04	0.02	0.063	0.00202	0.020	3.46	0.12	0.60	0.04	0.03
147+34.	59.125	4	0.005	0.9	7.93	0.04	0.03	0.064	0.002495	0.020	3.35	0.13	0.60	0.04	0.03
147+24.	59.125	10	0.014	0.9	7.93	0.10	0.03	0.122	0.003683	0.020	3.97	0.11	0.00	0.00	0.12
147+14.	59.125	10	0.014	0.9	7.93	0.10	0.12	0.219	0.004871	0.020	4.68	0.09	0.00	0.00	0.22
147+04.	59.125	10	0.014	0.9	7.93	0.10	0.22	0.316	0.006059	0.020	5.16	0.08	0.00	0.00	0.32
146+94.	59.125	10	0.014	0.9	7.93	0.10	0.32	0.413	0.007248	0.020	5.51	0.08	0.00	0.00	0.41
146+84.	59.125	10	0.014	0.9	7.93	0.10	0.41	0.510	0.008436	0.020	5.80	0.07	0.00	0.00	0.51
146+74.	59.125	10	0.014	0.9	7.93	0.10	0.51	0.607	0.009624	0.020	6.04	0.07	0.00	0.00	0.61
146+64.	59.125	10	0.014	0.9	7.93	0.10	0.61	0.704	0.010812	0.020	6.24	0.07	0.00	0.00	0.70
146+54.	59.125	10	0.014	0.9	7.93	0.10	0.70	0.801	0.012	0.020	6.42	0.07	0.00	0.00	0.80
146+44.	59.125	10	0.014	0.9	7.93	0.10	0.80	0.897	0.013188	0.020	6.59	0.06	0.00	0.00	0.90
146+34.	59.125	10	0.014	0.9	7.93	0.10	0.90	0.994	0.014376	0.020	6.74	0.06	0.00	0.00	0.99
146+27.	59.125	7	0.010	0.9	7.93	0.07	0.99	1.062	0.015208	0.020	6.83	0.06	0.00	0.00	1.06
146+07.	59.125	20	0.027	0.9	7.93	0.19	1.06	1.256	0.017584	0.020	7.08	0.06	0.00	0.00	1.26
Begin of approach slab Left 146+07.4401											**Maximum allowable spread = 8'**				

PROJECT: **I-77**
DATE: 12/22/2023
DESIGNER: Melanie Nguyen

Reference HEC 21 May 93, pg 59
n=.013

Provide 30% Blockage
Note: 30% decrease of a 6" (.5' D) hole results in a .42' D hole.
USE "D"= 0.42 FT FOR A 6" DIAMETER DRAIN

CONNECTOR ROAD

Deck Spread- from Crest to End of bridge Right															
147+55.			0.000	0.9	7.93	0.00	0	0.000	0.00001	0.020	0.00	#DIV/0!	0.00	0.00	0.00
147+65.	69	10	0.016	0.9	7.93	0.11	0.00	0.113	0.001188	0.020	4.76	0.09	0.00	0.00	0.11
147+75.	57	10	0.013	0.9	7.93	0.09	0.11	0.206	0.002376	0.020	5.24	0.08	0.00	0.00	0.21
147+85.	47.125	10	0.011	0.9	7.93	0.08	0.21	0.284	0.003564	0.020	5.47	0.08	0.00	0.00	0.28
147+95.	47.125	10	0.011	0.9	7.93	0.08	0.28	0.361	0.004752	0.020	5.67	0.07	0.00	0.00	0.36
148+05.	47.125	10	0.011	0.9	7.93	0.08	0.36	0.438	0.005941	0.020	5.85	0.07	0.00	0.00	0.44
148+15.	47.125	10	0.011	0.9	7.93	0.08	0.44	0.515	0.007129	0.020	6.00	0.07	0.00	0.00	0.52
148+25.	47.125	10	0.011	0.9	7.93	0.08	0.52	0.592	0.008317	0.020	6.15	0.07	0.00	0.00	0.59
148+35.	47.125	10	0.011	0.9	7.93	0.08	0.59	0.670	0.009505	0.020	6.28	0.07	0.00	0.00	0.67
148+45.	47.125	10	0.011	0.9	7.93	0.08	0.67	0.747	0.010693	0.020	6.40	0.07	0.00	0.00	0.75
148+55.	47.125	10	0.011	0.9	7.93	0.08	0.75	0.824	0.011881	0.020	6.51	0.06	0.00	0.00	0.82
148+65.	47.125	10	0.011	0.9	7.93	0.08	0.82	0.901	0.013069	0.020	6.61	0.06	0.00	0.00	0.90
148+75.	47.125	10	0.011	0.9	7.93	0.08	0.90	0.979	0.014257	0.020	6.71	0.06	0.00	0.00	0.98
148+85.	47.125	10	0.011	0.9	7.93	0.08	0.98	1.056	0.015446	0.020	6.80	0.06	0.00	0.00	1.06
148+95.	47.125	10	0.011	0.9	7.93	0.08	1.06	1.133	0.016634	0.020	6.88	0.06	0.00	0.00	1.13
149+05.	47.125	10	0.011	0.9	7.93	0.08	1.13	1.210	0.017822	0.020	6.96	0.06	0.00	0.00	1.21
149+15.	47.125	10	0.011	0.9	7.93	0.08	1.21	1.287	0.01901	0.020	7.04	0.06	0.00	0.00	1.29
149+25.	47.125	10	0.011	0.9	7.93	0.08	1.29	1.365	0.020198	0.020	7.12	0.06	0.00	0.00	1.36
149+35.	47.125	10	0.011	0.9	7.93	0.08	1.36	1.442	0.021386	0.020	7.19	0.06	0.00	0.00	1.44
149+45.	47.125	10	0.011	0.9	7.93	0.08	1.44	1.519	0.022574	0.020	7.25	0.06	0.00	0.00	1.52
149+55.	47.125	10	0.011	0.9	7.93	0.08	1.52	1.596	0.023762	0.020	7.32	0.06	0.00	0.00	1.60
149+65.	47.125	10	0.011	0.9	7.93	0.08	1.60	1.673	0.02495	0.020	7.38	0.06	0.00	0.00	1.67
149+75.	47.125	10	0.011	0.9	7.93	0.08	1.67	1.751	0.026139	0.020	7.44	0.06	0.00	0.00	1.75
149+87.	47.125	12	0.013	0.9	7.93	0.09	1.75	1.843	0.027564	0.020	7.51	0.06	0.00	0.00	1.84
150+07.	47.125	20	0.022	0.9	7.93	0.15	1.84	1.998	0.029941	0.020	7.62	0.06	0.00	0.00	2.00

end of approach slab Right 150+07.4357

Maximum allowable spread = 8'

PROJECT: **I-77**
DATE: 12/22/2023
DESIGNER: Melanie Nguyen

Reference HEC 21 May 93, pg 59
n=.013

Provide 30% Blockage
Note: 30% decrease of a 6" (.5' D) hole results in a .42' D hole.
USE "D"= 0.42 FT FOR A 6" DIAMETER DRAIN

CONNECTOR ROAD

Deck Spread- from Begin Bridge 146+07.4401 to 147+23.7715 Right															
146+27.			0.000	0.9	7.93	0.00	0	0.000	0.002000	0.020	0.00	#DIV/0!	0.00	0.00	0.00
146+37.	67.3	10	0.015	0.9	7.93	0.11	0.00	0.110	0.002000	0.020	4.28	0.10	0.00	0.00	0.11
146+47.	73.3	10	0.017	0.9	7.93	0.12	0.11	0.230	0.002000	0.020	5.64	0.07	0.00	0.00	0.23
146+57.	79.3	10	0.018	0.9	7.93	0.13	0.23	0.360	0.002000	0.020	6.66	0.06	0.00	0.00	0.36
146+67.	85.3	10	0.020	0.9	7.93	0.14	0.36	0.500	0.002000	0.020	7.53	0.06	0.00	0.00	0.50
146+77.	91.3	10	0.021	0.9	7.93	0.15	0.50	0.650	0.002000	0.020	8.31	0.05	0.00	0.00	0.65
146+87.	97.3	10	0.022	0.9	7.93	0.16	0.65	0.809	0.002000	0.020	9.02	0.05	0.00	0.00	0.81
146+95.	102	8	0.019	0.9	7.93	0.13	0.81	0.943	0.002000	0.020	9.55	0.04	0.00	0.00	0.94
146+99.	102	4	0.009	0.9	7.93	0.07	0.94	1.010	0.002000	0.020	9.80	0.04	0.60	0.61	0.40
147+03.	102	4	0.009	0.9	7.93	0.07	0.40	0.471	0.002000	0.020	7.36	0.06	0.60	0.28	0.19
147+07.	102	4	0.009	0.9	7.93	0.07	0.19	0.255	0.002000	0.020	5.85	0.07	0.60	0.15	0.10
147+11.	102	4	0.009	0.9	7.93	0.07	0.10	0.169	0.002000	0.020	5.02	0.08	0.60	0.10	0.07
147+15.	102	4	0.009	0.9	7.93	0.07	0.07	0.134	0.002000	0.020	4.61	0.09	0.60	0.08	0.05
147+19.	102	4	0.009	0.9	7.93	0.07	0.05	0.121	0.002000	0.020	4.42	0.09	0.60	0.07	0.05
147+23.	102	4	0.009	0.9	7.93	0.07	0.05	0.115	0.002000	0.020	4.35	0.10	0.00	0.00	0.12
147+27.	467	4	0.043	0.9	7.93	0.31	0.12	0.421	0.002000	0.020	7.06	0.06	0.00	0.00	0.42
Average width including drainage area from crest to Station 147+23.7715 RT											**Maximum allowable spread = 10'**				

PROJECT: **I-77** **Reference HEC 21 May 93, pg 59**
DATE: 12/22/2023 n=.013
DESIGNER: Melanie Nguyen

Provide 30% Blockage
Note: 30% decrease of a 6" (.5' D) hole results in a .42' D hole.
USE "D"= 0 FT FOR A 6" DIAMETER DRAIN

US-21

Station	D. A. Width (feet)	D. A. Length (feet)	D.A. (Acres)	"C" Value	I (In/hr)	Q (cfs)	Q Bypass	Total Q (cfs)	Longitudinal Slope (ft/ft)	Cross Slope (ft/ft)	Spread (feet)	D/T	E (from HEC 21)	Q in (cfs)	Q bypass (cfs)
Deck Spread- from Crest to end of bridge (Right)															
700+03.			0.000	0.9	7.93	0.00	0	0.000	0.000056	0.020	0.00	#DIV/0!	0.00	0.00	0.00
700+13.	39.125	10	0.009	0.9	7.93	0.06	0.00	0.064	0.001006	0.020	3.97	0.00	0.00	0.00	0.06
700+23.	39.125	10	0.009	0.9	7.93	0.06	0.06	0.128	0.002069	0.020	4.50	0.00	0.00	0.00	0.13
700+33.	39.125	10	0.009	0.9	7.93	0.06	0.13	0.192	0.003131	0.020	4.84	0.00	0.00	0.00	0.19
700+43.	39.125	10	0.009	0.9	7.93	0.06	0.19	0.256	0.004194	0.020	5.11	0.00	0.00	0.00	0.26
700+53.	39.125	10	0.009	0.9	7.93	0.06	0.26	0.321	0.005256	0.020	5.32	0.00	0.00	0.00	0.32
700+63.	39.125	10	0.009	0.9	7.93	0.06	0.32	0.385	0.006319	0.020	5.50	0.00	0.00	0.00	0.38
700+73.	39.125	10	0.009	0.9	7.93	0.06	0.38	0.449	0.007381	0.020	5.66	0.00	0.00	0.00	0.45
700+83.	39.125	10	0.009	0.9	7.93	0.06	0.45	0.513	0.008444	0.020	5.81	0.00	0.00	0.00	0.51
700+91.	39.125	8	0.007	0.9	7.93	0.05	0.51	0.564	0.009506	0.020	5.89	0.00	0.00	0.00	0.56
end of approach slab Right 700+91.1199											**Maximum allowable spread = 8'**				
Deck Spread- from Crest to beginning of bridge (Left)															
700+03.									0.000056	0.020					
699+93.	39.125	10	0.009	0.9	7.93	0.06	0.00	0.064	0.001438	0.020	3.71	0.00	0.00	0.00	0.06
699+83.	39.125	10	0.009	0.9	7.93	0.06	0.06	0.128	0.0025	0.020	4.34	0.00	0.00	0.00	0.13
699+73.	39.125	10	0.009	0.9	7.93	0.06	0.13	0.192	0.003563	0.020	4.73	0.00	0.00	0.00	0.19
699+63.	39.125	10	0.009	0.9	7.93	0.06	0.19	0.256	0.004625	0.020	5.01	0.00	0.00	0.00	0.26
699+53.	39.125	10	0.009	0.9	7.93	0.06	0.26	0.321	0.005687	0.020	5.24	0.00	0.00	0.00	0.32
699+43.	39.125	10	0.009	0.9	7.93	0.06	0.32	0.385	0.00675	0.020	5.44	0.00	0.00	0.00	0.38
699+33.	39.125	10	0.009	0.9	7.93	0.06	0.38	0.449	0.007813	0.020	5.60	0.00	0.00	0.00	0.45
699+23.	39.125	10	0.009	0.9	7.93	0.06	0.45	0.513	0.008875	0.020	5.75	0.00	0.00	0.00	0.51
699+13.	39.125	10	0.009	0.9	7.93	0.06	0.51	0.577	0.009938	0.020	5.89	0.00	0.00	0.00	0.58
699+03.	39.125	10	0.009	0.9	7.93	0.06	0.58	0.641	0.011	0.020	6.01	0.00	0.00	0.00	0.64
698+91.	39.125	12	0.011	0.9	7.93	0.08	0.64	0.718	0.012062	0.020	6.16	0.00	0.00	0.00	0.72
beginning of approach slab Right 698+91.5167											**Maximum allowable spread = 8'**				

PROJECT: **I-77** **Reference HEC 21 May 93, pg 59**
DATE: 12/22/2023 n=.013
DESIGNER: Melanie Nguyen

Provide 30% Blockage
Note: 30% decrease of a 6" (.5' D) hole results in a .42' D hole.
USE "D"= 0 FT FOR A 6" DIAMETER DRAIN

Ramp BA

Station	D. A. Width (feet)	D. A. Length (feet)	D.A. (Acres)	"C" Value	I (In/hr)	Q (cfs)	Q Bypass	Total Q (cfs)	Longitudinal Slope (ft/ft)	Cross Slope (ft/ft)	Spread (feet)	D/T	E (from HEC 21)	Q in (cfs)	Q bypass (cfs)
Deck Spread- from Crest to end of bridge															
1741+60.			0.000	0.9	7.93	0.00	0	0.000	0.000023	0.072	0.00	#DIV/0!	0.00	0.00	0.00
1741+70.	40.25	10	0.009	0.9	7.93	0.07	0.00	0.066	0.00098	0.072	1.81	0.00	0.00	0.00	0.07
1741+80.	40.25	10	0.009	0.9	7.93	0.07	0.07	0.132	0.00198	0.072	2.06	0.00	0.00	0.00	0.13
1741+90.	40.25	10	0.009	0.9	7.93	0.07	0.13	0.198	0.002994	0.072	2.22	0.00	0.00	0.00	0.20
1742+00.	40.25	10	0.009	0.9	7.93	0.07	0.20	0.264	0.00400	0.072	2.34	0.00	0.00	0.00	0.26
1742+10.	40.25	10	0.009	0.9	7.93	0.07	0.26	0.330	0.005006	0.072	2.44	0.00	0.00	0.00	0.33
1742+20.	40.25	10	0.009	0.9	7.93	0.07	0.33	0.396	0.006011	0.072	2.52	0.00	0.00	0.00	0.40
1742+30.	40.25	10	0.009	0.9	7.93	0.07	0.40	0.462	0.007017	0.072	2.59	0.00	0.00	0.00	0.46
1742+40.	40.25	10	0.009	0.9	7.93	0.07	0.46	0.528	0.008023	0.072	2.66	0.00	0.00	0.00	0.53
1742+50.	40.25	10	0.009	0.9	7.93	0.07	0.53	0.594	0.009029	0.072	2.72	0.00	0.00	0.00	0.59
1742+60.	40.25	10	0.009	0.9	7.93	0.07	0.59	0.659	0.010034	0.072	2.77	0.00	0.00	0.00	0.66
1742+70.	40.25	10	0.009	0.9	7.93	0.07	0.66	0.725	0.012046	0.072	2.78	0.00	0.00	0.00	0.73
1742+80.	40.25	10	0.009	0.9	7.93	0.07	0.73	0.791	0.013051	0.072	2.83	0.00	0.00	0.00	0.79
1742+90.	40.25	10	0.009	0.9	7.93	0.07	0.79	0.857	0.014057	0.072	2.87	0.00	0.00	0.00	0.86
1743+00.	40.25	10	0.009	0.9	7.93	0.07	0.86	0.923	0.015063	0.072	2.91	0.00	0.00	0.00	0.92
1743+10.	40.25	10	0.009	0.9	7.93	0.07	0.92	0.989	0.016069	0.072	2.95	0.00	0.00	0.00	0.99
1743+20.	40.25	10	0.009	0.9	7.93	0.07	0.99	1.055	0.017074	0.072	2.99	0.00	0.00	0.00	1.06
1743+30.	40.25	10	0.009	0.9	7.93	0.07	1.06	1.121	0.01808	0.072	3.03	0.00	0.00	0.00	1.12
1743+40.	40.25	10	0.009	0.9	7.93	0.07	1.12	1.187	0.019086	0.072	3.06	0.00	0.00	0.00	1.19
1743+50.	40.25	10	0.009	0.9	7.93	0.07	1.19	1.253	0.020091	0.072	3.10	0.00	0.00	0.00	1.25
1743+60.	40.25	10	0.009	0.9	7.93	0.07	1.25	1.319	0.021097	0.072	3.13	0.00	0.00	0.00	1.32
1743+70.	40.25	10	0.009	0.9	7.93	0.07	1.32	1.385	0.021097	0.072	3.19	0.00	0.00	0.00	1.38
1743+80.	40.25	10	0.009	0.9	7.93	0.07	1.38	1.451	0.021097	0.072	3.24	0.00	0.00	0.00	1.45
end of approach slab 1743+79.7202											**Maximum allowable spread = 10'**				
Deck Spread- from Crest to beginning of bridge															
1741+60.									0.000023	0.072					
1741+50.	40.25	10	0.009	0.9	7.93	0.07	0.00	0.066	0.001029	0.072	1.79	0.00	0.00	0.00	0.07
1741+40.	40.25	10	0.009	0.9	7.93	0.07	0.07	0.132	0.002034	0.072	2.05	0.00	0.00	0.00	0.13
1741+30.	40.25	10	0.009	0.9	7.93	0.07	0.13	0.198	0.00304	0.072	2.21	0.00	0.00	0.00	0.20
1741+20.	40.25	10	0.009	0.9	7.93	0.07	0.20	0.264	0.004046	0.072	2.33	0.00	0.00	0.00	0.26
1741+10.	40.25	10	0.009	0.9	7.93	0.07	0.26	0.330	0.005051	0.072	2.43	0.00	0.00	0.00	0.33
1741+00.	40.25	10	0.009	0.9	7.93	0.07	0.33	0.396	0.006057	0.072	2.52	0.00	0.00	0.00	0.40
1740+90.	40.25	10	0.009	0.9	7.93	0.07	0.40	0.462	0.007063	0.072	2.59	0.00	0.00	0.00	0.46
1740+80.	40.25	10	0.009	0.9	7.93	0.07	0.46	0.528	0.008069	0.072	2.66	0.00	0.00	0.00	0.53
1740+70.	40.25	10	0.009	0.9	7.93	0.07	0.53	0.594	0.009074	0.072	2.72	0.00	0.00	0.00	0.59
1740+60.	40.25	10	0.009	0.9	7.93	0.07	0.59	0.659	0.01000	0.072	2.77	0.00	0.00	0.00	0.66
1740+50.	40.25	10	0.009	0.9	7.93	0.07	0.66	0.725	0.011086	0.072	2.82	0.00	0.00	0.00	0.73
1740+40.	40.25	10	0.009	0.9	7.93	0.07	0.73	0.791	0.012091	0.072	2.87	0.00	0.00	0.00	0.79
1740+30.	40.25	10	0.009	0.9	7.93	0.07	0.79	0.857	0.013097	0.072	2.91	0.00	0.00	0.00	0.86
1740+20.	40.25	10	0.009	0.9	7.93	0.07	0.86	0.923	0.014103	0.072	2.95	0.00	0.00	0.00	0.92
1740+10.	40.25	10	0.009	0.9	7.93	0.07	0.92	0.989	0.015109	0.072	2.99	0.00	0.00	0.00	0.99
1740+00.	40.25	10	0.009	0.9	7.93	0.07	0.99	1.055	0.016114	0.072	3.03	0.00	0.00	0.00	1.06
1739+95.	40.25	5	0.005	0.9	7.93	0.03	1.06	1.088	0.01712	0.072	3.03	0.00	0.00	0.00	1.09
beginning of approach slab 1739+95.3730											**Maximum allowable spread = 10'**				

Appendix B.5: Conceptual Bridge Plans

bXXXXX1ts.dgn

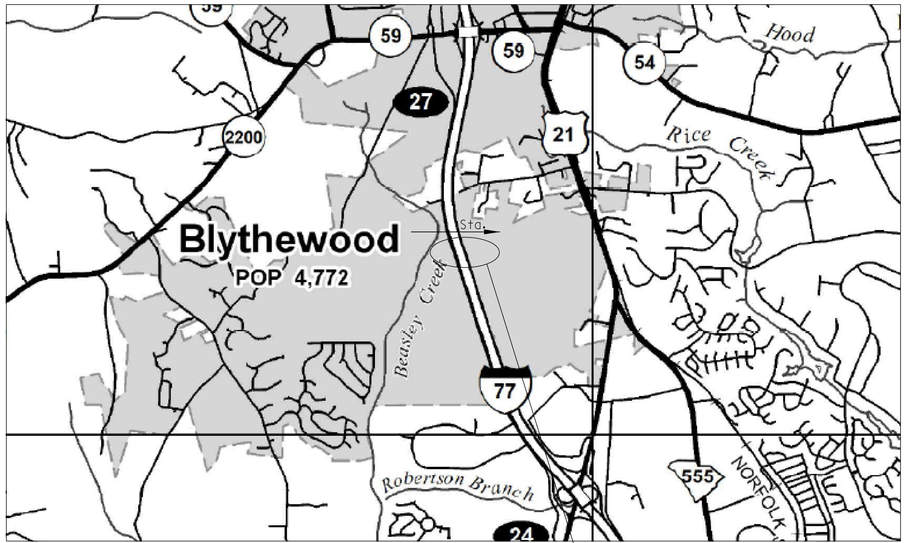
BRIDGE PLANS ID	SHEET NO.
P042443-B01	1

INDEX OF SHEETS

1. Title Sheet
2. General Notes
3. Bridge Plan View
4. Bridge Profile Views
5. Plan and Elevation End Bent 1
6. Plan and Elevation Bent 2
7. Plan and Elevation Bent 3
8. Plan and Elevation Bent 4
9. Plan and Elevation End Bent 5
10. Plan and Elevation End Bent 6
11. Plan and Elevation Bent 7
12. Typical Section Span 1
13. Typical Section Span 2
14. Typical Section Spans 3 & 4
15. Typical Section Span 5
16. MSE Walls (1 of 2)
17. MSE Walls (2 of 2)

South Carolina Department of Transportation

PROPOSED PLANS FOR RICHLAND COUNTY PROJECT ID P042443 I-77 INTERCHANGE AND CONNECTION ROADS CONSTRUCT BRIDGE ON CONNECTOR ROAD OVER I-77 AND COMMUNITY ROAD



LAYOUT

SITE LOCATION

-N-

Approximate Location of Bridge is

Latitude	34°- 11' - 27.9" N
Longitude	80°- 59' - 2.01" W

3 DAYS BEFORE DIGGING IN SOUTH CAROLINA

CALL 811

SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

NET LENGTH OF ROADWAY	1.252	MILES
NET LENGTH OF BRIDGES	0.086	MILES
NET LENGTH OF PROJECT	1.338	MILES
LENGTH OF EXCEPTIONS	0.000	MILES
GROSS LENGTH OF PROJECT	1.338	MILES

TRAFFIC DATA

2026 ADT 14,900 V.P.D.

2046 ADT 22,800 V.P.D.

TRUCKS 11 %

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF LETTING.

ENGINEER OF RECORD

CONCEPTUAL PLANS

NOT FOR CONSTRUCTION

FOR CONSTRUCTION : _____ _____ DATE

REVIEWED	TRL	12-23
DR.	NSC	CHK
	VAS	BY

Gunnyon
12/7/2023

DRAWING NO. 700-02

BRIDGE PLANS ID	SHEET NO.
P042443-B01	2

MATERIAL & WORKMANSHIP

Provide all material and workmanship in accordance with the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction, unless otherwise specified on the Plans or in the Special Provisions.

COORDINATION OF PLANS, SPECIFICATIONS, AND SPECIAL PROVISIONS

Generally, in case of discrepancy, this General Notes sheet governs over the Standard Specifications but the remainder of the plans govern over notes on this sheet and Special Provisions govern over all. See Subsection 105.4 of the Standard Specifications.

WATER ELEVATIONS

The water elevations shown in the plans are for information only and the actual water elevation during construction may vary depending on weather conditions and seasonal fluctuations.

COMPLETION DATES

On inside face of right side barrier parapet/railing at beginning of bridge and on left side barrier parapet/railing at end of bridge, place year of completion adjacent to guardrail attachment. Place this completion date so that it will not be covered by the guardrail connector when it is installed. Recess numbers in the concrete using numbers fabricated from reusable/durable material that is approved by the RCE. Provide numbers in accordance with SCDOT Standard Drawing No. 702-305-00.

REINFORCING STEEL

Fabricate reinforcing bars as noted on Reinforcing Bending Details sheet.

Do not use lap splices in column and shaft reinforcing steel.

PRESTRESSED CONCRETE BEAMS

Beam lengths given are based on horizontal span only. Increase lengths to correct for concrete shrinkage, concrete shortening when the strands are cut, and for beams being on a grade.

All overhang brackets in the top flange of exterior beams shall be galvanized in accordance with AASHTO M 111, AASHTO M 232, or ASTM F 2329 as appropriate and shall be detailed accordingly in the shop plans.

CONCRETE

Provide the class of concrete as noted in the contract documents. For cast-in-place structural elements, use Class 4000 concrete where the class of concrete is not specified in the contract documents.

When holes are cast in beams to accommodate falsework, fill the holes with a non-shrink structural grout suitable for overhead repairs after falsework is removed.

After erection of the beams and prior to the erection of the deck slab falsework, measure beam cambers. Compare the measured beam cambers to the values shown on the Plans to aid in determining if field adjustments are needed. Submit beam camber measurements and any proposed field adjustments to the RCE for approval. All cost of performing this work is considered incidental to the Contract and no additional compensation is allowed for the performance of this work.

Payment for concrete in slab is based on theoretical plan quantity. No adjustment is made for variation in camber.

Chamfer all exposed edges $^{3}/_{4}$" unless otherwise noted.

The minimum acceptable concrete cover for reinforcing steel is $^{1}/_{2}$" less than the plan dimensions when required by reinforcing bar fabrication tolerances.

Cast build-ups and shear keys on bent caps monolithic with the cap unless indicated otherwise in these plans. Construct the top of each build-up level.

GRINDING & TEXTURING CONCRETE DECKS

For bridge stage construction projects, grind and texture the bridge decks as necessary near the stage longitudinal construction joints in order to meet the longitudinal and transverse rideability and rolling straightedge requirements of the Contract.

Prior to casting any closure pour, grinding, or texturing, make profile line surveys (2 to 6 as determined by the RCE) of each stage of the bridge decks. Make one of these profile line surveys for each stage along the edge of the deck adjacent to the closure pour. Compare the surveys within each stage and compare the surveys of each stage to surveys of the adjacent stage to aid in determining the amount of grinding and texturing needed to meet the rideability and rolling straightedge requirements. Submit all grinding and texturing procedures, plotted survey profiles, and proposed grinding depths to the RCE for approval. Maintain a final cover of 2"minimum over the bridge deck reinforcing steel.

Follow the above procedures for all stages of the work. For all surveys performed on the same bridge, use identical stations for survey shots in order to facilitate survey comparisons. All costs for performing, evaluating, and submitting the surveys are considered incidental to the Contract and no additional compensation is allowed for the performance of this work.

Payment for grinding and texturing concrete bridge decks at the junction of new and existing bridge deck slabs is determined in accordance with Subsection 702.6 of the Standard Specifications. No payment is made for grinding and texturing of new bridge decks to correct irregularities and excessive deviations.

ALLOWANCE FOR DEAD LOAD DEFLECTION & SETTLEMENT

In setting forms for structural steel or prestressed concrete beam spans, apply an allowance to the design finished grade to compensate for computed dead load deflections.

Prior to making deck pours on any stage construction work, and bridge widening projects, consider and make adjustments as necessary for partially loaded beams adjacent to closure pour areas. Verify that any proposed adjustment on partially loaded beams does not create a change in the deck thickness or a reduction in the concrete cover over the reinforcing steel. Welded studs on steel beams and reinforcing steel extending up out of prestressed beams shall meet the requirements for a composite section (extend up into the deck past the bottom mat of reinforcing steel) regardless of any adjustments.

In setting falsework for reinforced concrete spans, make an allowance for the deflection of the falsework, for any settlement of the falsework, for the instantaneous dead load deflection of the span, and for the long-time dead load deflection of the span such that on removal of the falsework the top of the structure shall conform to theoretical finished grade plus the allowance for long-time deflection.

For instantaneous and long-time dead load deflection, use a camber of $^{1}/_{8}$" for concrete flat slab spans 22 feet in length, $^{3}/_{16}$" for concrete flat slab spans 30 feet in length, and $^{3}/_{8}$" for concrete flat slab spans 40 feet in length, unless otherwise directed by the RCE. Adjust these cambers as necessary to allow for falsework deflection, falsework settlement, and vertical curve ordinates.

PERMANENT STEEL BRIDGE DECK FORMS

Permanent stay-in-place steel bridge deck forms for concrete deck slabs may be used at the Contractor's option.

Notify the Department and the Fabricator of the beams if using this option so that shop plans can be properly detailed.

DRIVEN PILE FOUNDATIONS

Where piles occur in fill, place fill before driving piles.

Where prestressed concrete piles are to be driven through fill, install piles in pre-bored holes extending to the original ground. For square prestressed concrete piles, bore holes having a minimum diameter of 1.25 times the nominal pile size. Include all cost of pre-boring fills for pile installation in the unit price bid for the piles.

EXCAVATION FOR END BENTS

Include all cost of excavation necessary to construct end bents and to remove material under superstructure to an elevation twelve inches below tops of end bent caps, in the unit price bid for class of concrete specified in the Plans.

If a concrete footing is used for the end bent, the excavation below that included for the cap and berm in the above paragraph is paid for at the unit price bid for excavation. Include excavation above this in the unit price bid for class of concrete specified in the Plans.

STRUCTURAL STEEL

Layout dimensions and standard lengths of beams shown are horizontal dimensions which must be increased when bridge is on grade.

When holes are placed in webs to accommodate falsework, install high strength bolts in the holes after falsework is removed.

Notify the Department of the name and address of the Fabricator of the structural steel as soon as the Fabricator has been given the contract to fabricate so that the inspection procedure can be set up.

Do not field or shop weld erection hardware to the structural steel members.

Make all bolted connections with $^{7}/_{8}$" dia. ASTM F3125, Grade A325 bolts unless otherwise indicated.

Generally, holes for $^{7}/_{8}$" dia. bolts shall be $^{15}/_{16}$" dia. However,for straight girder spans, oversized holes, $^{3}/_{16}$" larger than bolt dia. may be used in diaphragms and/or crossframes and their connection plates provided hardened washers are installed over oversize holes in the outer ply of the material gripped.Hardened washers are required under DTIs on oversized holes. In every case install a hardened washer under the element turned for each bolt of a bolted connection. Indicate on the Shop Plans which holes are to be oversize and where hardened washers are required. No additionalpayment is made for the costs associated with the use of oversize holes and furnishing additional hardened washers as necessary.

PAINT FOR STRUCTURAL STEEL

Paint structural steel in accordance with Section 710 of the Standard Specifications.

BEARING ASSEMBLIES

If bearing assemblies support weathering steel beams or girders, fabricate bearing assembly components from weathering steel and paint them using the NS2 Paint System. Galvanize all other bearing assemblies in accordance with AASHTO M 111, AASHTO M 232, or ASTM F 2329 as applicable.

After the required field welding of painted bearing assemblies, field repair the weld areas and/or any damaged areas to the paint in accordance with Subsection 710.4.2 of the Standard Specifications. After the required field welding of galvanized bearing assemblies, field repair the weld areas and/or damaged areas of the galvanized coating in accordance with ASTM A 780.

Include all cost of furnishing and installing steel bearing assembly components in the lump sum price bid for structural steel if a bid item for structural steel is included in the project. Otherwise, include the cost in the unit price bid for prestressed beams.

ANCHOR BOLTS

Galvanize all components of anchor bolt assemblies in accordance with AASHTO M 232 or ASTM F 2329 as applicable. The weight of anchor bolt assemblies is included in the bent quantities for reinforcing steel. Include all costs of furnishing and installing anchor bolt assemblies in the unit price bid for reinforcing steel.

ORIENTATION IN RELATION TO STATIONING

Left and right sides, where referred to in these plans, are in relation to direction of stationing.

FINAL FINISH OF EXPOSED CONCRETE SURFACES

Apply the final surface finish on the bridge(s) only to the following checked and designated bridge areas:

☒ A) Entire surface of all barrier rails, parapet walls, approach slab curbs, concrete utility supports, and wing walls; outside vertical edge of bridge deck slabs and sidewalks.

☒ B) Outside face of exterior prestressed girders.

☒ C) Entire surface of designated substructure units, except top of bent caps and piers.

☒ All Units ☐ Designated Units:

☐ D) No final surface finish required.

SPECIFICATIONS

AASHTO 2017 LRFD Bridge Design Specifications, 8th Edition.

ANSI/AASHTO/AWS D1.5 Bridge Welding Code (Latest Edition) with additions and revisions as stated in the Standard Specifications.

DESIGN DATA

Load and Resistance Factor Design (LRFD) Method

Live Load: AASHTO HL-93 Loading

The top $^{1}/_{4}$" of all concrete slabs is considered as a wearing surface and is not included in the slab depth used for the calculation of section properties.

All bolted connections, except for steel diaphragm members used with prestressed concrete beams, are designed as slip-critical connections having Class "B" contact surfaces.

An extra dead load of 0.016 KSF is incorporated into the design of this structure to accommodate the use of steel stay-in-place forms.

An extra dead load of 0.015 KSF is incorporated into the design of this structure as an allowance for a future wearing surface.

Seismic Design is in accordance with the 2008 SCDOT "Seismic Design Specifications for Highway Bridges", Version 2.0, with the following parameters:

Seismic Design Category: To Be Determined

Analysis Method: To Be Determined

Operational Classification: II

CONCEPTUAL PLANS

CONCEPTUAL NOT FOR CONSTRUCTION

PLANS PREPARED BY: RS&H

REV.			
REV.	RCV	PCW	06-23
	DM0323		
REV.	PCW	HL	09-20
	ASTM F3125		
REVIEWED			
QUAN.			
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23
	BY	CHK.	DATE

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

GENERAL NOTES

CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

DRAWING NO. 700-03

12/11/2023

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BRIDGE PLANS ID	SHEET NO.
P042443-B01	3

146+00 147+00 148+00 149+00 150+00

N

To Charlotte

Tie Equality
Sta. 147+52.60 CONNECT =
Sta. 1731+70.67 CONRPC

PMVC

8'-0" Shldr.

Approach Slab 1

Begin Bridge
Sta. 146+27.44

10'-0" (Begin Bridge)
67'-10" (℄ Bent 2)
12'-0" Lane
12'-0" Lane
28'-0" Pointed Median
12'-0" Lane
12'-0" Lane
120'-5" (Min.) to 178'-1" (Max.) Out-To-Out (Span 1)

℄ Bent 2
Sta. 147+23.77

3'-0" Closure Pour

178'-1" Out-To-Out (Span 2)

90°00'00" (Typ.) (CONNECT)

℄ CONNECT

℄ Bent 3
Sta. 147+83.27

4'-0" Median

℄ Bent 4
Sta. 148+68.60

106'-3" Out-To-Out (Spans 3 & 4)

8'-0" Shldr.

12'-0" Lane
12'-0" Lane
12'-0" Lane
12'-0" Lane

Approach Slab 2

End Bridge (CONNECT)
Sta. 149+87.44

1'-0" CIP MASH Barrier Parapet w/ 1½" Slab Ext. (Typ.)

℄ CONRPC

PMVC

℄ Bent 7
Sta. 1730+49.96

60'-7½" Out-To-Out (Span 5)

90°00'00" (Typ.) (CONRPC)

End Bridge (CONRPC)
Sta. 1730+26.71

Approach Slab 3

16'-10" Shldr.
12'-0" Lane
12'-0" Lane
17'-6 1/2" Shldr.

℄ I-77

To Connector Rd.

To Columbia

To Columbia

To US-21

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

CONCEPTUAL NOT FOR CONSTRUCTION

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23
	BY	CHK.	DATE

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BRIDGE PLAN VIEW

CONNECTOR ROAD BRIDGE
OVER I-77 & COMMUNITY ROAD

COUNTY: RICHLAND
ROUTE: CONNECTOR ROAD

12/11/2023

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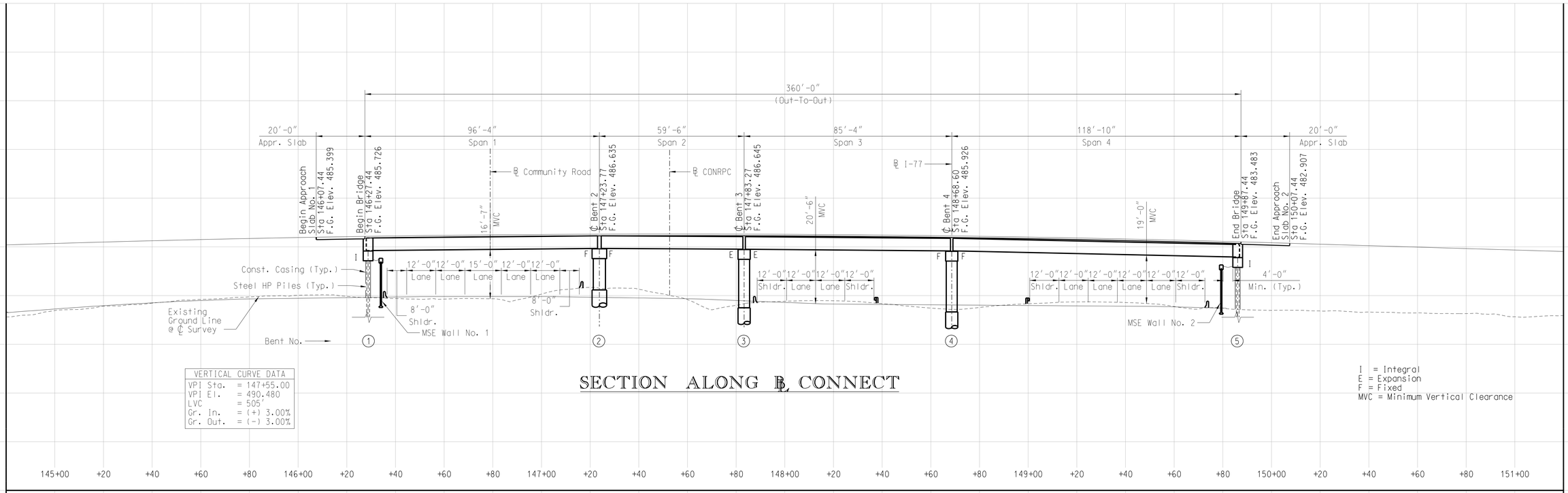
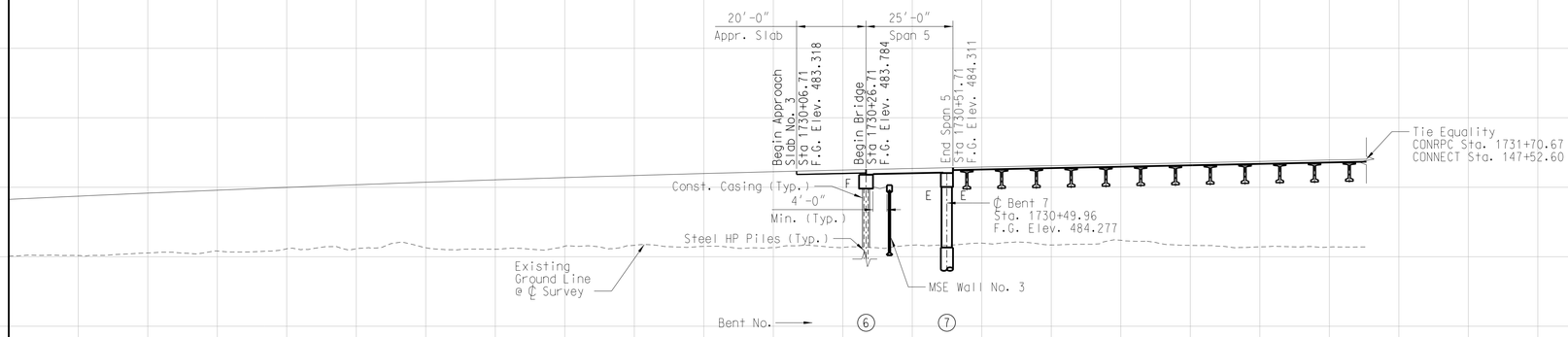
BRIDGE PLANS ID	SHEET NO.
P042443-B01	4



SECTION ALONG ℄ CONNECT

VERTICAL CURVE DATA	
VPI Sta.	= 147+55.00
VPI El.	= 490.480
LVC	= 505'
Gr. In.	= (+) 3.00%
Gr. Out.	= (-) 3.00%

I = Integral
E = Expansion
F = Fixed
MVC = Minimum Vertical Clearance



SECTION ALONG ℄ CONRPC

VERTICAL CURVE DATA	
VPI Sta.	= 1728+99.69
VPI El.	= 481.27
LVC	= 300'
Gr. In.	= (+) 5.00%
Gr. Out.	= (+) 2.00%

I = Integral
E = Expansion
F = Fixed
MVC = Minimum Vertical Clearance

CONCEPTUAL PLANS

CONCEPTUAL NOT FOR CONSTRUCTION

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

BRIDGE PROFILE VIEWS

CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

REV.			
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REV.			
REVIEWED	TRL		
QUAN.	---	---	-----
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23
	BY	CHK.	DATE

COUNTY: RICHLAND
ROUTE: CONNECTOR ROAD

12/12/2023
Border Sheet 6.08

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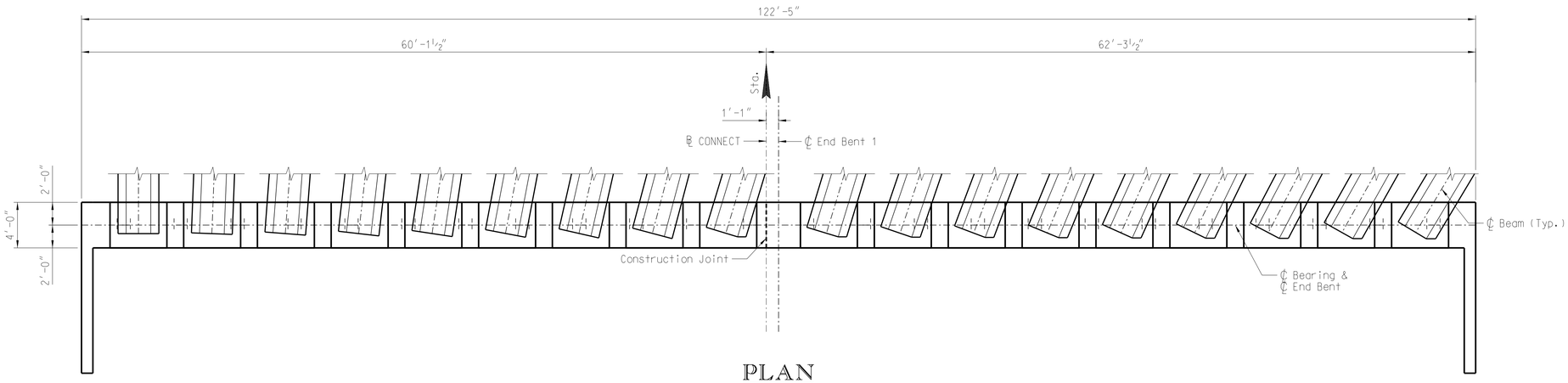
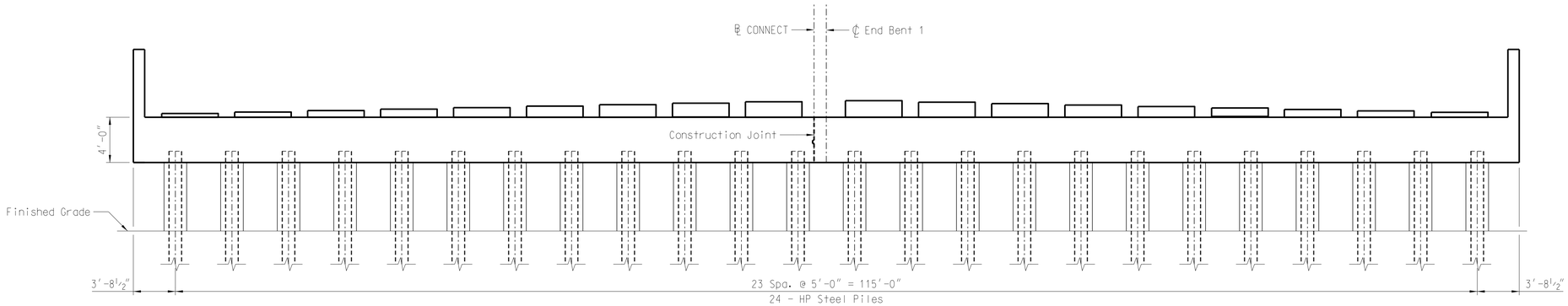
BRIDGE PLANS ID	SHEET NO.
P042443-B01	5



PLAN



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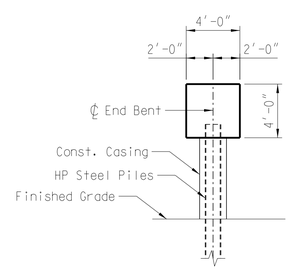

END ELEVATION

CONCEPTUAL PLANS

CONCEPTUAL NOT FOR CONSTRUCTION

PLANS PREPARED BY: RS&H

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PLAN AND ELEVATION
END BENT 1
CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

		BY	CHK.	DATE
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REVIEWED				
QUAN.				
DR.	VAS	NSC	12-23	
DES.	VAS	NSC	12-23	

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

12/12/2023

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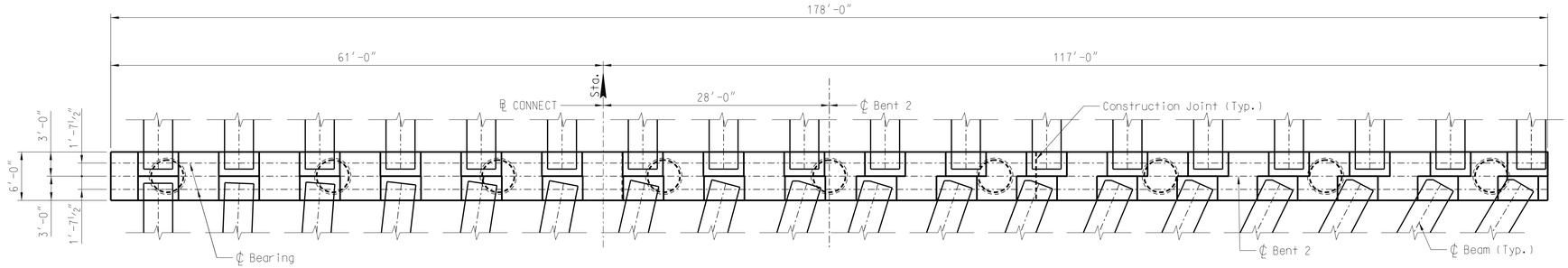
BRIDGE PLANS ID	SHEET NO.
P042443-B01	6



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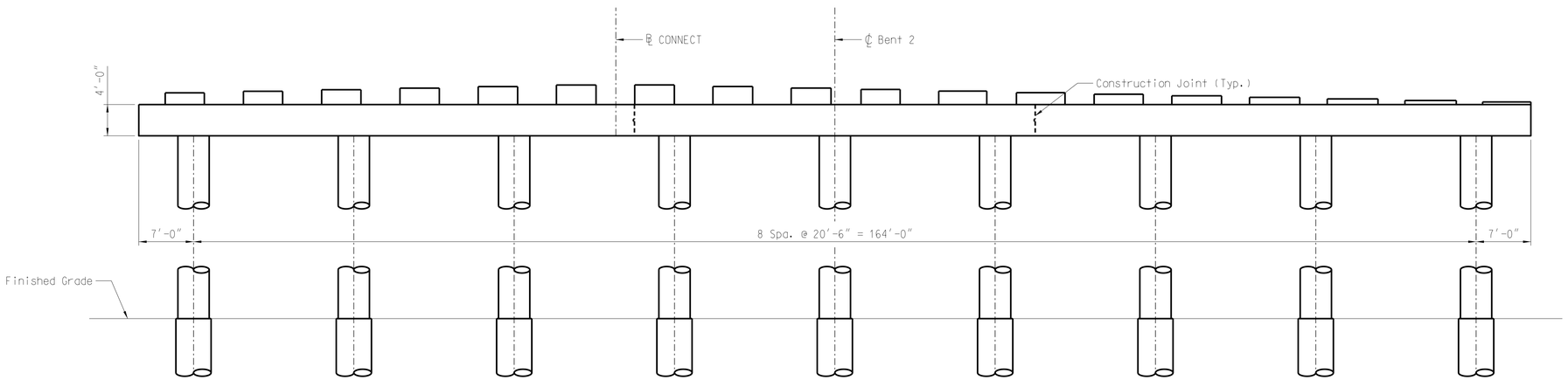

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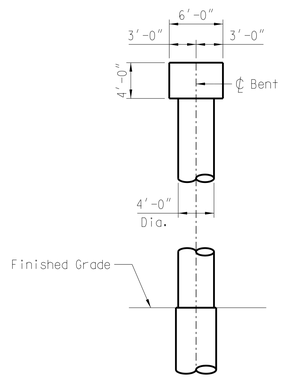

END ELEVATION

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

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DEPARTMENT OF TRANSPORTATION

PLAN AND ELEVATION
BENT 2
CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

CONCEPTUAL NOT FOR CONSTRUCTION

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REVIEWED				
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DR.	VAS	NSC	12-23	
DES.	VAS	NSC	12-23	

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

12/11/2023

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BRIDGE PLANS ID	SHEET NO.
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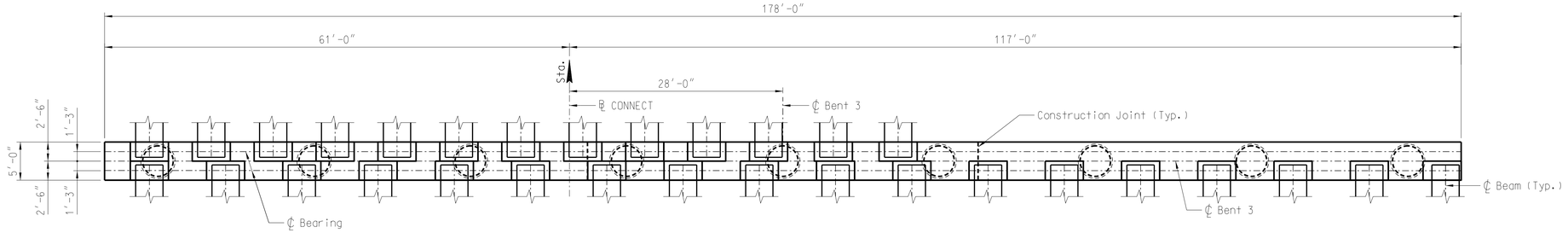

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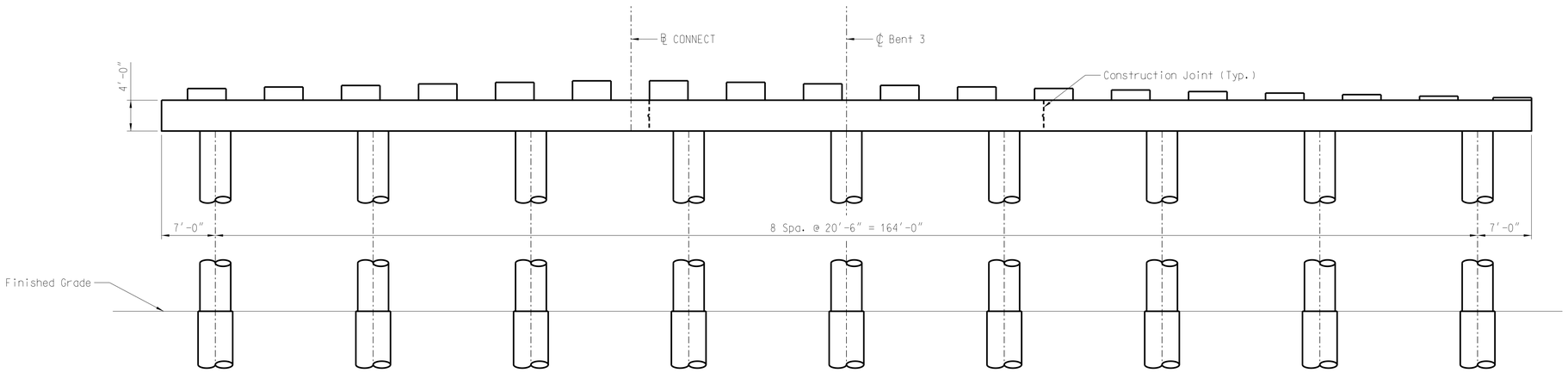

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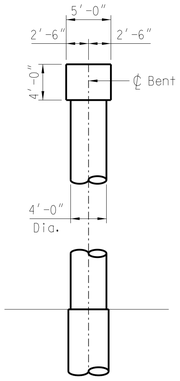

END ELEVATION

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

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DEPARTMENT OF TRANSPORTATION

PLAN AND ELEVATION BENT 3

CONNECTOR ROAD BRIDGE
OVER I-77 & COMMUNITY ROAD

CONCEPTUAL NOT FOR CONSTRUCTION

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DR.	VAS	NSC	12-23	
DES.	VAS	NSC	12-23	

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

12/11/2023

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BRIDGE PLANS ID	SHEET NO.
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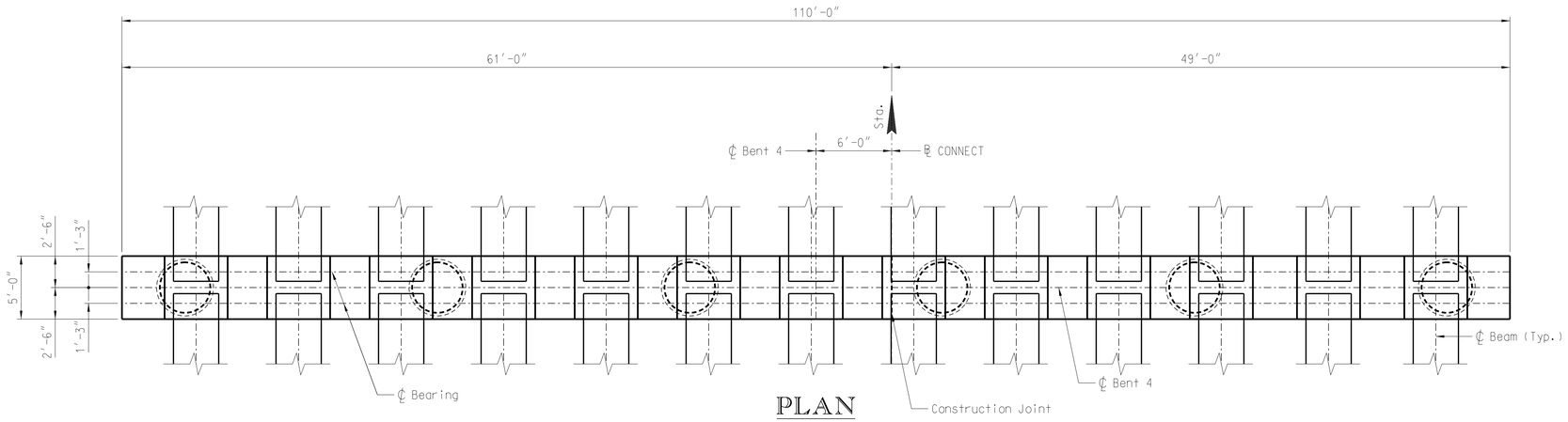

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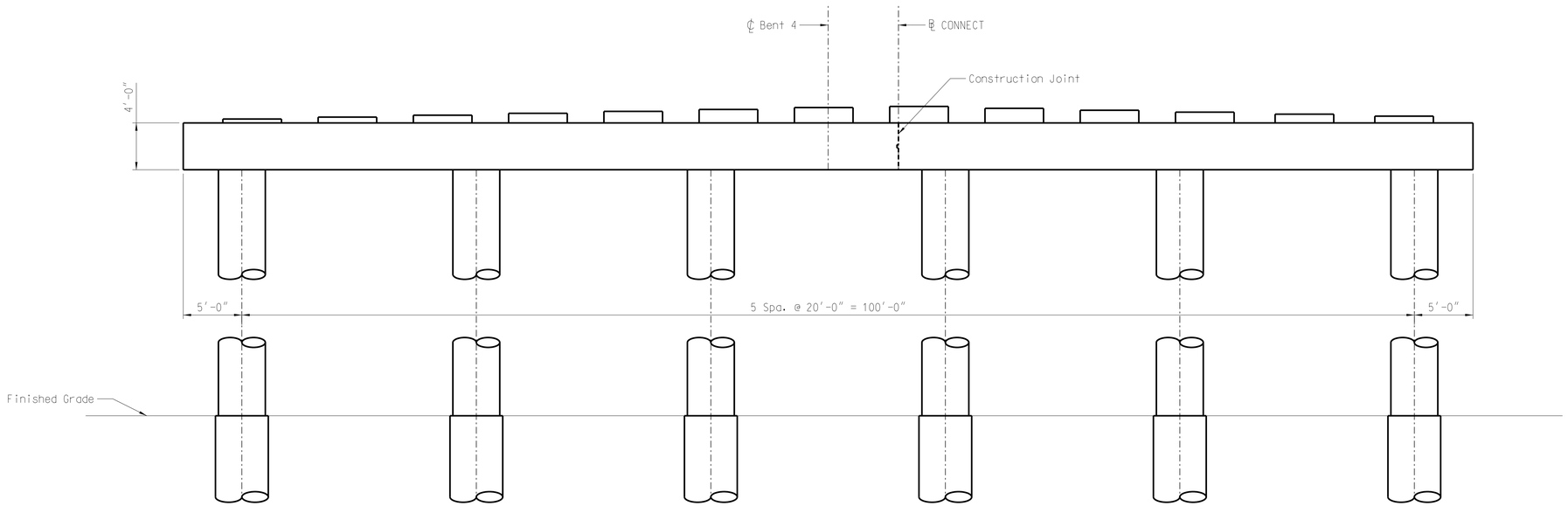

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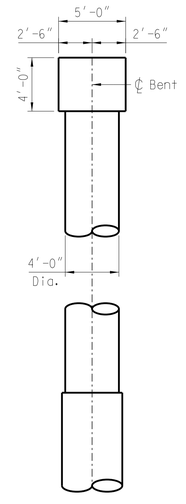

END ELEVATION

CONCEPTUAL PLANS

CONCEPTUAL NOT FOR CONSTRUCTION

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DEPARTMENT OF TRANSPORTATION

PLAN AND ELEVATION BENT 4

CONNECTOR ROAD BRIDGE
OVER I-77 & COMMUNITY ROAD

REV.			
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REVIEWED			
QUAN.			
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23
	BY	CHK.	DATE

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

12/11/2023

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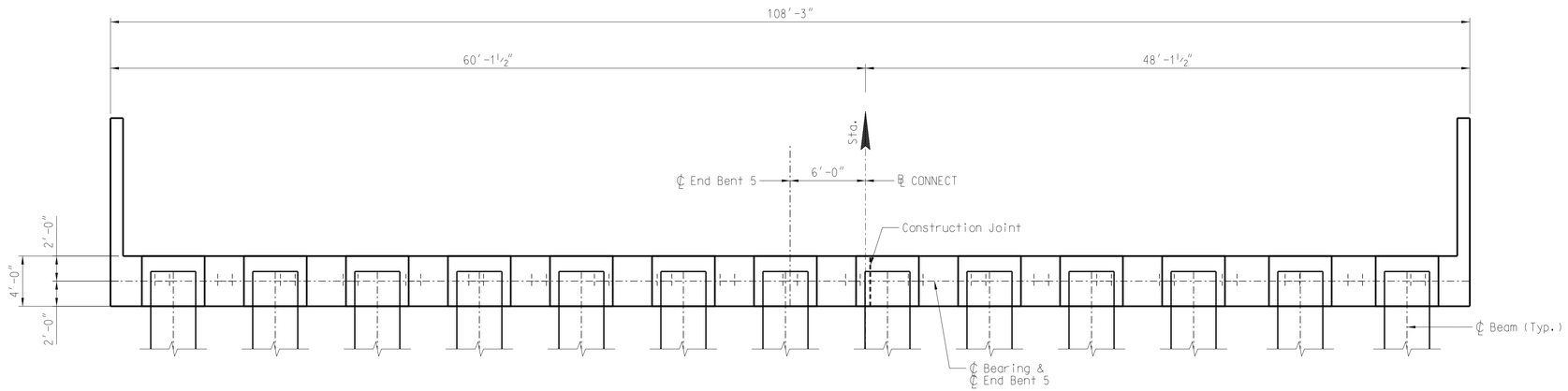
BRIDGE PLANS ID	SHEET NO.
P042443-B01	9



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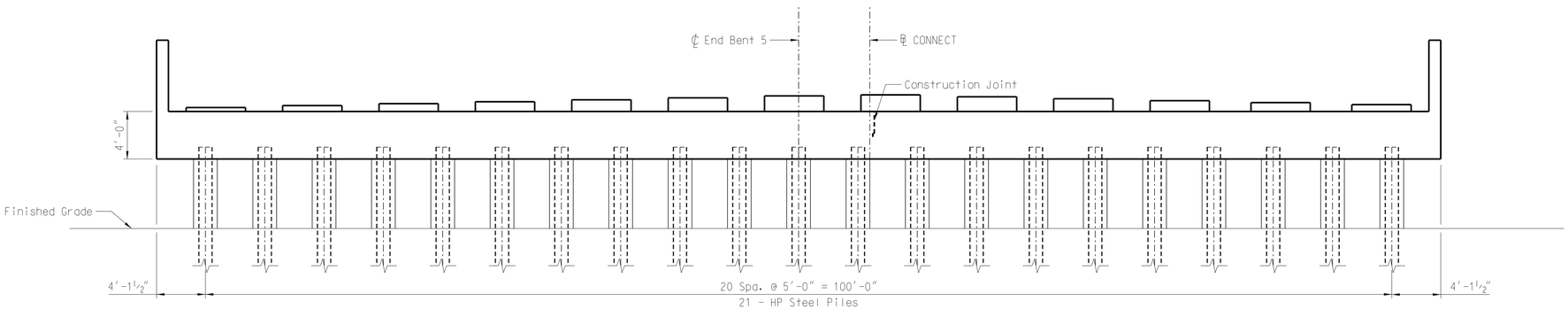

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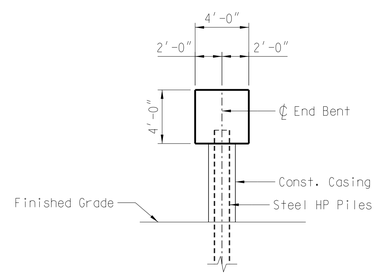

END ELEVATION

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

CONCEPTUAL NOT FOR CONSTRUCTION

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REV.				
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REVIEWED				
QUAN.				
DR.	VAS	NSC	12-23	
DES.	VAS	NSC	12-23	

PLAN AND ELEVATION
END BENT 5
CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

12/12/2023

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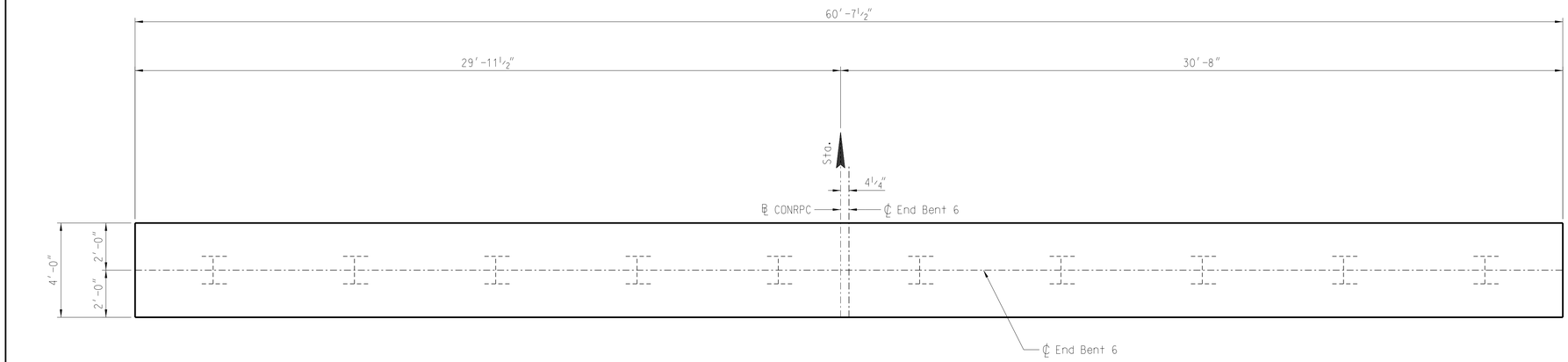
BRIDGE PLANS ID	SHEET NO.
P042443-B01	10



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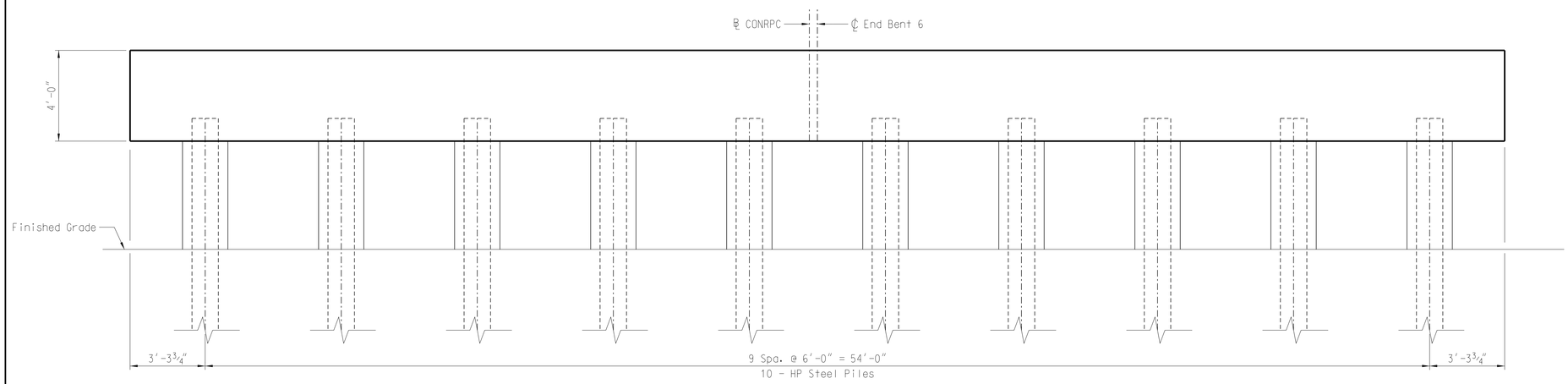

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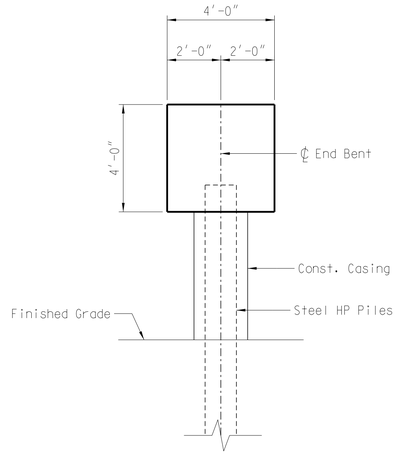

END ELEVATION

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

CONCEPTUAL NOT FOR CONSTRUCTION

	BY	CHK.	DATE
REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23

PLAN AND ELEVATION END BENT 6

CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

12/12/2023

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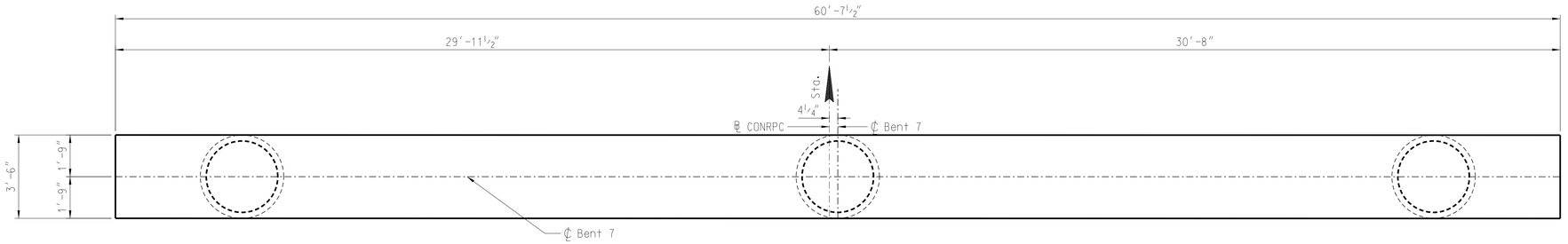
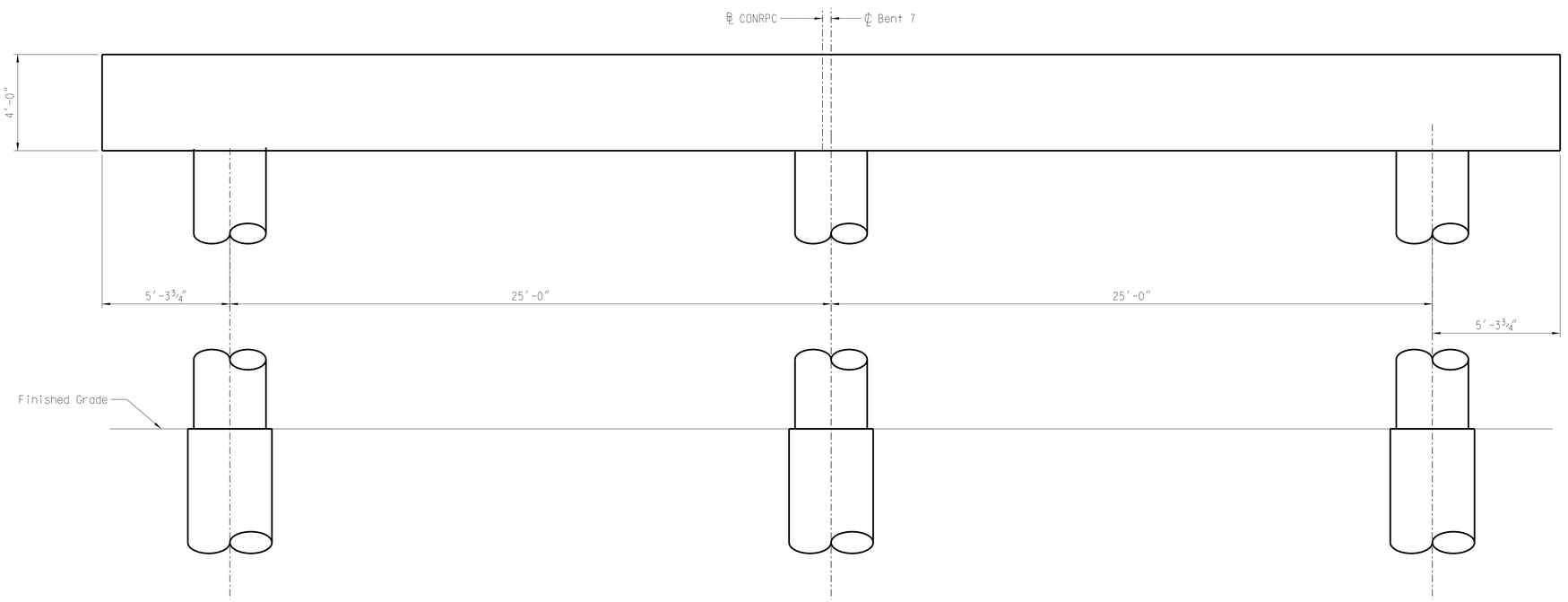
BRIDGE PLANS ID	SHEET NO.
P042443-B01	11



PLAN



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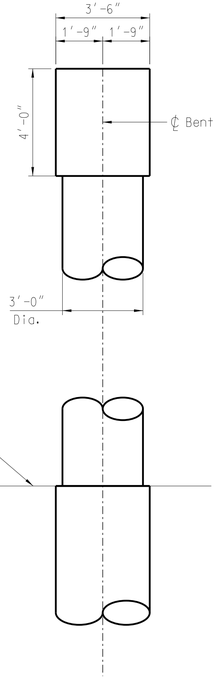

END ELEVATION

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

CONCEPTUAL NOT FOR CONSTRUCTION

REV.			
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REVIEWED			
QUAN.			
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23
	BY	CHK.	DATE

PLAN AND ELEVATION BENT 7

CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

12/11/2023

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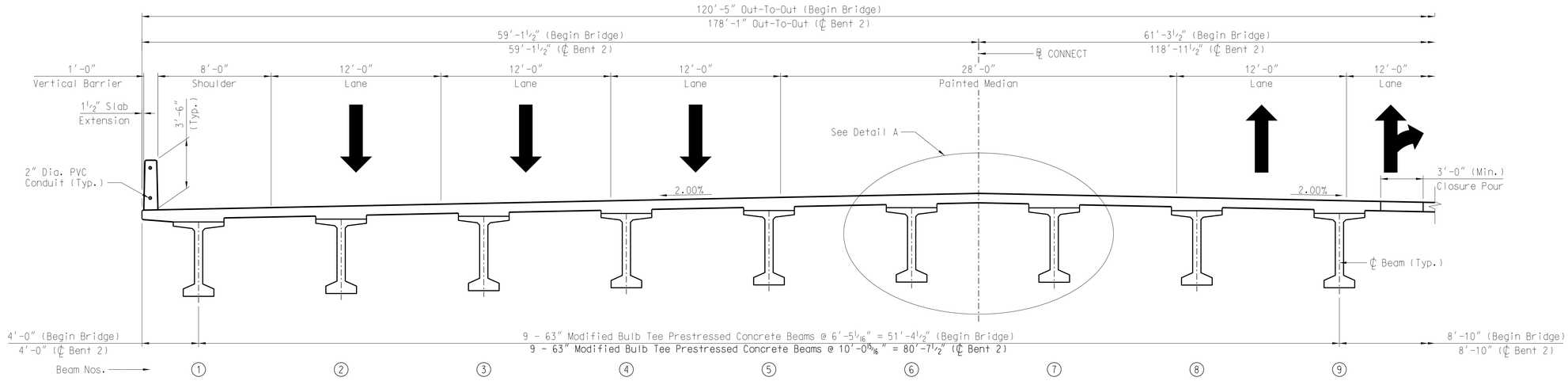
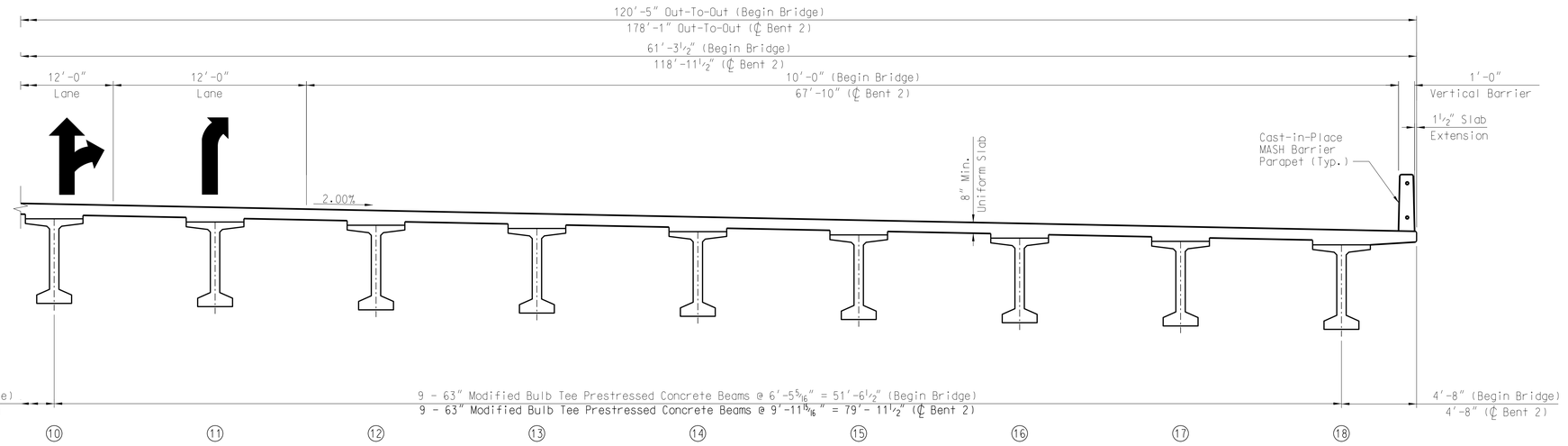
BRIDGE PLANS ID	SHEET NO.
P042443-B01	12



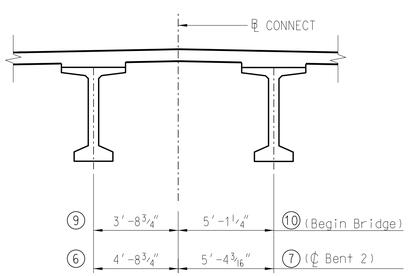
TYPICAL SECTION

(Looking in the Direction of Stationing)



TYPICAL SECTION

(Looking in the Direction of Stationing)



DETAIL A

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

REV.			
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QUAN.			
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23
	BY	CHK.	DATE

CONCEPTUAL NOT FOR CONSTRUCTION

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

TYPICAL SECTION SPAN 1

CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

12/11/2023

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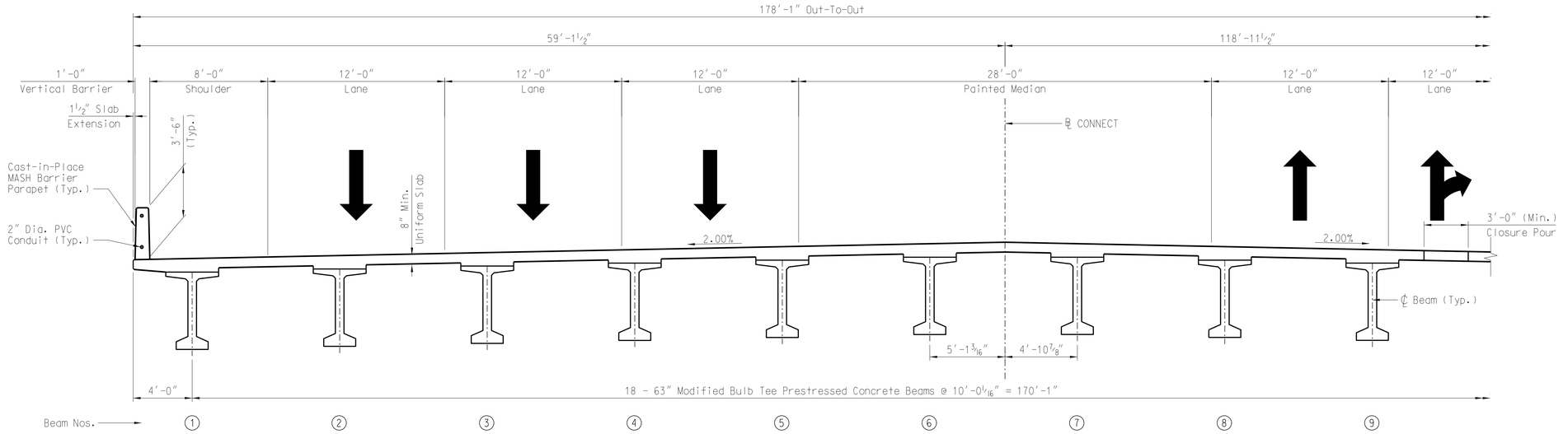
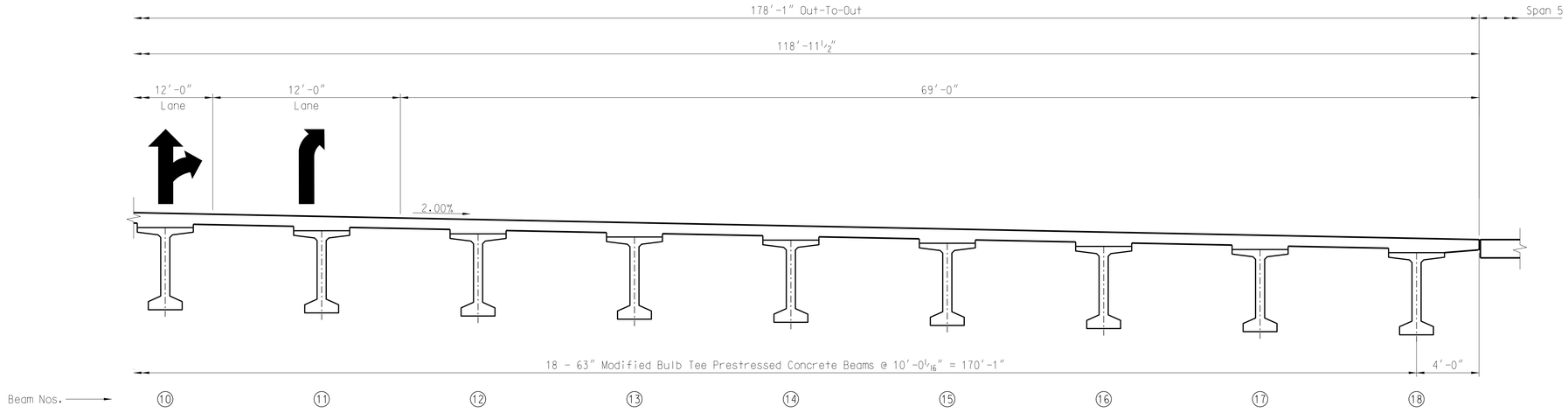
BRIDGE PLANS ID	SHEET NO.
P042443-B01	13



TYPICAL SECTION

(Looking in the Direction of Stationing)



TYPICAL SECTION

(Looking in the Direction of Stationing)

CONCEPTUAL PLANS

CONCEPTUAL NOT FOR CONSTRUCTION

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

TYPICAL SECTION
SPAN 2
CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

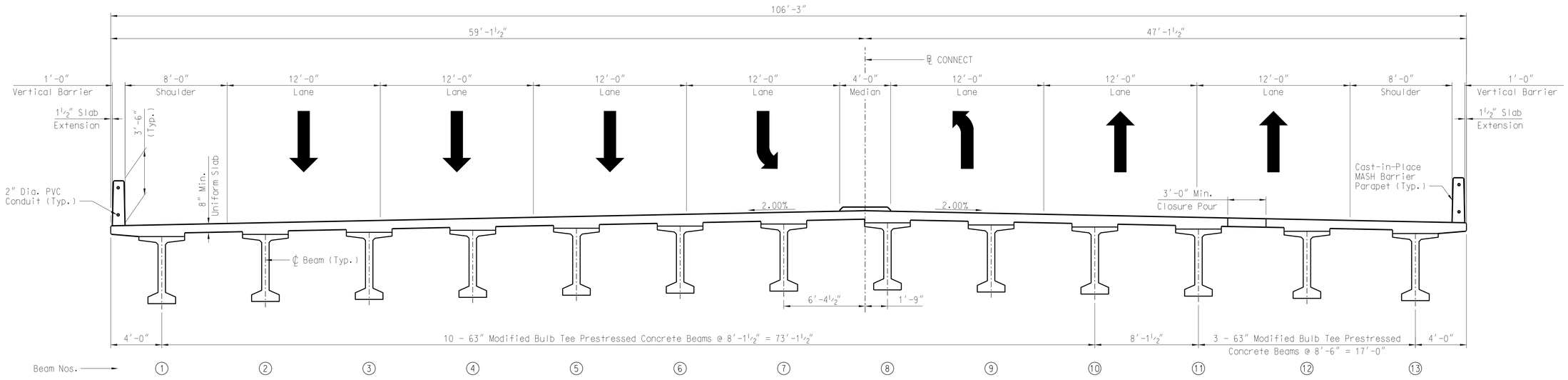
REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23
	BY	CHK.	DATE

COUNTY: RICHLAND
ROUTE: CONNECTOR ROAD

12/11/2023

bXXXXX1ss.dgn

BRIDGE PLANS ID	SHEET NO.
P042443-B01	14



TYPICAL SECTION

(Looking in the Direction of Stationing)

NOTE:
Steel Intermediate Diaphragm Not Shown.

CONCEPTUAL PLANS

CONCEPTUAL NOT FOR CONSTRUCTION

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

TYPICAL SECTION
SPANS 3 & 4
CONNECTOR ROAD BRIDGE
OVER I-77 & COMMUNITY ROAD

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23
	BY	CHK.	DATE

COUNTY: RICHLAND
ROUTE: CONNECTOR ROAD

12/11/2023

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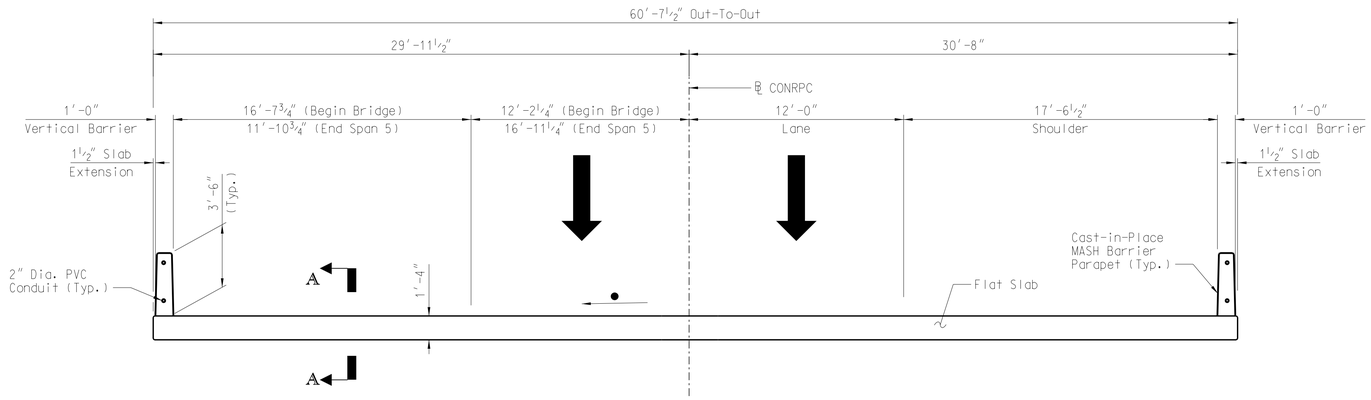
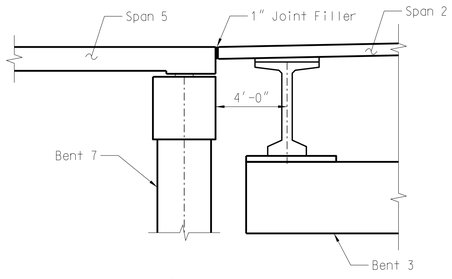
BRIDGE PLANS ID	SHEET NO.
P042443-B01	15



TYPICAL SECTION

(Looking in the Direction of Stationing)

- The superelevation will be set to match the transverse edge of the bridge deck in Span 2.



Section A-A

(At Bent 7)

CONCEPTUAL PLANS

CONCEPTUAL NOT FOR CONSTRUCTION

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

TYPICAL SECTION SPAN 5

CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

REV.				
REV.				
REV.				
REVIEWED				
QUAN.				
DR.	VAS	NSC	12-23	
DES.	VAS	NSC	12-23	
	BY	CHK.	DATE	

COUNTY	ROUTE
RICHLAND	CONNECTOR ROAD

12/11/2023

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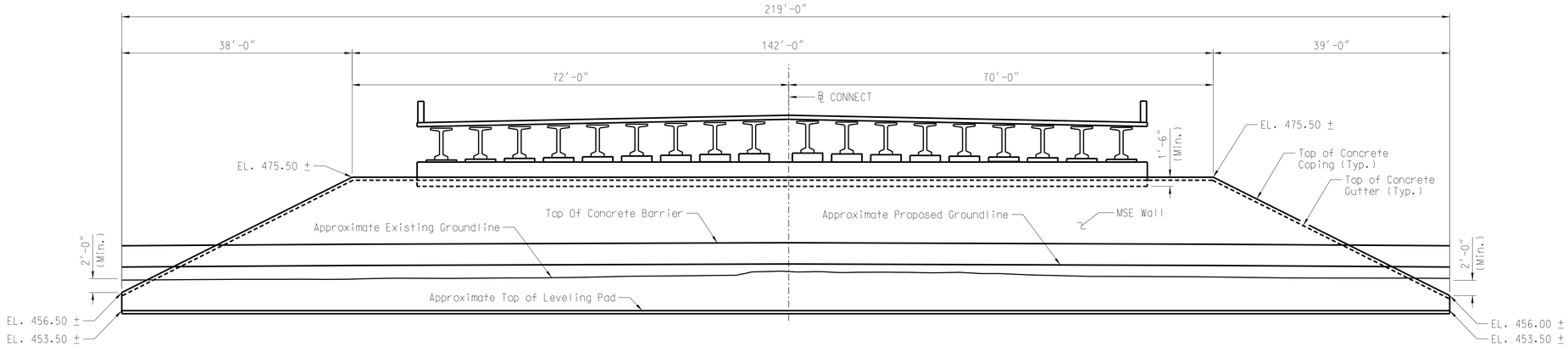
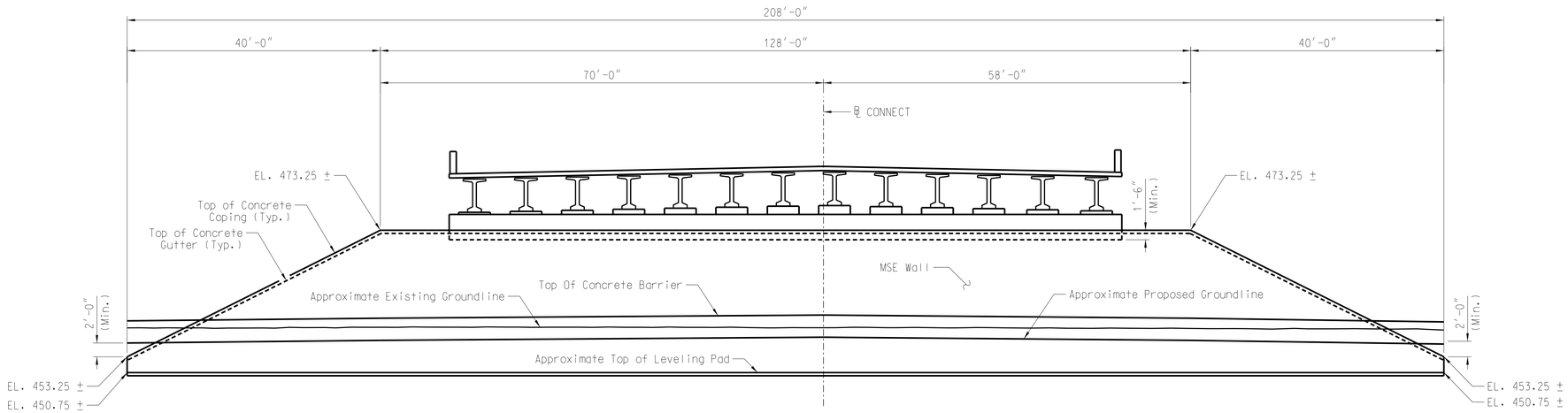
BRIDGE PLANS ID	SHEET NO.
P042443-B01	16



MSE WALL NO. 1

ELEVATION ALONG LAYOUT LINE

(Looking Opposite of Stationing)



MSE WALL NO. 2

ELEVATION ALONG LAYOUT LINE

(Looking Ahead of Stationing)

CONCEPTUAL PLANS

CONCEPTUAL NOT FOR CONSTRUCTION

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

MSE WALLS (1 OF 2)

CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

		BY	CHK.	DATE
REV.				
REV.				
REV.				
REVIEWED				
QUAN.				
DR.	VAS	NSC	12-23	
DES.	VAS	NSC	12-23	

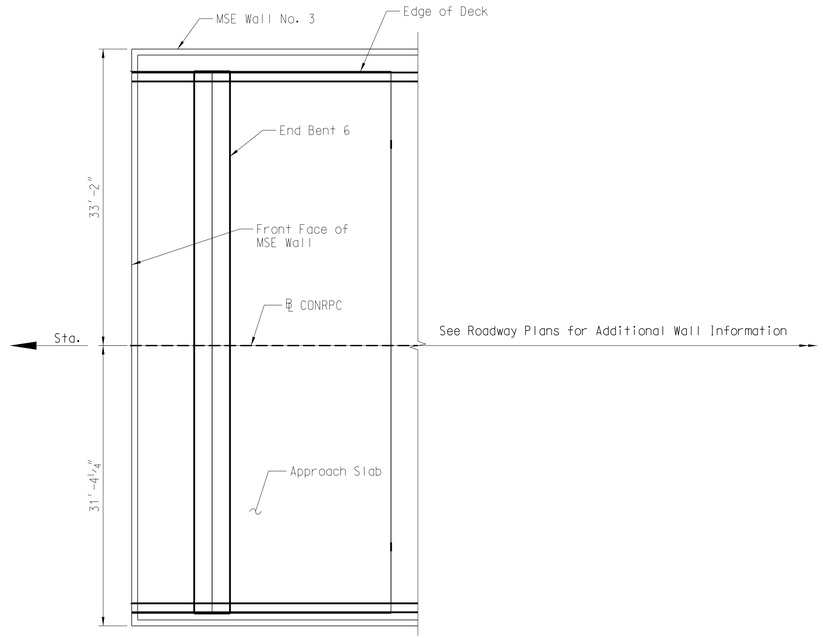
COUNTY: RICHLAND

ROUTE: CONNECTOR ROAD

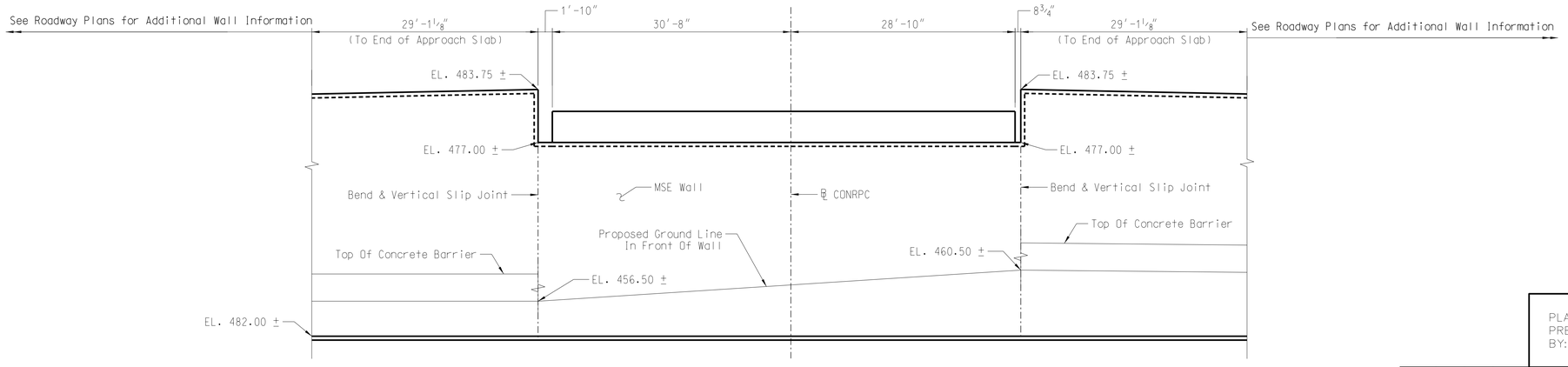
12/11/2023

bXXXXX1rw.dgn

BRIDGE PLANS ID	SHEET NO.
P042443-B01	17



MSE WALL NO. 3
PLAN VIEW



MSE WALL NO. 3
ELEVATION VIEW
(Looking Opposite of Stationing)

CONCEPTUAL NOT FOR CONSTRUCTION

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

MSE WALLS (2 OF 2)

CONNECTOR ROAD BRIDGE OVER I-77 & COMMUNITY ROAD

REV.			
REV.			
REV.			
REVIEWED			
QUAN.			
DR.	VAS	NSC	12-23
DES.	VAS	NSC	12-23
	BY	CHK.	DATE

COUNTY: RICHLAND

ROUTE: CONNECTOR ROAD

12/11/2023

bXXXXX2ts.dgn

BRIDGE PLANS ID	SHEET NO.
P042443-B02	1

INDEX OF SHEETS

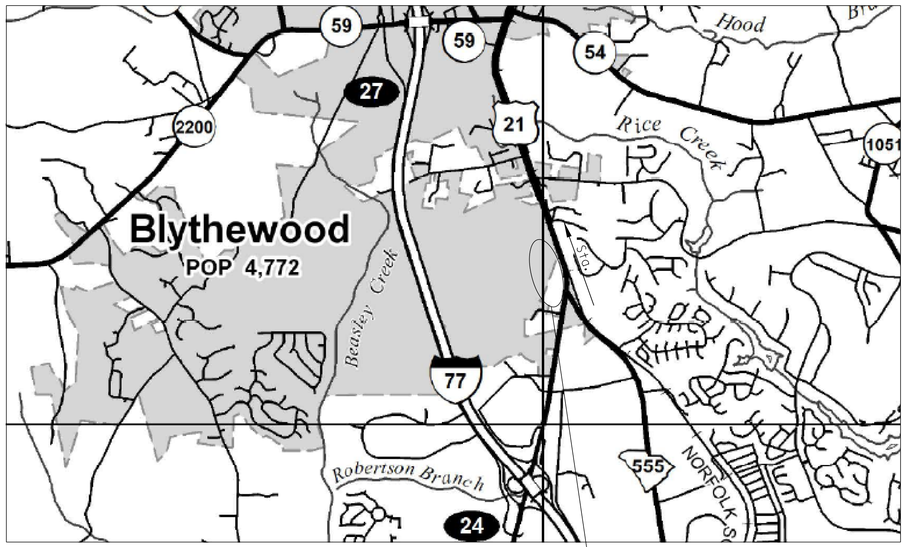
1. Title Sheet
2. General Notes
3. Bridge Plan and Profile
4. Typical Section
5. MSE Walls

SCDOT

South Carolina Department of Transportation

PROPOSED PLANS FOR

RICHLAND COUNTY
PROJECT ID P042443
I-77 INTERCHANGE AND CONNECTION ROADS
CONSTRUCT US-21 BRIDGE OVER PALMETTO RAILROAD/NSRR SPUR



LAYOUT

SITE LOCATION

-N-

Approximate Location of Bridge is

Latitude	34°- 11' - 24.0" N
Longitude	80°- 58' - 15.4" W

3 DAYS BEFORE DIGGING IN
SOUTH CAROLINA

CALL 811

SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

NET LENGTH OF ROADWAY	0.897	MILES
NET LENGTH OF BRIDGES	0.026	MILES
NET LENGTH OF PROJECT	0.923	MILES
LENGTH OF EXCEPTIONS	0.000	MILES
GROSS LENGTH OF PROJECT	0.923	MILES

TRAFFIC DATA

2026 ADT 17,900 V.P.D.

2046 ADT 21,500 V.P.D.

TRUCKS 10 %

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF LETTING.

PLANS PREPARED BY: RS&H

ENGINEER OF RECORD

CONCEPTUAL PLANS

NOT FOR CONSTRUCTION

FOR CONSTRUCTION : _____ _____ DATE

REVIEWED			
DR.	TRL	11-23	DATE
NSC	MRA	CHK	
BY			

CoannN
12/11/2023

DRAWING NO. 700-02

bXXXXX2gn.dgn

BRIDGE PLANS ID	SHEET NO.
P042443-B02	2

MATERIAL & WORKMANSHIP

Provide all material and workmanship in accordance with the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction, unless otherwise specified on the Plans or in the Special Provisions.

COORDINATION OF PLANS, SPECIFICATIONS, AND SPECIAL PROVISIONS

Generally, in case of discrepancy, this General Notes sheet governs over the Standard Specifications but the remainder of the plans govern over notes on this sheet and Special Provisions govern over all. See Subsection 105.4 of the Standard Specifications.

WATER ELEVATIONS

The water elevations shown in the plans are for information only and the actual water elevation during construction may vary depending on weather conditions and seasonal fluctuations.

COMPLETION DATES

On inside face of right side barrier parapet/railing at beginning of bridge and on left side barrier parapet/railing at end of bridge, place year of completion adjacent to guardrail attachment. Place this completion date so that it will not be covered by the guardrail connector when it is installed. Recess numbers in the concrete using numbers fabricated from reusable/durable material that is approved by the RCE. Provide numbers in accordance with SCDOT Standard Drawing No. 702-305-00.

REINFORCING STEEL

Fabricate reinforcing bars as noted on Reinforcing Bending Details sheet.

Do not use lap splices in column and shaft reinforcing steel.

PRESTRESSED CONCRETE BEAMS

Beam lengths given are based on horizontal span only. Increase lengths to correct for concrete shrinkage, concrete shortening when the strands are cut, and for beams being on a grade.

All overhang brackets in the top flange of exterior beams shall be galvanized in accordance with AASHTO M 111, AASHTO M 232, or ASTM F 2329 as appropriate and shall be detailed accordingly in the shop plans.

CONCRETE

Provide the class of concrete as noted in the contract documents. For cast-in-place structural elements, use Class 4000 concrete where the class of concrete is not specified in the contract documents.

When holes are cast in beams to accommodate falsework, fill the holes with a non-shrink structural grout suitable for overhead repairs after falsework is removed.

After erection of the beams and prior to the erection of the deck slab falsework, measure beam cambers. Compare the measured beam cambers to the values shown on the Plans to aid in determining if field adjustments are needed. Submit beam camber measurements and any proposed field adjustments to the RCE for approval. All cost of performing this work is considered incidental to the Contract and no additional compensation is allowed for the performance of this work.

Payment for concrete in slab is based on theoretical plan quantity. No adjustment is made for variation in camber.

Chamfer all exposed edges $^{3}/_{4}$" unless otherwise noted.

The minimum acceptable concrete cover for reinforcing steel is $^{1}/_{2}$" less than the plan dimensions when required by reinforcing bar fabrication tolerances.

Cast build-ups and shear keys on bent caps monolithic with the cap unless indicated otherwise in these plans. Construct the top of each build-up level.

GRINDING & TEXTURING CONCRETE DECKS

For bridge stage construction projects, grind and texture the bridge decks as necessary near the stage longitudinal construction joints in order to meet the longitudinal and transverse rideability and rolling straightedge requirements of the Contract.

Prior to casting any closure pour, grinding, or texturing, make profile line surveys (2 to 6 as determined by the RCE) of each stage of the bridge decks. Make one of these profile line surveys for each stage along the edge of the deck adjacent to the closure pour. Compare the surveys within each stage and compare the surveys of each stage to surveys of the adjacent stage to aid in determining the amount of grinding and texturing needed to meet the rideability and rolling straightedge requirements. Submit all grinding and texturing procedures, plotted survey profiles, and proposed grinding depths to the RCE for approval. Maintain a final cover of 2"minimum over the bridge deck reinforcing steel.

Follow the above procedures for all stages of the work. For all surveys performed on the same bridge, use identical stations for survey shots in order to facilitate survey comparisons. All costs for performing, evaluating, and submitting the surveys are considered incidental to the Contract and no additional compensation is allowed for the performance of this work.

Payment for grinding and texturing concrete bridge decks at the junction of new and existing bridge deck slabs is determined in accordance with Subsection 702.6 of the Standard Specifications. No payment is made for grinding and texturing of new bridge decks to correct irregularities and excessive deviations.

ALLOWANCE FOR DEAD LOAD DEFLECTION & SETTLEMENT

In setting forms for structural steel or prestressed concrete beam spans, apply an allowance to the design finished grade to compensate for computed dead load deflections.

Prior to making deck pours on any stage construction work, and bridge widening projects, consider and make adjustments as necessary for partially loaded beams adjacent to closure pour areas. Verify that any proposed adjustment on partially loaded beams does not create a change in the deck thickness or a reduction in the concrete cover over the reinforcing steel. Welded studs on steel beams and reinforcing steel extending up out of prestressed beams shall meet the requirements for a composite section (extend up into the deck past the bottom mat of reinforcing steel) regardless of any adjustments.

In setting falsework for reinforced concrete spans, make an allowance for the deflection of the falsework, for any settlement of the falsework, for the instantaneous dead load deflection of the span, and for the long-time dead load deflection of the span such that on removal of the falsework the top of the structure shall conform to theoretical finished grade plus the allowance for long-time deflection.

For instantaneous and long-time dead load deflection, use a camber of $^{1}/_{8}$" for concrete flat slab spans 22 feet in length, $^{3}/_{16}$" for concrete flat slab spans 30 feet in length, and $^{3}/_{8}$" for concrete flat slab spans 40 feet in length, unless otherwise directed by the RCE. Adjust these cambers as necessary to allow for falsework deflection, falsework settlement, and vertical curve ordinates.

PERMANENT STEEL BRIDGE DECK FORMS

Permanent stay-in-place steel bridge deck forms for concrete deck slabs may be used at the Contractor's option.

Notify the Department and the Fabricator of the beams if using this option so that shop plans can be properly detailed.

DRIVEN PILE FOUNDATIONS

Where piles occur in fill, place fill before driving piles.

Where prestressed concrete piles are to be driven through fill, install piles in pre-bored holes extending to the original ground. For square prestressed concrete piles, bore holes having a minimum diameter of 1.25 times the nominal pile size. Include all cost of pre-boring fills for pile installation in the unit price bid for the piles.

EXCAVATION FOR END BENTS

Include all cost of excavation necessary to construct end bents and to remove material under superstructure to an elevation twelve inches below tops of end bent caps, in the unit price bid for class of concrete specified in the Plans.

If a concrete footing is used for the end bent, the excavation below that included for the cap and berm in the above paragraph is paid for at the unit price bid for excavation. Include excavation above this in the unit price bid for class of concrete specified in the Plans.

STRUCTURAL STEEL

Layout dimensions and standard lengths of beams shown are horizontal dimensions which must be increased when bridge is on grade.

When holes are placed in webs to accommodate falsework, install high strength bolts in the holes after falsework is removed.

Notify the Department of the name and address of the Fabricator of the structural steel as soon as the Fabricator has been given the contract to fabricate so that the inspection procedure can be set up.

Do not field or shop weld erection hardware to the structural steel members.

Make all bolted connections with $^{7}/_{8}$" dia. ASTM F3125, Grade A325 bolts unless otherwise indicated.

Generally, holes for $^{7}/_{8}$" dia. bolts shall be $^{15}/_{16}$" dia. However,for straight girder spans, oversized holes, $^{3}/_{16}$" larger than bolt dia. may be used in diaphragms and/or crossframes and their connection plates provided hardened washers are installed over oversize holes in the outer ply of the material gripped.Hardened washers are required under DTIs on oversized holes. In every case install a hardened washer under the element turned for each bolt of a bolted connection. Indicate on the Shop Plans which holes are to be oversize and where hardened washers are required. No additionalpayment is made for the costs associated with the use of oversize holes and furnishing additional hardened washers as necessary.

PAINT FOR STRUCTURAL STEEL

Paint structural steel in accordance with Section 710 of the Standard Specifications.

BEARING ASSEMBLIES

If bearing assemblies support weathering steel beams or girders, fabricate bearing assembly components from weathering steel and paint them using the NS2 Paint System. Galvanize all other bearing assemblies in accordance with AASHTO M 111, AASHTO M 232, or ASTM F 2329 as applicable.

After the required field welding of painted bearing assemblies, field repair the weld areas and/or any damaged areas to the paint in accordance with Subsection 710.4.2 of the Standard Specifications. After the required field welding of galvanized bearing assemblies, field repair the weld areas and/or damaged areas of the galvanized coating in accordance with ASTM A 780.

Include all cost of furnishing and installing steel bearing assembly components in the lump sum price bid for structural steel if a bid item for structural steel is included in the project. Otherwise, include the cost in the unit price bid for prestressed beams.

ANCHOR BOLTS

Galvanize all components of anchor bolt assemblies in accordance with AASHTO M 232 or ASTM F 2329 as applicable. The weight of anchor bolt assemblies is included in the bent quantities for reinforcing steel. Include all costs of furnishing and installing anchor bolt assemblies in the unit price bid for reinforcing steel.

ORIENTATION IN RELATION TO STATIONING

Left and right sides, where referred to in these plans, are in relation to direction of stationing.

FINAL FINISH OF EXPOSED CONCRETE SURFACES

Apply the final surface finish on the bridge(s) only to the following checked and designated bridge areas:

☒ A) Entire surface of all barrier rails, parapet walls, approach slab curbs, concrete utility supports, and wing walls; outside vertical edge of bridge deck slabs and sidewalks.

☒ B) Outside face of exterior prestressed girders.

☒ C) Entire surface of designated substructure units, except top of bent caps and piers.

☒ All Units ☐ Designated Units:

☐ D) No final surface finish required.

SPECIFICATIONS

AASHTO 2017 LRFD Bridge Design Specifications, 8th Edition.

ANSI/AASHTO/AWS D1.5 Bridge Welding Code (Latest Edition) with additions and revisions as stated in the Standard Specifications.

DESIGN DATA

Load and Resistance Factor Design (LRFD) Method

Live Load: AASHTO HL-93 Loading

The top $^{1}/_{4}$" of all concrete slabs is considered as a wearing surface and is not included in the slab depth used for the calculation of section properties.

All bolted connections, except for steel diaphragm members used with prestressed concrete beams, are designed as slip-critical connections having Class "B" contact surfaces.

An extra dead load of 0.016 KSF is incorporated into the design of this structure to accommodate the use of steel stay-in-place forms.

An extra dead load of 0.015 KSF is incorporated into the design of this structure as an allowance for a future wearing surface.

Seismic Design is in accordance with the 2008 SCDOT "Seismic Design Specifications for Highway Bridges", Version 2.0, with the following parameters:

Seismic Design Category: To Be Determined

Analysis Method: To Be Determined

Operational Classification: II

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

REV.			
REV.	RCV	PCW	06-23
	DM0323		
REV.	PCW	HL	09-20
	ASTM F3125		
REVIEWED			
QUAN.			
DR.	NSC	MRA	11-23
DES.	NSC	TRL	11-23
	BY	CHK.	DATE

PRELIMINARY NOT FOR CONSTRUCTION

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

GENERAL NOTES

US-21 BRIDGE OVER PALMETTO RAILROAD/NSRR SPUR

COUNTY	ROUTE
RICHLAND	US-21

DRAWING NO. 700-03

12/11/2023

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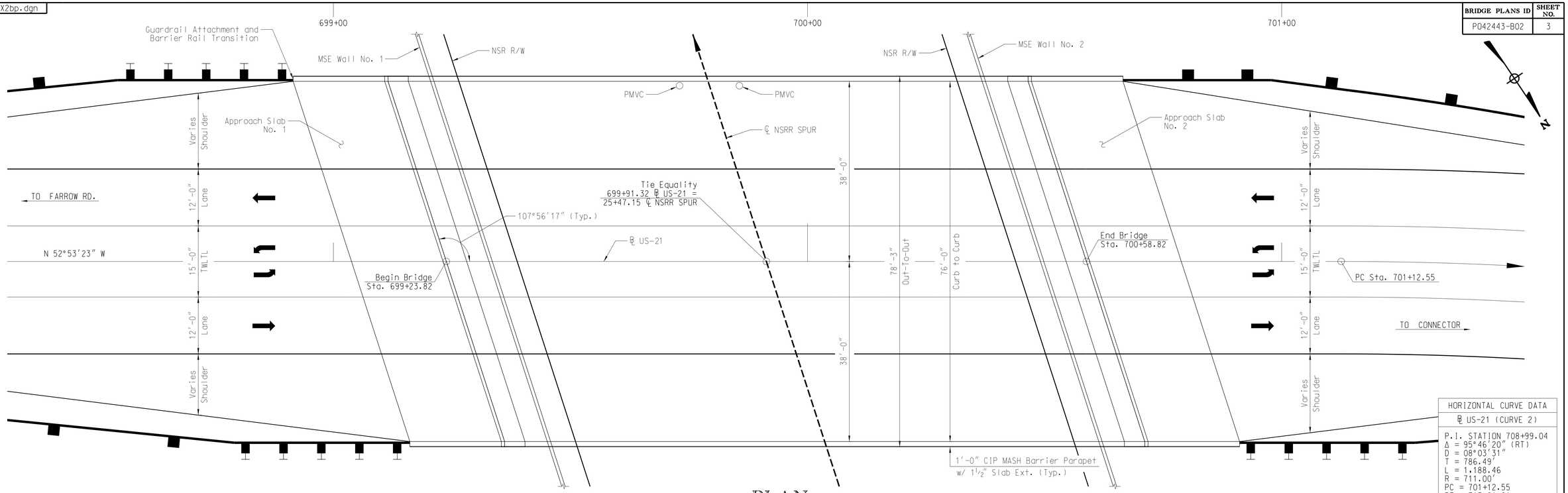
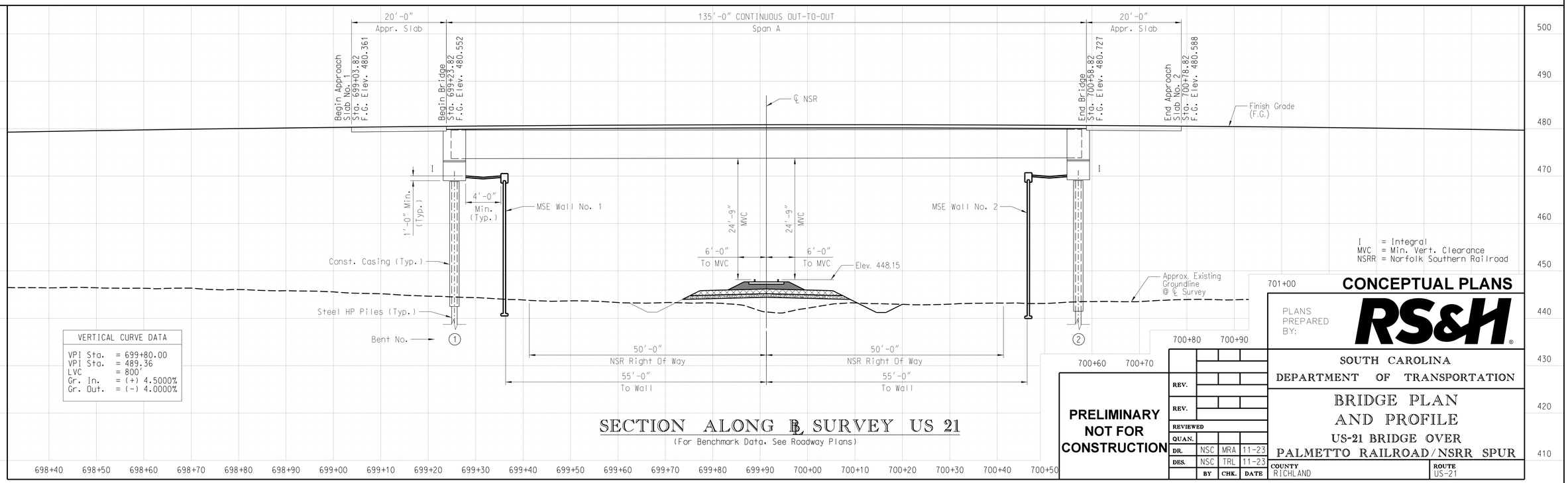
BRIDGE PLANS ID	SHEET NO.
P042443-B02	3



PLAN

HORIZONTAL CURVE DATA
℄ US-21 (CURVE 2)
P.I. STATION 708+99.04 Δ = 95°46'20" (RT) D = 08°03'31" T = 786.49' L = 1,188.46 R = 711.00' PC = 701+12.55 PT = 713+01.01



I = Integral
MVC = Min. Vert. Clearance
NSRR = Norfolk Southern Railroad

VERTICAL CURVE DATA
VPI Sta. = 699+80.00 VPI Sta. = 489.36 LVC = 800' Gr. In. = (+) 4.5000% Gr. Out. = (-) 4.0000%

SECTION ALONG ℄ SURVEY US 21

(For Benchmark Data, See Roadway Plans)

PRELIMINARY NOT FOR CONSTRUCTION

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

BRIDGE PLAN AND PROFILE

US-21 BRIDGE OVER PALMETTO RAILROAD/NSRR SPUR

		BY	CHK.	DATE
REV.				
REV.				
REVIEWED				
QUAN.				
DR.	NSC	MRA	11-23	
DES.	NSC	TRL	11-23	

COUNTY RICHLAND

ROUTE US-21

12/11/2023
Border Sheet 6/08

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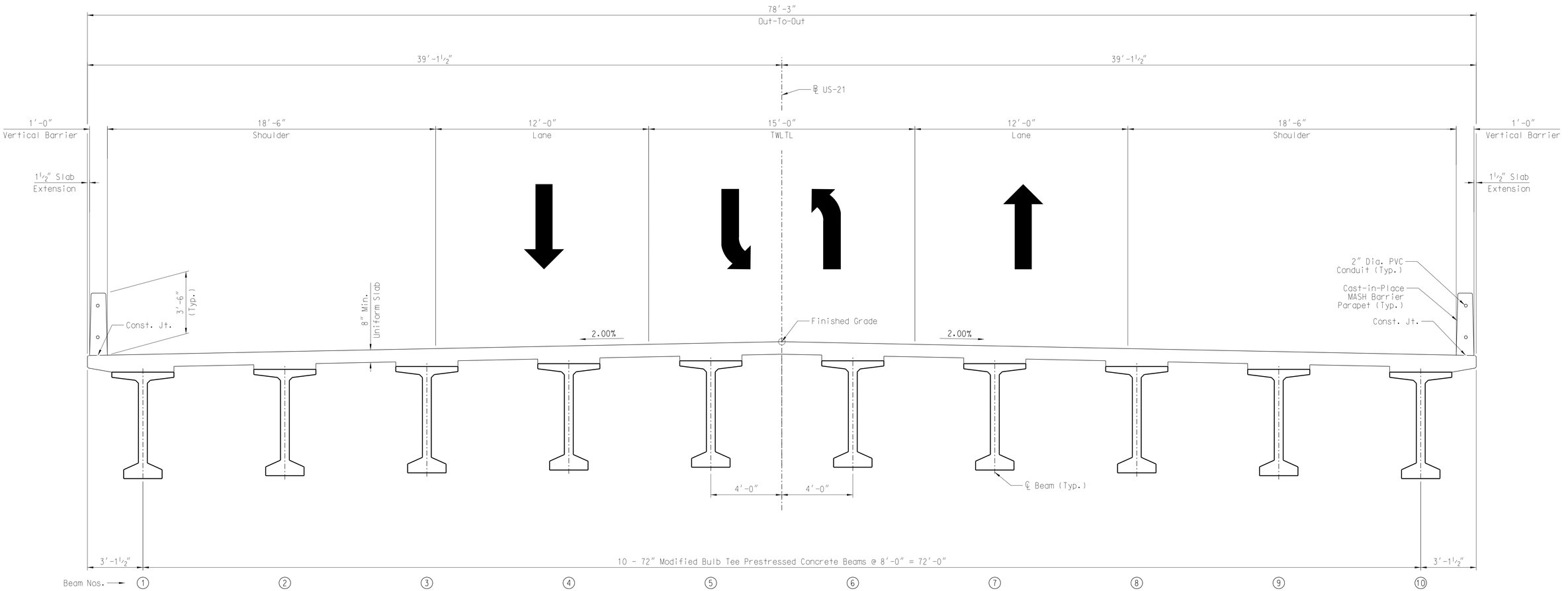
BRIDGE PLANS ID	SHEET NO.
P042443-B02	4



TYPICAL SECTION

(Looking In The Direction Of Stationing)

NOTE:

Steel Intermediate Diaphragm Not Shown.

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

PRELIMINARY NOT FOR CONSTRUCTION

	REV.	REV.	REV.	REVIEWED	QUAN.	DR.	DES.	BY
						NSC	NSC	CHK.
						MRA	TRL	DATE
						11-23	11-23	

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

TYPICAL SECTION

US-21 BRIDGE OVER PALMETTO RAILROAD/NSRR SPUR

COUNTY	ROUTE
RICHLAND	US-21

12/11/2023

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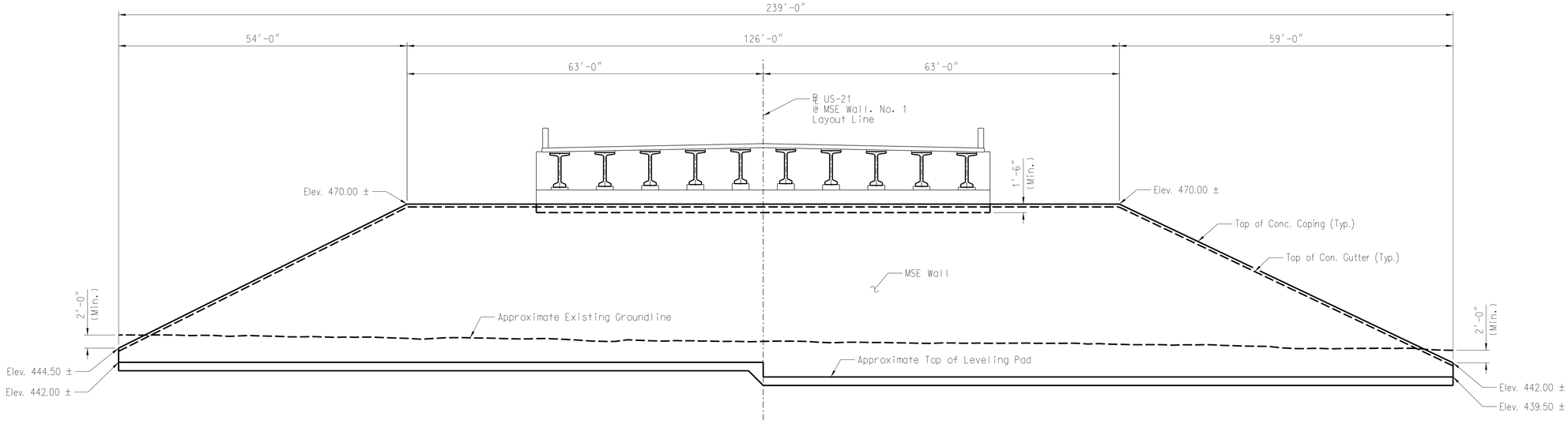
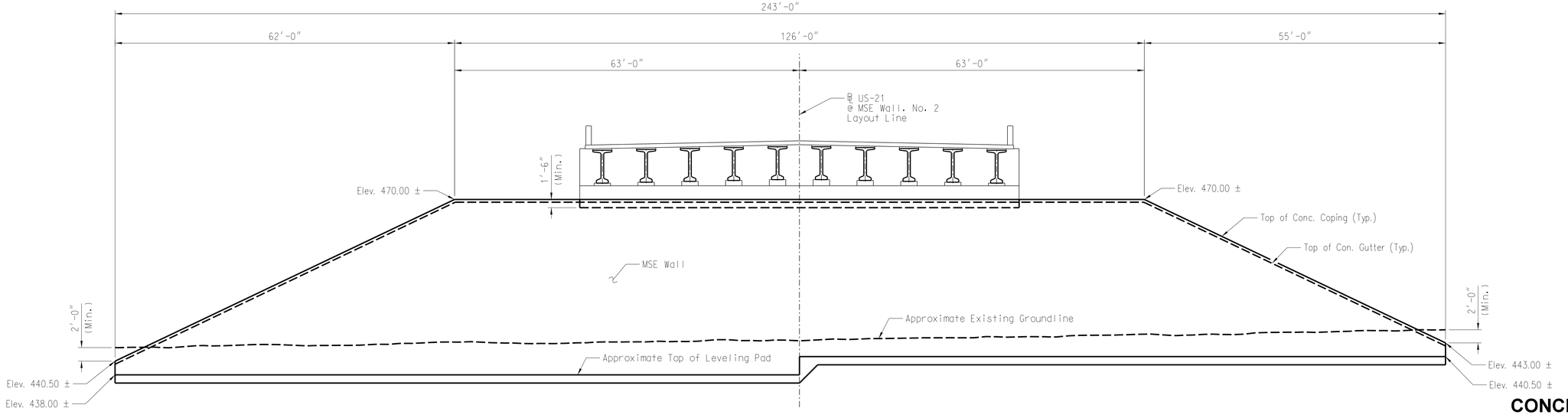
BRIDGE PLANS ID	SHEET NO.
P042443-B02	5



MSE WALL NO.1

ELEVATION ALONG LAYOUT LINE

(Looking Opposite of Stationing)



MSE WALL NO.2

ELEVATION ALONG LAYOUT LINE

(Looking Ahead of Stationing)

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

MSE WALLS

US-21 BRIDGE OVER PALMETTO RAILROAD/NSRR SPUR

PRELIMINARY NOT FOR CONSTRUCTION

REV.				
REV.				
REV.				
REVIEWED				
QUAN.				
DR.	NSC	MRA	11-23	
DES.	NSC	TRL	11-23	
	BY	CHK.	DATE	

COUNTY	ROUTE
RICHLAND	US-21

12/11/2023

bXXXXX3ts.dgn

BRIDGE PLANS ID	SHEET NO.
P042443-B03	1

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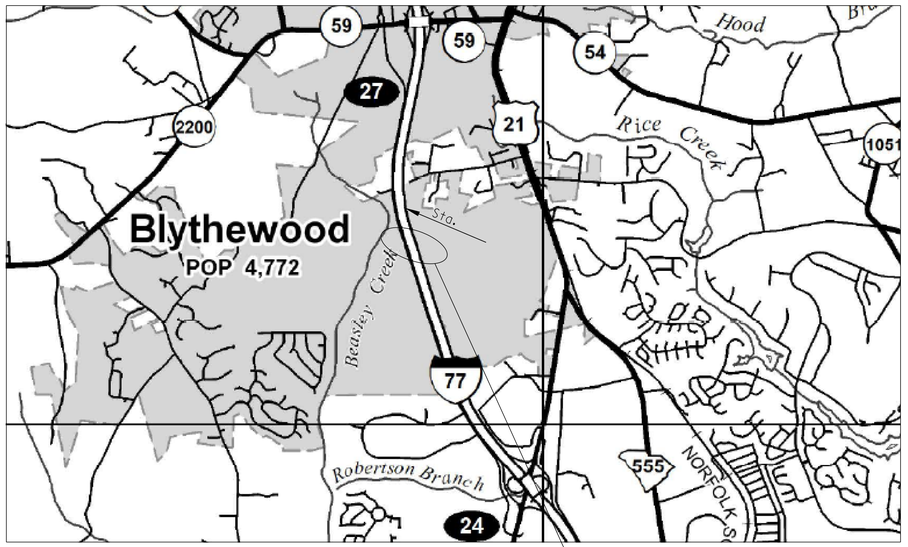
1. Title Sheet
2. General Notes
3. Bridge Plan and Profile
4. Plan and Elevation Bent 2
5. Typical Section
6. MSE Walls

SCDOT

South Carolina Department of Transportation

PROPOSED PLANS FOR

RICHLAND COUNTY
PROJECT ID P042443
I-77 INTERCHANGE AND CONNECTION ROADS
CONSTRUCT BRIDGE ON RAMP BA OVER I-77



LAYOUT

SITE LOCATION

N

Approximate Location of Bridge is

Latitude	34°- 11' - 38.3" N
Longitude	80°- 59' - 04.8" W

3 DAYS BEFORE DIGGING IN
SOUTH CAROLINA

CALL 811

SOUTH CAROLINA 811 (SC811)
WWW.SC811.COM
ALL UTILITIES MAY NOT BE A MEMBER OF SC811

NET LENGTH OF ROADWAY	0.517 MILES
NET LENGTH OF BRIDGES	0.060 MILES
NET LENGTH OF PROJECT	0.577 MILES
LENGTH OF EXCEPTIONS	0.000 MILES
GROSS LENGTH OF PROJECT	0.577 MILES

TRAFFIC DATA

2026 ADT 10,000 V.P.D.

2046 ADT 15,000 V.P.D.

TRUCKS 7 %

NOTE: EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIALS AND WORKMANSHIP ON THIS PROJECT SHALL CONFORM TO THE SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION (2007 EDITION) AND THE STANDARD DRAWINGS FOR ROAD CONSTRUCTION IN EFFECT AT THE TIME OF LETTING.

PLANS PREPARED BY: RS&H

ENGINEER OF RECORD

CONCEPTUAL PLANS

NOT FOR CONSTRUCTION

FOR CONSTRUCTION : _____ _____ DATE

REVIEWED	TRL	12-23	DATE
DR.	VAS	CHK	
	NSC	BY	

CoannN
12/11/2023

DRAWING NO. 700-02

BRIDGE PLANS ID	SHEET NO.
P042443-B03	2

MATERIAL & WORKMANSHIP

Provide all material and workmanship in accordance with the South Carolina Department of Transportation 2007 Standard Specifications for Highway Construction, unless otherwise specified on the Plans or in the Special Provisions.

COORDINATION OF PLANS, SPECIFICATIONS, AND SPECIAL PROVISIONS

Generally, in case of discrepancy, this General Notes sheet governs over the Standard Specifications but the remainder of the plans govern over notes on this sheet and Special Provisions govern over all. See Subsection 105.4 of the Standard Specifications.

WATER ELEVATIONS

The water elevations shown in the plans are for information only and the actual water elevation during construction may vary depending on weather conditions and seasonal fluctuations.

COMPLETION DATES

On inside face of right side barrier parapet/railing at beginning of bridge and on left side barrier parapet/railing at end of bridge, place year of completion adjacent to guardrail attachment. Place this completion date so that it will not be covered by the guardrail connector when it is installed. Recess numbers in the concrete using numbers fabricated from reusable/durable material that is approved by the RCE. Provide numbers in accordance with SCDOT Standard Drawing No. 702-305-00.

REINFORCING STEEL

Fabricate reinforcing bars as noted on Reinforcing Bending Details sheet.

Do not use lap splices in column and shaft reinforcing steel.

PRESTRESSED CONCRETE BEAMS

Beam lengths given are based on horizontal span only. Increase lengths to correct for concrete shrinkage, concrete shortening when the strands are cut, and for beams being on a grade.

All overhang brackets in the top flange of exterior beams shall be galvanized in accordance with AASHTO M 111, AASHTO M 232, or ASTM F 2329 as appropriate and shall be detailed accordingly in the shop plans.

CONCRETE

Provide the class of concrete as noted in the contract documents. For cast-in-place structural elements, use Class 4000 concrete where the class of concrete is not specified in the contract documents.

When holes are cast in beams to accommodate falsework, fill the holes with a non-shrink structural grout suitable for overhead repairs after falsework is removed.

After erection of the beams and prior to the erection of the deck slab falsework, measure beam cambers. Compare the measured beam cambers to the values shown on the Plans to aid in determining if field adjustments are needed. Submit beam camber measurements and any proposed field adjustments to the RCE for approval. All cost of performing this work is considered incidental to the Contract and no additional compensation is allowed for the performance of this work.

Payment for concrete in slab is based on theoretical plan quantity. No adjustment is made for variation in camber.

Chamfer all exposed edges $^{3}/_{4}$" unless otherwise noted.

The minimum acceptable concrete cover for reinforcing steel is $^{1}/_{2}$" less than the plan dimensions when required by reinforcing bar fabrication tolerances.

Cast build-ups and shear keys on bent caps monolithic with the cap unless indicated otherwise in these plans. Construct the top of each build-up level.

GRINDING & TEXTURING CONCRETE DECKS

For bridge stage construction projects, grind and texture the bridge decks as necessary near the stage longitudinal construction joints in order to meet the longitudinal and transverse rideability and rolling straightedge requirements of the Contract.

Prior to casting any closure pour, grinding, or texturing, make profile line surveys (2 to 6 as determined by the RCE) of each stage of the bridge decks. Make one of these profile line surveys for each stage along the edge of the deck adjacent to the closure pour. Compare the surveys within each stage and compare the surveys of each stage to surveys of the adjacent stage to aid in determining the amount of grinding and texturing needed to meet the rideability and rolling straightedge requirements. Submit all grinding and texturing procedures, plotted survey profiles, and proposed grinding depths to the RCE for approval. Maintain a final cover of 2"minimum over the bridge deck reinforcing steel.

Follow the above procedures for all stages of the work. For all surveys performed on the same bridge, use identical stations for survey shots in order to facilitate survey comparisons. All costs for performing, evaluating, and submitting the surveys are considered incidental to the Contract and no additional compensation is allowed for the performance of this work.

Payment for grinding and texturing concrete bridge decks at the junction of new and existing bridge deck slabs is determined in accordance with Subsection 702.6 of the Standard Specifications. No payment is made for grinding and texturing of new bridge decks to correct irregularities and excessive deviations.

ALLOWANCE FOR DEAD LOAD DEFLECTION & SETTLEMENT

In setting forms for structural steel or prestressed concrete beam spans, apply an allowance to the design finished grade to compensate for computed dead load deflections.

Prior to making deck pours on any stage construction work, and bridge widening projects, consider and make adjustments as necessary for partially loaded beams adjacent to closure pour areas. Verify that any proposed adjustment on partially loaded beams does not create a change in the deck thickness or a reduction in the concrete cover over the reinforcing steel. Welded studs on steel beams and reinforcing steel extending up out of prestressed beams shall meet the requirements for a composite section (extend up into the deck past the bottom mat of reinforcing steel) regardless of any adjustments.

In setting falsework for reinforced concrete spans, make an allowance for the deflection of the falsework, for any settlement of the falsework, for the instantaneous dead load deflection of the span, and for the long-time dead load deflection of the span such that on removal of the falsework the top of the structure shall conform to theoretical finished grade plus the allowance for long-time deflection.

For instantaneous and long-time dead load deflection, use a camber of $^{1}/_{8}$" for concrete flat slab spans 22 feet in length, $^{3}/_{16}$" for concrete flat slab spans 30 feet in length, and $^{3}/_{8}$" for concrete flat slab spans 40 feet in length, unless otherwise directed by the RCE. Adjust these cambers as necessary to allow for falsework deflection, falsework settlement, and vertical curve ordinates.

PERMANENT STEEL BRIDGE DECK FORMS

Permanent stay-in-place steel bridge deck forms for concrete deck slabs may be used at the Contractor's option.

Notify the Department and the Fabricator of the beams if using this option so that shop plans can be properly detailed.

DRIVEN PILE FOUNDATIONS

Where piles occur in fill, place fill before driving piles.

Where prestressed concrete piles are to be driven through fill, install piles in pre-bored holes extending to the original ground. For square prestressed concrete piles, bore holes having a minimum diameter of 1.25 times the nominal pile size. Include all cost of pre-boring fills for pile installation in the unit price bid for the piles.

EXCAVATION FOR END BENTS

Include all cost of excavation necessary to construct end bents and to remove material under superstructure to an elevation twelve inches below tops of end bent caps, in the unit price bid for class of concrete specified in the Plans.

If a concrete footing is used for the end bent, the excavation below that included for the cap and berm in the above paragraph is paid for at the unit price bid for excavation. Include excavation above this in the unit price bid for class of concrete specified in the Plans.

STRUCTURAL STEEL

Layout dimensions and standard lengths of beams shown are horizontal dimensions which must be increased when bridge is on grade.

When holes are placed in webs to accommodate falsework, install high strength bolts in the holes after falsework is removed.

Notify the Department of the name and address of the Fabricator of the structural steel as soon as the Fabricator has been given the contract to fabricate so that the inspection procedure can be set up.

Do not field or shop weld erection hardware to the structural steel members.

Make all bolted connections with $^{7}/_{8}$" dia. ASTM F3125, Grade A325 bolts unless otherwise indicated.

Generally, holes for $^{7}/_{8}$" dia. bolts shall be $^{15}/_{16}$" dia. However,for straight girder spans, oversized holes, $^{3}/_{16}$" larger than bolt dia. may be used in diaphragms and/or crossframes and their connection plates provided hardened washers are installed over oversize holes in the outer ply of the material gripped.Hardened washers are required under DTIs on oversized holes. In every case install a hardened washer under the element turned for each bolt of a bolted connection. Indicate on the Shop Plans which holes are to be oversize and where hardened washers are required. No additionalpayment is made for the costs associated with the use of oversize holes and furnishing additional hardened washers as necessary.

PAINT FOR STRUCTURAL STEEL

Paint structural steel in accordance with Section 710 of the Standard Specifications.

BEARING ASSEMBLIES

If bearing assemblies support weathering steel beams or girders, fabricate bearing assembly components from weathering steel and paint them using the NS2 Paint System. Galvanize all other bearing assemblies in accordance with AASHTO M 111, AASHTO M 232, or ASTM F 2329 as applicable.

After the required field welding of painted bearing assemblies, field repair the weld areas and/or any damaged areas to the paint in accordance with Subsection 710.4.2 of the Standard Specifications. After the required field welding of galvanized bearing assemblies, field repair the weld areas and/or damaged areas of the galvanized coating in accordance with ASTM A 780.

Include all cost of furnishing and installing steel bearing assembly components in the lump sum price bid for structural steel if a bid item for structural steel is included in the project. Otherwise, include the cost in the unit price bid for prestressed beams.

ANCHOR BOLTS

Galvanize all components of anchor bolt assemblies in accordance with AASHTO M 232 or ASTM F 2329 as applicable. The weight of anchor bolt assemblies is included in the bent quantities for reinforcing steel. Include all costs of furnishing and installing anchor bolt assemblies in the unit price bid for reinforcing steel.

ORIENTATION IN RELATION TO STATIONING

Left and right sides, where referred to in these plans, are in relation to direction of stationing.

FINAL FINISH OF EXPOSED CONCRETE SURFACES

Apply the final surface finish on the bridge(s) only to the following checked and designated bridge areas:

☒ A) Entire surface of all barrier rails, parapet walls, approach slab curbs, concrete utility supports, and wing walls; outside vertical edge of bridge deck slabs and sidewalks.

☐ B) Outside face of exterior prestressed girders.

☒ C) Entire surface of designated substructure units, except top of bent caps and piers.

☒ All Units ☐ Designated Units:

☐ D) No final surface finish required.

SPECIFICATIONS

AASHTO 2017 LRFD Bridge Design Specifications, 8th Edition.

ANSI/AASHTO/AWS D1.5 Bridge Welding Code (Latest Edition) with additions and revisions as stated in the Standard Specifications.

DESIGN DATA

Load and Resistance Factor Design (LRFD) Method

Live Load: AASHTO HL-93 Loading

The top $^{1}/_{4}$" of all concrete slabs is considered as a wearing surface and is not included in the slab depth used for the calculation of section properties.

All bolted connections, except for steel diaphragm members used with prestressed concrete beams, are designed as slip-critical connections having Class "B" contact surfaces.

An extra dead load of 0.016 KSF is incorporated into the design of this structure to accommodate the use of steel stay-in-place forms.

An extra dead load of 0.015 KSF is incorporated into the design of this structure as an allowance for a future wearing surface.

Seismic Design is in accordance with the 2008 SCDOT "Seismic Design Specifications for Highway Bridges", Version 2.0, with the following parameters:

Seismic Design Category: To Be Determined

Analysis Method: To Be Determined

Operational Classification: II

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

REV.			
REV.	RCV	PCW	06-23
	DM0323		
REV.	PCW	HL	09-20
	ASTM F3125		
REVIEWED			
QUAN.			
DR.	NSC	VAS	12-23
DES.	NSC	VAS	12-23
	BY	CHK.	DATE

PRELIMINARY NOT FOR CONSTRUCTION

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

GENERAL NOTES

RAMP BA BRIDGE OVER I-77

COUNTY	ROUTE
RICHLAND	RAMP BA

DRAWING NO. 700-03

12/11/2023

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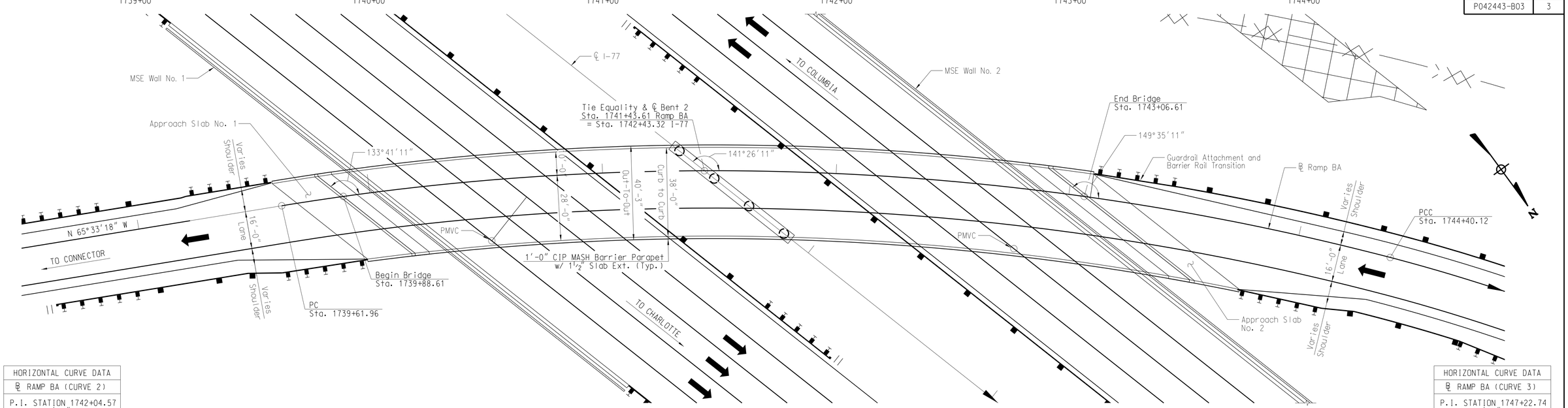
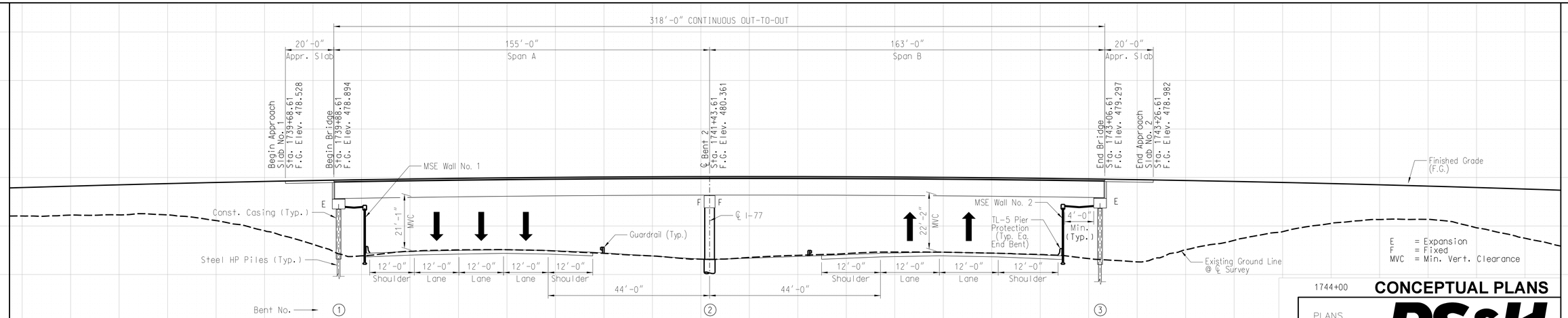
BRIDGE PLANS ID	SHEET NO.
P042443-B03	3



PLAN

HORIZONTAL CURVE DATA
℄ RAMP BA (CURVE 2)
P.I. STATION 1742+04.57 Δ = 23°54'30" (RT) D = 05°00'00" T = 242.61' L = 478.17' R = 1,145.92' PC = 1739+61.96 PCC = 1744+40.12

HORIZONTAL CURVE DATA
℄ RAMP BA (CURVE 3)
P.I. STATION 1747+22.74 Δ = 40°36'11" (RT) D = 07°30'00" T = 282.62' L = 541.38' R = 763.94' PCC = 1744+40.12 PT = 1749+81.50



SECTION ALONG ℄ SURVEY RAMP BA

(For Benchmark Data, See Roadway Plans)

VERTICAL CURVE DATA
VPI Sta. = 1742+00.00 VPI Elev. = 489.920 LVC = 875.00' Gr. In. = (+) 4.00% Gr. Out. = (-) 4.80%

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

BRIDGE PLAN AND PROFILE

RAMP BA BRIDGE OVER I-77

PRELIMINARY NOT FOR CONSTRUCTION

REV.				
REV.				
REVIEWED				
QUAN.				
DR.	NSC	VAS	12-23	
DES.	NSC	VAS	12-23	
	BY	CHK.	DATE	

COUNTY: RICHLAND

ROUTE: RAMP BA

12/11/2023
Border Sheet 6/08

DRAWING NO. 700-06

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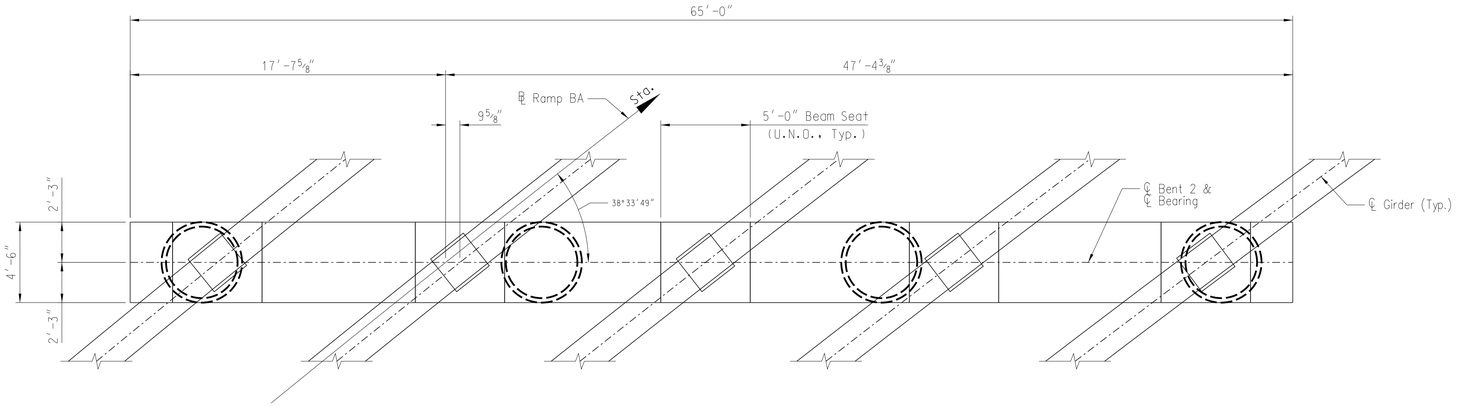
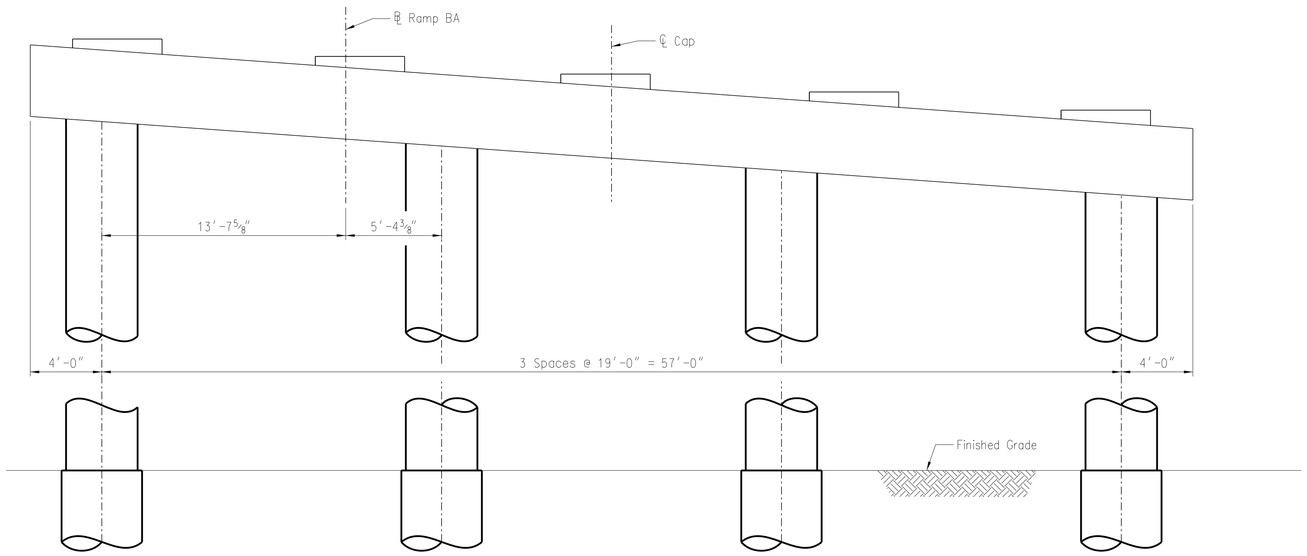
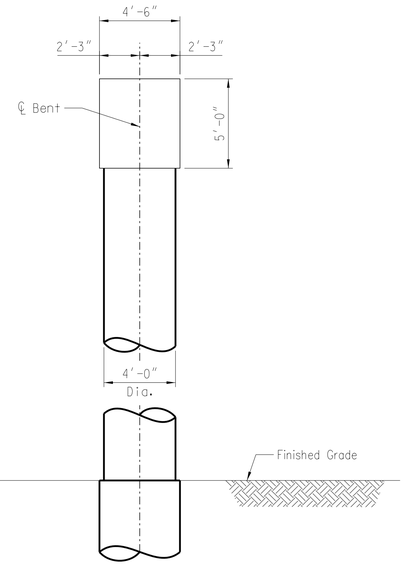
BRIDGE PLANS ID	SHEET NO.
P042443-B03	4



PLAN



ELEVATION



END ELEVATION

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PLAN AND ELEVATION BENT 2

RAMP BA BRIDGE OVER I-77

PRELIMINARY NOT FOR CONSTRUCTION

	REV.			
	REV.			
	REV.			
	REVIEWED			
	QUAN.			
	DR.	NSC	VAS	12-23
	DES.	NSC	VAS	12-23
		BY	CHK.	DATE

COUNTY	ROUTE
RICHLAND	RAMP BA

12/11/2023

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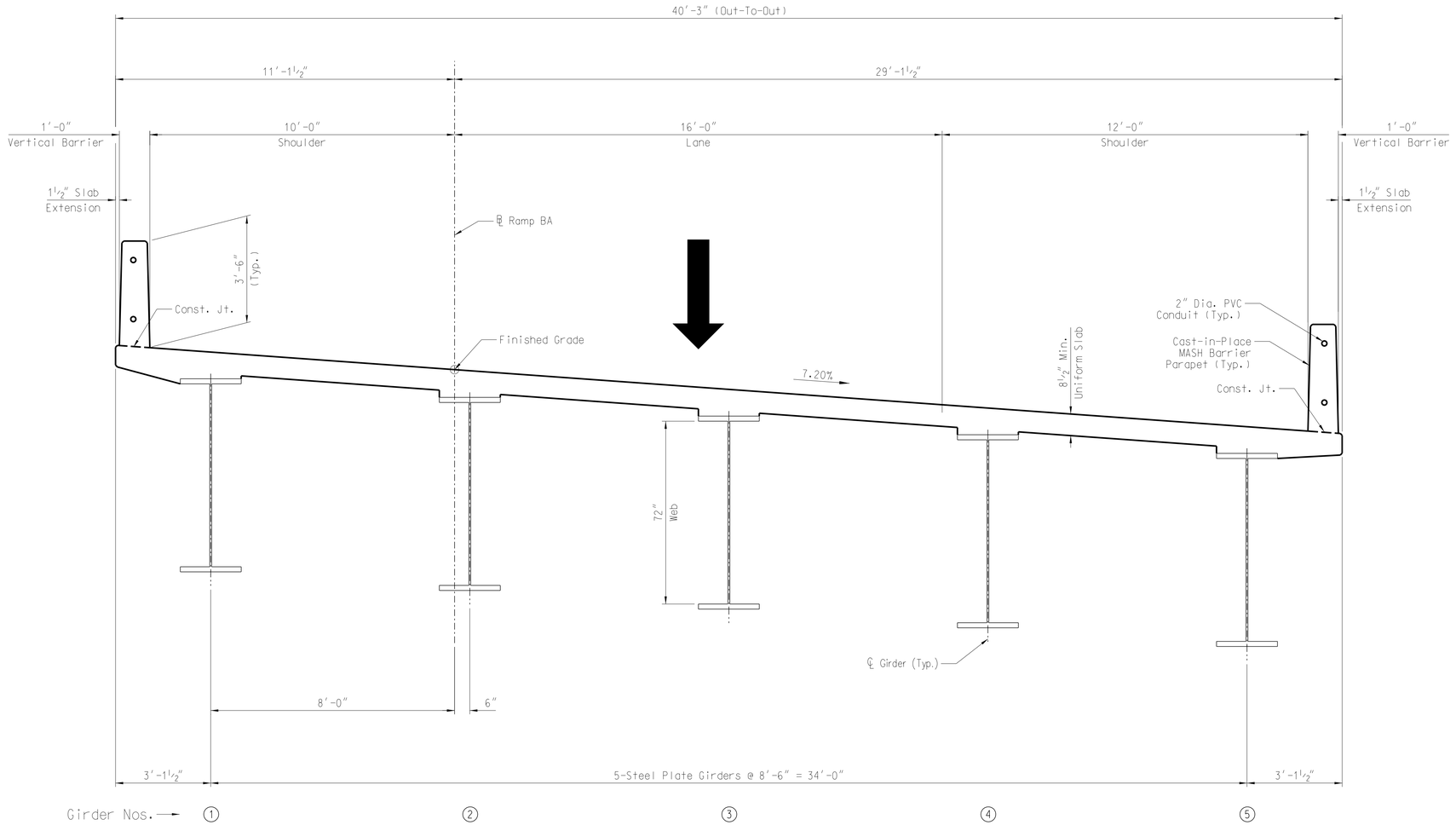
BRIDGE PLANS ID	SHEET NO.
P042443-B03	5



TYPICAL SECTION

(Looking In The Direction Of Stationing)

NOTES:

Steel Intermediate Diaphragm Not Shown.

Dimensions Are Radial to ℄ Ramp BA.

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

TYPCIAL SECTION

RAMP BA BRIDGE OVER I-77

PRELIMINARY NOT FOR CONSTRUCTION

		BY	CHK.	DATE
REV.				
REV.				
REV.				
REVIEWED				
QUAN.				
DR.	NSC	VAS	12-23	
DES.	NSC	VAS	12-23	

COUNTY	ROUTE
RICHLAND	RAMP BA

12/11/2023

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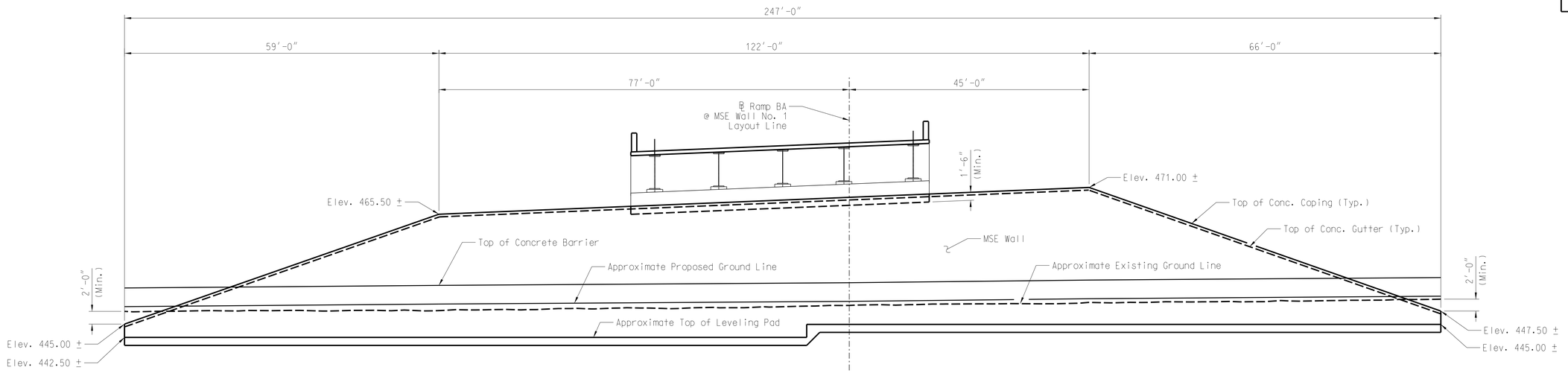
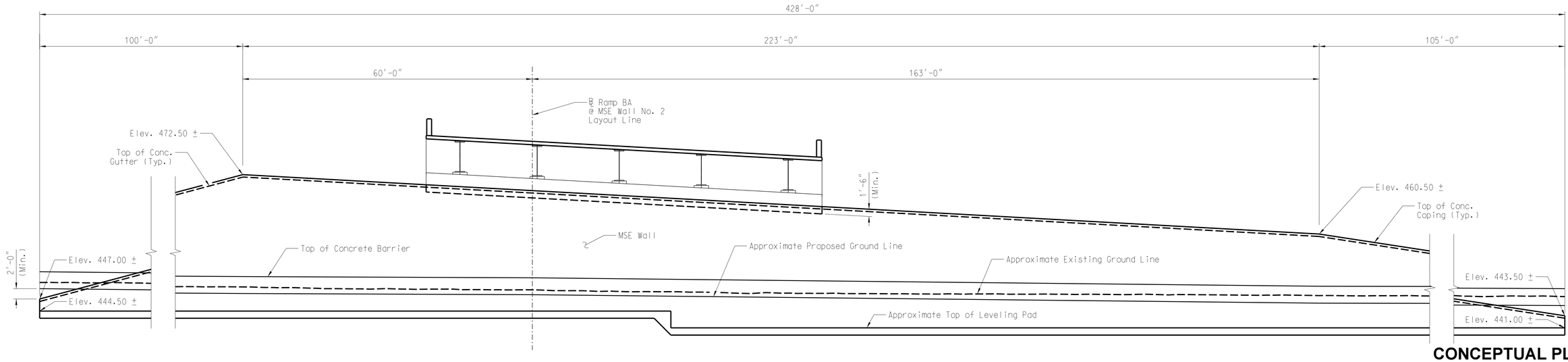
BRIDGE PLANS ID	SHEET NO.
P042443-B03	6



MSE WALL NO.1

ELEVATION ALONG LAYOUT LINE

(Looking Opposite of Stationing)



MSE WALL NO.2

ELEVATION ALONG LAYOUT LINE

(Looking Ahead of Stationing)

CONCEPTUAL PLANS

PLANS PREPARED BY: RS&H

SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

PRELIMINARY NOT FOR CONSTRUCTION

REV.				
REV.				
REV.				
REVIEWED				
QUAN.				
DR.	NSC	VAS	12-23	
DES.	NSC	VAS	12-23	
	BY	CHK.	DATE	

MSE WALLS

RAMP BA BRIDGE OVER I-77

COUNTY	ROUTE
RICHLAND	RAMP BA

12/11/2023

Appendix B.6: Ditch Calculations

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Monday, December 18, 2023

Project Units: U.S. Customary Units

Notes:

Channel Analysis: DITCH-1-1

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0114 ft/ft

Manning's n: 0.0350

Flow 23.0510 cfs

Result Parameters

Depth 1.3135 ft

Area of Flow 6.9015 ft^2

Wetted Perimeter 10.9271 ft

Hydraulic Radius 0.6316 ft

Average Velocity 3.3400 ft/s

Top Width 10.5083 ft

Froude Number: 0.7263

Critical Depth 1.2243 ft

Critical Velocity 3.8449 ft/s

Critical Slope: 0.0166 ft/ft

Critical Top Width 13.06 ft

Calculated Max Shear Stress 0.9360 lb/ft^2

Calculated Avg Shear Stress 0.4501 lb/ft^2

Channel Analysis: DITCH-1-2

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0289 ft/ft

Manning's n: 0.0350

Flow 44.2820 cfs

Result Parameters

Depth 1.5780 ft

Area of Flow 7.4705 ft^2

Wetted Perimeter 10.0349 ft

Hydraulic Radius 0.7444 ft

Average Velocity 5.9276 ft/s

Top Width 9.4681 ft

Froude Number: 1.1760

Critical Depth 1.7239 ft

Critical Velocity 4.9670 ft/s

Critical Slope: 0.0180 ft/ft

Critical Top Width 11.64 ft

Calculated Max Shear Stress 2.8448 lb/ft^2

Calculated Avg Shear Stress 1.3420 lb/ft^2

Channel Analysis: DITCH-1-3

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.5000 ft/ft

Side Slope 2 (Z2): 2.5000 ft/ft

Longitudinal Slope: 0.0299 ft/ft

Manning's n: 0.0350

Flow 4.8890 cfs

Result Parameters

Depth 0.7377 ft

Area of Flow 1.3606 ft^2

Wetted Perimeter 3.9728 ft

Hydraulic Radius 0.3425 ft

Average Velocity 3.5932 ft/s

Top Width 3.6887 ft

Froude Number: 1.0426

Critical Depth 0.7501 ft

Critical Velocity 3.4753 ft/s

Critical Slope: 0.0273 ft/ft

Critical Top Width 3.75 ft

Calculated Max Shear Stress 1.3760 lb/ft^2

Calculated Avg Shear Stress 0.6388 lb/ft^2

Channel Analysis: DITCH-1-4

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.5000 ft/ft

Side Slope 2 (Z2): 2.5000 ft/ft

Longitudinal Slope: 0.0274 ft/ft

Manning's n: 0.0350

Flow 16.8240 cfs

Result Parameters

Depth 1.1915 ft

Area of Flow 3.5493 ft^2

Wetted Perimeter 6.4165 ft

Hydraulic Radius 0.5532 ft

Average Velocity 4.7401 ft/s

Top Width 5.9576 ft

Froude Number: 1.0822

Critical Depth 1.2298 ft

Critical Velocity 4.4497 ft/s

Critical Slope: 0.0232 ft/ft

Critical Top Width 6.15 ft

Calculated Max Shear Stress 2.0409 lb/ft^2

Calculated Avg Shear Stress 0.9475 lb/ft^2

Channel Analysis: DITCH-1-5

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0341 ft/ft

Manning's n: 0.0350

Flow 84.9650 cfs

Result Parameters

Depth 2.3040 ft

Area of Flow 10.6168 ft^2

Wetted Perimeter 10.3038 ft

Hydraulic Radius 1.0304 ft

Average Velocity 8.0029 ft/s

Top Width 9.2160 ft

Froude Number: 1.3140

Critical Depth 2.5699 ft

Critical Velocity 6.4324 ft/s

Critical Slope: 0.0191 ft/ft

Critical Top Width 10.28 ft

Calculated Max Shear Stress 4.9083 lb/ft^2

Calculated Avg Shear Stress 2.1951 lb/ft^2

Channel Analysis: DITCH-1-6

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0293 ft/ft

Manning's n: 0.0350

Flow 109.5600 cfs

Result Parameters

Depth 2.6088 ft

Area of Flow 13.6120 ft^2

Wetted Perimeter 11.6671 ft

Hydraulic Radius 1.1667 ft

Average Velocity 8.0488 ft/s

Top Width 10.4353 ft

Froude Number: 1.2419

Critical Depth 2.8450 ft

Critical Velocity 6.7679 ft/s

Critical Slope: 0.0184 ft/ft

Critical Top Width 11.38 ft

Calculated Max Shear Stress 4.7633 lb/ft^2

Calculated Avg Shear Stress 2.1302 lb/ft^2

Channel Analysis: DITCH-1-7

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0120 ft/ft

Manning's n: 0.0350

Flow 129.0950 cfs

Result Parameters

Depth 3.2770 ft

Area of Flow 21.4775 ft^2

Wetted Perimeter 14.6552 ft

Hydraulic Radius 1.4655 ft

Average Velocity 6.0107 ft/s

Top Width 13.1080 ft

Froude Number: 0.8275

Critical Depth 3.0380 ft

Critical Velocity 6.9937 ft/s

Critical Slope: 0.0180 ft/ft

Critical Top Width 12.15 ft

Calculated Max Shear Stress 2.4620 lb/ft^2

Calculated Avg Shear Stress 1.1010 lb/ft^2

Channel Analysis: DITCH-1-11

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0386 ft/ft

Manning's n: 0.0350

Flow 7.1840 cfs

Result Parameters

Depth 0.6753 ft

Area of Flow 1.8242 ft^2

Wetted Perimeter 5.6178 ft

Hydraulic Radius 0.3247 ft

Average Velocity 3.9382 ft/s

Top Width 5.4025 ft

Froude Number: 1.1944

Critical Depth 0.7680 ft

Critical Velocity 3.0452 ft/s

Critical Slope: 0.0194 ft/ft

Critical Top Width 8.19 ft

Calculated Max Shear Stress 1.6245 lb/ft^2

Calculated Avg Shear Stress 0.7811 lb/ft^2

Channel Analysis: DITCH-1-12

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 10.0000 ft/ft

Side Slope 2 (Z2): 10.0000 ft/ft

Longitudinal Slope: 0.0222 ft/ft

Manning's n: 0.0350

Flow 6.6120 cfs

Result Parameters

Depth 0.5103 ft

Area of Flow 2.6044 ft^2

Wetted Perimeter 10.2576 ft

Hydraulic Radius 0.2539 ft

Average Velocity 2.5388 ft/s

Top Width 10.2066 ft

Froude Number: 0.8857

Critical Depth 0.4861 ft

Critical Velocity 2.7977 ft/s

Critical Slope: 0.0288 ft/ft

Critical Top Width 9.72 ft

Calculated Max Shear Stress 0.7082 lb/ft^2

Calculated Avg Shear Stress 0.3524 lb/ft^2

Channel Analysis: DITCH-1-13

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 9.0000 ft/ft

Side Slope 2 (Z2): 9.0000 ft/ft

Longitudinal Slope: 0.0316 ft/ft

Manning's n: 0.0350

Flow 0.9980 cfs

Result Parameters

Depth 0.2446 ft

Area of Flow 0.5386 ft^2

Wetted Perimeter 4.4304 ft

Hydraulic Radius 0.1216 ft

Average Velocity 1.8530 ft/s

Top Width 4.4033 ft

Froude Number: 0.9337

Critical Depth 0.2380 ft

Critical Velocity 1.9575 ft/s

Critical Slope: 0.0366 ft/ft

Critical Top Width 4.28 ft

Calculated Max Shear Stress 0.4828 lb/ft^2

Calculated Avg Shear Stress 0.2399 lb/ft^2

Channel Analysis: DITCH-1-14

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 10.0000 ft/ft

Side Slope 2 (Z2): 10.0000 ft/ft

Longitudinal Slope: 0.0374 ft/ft

Manning's n: 0.0350

Flow 1.5130 cfs

Result Parameters

Depth 0.2663 ft

Area of Flow 0.7094 ft^2

Wetted Perimeter 5.3536 ft

Hydraulic Radius 0.1325 ft

Average Velocity 2.1327 ft/s

Top Width 5.3270 ft

Froude Number: 1.0299

Critical Depth 0.2695 ft

Critical Velocity 2.0830 ft/s

Critical Slope: 0.0351 ft/ft

Critical Top Width 5.39 ft

Calculated Max Shear Stress 0.6208 lb/ft^2

Calculated Avg Shear Stress 0.3088 lb/ft^2

Channel Analysis: DITCH-1-15

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 10.0000 ft/ft

Side Slope 2 (Z2): 10.0000 ft/ft

Longitudinal Slope: 0.0249 ft/ft

Manning's n: 0.0350

Flow 2.5170 cfs

Result Parameters

Depth 0.3478 ft

Area of Flow 1.2095 ft^2

Wetted Perimeter 6.9901 ft

Hydraulic Radius 0.1730 ft

Average Velocity 2.0811 ft/s

Top Width 6.9554 ft

Froude Number: 0.8795

Critical Depth 0.3304 ft

Critical Velocity 2.3063 ft/s

Critical Slope: 0.0328 ft/ft

Critical Top Width 6.61 ft

Calculated Max Shear Stress 0.5408 lb/ft^2

Calculated Avg Shear Stress 0.2691 lb/ft^2

Channel Analysis: DITCH-2-5

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0159 ft/ft

Manning's n: 0.0350

Flow 16.4630 cfs

Result Parameters

Depth 1.0886 ft

Area of Flow 4.7405 ft^2

Wetted Perimeter 9.0561 ft

Hydraulic Radius 0.5235 ft

Average Velocity 3.4729 ft/s

Top Width 8.7090 ft

Froude Number: 0.8295

Critical Depth 1.0700 ft

Critical Velocity 3.5946 ft/s

Critical Slope: 0.0174 ft/ft

Critical Top Width 11.41 ft

Calculated Max Shear Stress 1.0774 lb/ft^2

Calculated Avg Shear Stress 0.5180 lb/ft^2

Channel Analysis: DITCH-2-6

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0137 ft/ft

Manning's n: 0.0350

Flow 18.8550 cfs

Result Parameters

Depth 1.1778 ft

Area of Flow 5.5489 ft^2

Wetted Perimeter 9.7980 ft

Hydraulic Radius 0.5663 ft

Average Velocity 3.3979 ft/s

Top Width 9.4225 ft

Froude Number: 0.7803

Critical Depth 1.1297 ft

Critical Velocity 3.6934 ft/s

Critical Slope: 0.0171 ft/ft

Critical Top Width 12.05 ft

Calculated Max Shear Stress 1.0047 lb/ft^2

Calculated Avg Shear Stress 0.4831 lb/ft^2

Channel Analysis: DITCH-2-7

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 4.0000 ft/ft

Longitudinal Slope: 0.0054 ft/ft

Manning's n: 0.0350

Flow 10.0010 cfs

Result Parameters

Depth 1.0131 ft

Area of Flow 5.1323 ft^2

Wetted Perimeter 10.3400 ft

Hydraulic Radius 0.4964 ft

Average Velocity 1.9486 ft/s

Top Width 10.1315 ft

Froude Number: 0.4825

Critical Depth 0.7632 ft

Critical Velocity 3.4344 ft/s

Critical Slope: 0.0243 ft/ft

Critical Top Width 7.95 ft

Calculated Max Shear Stress 0.3389 lb/ft^2

Calculated Avg Shear Stress 0.1660 lb/ft^2

Channel Analysis: DITCH-3-1

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0120 ft/ft

Manning's n: 0.0350

Flow 3.7750 cfs

Result Parameters

Depth 0.7387 ft

Area of Flow 1.6370 ft^2

Wetted Perimeter 4.6975 ft

Hydraulic Radius 0.3485 ft

Average Velocity 2.3061 ft/s

Top Width 4.4321 ft

Froude Number: 0.6687

Critical Depth 0.6438 ft

Critical Velocity 3.0355 ft/s

Critical Slope: 0.0250 ft/ft

Critical Top Width 4.35 ft

Calculated Max Shear Stress 0.5545 lb/ft^2

Calculated Avg Shear Stress 0.2616 lb/ft^2

Channel Analysis: DITCH-3-2

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0152 ft/ft

Manning's n: 0.0350

Flow 4.5880 cfs

Result Parameters

Depth 0.7606 ft

Area of Flow 1.7357 ft^2

Wetted Perimeter 4.8371 ft

Hydraulic Radius 0.3588 ft

Average Velocity 2.6433 ft/s

Top Width 4.5639 ft

Froude Number: 0.7553

Critical Depth 0.6961 ft

Critical Velocity 3.1562 ft/s

Critical Slope: 0.0244 ft/ft

Critical Top Width 4.70 ft

Calculated Max Shear Stress 0.7215 lb/ft^2

Calculated Avg Shear Stress 0.3404 lb/ft^2

Channel Analysis: DITCH-3-3

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0161 ft/ft

Manning's n: 0.0150

Flow 19.5420 cfs

Result Parameters

Depth 1.1125 ft

Area of Flow 2.4753 ft^2

Wetted Perimeter 4.9752 ft

Hydraulic Radius 0.4975 ft

Average Velocity 7.8949 ft/s

Top Width 4.4499 ft

Froude Number: 1.8655

Critical Depth 1.4276 ft

Critical Velocity 4.7942 ft/s

Critical Slope: 0.0043 ft/ft

Critical Top Width 5.71 ft

Calculated Max Shear Stress 1.1183 lb/ft^2

Calculated Avg Shear Stress 0.5001 lb/ft^2

Channel Analysis: DITCH-4-1

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0339 ft/ft

Manning's n: 0.0350

Flow 9.4460 cfs

Result Parameters

Depth 0.8582 ft

Area of Flow 2.2093 ft^2

Wetted Perimeter 5.4572 ft

Hydraulic Radius 0.4048 ft

Average Velocity 4.2755 ft/s

Top Width 5.1490 ft

Froude Number: 1.1502

Critical Depth 0.9292 ft

Critical Velocity 3.6467 ft/s

Critical Slope: 0.0222 ft/ft

Critical Top Width 6.27 ft

Calculated Max Shear Stress 1.8132 lb/ft^2

Calculated Avg Shear Stress 0.8554 lb/ft^2

Channel Analysis: DITCH-5-1

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0897 ft/ft

Manning's n: 0.0350

Flow 10.0380 cfs

Result Parameters

Depth 0.6535 ft

Area of Flow 1.7080 ft^2

Wetted Perimeter 5.4360 ft

Hydraulic Radius 0.3142 ft

Average Velocity 5.8770 ft/s

Top Width 5.2276 ft

Froude Number: 1.8119

Critical Depth 0.8779 ft

Critical Velocity 3.2559 ft/s

Critical Slope: 0.0186 ft/ft

Critical Top Width 9.36 ft

Calculated Max Shear Stress 3.6576 lb/ft^2

Calculated Avg Shear Stress 1.7587 lb/ft^2

Channel Analysis: DITCH-5-2

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0275 ft/ft

Manning's n: 0.0350

Flow 8.8880 cfs

Result Parameters

Depth 0.8722 ft

Area of Flow 2.2823 ft^2

Wetted Perimeter 5.5466 ft

Hydraulic Radius 0.4115 ft

Average Velocity 3.8943 ft/s

Top Width 5.2333 ft

Froude Number: 1.0392

Critical Depth 0.9069 ft

Critical Velocity 3.6025 ft/s

Critical Slope: 0.0223 ft/ft

Critical Top Width 6.12 ft

Calculated Max Shear Stress 1.4962 lb/ft^2

Calculated Avg Shear Stress 0.7058 lb/ft^2

Channel Analysis: DITCH-5-3

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0166 ft/ft

Manning's n: 0.0350

Flow 11.2570 cfs

Result Parameters

Depth 1.0479 ft

Area of Flow 3.2944 ft^2

Wetted Perimeter 6.6639 ft

Hydraulic Radius 0.4944 ft

Average Velocity 3.4170 ft/s

Top Width 6.2875 ft

Froude Number: 0.8319

Critical Depth 0.9967 ft

Critical Velocity 3.7768 ft/s

Critical Slope: 0.0216 ft/ft

Critical Top Width 6.73 ft

Calculated Max Shear Stress 1.0835 lb/ft^2

Calculated Avg Shear Stress 0.5112 lb/ft^2

Channel Analysis: DITCH-6-2

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0248 ft/ft

Manning's n: 0.0350

Flow 13.3920 cfs

Result Parameters

Depth 0.9266 ft

Area of Flow 3.4343 ft^2

Wetted Perimeter 7.7081 ft

Hydraulic Radius 0.4455 ft

Average Velocity 3.8995 ft/s

Top Width 7.4127 ft

Froude Number: 1.0096

Critical Depth 0.9852 ft

Critical Velocity 3.4491 ft/s

Critical Slope: 0.0179 ft/ft

Critical Top Width 10.51 ft

Calculated Max Shear Stress 1.4333 lb/ft^2

Calculated Avg Shear Stress 0.6892 lb/ft^2

Channel Analysis: DITCH-6-3

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0342 ft/ft

Manning's n: 0.0350

Flow 13.8580 cfs

Result Parameters

Depth 0.8835 ft

Area of Flow 3.1226 ft^2

Wetted Perimeter 7.3501 ft

Hydraulic Radius 0.4248 ft

Average Velocity 4.4379 ft/s

Top Width 7.0684 ft

Froude Number: 1.1767

Critical Depth 0.9988 ft

Critical Velocity 3.4728 ft/s

Critical Slope: 0.0178 ft/ft

Critical Top Width 10.65 ft

Calculated Max Shear Stress 1.8861 lb/ft^2

Calculated Avg Shear Stress 0.9069 lb/ft^2

Channel Analysis: DITCH-6-4

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0145 ft/ft

Manning's n: 0.0350

Flow 15.8650 cfs

Result Parameters

Depth 1.0913 ft

Area of Flow 4.7634 ft^2

Wetted Perimeter 9.0781 ft

Hydraulic Radius 0.5247 ft

Average Velocity 3.3306 ft/s

Top Width 8.7301 ft

Froude Number: 0.7946

Critical Depth 1.0543 ft

Critical Velocity 3.5680 ft/s

Critical Slope: 0.0175 ft/ft

Critical Top Width 11.25 ft

Calculated Max Shear Stress 0.9901 lb/ft^2

Calculated Avg Shear Stress 0.4761 lb/ft^2

Channel Analysis: DITCH-6-5

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0848 ft/ft

Manning's n: 0.0350

Flow 16.3120 cfs

Result Parameters

Depth 1.0462 ft

Area of Flow 2.1891 ft^2

Wetted Perimeter 4.6788 ft

Hydraulic Radius 0.4679 ft

Average Velocity 7.4514 ft/s

Top Width 4.1848 ft

Froude Number: 1.8156

Critical Depth 1.3281 ft

Critical Velocity 4.6241 ft/s

Critical Slope: 0.0238 ft/ft

Critical Top Width 5.31 ft

Calculated Max Shear Stress 5.5360 lb/ft^2

Calculated Avg Shear Stress 2.4758 lb/ft^2

Channel Analysis: DITCH-6-6

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 6.0000 ft/ft

Longitudinal Slope: 0.0178 ft/ft

Manning's n: 0.0350

Flow 1.0380 cfs

Result Parameters

Depth 0.3227 ft

Area of Flow 0.6247 ft^2

Wetted Perimeter 3.9255 ft

Hydraulic Radius 0.1591 ft

Average Velocity 1.6616 ft/s

Top Width 3.8721 ft

Froude Number: 0.7290

Critical Depth 0.2844 ft

Critical Velocity 2.1396 ft/s

Critical Slope: 0.0349 ft/ft

Critical Top Width 3.41 ft

Calculated Max Shear Stress 0.3576 lb/ft^2

Calculated Avg Shear Stress 0.1764 lb/ft^2

Channel Analysis: DITCH-7-1

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 6.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0287 ft/ft

Manning's n: 0.0350

Flow 25.1110 cfs

Result Parameters

Depth 1.1413 ft

Area of Flow 5.2103 ft^2

Wetted Perimeter 9.4943 ft

Hydraulic Radius 0.5488 ft

Average Velocity 4.8195 ft/s

Top Width 9.1304 ft

Froude Number: 1.1243

Critical Depth 1.2669 ft

Critical Velocity 3.9113 ft/s

Critical Slope: 0.0164 ft/ft

Critical Top Width 13.51 ft

Calculated Max Shear Stress 2.0425 lb/ft^2

Calculated Avg Shear Stress 0.9821 lb/ft^2

Channel Analysis: DITCH-8-1

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 4.0000 ft/ft

Longitudinal Slope: 0.0040 ft/ft

Manning's n: 0.0350

Flow 13.0400 cfs

Result Parameters

Depth 1.2863 ft

Area of Flow 6.6178 ft^2

Wetted Perimeter 10.6067 ft

Hydraulic Radius 0.6239 ft

Average Velocity 1.9704 ft/s

Top Width 10.2900 ft

Froude Number: 0.4330

Critical Depth 0.9203 ft

Critical Velocity 3.8492 ft/s

Critical Slope: 0.0241 ft/ft

Critical Top Width 7.36 ft

Calculated Max Shear Stress 0.3243 lb/ft^2

Calculated Avg Shear Stress 0.1573 lb/ft^2

Channel Analysis: DITCH-8-2

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 6.0000 ft/ft

Longitudinal Slope: 0.0210 ft/ft

Manning's n: 0.0350

Flow 18.5170 cfs

Result Parameters

Depth 0.9880 ft

Area of Flow 4.8808 ft^2

Wetted Perimeter 10.0834 ft

Hydraulic Radius 0.4840 ft

Average Velocity 3.7939 ft/s

Top Width 9.8800 ft

Froude Number: 0.9512

Critical Depth 0.9764 ft

Critical Velocity 3.8847 ft/s

Critical Slope: 0.0224 ft/ft

Critical Top Width 10.17 ft

Calculated Max Shear Stress 1.2953 lb/ft^2

Calculated Avg Shear Stress 0.6346 lb/ft^2

Channel Analysis: DITCH-8-3

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width 5.00 ft

Longitudinal Slope: 0.0084 ft/ft

Manning's n: 0.0350

Flow 35.1090 cfs

Result Parameters

Depth 1.2779 ft

Area of Flow 9.6551 ft^2

Wetted Perimeter 10.7147 ft

Hydraulic Radius 0.9011 ft

Average Velocity 3.6363 ft/s

Top Width 10.1114 ft

Froude Number: 0.6558

Critical Depth 1.0013 ft

Critical Velocity 5.0071 ft/s

Critical Slope: 0.0208 ft/ft

Critical Top Width 9.01 ft

Calculated Max Shear Stress 0.6722 lb/ft^2

Calculated Avg Shear Stress 0.4740 lb/ft^2

Channel Analysis: DITCH-8-4

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width 5.00 ft

Longitudinal Slope: 0.0126 ft/ft

Manning's n: 0.0350

Flow 36.2750 cfs

Result Parameters

Depth 1.1686 ft

Area of Flow 8.5743 ft^2

Wetted Perimeter 10.2261 ft

Hydraulic Radius 0.8385 ft

Average Velocity 4.2307 ft/s

Top Width 9.6744 ft

Froude Number: 0.7919

Critical Depth 1.0207 ft

Critical Velocity 5.0473 ft/s

Critical Slope: 0.0207 ft/ft

Critical Top Width 9.08 ft

Calculated Max Shear Stress 0.9159 lb/ft^2

Calculated Avg Shear Stress 0.6571 lb/ft^2

Channel Analysis: DITCH-9-1

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width 5.00 ft

Longitudinal Slope: 0.0437 ft/ft

Manning's n: 0.0350

Flow 8.1160 cfs

Result Parameters

Depth 0.3529 ft

Area of Flow 2.0139 ft^2

Wetted Perimeter 6.5784 ft

Hydraulic Radius 0.3061 ft

Average Velocity 4.0300 ft/s

Top Width 6.4118 ft

Froude Number: 1.2672

Critical Depth 0.4099 ft

Critical Velocity 3.4017 ft/s

Critical Slope: 0.0261 ft/ft

Critical Top Width 6.64 ft

Calculated Max Shear Stress 0.9614 lb/ft^2

Calculated Avg Shear Stress 0.8338 lb/ft^2

Channel Analysis: DITCH-9-3

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0202 ft/ft

Manning's n: 0.0350

Flow 100.3200 cfs

Result Parameters

Depth 2.2932 ft

Area of Flow 15.7758 ft^2

Wetted Perimeter 14.5826 ft

Hydraulic Radius 1.0818 ft

Average Velocity 6.3591 ft/s

Top Width 13.7590 ft

Froude Number: 1.0466

Critical Depth 2.3910 ft

Critical Velocity 5.8496 ft/s

Critical Slope: 0.0162 ft/ft

Critical Top Width 16.14 ft

Calculated Max Shear Stress 2.8905 lb/ft^2

Calculated Avg Shear Stress 1.3636 lb/ft^2

Channel Analysis: DITCH-9-4

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0301 ft/ft

Manning's n: 0.0350

Flow 100.9560 cfs

Result Parameters

Depth 2.5160 ft

Area of Flow 12.6607 ft^2

Wetted Perimeter 11.2520 ft

Hydraulic Radius 1.1252 ft

Average Velocity 7.9740 ft/s

Top Width 10.0641 ft

Froude Number: 1.2529

Critical Depth 2.7534 ft

Critical Velocity 6.6581 ft/s

Critical Slope: 0.0186 ft/ft

Critical Top Width 11.01 ft

Calculated Max Shear Stress 4.7320 lb/ft^2

Calculated Avg Shear Stress 2.1162 lb/ft^2

Hydraulic Analysis Report

Project Data

Project Title:

Designer:

Project Date: Tuesday, September 19, 2023

Project Units: U.S. Customary Units

Notes:

Channel Analysis: LT 350+50 to 356+00 Farrow Rd

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0400

Flow 1.0660 cfs

Result Parameters

Depth 0.5699 ft

Area of Flow 0.9742 ft^2

Wetted Perimeter 3.6238 ft

Hydraulic Radius 0.2688 ft

Average Velocity 1.0942 ft/s

Top Width 3.4192 ft

Froude Number: 0.3612

Critical Depth 0.3883 ft

Critical Velocity 2.3572 ft/s

Critical Slope: 0.0387 ft/ft

Critical Top Width 2.62 ft

Calculated Max Shear Stress 0.1778 lb/ft^2

Calculated Avg Shear Stress 0.0839 lb/ft^2

Channel Analysis: LT 350+50 to 352+00 Farrow Rd

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0110 ft/ft

Manning's n: 0.0400

Flow 6.6120 cfs

Result Parameters

Depth 0.9745 ft

Area of Flow 2.8489 ft^2

Wetted Perimeter 6.1970 ft

Hydraulic Radius 0.4597 ft

Average Velocity 2.3209 ft/s

Top Width 5.8470 ft

Froude Number: 0.5859

Critical Depth 0.8057 ft

Critical Velocity 3.3956 ft/s

Critical Slope: 0.0303 ft/ft

Critical Top Width 5.44 ft

Calculated Max Shear Stress 0.6689 lb/ft^2

Calculated Avg Shear Stress 0.3156 lb/ft^2

Channel Analysis: LT 352+00 to 354+50 Farrow Rd

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0110 ft/ft

Manning's n: 0.0400

Flow 6.6120 cfs

Result Parameters

Depth 0.9745 ft

Area of Flow 2.8489 ft^2

Wetted Perimeter 6.1970 ft

Hydraulic Radius 0.4597 ft

Average Velocity 2.3209 ft/s

Top Width 5.8470 ft

Froude Number: 0.5859

Critical Depth 0.8057 ft

Critical Velocity 3.3956 ft/s

Critical Slope: 0.0303 ft/ft

Critical Top Width 5.44 ft

Calculated Max Shear Stress 0.6689 lb/ft^2

Calculated Avg Shear Stress 0.3156 lb/ft^2

Channel Analysis: RT 725+00 to 721+50 R2 US-21

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width 5.00 ft

Longitudinal Slope: 0.0110 ft/ft

Manning's n: 0.0400

Flow 19.5300 cfs

Result Parameters

Depth 0.8844 ft

Area of Flow 6.7689 ft^2

Wetted Perimeter 10.6243 ft

Hydraulic Radius 0.6371 ft

Average Velocity 2.8852 ft/s

Top Width 10.3067 ft

Froude Number: 0.6274

Critical Depth 0.6761 ft

Critical Velocity 4.1100 ft/s

Critical Slope: 0.0300 ft/ft

Critical Top Width 9.06 ft

Calculated Max Shear Stress 0.6071 lb/ft^2

Calculated Avg Shear Stress 0.4373 lb/ft^2

Channel Analysis: RT 721+50 R2 to 722+00 R2 US-21

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width 10.00 ft

Longitudinal Slope: 0.0610 ft/ft

Manning's n: 0.0300

Flow 19.5300 cfs

Result Parameters

Depth 0.3266 ft

Area of Flow 3.5856 ft^2

Wetted Perimeter 12.0767 ft

Hydraulic Radius 0.2969 ft

Average Velocity 5.4468 ft/s

Top Width 11.9594 ft

Froude Number: 1.7530

Critical Depth 0.4677 ft

Critical Velocity 3.6622 ft/s

Critical Slope: 0.0179 ft/ft

Critical Top Width 12.81 ft

Calculated Max Shear Stress 1.2430 lb/ft^2

Calculated Avg Shear Stress 1.1301 lb/ft^2

Channel Lining Analysis: Channel Lining Design Analysis RT 721+50R2 TO 722+00RT US21

Notes:

Lining Input Parameters

Channel Lining Type: Rolled Erosion Control Product

Shear Stress on RECP that results in 0.5 in of erosion: 3 lb/ft^2

See https://highways.dot.gov/federal-lands/specs refer to FLH FP 14, Table 713-3 or 713-4 to get this value

Manning's n value input as user-supplied n

RECP is an open weave textile

Manning's n: 0.03

Manning's n range: 0.022-0.028

Specific Weight of Water: 62.4 lb/ft^3

soil is noncohesive

D75: 2.54 mm

Safety Factor: 1

Lining Results

Permissible Soil Shear Stress: 0.04 lb/ft^2

Mean Boundary Shear Stress: 1.13012 lb/ft^2

Maximum Shear Stress on the Channel Bottom: 1.24304 lb/ft^2

Effective Shear Stress: 0.0254502 lb/ft^2

Permissible Shear Stress on RECP: 1.55482 lb/ft^2

This value is compared with the maximum shear stress times the safety factor to determine lining stability

This value is compared with the maximum shear stress times the safety factor to determine lining stability

Channel bottom is stable

Channel Lining Stability Results 2

The channel is stable

Channel Summary

Name of Selected Channel: RT 721+50 R2 to 722+00 R2 US-21

Channel Analysis: RT 679+50 to 684+50 US-21

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width 8.00 ft

Longitudinal Slope: 0.0030 ft/ft

Manning's n: 0.0400

Flow 12.7870 cfs

Result Parameters

Depth 0.8097 ft

Area of Flow 8.4442 ft^2

Wetted Perimeter 13.1489 ft

Hydraulic Radius 0.6422 ft

Average Velocity 1.5143 ft/s

Top Width 12.8581 ft

Froude Number: 0.3293

Critical Depth 0.4074 ft

Critical Velocity 3.4033 ft/s

Critical Slope: 0.0334 ft/ft

Critical Top Width 10.44 ft

Calculated Max Shear Stress 0.1516 lb/ft^2

Calculated Avg Shear Stress 0.1202 lb/ft^2

Channel Analysis: LT 679+50 to 684+50 US-21

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Channel Width 5.00 ft

Longitudinal Slope: 0.0015 ft/ft

Manning's n: 0.0400

Flow 5.6450 cfs

Result Parameters

Depth 0.7764 ft

Area of Flow 5.6902 ft^2

Wetted Perimeter 9.9371 ft

Hydraulic Radius 0.5726 ft

Average Velocity 0.9921 ft/s

Top Width 9.6583 ft

Froude Number: 0.2278

Critical Depth 0.3187 ft

Critical Velocity 2.9735 ft/s

Critical Slope: 0.0367 ft/ft

Critical Top Width 6.91 ft

Calculated Max Shear Stress 0.0727 lb/ft^2

Calculated Avg Shear Stress 0.0536 lb/ft^2

Channel Analysis: LT 355+50 to 356+50 Farrow Rd

Notes:

Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 4.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0400

Flow 1.0660 cfs

Result Parameters

Depth 0.5699 ft

Area of Flow 0.9742 ft^2

Wetted Perimeter 3.6238 ft

Hydraulic Radius 0.2688 ft

Average Velocity 1.0942 ft/s

Top Width 3.4192 ft

Froude Number: 0.3612

Critical Depth 0.3883 ft

Critical Velocity 2.3572 ft/s

Critical Slope: 0.0387 ft/ft

Critical Top Width 2.62 ft

Calculated Max Shear Stress 0.1778 lb/ft^2

Calculated Avg Shear Stress 0.0839 lb/ft^2

Appendix B.7: Rip-Rap Calculations

RIP RAP at SCDOT Pipe Outlets

Reference: FHWA HEC14 Hydraulic Design of Energy Dissipators for Culverts and Channels
Chapter 10

Procedure and Formulas

1. Determine D50

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

D50 = median stone size, ft
TW = tailwater depth, ft (if tailwater is unknown, use 0.4D)
Q = design discharge, cfs
D0 = pipe diameter, ft

2. Determine Thickness of Stone Lining
For non-fabric lined mats use 3*D50
For fabric lined mats use 2*D50

3. Determine Length & Depth of Apron

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

4. Determine Width
Width at pipe openening shall be 3D
Width at downstream end of pad shall be 3D+(2/3 * L)

Rip rap and geotextile fabric at pipe ends are also added to the equations above.
The quantities for rip rap at pipe ends are taken from the SCDOT Plan Prep Guide Page 16-2.
The quantities for geotextile fabric at pipe ends are calculated using slope and pipe properties.

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COMPUTATION SHEET

Subject **I-77 Scout Motors Interchange**
Richalnd County
SCDOT Rip-Rap CALCULATIONS

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RIP RAP at SCDOT Pipe Outlets
24" RCP at Blythewood Rd Sta. 1804+04.58 (NP-1-1)

Design Discharge, Q10 = 13.81 cfs
Pipe Diameter, Do = 1.5 ft
Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 1.3 ft = 16 in

2. Determine Thickness of Stone Lining

Thickness = 3.1 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 8 ft

4. Determine Width

Width at openening = 4.5 ft
Width at end = 9.5 ft

5. Determine Quantities

6 sy Geotextile lining Class 2 will be used under Rip Rap. Add 22 sy at pipe end for **28** sy total.

Volume = Area x D = 163.83 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{163.83 \text{ cf}}{1} \times \frac{120 \text{ lb}}{1 \text{ cf}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$ = 10 Tons

Use 28 tons, b/c 18" RCP w/ 6:1 slope
requires 18 tons at pipe end

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Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

6'x6' RCBC at I-77 Sta. 1763+08.92 (NP-1-4)

Design Discharge, Q50 = 72.69 cfs

Pipe Diameter, Do = 6 ft

Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 1.3 ft = 16 in

2. Determine Thickness of Stone Lining

Thickness = 3.1 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 30 ft

4. Determine Width

Width at openening = 18.0 ft

Width at end = 38.0 ft

5. Determine Quantities

93 sy Geotextile lining Class 2 will be used under Rip Rap. Add 53 sy at pipe end for **146** sy total.

Volume = Area x D = 2621.3 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{2621.3 \text{ cf}}{1} \times \frac{120 \text{ lb}}{1 \text{ cf}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$ = 157 Tons

Use 197 tons, b/c 72" RCBC w/ 2:1 slope

requires 40 tons at pipe end

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SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
30" RCP at I-77 Sta. 1759+64.65 (NP-1-3)

Design Discharge, Q50 = 30.93 cfs
Pipe Diameter, Do = 2.5 ft
Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 1.3 ft = 16 in

2. Determine Thickness of Stone Lining

Thickness = 3.1 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 13 ft

4. Determine Width

Width at openening = 7.5 ft
Width at end = 15.8 ft

5. Determine Quantities

16 sy Geotextile lining Class 2 will be used under Rip Rap. Add 13 sy at pipe end for **29** sy total.

Volume = Area x D = 455.08 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{455.08\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

27 Tons
Use 37 tons, b/c 30" RCP w/ 2:1 slope
requires 10 tons at pipe end

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Subject **I-77 Scout Motors Interchange**
Richalnd County
SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
48" RCP at I-77 Sta. 1756+19.97 (NP-1-6)

Design Discharge, Q50 = 41.46 cfs
Pipe Diameter, Do = 4 ft
Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 1.3 ft = 16 in

2. Determine Thickness of Stone Lining

Thickness = 3.1 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 20 ft

4. Determine Width

Width at openening = 12.0 ft
Width at end = 25.3 ft

5. Determine Quantities

41 sy Geotextile lining Class 2 will be used under Rip Rap. Add 26 sy at pipe end for **67** sy total.

Volume = Area x D = 1165 cf Assume unit wt of rip rap is 120 lb/cf

$$\text{Weight in tons} = \frac{1165\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

70 Tons
Use 90 tons, b/c 48" RCP w/ 2:1 slope
requires 20 tons at pipe end

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Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

48" RCP at CONNECT Sta. 114+19.82 (NP-2-13)

Design Discharge, Q50 = 62.64 cfs

Pipe Diameter, Do = 4 ft

Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 1.3 ft = 16 in

2. Determine Thickness of Stone Lining

Thickness = 3.1 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 20 ft

4. Determine Width

Width at openening = 12.0 ft

Width at end = 25.3 ft

5. Determine Quantities

41 sy Geotextile lining Class 2 will be used under Rip Rap. Add 48 sy at pipe end for **89** sy total.

Volume = Area x D = 1165 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{1165\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$ = 70 Tons

Use 106 tons, b/c 48" RCP w/ 4:1 slope

requires 36 tons at pipe end

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SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

24" RCP at CONRPA Sta. 1743+83.47 (NP-2-2)

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

Design Discharge, Q50 = 12.94 cfs

Pipe Diameter, Do = 2 ft

Tailwater, TW = 0.6 ft

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 10 ft

4. Determine Width

Width at openening = 6.0 ft

Width at end = 12.7 ft

5. Determine Quantities

10 sy Geotextile lining Class 2 will be used under Rip Rap. Add 27 sy at pipe end for **37** sy total.

Volume = Area x D = 168.03 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{168.03\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

10 Tons

Use 32 tons, b/c 24" RCP w/ 6:1 slope

requires 22 tons at pipe end

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SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
18" RCP at I-77 Sta. 1742+93.14(NP-11-1)

Design Discharge, Q50 = 3.33 cfs
Pipe Diameter, Do = 1.5 ft
Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 8 ft

4. Determine Width

Width at openening = 4.5 ft
Width at end = 9.5 ft

5. Determine Quantities

6 sy Geotextile lining Class 2 will be used under Rip Rap. Add 22 sy at pipe end for **28** sy total.

Volume = Area x D = 94.517 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{94.517\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

6 Tons
Use 24 tons, b/c 18" RCBC w/ 6:1 slope
requires 18 tons at pipe end

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Richalnd County
SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
24" RCP at I-77 Sta. 1742+58.45 (NP-2-1)

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

Design Discharge, Q50	=	8.41	cfs	
Pipe Diameter, Do	=	2	ft	
Tailwater, TW	=	0.6	ft	
1. Determine D_{50}	=	0.75	ft	= 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 10 ft

4. Determine Width

Width at openening = 6.0 ft
Width at end = 12.7 ft

5. Determine Quantities

10 sy Geotextile lining Class 2 will be used under Rip Rap. Add 27 sy at pipe end for **37** sy total.

Volume = Area x D = 168.03 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{168.03\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$ = 10 Tons

Use 32 tons, b/c 24" RCBC w/ 6:1 slope
requires 22 tons at pipe end

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Richalnd County
SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
30" RCP at Community Rd Sta. 113+16.10 (NP-4-1)

Design Discharge, Q50 = 9.45 cfs
Pipe Diameter, Do = 2.5 ft
Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 13 ft

4. Determine Width

Width at openening = 7.5 ft
Width at end = 15.8 ft

5. Determine Quantities

16 sy Geotextile lining Class 2 will be used under Rip Rap. Add 23 sy at pipe end for **39** sy total.

Volume = Area x D = 262.55 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{262.55\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$ = 16 Tons

Use 34 tons, b/c 30" RCP w/ 4:1 slope
requires 18 tons at pipe end

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Richalnd County
SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
18" RCP at CONLPA Sta. 1736+85.89

Design Discharge, Q50 = 3.49 cfs
Pipe Diameter, Do = 1.5 ft
Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 8 ft

4. Determine Width

Width at openening = 4.5 ft
Width at end = 9.5 ft

5. Determine Quantities

6 sy Geotextile lining Class 2 will be used under Rip Rap. Add 22 sy at pipe end for **28** sy total.

Volume = Area x D = 94.517 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{94.517\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$ = 6 Tons

Use 24 tons, b/c 18" RCP w/ 6:1 slope
requires 18 tons at pipe end

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Richalnd County
SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
36" RCP at CONRPA Sta. 1731+57.18 (NP-3-2)

Design Discharge, Q10 = 15.24 cfs
Pipe Diameter, Do = 3 ft
Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 15 ft

4. Determine Width

Width at openening = 9.0 ft
Width at end = 19.0 ft

5. Determine Quantities

23 sy Geotextile lining Class 2 will be used under Rip Rap. Add 17 sy at pipe end for **40** sy total.

Volume = Area x D = 378.07 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{378.07\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$ = 23 Tons

Use 36 tons, b/c 36" RCP w/ 2:1 slope
requires 13 tons at pipe end

NEEL-SCHAFFER, INC.
COMPUTATION SHEET

Made by MLB

Date November 6,2023

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Subject **I-77 Scout Motors Interchange**

Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

36" RCP at CONRPD Sta. 1726+37.43 (NP-6-1)

Design Discharge, Q50 = 11.02 cfs

Pipe Diameter, Do = 3 ft

Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 15 ft

4. Determine Width

Width at openening = 9.0 ft

Width at end = 19.0 ft

5. Determine Quantities

23 sy Geotextile lining Class 2 will be used under Rip Rap. Add 31 sy at pipe end for **54** sy total.

Volume = Area x D = 378.07 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{378.07\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

23 Tons

Use 46 tons, b/c 36" RCP w/ 4:1 slope

requires 23 tons at pipe end

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SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

18" RCP at CONRPD Sta. 1721+03.66 (NP-6-2)

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

Design Discharge, Q50 = 11.79 cfs

Pipe Diameter, Do = 1.5 ft

Tailwater, TW = 0.6 ft

1. Determine D_{50} = 1.3 ft = 16 in

2. Determine Thickness of Stone Lining

Thickness = 3.1 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 8 ft

4. Determine Width

Width at openening = 4.5 ft

Width at end = 9.5 ft

5. Determine Quantities

6 sy Geotextile lining Class 2 will be used under Rip Rap. Add 22 sy at pipe end for **28** sy total.

Volume = Area x D = 163.83 cf Assume unit wt of rip rap is 120 lb/cf

$$\text{Weight in tons} = \frac{163.83\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

10 Tons

Use 28 tons, b/c 18" RCP w/ 6:1 slope

requires 18 tons at pipe end

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SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

24" RCP at I-77 Sta. 1722+27.18 (NP-5-6)

Design Discharge, Q10	=	8.56	cfs
Pipe Diameter, Do	=	2	ft
Tailwater, TW	=	0.6	ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 10 ft

4. Determine Width

Width at openening = 6.0 ft

Width at end = 12.7 ft

5. Determine Quantities

10 sy Geotextile lining Class 2 will be used under Rip Rap. Add 19 sy at pipe end for **29** sy total.

Volume = Area x D = 168.03 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{168.03\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

10 Tons

Use 25 tons, b/c 24" RCP w/ 4:1 slope

requires 15 tons at pipe end

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Subject I-77 Scout Motors Interchange
Richalnd County
SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
24" RCP at I-77 Sta. 1720+63.50 (NP-5-10)

Design Discharge, Q50 = 2.53 cfs
Pipe Diameter, Do = 2 ft
Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 10 ft

4. Determine Width

Width at openening = 6.0 ft
Width at end = 12.7 ft

5. Determine Quantities

10 sy Geotextile lining Class 2 will be used under Rip Rap. Add 19 sy at pipe end for **29** sy total.

Volume = Area x D = 168.03 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{168.03\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$ = 10 Tons

Use 25 tons, b/c 24" RCP w/ 4:1 slope
requires 15 tons at pipe end

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Subject **I-77 Scout Motors Interchange**

Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

36" RCP at Community Rd Sta. 94+13.06 (NP-5-1)

Design Discharge, Q50 = 20.47 cfs

Pipe Diameter, Do = 3 ft

Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 15 ft

4. Determine Width

Width at openening = 9.0 ft

Width at end = 19.0 ft

5. Determine Quantities

23 sy Geotextile lining Class 2 will be used under Rip Rap. Add 31 sy at pipe end for **54** sy total.

Volume = Area x D = 378.07 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{378.07\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

23 Tons

Use 146 tons, b/c 36" RCP w/ 4:1 slope

requires 23 tons at pipe end

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Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

10' x 10' RCBC at I-77 Sta. 1710+11.20

Design Discharge, Q50 = 336.00 cfs

Pipe Diameter, Do = 10 ft

Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 1.3 ft = 16 in

2. Determine Thickness of Stone Lining

Thickness = 3.1 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 50 ft

4. Determine Width

Width at openening = 30.0 ft

Width at end = 63.4 ft

5. Determine Quantities

259 sy Geotextile lining Class 2 will be used under Rip Rap. Add 138 sy at pipe end for **397** sy total.

Volume = Area x D = 7281.3 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{7281.3\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

437 Tons

Use 612 tons, b/c 120" RCBC w/ 2:1 slope

requires 175 tons at pipe end

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Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

6' x 6' RCBC at I-77 Sta. 1705+32.80

Design Discharge, Q50 = 213.08 cfs

Pipe Diameter, Do = 6 ft

Tailwater, TW = 2.4 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 1.3 ft = 16 in

2. Determine Thickness of Stone Lining

Thickness = 3.1 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 30 ft

4. Determine Width

Width at openening = 18.0 ft

Width at end = 38.0 ft

5. Determine Quantities

93 sy Geotextile lining Class 2 will be used under Rip Rap. Add 53 sy at pipe end for **146** sy total.

Volume = Area x D = 2621.3 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{2621.3\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$ = 157 Tons

Use 197 tons, b/c 72" RCBC w/ 2:1 slope

requires 40 tons at pipe end

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Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

DBL 6'x5' RCBC at Connector Rd Sta. 160+54.03

Design Discharge, Q50 = 52.96 cfs

Pipe Diameter, Do = 12 ft

Tailwater, TW = 4.8 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 60 ft

4. Determine Width

Width at openening = 36.0 ft

Width at end = 76.0 ft

5. Determine Quantities

373 sy Geotextile lining Class 2 will be used under Rip Rap. Add 138 sy at pipe end for **511** sy total.

Volume = Area x D = 6049.1 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{6049.1\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

363 Tons

Use 538 tons, b/c 144" RCBC w/ 2:1 slope

requires 175 tons at pipe end

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Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

DBL 6'x5' RCBC at Connector Rd Sta. 164+01.17

Design Discharge, Q50 = 90.03 cfs

Pipe Diameter, Do = 12 ft

Tailwater, TW = 4.8 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 60 ft

4. Determine Width

Width at openening = 36.0 ft

Width at end = 76.0 ft

5. Determine Quantities

373 sy Geotextile lining Class 2 will be used under Rip Rap. Add 138 sy at pipe end for **511** sy total.

Volume = Area x D = 6049.1 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{6049.1\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

363 Tons

Use 538 tons, b/c 144" RCBC w/ 2:1 slope

requires 175 tons at pipe end

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Subject I-77 Scout Motors Interchange
Richalnd County
SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
DBL 8'x6' RCBC at Connector Rd Sta. 170+50.11

Design Discharge, Q50 = 127.00 cfs
Pipe Diameter, Do = 16 ft
Tailwater, TW = 6.4 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 80 ft

4. Determine Width

Width at openening = 48.0 ft
Width at end = 101.4 ft

5. Determine Quantities

664 sy Geotextile lining Class 2 will be used under Rip Rap. Add 98 sy at pipe end for **762** sy total.

Volume = Area x D = 10754 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{10754 \text{ cf}}{1} \times \frac{120 \text{ lb}}{1 \text{ cf}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$ = 645 Tons

Use 820 tons, b/c192" RCBC w/ 2:1 slope
requires 175 tons at pipe end

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Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

6'x4' RCBC at US 21 Sta. 708+90.26 (NP-9-1)

Design Discharge, Q50 = 89.69 cfs

Pipe Diameter, Do = 6 ft

Tailwater, TW = 2.4 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 30 ft

4. Determine Width

Width at openening = 18.0 ft

Width at end = 38.0 ft

5. Determine Quantities

93 sy Geotextile lining Class 2 will be used under Rip Rap. Add 96 sy at pipe end for **189** sy total.

Volume = Area x D = 1512.3 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{1512.3\ \text{cf}}{1} \left|\frac{120\ \text{lb}}{1\ \text{cf}}\right| \frac{1\ \text{ton}}{2000\ \text{lb}}$ = 91 Tons

Use 164 tons, b/c 72" RCP w/ 4:1 slope

requires 73 tons at pipe end

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SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
DBL 10'x7' RCBC at US 21 Sta. 704+78.31

Design Discharge, Q50 = 31 cfs
Pipe Diameter, Do = 20 ft
Tailwater, TW = 8 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 100 ft

4. Determine Width

Width at openening = 60.0 ft
Width at end = 126.7 ft

5. Determine Quantities

1037 sy Geotextile lining Class 2 will be used under Rip Rap. Add 138 sy at pipe end for **1175** sy total.

Volume = Area x D = 16803 cf Assume unit wt of rip rap is 120 lb/cf

$$\text{Weight in tons} = \frac{16803\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

1008 Tons
Use 1183 tons, b/c 240" RCP w/ 2:1 slope
requires 175 tons at pipe end

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SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
48" RCP at US 21 Sta. 690+93.64 (NP-8-2)

Design Discharge, Q50 = 29.45 cfs
Pipe Diameter, Do = 4 ft
Tailwater, TW = 1.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 20 ft

4. Determine Width

Width at openening = 12.0 ft
Width at end = 25.3 ft

5. Determine Quantities

41 sy Geotextile lining Class 2 will be used under Rip Rap. Add 26 sy at pipe end for **67** sy total.

Volume = Area x D = 672.12 cf Assume unit wt of rip rap is 120 lb/cf

$$\text{Weight in tons} = \frac{672.12\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

40 Tons
Use 60 tons, b/c 48" RCP w/ 2:1 slope
requires 20 tons at pipe end

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Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets

24" RCP at Farrow Rd Sta. 363+13.70 (NP-8-1)

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

Design Discharge, Q50	=	9.57	cfs
Pipe Diameter, Do	=	2	ft
Tailwater, TW	=	0.8	ft

1. Determine D_{50} = 0.75 ft = 9 in

2. Determine Thickness of Stone Lining

Thickness = 1.8 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 10 ft

4. Determine Width

Width at openening = 6.0 ft

Width at end = 12.7 ft

5. Determine Quantities

10 sy Geotextile lining Class 2 will be used under Rip Rap. Add 23 sy at pipe end for **33** sy total.

Volume = Area x D = 168.03 cf Assume unit wt of rip rap is 120 lb/cf

Weight in tons = $\frac{168.03\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$

10 Tons

Use 28 tons, b/c 24" RCP w/ 4:1 slope

requires 18 tons at pipe end

NEEL-SCHAFFER, INC.
COMPUTATION SHEET

Made by MLB

Date November 6,2023

Checked by -

Date -

Subject **I-77 Scout Motors Interchange**

Richalnd County

SCDOT Rip-Rap CALCULATIONS

RIP RAP at SCDOT Pipe Outlets
24" RCP at I-77 Sta. 1708+50 (NP-12-1)

Design Discharge, Q50 = 12.01 cfs
Pipe Diameter, Do = 1.5 ft
Tailwater, TW = 0.6 ft

$$D_{50} = 0.2\,D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{TW}\right)$$

1. Determine D_{50} = 1.3 ft = 16 in

2. Determine Thickness of Stone Lining

Thickness = 3.1 ft

Table 10.1. Example Riprap Classes and Apron Dimensions

Class	D_{50} (mm)	D_{50} (in)	Apron Length[1]	Apron Depth
1	125	5	4D	$3.5D_{50}$
2	150	6	4D	$3.3D_{50}$
3	250	10	5D	$2.4D_{50}$
4	350	14	6D	$2.2D_{50}$
5	500	20	7D	$2.0D_{50}$
6	550	22	8D	$2.0D_{50}$

[1]D is the culvert rise.

3. Determine Length of Apron

Length (La) = 8 ft

4. Determine Width

Width at openening = 4.5 ft
Width at end = 9.5 ft

5. Determine Quantities

6 sy Geotextile lining Class 2 will be used under Rip Rap. Add 9 sy at pipe end for **15** sy total.

Volume = Area x D = 163.83 cf Assume unit wt of rip rap is 120 lb/cf

$$\text{Weight in tons} = \frac{163.83\ \text{cf}}{1} \times \frac{120\ \text{lb}}{1\ \text{cf}} \times \frac{1\ \text{ton}}{2000\ \text{lb}}$$

10 Tons

Use 17 tons, b/c 18" RCP w/ 2:1 slope
requires 7 tons at pipe end

Appendix B.8: Crossline Pipe Analysis

HY-8 Culvert Analysis Report

Crossing Discharge Data

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

Minimum Flow: 78.92 cfs

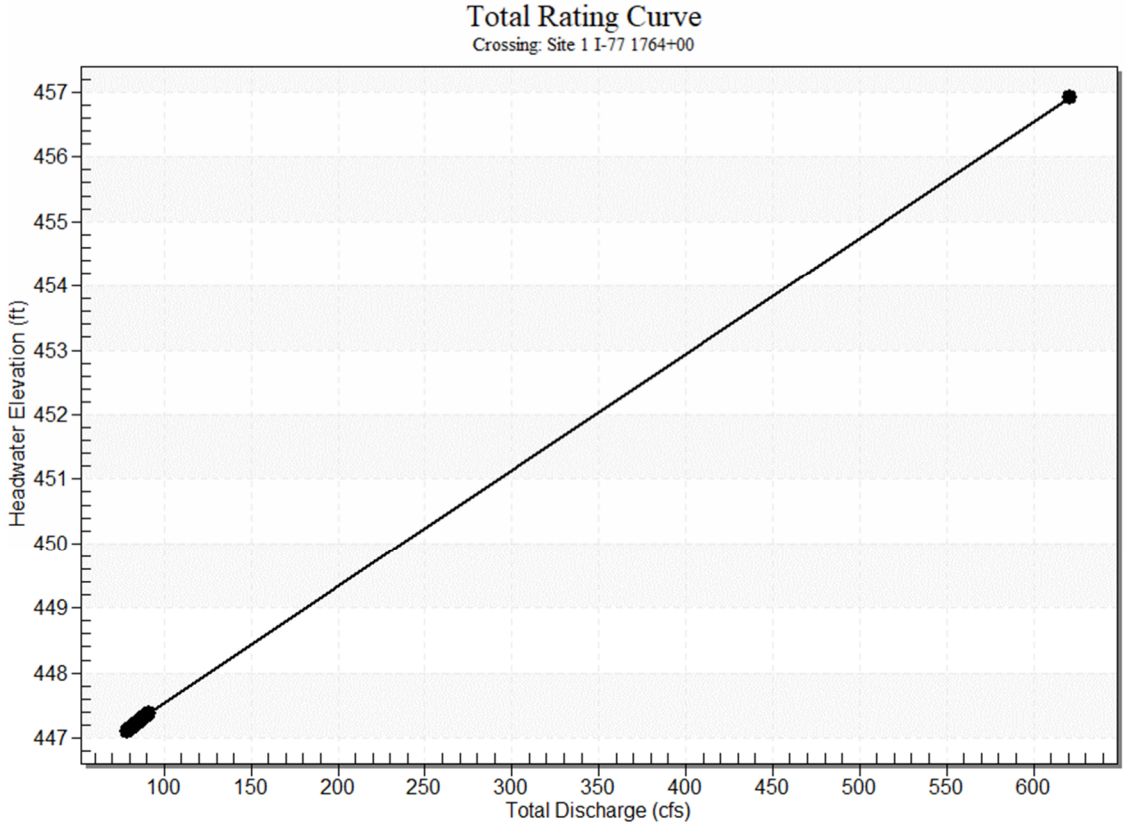
Design Flow: 78.92 cfs

Maximum Flow: 91.05 cfs

Table 1 - Summary of Culvert Flows at Crossing: Site 1 I-77 1764+00

Headwater Elevation (ft)	Total Discharge (cfs)	6 x 6 RCBC Discharge (cfs)	Roadway Discharge (cfs)	Iterations
447.10	78.92	78.92	0.00	1
447.13	80.13	80.13	0.00	1
447.16	81.35	81.35	0.00	1
447.19	82.56	82.56	0.00	1
447.21	83.77	83.77	0.00	1
447.24	84.98	84.98	0.00	1
447.27	86.20	86.20	0.00	1
447.29	87.41	87.41	0.00	1
447.32	88.62	88.62	0.00	1
447.35	89.84	89.84	0.00	1
447.37	91.05	91.05	0.00	1
456.90	614.93	614.93	0.00	Overtopping

Rating Curve Plot for Crossing: Site 1 I-77 1764+00



Culvert Data: 6 x 6 RCBC

Table 1 - Culvert Summary Table: 6 x 6 RCBC

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
78.92 cfs	78.92 cfs	447.10	2.67	0.0*	1-S2n	0.92	1.75	0.94	2.53	14.00	6.17
80.13 cfs	80.13 cfs	447.13	2.70	0.0*	1-S2n	0.93	1.77	0.93	2.54	14.30	6.19
81.35 cfs	81.35 cfs	447.16	2.73	0.0*	1-S2n	0.94	1.79	0.94	2.56	14.47	6.22
82.56 cfs	82.56 cfs	447.19	2.76	0.0*	1-S2n	0.95	1.80	0.95	2.57	14.54	6.24
83.77 cfs	83.77 cfs	447.21	2.78	0.0*	1-S2n	0.96	1.82	0.96	2.59	14.62	6.26
84.98 cfs	84.98 cfs	447.24	2.81	0.0*	1-S2n	0.96	1.84	0.96	2.60	14.69	6.28

86.20 cfs	86.20 cfs	447.27	2.84	0.0*	1-S2n	0.97	1.86	1.00	2.61	14.43	6.31
87.41 cfs	87.41 cfs	447.29	2.86	0.0*	1-S2n	0.98	1.87	0.99	2.63	14.67	6.33
88.62 cfs	88.62 cfs	447.32	2.89	0.0*	1-S2n	0.99	1.89	0.99	2.64	14.90	6.35
89.84 cfs	89.84 cfs	447.35	2.92	0.0*	1-S2n	1.00	1.91	1.00	2.66	14.97	6.37
91.05 cfs	91.05 cfs	447.37	2.94	0.0*	1-S2n	1.01	1.93	1.01	2.67	15.04	6.39

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

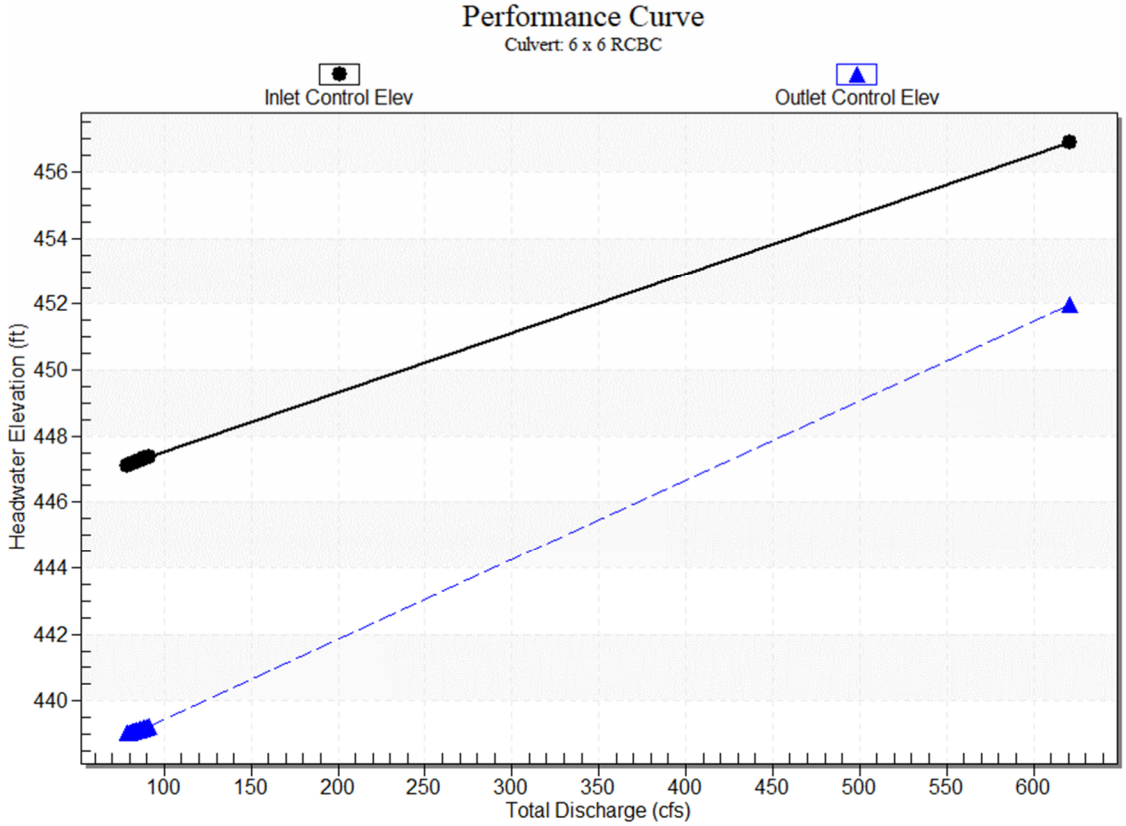
Inlet Elevation (invert): 444.43 ft,

Outlet Elevation (invert): 436.34 ft

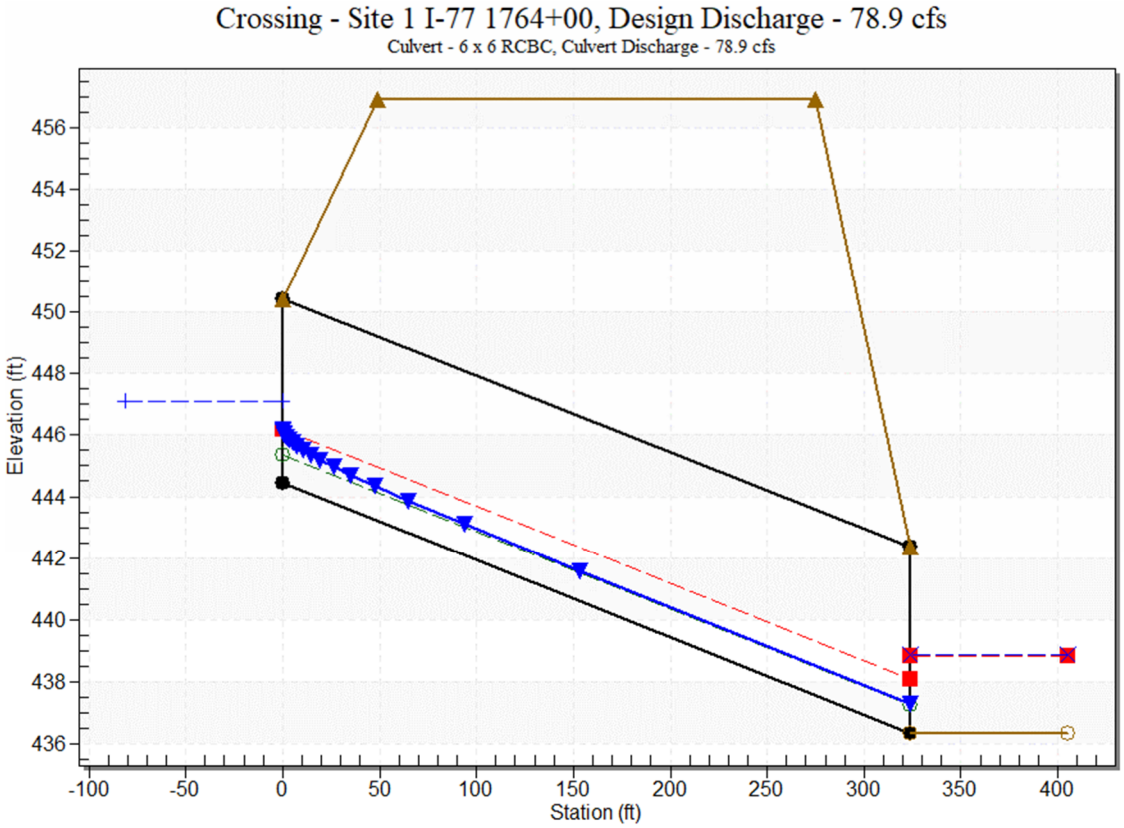
Culvert Length: 324.10 ft,

Culvert Slope: 0.0250

Culvert Performance Curve Plot: 6 x 6 RCBC



Water Surface Profile Plot for Culvert: 6 x 6 RCBC



Site Data - 6 x 6 RCBC

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 444.43 ft

Outlet Station: 324.00 ft

Outlet Elevation: 436.34 ft

Number of Barrels: 1

Culvert Data Summary - 6 x 6 RCBC

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: 1.5:1 Bevel (90º) Headwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 1 I-77 1764+00

Table 2 - Downstream Channel Rating Curve (Crossing: Site 1 I-77 1764+00)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
78.92	438.87	2.53	6.17	3.69	0.97
80.13	438.88	2.54	6.19	3.71	0.97
81.35	438.90	2.56	6.22	3.74	0.97
82.56	438.91	2.57	6.24	3.76	0.97
83.77	438.93	2.59	6.26	3.78	0.97
84.98	438.94	2.60	6.28	3.80	0.97
86.20	438.95	2.61	6.31	3.82	0.97
87.41	438.97	2.63	6.33	3.84	0.97
88.62	438.98	2.64	6.35	3.86	0.97
89.84	439.00	2.66	6.37	3.88	0.97
91.05	439.01	2.67	6.39	3.90	0.98

Tailwater Channel Data - Site 1 I-77 1764+00

Tailwater Channel Option: Triangular Channel

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

Channel Slope: 0.0234

Channel Manning's n: 0.0400

Channel Invert Elevation: 436.34 ft

Roadway Data for Crossing: Site 1 I-77 1764+00

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 1000.00 ft

Crest Elevation: 456.90 ft

Roadway Surface: Paved

Roadway Top Width: 226.00 ft

Crossing Discharge Data

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

Minimum Flow: 63.46 cfs

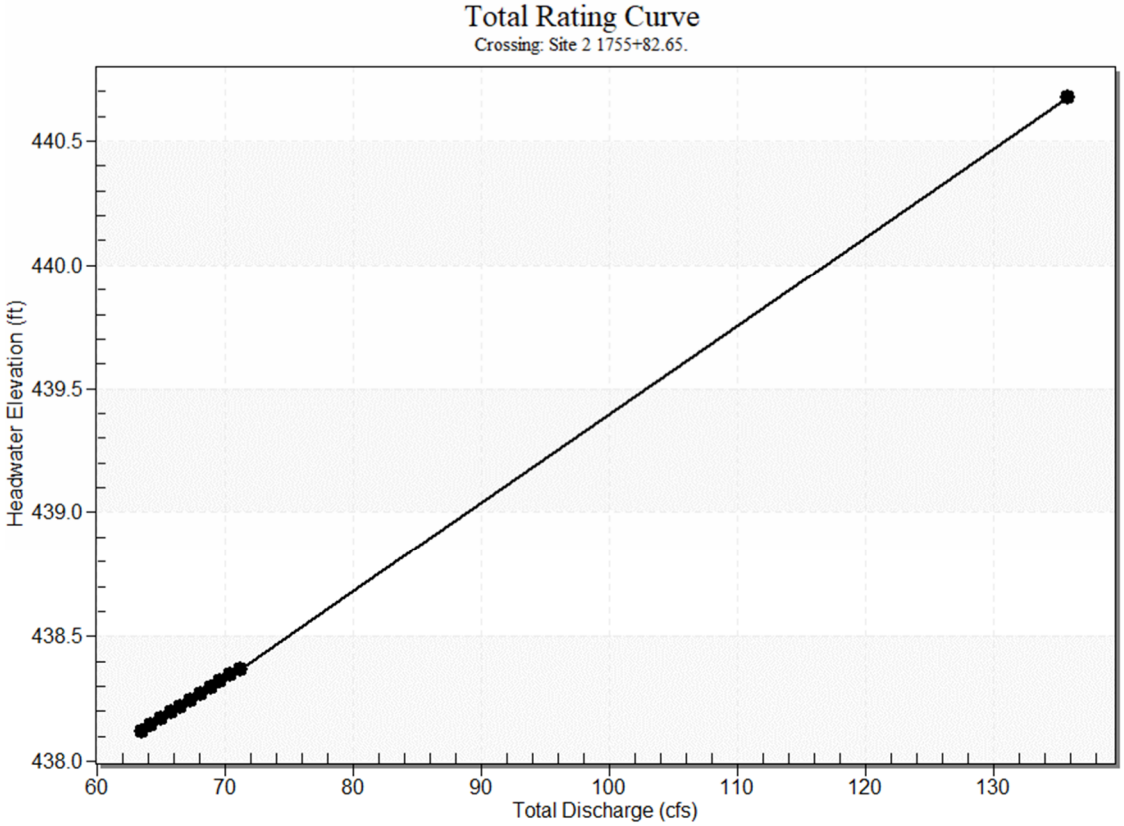
Design Flow: 63.46 cfs

Maximum Flow: 71.16 cfs

Table 3 - Summary of Culvert Flows at Crossing: Site 2 1755+82.65.

Headwater Elevation (ft)	Total Discharge (cfs)	48" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
438.12	63.46	63.46	0.00	1
438.15	64.23	64.23	0.00	1
438.17	65.00	65.00	0.00	1
438.20	65.77	65.77	0.00	1
438.22	66.54	66.54	0.00	1
438.24	67.31	67.31	0.00	1
438.27	68.08	68.08	0.00	1
438.29	68.85	68.85	0.00	1
438.32	69.62	69.62	0.00	1
438.34	70.39	70.39	0.00	1
438.37	71.16	71.16	0.00	1
440.63	128.87	128.87	0.00	Overtopping

Rating Curve Plot for Crossing: Site 2 1755+82.65.



Culvert Data: 48" RCP

Table 2 - Culvert Summary Table: 48" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
63.46 cfs	63.46 cfs	438.12	3.41	0.0*	1-S2n	1.33	2.40	1.33	0.66	17.39	5.90
64.23 cfs	64.23 cfs	438.15	3.44	0.0*	1-S2n	1.34	2.42	1.36	0.66	16.96	5.93
65.00 cfs	65.00 cfs	438.17	3.46	0.0*	1-S2n	1.35	2.43	1.37	0.67	17.04	5.95
65.77 cfs	65.77 cfs	438.20	3.49	0.0*	1-S2n	1.35	2.45	1.38	0.67	17.15	5.98
66.54 cfs	66.54 cfs	438.22	3.51	0.0*	1-S2n	1.36	2.46	1.38	0.68	17.29	6.00
67.31 cfs	67.31 cfs	438.24	3.53	0.0*	1-S2n	1.37	2.48	1.38	0.68	17.44	6.03

68.08 cfs	68.08 cfs	438.27	3.56	0.0*	1-S2n	1.38	2.49	1.38	0.69	17.74	6.06
68.85 cfs	68.85 cfs	438.29	3.58	0.0*	1-S2n	1.39	2.51	1.39	0.69	17.79	6.08
69.62 cfs	69.62 cfs	438.32	3.61	0.0*	1-S2n	1.39	2.52	1.39	0.70	17.85	6.10
70.39 cfs	70.39 cfs	438.34	3.63	0.0*	1-S2n	1.40	2.54	1.43	0.70	17.41	6.13
71.16 cfs	71.16 cfs	438.37	3.66	0.0*	1-S2n	1.41	2.55	1.44	0.70	17.47	6.15

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

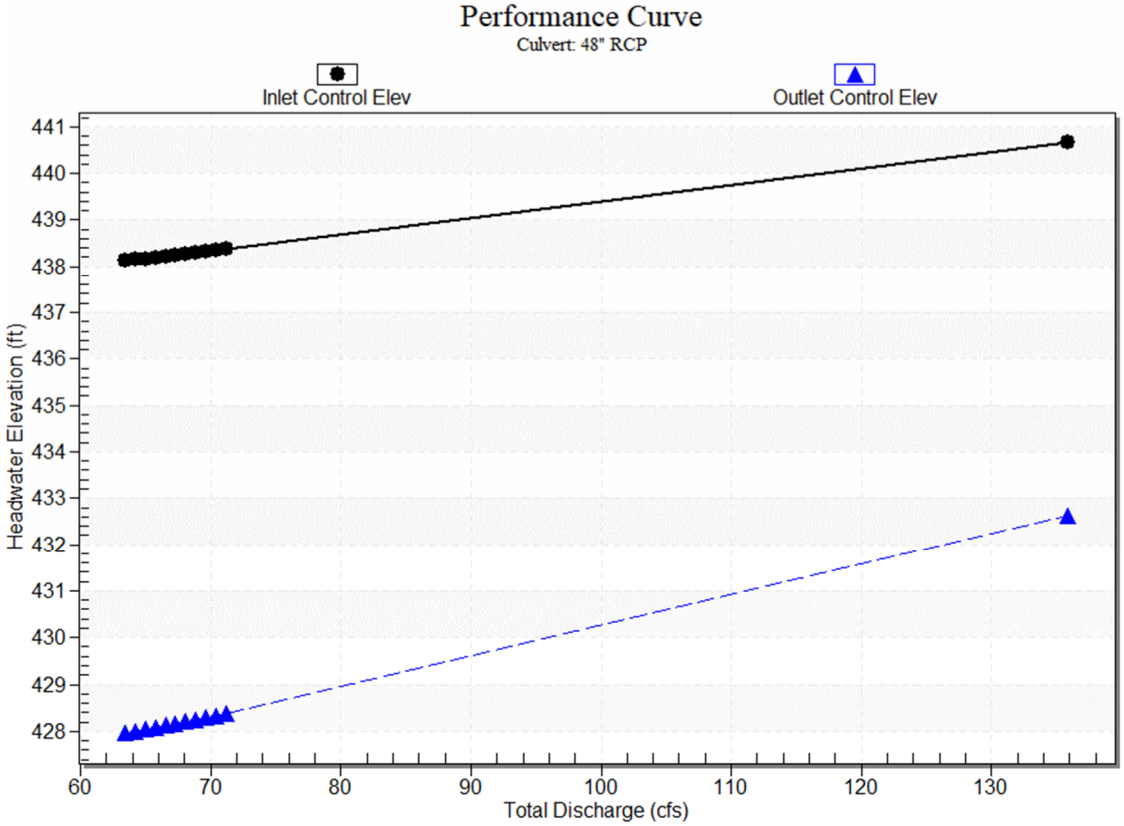
Inlet Elevation (invert): 434.71 ft,

Outlet Elevation (invert): 424.50 ft

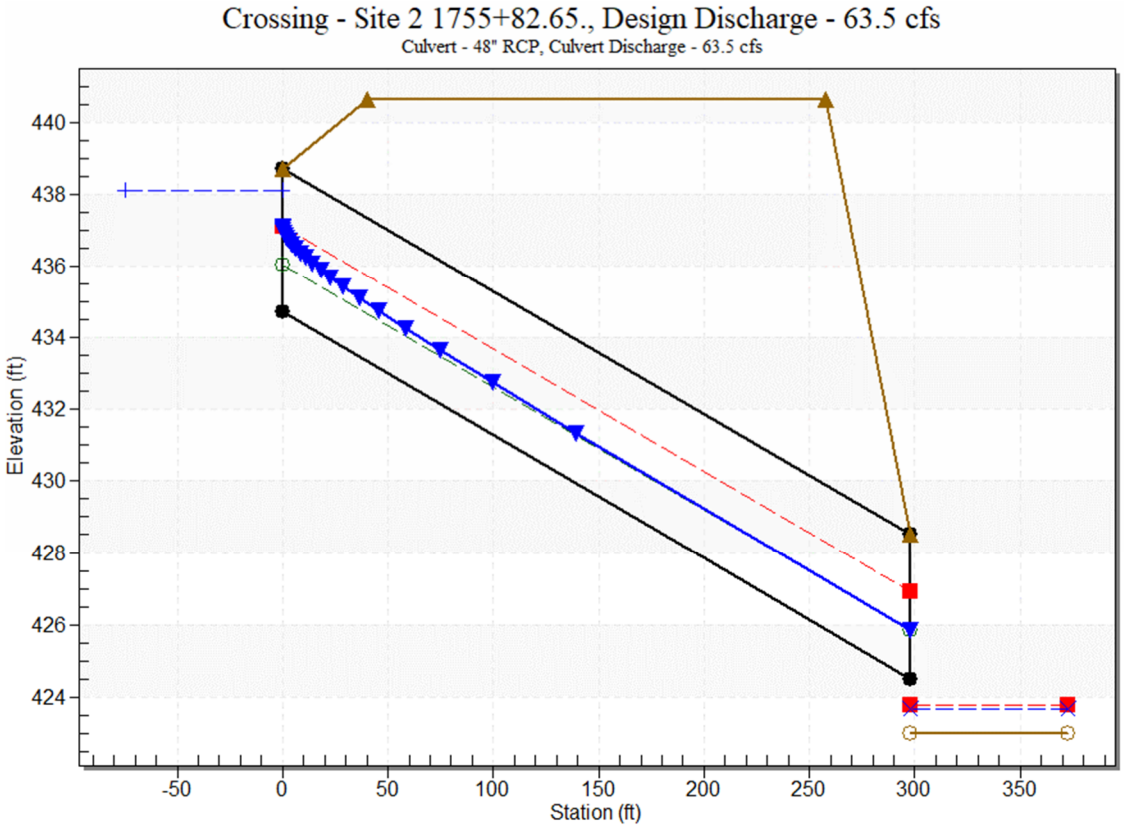
Culvert Length: 298.17 ft,

Culvert Slope: 0.0343

Culvert Performance Curve Plot: 48" RCP



Water Surface Profile Plot for Culvert: 48" RCP



Site Data - 48" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 434.71 ft

Outlet Station: 298.00 ft

Outlet Elevation: 424.50 ft

Number of Barrels: 1

Culvert Data Summary - 48" RCP

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Grooved End in Headwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 2 1755+82.65.

Table 4 - Downstream Channel Rating Curve (Crossing: Site 2 1755+82.65.)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
63.46	423.66	0.66	5.90	2.06	1.33
64.23	423.66	0.66	5.93	2.07	1.33
65.00	423.67	0.67	5.95	2.08	1.34
65.77	423.67	0.67	5.98	2.10	1.34
66.54	423.68	0.68	6.00	2.11	1.34
67.31	423.68	0.68	6.03	2.13	1.34
68.08	423.69	0.69	6.06	2.14	1.34
68.85	423.69	0.69	6.08	2.16	1.34
69.62	423.70	0.70	6.10	2.17	1.34
70.39	423.70	0.70	6.13	2.19	1.34
71.16	423.70	0.70	6.15	2.20	1.35

Tailwater Channel Data - Site 2 1755+82.65.

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 15.00 ft

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

Channel Slope: 0.0500

Channel Manning's n: 0.0400

Channel Invert Elevation: 423.00 ft

Roadway Data for Crossing: Site 2 1755+82.65.

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 218.00 ft

Crest Elevation: 440.63 ft

Roadway Surface: Paved

Roadway Top Width: 218.00 ft

Crossing Discharge Data

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

Minimum Flow: 213.50 cfs

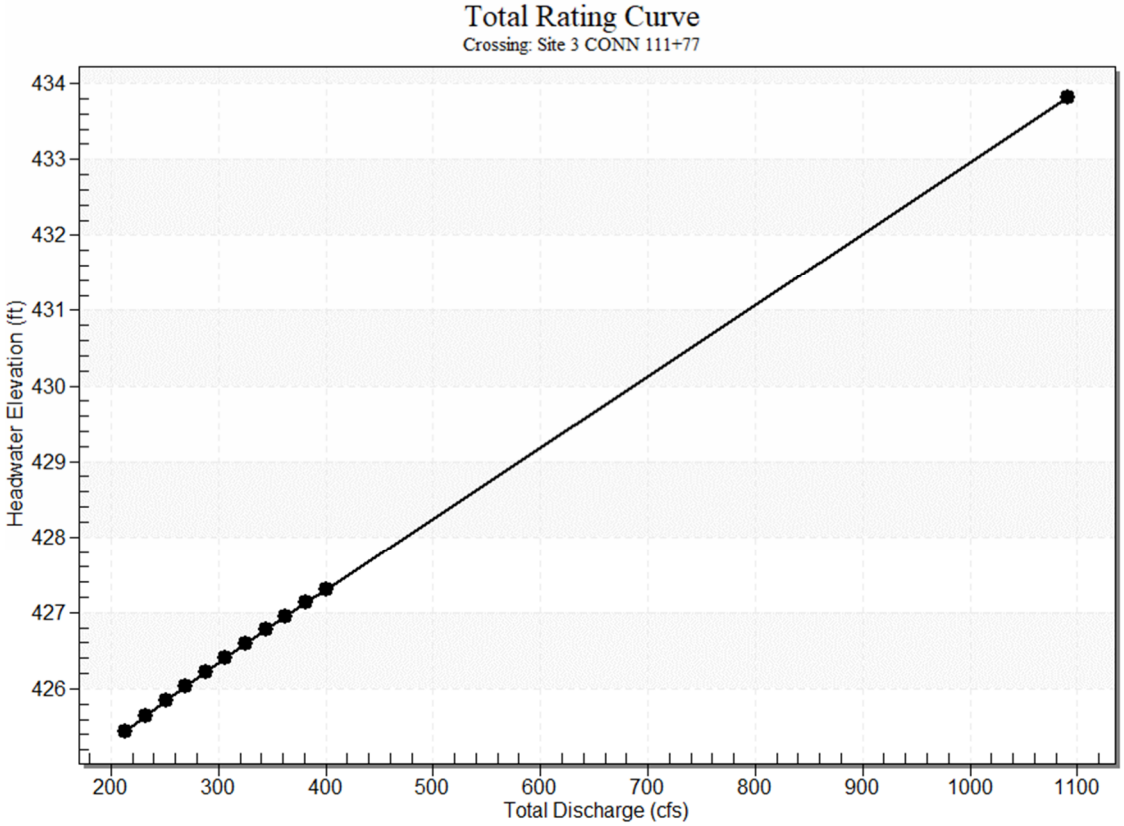
Design Flow: 213.50 cfs

Maximum Flow: 400.00 cfs

Table 5 - Summary of Culvert Flows at Crossing: Site 3 CONN 111+77

Headwater Elevation (ft)	Total Discharge (cfs)	6 x 6 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
425.44	213.50	213.50	0.00	1
425.65	232.15	232.15	0.00	1
425.85	250.80	250.80	0.00	1
426.04	269.45	269.45	0.00	1
426.23	288.10	288.10	0.00	1
426.41	306.75	306.75	0.00	1
426.59	325.40	325.40	0.00	1
426.77	344.05	344.05	0.00	1
426.95	362.70	362.70	0.00	1
427.13	381.35	381.35	0.00	1
427.30	400.00	400.00	0.00	1
432.50	881.27	881.27	0.00	Overtopping

Rating Curve Plot for Crossing: Site 3 CONN 111+77



Culvert Data: 6 x 6

Table 3 - Culvert Summary Table: 6 x 6

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
213.50 cfs	213.50 cfs	425.44	3.57	0.741	1-S2n	1.10	2.14	1.32	1.69	13.48	8.23
232.15 cfs	232.15 cfs	425.65	3.78	0.906	1-S2n	1.17	2.27	1.41	1.77	13.75	8.45
250.80 cfs	250.80 cfs	425.85	3.98	1.071	1-S2n	1.23	2.38	1.49	1.85	13.99	8.66
269.45 cfs	269.45 cfs	426.04	4.17	1.236	1-S2n	1.29	2.50	1.58	1.92	14.21	8.85
288.10 cfs	288.10 cfs	426.23	4.36	1.403	1-S2n	1.35	2.62	1.66	1.99	14.43	9.03
306.75 cfs	306.75 cfs	426.41	4.54	1.570	1-S2n	1.41	2.73	1.75	2.07	14.62	9.21

325.40 cfs	325.40 cfs	426.59	4.72	1.739	1-S2n	1.47	2.84	1.83	2.13	14.82	9.37
344.05 cfs	344.05 cfs	426.77	4.90	1.909	1-S2n	1.53	2.94	1.91	2.20	15.00	9.53
362.70 cfs	362.70 cfs	426.95	5.08	2.081	1-S2n	1.59	3.05	1.99	2.27	15.17	9.68
381.35 cfs	381.35 cfs	427.13	5.26	2.254	1-S2n	1.64	3.15	2.07	2.33	15.34	9.83
400.00 cfs	400.00 cfs	427.30	5.43	2.429	1-S2n	1.70	3.26	2.15	2.39	15.50	9.97

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

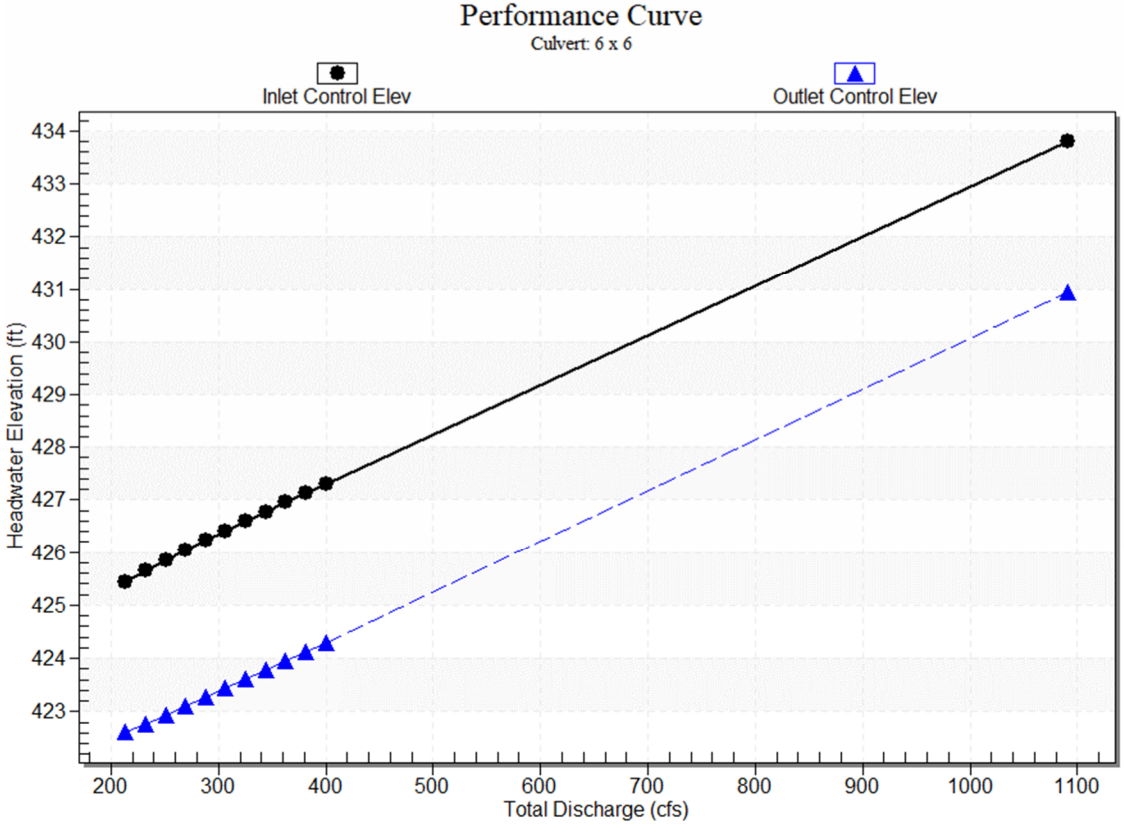
Inlet Elevation (invert): 421.87 ft,

Outlet Elevation (invert): 420.24 ft

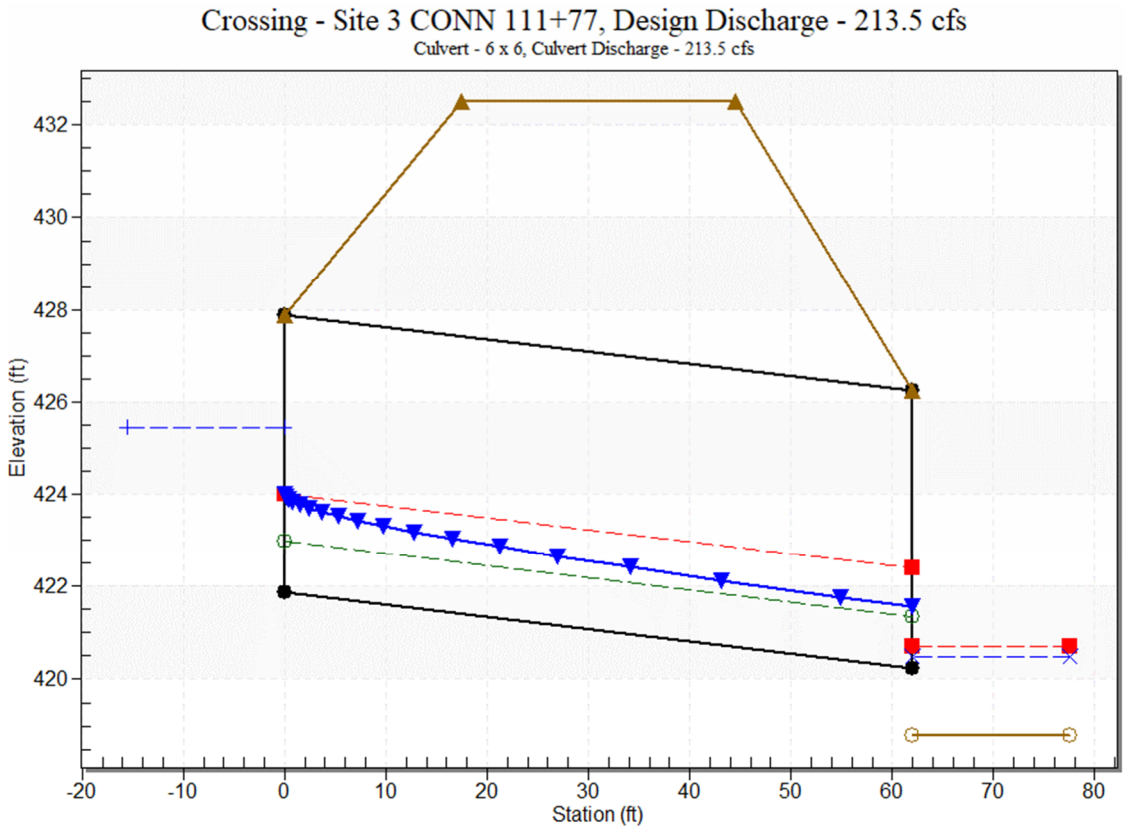
Culvert Length: 62.02 ft,

Culvert Slope: 0.0263

Culvert Performance Curve Plot: 6 x 6



Water Surface Profile Plot for Culvert: 6 x 6



Site Data - 6 x 6

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 421.87 ft

Outlet Station: 62.00 ft

Outlet Elevation: 420.24 ft

Number of Barrels: 2

Culvert Data Summary - 6 x 6

Barrel Shape: Concrete Box

Barrel Span: 6.00 ft

Barrel Rise: 6.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Square Edge (90º) Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Site 3 CONN 111+77

Table 6 - Downstream Channel Rating Curve (Crossing: Site 3 CONN 111+77)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
213.50	420.49	1.69	8.23	3.55	1.23
232.15	420.57	1.77	8.45	3.72	1.24
250.80	420.65	1.85	8.66	3.88	1.25
269.45	420.72	1.92	8.85	4.04	1.25
288.10	420.79	1.99	9.03	4.19	1.26
306.75	420.87	2.07	9.21	4.34	1.27
325.40	420.93	2.13	9.37	4.49	1.27
344.05	421.00	2.20	9.53	4.63	1.28
362.70	421.07	2.27	9.68	4.76	1.28
381.35	421.13	2.33	9.83	4.90	1.28
400.00	421.19	2.39	9.97	5.03	1.29

Tailwater Channel Data - Site 3 CONN 111+77

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 12.00 ft

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

Channel Slope: 0.0337

Channel Manning's n: 0.0400

Channel Invert Elevation: 418.80 ft

Roadway Data for Crossing: Site 3 CONN 111+77

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 26.00 ft

Crest Elevation: 432.50 ft

Roadway Surface: Paved

Roadway Top Width: 27.00 ft

Crossing Discharge Data

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

Minimum Flow: 8.34 cfs

Design Flow: 8.34 cfs

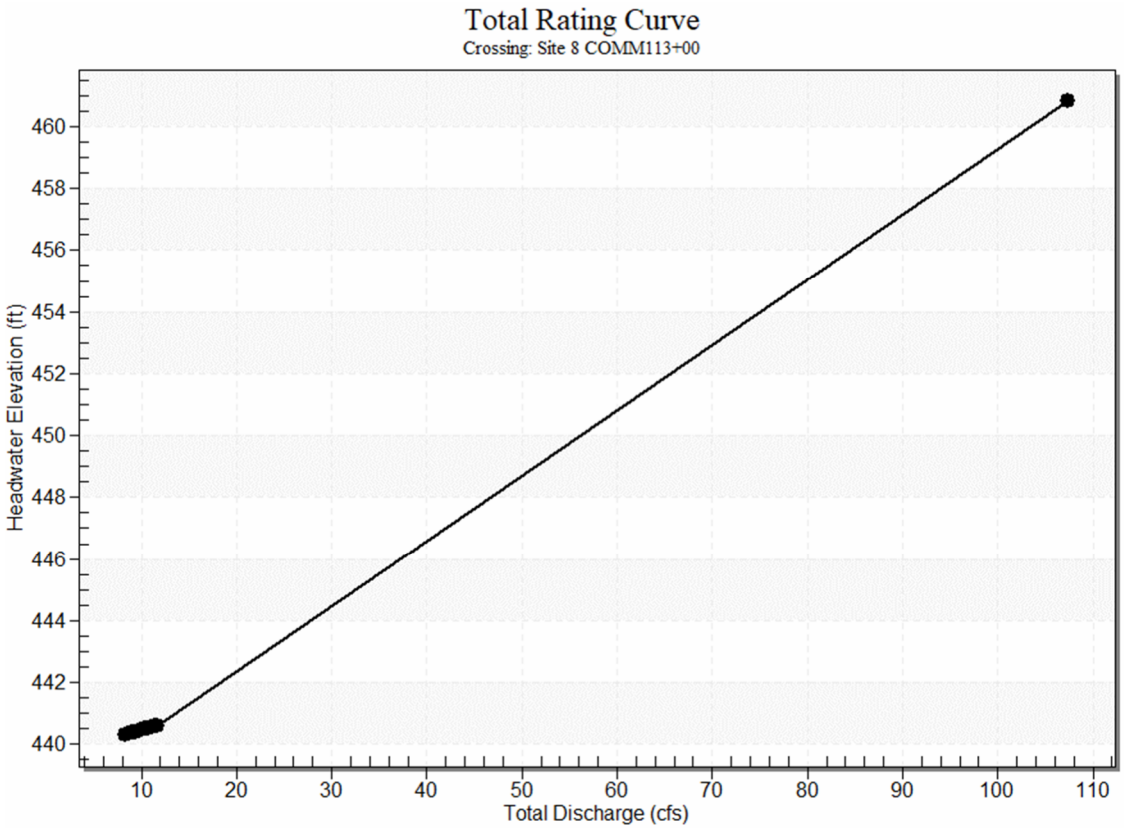
Maximum Flow: 11.69 cfs

Table 7 - Summary of Culvert Flows at Crossing: Site 8 COMM113+00

Headwater Elevation (ft)	Total Discharge (cfs)	30" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
440.31	8.34	8.34	0.00	1
440.34	8.68	8.68	0.00	1
440.37	9.01	9.01	0.00	1
440.40	9.34	9.34	0.00	1
440.43	9.68	9.68	0.00	1
440.46	10.02	10.02	0.00	1
440.49	10.35	10.35	0.00	1
440.52	10.68	10.68	0.00	1
440.55	11.02	11.02	0.00	1
440.58	11.36	11.36	0.00	1
440.60	11.69	11.69	0.00	1

460.80	106.76	106.76	0.00	Overtopping

Rating Curve Plot for Crossing: Site 8 COMM113+00



Culvert Data: 30" RCP

Table 4 - Culvert Summary Table: 30" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
8.34 cfs	8.34 cfs	440.31	1.31	0.0*	1-S2n	0.65	0.96	0.65	0.49	8.20	3.84
8.68 cfs	8.68 cfs	440.34	1.34	0.0*	1-S2n	0.66	0.98	0.66	0.50	8.29	3.88
9.01 cfs	9.01 cfs	440.37	1.37	0.0*	1-S2n	0.68	1.00	0.68	0.51	8.39	3.92
9.34 cfs	9.34 cfs	440.40	1.40	0.0*	1-S2n	0.69	1.02	0.69	0.52	8.47	3.96

9.68 cfs	9.68 cfs	440.43	1.43	0.0*	1-S2n	0.70	1.04	0.70	0.53	8.55	4.00
10.02 cfs	10.02 cfs	440.46	1.46	0.0*	1-S2n	0.72	1.06	0.72	0.54	8.64	4.04
10.35 cfs	10.35 cfs	440.49	1.49	0.0*	1-S2n	0.73	1.08	0.73	0.55	8.72	4.08
10.68 cfs	10.68 cfs	440.52	1.52	0.0*	1-S2n	0.74	1.09	0.74	0.56	8.80	4.12
11.02 cfs	11.02 cfs	440.55	1.55	0.0*	1-S2n	0.75	1.11	0.75	0.56	8.88	4.16
11.36 cfs	11.36 cfs	440.58	1.58	0.0*	1-S2n	0.76	1.13	0.76	0.57	8.95	4.19
11.69 cfs	11.69 cfs	440.60	1.60	0.0*	1-S2n	0.77	1.15	0.77	0.58	9.02	4.23

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

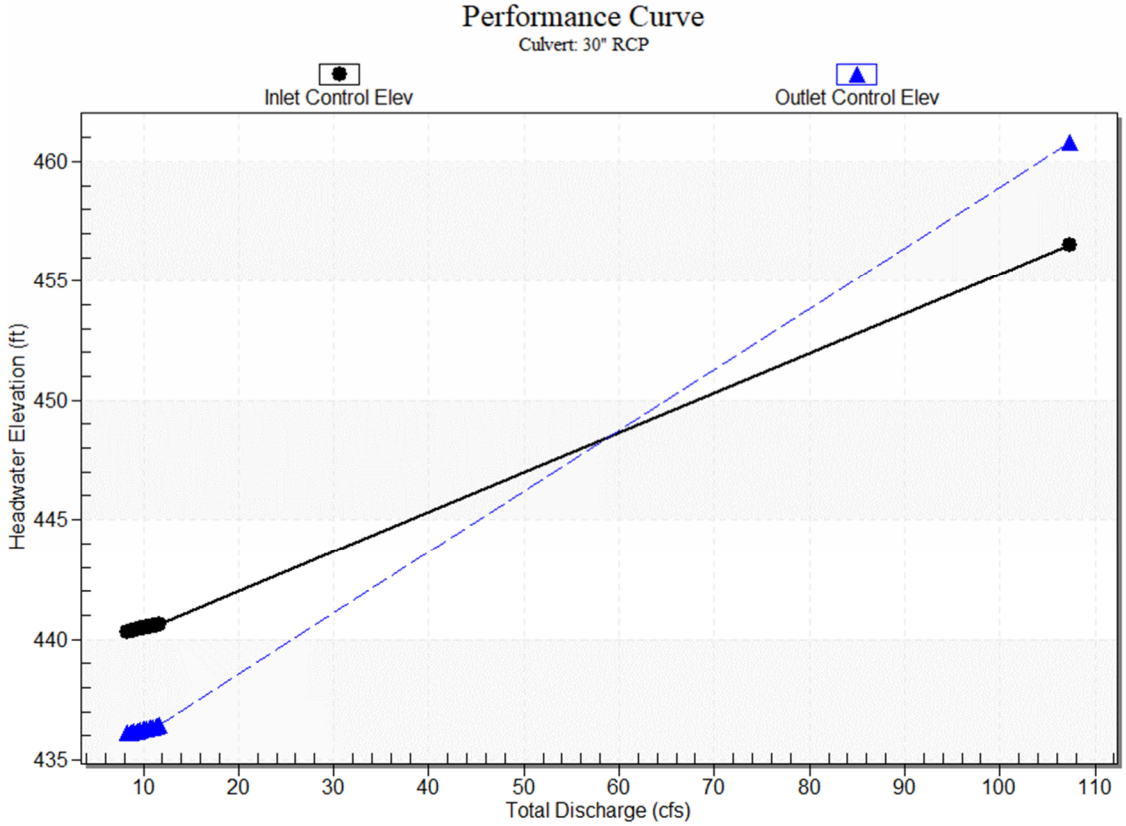
Inlet Elevation (invert): 439.00 ft,

Outlet Elevation (invert): 435.00 ft

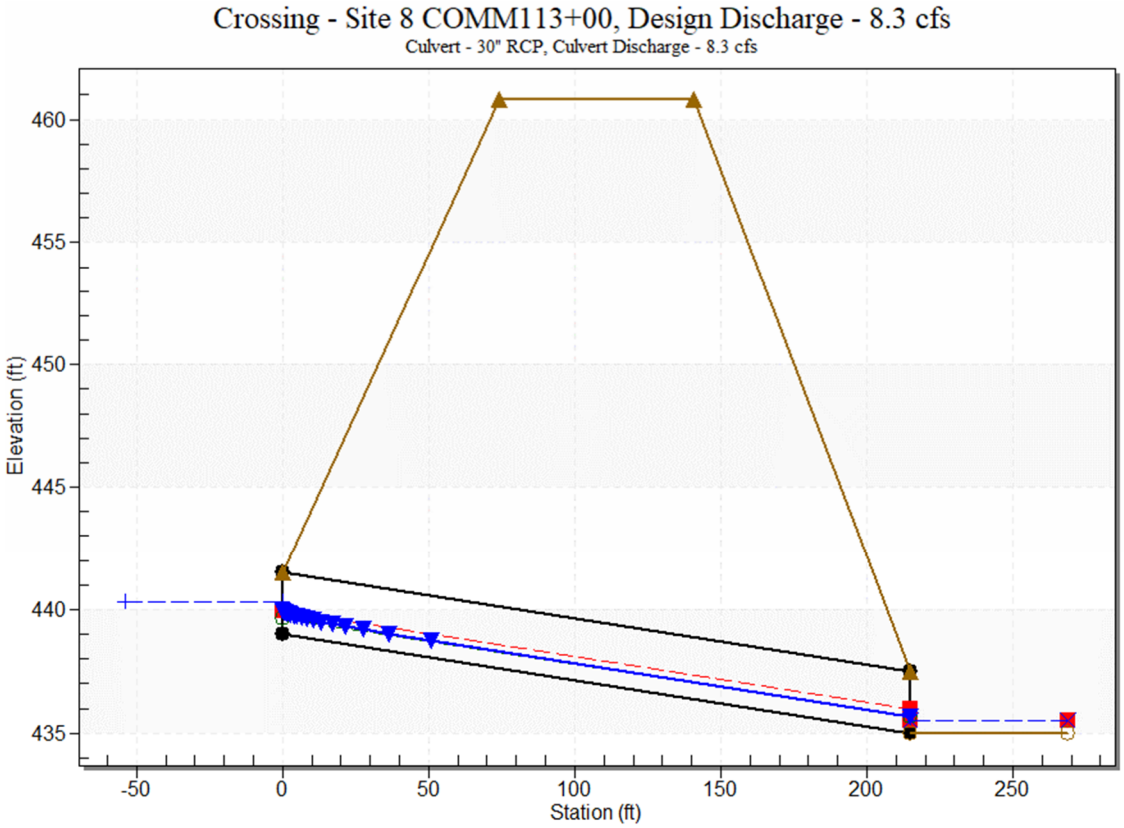
Culvert Length: 215.04 ft,

Culvert Slope: 0.0186

Culvert Performance Curve Plot: 30" RCP



Water Surface Profile Plot for Culvert: 30" RCP



Site Data - 30" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 439.00 ft

Outlet Station: 215.00 ft

Outlet Elevation: 435.00 ft

Number of Barrels: 1

Culvert Data Summary - 30" RCP

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 8 COMM113+00

Table 8 - Downstream Channel Rating Curve (Crossing: Site 8 COMM113+00)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
8.34	435.49	0.49	3.84	1.28	1.12
8.68	435.50	0.50	3.88	1.30	1.12
9.01	435.51	0.51	3.92	1.33	1.12
9.34	435.52	0.52	3.96	1.36	1.12
9.68	435.53	0.53	4.00	1.38	1.13
10.02	435.54	0.54	4.04	1.41	1.13
10.35	435.55	0.55	4.08	1.43	1.13
10.68	435.56	0.56	4.12	1.46	1.13
11.02	435.56	0.56	4.16	1.48	1.14
11.36	435.57	0.57	4.19	1.50	1.14
11.69	435.58	0.58	4.23	1.53	1.14

Tailwater Channel Data - Site 8 COMM113+00

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 3.00 ft

Side Slope (H:V): 3.00 (_:1)

Channel Slope: 0.0420

Channel Manning's n: 0.0400

Channel Invert Elevation: 435.00 ft

Roadway Data for Crossing: Site 8 COMM113+00

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 67.00 ft

Crest Elevation: 460.80 ft

Roadway Surface: Paved

Roadway Top Width: 67.00 ft

Crossing Discharge Data

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

Minimum Flow: 34.88 cfs

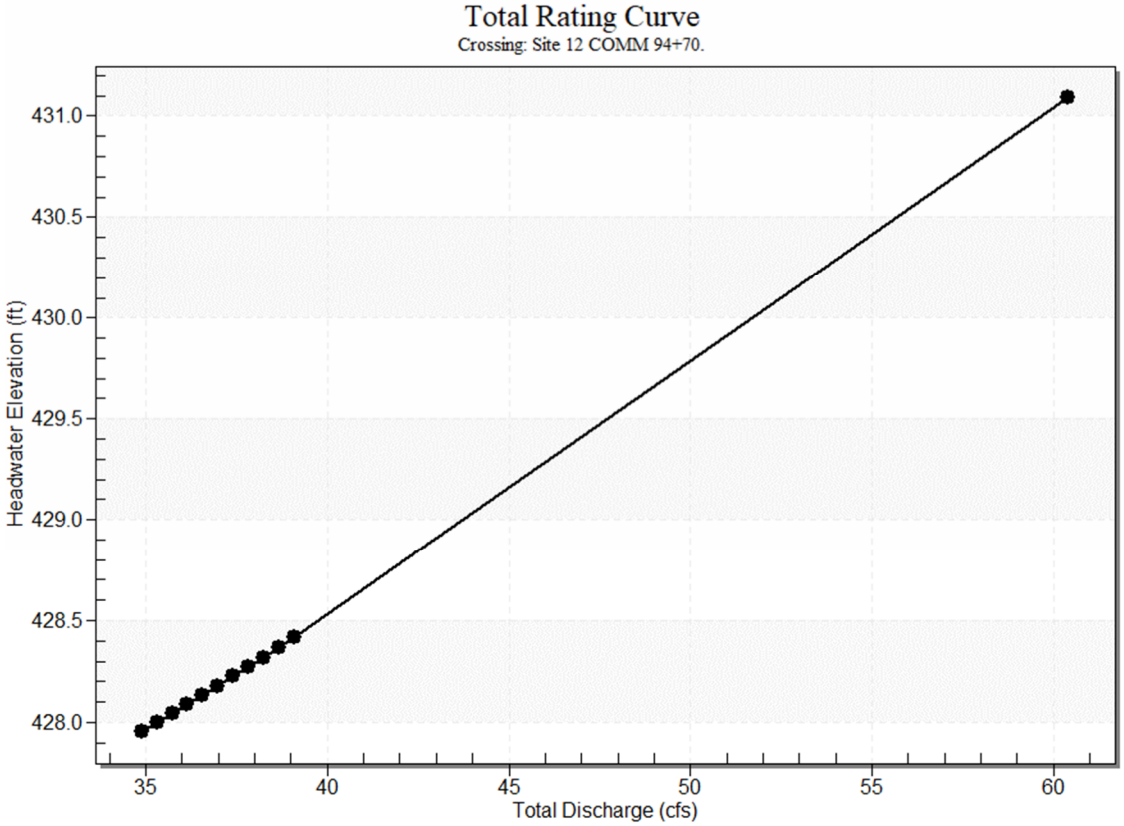
Design Flow: 34.88 cfs

Maximum Flow: 39.09 cfs

Table 9 - Summary of Culvert Flows at Crossing: Site 12 COMM 94+70.

Headwater Elevation (ft)	Total Discharge (cfs)	36" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
427.96	34.88	34.88	0.00	1
428.00	35.30	35.30	0.00	1
428.04	35.72	35.72	0.00	1
428.09	36.14	36.14	0.00	1
428.13	36.56	36.56	0.00	1
428.18	36.98	36.98	0.00	1
428.22	37.41	37.41	0.00	1
428.27	37.83	37.83	0.00	1
428.32	38.25	38.25	0.00	1
428.37	38.67	38.67	0.00	1
428.41	39.09	39.09	0.00	1
431.05	57.81	57.81	0.00	Overtopping

Rating Curve Plot for Crossing: Site 12 COMM 94+70.



Culvert Data: 36" RCP

Table 5 - Culvert Summary Table: 36" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
34.88 cfs	34.88 cfs	427.96	3.46	2.553	5-S2n	1.78	2.01	1.78	2.02	9.34	4.28
35.30 cfs	35.30 cfs	428.00	3.50	2.611	5-S2n	1.79	2.02	1.79	2.03	9.36	4.29
35.72 cfs	35.72 cfs	428.04	3.54	2.670	5-S2n	1.81	2.03	1.81	2.04	9.38	4.30
36.14 cfs	36.14 cfs	428.09	3.59	2.730	5-S2n	1.83	2.04	1.83	2.05	9.39	4.32
36.56 cfs	36.56 cfs	428.13	3.63	2.790	5-S2n	1.85	2.05	1.85	2.05	9.41	4.33
36.98 cfs	36.98 cfs	428.18	3.68	2.851	5-S2n	1.86	2.06	1.87	2.06	9.38	4.34

37.41 cfs	37.41 cfs	428.22	3.72	2.912	5-S2n	1.88	2.07	1.89	2.07	9.40	4.35
37.83 cfs	37.83 cfs	428.27	3.77	2.973	5-S2n	1.90	2.08	1.90	2.08	9.44	4.37
38.25 cfs	38.25 cfs	428.32	3.82	3.036	5-S2n	1.92	2.09	1.92	2.09	9.45	4.38
38.67 cfs	38.67 cfs	428.37	3.87	3.299	5-S2n	1.94	2.10	1.94	2.10	9.46	4.39
39.09 cfs	39.09 cfs	428.41	3.91	3.359	5-S2n	1.96	2.11	1.96	2.11	9.47	4.40

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

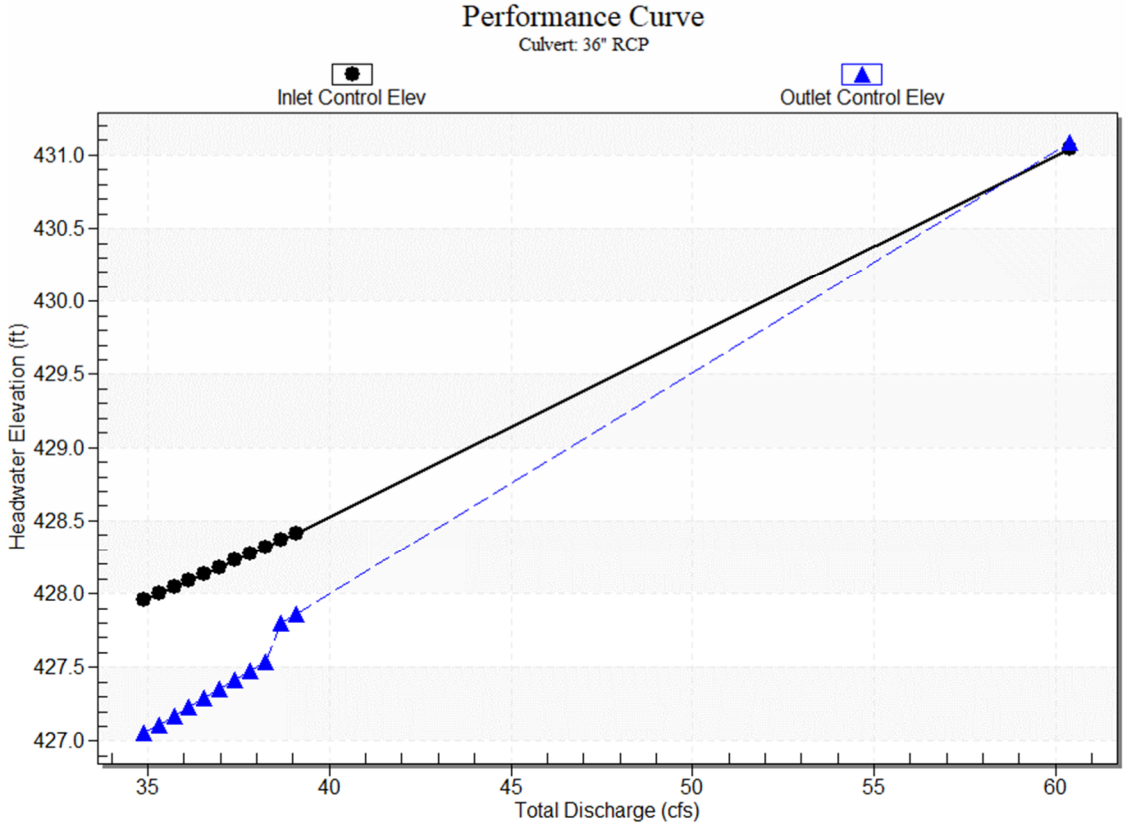
Inlet Elevation (invert): 424.50 ft,

Outlet Elevation (invert): 423.00 ft

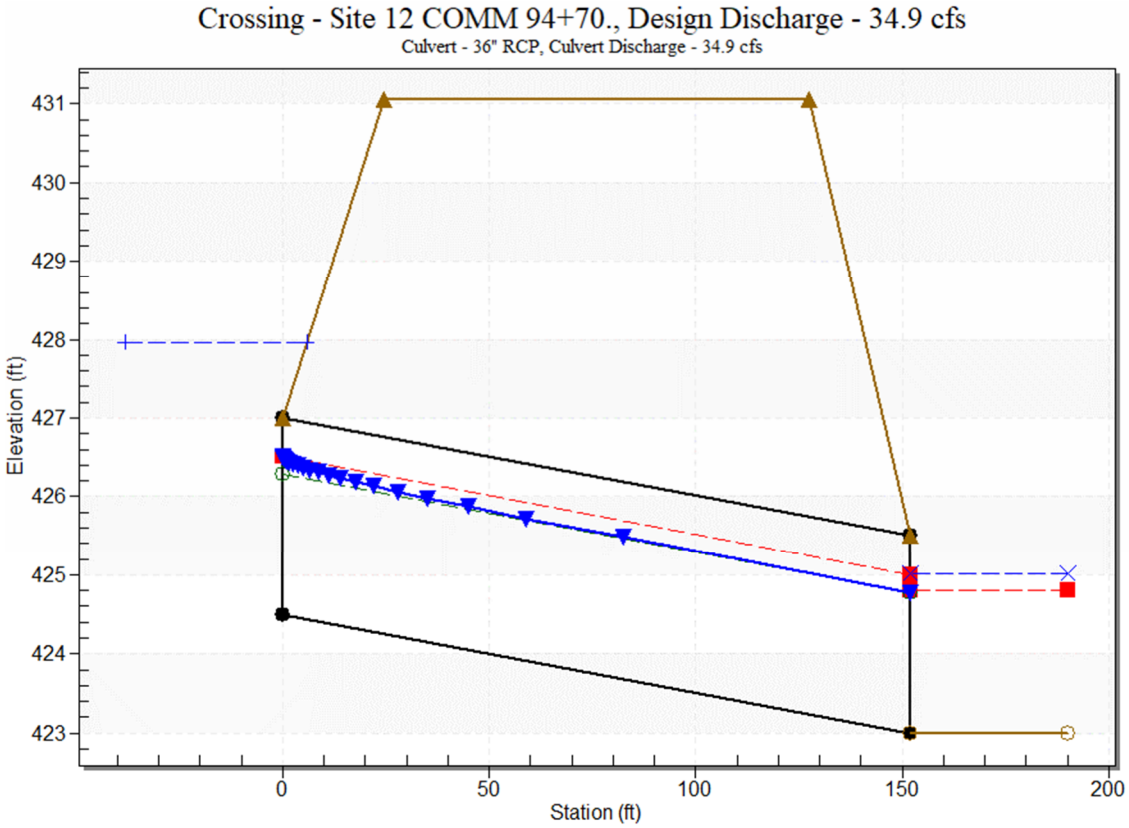
Culvert Length: 152.01 ft,

Culvert Slope: 0.0099

Culvert Performance Curve Plot: 36" RCP



Water Surface Profile Plot for Culvert: 36" RCP



Site Data - 36" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 424.50 ft

Outlet Station: 152.00 ft

Outlet Elevation: 423.00 ft

Number of Barrels: 1

Culvert Data Summary - 36" RCP

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1) (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 12 COMM 94+70.

Table 10 - Downstream Channel Rating Curve (Crossing: Site 12 COMM 94+70.)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
34.88	425.02	2.02	4.28	1.91	0.75
35.30	425.03	2.03	4.29	1.92	0.75
35.72	425.04	2.04	4.30	1.93	0.75
36.14	425.05	2.05	4.32	1.94	0.75
36.56	425.05	2.05	4.33	1.95	0.75
36.98	425.06	2.06	4.34	1.96	0.75
37.41	425.07	2.07	4.35	1.97	0.75
37.83	425.08	2.08	4.37	1.97	0.75
38.25	425.09	2.09	4.38	1.98	0.75
38.67	425.10	2.10	4.39	1.99	0.76
39.09	425.11	2.11	4.40	2.00	0.76

Tailwater Channel Data - Site 12 COMM 94+70.

Tailwater Channel Option: Triangular Channel

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

Channel Slope: 0.0152

Channel Manning's n: 0.0400

Channel Invert Elevation: 423.00 ft

Roadway Data for Crossing: Site 12 COMM 94+70.

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 103.00 ft

Crest Elevation: 431.05 ft

Roadway Surface: Paved

Roadway Top Width: 103.00 ft

Crossing Discharge Data

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

Minimum Flow: 47.46 cfs

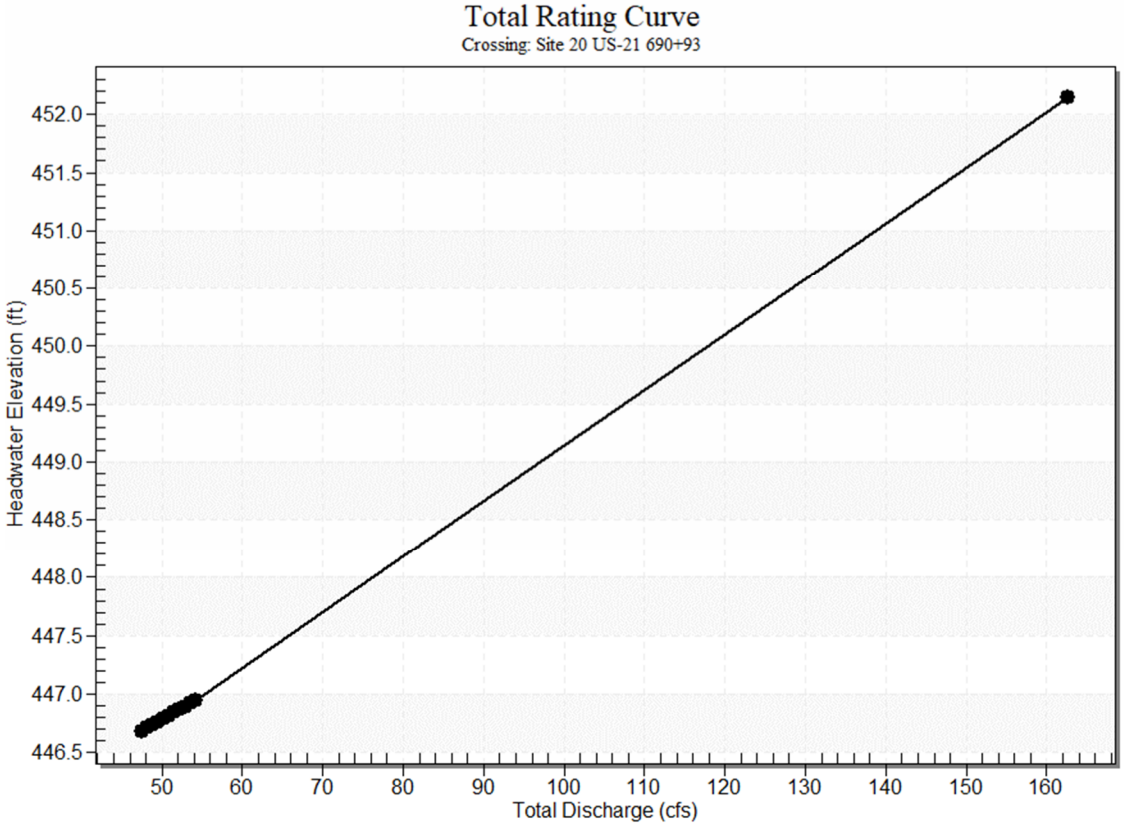
Design Flow: 47.46 cfs

Maximum Flow: 54.23 cfs

Table 11 - Summary of Culvert Flows at Crossing: Site 20 US-21 690+93

Headwater Elevation (ft)	Total Discharge (cfs)	48" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
446.68	47.46	47.46	0.00	1
446.71	48.14	48.14	0.00	1
446.74	48.81	48.81	0.00	1
446.76	49.49	49.49	0.00	1
446.79	50.17	50.17	0.00	1
446.81	50.84	50.84	0.00	1
446.84	51.52	51.52	0.00	1
446.87	52.20	52.20	0.00	1
446.89	52.88	52.88	0.00	1
446.92	53.55	53.55	0.00	1
446.94	54.23	54.23	0.00	1
452.00	153.38	153.38	0.00	Overtopping

Rating Curve Plot for Crossing: Site 20 US-21 690+93



Culvert Data: 48" RCP

Table 6 - Culvert Summary Table: 48" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
47.46 cfs	47.46 cfs	446.68	3.06	3.242	2-M2c	2.24	2.06	2.06	0.28	7.26	34.27
48.14 cfs	48.14 cfs	446.71	3.08	3.269	2-M2c	2.26	2.08	2.08	0.28	7.29	34.46
48.81 cfs	48.81 cfs	446.74	3.11	3.295	2-M2c	2.28	2.09	2.09	0.28	7.33	34.63
49.49 cfs	49.49 cfs	446.76	3.14	3.322	2-M2c	2.30	2.11	2.11	0.28	7.36	34.82
50.17 cfs	50.17 cfs	446.79	3.16	3.348	2-M2c	2.32	2.12	2.12	0.29	7.40	34.98
50.84 cfs	50.84 cfs	446.81	3.19	3.374	2-M2c	2.34	2.14	2.14	0.29	7.43	35.16

51.52 cfs	51.52 cfs	446.84	3.21	3.401	2-M2c	2.36	2.15	2.15	0.29	7.47	35.34
52.20 cfs	52.20 cfs	446.87	3.24	3.427	2-M2c	2.38	2.17	2.17	0.29	7.50	35.51
52.88 cfs	52.88 cfs	446.89	3.27	3.453	2-M2c	2.40	2.18	2.18	0.30	7.53	35.68
53.55 cfs	53.55 cfs	446.92	3.29	3.479	2-M2c	2.42	2.20	2.20	0.30	7.57	35.85
54.23 cfs	54.23 cfs	446.94	3.32	3.504	2-M2c	2.44	2.21	2.21	0.30	7.60	36.02

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

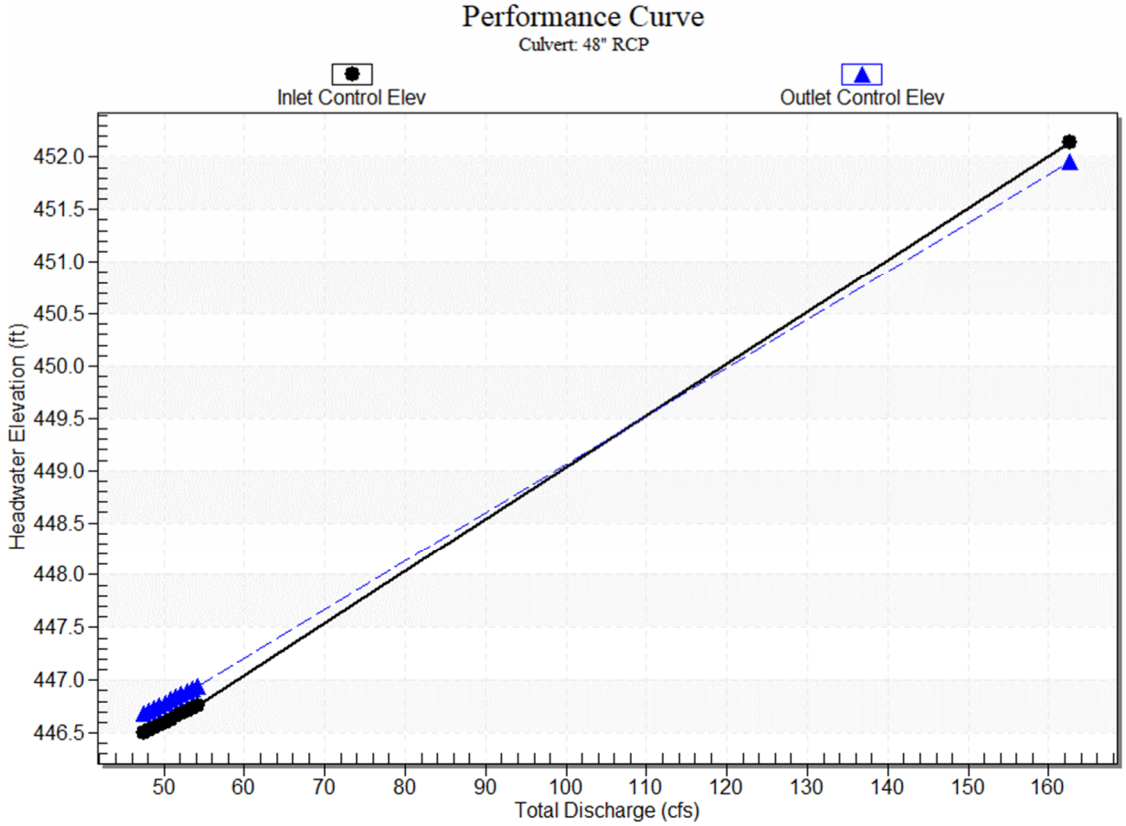
Inlet Elevation (invert): 443.44 ft,

Outlet Elevation (invert): 443.05 ft

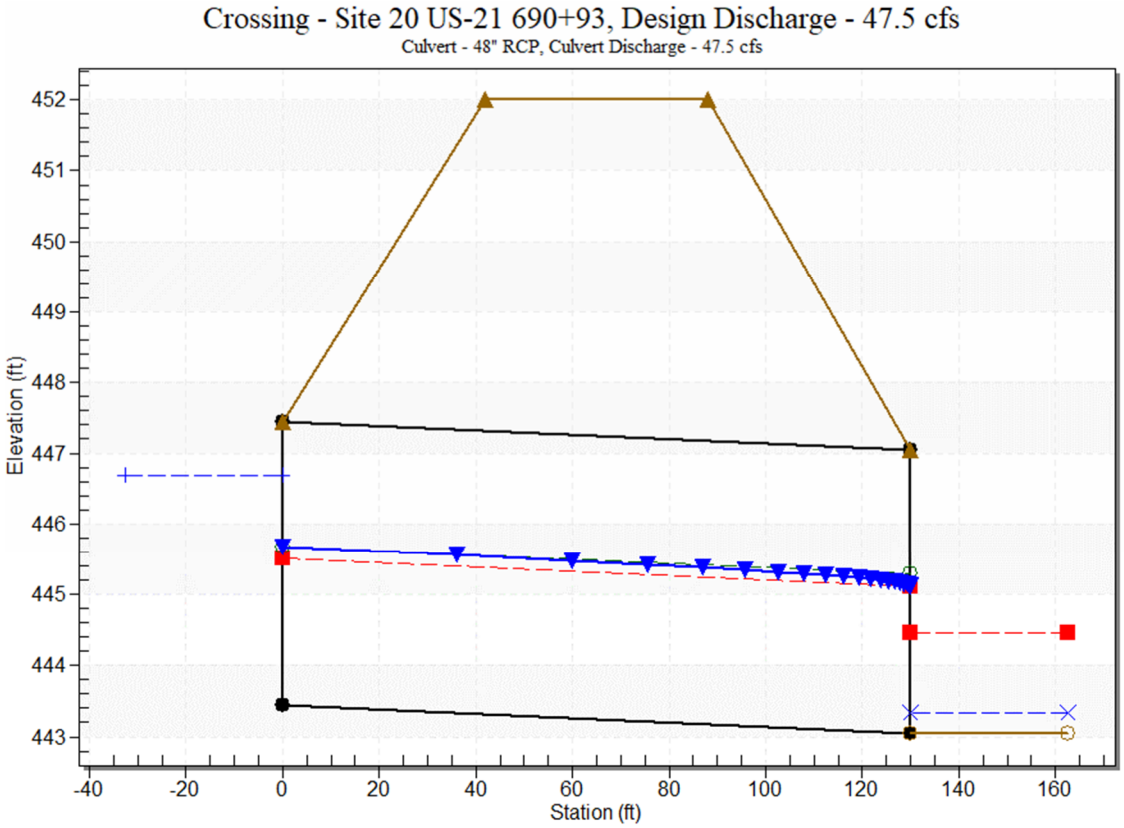
Culvert Length: 130.00 ft,

Culvert Slope: 0.0030

Culvert Performance Curve Plot: 48" RCP



Water Surface Profile Plot for Culvert: 48" RCP



Site Data - 48" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 443.44 ft

Outlet Station: 130.00 ft

Outlet Elevation: 443.05 ft

Number of Barrels: 1

Culvert Data Summary - 48" RCP

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

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

Inlet Depression: None

Tailwater Data for Crossing: Site 20 US-21 690+93

Table 12 - Downstream Channel Rating Curve (Crossing: Site 20 US-21 690+93)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
47.46	443.33	0.28	34.27	0.53	11.47
48.14	443.33	0.28	34.46	0.53	11.49
48.81	443.33	0.28	34.63	0.54	11.49
49.49	443.33	0.28	34.82	0.54	11.51
50.17	443.34	0.29	34.98	0.55	11.51
50.84	443.34	0.29	35.16	0.55	11.52
51.52	443.34	0.29	35.34	0.55	11.53
52.20	443.34	0.29	35.51	0.56	11.54
52.88	443.35	0.30	35.68	0.56	11.55
53.55	443.35	0.30	35.85	0.57	11.56
54.23	443.35	0.30	36.02	0.57	11.57

Tailwater Channel Data - Site 20 US-21 690+93

Tailwater Channel Option: Rectangular Channel

Bottom Width: 5.00 ft

Channel Slope: 0.0305

Channel Manning's n: 0.0030

Channel Invert Elevation: 443.05 ft

Roadway Data for Crossing: Site 20 US-21 690+93

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 46.00 ft

Crest Elevation: 452.00 ft

Roadway Surface: Paved

Roadway Top Width: 46.00 ft

Crossing Discharge Data

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

Minimum Flow: 25.73 cfs

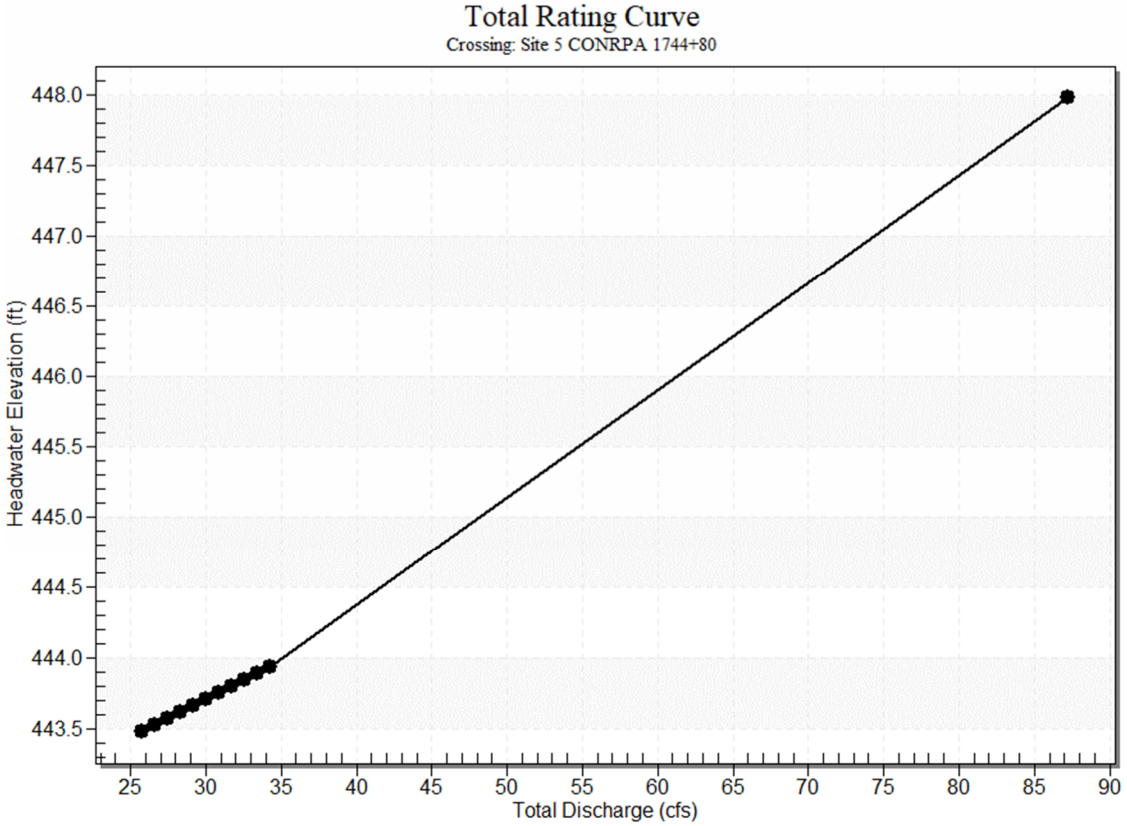
Design Flow: 25.73 cfs

Maximum Flow: 34.28 cfs

Table 13 - Summary of Culvert Flows at Crossing: Site 5 CONRPA 1744+80

Headwater Elevation (ft)	Total Discharge (cfs)	36" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
443.48	25.73	25.73	0.00	1
443.53	26.59	26.59	0.00	1
443.57	27.44	27.44	0.00	1
443.62	28.30	28.30	0.00	1
443.66	29.15	29.15	0.00	1
443.71	30.01	30.01	0.00	1
443.75	30.86	30.86	0.00	1
443.80	31.71	31.71	0.00	1
443.84	32.57	32.57	0.00	1
443.89	33.43	33.43	0.00	1
443.93	34.28	34.28	0.00	1
447.84	81.74	81.74	0.00	Overtopping

Rating Curve Plot for Crossing: Site 5 CONRPA 1744+80



Culvert Data: 36" RCP

Table 7 - Culvert Summary Table: 36" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
25.73 cfs	25.73 cfs	443.48	2.36	1.494	1-JS1t	1.22	1.64	2.32	2.32	4.38	2.39
26.59 cfs	26.59 cfs	443.53	2.41	1.550	1-JS1t	1.24	1.67	2.35	2.35	4.47	2.40
27.44 cfs	27.44 cfs	443.57	2.45	1.605	1-JS1t	1.26	1.69	2.38	2.38	4.56	2.42
28.30 cfs	28.30 cfs	443.62	2.50	1.661	1-JS1t	1.28	1.72	2.41	2.41	4.66	2.44
29.15 cfs	29.15 cfs	443.66	2.54	1.717	1-S2n	1.30	1.75	1.34	2.43	9.52	2.46
30.01 cfs	30.01 cfs	443.71	2.59	1.773	1-S2n	1.32	1.77	1.37	2.46	9.57	2.48

30.86 cfs	30.86 cfs	443.75	2.63	1.830	1-S2n	1.34	1.80	1.39	2.49	9.64	2.50
31.71 cfs	31.71 cfs	443.80	2.68	1.887	1-S2n	1.37	1.83	1.41	2.51	9.70	2.51
32.57 cfs	32.57 cfs	443.84	2.72	1.945	1-S2n	1.39	1.85	1.43	2.54	9.77	2.53
33.43 cfs	33.43 cfs	443.89	2.77	2.003	1-S2n	1.41	1.88	1.45	2.56	9.83	2.55
34.28 cfs	34.28 cfs	443.93	2.81	2.062	1-S2n	1.43	1.90	1.48	2.59	9.90	2.56

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

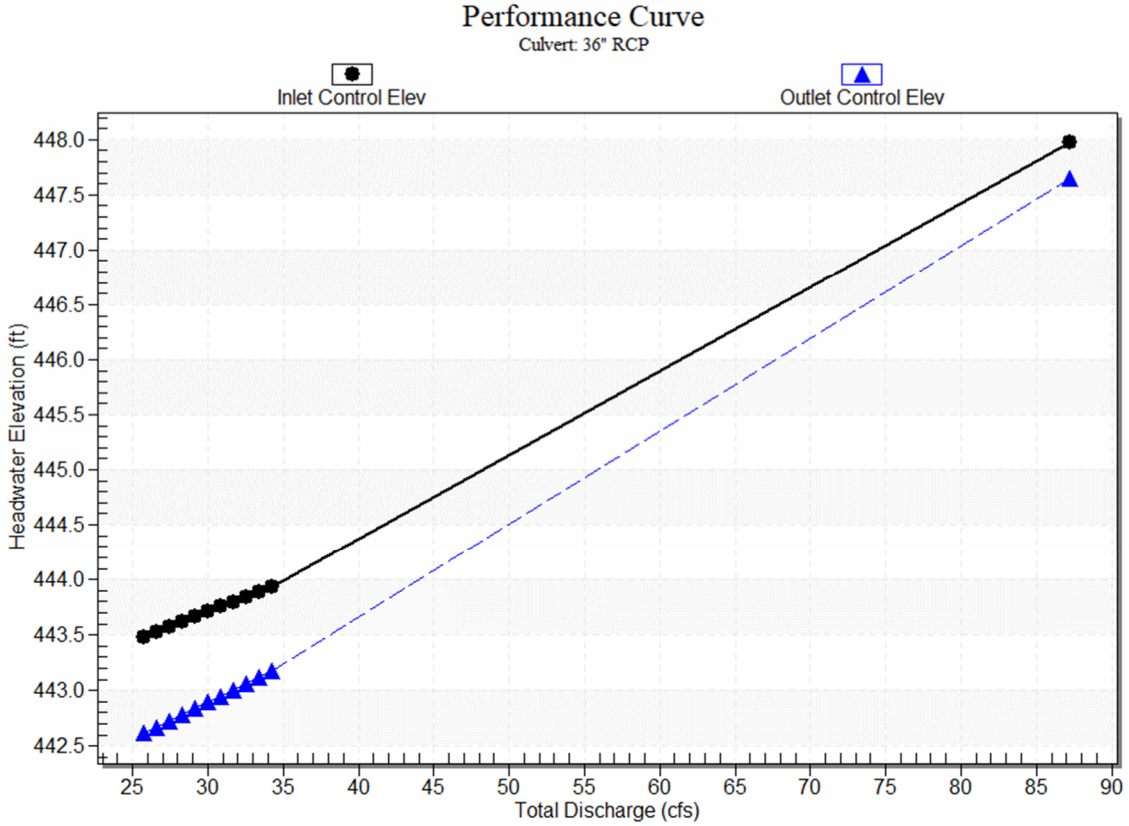
Inlet Elevation (invert): 441.12 ft,

Outlet Elevation (invert): 439.90 ft

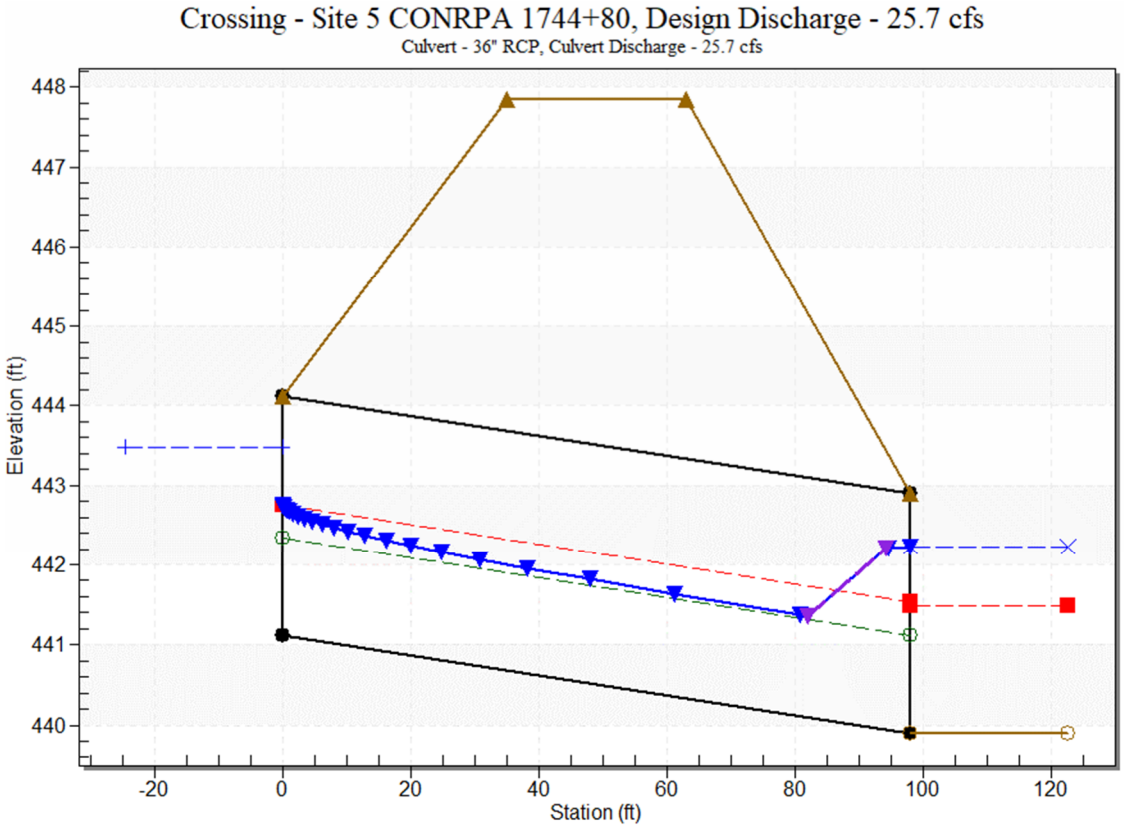
Culvert Length: 98.01 ft,

Culvert Slope: 0.0124

Culvert Performance Curve Plot: 36" RCP



Water Surface Profile Plot for Culvert: 36" RCP



Site Data - 36" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 441.12 ft

Outlet Station: 98.00 ft

Outlet Elevation: 439.90 ft

Number of Barrels: 1

Culvert Data Summary - 36" RCP

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1) (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 5 CONRPA 1744+80

Table 14 - Downstream Channel Rating Curve (Crossing: Site 5 CONRPA 1744+80)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
25.73	442.22	2.32	2.39	0.43	0.39
26.59	442.25	2.35	2.40	0.44	0.39
27.44	442.28	2.38	2.42	0.45	0.39
28.30	442.31	2.41	2.44	0.45	0.39
29.15	442.33	2.43	2.46	0.46	0.39
30.01	442.36	2.46	2.48	0.46	0.39
30.86	442.39	2.49	2.50	0.47	0.39
31.71	442.41	2.51	2.51	0.47	0.40
32.57	442.44	2.54	2.53	0.47	0.40
33.43	442.46	2.56	2.55	0.48	0.40
34.28	442.49	2.59	2.56	0.48	0.40

Tailwater Channel Data - Site 5 CONRPA 1744+80

Tailwater Channel Option: Triangular Channel

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

Channel Slope: 0.0030

Channel Manning's n: 0.0350

Channel Invert Elevation: 439.90 ft

Roadway Data for Crossing: Site 5 CONRPA 1744+80

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 28.00 ft

Crest Elevation: 447.84 ft

Roadway Surface: Paved

Roadway Top Width: 28.00 ft

Crossing Discharge Data

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

Minimum Flow: 22.78 cfs

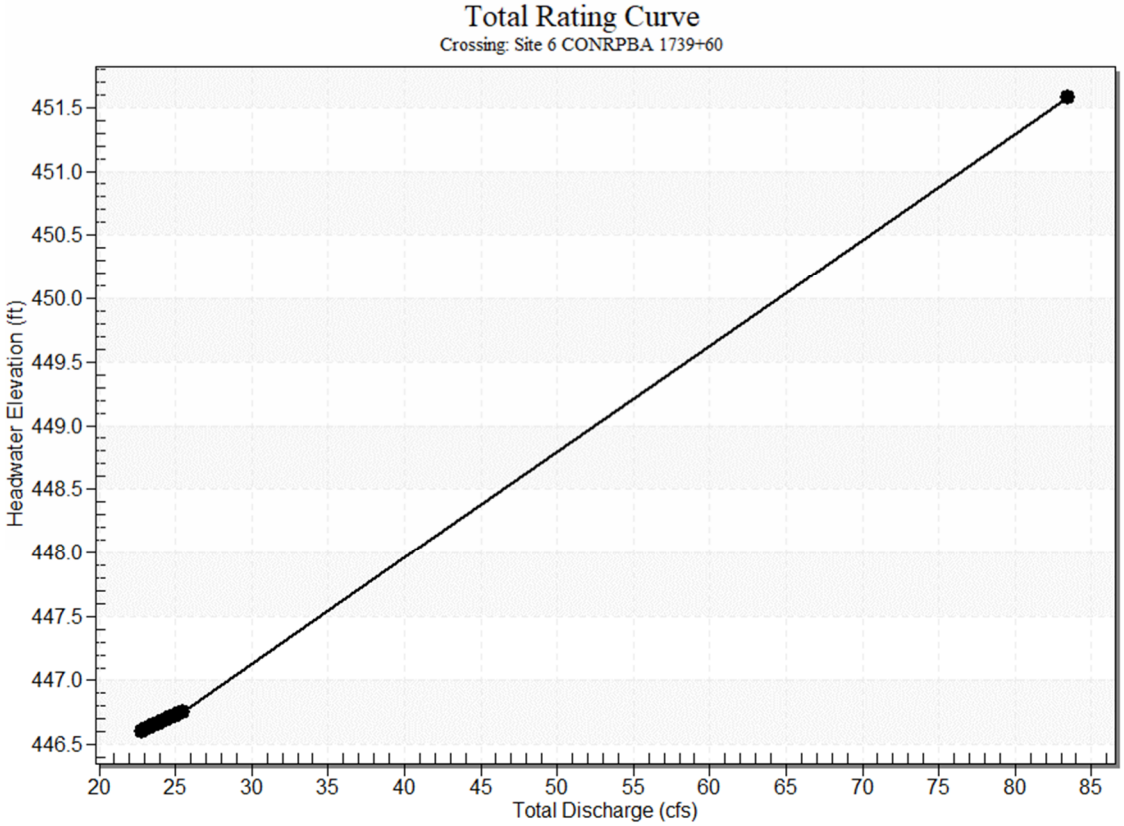
Design Flow: 22.78 cfs

Maximum Flow: 25.51 cfs

Table 15 - Summary of Culvert Flows at Crossing: Site 6 CONRPBA 1739+60

Headwater Elevation (ft)	Total Discharge (cfs)	36" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
446.61	22.78	22.78	0.00	1
446.62	23.05	23.05	0.00	1
446.64	23.33	23.33	0.00	1
446.65	23.60	23.60	0.00	1
446.67	23.87	23.87	0.00	1
446.68	24.15	24.15	0.00	1
446.70	24.42	24.42	0.00	1
446.71	24.69	24.69	0.00	1
446.73	24.96	24.96	0.00	1
446.74	25.24	25.24	0.00	1
446.75	25.51	25.51	0.00	1
451.50	79.98	79.98	0.00	Overtopping

Rating Curve Plot for Crossing: Site 6 CONRPBA 1739+60



Culvert Data: 36" RCP

Table 8 - Culvert Summary Table: 36" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
22.78 cfs	22.78 cfs	446.61	2.21	0.209	1-JS1t	1.22	1.54	2.22	2.22	4.06	2.31
23.05 cfs	23.05 cfs	446.62	2.22	0.231	1-JS1t	1.22	1.55	2.23	2.23	4.09	2.32
23.33 cfs	23.33 cfs	446.64	2.24	0.253	1-JS1t	1.23	1.56	2.24	2.24	4.12	2.33
23.60 cfs	23.60 cfs	446.65	2.25	0.275	1-JS1t	1.24	1.56	2.25	2.25	4.15	2.33
23.87 cfs	23.87 cfs	446.67	2.27	0.297	1-JS1t	1.25	1.57	2.26	2.26	4.18	2.34
24.15 cfs	24.15 cfs	446.68	2.28	0.319	1-JS1t	1.25	1.58	2.27	2.27	4.21	2.35

24.42 cfs	24.42 cfs	446.70	2.30	0.341	1-JS1t	1.26	1.59	2.28	2.28	4.24	2.35
24.69 cfs	24.69 cfs	446.71	2.31	0.363	1-JS1t	1.27	1.60	2.29	2.29	4.27	2.36
24.96 cfs	24.96 cfs	446.73	2.33	0.385	1-JS1t	1.28	1.61	2.30	2.30	4.30	2.37
25.24 cfs	25.24 cfs	446.74	2.34	0.408	1-JS1t	1.29	1.62	2.31	2.31	4.33	2.37
25.51 cfs	25.51 cfs	446.75	2.35	0.430	1-JS1t	1.29	1.63	2.32	2.32	4.36	2.38

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

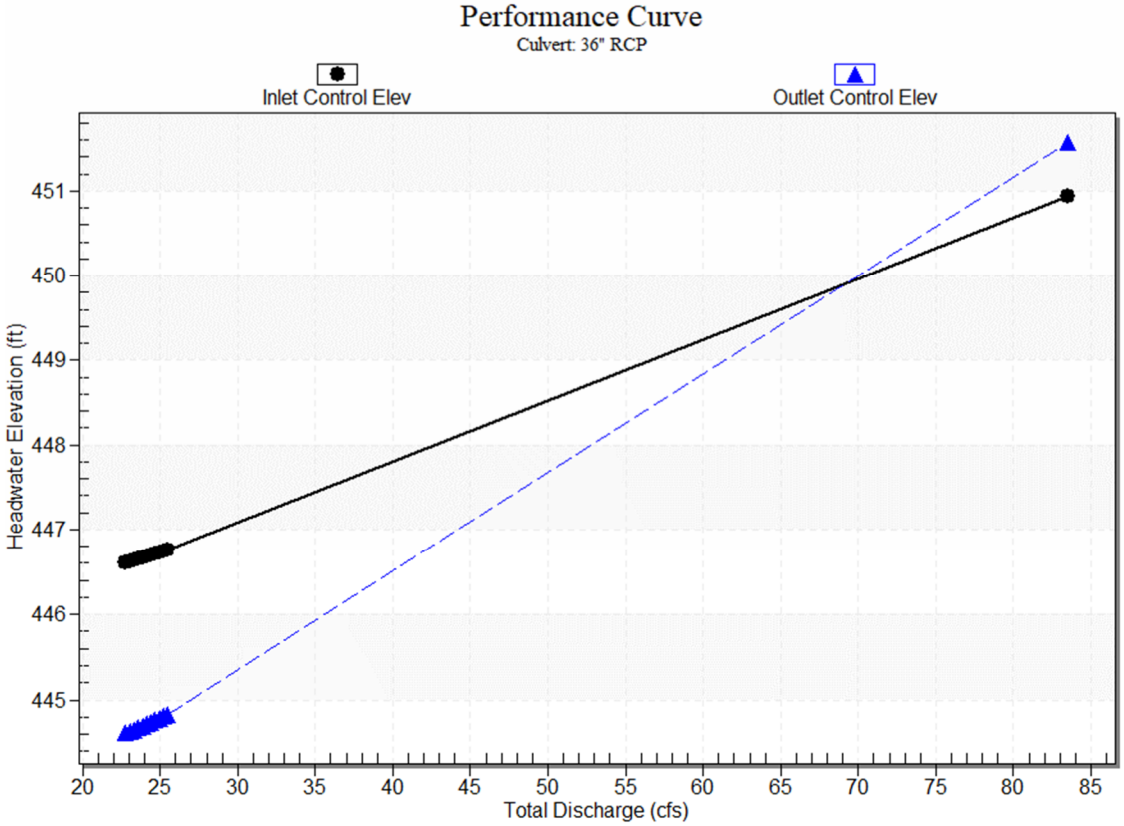
Inlet Elevation (invert): 444.40 ft,

Outlet Elevation (invert): 441.90 ft

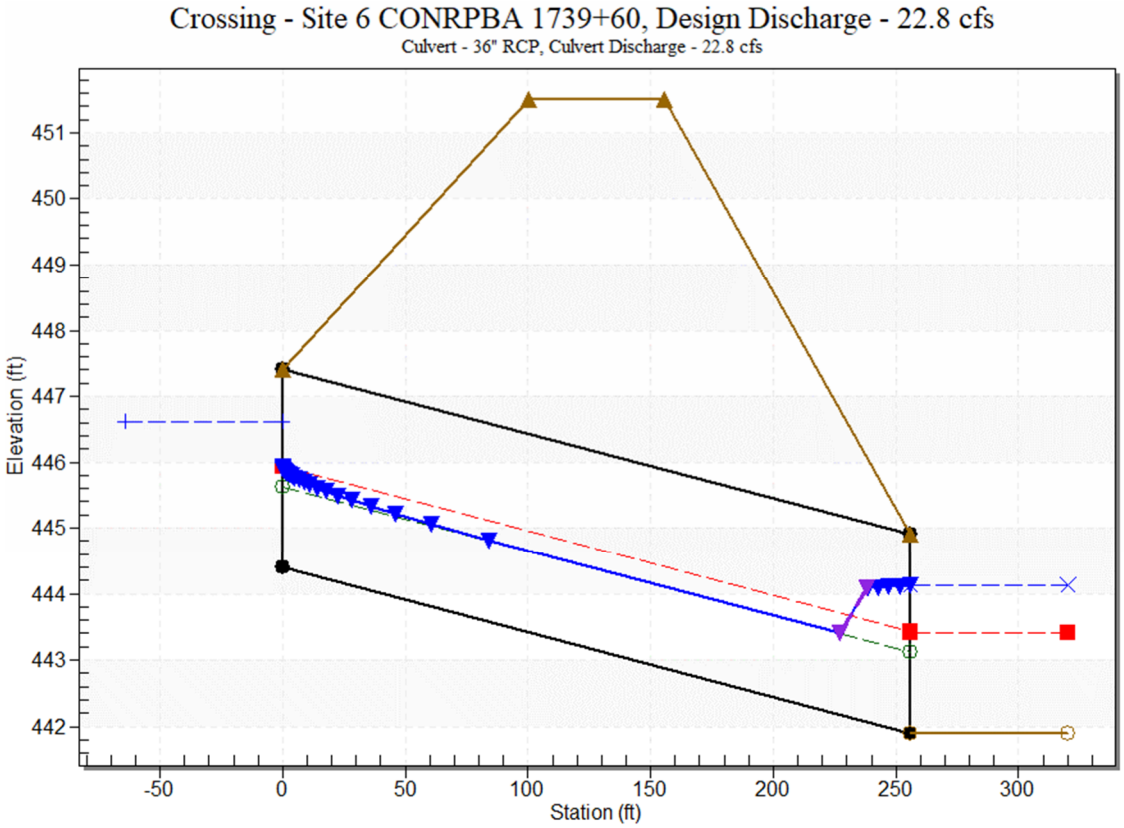
Culvert Length: 256.01 ft,

Culvert Slope: 0.0098

Culvert Performance Curve Plot: 36" RCP



Water Surface Profile Plot for Culvert: 36" RCP



Site Data - 36" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 444.40 ft

Outlet Station: 256.00 ft

Outlet Elevation: 441.90 ft

Number of Barrels: 1

Culvert Data Summary - 36" RCP

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1) (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 6 CONRPBA 1739+60

Table 16 - Downstream Channel Rating Curve (Crossing: Site 6 CONRPBA 1739+60)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
22.78	444.12	2.22	2.31	0.42	0.39
23.05	444.13	2.23	2.32	0.42	0.39
23.33	444.14	2.24	2.33	0.42	0.39
23.60	444.15	2.25	2.33	0.42	0.39
23.87	444.16	2.26	2.34	0.42	0.39
24.15	444.17	2.27	2.35	0.42	0.39
24.42	444.18	2.28	2.35	0.43	0.39
24.69	444.19	2.29	2.36	0.43	0.39
24.96	444.20	2.30	2.37	0.43	0.39
25.24	444.21	2.31	2.37	0.43	0.39
25.51	444.22	2.32	2.38	0.43	0.39

Tailwater Channel Data - Site 6 CONRPBA 1739+60

Tailwater Channel Option: Triangular Channel

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

Channel Slope: 0.0030

Channel Manning's n: 0.0350

Channel Invert Elevation: 441.90 ft

Roadway Data for Crossing: Site 6 CONRPBA 1739+60

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 55.00 ft

Crest Elevation: 451.50 ft

Roadway Surface: Paved

Roadway Top Width: 55.00 ft

Crossing Discharge Data

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

Minimum Flow: 5.07 cfs

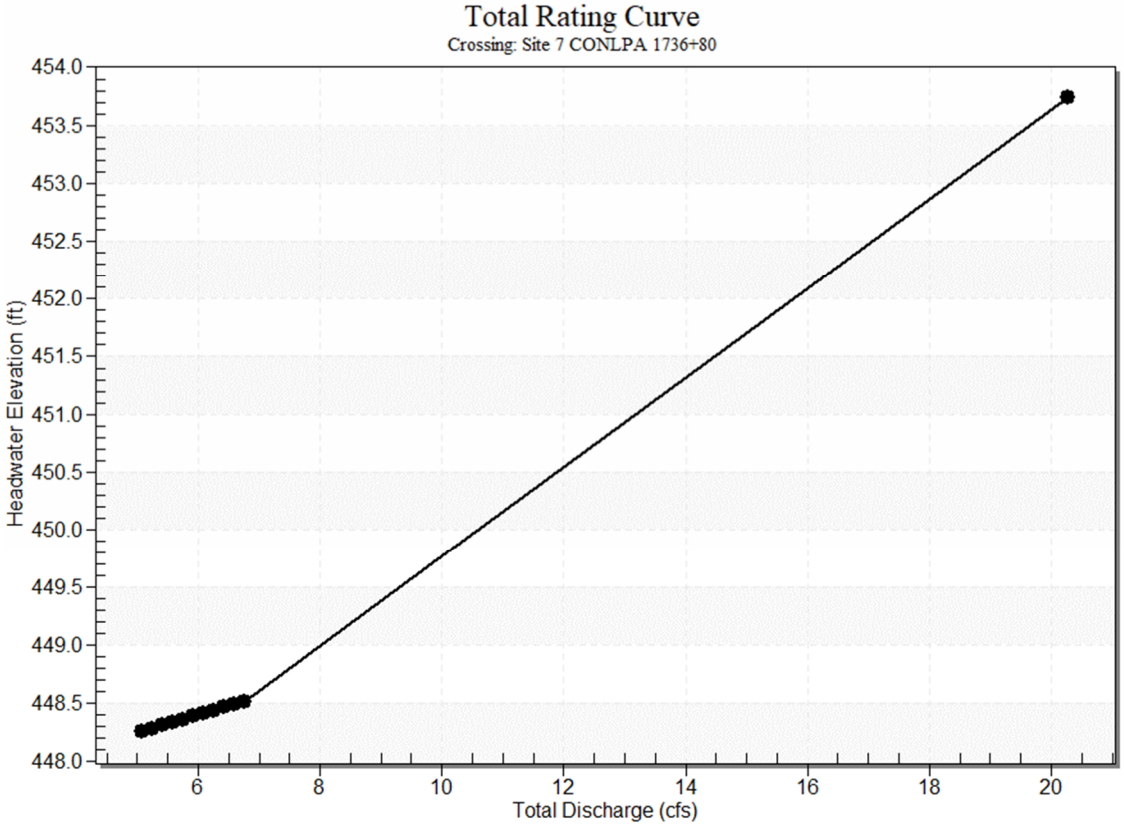
Design Flow: 5.07 cfs

Maximum Flow: 6.76 cfs

Table 17 - Summary of Culvert Flows at Crossing: Site 7 CONLPA 1736+80

Headwater Elevation (ft)	Total Discharge (cfs)	18" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
448.26	5.07	5.07	0.00	1
448.29	5.24	5.24	0.00	1
448.31	5.41	5.41	0.00	1
448.34	5.58	5.58	0.00	1
448.36	5.75	5.75	0.00	1
448.39	5.92	5.92	0.00	1
448.41	6.08	6.08	0.00	1
448.44	6.25	6.25	0.00	1
448.46	6.42	6.42	0.00	1
448.49	6.59	6.59	0.00	1
448.52	6.76	6.76	0.00	1
453.70	19.61	19.61	0.00	Overtopping

Rating Curve Plot for Crossing: Site 7 CONLPA 1736+80



Culvert Data: 18" RCP

Table 9 - Culvert Summary Table: 18" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
5.07 cfs	5.07 cfs	448.26	1.26	0.628	1-JS1t	0.75	0.87	1.15	1.15	3.49	1.92
5.24 cfs	5.24 cfs	448.29	1.29	0.668	1-JS1t	0.77	0.88	1.16	1.16	3.57	1.94
5.41 cfs	5.41 cfs	448.31	1.31	0.709	1-JS1t	0.78	0.90	1.18	1.18	3.64	1.96
5.58 cfs	5.58 cfs	448.34	1.34	0.750	1-JS1t	0.80	0.91	1.19	1.19	3.71	1.97
5.75 cfs	5.75 cfs	448.36	1.36	0.791	1-JS1t	0.81	0.92	1.20	1.20	3.78	1.99
5.92 cfs	5.92 cfs	448.39	1.39	0.834	1-JS1t	0.83	0.94	1.22	1.22	3.86	2.00

6.08 cfs	6.08 cfs	448.41	1.41	0.877	1-JS1t	0.84	0.95	1.23	1.23	3.93	2.01
6.25 cfs	6.25 cfs	448.44	1.44	0.920	1-JS1t	0.85	0.97	1.24	1.24	4.00	2.03
6.42 cfs	6.42 cfs	448.46	1.46	0.964	1-JS1t	0.87	0.98	1.25	1.25	4.07	2.04
6.59 cfs	6.59 cfs	448.49	1.49	1.009	1-JS1t	0.88	0.99	1.27	1.27	4.14	2.06
6.76 cfs	6.76 cfs	448.52	1.52	1.055	5-JS1t	0.90	1.01	1.28	1.28	4.21	2.07

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

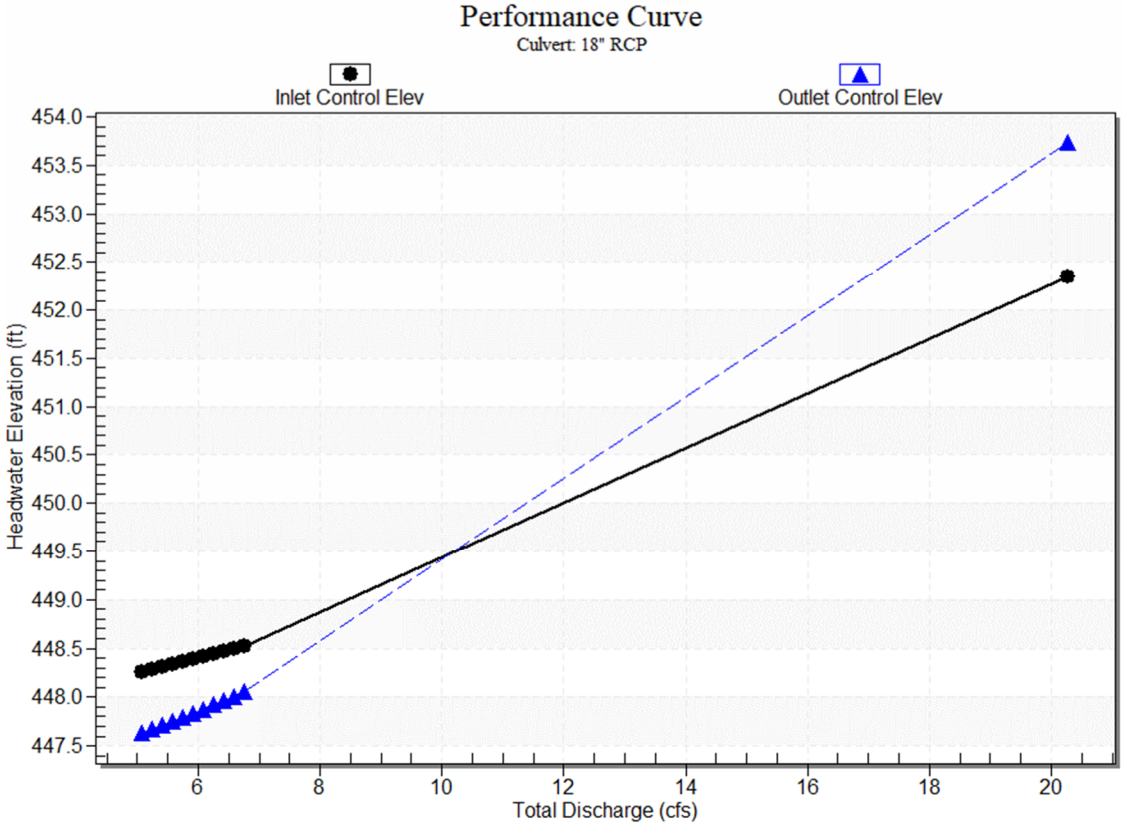
Inlet Elevation (invert): 447.00 ft,

Outlet Elevation (invert): 446.10 ft

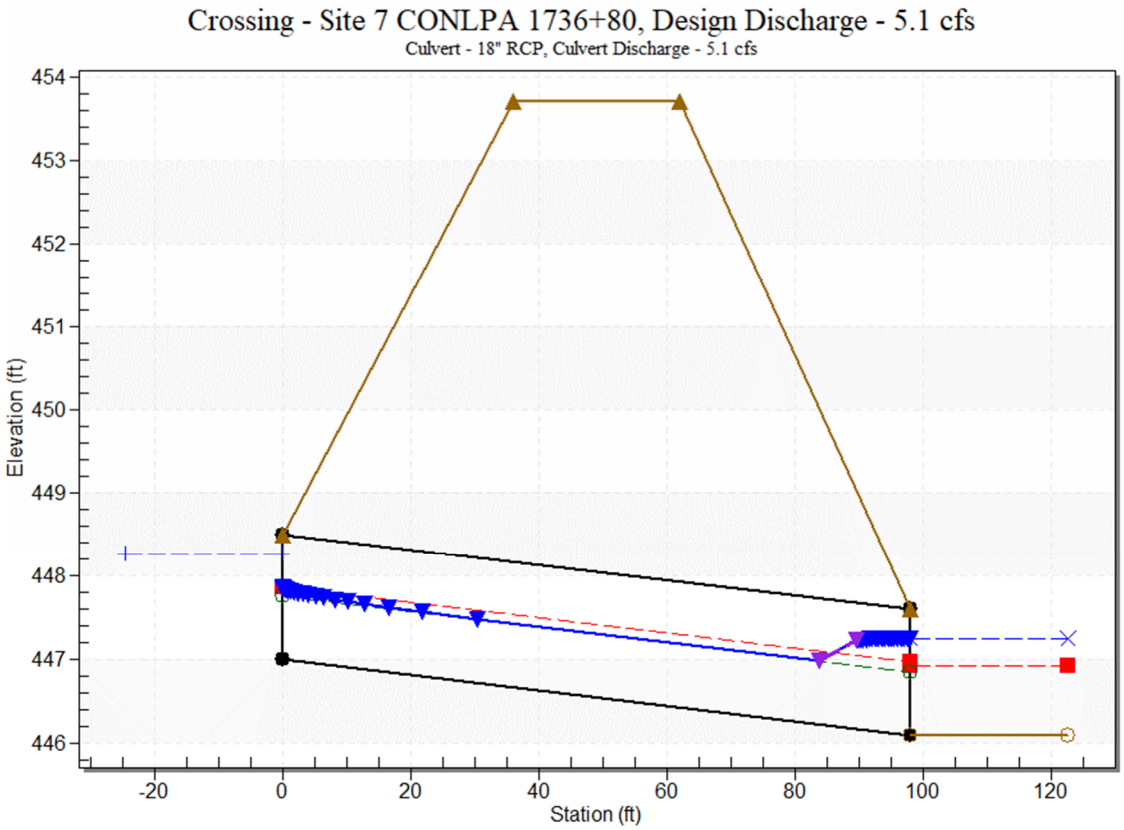
Culvert Length: 98.00 ft,

Culvert Slope: 0.0092

Culvert Performance Curve Plot: 18" RCP



Water Surface Profile Plot for Culvert: 18" RCP



Site Data - 18" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 447.00 ft

Outlet Station: 98.00 ft

Outlet Elevation: 446.10 ft

Number of Barrels: 1

Culvert Data Summary - 18" RCP

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1) (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 7 CONLPA 1736+80

Table 18 - Downstream Channel Rating Curve (Crossing: Site 7 CONLPA 1736+80)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
5.07	447.25	1.15	1.92	0.36	0.45
5.24	447.26	1.16	1.94	0.36	0.45
5.41	447.28	1.18	1.96	0.37	0.45
5.58	447.29	1.19	1.97	0.37	0.45
5.75	447.30	1.20	1.99	0.38	0.45
5.92	447.32	1.22	2.00	0.38	0.45
6.08	447.33	1.23	2.01	0.38	0.45
6.25	447.34	1.24	2.03	0.39	0.45
6.42	447.35	1.25	2.04	0.39	0.45
6.59	447.37	1.27	2.06	0.40	0.46
6.76	447.38	1.28	2.07	0.40	0.46

Tailwater Channel Data - Site 7 CONLPA 1736+80

Tailwater Channel Option: Triangular Channel

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

Channel Slope: 0.0050

Channel Manning's n: 0.0350

Channel Invert Elevation: 446.10 ft

Roadway Data for Crossing: Site 7 CONLPA 1736+80

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 26.00 ft

Crest Elevation: 453.70 ft

Roadway Surface: Paved

Roadway Top Width: 26.00 ft

Crossing Discharge Data

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

Minimum Flow: 11.00 cfs

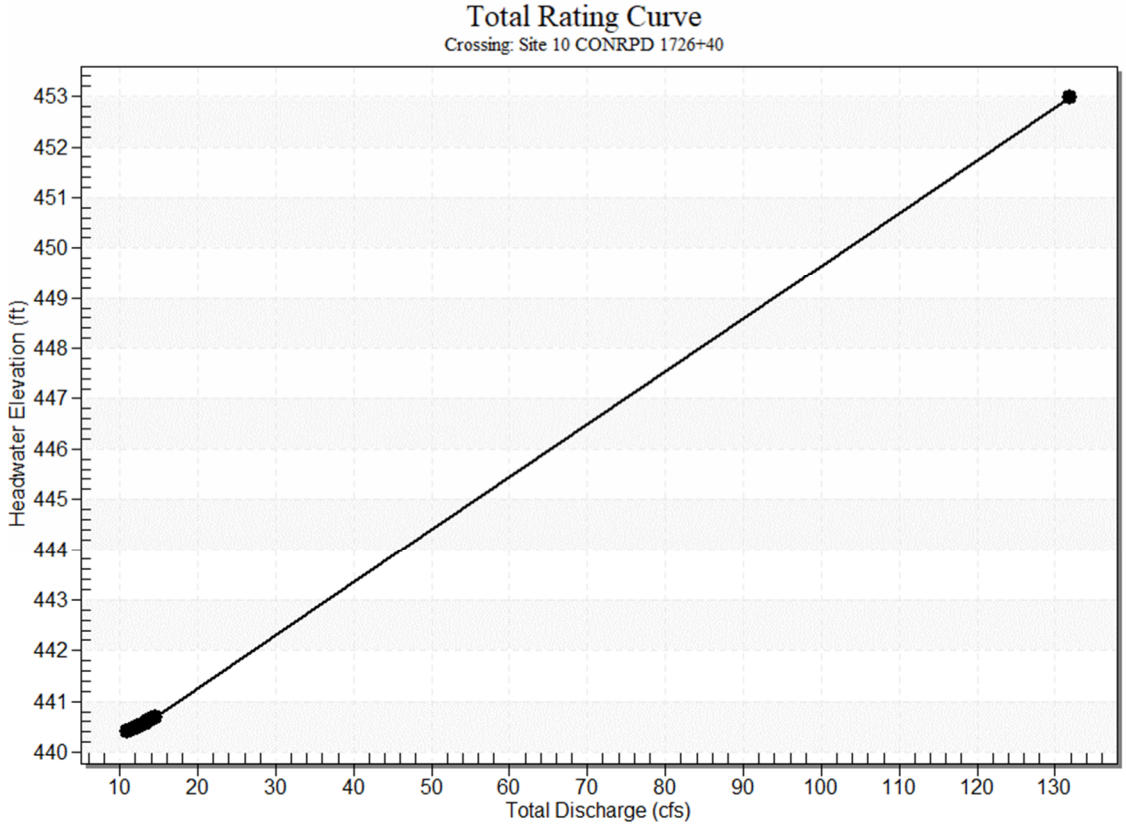
Design Flow: 11.00 cfs

Maximum Flow: 14.65 cfs

Table 19 - Summary of Culvert Flows at Crossing: Site 10 CONRPD 1726+40

Headwater Elevation (ft)	Total Discharge (cfs)	36" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
440.41	11.00	11.00	0.00	1
440.44	11.37	11.37	0.00	1
440.46	11.73	11.73	0.00	1
440.49	12.10	12.10	0.00	1
440.52	12.46	12.46	0.00	1
440.54	12.82	12.82	0.00	1
440.57	13.19	13.19	0.00	1
440.60	13.55	13.55	0.00	1
440.63	13.92	13.92	0.00	1
440.65	14.29	14.29	0.00	1
440.68	14.65	14.65	0.00	1
452.90	129.30	129.30	0.00	Overtopping

Rating Curve Plot for Crossing: Site 10 CONRPD 1726+40



Culvert Data: 36" RCP

Table 10 - Culvert Summary Table: 36" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
11.00 cfs	11.00 cfs	440.41	1.41	0.0*	1-S2n	0.70	1.05	0.70	1.10	8.82	4.57
11.37 cfs	11.37 cfs	440.44	1.44	0.0*	1-S2n	0.71	1.07	0.71	1.11	8.90	4.61
11.73 cfs	11.73 cfs	440.46	1.46	0.0*	1-S2n	0.72	1.09	0.72	1.12	8.99	4.65
12.10 cfs	12.10 cfs	440.49	1.49	0.0*	1-S2n	0.73	1.10	0.73	1.14	9.07	4.68
12.46 cfs	12.46 cfs	440.52	1.52	0.0*	1-S2n	0.74	1.12	0.75	1.15	8.94	4.72
12.82 cfs	12.82 cfs	440.54	1.54	0.0*	1-S2n	0.75	1.14	0.77	1.16	9.00	4.75

13.19 cfs	13.19 cfs	440.57	1.57	0.0*	1-S2n	0.76	1.15	0.78	1.17	9.08	4.79
13.55 cfs	13.55 cfs	440.60	1.60	0.0*	1-S2n	0.78	1.17	0.79	1.19	9.18	4.82
13.92 cfs	13.92 cfs	440.63	1.63	0.0*	1-S2n	0.79	1.19	0.80	1.20	9.20	4.85
14.29 cfs	14.29 cfs	440.65	1.65	0.0*	1-S2n	0.80	1.20	0.81	1.21	9.26	4.88
14.65 cfs	14.65 cfs	440.68	1.68	0.0*	1-S2n	0.81	1.22	0.82	1.22	9.35	4.91

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

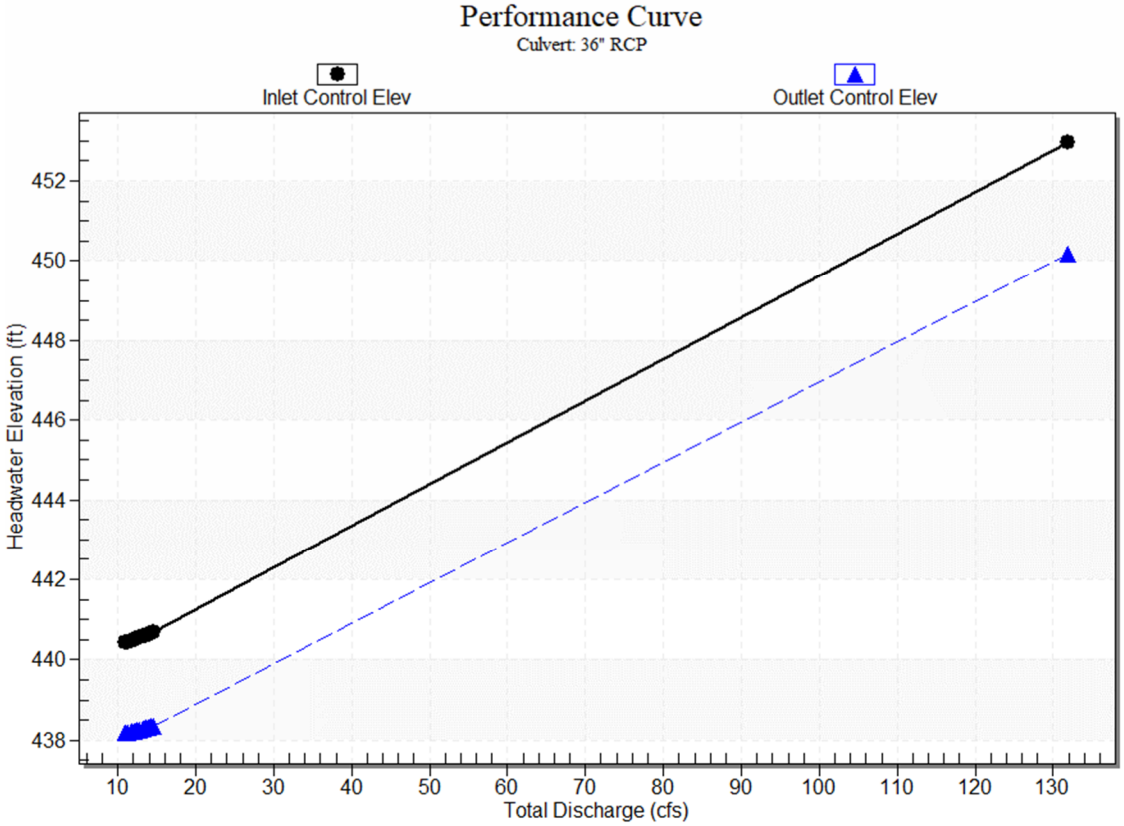
Inlet Elevation (invert): 439.00 ft,

Outlet Elevation (invert): 437.00 ft

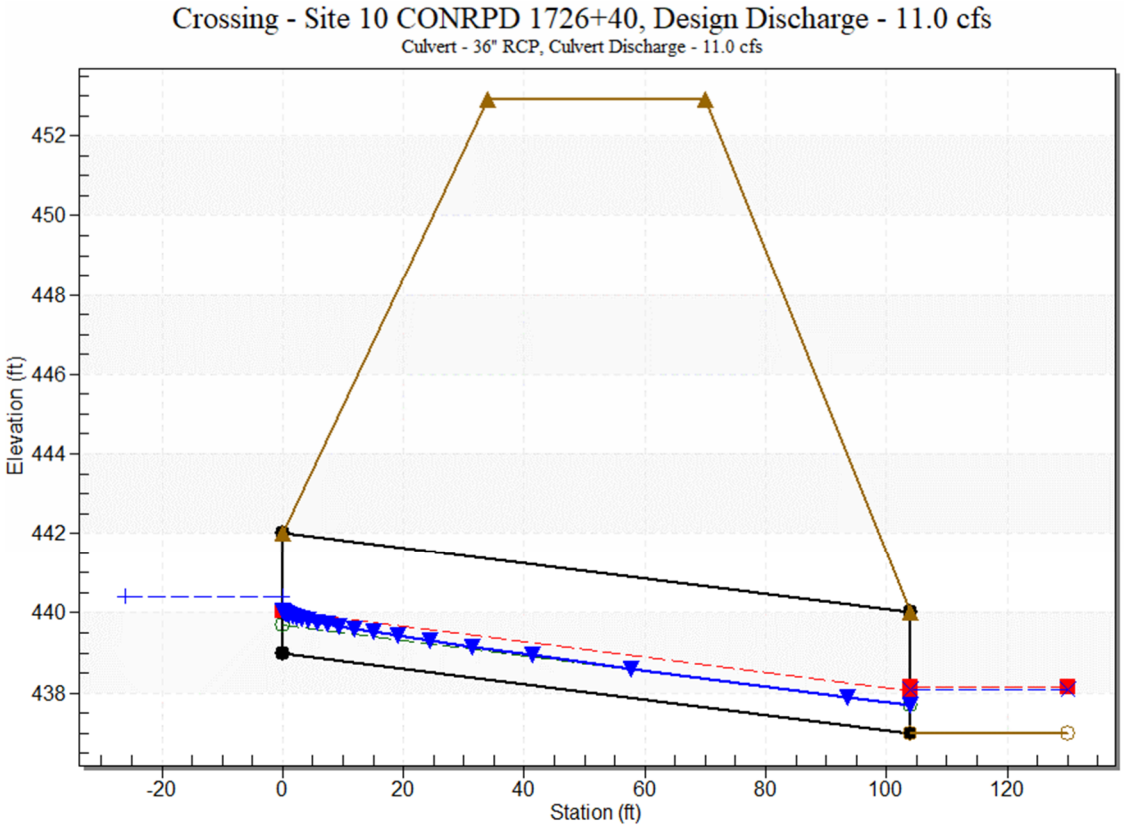
Culvert Length: 104.02 ft,

Culvert Slope: 0.0192

Culvert Performance Curve Plot: 36" RCP



Water Surface Profile Plot for Culvert: 36" RCP



Site Data - 36" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 439.00 ft

Outlet Station: 104.00 ft

Outlet Elevation: 437.00 ft

Number of Barrels: 1

Culvert Data Summary - 36" RCP

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1) (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 10 CONRPD 1726+40

Table 20 - Downstream Channel Rating Curve (Crossing: Site 10 CONRPD 1726+40)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
11.00	438.10	1.10	4.57	2.05	1.09
11.37	438.11	1.11	4.61	2.08	1.09
11.73	438.12	1.12	4.65	2.10	1.09
12.10	438.14	1.14	4.68	2.13	1.09
12.46	438.15	1.15	4.72	2.15	1.10
12.82	438.16	1.16	4.75	2.17	1.10
13.19	438.17	1.17	4.79	2.20	1.10
13.55	438.19	1.19	4.82	2.22	1.10
13.92	438.20	1.20	4.85	2.24	1.10
14.29	438.21	1.21	4.88	2.26	1.11
14.65	438.22	1.22	4.91	2.29	1.11

Tailwater Channel Data - Site 10 CONRPD 1726+40

Tailwater Channel Option: Triangular Channel

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

Channel Slope: 0.0300

Channel Manning's n: 0.0350

Channel Invert Elevation: 437.00 ft

Roadway Data for Crossing: Site 10 CONRPD 1726+40

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 36.00 ft

Crest Elevation: 452.90 ft

Roadway Surface: Paved

Roadway Top Width: 36.00 ft

Crossing Discharge Data

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

Minimum Flow: 10.46 cfs

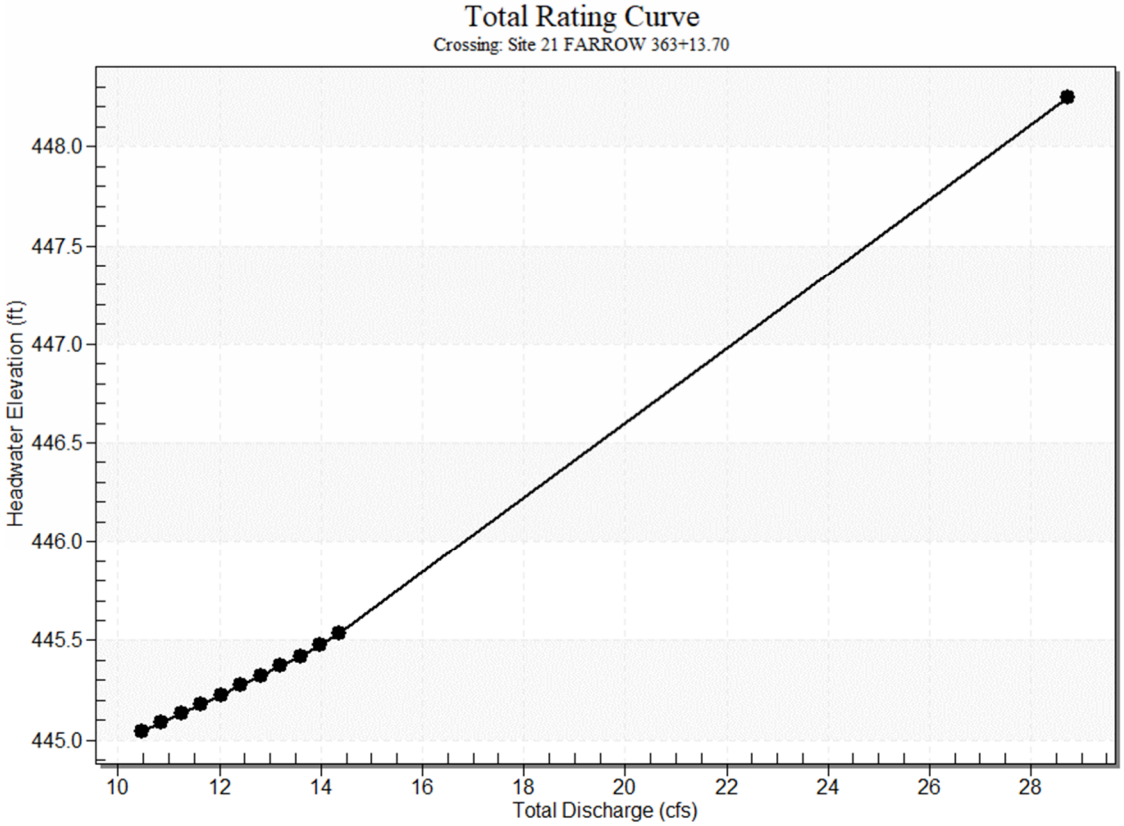
Design Flow: 10.46 cfs

Maximum Flow: 14.37 cfs

Table 21 - Summary of Culvert Flows at Crossing: Site 21 FARROW 363+13.70

Headwater Elevation (ft)	Total Discharge (cfs)	24" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
445.04	10.46	10.46	0.00	1
445.09	10.85	10.85	0.00	1
445.13	11.24	11.24	0.00	1
445.18	11.63	11.63	0.00	1
445.23	12.02	12.02	0.00	1
445.27	12.41	12.41	0.00	1
445.32	12.81	12.81	0.00	1
445.37	13.20	13.20	0.00	1
445.42	13.59	13.59	0.00	1
445.48	13.98	13.98	0.00	1
445.53	14.37	14.37	0.00	1
448.20	27.13	27.13	0.00	Overtopping

Rating Curve Plot for Crossing: Site 21 FARROW 363+13.70



Culvert Data: 24" RCP

Table 11 - Culvert Summary Table: 24" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10.46 cfs	10.46 cfs	445.04	1.69	1.845	3-M1t	1.41	1.16	1.66	1.66	3.76	1.90
10.85 cfs	10.85 cfs	445.09	1.73	1.889	3-M1t	1.45	1.18	1.68	1.68	3.85	1.92
11.24 cfs	11.24 cfs	445.13	1.77	1.934	3-M1t	1.49	1.20	1.70	1.70	3.94	1.94
11.63 cfs	11.63 cfs	445.18	1.81	1.980	3-M1t	1.54	1.22	1.72	1.72	4.04	1.96
12.02 cfs	12.02 cfs	445.23	1.84	2.026	7-M1t	1.59	1.25	1.75	1.75	4.13	1.97
12.41 cfs	12.41 cfs	445.27	1.88	2.073	7-M1t	1.64	1.27	1.77	1.77	4.23	1.99

12.81 cfs	12.81 cfs	445.32	1.92	2.121	7-M1t	1.70	1.29	1.79	1.79	4.32	2.00
13.20 cfs	13.20 cfs	445.37	1.96	2.171	7-M1t	1.79	1.31	1.81	1.81	4.42	2.02
13.59 cfs	13.59 cfs	445.42	2.00	2.222	3-M2t	2.00	1.33	1.83	1.83	4.51	2.03
13.98 cfs	13.98 cfs	445.48	2.04	2.275	3-M2t	2.00	1.35	1.85	1.85	4.61	2.05
14.37 cfs	14.37 cfs	445.53	2.08	2.333	3-M2t	2.00	1.37	1.87	1.87	4.71	2.06

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

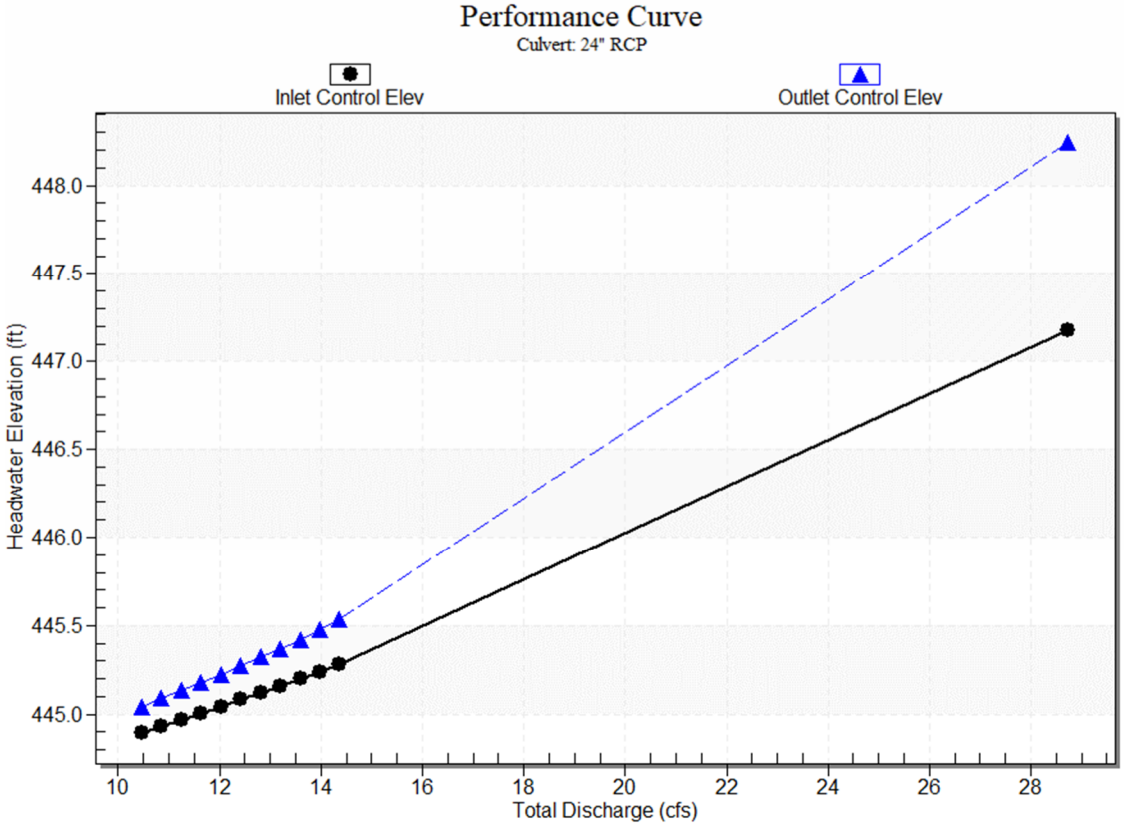
Inlet Elevation (invert): 443.20 ft,

Outlet Elevation (invert): 442.87 ft

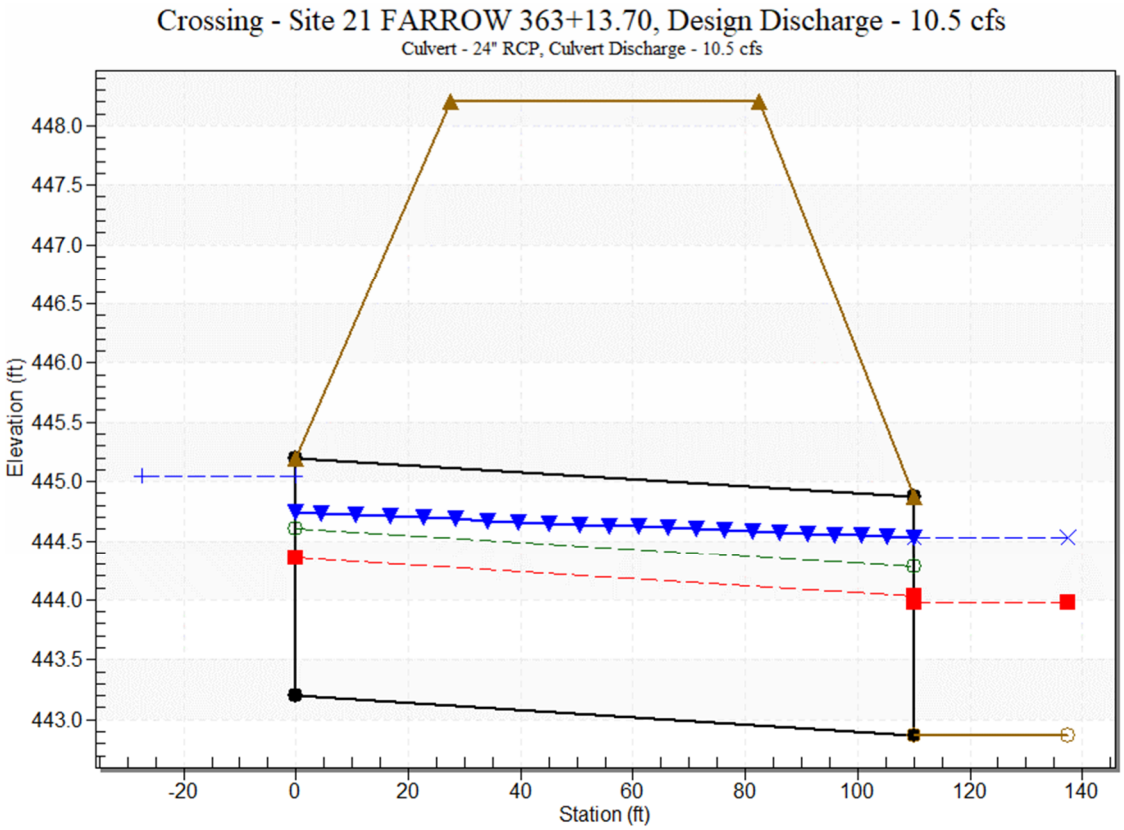
Culvert Length: 110.00 ft,

Culvert Slope: 0.0030

Culvert Performance Curve Plot: 24" RCP



Water Surface Profile Plot for Culvert: 24" RCP



Site Data - 24" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 443.20 ft

Outlet Station: 110.00 ft

Outlet Elevation: 442.87 ft

Number of Barrels: 1

Culvert Data Summary - 24" RCP

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1) (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 21 FARROW 363+13.70

Table 22 - Downstream Channel Rating Curve (Crossing: Site 21 FARROW 363+13.70)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
10.46	444.53	1.66	1.90	0.31	0.37
10.85	444.55	1.68	1.92	0.31	0.37
11.24	444.57	1.70	1.94	0.32	0.37
11.63	444.59	1.72	1.96	0.32	0.37
12.02	444.62	1.75	1.97	0.33	0.37
12.41	444.64	1.77	1.99	0.33	0.37
12.81	444.66	1.79	2.00	0.33	0.37
13.20	444.68	1.81	2.02	0.34	0.37
13.59	444.70	1.83	2.03	0.34	0.37
13.98	444.72	1.85	2.05	0.35	0.38
14.37	444.74	1.87	2.06	0.35	0.38

Tailwater Channel Data - Site 21 FARROW 363+13.70

Tailwater Channel Option: Triangular Channel

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

Channel Slope: 0.0030

Channel Manning's n: 0.0350

Channel Invert Elevation: 442.87 ft

Roadway Data for Crossing: Site 21 FARROW 363+13.70

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 55.00 ft

Crest Elevation: 448.20 ft

Roadway Surface: Paved

Roadway Top Width: 55.00 ft

Crossing Discharge Data

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

Minimum Flow: 42.09 cfs

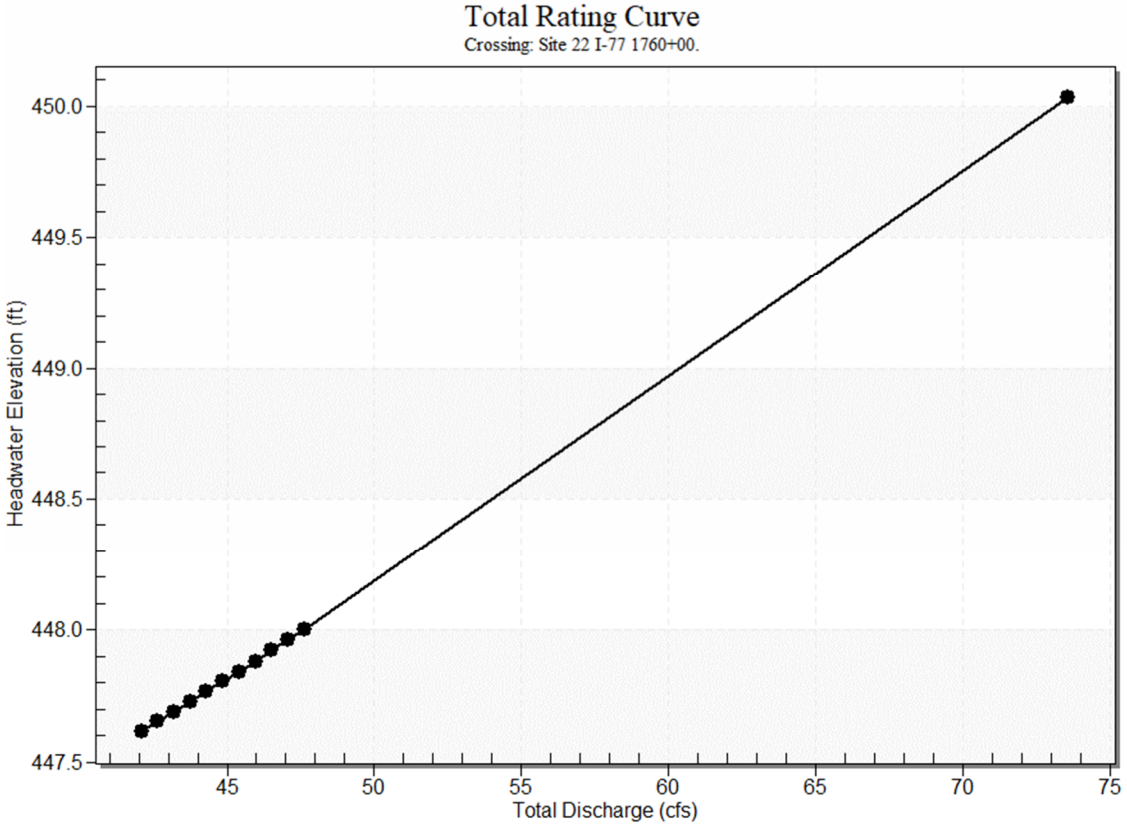
Design Flow: 42.09 cfs

Maximum Flow: 47.62 cfs

Table 23 - Summary of Culvert Flows at Crossing: Site 22 I-77 1760+00.

Headwater Elevation (ft)	Total Discharge (cfs)	36"RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
447.62	42.09	42.09	0.00	1
447.65	42.64	42.64	0.00	1
447.69	43.20	43.20	0.00	1
447.73	43.75	43.75	0.00	1
447.77	44.30	44.30	0.00	1
447.80	44.86	44.86	0.00	1
447.84	45.41	45.41	0.00	1
447.88	45.96	45.96	0.00	1
447.92	46.51	46.51	0.00	1
447.96	47.07	47.07	0.00	1
448.00	47.62	47.62	0.00	1
450.00	69.48	69.48	0.00	Overtopping

Rating Curve Plot for Crossing: Site 22 I-77 1760+00.



Culvert Data: 36"RCP

Table 12 - Culvert Summary Table: 36"RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
42.09 cfs	42.09 cfs	447.62	3.39	0.0*	5-S2n	1.21	2.11	1.21	2.00	15.80	5.24
42.64 cfs	42.64 cfs	447.65	3.42	0.0*	5-S2n	1.22	2.13	1.22	2.01	15.86	5.26
43.20 cfs	43.20 cfs	447.69	3.46	0.0*	5-S2n	1.23	2.14	1.23	2.02	15.91	5.27
43.75 cfs	43.75 cfs	447.73	3.50	0.0*	5-S2n	1.23	2.15	1.23	2.03	15.96	5.29
44.30 cfs	44.30 cfs	447.77	3.54	0.0*	5-S2n	1.24	2.17	1.24	2.04	16.02	5.31
44.86 cfs	44.86 cfs	447.80	3.57	0.0*	5-S2n	1.25	2.18	1.28	2.05	15.64	5.32

45.41 cfs	45.41 cfs	447.84	3.61	0.0*	5-S2n	1.26	2.20	1.28	2.06	15.76	5.34
45.96 cfs	45.96 cfs	447.88	3.65	0.0*	5-S2n	1.27	2.21	1.29	2.07	15.89	5.35
46.51 cfs	46.51 cfs	447.92	3.69	0.0*	5-S2n	1.28	2.22	1.29	2.08	16.02	5.37
47.07 cfs	47.07 cfs	447.96	3.73	0.0*	5-S2n	1.28	2.23	1.29	2.09	16.17	5.39
47.62 cfs	47.62 cfs	448.00	3.77	0.0*	5-S2n	1.29	2.25	1.29	2.10	16.33	5.40

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

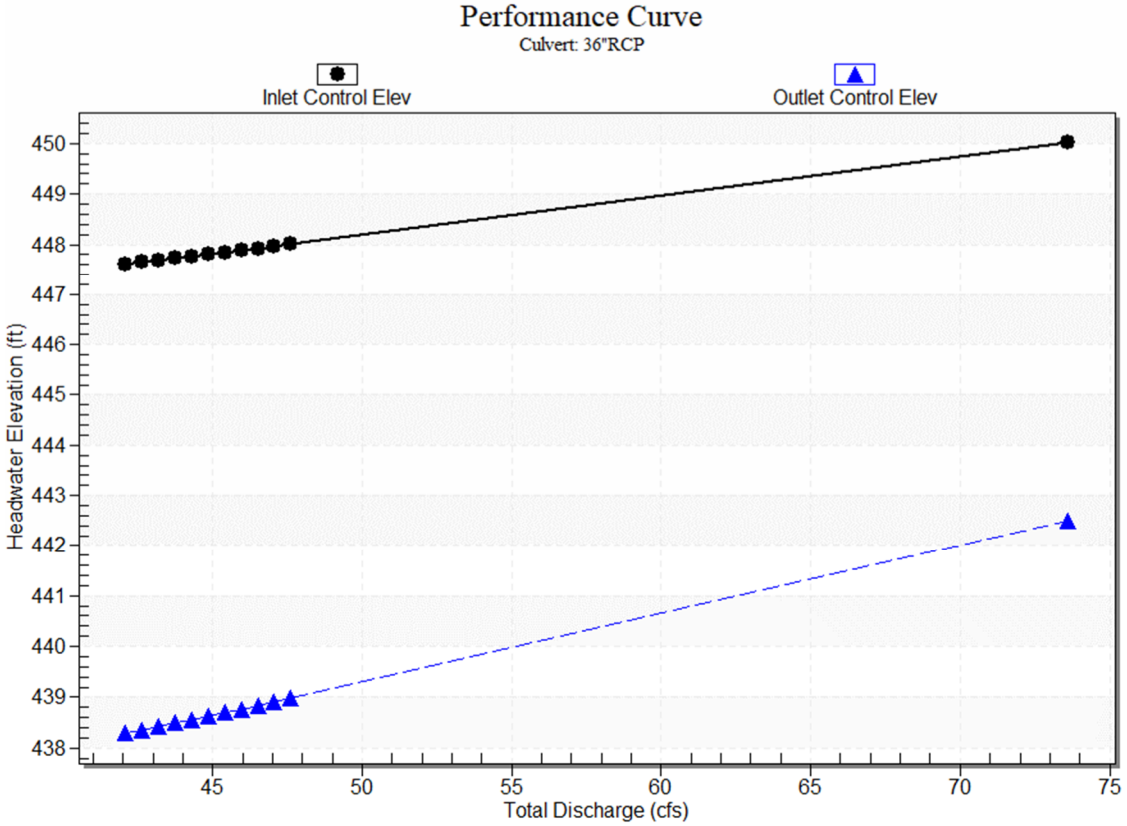
Inlet Elevation (invert): 444.23 ft,

Outlet Elevation (invert): 434.18 ft

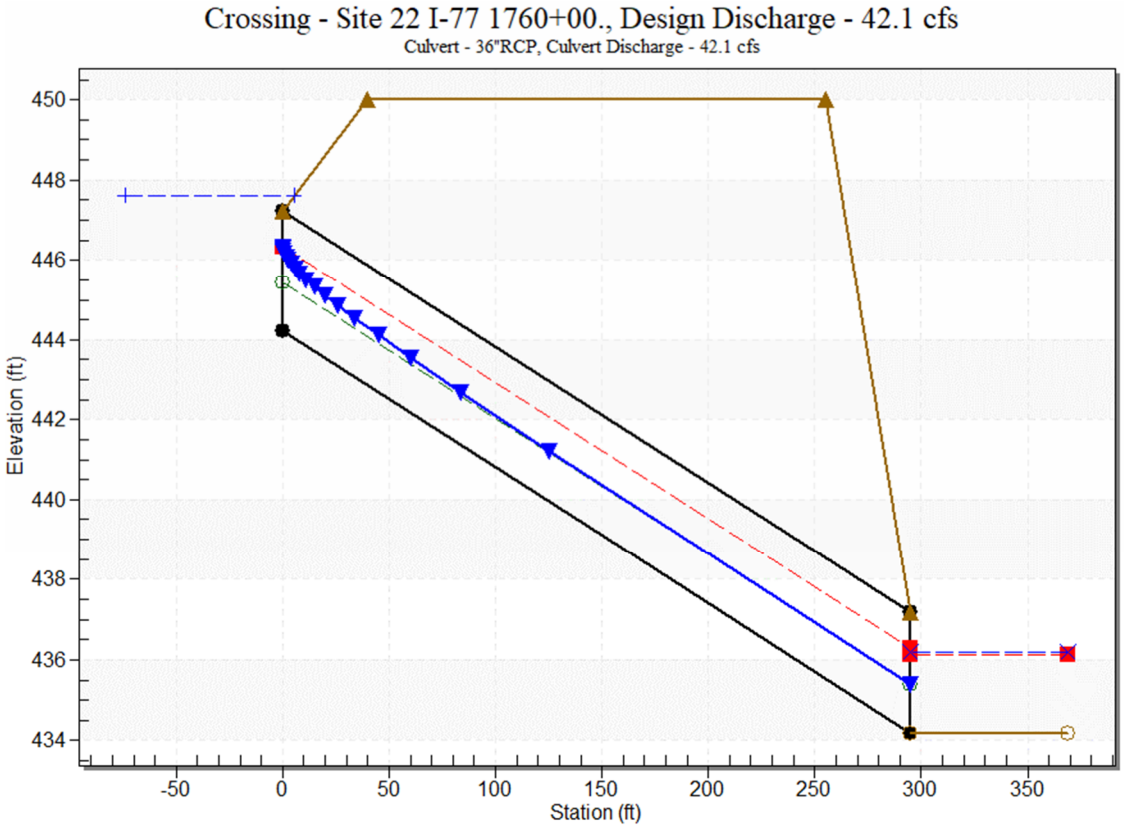
Culvert Length: 295.17 ft,

Culvert Slope: 0.0341

Culvert Performance Curve Plot: 36"RCP



Water Surface Profile Plot for Culvert: 36"RCP



Site Data - 36"RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 444.23 ft

Outlet Station: 295.00 ft

Outlet Elevation: 434.18 ft

Number of Barrels: 1

Culvert Data Summary - 36"RCP

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

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

Inlet Depression: None

Tailwater Data for Crossing: Site 22 I-77 1760+00.

Table 24 - Downstream Channel Rating Curve (Crossing: Site 22 I-77 1760+00.)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.09	436.18	2.00	5.24	2.88	0.92
42.64	436.19	2.01	5.26	2.89	0.92
43.20	436.20	2.02	5.27	2.90	0.92
43.75	436.21	2.03	5.29	2.92	0.92
44.30	436.22	2.04	5.31	2.93	0.93
44.86	436.23	2.05	5.32	2.95	0.93
45.41	436.24	2.06	5.34	2.96	0.93
45.96	436.25	2.07	5.35	2.97	0.93
46.51	436.26	2.08	5.37	2.99	0.93
47.07	436.27	2.09	5.39	3.00	0.93
47.62	436.28	2.10	5.40	3.01	0.93

Tailwater Channel Data - Site 22 I-77 1760+00.

Tailwater Channel Option: Triangular Channel

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

Channel Slope: 0.0230

Channel Manning's n: 0.0400

Channel Invert Elevation: 434.18 ft

Roadway Data for Crossing: Site 22 I-77 1760+00.

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 215.00 ft

Crest Elevation: 450.00 ft

Roadway Surface: Paved

Roadway Top Width: 215.00 ft

Crossing Discharge Data

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

Minimum Flow: 1.28 cfs

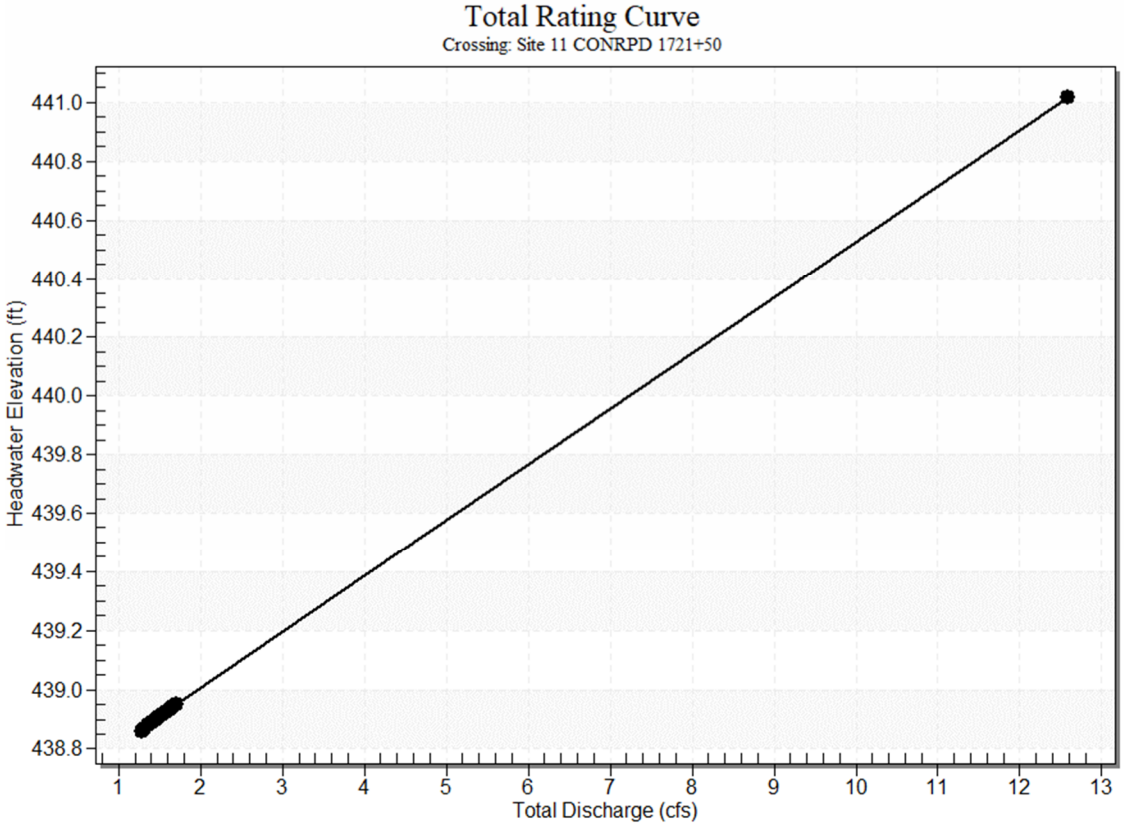
Design Flow: 1.28 cfs

Maximum Flow: 1.71 cfs

Table 25 - Summary of Culvert Flows at Crossing: Site 11 CONRPD 1721+50

Headwater Elevation (ft)	Total Discharge (cfs)	18" RCP Discharge (cfs)	Roadway Discharge (cfs)	Iterations
438.86	1.28	1.28	0.00	1
438.87	1.32	1.32	0.00	1
438.88	1.37	1.37	0.00	1
438.89	1.41	1.41	0.00	1
438.90	1.45	1.45	0.00	1
438.91	1.50	1.50	0.00	1
438.92	1.54	1.54	0.00	1
438.93	1.58	1.58	0.00	1
438.93	1.62	1.62	0.00	1
438.94	1.67	1.67	0.00	1
438.95	1.71	1.71	0.00	1
441.00	12.30	12.30	0.00	Overtopping

Rating Curve Plot for Crossing: Site 11 CONRPD 1721+50



Culvert Data: 18" RCP

Table 13 - Culvert Summary Table: 18" RCP

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.28 cfs	1.28 cfs	438.86	0.56	0.0*	1-S2n	0.26	0.42	0.26	0.52	6.25	2.36
1.32 cfs	1.32 cfs	438.87	0.57	0.0*	1-S2n	0.26	0.43	0.26	0.53	6.31	2.38
1.37 cfs	1.37 cfs	438.88	0.58	0.0*	1-S2n	0.27	0.44	0.27	0.53	6.37	2.40
1.41 cfs	1.41 cfs	438.89	0.59	0.0*	1-S2n	0.27	0.44	0.27	0.54	6.43	2.42
1.45 cfs	1.45 cfs	438.90	0.60	0.0*	1-S2n	0.28	0.45	0.28	0.55	6.49	2.44
1.50 cfs	1.50 cfs	438.91	0.61	0.0*	1-S2n	0.28	0.46	0.28	0.55	6.55	2.45

1.54 cfs	1.54 cfs	438.92	0.62	0.0*	1-S2n	0.28	0.47	0.29	0.56	6.56	2.47
1.58 cfs	1.58 cfs	438.93	0.63	0.0*	1-S2n	0.29	0.47	0.29	0.56	6.66	2.49
1.62 cfs	1.62 cfs	438.93	0.63	0.0*	1-S2n	0.29	0.48	0.29	0.57	6.71	2.51
1.67 cfs	1.67 cfs	438.94	0.64	0.0*	1-S2n	0.30	0.49	0.30	0.57	6.76	2.52
1.71 cfs	1.71 cfs	438.95	0.65	0.0*	1-S2n	0.30	0.49	0.30	0.58	6.81	2.54

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

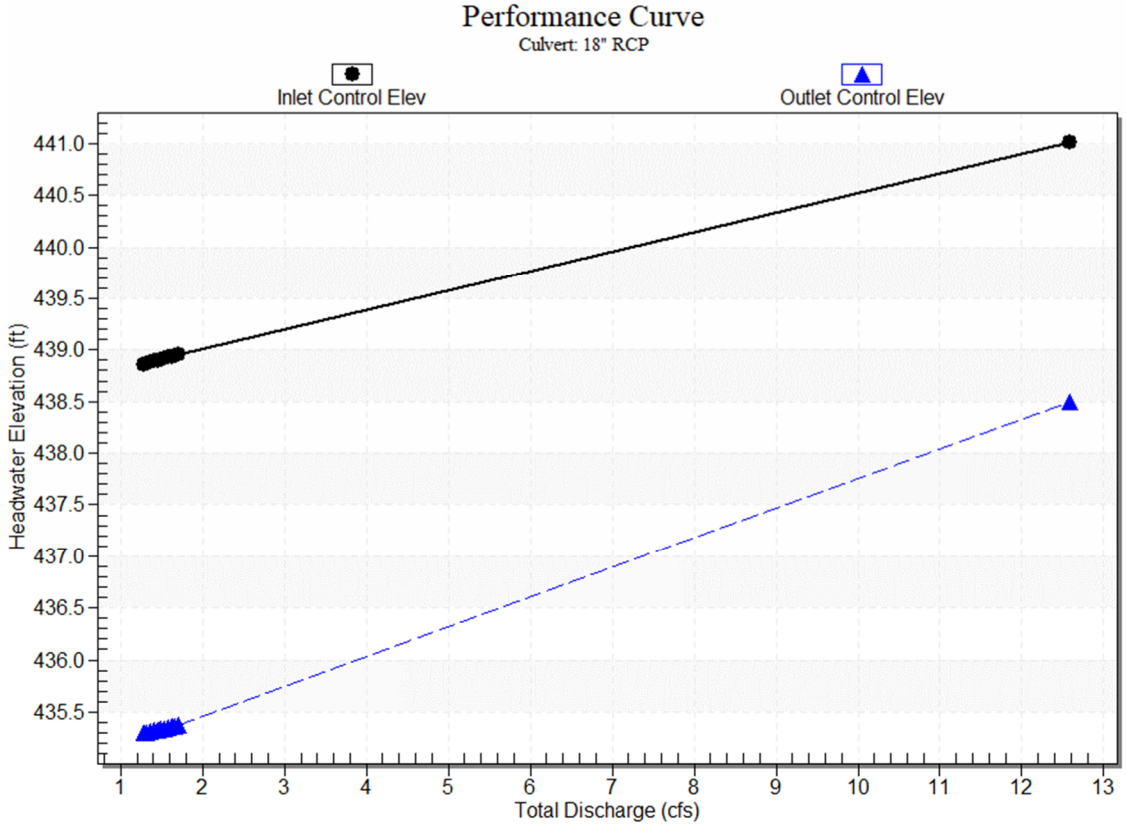
Inlet Elevation (invert): 438.30 ft,

Outlet Elevation (invert): 434.75 ft

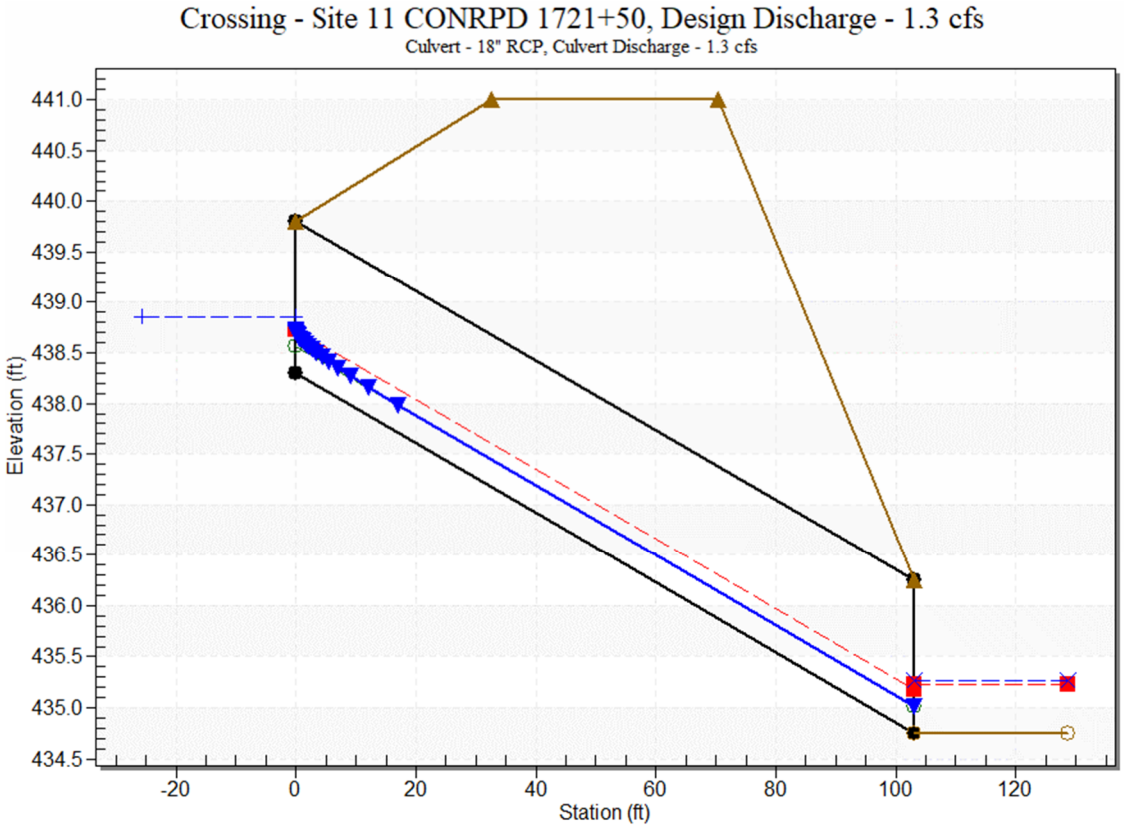
Culvert Length: 103.06 ft,

Culvert Slope: 0.0345

Culvert Performance Curve Plot: 18" RCP



Water Surface Profile Plot for Culvert: 18" RCP



Site Data - 18" RCP

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 438.30 ft

Outlet Station: 103.00 ft

Outlet Elevation: 434.75 ft

Number of Barrels: 1

Culvert Data Summary - 18" RCP

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0130

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1) (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: Site 11 CONRPD 1721+50

Table 26 - Downstream Channel Rating Curve (Crossing: Site 11 CONRPD 1721+50)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
1.28	435.27	0.52	2.36	0.70	0.82
1.32	435.28	0.53	2.38	0.71	0.82
1.37	435.28	0.53	2.40	0.72	0.82
1.41	435.29	0.54	2.42	0.73	0.82
1.45	435.30	0.55	2.44	0.74	0.82
1.50	435.30	0.55	2.45	0.74	0.82
1.54	435.31	0.56	2.47	0.75	0.83
1.58	435.31	0.56	2.49	0.76	0.83
1.62	435.32	0.57	2.51	0.77	0.83
1.67	435.32	0.57	2.52	0.77	0.83
1.71	435.33	0.58	2.54	0.78	0.83

Tailwater Channel Data - Site 11 CONRPD 1721+50

Tailwater Channel Option: Triangular Channel

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

Channel Slope: 0.0216

Channel Manning's n: 0.0350

Channel Invert Elevation: 434.75 ft

Roadway Data for Crossing: Site 11 CONRPD 1721+50

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 38.00 ft

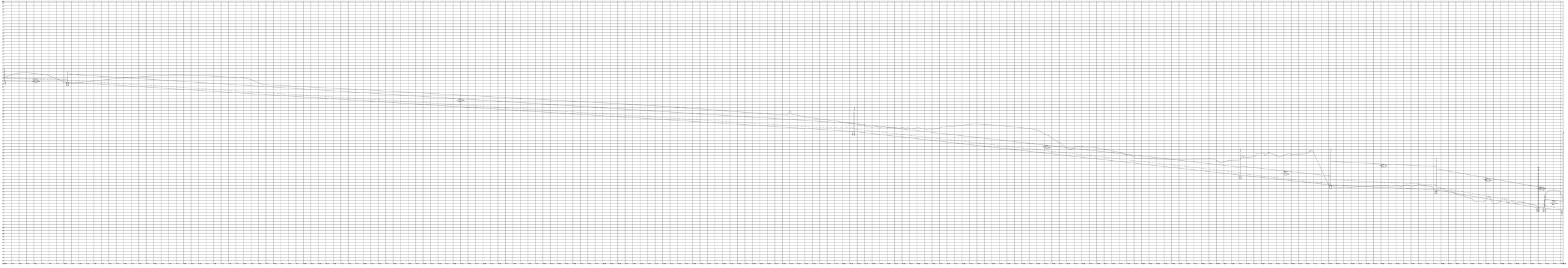
Crest Elevation: 441.00 ft

Roadway Surface: Paved

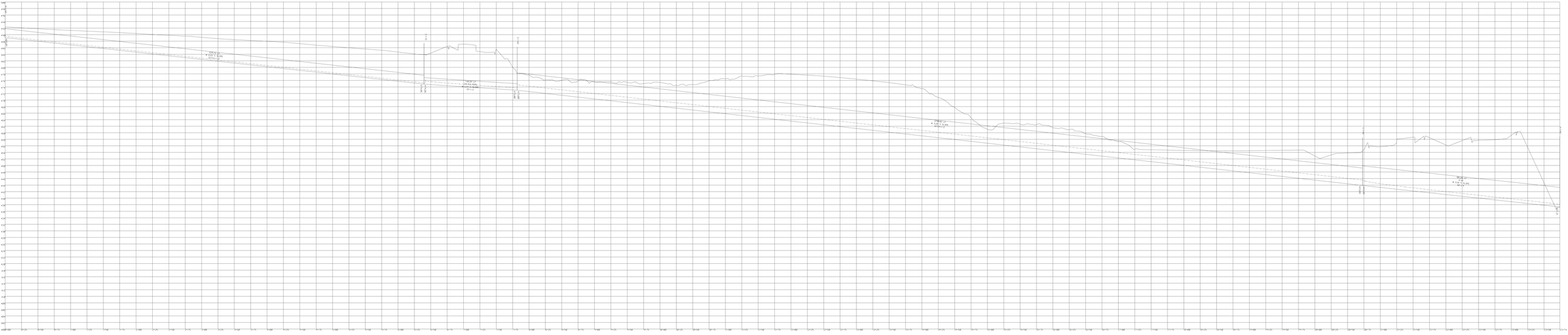
Roadway Top Width: 38.00 ft

Appendix B.9: Drainage Profiles

Pro-1-1



Pro-1-2



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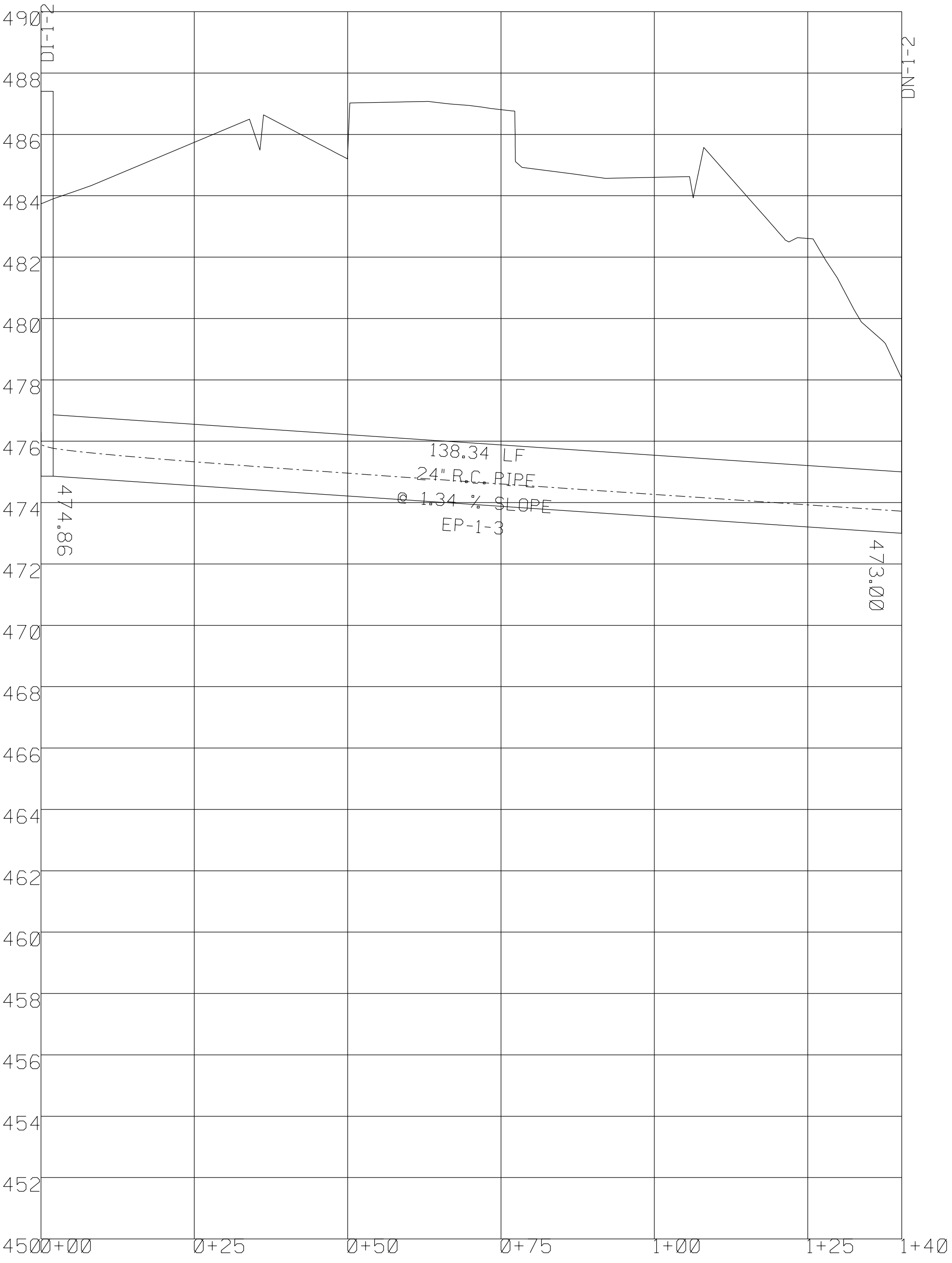
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DN-1-2
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466
464
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456
454
452
450
474.86
138.34 LF
24" R.C. PIPE
@ 1.34 % SLOPE
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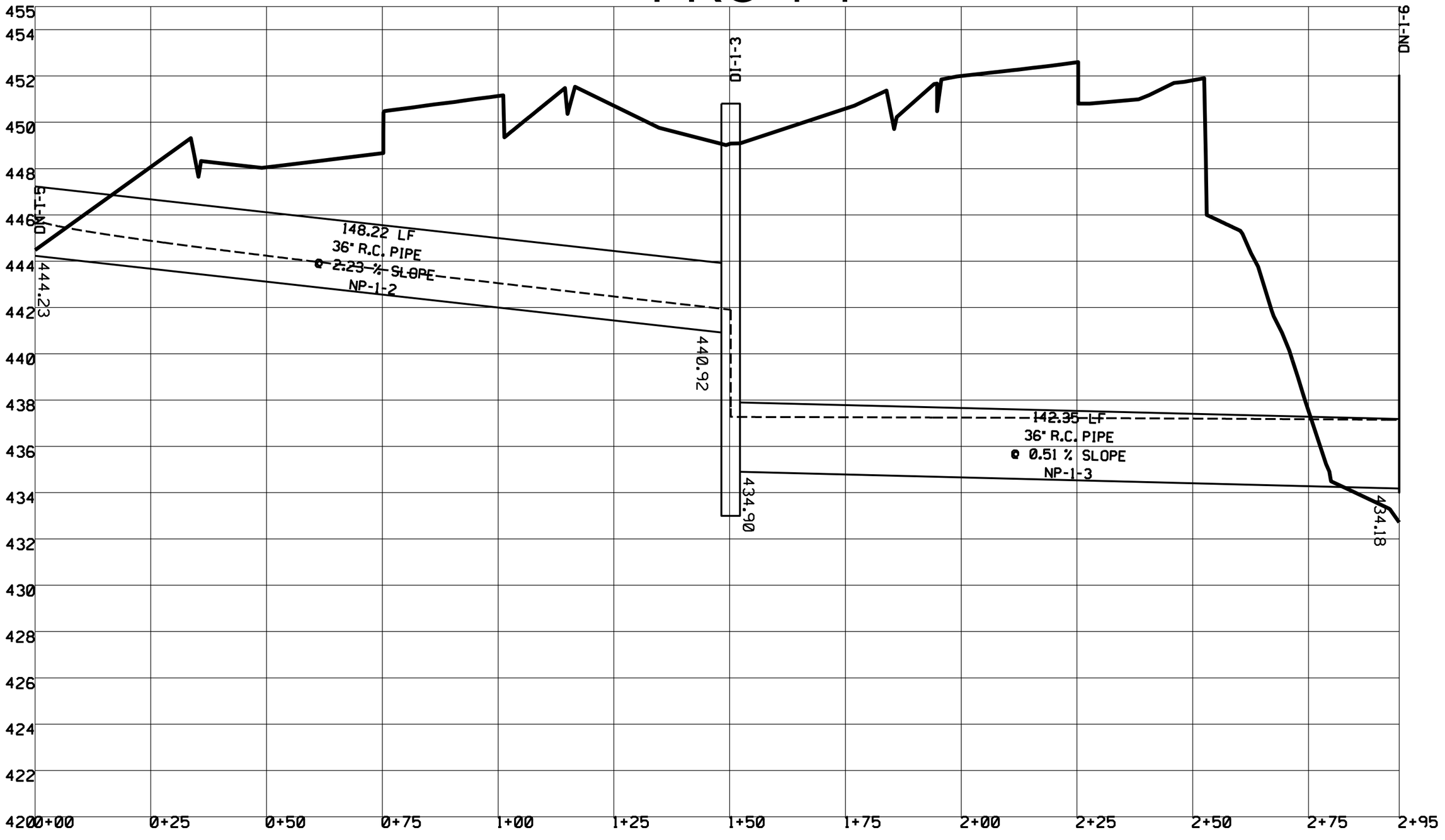
473.00
0+00
0+25
0+50
0+75
1+00
1+25
1+40

PRO-1-4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0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
2+95
DN-1-5
444.23
148.22 LF
36" R.C. PIPE
@ 2.23 % SLOPE
NP-1-2
DI-1-3
440.92
434.90
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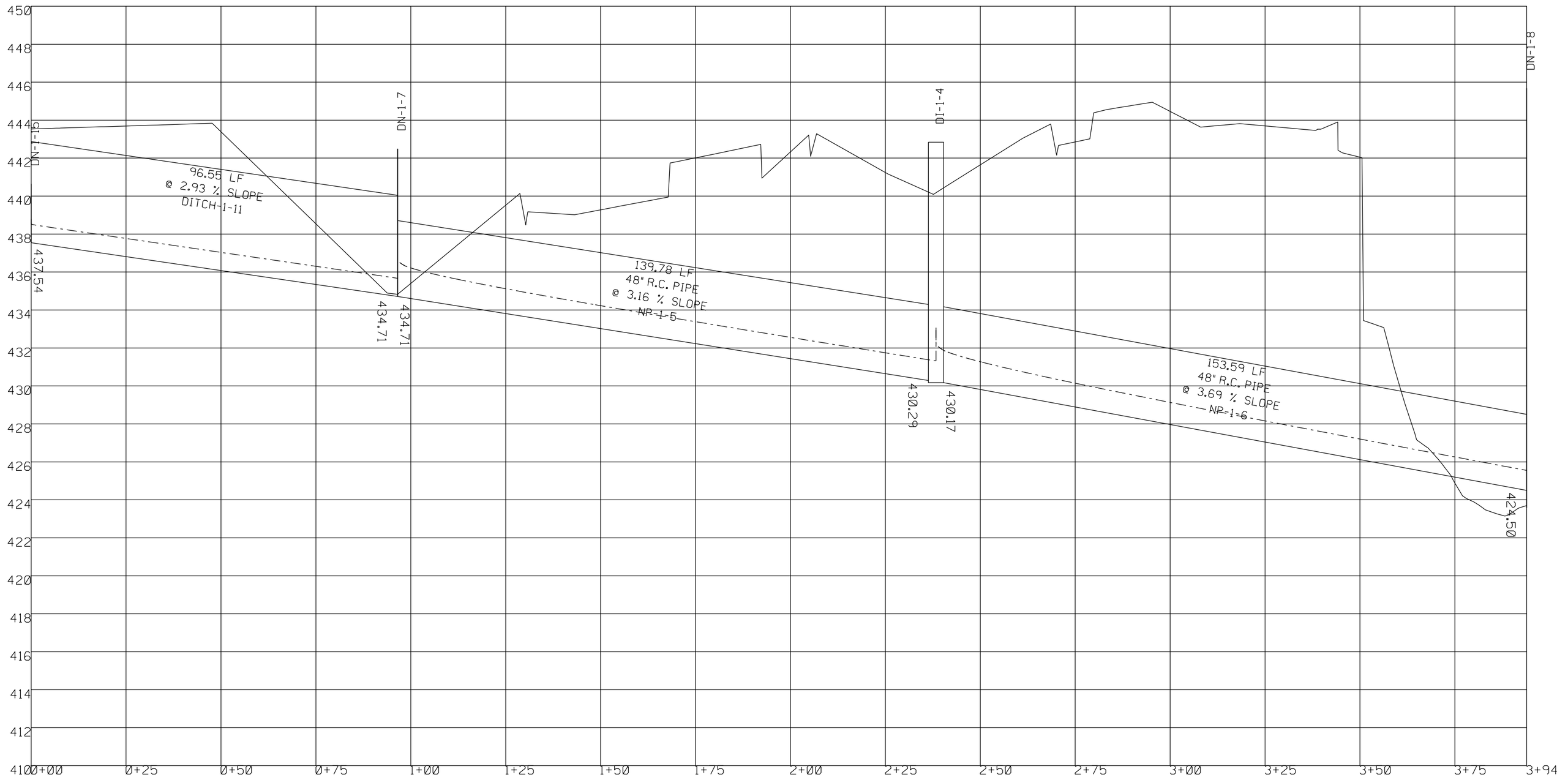
36" R.C. PIPE
@ 0.51 % SLOPE
NP-1-3
DN-1-6
434.18

Pro-1-5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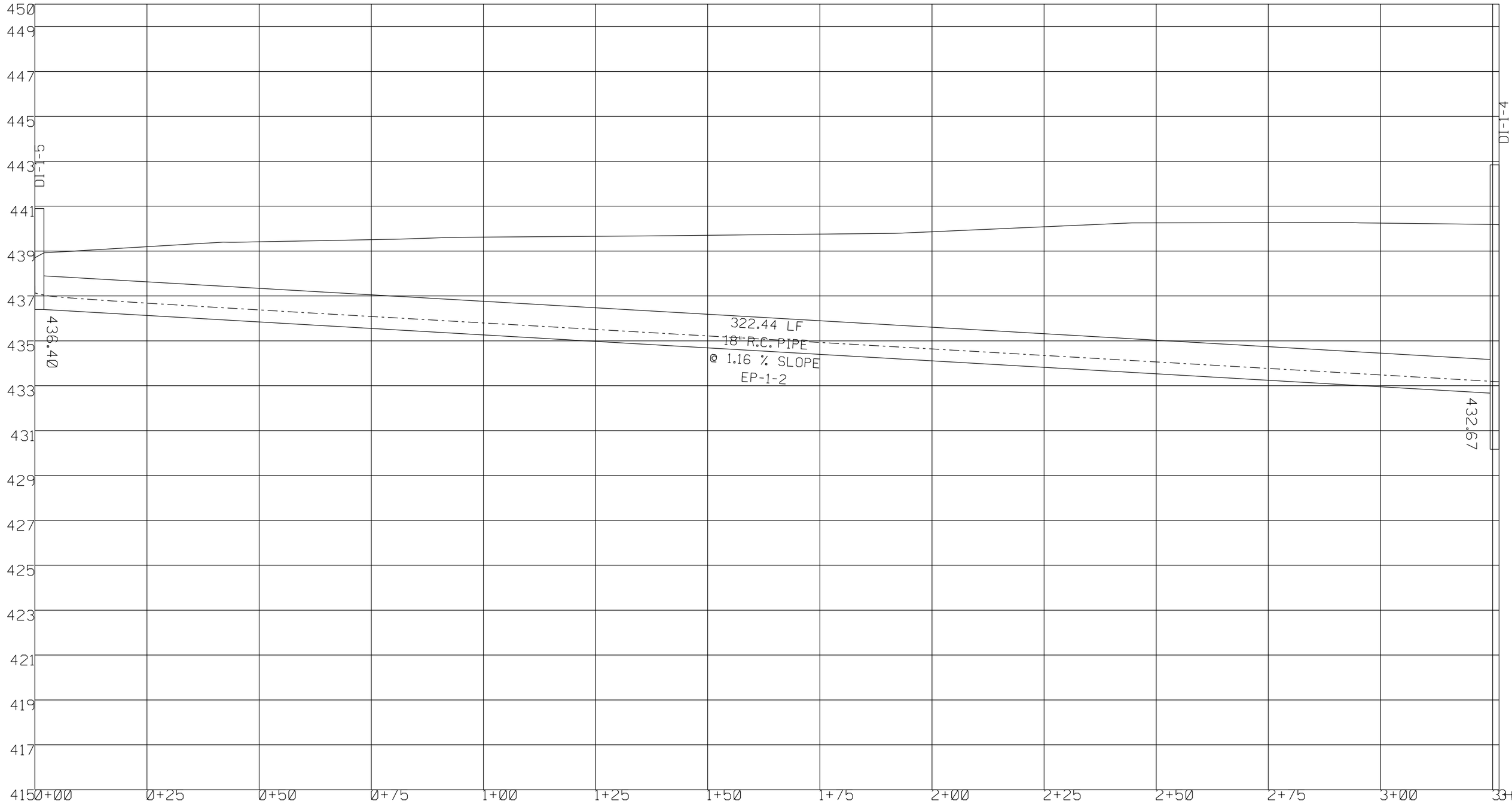
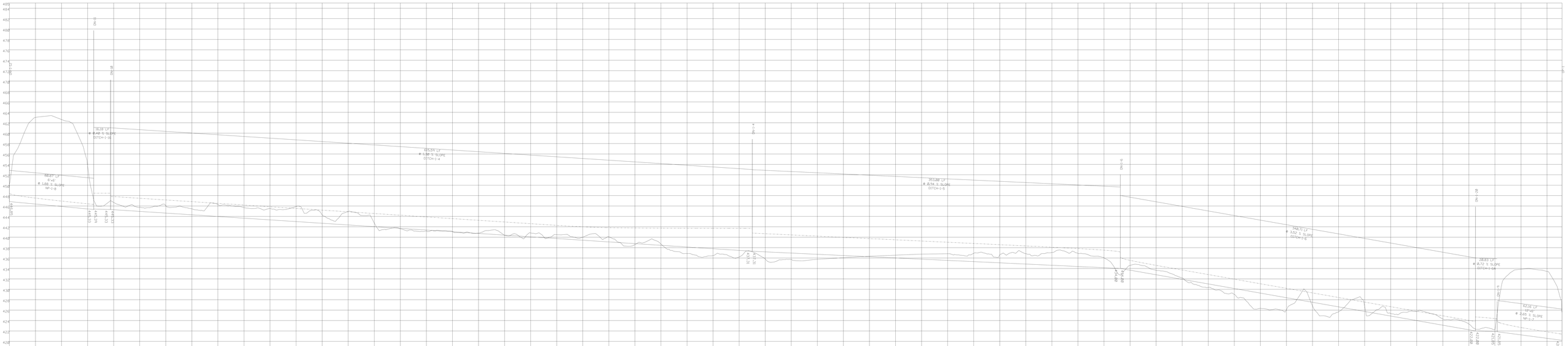
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+75
3+94
DI-1-5
DI-1-7
DI-1-10
DI-1-8
437.54
434.71
434.71
430.29
430.17
424.50
96.55 LF
@ 2.93 % SLOPE
DITCH-1-11
139.78 LF
48" R.C. PIPE
@ 3.16 % SLOPE
NP-1-5
153.59 LF
48" R.C. PIPE
@ 3.69 % SLOPE
NP-1-6

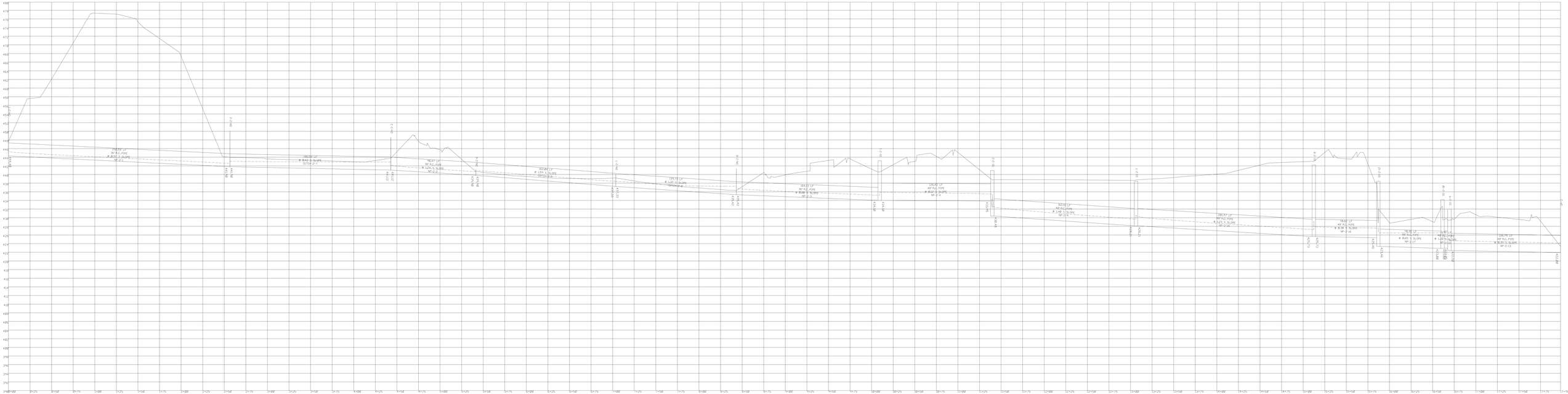
Pro-1-7


450
449
447
445
443
441
439
437
435
433
431
429
427
425
423
421
419
417
415
DI-1-5
436.40
322.44 LF
18" R.C. PIPE
@ 1.16 % SLOPE
EP-1-2
DI-1-4
432.67
0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25

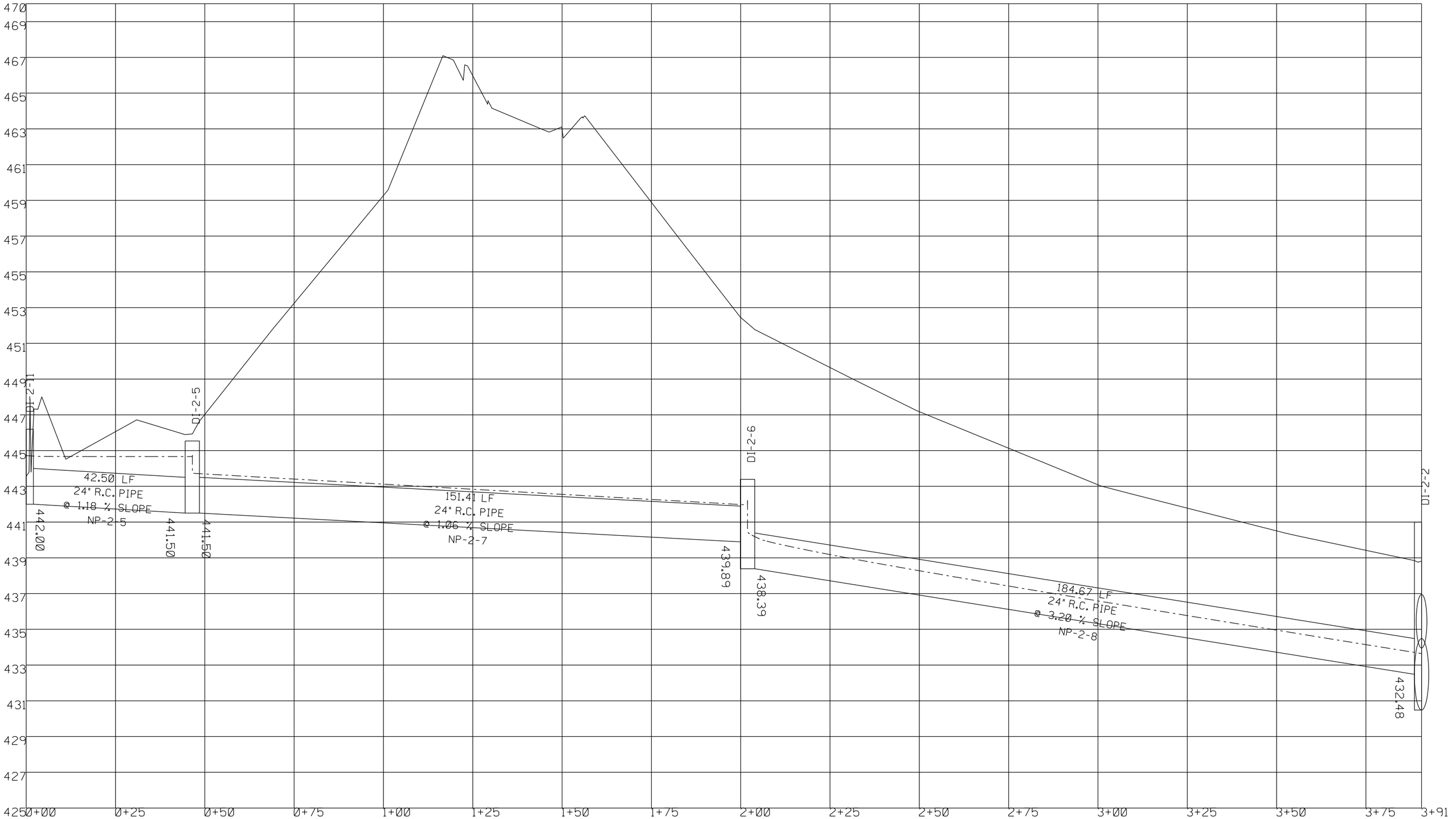
Pro-1-4


CH-10
CH-9
CH-8
CH-7
CH-6
CH-5
CH-4
CH-3
CH-2
CH-1
DITCH-1-10
DITCH-1-9
DITCH-1-8
DITCH-1-7
DITCH-1-6
DITCH-1-5
DITCH-1-4
DITCH-1-3
DITCH-1-2
DITCH-1-1
NP-1-8
NP-1-7
NP-1-6
NP-1-5
NP-1-4
NP-1-3
NP-1-2
NP-1-1

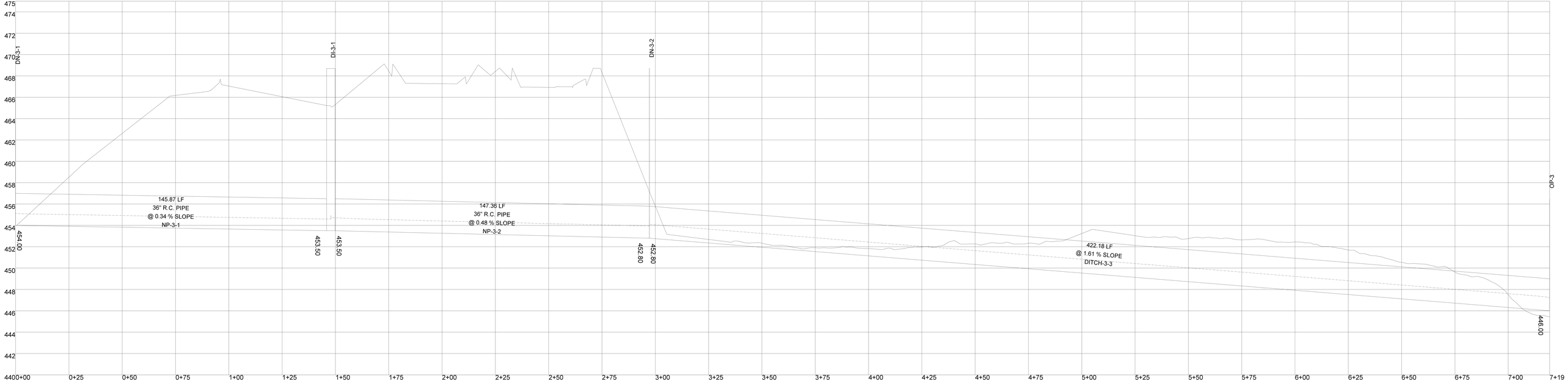
Pro-2-1

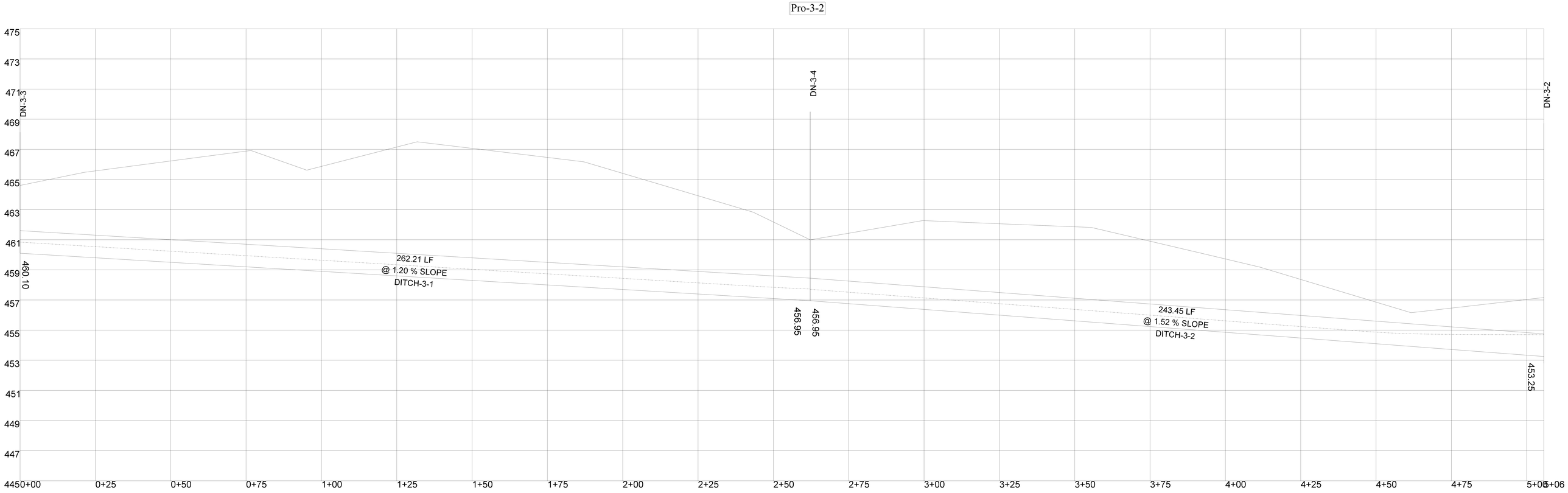

250.54' LF
30" R.C. PIPE
@ 0.25 % SLOPE
NP-2-1
180.56' LF
@ 0.45 % SLOPE
CUT=2.7'
16.43' LF
30" R.C. PIPE
@ 1.24 % SLOPE
NP-2-2
122.39' LF
@ 1.55 % SLOPE
CUT=2.9'
126.73' LF
@ 1.31 % SLOPE
PIPE CHANGE
104.23' LF
30" R.C. PIPE
@ 10.88 % SLOPE
NP-2-3
126.06' LF
48" R.C. PIPE
@ 20.21 % SLOPE
NP-1-4
62.03' LF
48" R.C. PIPE
@ 1.48 % SLOPE
NP-2-5
126.31' LF
48" R.C. PIPE
@ 1.73 % SLOPE
NP-2-6
16.43' LF
48" R.C. PIPE
@ 16.58 % SLOPE
NP-2-16
15.43' LF
48" R.C. PIPE
@ 8.45 % SLOPE
NP-2-17
24" R.C. PIPE
@ 1.24 % SLOPE
NP-2-18
126.79' LF
30" R.C. PIPE
@ 10.87 % SLOPE
NP-2-13

Pro-2-2

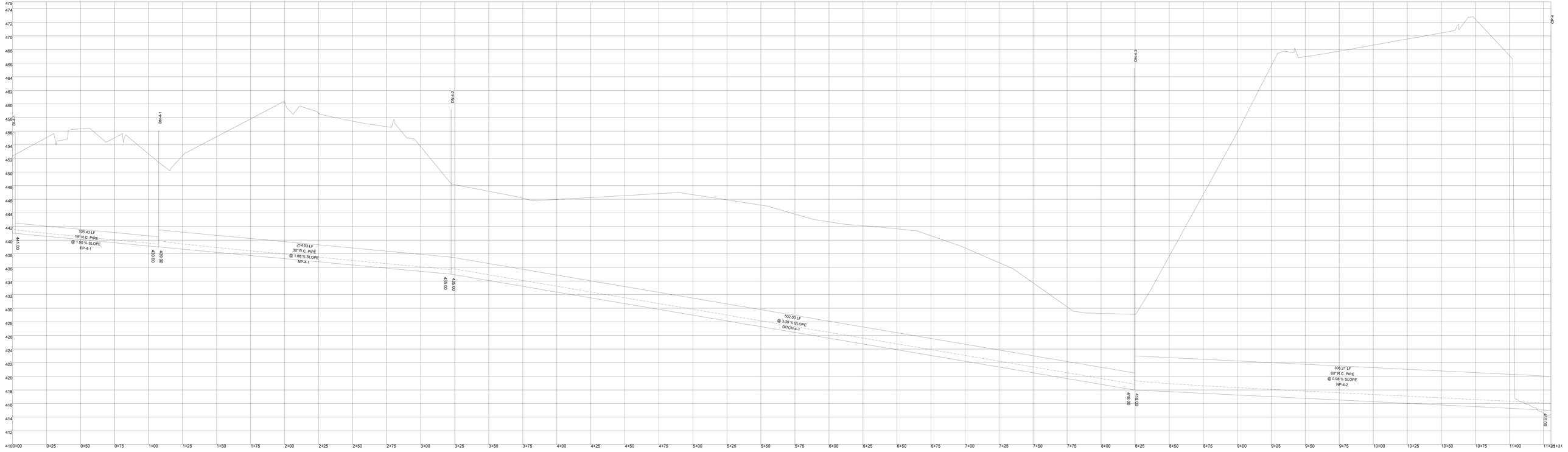

470
469
467
465
463
461
459
457
455
453
451
449
447
445
443
441
439
437
435
433
431
429
427
425
0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+75
3+91
DI-2-11
DI-2-10
DI-2-9
DI-2-8
442.00
441.50
441.50
439.89
438.39
432.48
42.50 LF
24" R.C. PIPE
@ 1.18 % SLOPE
NP-2-5
151.41 LF
24" R.C. PIPE
@ 1.06 % SLOPE
NP-2-7
184.67 LF
24" R.C. PIPE
@ 3.20 % SLOPE
NP-2-8

Pro-3-1

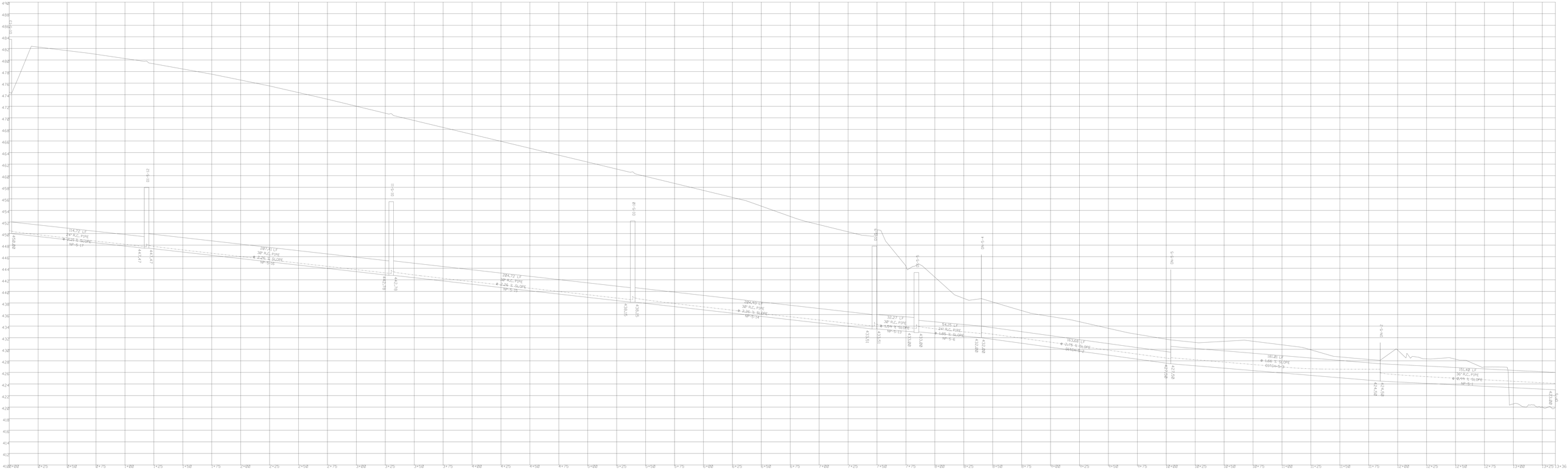

475
474
472
470
468
466
464
462
460
458
456
454
452
450
448
446
444
442
DN-3-1
DI-3-1
DN-3-2
145.87 LF
36" R.C. PIPE
@ 0.34 % SLOPE
NP-3-1
147.36 LF
36" R.C. PIPE
@ 0.48 % SLOPE
NP-3-2
422.18 LF
@ 1.61 % SLOPE
DITCH-3-3
454.00
453.50
453.50
452.80
452.80
448.00
3+40
4400+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+75
4+00
4+25
4+50
4+75
5+00
5+25
5+50
5+75
6+00
6+25
6+50
6+75
7+00
7+19


Pro-3-2
475
473
471
469
467
465
463
461
459
457
455
453
451
449
447
DN-3-3
DN-3-4
DN-3-2
460.10
262.21 LF
@ 1.20 % SLOPE
DITCH-3-1
456.95
456.95
243.45 LF
@ 1.52 % SLOPE
DITCH-3-2
453.25
4450+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+75
4+00
4+25
4+50
4+75
5+00
5+06

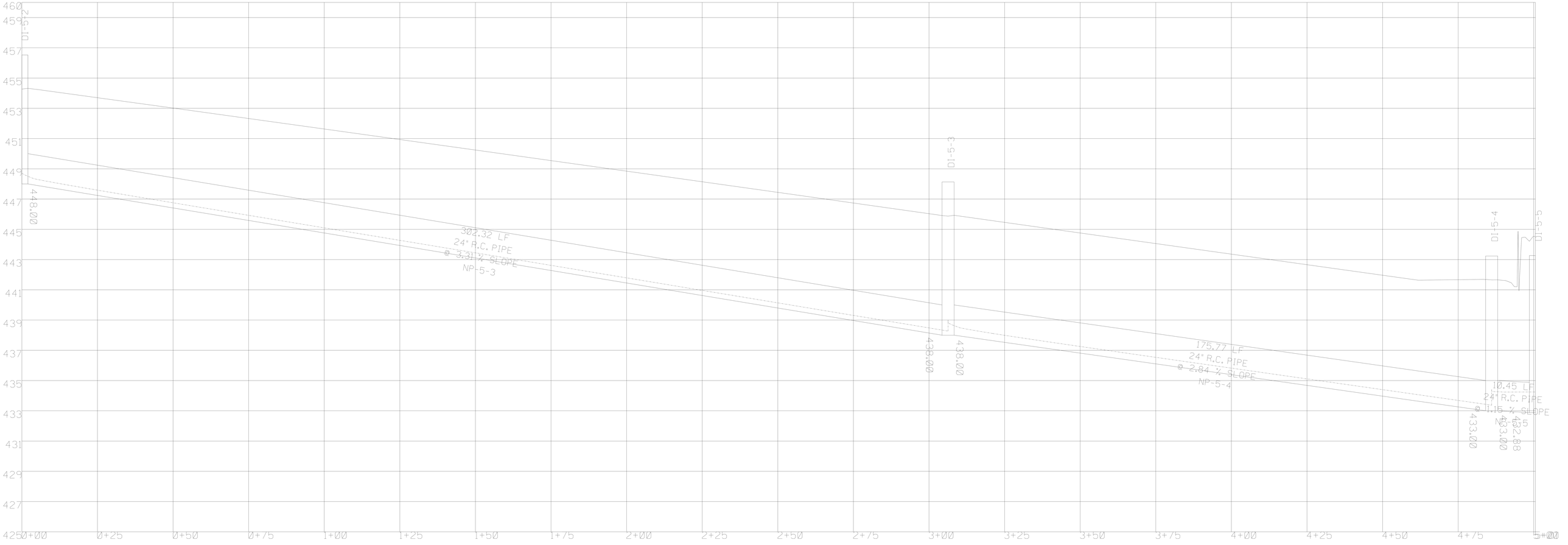
Pro-4-1


DN-1
DN-4-1
DN-4-2
DN-4-3
OP-4
441.00
439.00
439.00
435.00
419.00
419.00
415.00
105.43 LF
15" R.C. PIPE
@ 1.90 % SLOPE
EP-4-1
214.93 LF
30" R.C. PIPE
@ 7.88 % SLOPE
NP-4-1
502.00 LF
@ 3.39 % SLOPE
DITCH-4-1
306.21 LF
60" R.C. PIPE
@ 0.98 % SLOPE
NP-4-2
475
474
472
470
468
466
464
462
460
458
456
454
452
450
448
446
444
442
440
438
436
434
432
430
428
426
424
422
420
418
416
414
412
410
0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+75
4+00
4+25
4+50
4+75
5+00
5+25
5+50
5+75
6+00
6+25
6+50
6+75
7+00
7+25
7+50
7+75
8+00
8+25
8+50
8+75
9+00
9+25
9+50
9+75
10+00
10+25
10+50
10+75
11+00
11+25
11+31

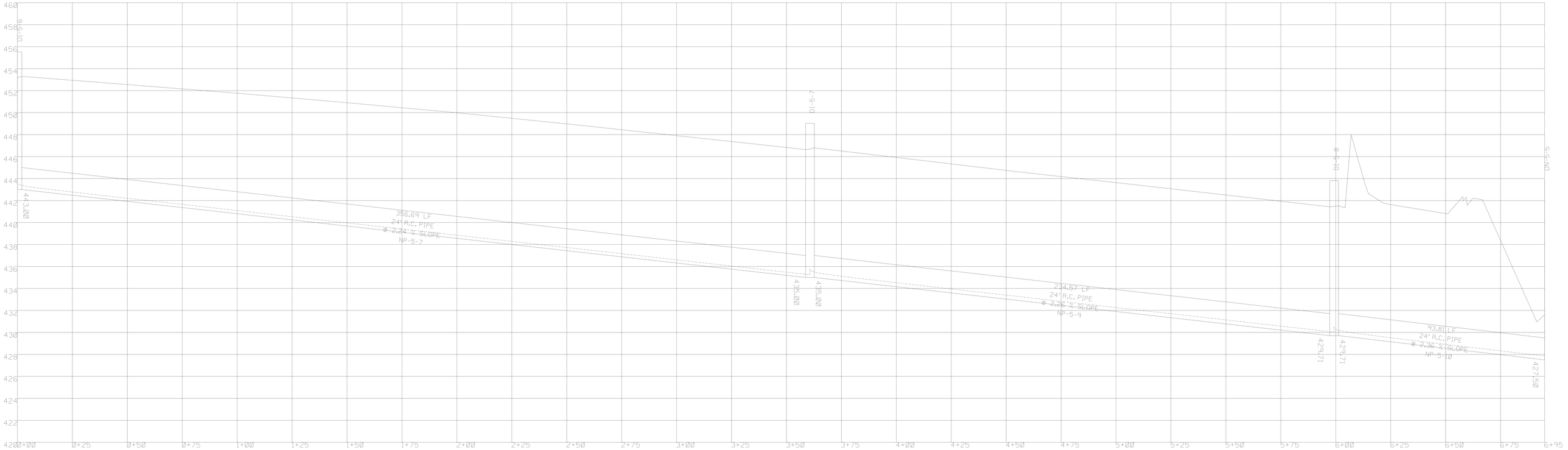
Pro-5-1


114.72 LF
24" R.C. PIPE
0.71 % SLOPE
N= 0.17
207.41 LF
30" R.C. PIPE
2.26 % SLOPE
N= 0.16
284.72 LF
30" R.C. PIPE
2.26 % SLOPE
N= 0.16
284.63 LF
30" R.C. PIPE
2.26 % SLOPE
N= 0.16
32.27 LF
30" R.C. PIPE
1.59 % SLOPE
N= 0.12
54.16 LF
24" R.C. PIPE
1.85 % SLOPE
N= 0.16
163.68 LF
0.76 % SLOPE
181.81 LF
1.66 % SLOPE
151.48 LF
30" R.C. PIPE
0.99 % SLOPE
N= 0.1
22'-5"D
11'-5"D
8'-5"D
5'-5"D
5'-5"D
5

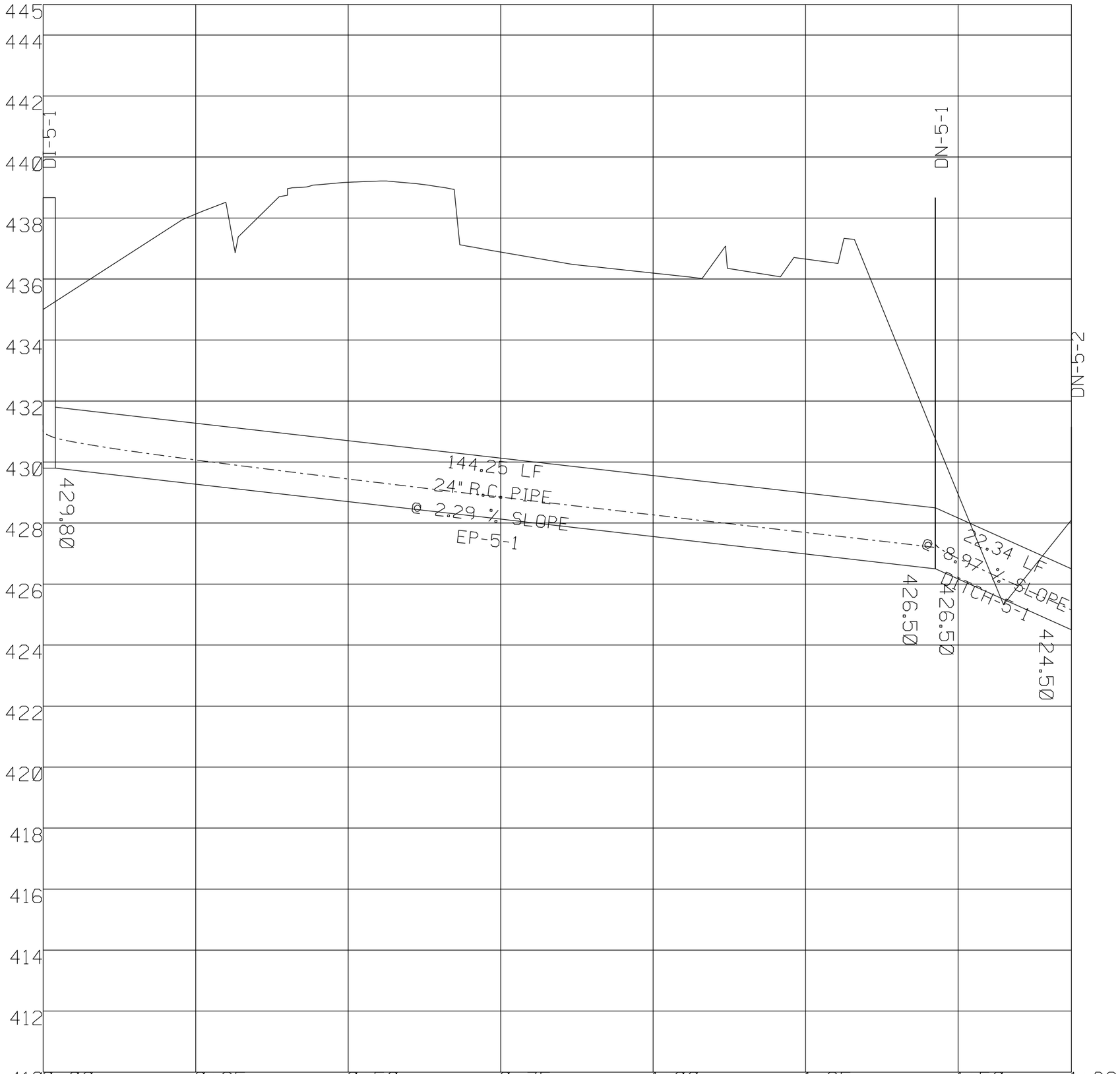
Pro-5-2


460
459
457
455
453
451
449
447
445
443
441
439
437
435
433
431
429
427
425
0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+75
4+00
4+25
4+50
4+75
5+00
D1-6
448.00
302.32 LF
24" R.C. PIPE
@ 3.31 % SLOPE
NP-5-3
D1-5-3
438.00
438.00
175.77 LF
24" R.C. PIPE
@ 2.84 % SLOPE
NP-5-4
D1-5-4
433.00
10.45 LF
24" R.C. PIPE
@ 1.15 % SLOPE
NP-5-5
433.00
432.88
D1-5-5

Pro-5-3


460
458
456
454
452
450
448
446
444
442
440
438
436
434
432
430
428
426
424
422
420
0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+75
4+00
4+25
4+50
4+75
5+00
5+25
5+50
5+75
6+00
6+25
6+50
6+75
6+95
DI-5-6
DI-5-7
DI-5-8
DI-5-9
443.00
435.00
435.00
429.71
429.71
427.50
356.69 LF
24" R.C. PIPE
@ 2.24 % SLOPE
NP-5-7
234.57 LF
24" R.C. PIPE
@ 2.26 % SLOPE
NP-5-9
93.81 LF
24" R.C. PIPE
@ 2.36 % SLOPE
NP-5-10

Pro-5-4


445
444
442
440
438
436
434
432
430
428
426
424
422
420
418
416
414
412
410
0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+69
DI-5-1
DN-5-1
DN-5-2
429.80
144.25 LF
24" R.C. PIPE
@ 2.29 % SLOPE
EP-5-1
@ 8.97 % SLOPE
DITCH-5-1
426.50
426.50
424.50

Pro-5-5

440
439
437
435
433
431
429
427
425
423
421
419
417
415

0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
1+89

DN-5-3

JB-5-1

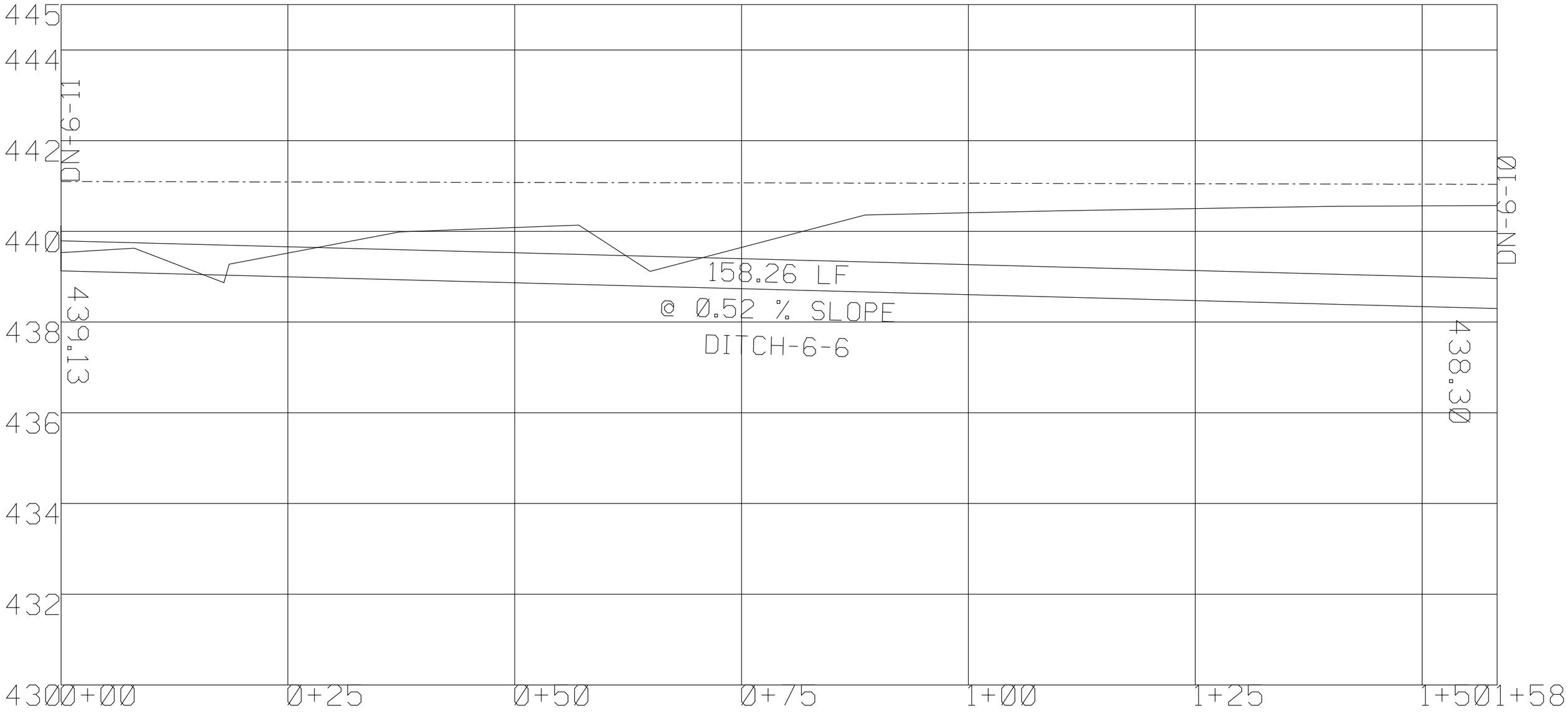
JB-5-2

OP-5-4

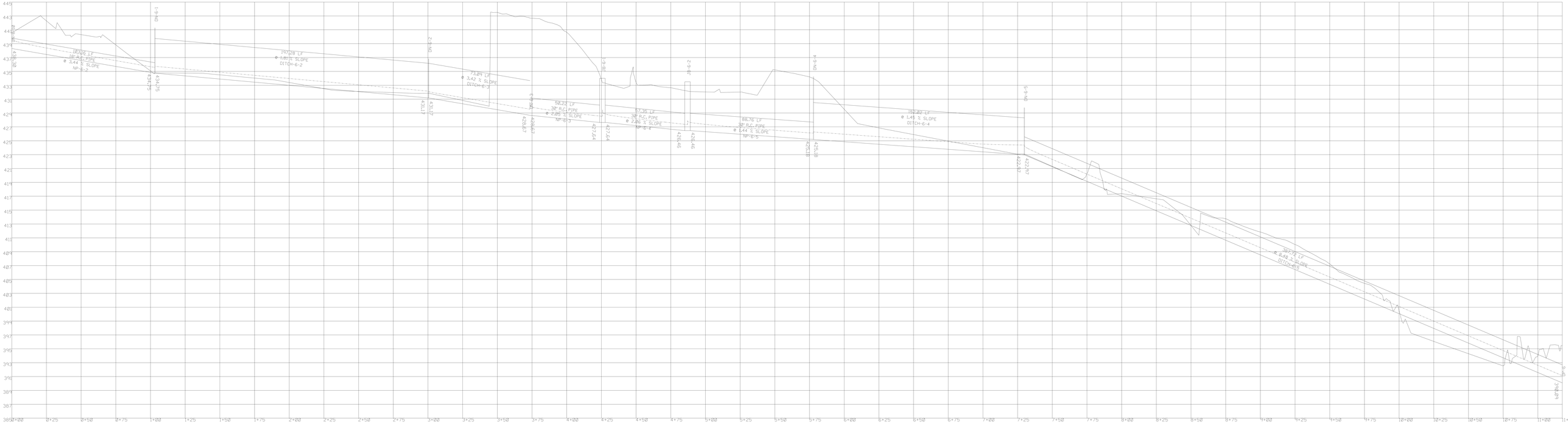
37.55 LF
24" R.C. PIPE
@ 1.33 % SLOPE
NP-5-2

427.00
426.50
423.50
78.36 LF
24" R.C. PIPE
@ 3.70 % SLOPE
NP-5-11
420.60
420.60
65.51 LF
24" R.C. PIPE
@ 0.92 % SLOPE
NP-5-12
420.00

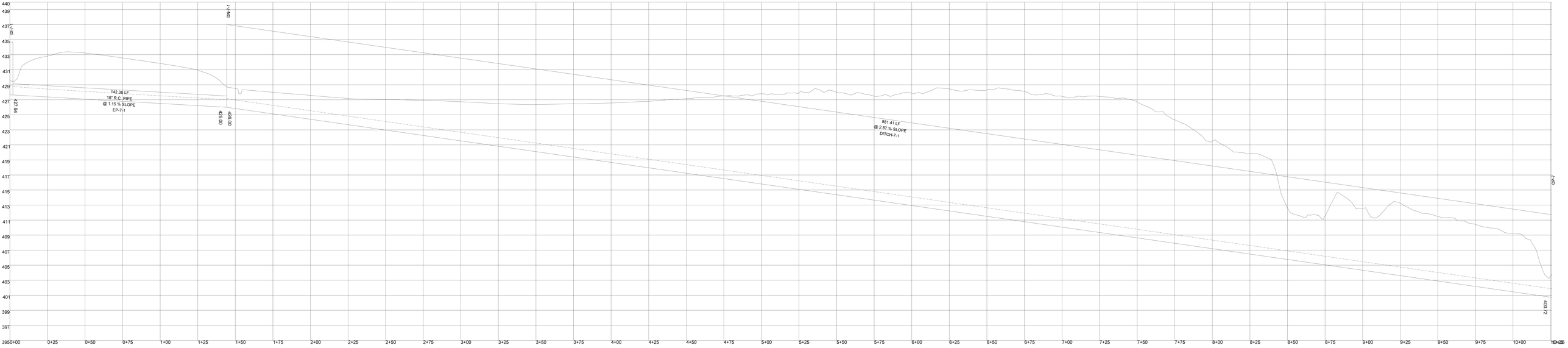
Pro-6-1


445
444
442
440
438
436
434
432
430
DN-6-11
439.13
158.26 LF
@ 0.52 % SLOPE
DITCH-6-6
DN-6-10
438.30
0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+58

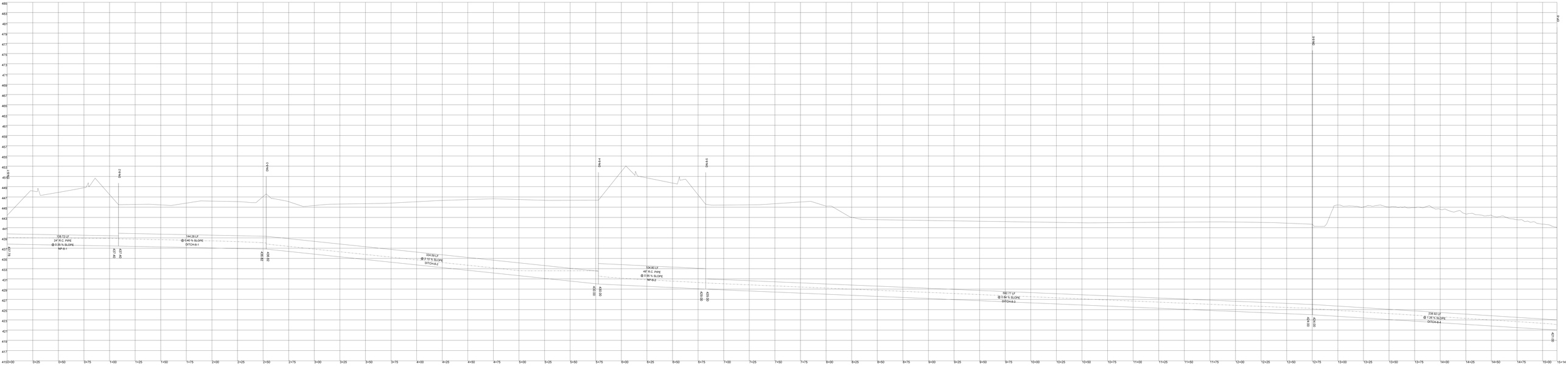
Pro-6-2


I-9-ND
2-9-ND
3-9-ND
4-9-ND
5-9-ND
1-9-BI
2-9-BI
I-9-BI
2-9-BI
3-9-BI
4-9-BI
5-9-BI
6-9-BI
7-9-BI
8-9-BI
9-9-BI
10-9-BI
11-9-BI
12-9-BI
13-9-BI
14-9-BI
15-9-BI
16-9-BI
17-9-BI
18-9-BI
19-9-BI
20-9-BI
21-9-BI
22-9-BI
23-9-BI
24-9-BI
25-9-BI
26-9-BI
27-9-BI
28-9-BI
29-9-BI
30-9-BI
31-9-BI
32-9-BI
33-9-BI
34-9-BI
35-9-BI
36-9-BI
37-9-BI
38-9-BI
39-9-BI
40-9-BI
41-9-BI

Pro-7-1


DI-7-1
427.64
142.38 LF
18" R.C. PIPE
@ 1.15 % SLOPE
EP-7-1
DN-7-1
426.00
881.41 LF
@ 2.87 % SLOPE
DITCH-7-1
DP-7
400.12

Pro-8-1


DN 8-1
DN 8-2
DN 8-3
DN 8-4
DN 8-5
DN 8-6
106.72 LF
24" R.C. PIPE
@ 0.35 % SLOPE
NP-8-1
144.28 LF
@ 0.40 % SLOPE
DITCH-8-1
324.59 LF
@ 2.10 % SLOPE
DITCH-8-2
124.80 LF
48" R.C. PIPE
@ 0.95 % SLOPE
NP-8-2
582.77 LF
@ 0.98 % SLOPE
DITCH-8-3
238.82 LF
@ 1.20 % SLOPE
DITCH-8-4
431.73
431.40
430.82
430.00
430.00
430.00
429.00
429.00
421.10
485
483
481
479
477
475
473
471
469
467
465
463
461
459
457
455
453
451
449
447
445
443
441
439
437
435
433
431
429
427
425
423
421
419
417
410+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+75
4+00
4+25
4+50
4+75
5+00
5+25
5+50
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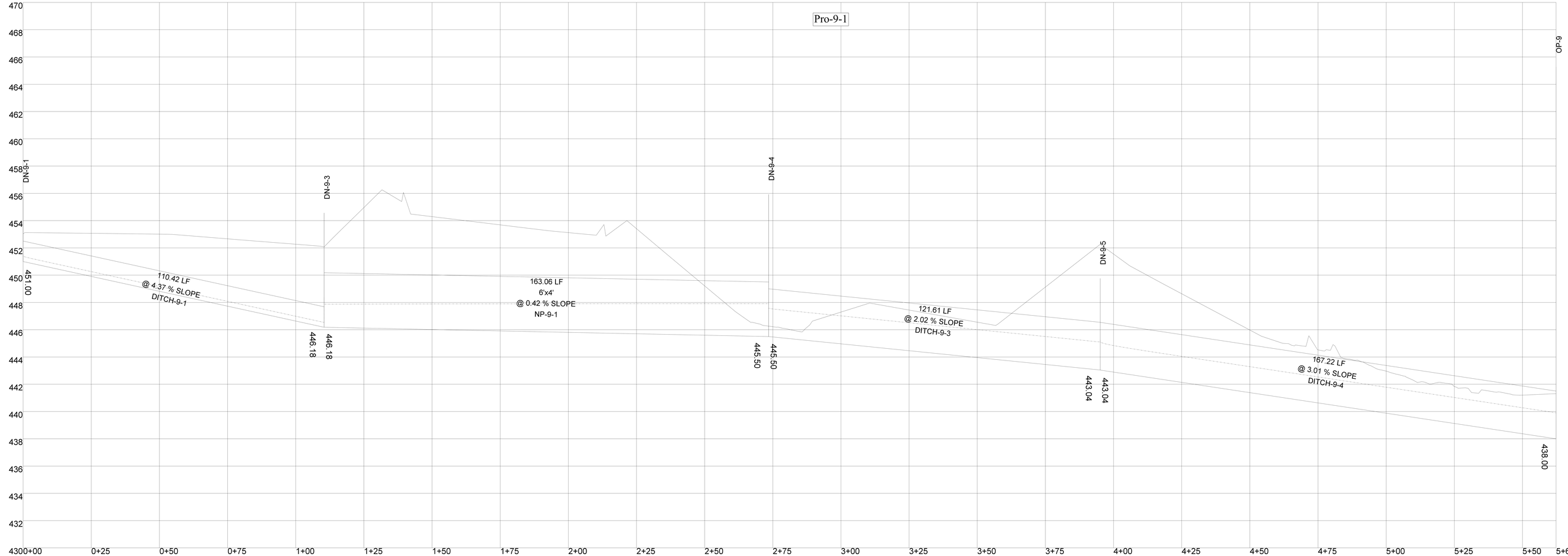
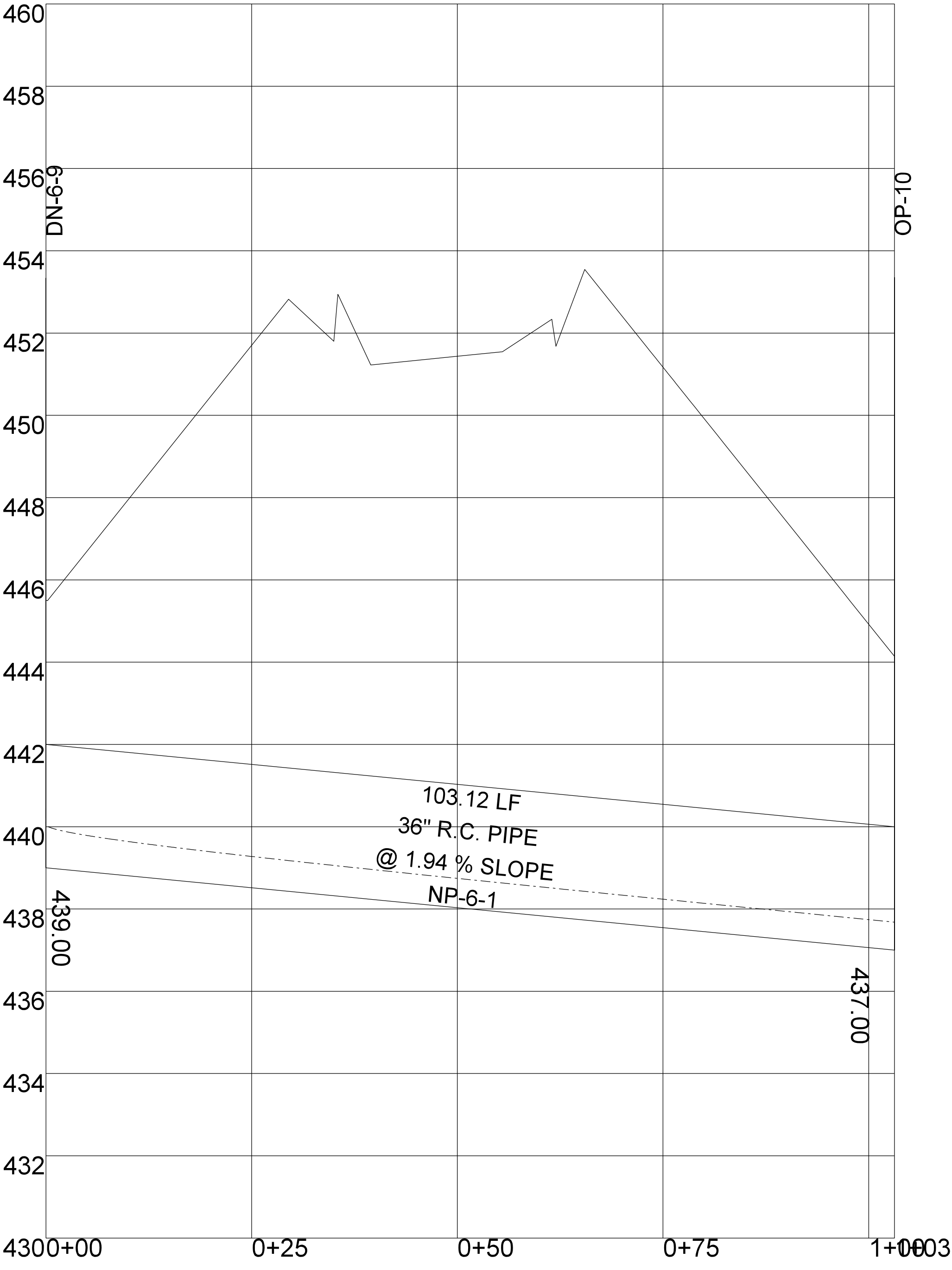
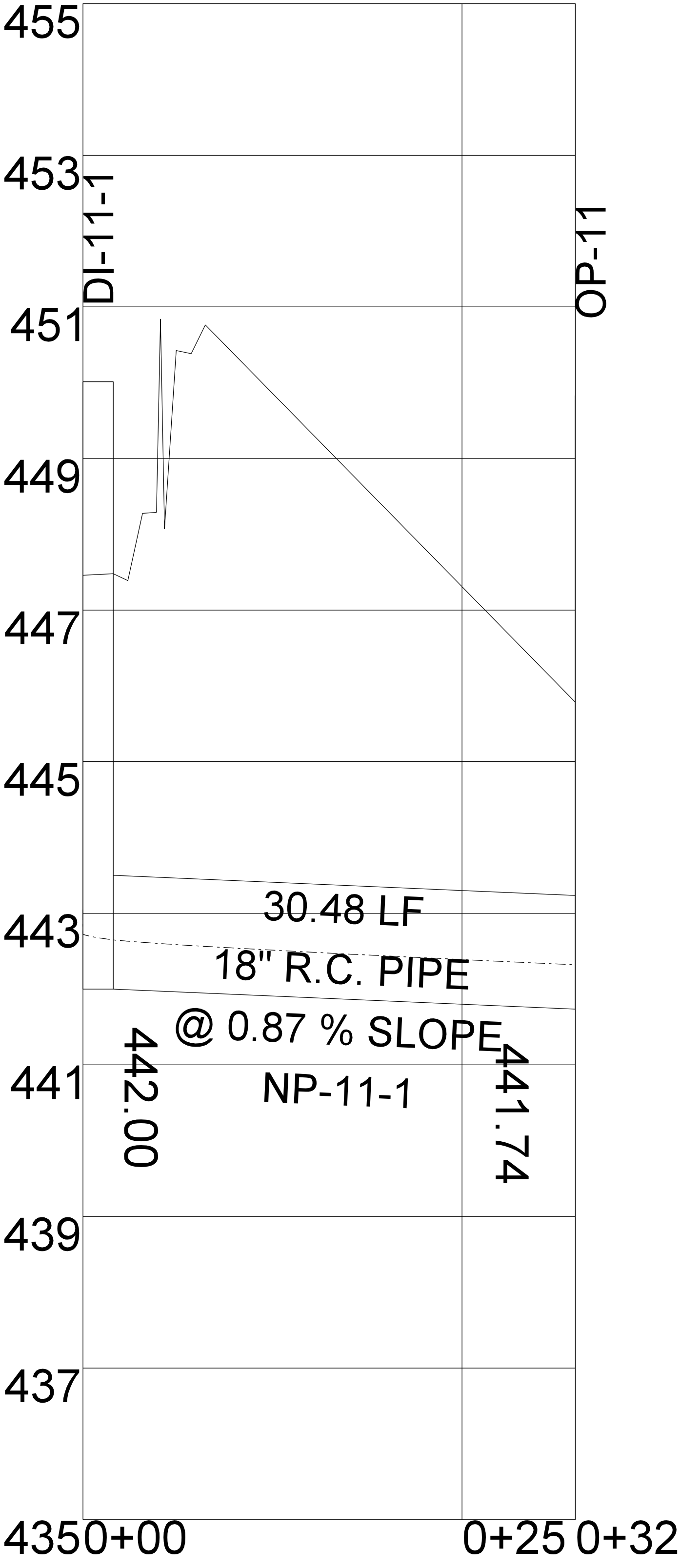
10+50
10+75
11+00
11+25
11+50
11+75
12+00
12+25
12+50
12+75
13+00
13+25
13+50
13+75
14+00
14+25
14+50
14+75
15+00
15+14

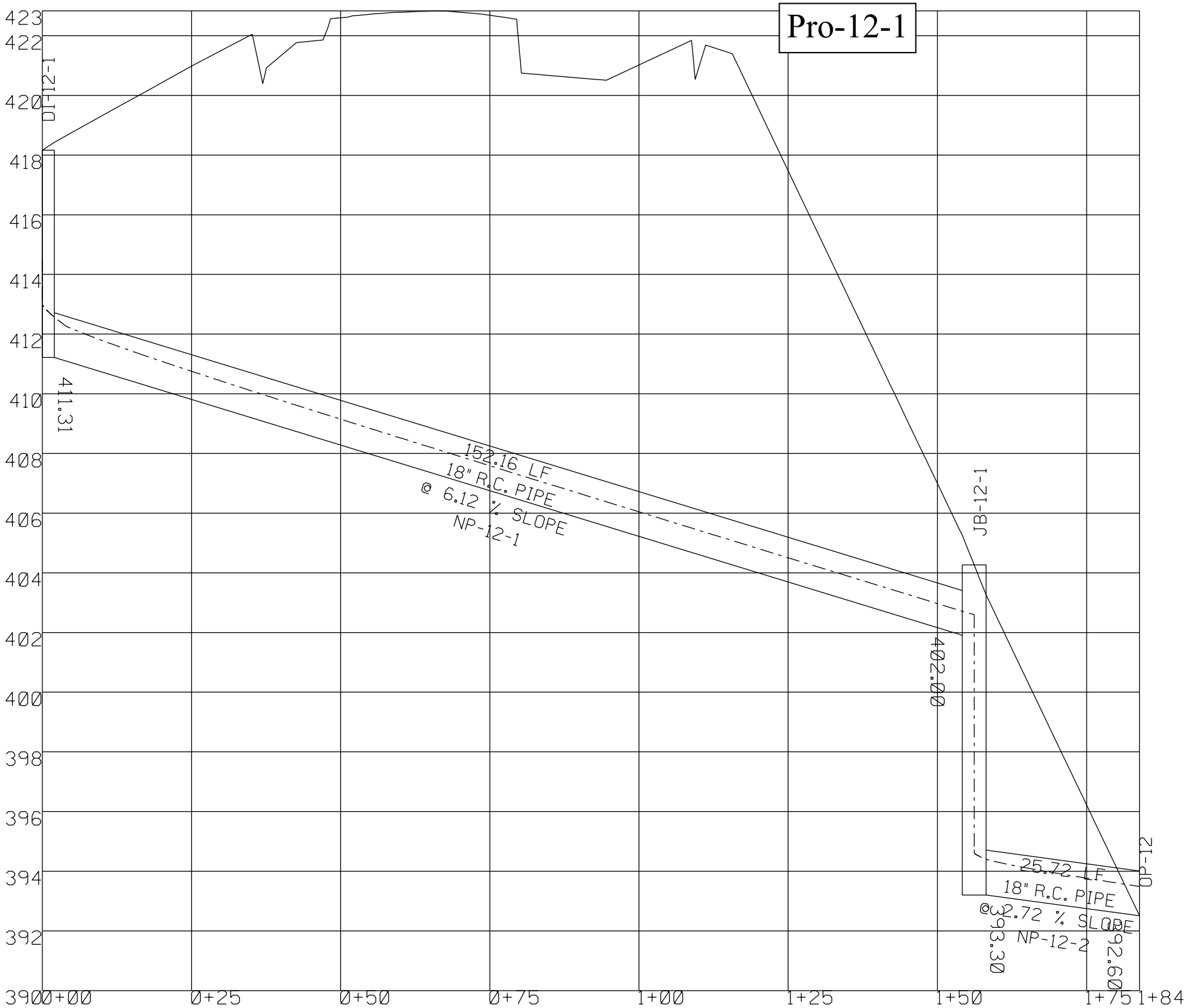

Pro-9-1
DN-9-1
DN-9-3
DN-9-4
DN-9-5
OP-9
451.00
446.18
446.18
445.50
445.50
443.04
443.04
438.00
110.42 LF
@ 4.37 % SLOPE
DITCH-9-1
163.06 LF
6'x4'
@ 0.42 % SLOPE
NP-9-1
121.61 LF
@ 2.02 % SLOPE
DITCH-9-3
167.22 LF
@ 3.01 % SLOPE
DITCH-9-4
470
468
466
464
462
460
458
456
454
452
450
448
446
444
442
440
438
436
434
432
430
0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
2+00
2+25
2+50
2+75
3+00
3+25
3+50
3+75
4+00
4+25
4+50
4+75
5+00
5+25
5+50
5+62

Pro-10-1


460
458
456
454
452
450
448
446
444
442
440
438
436
434
432
430
DN-6-9
OP-10
103.12 LF
36" R.C. PIPE
@ 1.94 % SLOPE
NP-6-1
439.00
437.00
0+00
0+25
0+50
0+75
1+00
1+03

Pro-11-1


455
453
451
449
447
445
443
441
439
437
435
DI-11-1
OP-11
30.48 LF
18" R.C. PIPE
@ 0.87 % SLOPE
NP-11-1
442.00
441.74
0+00
0+25
0+32


Pro-12-1
423
422
420
418
416
414
412
410
408
406
404
402
400
398
396
394
392
390
0+00
0+25
0+50
0+75
1+00
1+25
1+50
1+75
1+84
DI-12-1
411.31
152.16 LF
18" R.C. PIPE
@ 6.12 % SLOPE
NP-12-1
JB-12-1
402.00
25.72 LF
18" R.C. PIPE
@ 2.72 % SLOPE
NP-12-2
393.30
OP-12
392.60

B.10: Water Quality Report

Healthy People Healthly Communities

Watershed and Water Quality Information

General Information

Applicant Name:
Address: 2534 I77 S, BLYTHEWOOD, SC, 29016
MS4 Designation: Not Yet Permitted
Within Coastal Critical Area: No
Waterbody Name: Unnamed Trib

Permit Type: MS4
Latitude/Longitude: 34.185780 / -80.981619
Monitoring Station: B-081
Water Classification (Provisional): FW
Entered Waterbody Name:

Parameter Description

NH3N	Ammonia	CD	Cadmium	CR	Chromium
CU	Copper	HG	Mercury	NI	Nickel
PB	Lead	ZN	Zinc	DO	Dissolved Oxygen
PH	pH	TURBIDITY	Turbidity	ECOLI	Escherichia coli (Freshwaters)
FC	Fecal Coliform (Shellfish)	BIO	Macroinvertebrates (Bio)	TP	(Lakes) Phosphorus
TN	(Lakes) Nitrogen	CHLA	(Lakes) Chlorophyll a	ENTERO	Enterococcus (Coastal Waters)
HGF	Mercury (Fish Tissue)	PCB	PCB (Fish)		

Impaired Status (downstream sites)

Station	NH3N	CD	CR	CU	HG	NI	PB	ZN	DO	PH	TURBIDITY	ECOLI	FC	BIO	TP	TN	CHLA	ENTERO	HGF	PCB
B-081	X	X	X	X	X	X	X	X	X	X	X	X	X	N	X	X	X	X	X	X
B-316	X	X	X	X	X	X	X	X	N	X	X	InTF	X	A	X	X	X	X	X	X

F = Standards full supported
N = Standards not supported
A = Assessed at upstream station
X = Parameter not assessed at station
WnTN = Within TMDL, parameter not supported
InTN = In TMDL, parameter not supported
WnTF = Within TMDL, parameter full supported
InTF = In TMDL, parameter full supported

Parameters to be addressed (those not supporting standards)

BIO - Macroinvertebrates (Bio)
DO - Dissolved Oxygen
ECOLI - Escherichia coli (Freshwaters)

Fish Consumption Advisory

Waters of Concern (WOC)

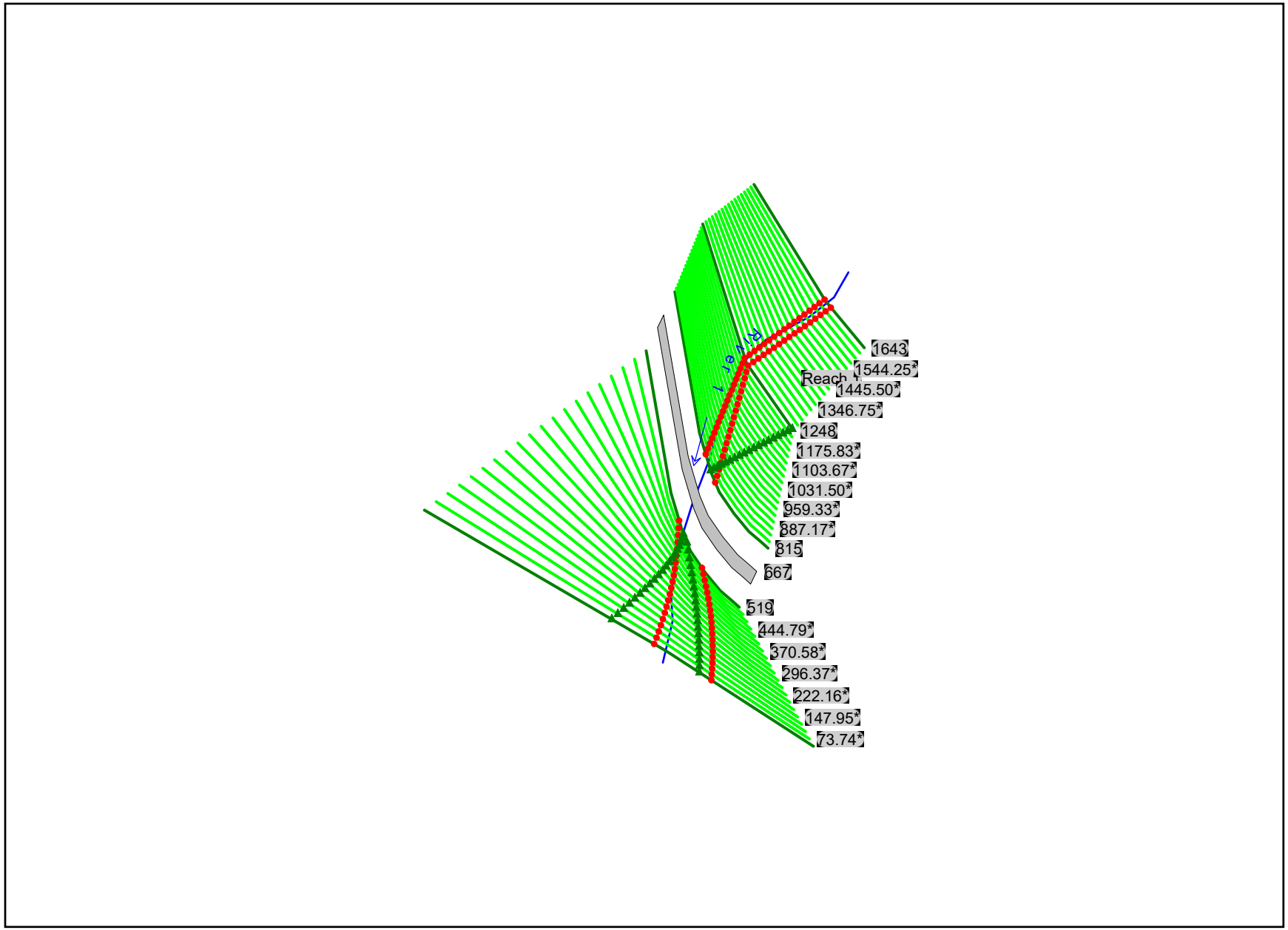
TMDL Information - TMDL Parameters to be addressed

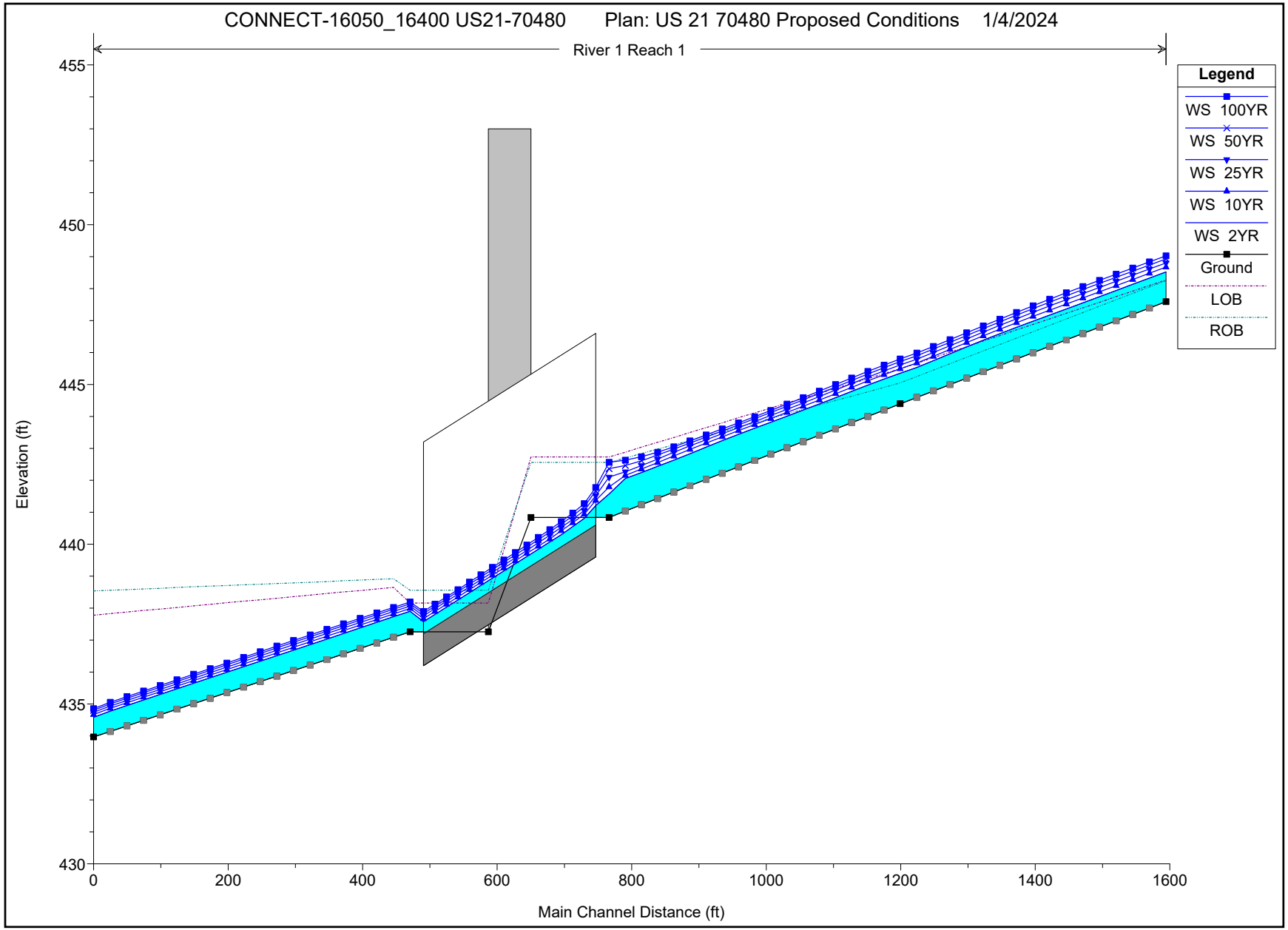
In TMDL Watershed: Yes
TMDL Site: B-110
TMDL Report No: 028-05
TMDL Parameter: Fecal
TMDL Document Link: https://www.scdhec.gov/sites/default/files/docs/HomeAndEnvironment/Docs/tmdl_lwrbrd_fc.pdf

Report Date: December 20, 2023

B.11: HEC-RAS Analysis

US21 704+80 PROPOSED PLAN

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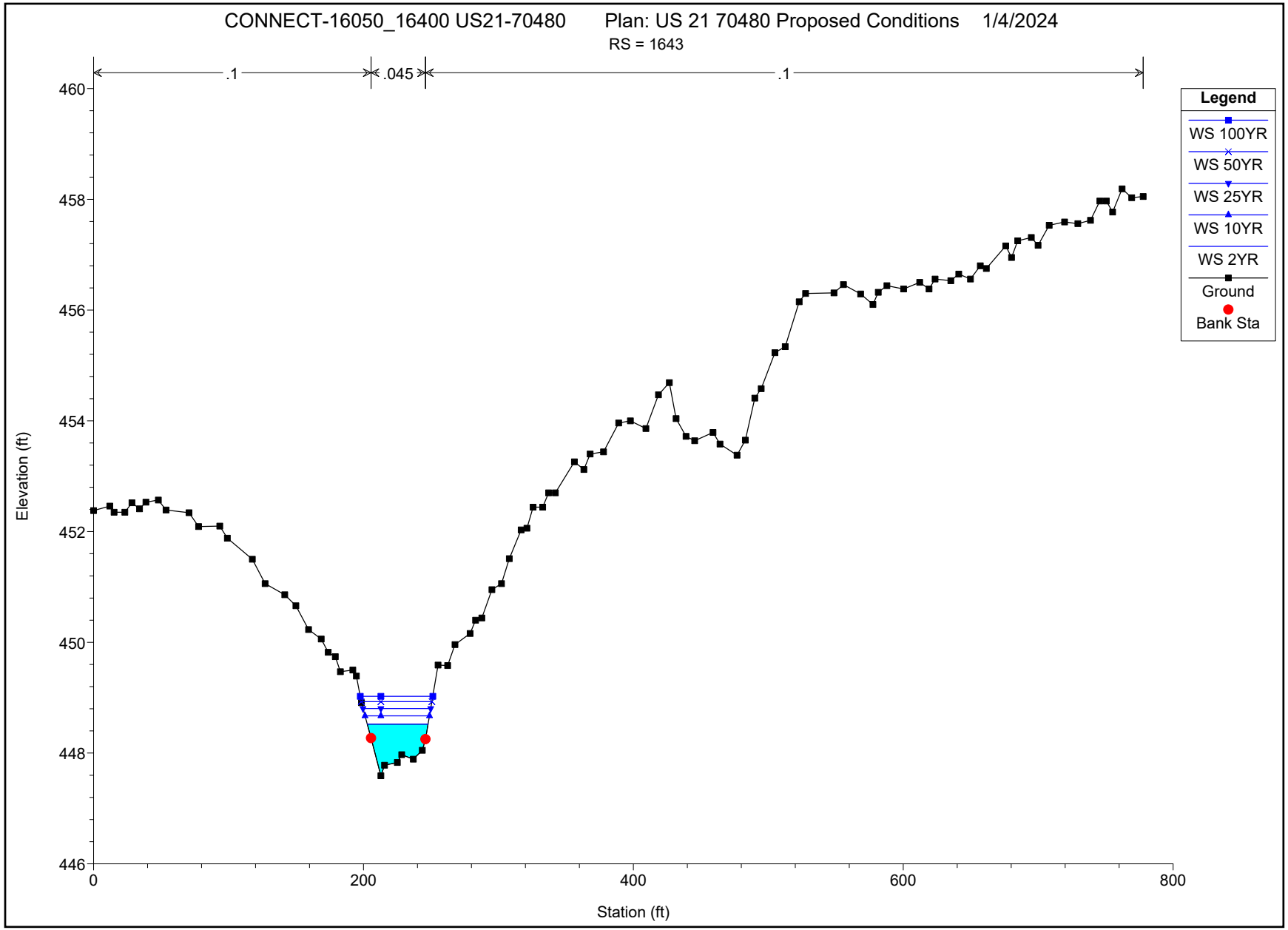
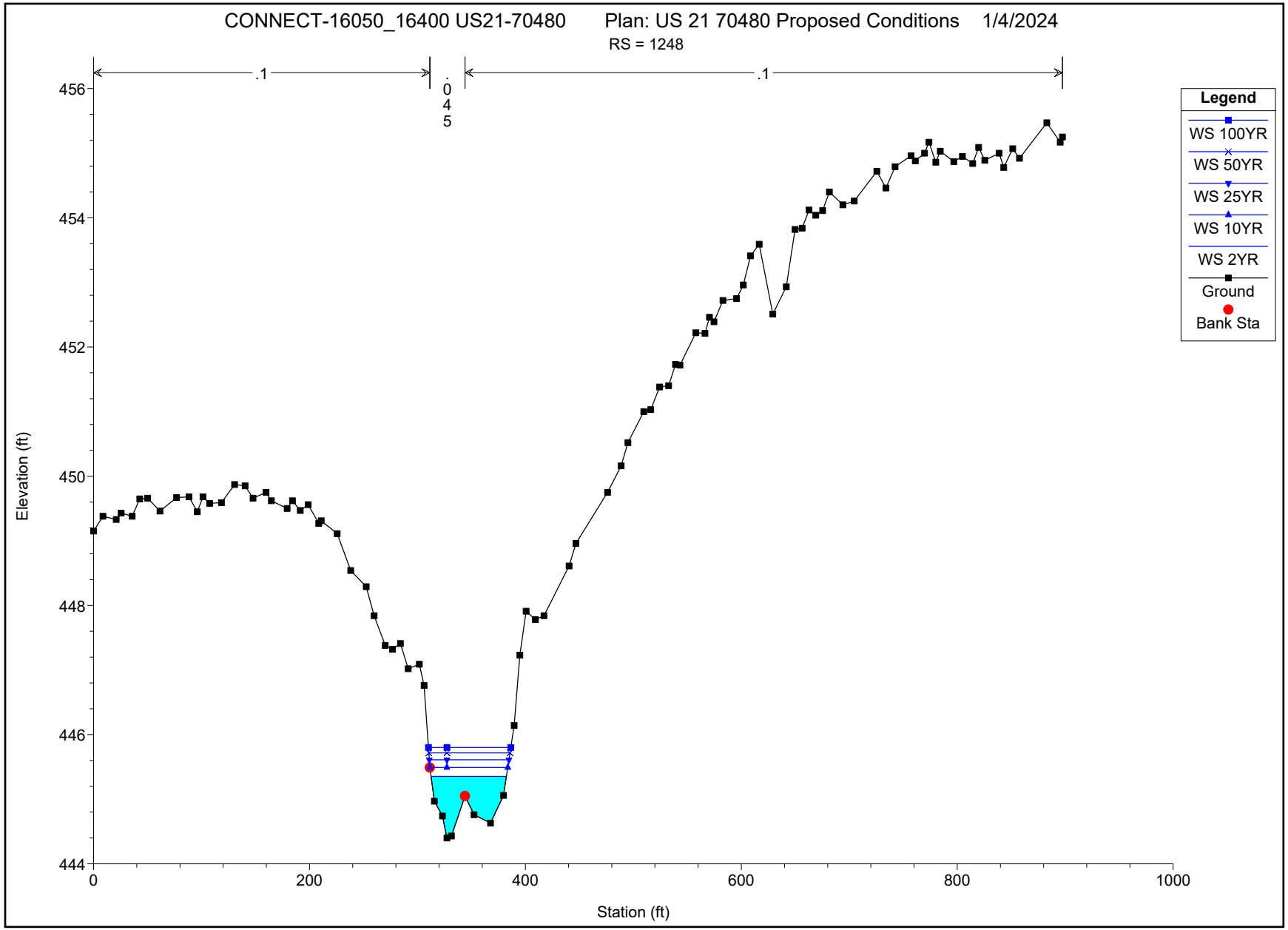
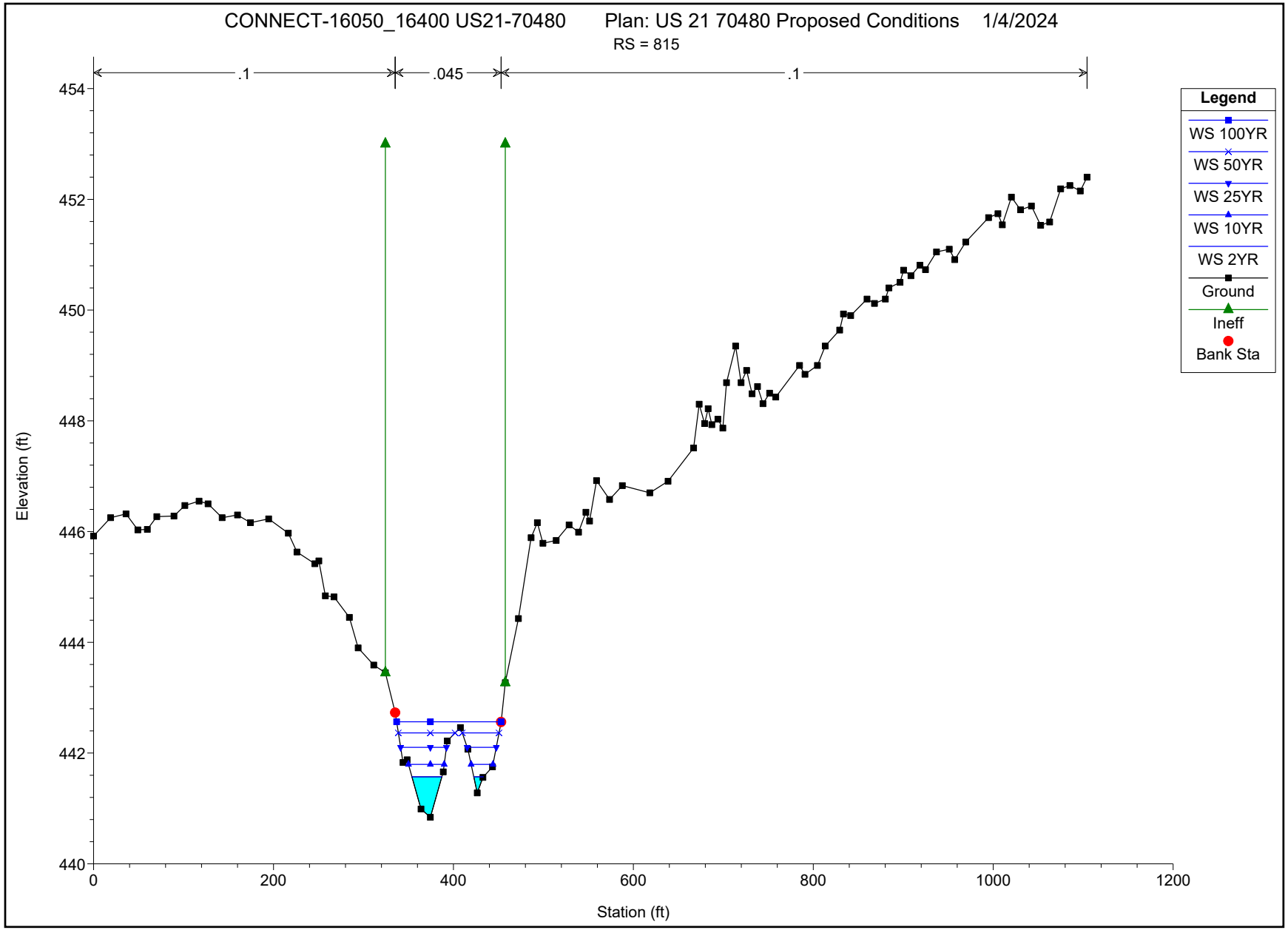
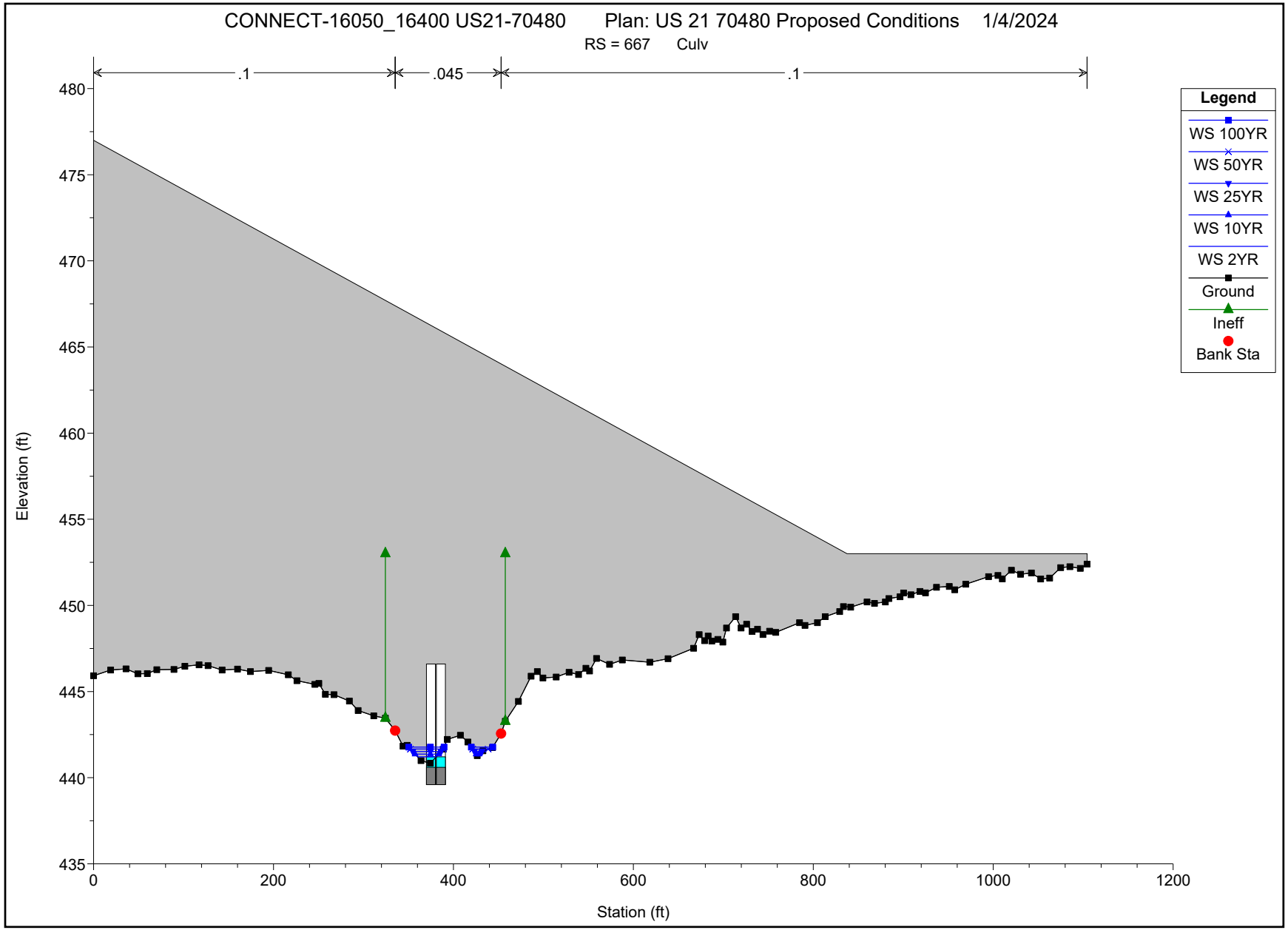
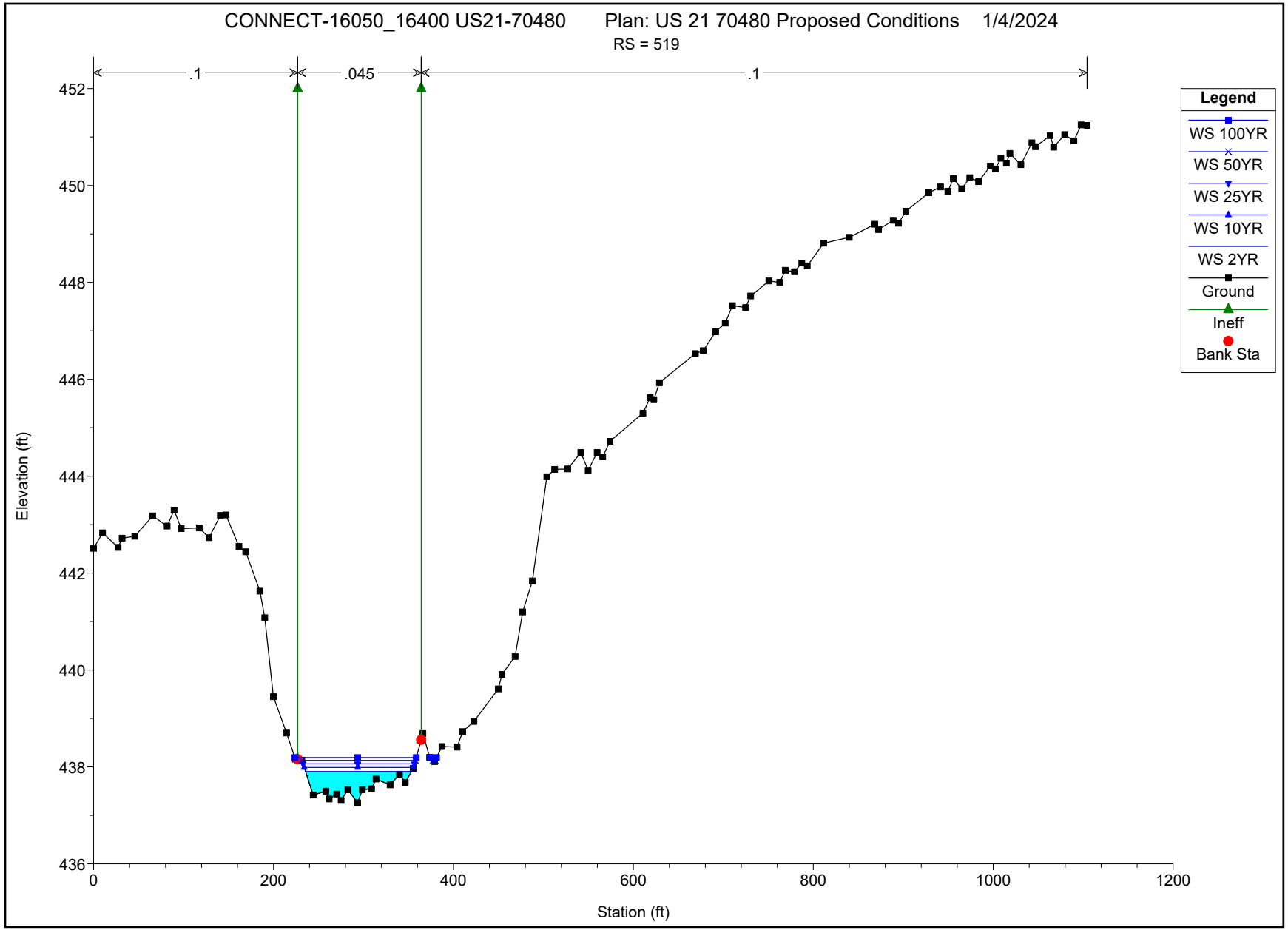
River 1 Reach 1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
LOB
ROB
Elevation (ft)
455
450
445
440
435
430
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)


CONNECT-16050_16400 US21-70480
Plan: US 21 70480 Proposed Conditions
1/4/2024
RS = 1643
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
460
458
456
454
452
450
448
446
0
200
400
600
800
Station (ft)


CONNECT-16050_16400 US21-70480
Plan: US 21 70480 Proposed Conditions
1/4/2024
RS = 1248
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
456
454
452
450
448
446
444
0
200
400
600
800
1000


CONNECT-16050_16400 US21-70480
Plan: US 21 70480 Proposed Conditions
1/4/2024
RS = 815
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
454
452
450
448
446
444
442
440
0
200
400
600
800
1000
1200


CONNECT-16050_16400 US21-70480 Plan: US 21 70480 Proposed Conditions 1/4/2024
RS = 667 Culv
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
480
475
470
465
460
455
450
445
440
435
0
200
400
600
800
1000
1200
Station (ft)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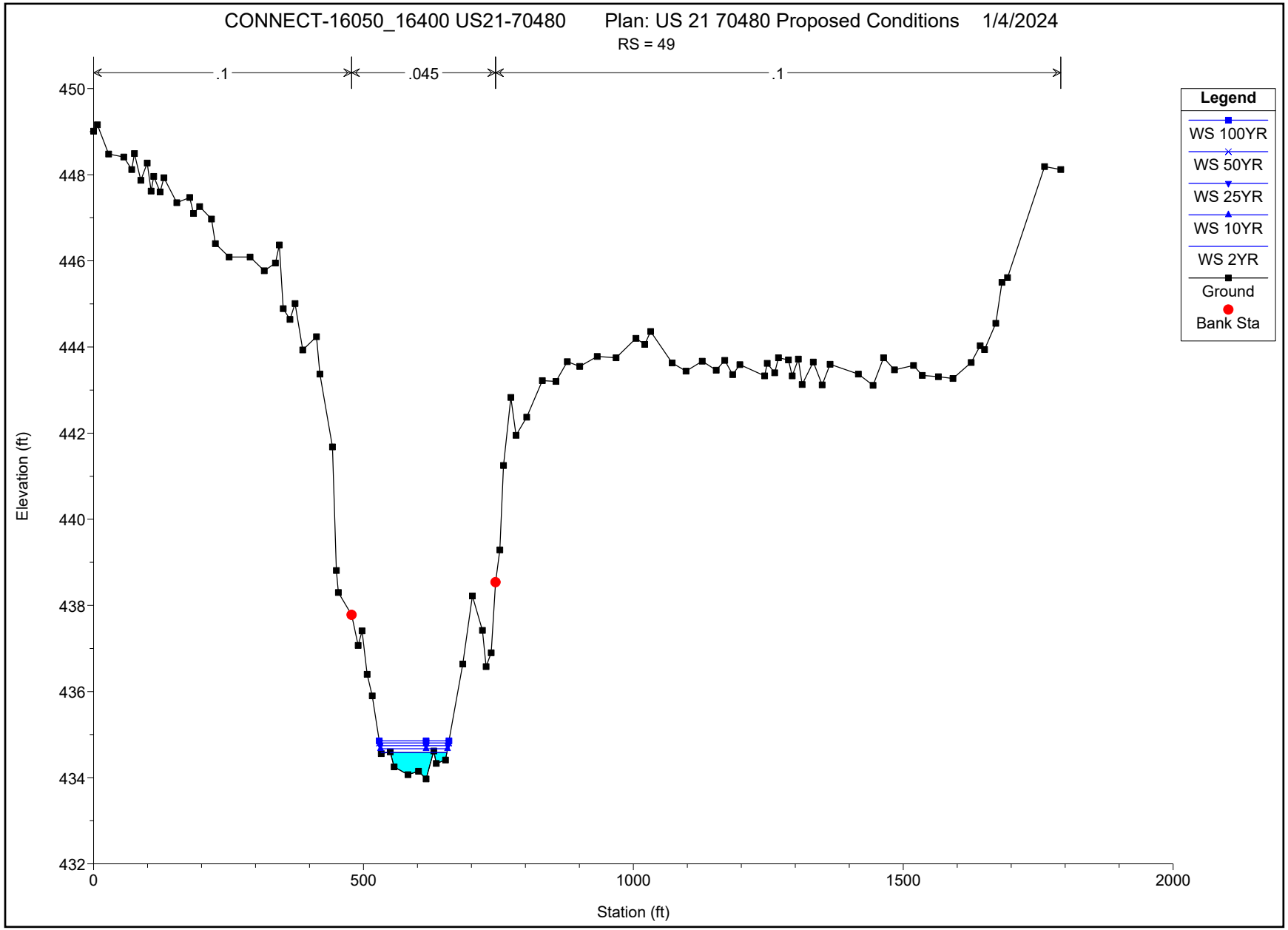
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
452
450
448
446
444
442
440
438
436
0
200
400
600
800
1000
1200


CONNECT-16050_16400 US21-70480
Plan: US 21 70480 Proposed Conditions
1/4/2024
RS = 49
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
448
446
444
442
440
438
436
434
432
0
500
1000
1500
2000

HEC-RAS River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1643	50YR	US 21 70480 Nat	124.38	447.59	448.93		449.06	0.007665	2.94	45.47	52.35	0.51
Reach 1	1643	50YR	US 21 70480 Proposed Conditions	124.38	447.59	448.93		449.06	0.007665	2.94	45.47	52.35	0.51
Reach 1	1643	100YR	US 21 70480 Nat	144.76	447.59	449.02		449.17	0.007612	3.11	50.61	53.79	0.52
Reach 1	1643	100YR	US 21 70480 Proposed Conditions	144.76	447.59	449.02		449.17	0.007612	3.11	50.61	53.79	0.52
Reach 1	1618.31*	50YR	US 21 70480 Nat	124.38	447.39	448.74		448.87	0.007667	2.96	45.11	51.74	0.51
Reach 1	1618.31*	50YR	US 21 70480 Proposed Conditions	124.38	447.39	448.74		448.87	0.007667	2.96	45.11	51.74	0.51
Reach 1	1618.31*	100YR	US 21 70480 Nat	144.76	447.39	448.83		448.98	0.007622	3.13	50.23	53.47	0.52
Reach 1	1618.31*	100YR	US 21 70480 Proposed Conditions	144.76	447.39	448.83		448.98	0.007622	3.13	50.23	53.47	0.52
Reach 1	1593.63*	50YR	US 21 70480 Nat	124.38	447.19	448.54		448.68	0.007725	2.98	44.74	51.08	0.51
Reach 1	1593.63*	50YR	US 21 70480 Proposed Conditions	124.38	447.19	448.54		448.68	0.007725	2.98	44.74	51.08	0.51
Reach 1	1593.63*	100YR	US 21 70480 Nat	144.76	447.19	448.64		448.79	0.007686	3.15	49.83	53.03	0.52
Reach 1	1593.63*	100YR	US 21 70480 Proposed Conditions	144.76	447.19	448.64		448.79	0.007686	3.15	49.83	53.03	0.52
Reach 1	1568.94*	50YR	US 21 70480 Nat	124.38	446.99	448.35		448.49	0.007698	2.99	44.55	50.48	0.51
Reach 1	1568.94*	50YR	US 21 70480 Proposed Conditions	124.38	446.99	448.35		448.49	0.007698	2.99	44.55	50.48	0.51
Reach 1	1568.94*	100YR	US 21 70480 Nat	144.76	446.99	448.45		448.60	0.007680	3.17	49.59	52.53	0.52
Reach 1	1568.94*	100YR	US 21 70480 Proposed Conditions	144.76	446.99	448.45		448.60	0.007680	3.17	49.59	52.53	0.52
Reach 1	1544.25*	50YR	US 21 70480 Nat	124.38	446.79	448.16		448.30	0.007675	3.00	44.51	50.12	0.51
Reach 1	1544.25*	50YR	US 21 70480 Proposed Conditions	124.38	446.79	448.16		448.30	0.007675	3.00	44.51	50.12	0.51
Reach 1	1544.25*	100YR	US 21 70480 Nat	144.76	446.79	448.26		448.41	0.007696	3.19	49.46	52.23	0.52
Reach 1	1544.25*	100YR	US 21 70480 Proposed Conditions	144.76	446.79	448.26		448.41	0.007696	3.19	49.46	52.23	0.52
Reach 1	1519.56*	50YR	US 21 70480 Nat	124.38	446.59	447.97		448.11	0.007640	3.01	44.58	50.09	0.51
Reach 1	1519.56*	50YR	US 21 70480 Proposed Conditions	124.38	446.59	447.97		448.11	0.007640	3.01	44.58	50.09	0.51
Reach 1	1519.56*	100YR	US 21 70480 Nat	144.76	446.59	448.07		448.22	0.007734	3.20	49.40	56.31	0.52
Reach 1	1519.56*	100YR	US 21 70480 Proposed Conditions	144.76	446.59	448.07		448.22	0.007735	3.20	49.40	56.30	0.52
Reach 1	1494.88*	50YR	US 21 70480 Nat	124.38	446.39	447.77		447.92	0.007923	3.06	44.48	58.45	0.52
Reach 1	1494.88*	50YR	US 21 70480 Proposed Conditions	124.38	446.39	447.77		447.92	0.007923	3.06	44.48	58.45	0.52
Reach 1	1494.88*	100YR	US 21 70480 Nat	144.76	446.39	447.87		448.03	0.007973	3.25	50.07	61.37	0.53
Reach 1	1494.88*	100YR	US 21 70480 Proposed Conditions	144.76	446.39	447.87		448.03	0.007974	3.25	50.07	61.37	0.53
Reach 1	1470.19*	50YR	US 21 70480 Nat	124.38	446.19	447.58		447.72	0.008035	3.08	45.31	60.75	0.53
Reach 1	1470.19*	50YR	US 21 70480 Proposed Conditions	124.38	446.19	447.58		447.72	0.008035	3.08	45.31	60.75	0.53
Reach 1	1470.19*	100YR	US 21 70480 Nat	144.76	446.19	447.67		447.83	0.008136	3.27	50.99	64.79	0.54
Reach 1	1470.19*	100YR	US 21 70480 Proposed Conditions	144.76	446.19	447.67		447.83	0.008136	3.27	50.99	64.79	0.54
Reach 1	1445.50*	50YR	US 21 70480 Nat	124.38	445.99	447.37		447.52	0.008267	3.11	46.38	65.10	0.53
Reach 1	1445.50*	50YR	US 21 70480 Proposed Conditions	124.38	445.99	447.37		447.52	0.008267	3.11	46.38	65.10	0.53
Reach 1	1445.50*	100YR	US 21 70480 Nat	144.76	445.99	447.46		447.62	0.008362	3.30	52.33	68.82	0.54
Reach 1	1445.50*	100YR	US 21 70480 Proposed Conditions	144.76	445.99	447.46		447.62	0.008362	3.30	52.33	68.82	0.54
Reach 1	1420.81*	50YR	US 21 70480 Nat	124.38	445.80	447.17		447.31	0.008458	3.13	47.87	68.66	0.54

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1420.81*	50YR	US 21 70480 Proposed Conditions	124.38	445.80	447.17		447.31	0.008458	3.13	47.87	68.66	0.54
Reach 1	1420.81*	100YR	US 21 70480 Nat	144.76	445.80	447.25		447.42	0.008569	3.32	53.96	72.17	0.55
Reach 1	1420.81*	100YR	US 21 70480 Proposed Conditions	144.76	445.80	447.25		447.42	0.008568	3.32	53.96	72.17	0.55
Reach 1	1396.13*	50YR	US 21 70480 Nat	124.38	445.60	446.96		447.10	0.008668	3.14	49.84	71.96	0.54
Reach 1	1396.13*	50YR	US 21 70480 Proposed Conditions	124.38	445.60	446.96		447.10	0.008668	3.14	49.84	71.96	0.54
Reach 1	1396.13*	100YR	US 21 70480 Nat	144.76	445.60	447.04		447.20	0.008720	3.32	56.07	73.73	0.55
Reach 1	1396.13*	100YR	US 21 70480 Proposed Conditions	144.76	445.60	447.04		447.20	0.008718	3.32	56.08	73.73	0.55
Reach 1	1371.44*	50YR	US 21 70480 Nat	124.38	445.40	446.75		446.89	0.008828	3.13	51.74	72.87	0.55
Reach 1	1371.44*	50YR	US 21 70480 Proposed Conditions	124.38	445.40	446.75		446.89	0.008828	3.13	51.74	72.87	0.55
Reach 1	1371.44*	100YR	US 21 70480 Nat	144.76	445.40	446.83		446.98	0.008857	3.31	57.97	74.22	0.56
Reach 1	1371.44*	100YR	US 21 70480 Proposed Conditions	144.76	445.40	446.83		446.98	0.008856	3.31	57.97	74.23	0.56
Reach 1	1346.75*	50YR	US 21 70480 Nat	124.38	445.20	446.53		446.67	0.008931	3.11	53.76	73.37	0.55
Reach 1	1346.75*	50YR	US 21 70480 Proposed Conditions	124.38	445.20	446.53		446.67	0.008931	3.11	53.76	73.37	0.55
Reach 1	1346.75*	100YR	US 21 70480 Nat	144.76	445.20	446.62		446.76	0.008940	3.29	60.00	74.64	0.56
Reach 1	1346.75*	100YR	US 21 70480 Proposed Conditions	144.76	445.20	446.62		446.76	0.008940	3.29	60.00	74.64	0.56
Reach 1	1322.06*	50YR	US 21 70480 Nat	124.38	445.00	446.32		446.44	0.008926	3.07	55.95	73.73	0.55
Reach 1	1322.06*	50YR	US 21 70480 Proposed Conditions	124.38	445.00	446.32		446.44	0.008926	3.07	55.95	73.73	0.55
Reach 1	1322.06*	100YR	US 21 70480 Nat	144.76	445.00	446.40		446.54	0.008936	3.25	62.20	75.04	0.56
Reach 1	1322.06*	100YR	US 21 70480 Proposed Conditions	144.76	445.00	446.40		446.54	0.008937	3.25	62.20	75.04	0.56
Reach 1	1297.38*	50YR	US 21 70480 Nat	124.38	444.80	446.11		446.22	0.008890	3.02	58.17	74.17	0.54
Reach 1	1297.38*	50YR	US 21 70480 Proposed Conditions	124.38	444.80	446.11		446.22	0.008890	3.02	58.17	74.17	0.54
Reach 1	1297.38*	100YR	US 21 70480 Nat	144.76	444.80	446.19		446.32	0.008880	3.19	64.49	75.40	0.55
Reach 1	1297.38*	100YR	US 21 70480 Proposed Conditions	144.76	444.80	446.19		446.32	0.008882	3.19	64.49	75.40	0.55
Reach 1	1272.69*	50YR	US 21 70480 Nat	124.38	444.60	445.90		446.00	0.008441	2.92	61.21	74.59	0.53
Reach 1	1272.69*	50YR	US 21 70480 Proposed Conditions	124.38	444.60	445.90		446.00	0.008444	2.92	61.20	74.59	0.53
Reach 1	1272.69*	100YR	US 21 70480 Nat	144.76	444.60	445.99		446.10	0.008438	3.09	67.64	75.79	0.54
Reach 1	1272.69*	100YR	US 21 70480 Proposed Conditions	144.76	444.60	445.99		446.10	0.008443	3.09	67.63	75.79	0.54
Reach 1	1248	50YR	US 21 70480 Nat	124.38	444.40	445.72		445.80	0.007373	2.74	65.94	75.19	0.50
Reach 1	1248	50YR	US 21 70480 Proposed Conditions	124.38	444.40	445.72		445.80	0.007378	2.74	65.92	75.18	0.50
Reach 1	1248	100YR	US 21 70480 Nat	144.76	444.40	445.80		445.90	0.007497	2.92	72.29	76.31	0.51
Reach 1	1248	100YR	US 21 70480 Proposed Conditions	144.76	444.40	445.80		445.90	0.007505	2.92	72.26	76.31	0.51
Reach 1	1223.94*	50YR	US 21 70480 Nat	124.38	444.20	445.53		445.62	0.007641	2.77	62.52	78.27	0.50
Reach 1	1223.94*	50YR	US 21 70480 Proposed Conditions	124.38	444.20	445.53		445.62	0.007660	2.76	62.51	78.31	0.50
Reach 1	1223.94*	100YR	US 21 70480 Nat	144.76	444.20	445.61		445.71	0.007733	2.94	68.87	79.41	0.51
Reach 1	1223.94*	100YR	US 21 70480 Proposed Conditions	144.76	444.20	445.61		445.71	0.007753	2.94	68.85	79.45	0.51
Reach 1	1199.89*	50YR	US 21 70480 Nat	124.38	444.00	445.33		445.43	0.008002	2.79	58.58	80.69	0.51
Reach 1	1199.89*	50YR	US 21 70480 Proposed Conditions	124.38	444.00	445.33		445.43	0.007966	2.78	58.74	80.87	0.51

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1199.89*	100YR	US 21 70480 Nat	144.76	444.00	445.41		445.52	0.008036	2.95	65.00	81.95	0.52
Reach 1	1199.89*	100YR	US 21 70480 Proposed Conditions	144.76	444.00	445.41		445.52	0.008004	2.94	65.16	82.13	0.52
Reach 1	1175.83*	50YR	US 21 70480 Nat	124.38	443.81	445.13		445.24	0.008341	2.78	54.54	80.25	0.52
Reach 1	1175.83*	50YR	US 21 70480 Proposed Conditions	124.38	443.81	445.13		445.24	0.008356	2.77	54.65	80.46	0.52
Reach 1	1175.83*	100YR	US 21 70480 Nat	144.76	443.81	445.20		445.33	0.008413	2.95	60.75	82.76	0.53
Reach 1	1175.83*	100YR	US 21 70480 Proposed Conditions	144.76	443.81	445.20		445.33	0.008425	2.94	60.86	82.99	0.53
Reach 1	1151.78*	50YR	US 21 70480 Nat	124.38	443.61	444.92		445.03	0.008554	2.74	51.63	78.67	0.52
Reach 1	1151.78*	50YR	US 21 70480 Proposed Conditions	124.38	443.61	444.92		445.03	0.008525	2.73	51.86	78.95	0.52
Reach 1	1151.78*	100YR	US 21 70480 Nat	144.76	443.61	445.00		445.12	0.008596	2.91	57.57	80.44	0.53
Reach 1	1151.78*	100YR	US 21 70480 Proposed Conditions	144.76	443.61	445.00		445.12	0.008558	2.89	57.83	80.74	0.53
Reach 1	1127.72*	50YR	US 21 70480 Nat	124.38	443.41	444.72		444.83	0.008594	2.68	49.80	76.78	0.52
Reach 1	1127.72*	50YR	US 21 70480 Proposed Conditions	124.38	443.41	444.72		444.83	0.008648	2.67	49.92	77.12	0.52
Reach 1	1127.72*	100YR	US 21 70480 Nat	144.76	443.41	444.79		444.91	0.008654	2.85	55.53	79.95	0.53
Reach 1	1127.72*	100YR	US 21 70480 Proposed Conditions	144.76	443.41	444.79		444.91	0.008661	2.84	55.75	80.35	0.53
Reach 1	1103.67*	50YR	US 21 70480 Nat	124.38	443.21	444.52		444.62	0.008509	2.60	49.40	74.07	0.52
Reach 1	1103.67*	50YR	US 21 70480 Proposed Conditions	124.38	443.21	444.52		444.62	0.008545	2.60	49.41	74.20	0.52
Reach 1	1103.67*	100YR	US 21 70480 Nat	144.76	443.21	444.59		444.71	0.008576	2.77	54.82	77.49	0.53
Reach 1	1103.67*	100YR	US 21 70480 Proposed Conditions	144.76	443.21	444.59		444.71	0.008612	2.76	55.01	77.91	0.53
Reach 1	1079.61*	50YR	US 21 70480 Nat	124.38	443.02	444.32		444.42	0.008481	2.53	49.80	72.02	0.51
Reach 1	1079.61*	50YR	US 21 70480 Proposed Conditions	124.38	443.02	444.32		444.41	0.008463	2.53	49.84	72.00	0.51
Reach 1	1079.61*	100YR	US 21 70480 Nat	144.76	443.02	444.39		444.50	0.008530	2.69	55.03	75.67	0.52
Reach 1	1079.61*	100YR	US 21 70480 Proposed Conditions	144.76	443.02	444.39		444.50	0.008546	2.68	55.18	75.92	0.52
Reach 1	1055.56*	50YR	US 21 70480 Nat	124.38	442.82	444.12		444.21	0.008306	2.45	51.04	72.19	0.50
Reach 1	1055.56*	50YR	US 21 70480 Proposed Conditions	124.38	442.82	444.12		444.21	0.008311	2.45	51.07	72.32	0.50
Reach 1	1055.56*	100YR	US 21 70480 Nat	144.76	442.82	444.19		444.29	0.008375	2.60	56.13	74.24	0.51
Reach 1	1055.56*	100YR	US 21 70480 Proposed Conditions	144.76	442.82	444.19		444.29	0.008392	2.60	56.20	74.44	0.51
Reach 1	1031.50*	50YR	US 21 70480 Nat	124.38	442.62	443.92		444.01	0.008260	2.39	52.23	75.25	0.50
Reach 1	1031.50*	50YR	US 21 70480 Proposed Conditions	124.38	442.62	443.92		444.01	0.008241	2.38	52.30	75.33	0.50
Reach 1	1031.50*	100YR	US 21 70480 Nat	144.76	442.62	443.99		444.09	0.008328	2.53	57.40	76.86	0.51
Reach 1	1031.50*	100YR	US 21 70480 Proposed Conditions	144.76	442.62	443.99		444.09	0.008308	2.53	57.47	76.95	0.51
Reach 1	1007.44*	50YR	US 21 70480 Nat	124.38	442.42	443.73		443.82	0.008113	2.32	53.67	78.66	0.49
Reach 1	1007.44*	50YR	US 21 70480 Proposed Conditions	124.38	442.42	443.73		443.82	0.008092	2.32	53.73	78.70	0.49
Reach 1	1007.44*	100YR	US 21 70480 Nat	144.76	442.42	443.80		443.89	0.008186	2.46	58.89	80.12	0.50
Reach 1	1007.44*	100YR	US 21 70480 Proposed Conditions	144.76	442.42	443.80		443.89	0.008166	2.46	58.94	80.15	0.50
Reach 1	983.39*	50YR	US 21 70480 Nat	124.38	442.22	443.54		443.62	0.007992	2.26	55.07	82.32	0.49
Reach 1	983.39*	50YR	US 21 70480 Proposed Conditions	124.38	442.22	443.54		443.62	0.007979	2.26	55.13	82.46	0.49
Reach 1	983.39*	100YR	US 21 70480 Nat	144.76	442.22	443.61		443.70	0.008016	2.40	60.47	83.66	0.49

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	983.39*	100YR	US 21 70480 Proposed Conditions	144.76	442.22	443.61		443.70	0.008009	2.39	60.53	83.80	0.49
Reach 1	959.33*	50YR	US 21 70480 Nat	124.38	442.03	443.36		443.43	0.007975	2.21	56.16	86.14	0.48
Reach 1	959.33*	50YR	US 21 70480 Proposed Conditions	124.38	442.03	443.36		443.43	0.007906	2.21	56.33	86.25	0.48
Reach 1	959.33*	100YR	US 21 70480 Nat	144.76	442.03	443.42		443.51	0.007993	2.34	61.77	87.48	0.49
Reach 1	959.33*	100YR	US 21 70480 Proposed Conditions	144.76	442.03	443.42		443.51	0.007924	2.34	61.96	87.59	0.49
Reach 1	935.28*	50YR	US 21 70480 Nat	124.38	441.83	443.16		443.24	0.008059	2.18	56.94	89.86	0.48
Reach 1	935.28*	50YR	US 21 70480 Proposed Conditions	124.38	441.83	443.17		443.24	0.007932	2.17	57.24	89.99	0.48
Reach 1	935.28*	100YR	US 21 70480 Nat	144.76	441.83	443.23		443.31	0.007988	2.30	62.92	91.28	0.49
Reach 1	935.28*	100YR	US 21 70480 Proposed Conditions	144.76	441.83	443.23		443.32	0.007883	2.29	63.21	91.42	0.49
Reach 1	911.22*	50YR	US 21 70480 Nat	124.38	441.63	442.97		443.04	0.008288	2.17	57.38	93.59	0.49
Reach 1	911.22*	50YR	US 21 70480 Proposed Conditions	124.38	441.63	442.98		443.05	0.008002	2.14	58.05	93.81	0.48
Reach 1	911.22*	100YR	US 21 70480 Nat	144.76	441.63	443.04		443.12	0.008045	2.27	63.82	95.07	0.49
Reach 1	911.22*	100YR	US 21 70480 Proposed Conditions	144.76	441.63	443.05		443.13	0.007630	2.23	64.93	95.39	0.48
Reach 1	887.17*	50YR	US 21 70480 Nat	124.38	441.43	442.77		442.84	0.008589	2.19	56.81	93.74	0.50
Reach 1	887.17*	50YR	US 21 70480 Proposed Conditions	124.38	441.43	442.79		442.86	0.007944	2.12	58.65	95.72	0.48
Reach 1	887.17*	100YR	US 21 70480 Nat	144.76	441.43	442.84		442.92	0.008376	2.26	63.97	98.58	0.50
Reach 1	887.17*	100YR	US 21 70480 Proposed Conditions	144.76	441.43	442.88		442.95	0.006976	2.13	67.83	99.48	0.46
Reach 1	863.11*	50YR	US 21 70480 Nat	124.38	441.24	442.55		442.63	0.008969	2.27	54.88	88.78	0.51
Reach 1	863.11*	50YR	US 21 70480 Proposed Conditions	124.38	441.24	442.61	442.26	442.68	0.007219	2.07	60.11	94.74	0.46
Reach 1	863.11*	100YR	US 21 70480 Nat	144.76	441.24	442.63		442.72	0.008967	2.32	62.30	97.10	0.51
Reach 1	863.11*	100YR	US 21 70480 Proposed Conditions	144.76	441.24	442.74	442.31	442.80	0.005792	1.98	73.07	104.21	0.42
Reach 1	839.06*	50YR	US 21 70480 Nat	124.38	441.04	442.33		442.42	0.008927	2.31	53.78	84.12	0.51
Reach 1	839.06*	50YR	US 21 70480 Proposed Conditions	124.38	441.04	442.46	442.06	442.52	0.005579	1.90	65.52	96.86	0.41
Reach 1	839.06*	100YR	US 21 70480 Nat	144.76	441.04	442.41		442.50	0.009232	2.41	60.17	90.97	0.52
Reach 1	839.06*	100YR	US 21 70480 Proposed Conditions	144.76	441.04	442.63	442.11	442.68	0.004054	1.74	83.05	109.85	0.35
Reach 1	815	50YR	US 21 70480 Nat	124.38	440.84	442.04		442.15	0.013552	2.67	46.60	80.41	0.62
Reach 1	815	50YR	US 21 70480 Proposed Conditions	124.38	440.84	442.36	441.85	442.41	0.003848	1.65	75.36	104.00	0.34
Reach 1	815	100YR	US 21 70480 Nat	144.76	440.84	442.11		442.23	0.013408	2.78	51.99	83.53	0.62
Reach 1	815	100YR	US 21 70480 Proposed Conditions	144.76	440.84	442.57	441.91	442.60	0.002518	1.48	97.99	116.24	0.28
Reach 1	790.33*	50YR	US 21 70480 Nat	124.38	440.54	441.72		441.83	0.013185	2.58	48.14	85.48	0.61
Reach 1	790.33*	100YR	US 21 70480 Nat	144.76	440.54	441.78		441.90	0.013496	2.73	53.10	88.51	0.62
Reach 1	765.67*	50YR	US 21 70480 Nat	124.38	440.24	441.40		441.50	0.013447	2.55	48.80	89.74	0.61
Reach 1	765.67*	100YR	US 21 70480 Nat	144.76	440.24	441.46		441.57	0.013061	2.63	54.97	94.18	0.61
Reach 1	741.00*	50YR	US 21 70480 Nat	124.38	439.95	441.08		441.17	0.012926	2.47	50.32	94.08	0.60
Reach 1	741.00*	100YR	US 21 70480 Nat	144.76	439.95	441.14		441.24	0.013403	2.56	56.63	103.49	0.61

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	716.33*	50YR	US 21 70480 Nat	124.38	439.65	440.76		440.85	0.013267	2.40	51.92	103.82	0.60
Reach 1	716.33*	100YR	US 21 70480 Nat	144.76	439.65	440.82		440.92	0.012751	2.45	58.99	110.38	0.59
Reach 1	691.67*	50YR	US 21 70480 Nat	124.38	439.35	440.44		440.53	0.012591	2.29	54.32	111.77	0.58
Reach 1	691.67*	100YR	US 21 70480 Nat	144.76	439.35	440.50		440.59	0.013884	2.35	61.53	130.80	0.60
Reach 1	667.00*	50YR	US 21 70480 Nat	124.38	439.05	440.12		440.20	0.013660	2.20	56.45	130.78	0.59
Reach 1	667.00*	100YR	US 21 70480 Nat	144.76	439.05	440.17		440.25	0.013609	2.31	62.73	135.24	0.60
Reach 1	642.33*	50YR	US 21 70480 Nat	124.38	438.75	439.78		439.85	0.014303	2.23	55.84	131.78	0.60
Reach 1	642.33*	100YR	US 21 70480 Nat	144.76	438.75	439.83		439.91	0.013764	2.29	63.14	138.65	0.60
Reach 1	617.67*	50YR	US 21 70480 Nat	124.38	438.45	439.43		439.51	0.013819	2.27	54.86	122.85	0.60
Reach 1	617.67*	100YR	US 21 70480 Nat	144.76	438.45	439.47		439.56	0.014190	2.37	61.05	130.36	0.61
Reach 1	593.00*	50YR	US 21 70480 Nat	124.38	438.15	439.07		439.15	0.014294	2.31	53.77	119.85	0.61
Reach 1	593.00*	100YR	US 21 70480 Nat	144.76	438.15	439.13		439.21	0.014098	2.38	60.90	128.94	0.61
Reach 1	568.33*	50YR	US 21 70480 Nat	124.38	437.86	438.72		438.80	0.013900	2.29	54.22	119.81	0.60
Reach 1	568.33*	100YR	US 21 70480 Nat	144.76	437.86	438.77		438.86	0.014431	2.41	60.17	127.33	0.62
Reach 1	543.67*	50YR	US 21 70480 Nat	124.38	437.56	438.35		438.44	0.015743	2.40	51.84	117.57	0.64
Reach 1	543.67*	100YR	US 21 70480 Nat	144.76	437.56	438.42		438.51	0.014254	2.43	59.50	122.68	0.62
Reach 1	519	50YR	US 21 70480 Nat	124.38	437.26	438.14		438.19	0.006832	1.80	69.01	128.56	0.43
Reach 1	519	50YR	US 21 70480 Proposed Conditions	124.38	437.26	438.14	437.89	438.19	0.006740	1.81	68.78	128.37	0.43
Reach 1	519	100YR	US 21 70480 Nat	144.76	437.26	438.20		438.25	0.007166	1.86	77.73	142.87	0.45
Reach 1	519	100YR	US 21 70480 Proposed Conditions	144.76	437.26	438.19	437.92	438.25	0.006836	1.90	76.33	142.03	0.44
Reach 1	494.26*	50YR	US 21 70480 Nat	124.38	437.09	437.97		438.02	0.006814	1.81	68.53	126.07	0.43
Reach 1	494.26*	50YR	US 21 70480 Proposed Conditions	124.38	437.09	437.97	437.72	438.02	0.006808	1.81	68.55	126.08	0.43
Reach 1	494.26*	100YR	US 21 70480 Nat	144.76	437.09	438.02		438.08	0.006810	1.92	75.50	127.86	0.44
Reach 1	494.26*	100YR	US 21 70480 Proposed Conditions	144.76	437.09	438.02	437.76	438.08	0.006804	1.92	75.52	127.87	0.44
Reach 1	469.53*	50YR	US 21 70480 Nat	124.38	436.91	437.80		437.85	0.006856	1.82	68.44	126.23	0.44
Reach 1	469.53*	50YR	US 21 70480 Proposed Conditions	124.38	436.91	437.80	437.55	437.85	0.006830	1.82	68.52	126.25	0.43
Reach 1	469.53*	100YR	US 21 70480 Nat	144.76	436.91	437.85		437.91	0.006825	1.92	75.49	128.02	0.44
Reach 1	469.53*	100YR	US 21 70480 Proposed Conditions	144.76	436.91	437.85	437.58	437.91	0.006801	1.92	75.57	128.04	0.44
Reach 1	444.79*	50YR	US 21 70480 Nat	124.38	436.74	437.63		437.68	0.006940	1.83	67.99	125.31	0.44
Reach 1	444.79*	50YR	US 21 70480 Proposed Conditions	124.38	436.74	437.63		437.68	0.006918	1.83	68.06	125.34	0.44
Reach 1	444.79*	100YR	US 21 70480 Nat	144.76	436.74	437.68		437.74	0.006930	1.93	75.08	127.75	0.44
Reach 1	444.79*	100YR	US 21 70480 Proposed Conditions	144.76	436.74	437.68		437.74	0.006909	1.93	75.15	127.78	0.44
Reach 1	420.05*	50YR	US 21 70480 Nat	124.38	436.57	437.45		437.51	0.007017	1.84	67.54	124.29	0.44
Reach 1	420.05*	50YR	US 21 70480 Proposed Conditions	124.38	436.57	437.45		437.51	0.006982	1.84	67.65	124.33	0.44

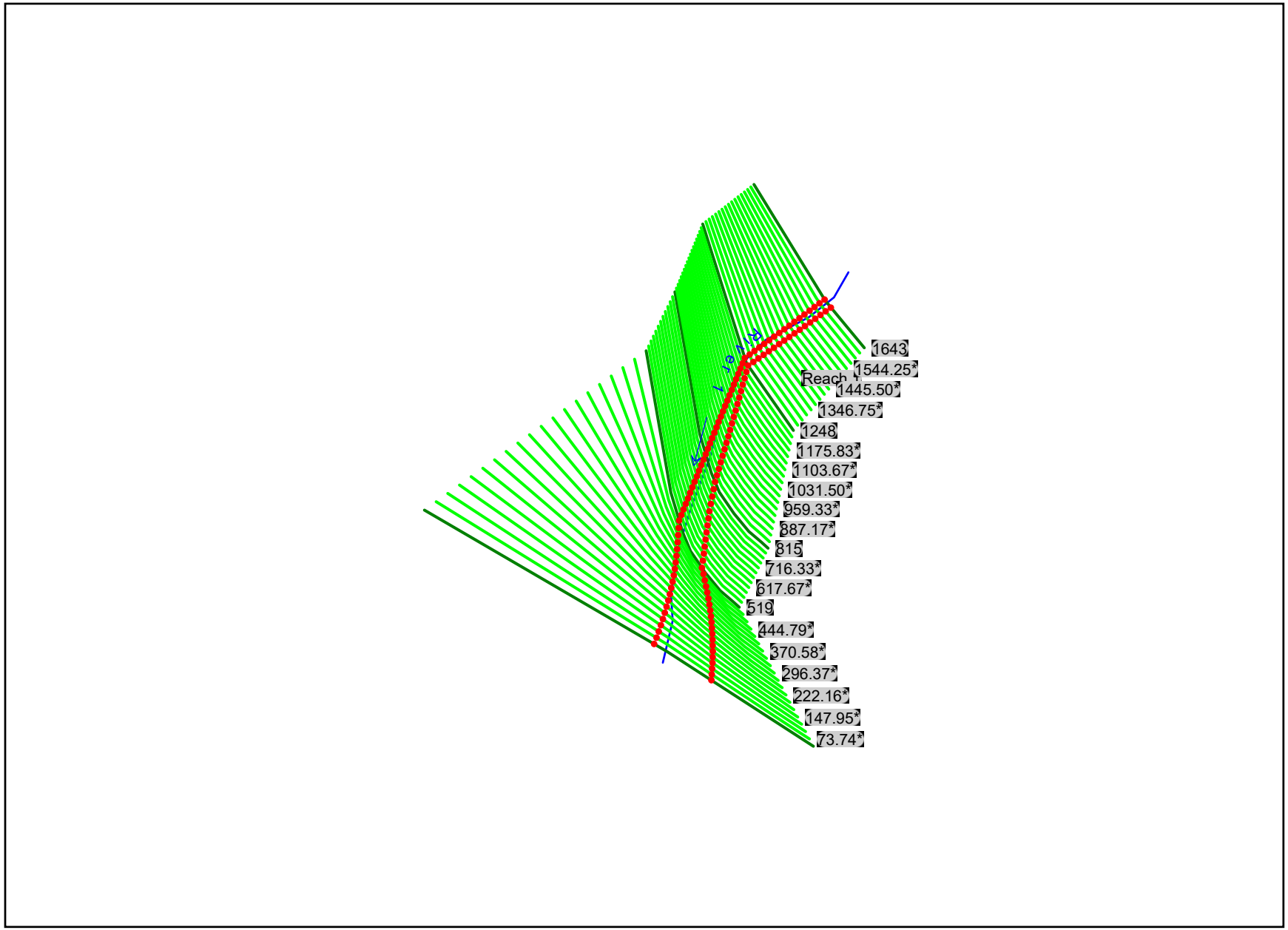
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

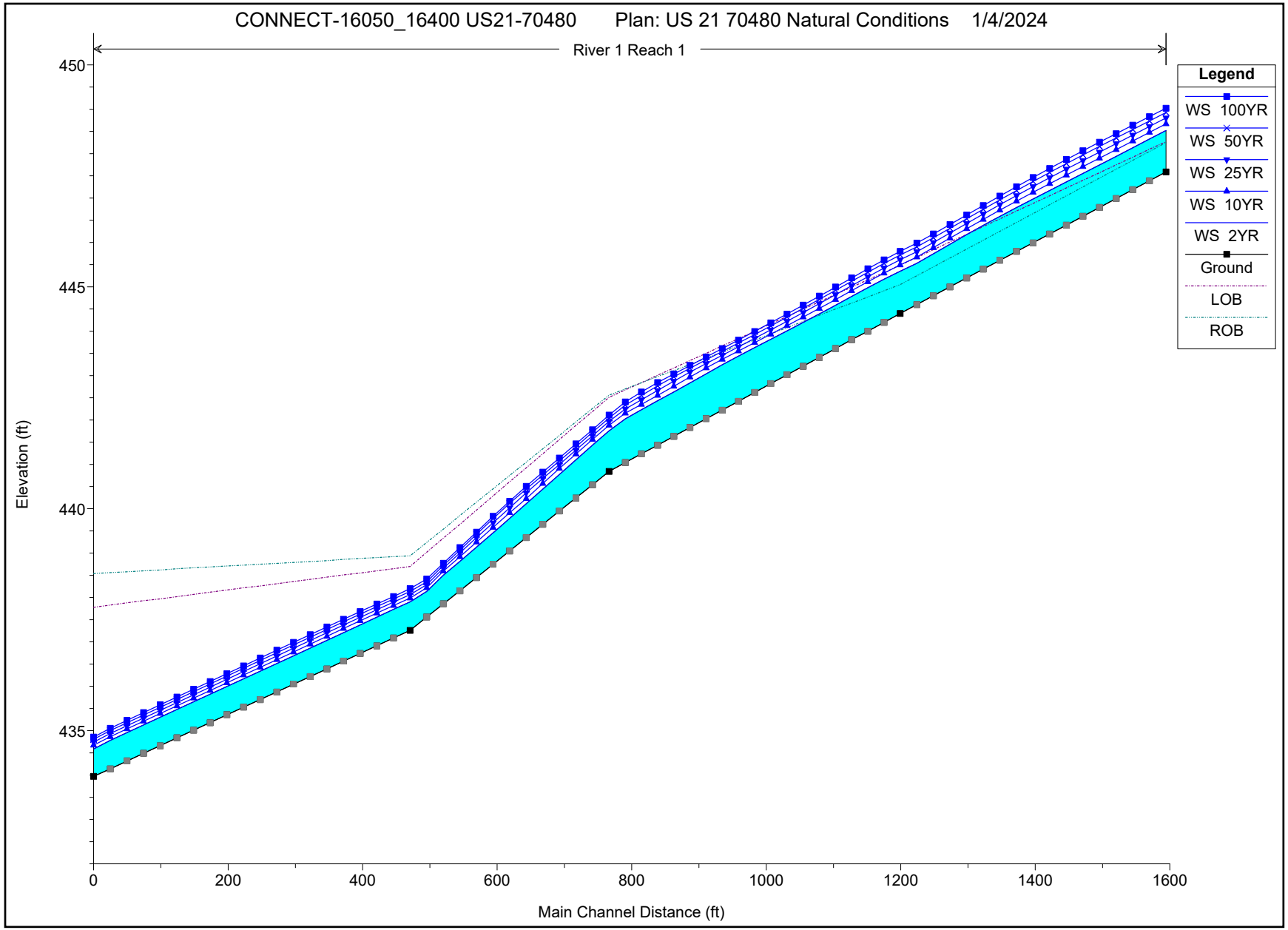
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	420.05*	100YR	US 21 70480 Nat	144.76	436.57	437.51		437.57	0.007006	1.94	74.58	126.69	0.45
Reach 1	420.05*	100YR	US 21 70480 Proposed Conditions	144.76	436.57	437.51		437.57	0.006971	1.94	74.70	126.73	0.44
Reach 1	395.32*	50YR	US 21 70480 Nat	124.38	436.39	437.28		437.33	0.007030	1.84	67.43	123.95	0.44
Reach 1	395.32*	50YR	US 21 70480 Proposed Conditions	124.38	436.39	437.28		437.33	0.007015	1.84	67.48	123.96	0.44
Reach 1	395.32*	100YR	US 21 70480 Nat	144.76	436.39	437.34		437.40	0.007011	1.94	74.44	126.14	0.45
Reach 1	395.32*	100YR	US 21 70480 Proposed Conditions	144.76	436.39	437.34		437.40	0.007000	1.94	74.47	126.15	0.45
Reach 1	370.58*	50YR	US 21 70480 Nat	124.38	436.22	437.11		437.16	0.007017	1.85	67.37	123.51	0.44
Reach 1	370.58*	50YR	US 21 70480 Proposed Conditions	124.38	436.22	437.11		437.16	0.006995	1.84	67.44	123.53	0.44
Reach 1	370.58*	100YR	US 21 70480 Nat	144.76	436.22	437.16		437.22	0.007006	1.95	74.33	125.60	0.45
Reach 1	370.58*	100YR	US 21 70480 Proposed Conditions	144.76	436.22	437.16		437.22	0.006988	1.95	74.39	125.62	0.45
Reach 1	345.84*	50YR	US 21 70480 Nat	124.38	436.05	436.93		436.99	0.007196	1.86	66.79	123.17	0.45
Reach 1	345.84*	50YR	US 21 70480 Proposed Conditions	124.38	436.05	436.93		436.99	0.007173	1.86	66.86	123.19	0.45
Reach 1	345.84*	100YR	US 21 70480 Nat	144.76	436.05	436.99		437.05	0.007098	1.96	73.95	125.26	0.45
Reach 1	345.84*	100YR	US 21 70480 Proposed Conditions	144.76	436.05	436.99		437.05	0.007077	1.96	74.03	125.29	0.45
Reach 1	321.11*	50YR	US 21 70480 Nat	124.38	435.87	436.75		436.81	0.007116	1.87	66.56	121.08	0.44
Reach 1	321.11*	50YR	US 21 70480 Proposed Conditions	124.38	435.87	436.75		436.81	0.007111	1.87	66.58	121.09	0.44
Reach 1	321.11*	100YR	US 21 70480 Nat	144.76	435.87	436.81		436.87	0.007109	1.96	73.90	125.17	0.45
Reach 1	321.11*	100YR	US 21 70480 Proposed Conditions	144.76	435.87	436.81		436.87	0.007097	1.96	73.94	125.18	0.45
Reach 1	296.37*	50YR	US 21 70480 Nat	124.38	435.70	436.58		436.63	0.007079	1.87	66.36	119.72	0.44
Reach 1	296.37*	50YR	US 21 70480 Proposed Conditions	124.38	435.70	436.58		436.63	0.007072	1.87	66.38	119.74	0.44
Reach 1	296.37*	100YR	US 21 70480 Nat	144.76	435.70	436.64		436.70	0.007123	1.97	73.51	123.73	0.45
Reach 1	296.37*	100YR	US 21 70480 Proposed Conditions	144.76	435.70	436.64		436.70	0.007114	1.97	73.55	123.75	0.45
Reach 1	271.63*	50YR	US 21 70480 Nat	124.38	435.53	436.40		436.46	0.007105	1.88	66.28	119.68	0.44
Reach 1	271.63*	50YR	US 21 70480 Proposed Conditions	124.38	435.53	436.40		436.46	0.007093	1.88	66.32	119.69	0.44
Reach 1	271.63*	100YR	US 21 70480 Nat	144.76	435.53	436.46		436.52	0.007145	1.98	73.17	122.54	0.45
Reach 1	271.63*	100YR	US 21 70480 Proposed Conditions	144.76	435.53	436.46		436.52	0.007134	1.98	73.20	122.56	0.45
Reach 1	246.89*	50YR	US 21 70480 Nat	124.38	435.36	436.23		436.28	0.007127	1.87	66.41	120.54	0.44
Reach 1	246.89*	50YR	US 21 70480 Proposed Conditions	124.38	435.36	436.23		436.28	0.007112	1.87	66.45	120.55	0.44
Reach 1	246.89*	100YR	US 21 70480 Nat	144.76	435.36	436.28		436.34	0.007129	1.98	73.24	122.63	0.45
Reach 1	246.89*	100YR	US 21 70480 Proposed Conditions	144.76	435.36	436.28		436.34	0.007116	1.98	73.28	122.65	0.45
Reach 1	222.16*	50YR	US 21 70480 Nat	124.38	435.18	436.05		436.11	0.007072	1.86	66.72	121.24	0.44
Reach 1	222.16*	50YR	US 21 70480 Proposed Conditions	124.38	435.18	436.05		436.11	0.007064	1.86	66.74	121.25	0.44
Reach 1	222.16*	100YR	US 21 70480 Nat	144.76	435.18	436.11		436.17	0.007083	1.97	73.48	123.06	0.45
Reach 1	222.16*	100YR	US 21 70480 Proposed Conditions	144.76	435.18	436.11		436.17	0.007076	1.97	73.51	123.07	0.45
Reach 1	197.42*	50YR	US 21 70480 Nat	124.38	435.01	435.88		435.93	0.007060	1.86	66.94	122.11	0.44
Reach 1	197.42*	50YR	US 21 70480 Proposed Conditions	124.38	435.01	435.88		435.93	0.007055	1.86	66.96	122.11	0.44
Reach 1	197.42*	100YR	US 21 70480 Nat	144.76	435.01	435.93		435.99	0.007076	1.96	73.69	123.84	0.45

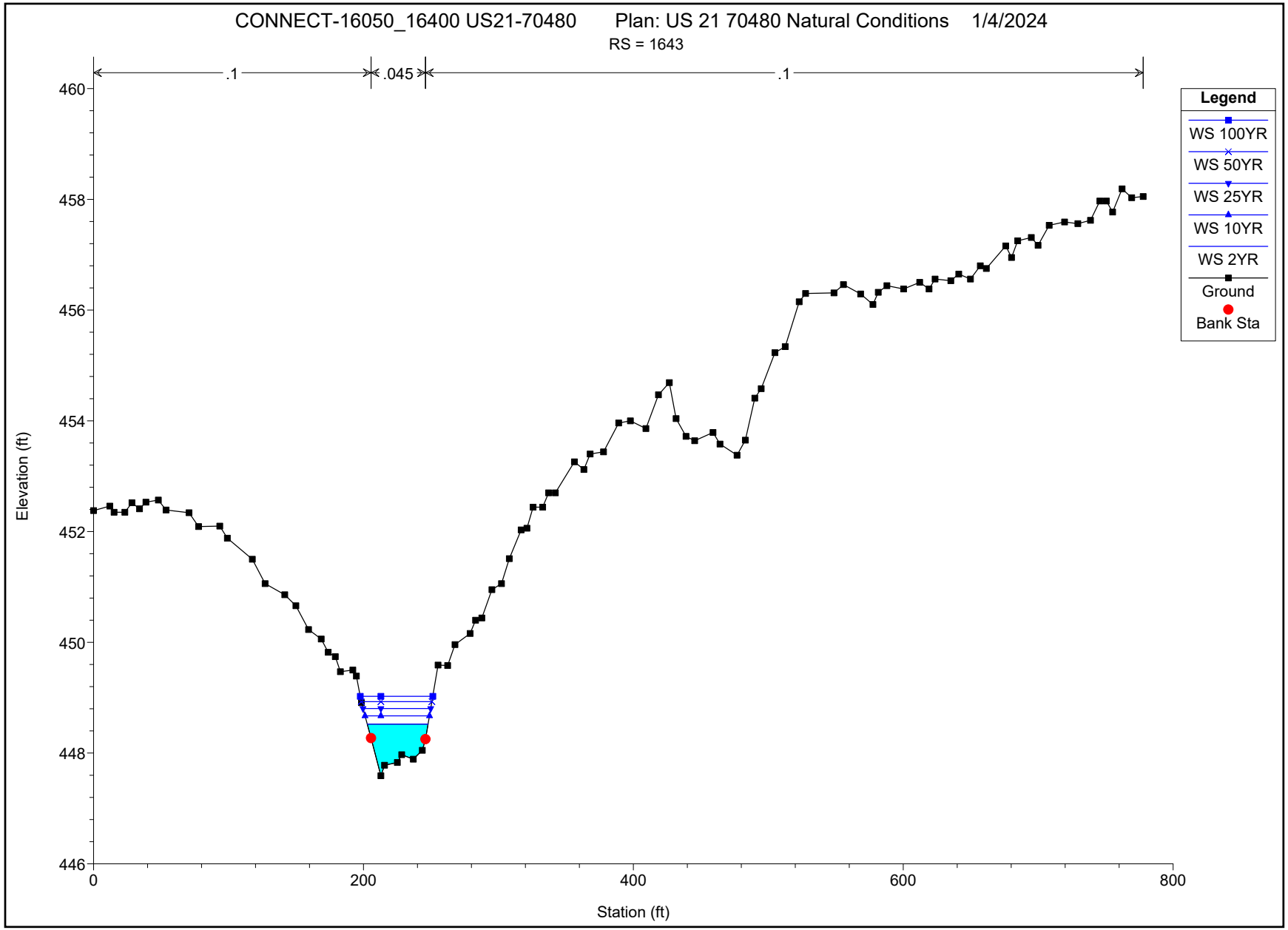
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	197.42*	100YR	US 21 70480 Proposed Conditions	144.76	435.01	435.93		435.99	0.007069	1.96	73.71	123.85	0.45
Reach 1	172.68*	50YR	US 21 70480 Nat	124.38	434.84	435.70		435.76	0.007125	1.86	66.98	123.14	0.44
Reach 1	172.68*	50YR	US 21 70480 Proposed Conditions	124.38	434.84	435.70		435.76	0.007109	1.86	67.03	123.15	0.44
Reach 1	172.68*	100YR	US 21 70480 Nat	144.76	434.84	435.76		435.82	0.007121	1.96	73.78	124.82	0.45
Reach 1	172.68*	100YR	US 21 70480 Proposed Conditions	144.76	434.84	435.76		435.82	0.007108	1.96	73.82	124.83	0.45
Reach 1	147.95*	50YR	US 21 70480 Nat	124.38	434.66	435.53		435.58	0.007071	1.85	67.34	124.07	0.44
Reach 1	147.95*	50YR	US 21 70480 Proposed Conditions	124.38	434.66	435.53		435.58	0.007065	1.85	67.36	124.07	0.44
Reach 1	147.95*	100YR	US 21 70480 Nat	144.76	434.66	435.58		435.64	0.007094	1.95	74.07	125.68	0.45
Reach 1	147.95*	100YR	US 21 70480 Proposed Conditions	144.76	434.66	435.58		435.64	0.007088	1.95	74.09	125.68	0.45
Reach 1	123.21*	50YR	US 21 70480 Nat	124.38	434.49	435.36		435.41	0.007084	1.84	67.53	125.10	0.44
Reach 1	123.21*	50YR	US 21 70480 Proposed Conditions	124.38	434.49	435.36		435.41	0.007068	1.84	67.58	125.11	0.44
Reach 1	123.21*	100YR	US 21 70480 Nat	144.76	434.49	435.41		435.47	0.007121	1.95	74.21	126.63	0.45
Reach 1	123.21*	100YR	US 21 70480 Proposed Conditions	144.76	434.49	435.41		435.47	0.007104	1.95	74.26	126.64	0.45
Reach 1	98.47*	50YR	US 21 70480 Nat	124.38	434.32	435.18		435.23	0.007117	1.84	67.69	126.27	0.44
Reach 1	98.47*	50YR	US 21 70480 Proposed Conditions	124.38	434.32	435.18		435.23	0.007112	1.84	67.70	126.28	0.44
Reach 1	98.47*	100YR	US 21 70480 Nat	144.76	434.32	435.23		435.29	0.007160	1.95	74.35	127.75	0.45
Reach 1	98.47*	100YR	US 21 70480 Proposed Conditions	144.76	434.32	435.23		435.29	0.007143	1.95	74.40	127.76	0.45
Reach 1	73.74*	50YR	US 21 70480 Nat	124.38	434.14	435.00		435.06	0.007144	1.83	67.84	127.37	0.44
Reach 1	73.74*	50YR	US 21 70480 Proposed Conditions	124.38	434.14	435.01		435.06	0.007072	1.83	68.06	127.42	0.44
Reach 1	73.74*	100YR	US 21 70480 Nat	144.76	434.14	435.05		435.11	0.007272	1.95	74.23	128.74	0.45
Reach 1	73.74*	100YR	US 21 70480 Proposed Conditions	144.76	434.14	435.06		435.11	0.007189	1.94	74.50	128.80	0.45
Reach 1	49	50YR	US 21 70480 Nat	124.38	433.97	434.81	434.59	434.86	0.008301	1.92	64.95	127.83	0.47
Reach 1	49	50YR	US 21 70480 Proposed Conditions	124.38	433.97	434.81	434.59	434.86	0.008301	1.92	64.95	127.83	0.47
Reach 1	49	100YR	US 21 70480 Nat	144.76	433.97	434.86	434.63	434.92	0.008312	2.03	71.41	129.18	0.48
Reach 1	49	100YR	US 21 70480 Proposed Conditions	144.76	433.97	434.86	434.63	434.92	0.008312	2.03	71.41	129.18	0.48

US21 704+80 NATURAL PLAN




CONNECT-16050_16400 US21-70480 Plan: US 21 70480 Natural Conditions 1/4/2024
River 1 Reach 1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
LOB
ROB
Elevation (ft)
450
445
440
435
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)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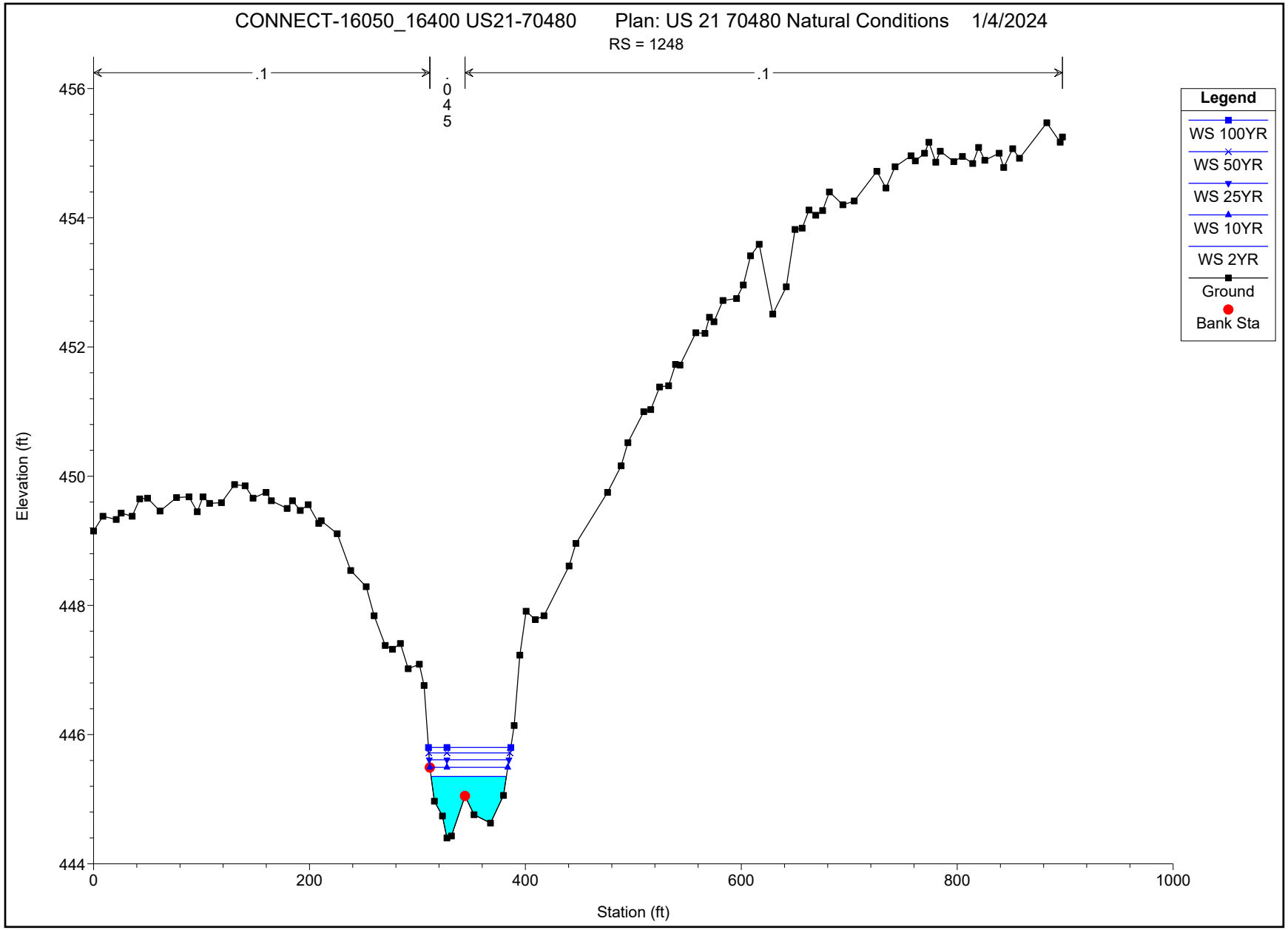
RS = 1643
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
460
458
456
454
452
450
448
446
0
200
400
600
800
Station (ft)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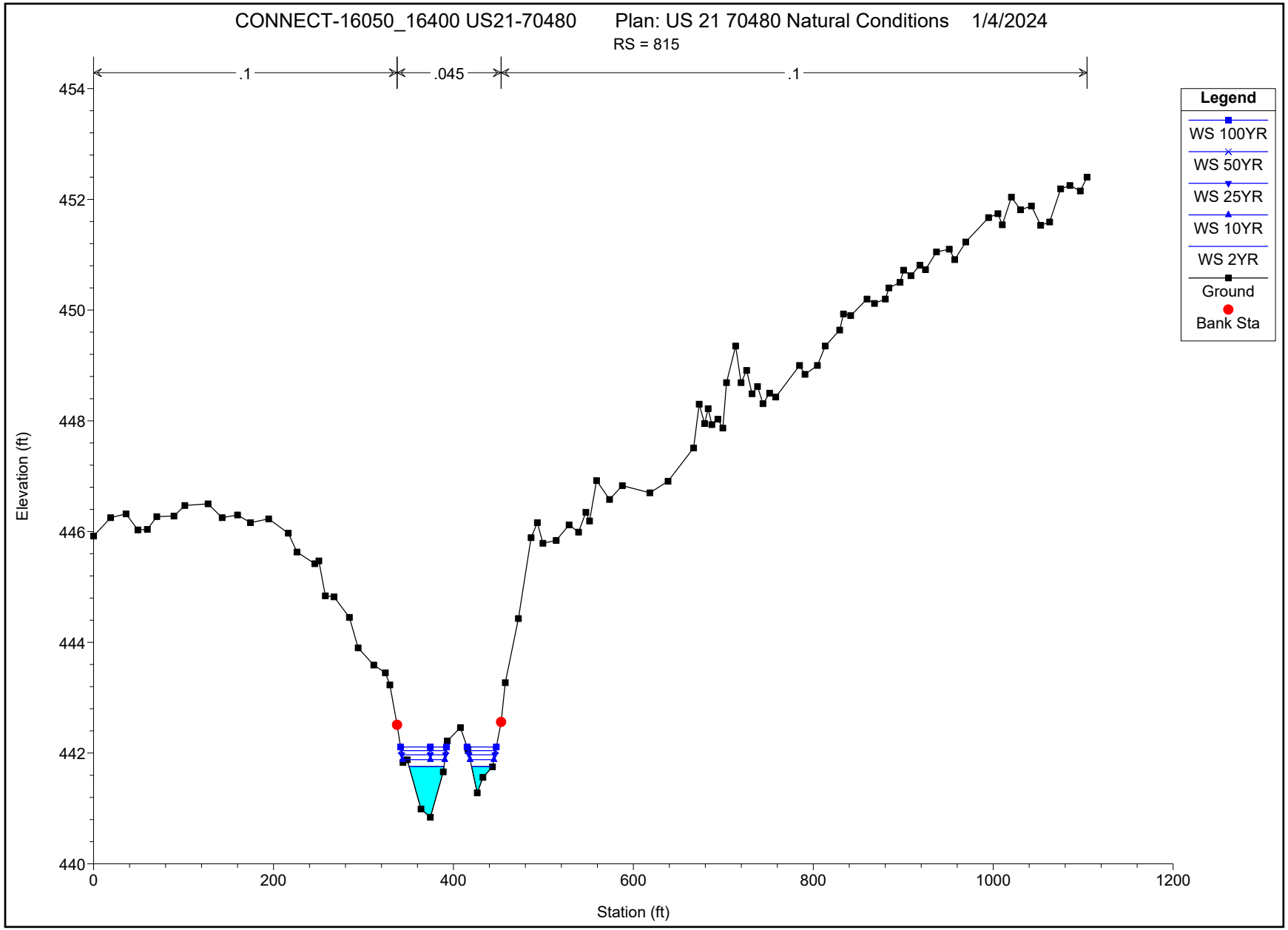
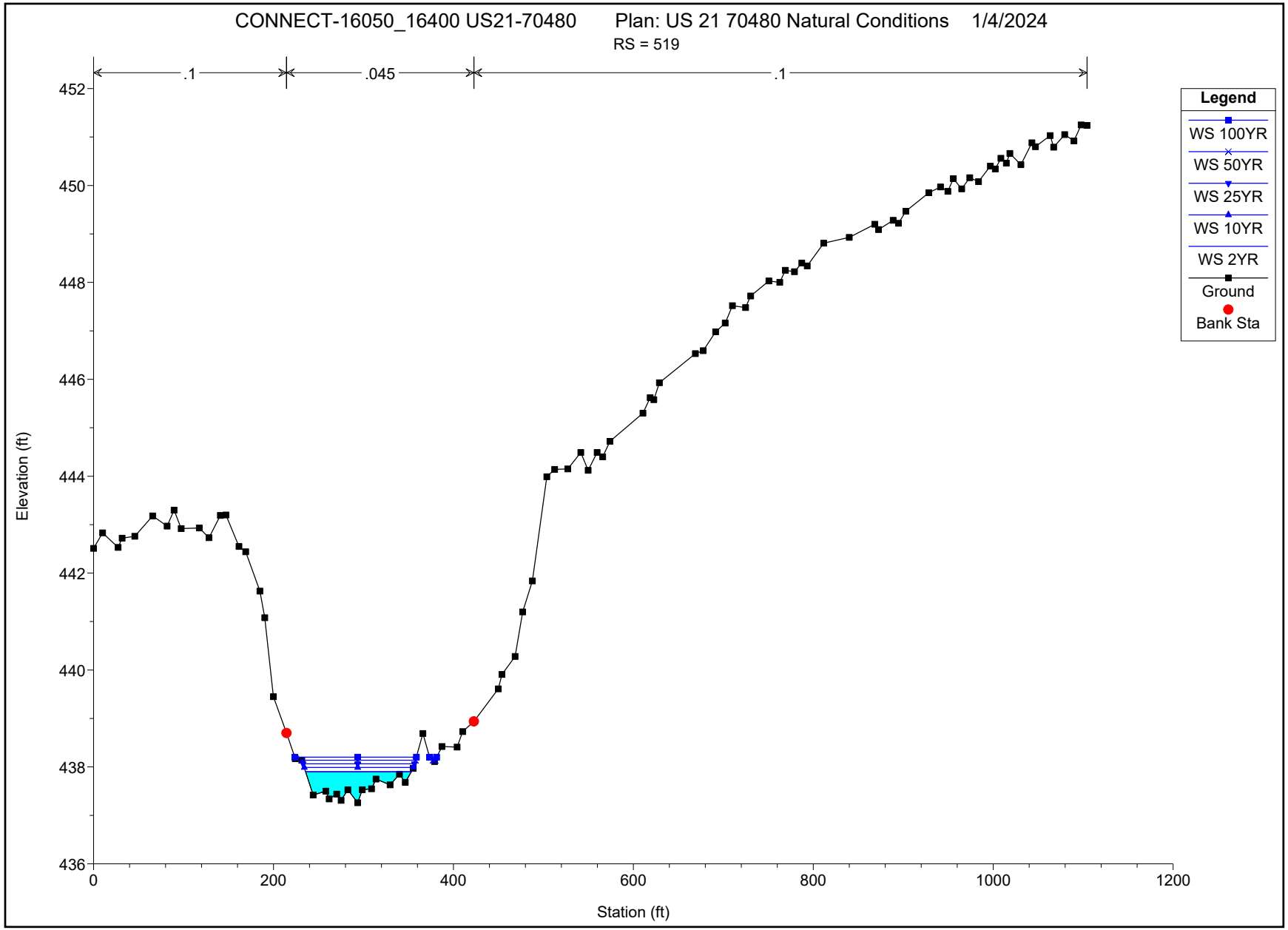
RS = 1248
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
456
454
452
450
448
446
444
0
200
400
600
800
1000


CONNECT-16050_16400 US21-70480
Plan: US 21 70480 Natural Conditions
1/4/2024
RS = 815
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
454
452
450
448
446
444
442
440
0
200
400
600
800
1000
1200
Station (ft)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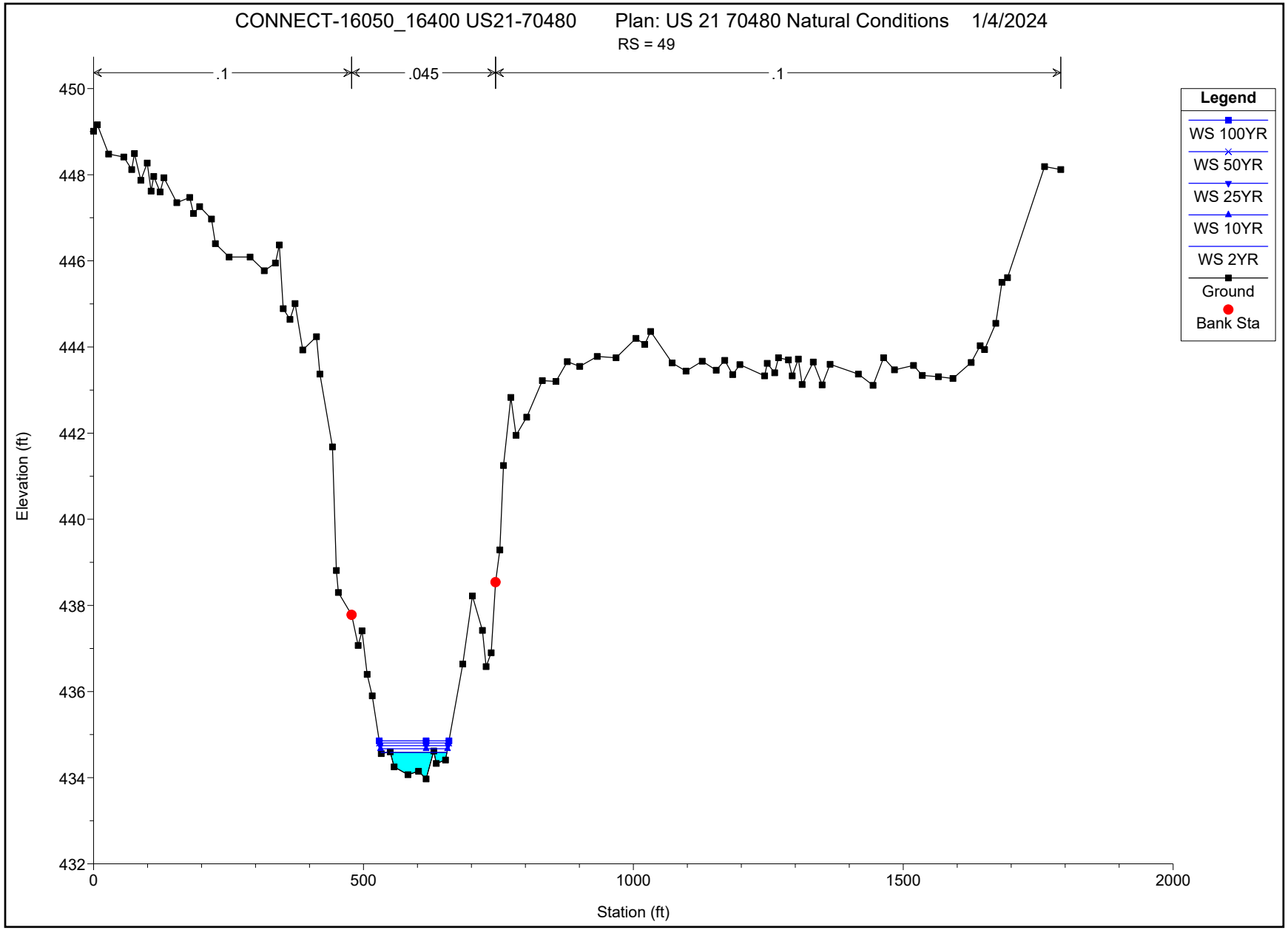
RS = 519
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
452
450
448
446
444
442
440
438
436
0
200
400
600
800
1000
1200
Station (ft)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RS = 49
.1
.045
.1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
448
446
444
442
440
438
436
434
432
0
500
1000
1500
2000

HEC-RAS River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1643	50YR	US 21 70480 Nat	124.38	447.59	448.93		449.06	0.007665	2.94	45.47	52.35	0.51
Reach 1	1643	50YR	US 21 70480 Proposed Conditions	124.38	447.59	448.93		449.06	0.007665	2.94	45.47	52.35	0.51
Reach 1	1643	100YR	US 21 70480 Nat	144.76	447.59	449.02		449.17	0.007612	3.11	50.61	53.79	0.52
Reach 1	1643	100YR	US 21 70480 Proposed Conditions	144.76	447.59	449.02		449.17	0.007612	3.11	50.61	53.79	0.52
Reach 1	1618.31*	50YR	US 21 70480 Nat	124.38	447.39	448.74		448.87	0.007667	2.96	45.11	51.74	0.51
Reach 1	1618.31*	50YR	US 21 70480 Proposed Conditions	124.38	447.39	448.74		448.87	0.007667	2.96	45.11	51.74	0.51
Reach 1	1618.31*	100YR	US 21 70480 Nat	144.76	447.39	448.83		448.98	0.007622	3.13	50.23	53.47	0.52
Reach 1	1618.31*	100YR	US 21 70480 Proposed Conditions	144.76	447.39	448.83		448.98	0.007622	3.13	50.23	53.47	0.52
Reach 1	1593.63*	50YR	US 21 70480 Nat	124.38	447.19	448.54		448.68	0.007725	2.98	44.74	51.08	0.51
Reach 1	1593.63*	50YR	US 21 70480 Proposed Conditions	124.38	447.19	448.54		448.68	0.007725	2.98	44.74	51.08	0.51
Reach 1	1593.63*	100YR	US 21 70480 Nat	144.76	447.19	448.64		448.79	0.007686	3.15	49.83	53.03	0.52
Reach 1	1593.63*	100YR	US 21 70480 Proposed Conditions	144.76	447.19	448.64		448.79	0.007686	3.15	49.83	53.03	0.52
Reach 1	1568.94*	50YR	US 21 70480 Nat	124.38	446.99	448.35		448.49	0.007698	2.99	44.55	50.48	0.51
Reach 1	1568.94*	50YR	US 21 70480 Proposed Conditions	124.38	446.99	448.35		448.49	0.007698	2.99	44.55	50.48	0.51
Reach 1	1568.94*	100YR	US 21 70480 Nat	144.76	446.99	448.45		448.60	0.007680	3.17	49.59	52.53	0.52
Reach 1	1568.94*	100YR	US 21 70480 Proposed Conditions	144.76	446.99	448.45		448.60	0.007680	3.17	49.59	52.53	0.52
Reach 1	1544.25*	50YR	US 21 70480 Nat	124.38	446.79	448.16		448.30	0.007675	3.00	44.51	50.12	0.51
Reach 1	1544.25*	50YR	US 21 70480 Proposed Conditions	124.38	446.79	448.16		448.30	0.007675	3.00	44.51	50.12	0.51
Reach 1	1544.25*	100YR	US 21 70480 Nat	144.76	446.79	448.26		448.41	0.007696	3.19	49.46	52.23	0.52
Reach 1	1544.25*	100YR	US 21 70480 Proposed Conditions	144.76	446.79	448.26		448.41	0.007696	3.19	49.46	52.23	0.52
Reach 1	1519.56*	50YR	US 21 70480 Nat	124.38	446.59	447.97		448.11	0.007640	3.01	44.58	50.09	0.51
Reach 1	1519.56*	50YR	US 21 70480 Proposed Conditions	124.38	446.59	447.97		448.11	0.007640	3.01	44.58	50.09	0.51
Reach 1	1519.56*	100YR	US 21 70480 Nat	144.76	446.59	448.07		448.22	0.007734	3.20	49.40	56.31	0.52
Reach 1	1519.56*	100YR	US 21 70480 Proposed Conditions	144.76	446.59	448.07		448.22	0.007735	3.20	49.40	56.30	0.52
Reach 1	1494.88*	50YR	US 21 70480 Nat	124.38	446.39	447.77		447.92	0.007923	3.06	44.48	58.45	0.52
Reach 1	1494.88*	50YR	US 21 70480 Proposed Conditions	124.38	446.39	447.77		447.92	0.007923	3.06	44.48	58.45	0.52
Reach 1	1494.88*	100YR	US 21 70480 Nat	144.76	446.39	447.87		448.03	0.007973	3.25	50.07	61.37	0.53
Reach 1	1494.88*	100YR	US 21 70480 Proposed Conditions	144.76	446.39	447.87		448.03	0.007974	3.25	50.07	61.37	0.53
Reach 1	1470.19*	50YR	US 21 70480 Nat	124.38	446.19	447.58		447.72	0.008035	3.08	45.31	60.75	0.53
Reach 1	1470.19*	50YR	US 21 70480 Proposed Conditions	124.38	446.19	447.58		447.72	0.008035	3.08	45.31	60.75	0.53
Reach 1	1470.19*	100YR	US 21 70480 Nat	144.76	446.19	447.67		447.83	0.008136	3.27	50.99	64.79	0.54
Reach 1	1470.19*	100YR	US 21 70480 Proposed Conditions	144.76	446.19	447.67		447.83	0.008136	3.27	50.99	64.79	0.54
Reach 1	1445.50*	50YR	US 21 70480 Nat	124.38	445.99	447.37		447.52	0.008267	3.11	46.38	65.10	0.53
Reach 1	1445.50*	50YR	US 21 70480 Proposed Conditions	124.38	445.99	447.37		447.52	0.008267	3.11	46.38	65.10	0.53
Reach 1	1445.50*	100YR	US 21 70480 Nat	144.76	445.99	447.46		447.62	0.008362	3.30	52.33	68.82	0.54
Reach 1	1445.50*	100YR	US 21 70480 Proposed Conditions	144.76	445.99	447.46		447.62	0.008362	3.30	52.33	68.82	0.54
Reach 1	1420.81*	50YR	US 21 70480 Nat	124.38	445.80	447.17		447.31	0.008458	3.13	47.87	68.66	0.54

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1420.81*	50YR	US 21 70480 Proposed Conditions	124.38	445.80	447.17		447.31	0.008458	3.13	47.87	68.66	0.54
Reach 1	1420.81*	100YR	US 21 70480 Nat	144.76	445.80	447.25		447.42	0.008569	3.32	53.96	72.17	0.55
Reach 1	1420.81*	100YR	US 21 70480 Proposed Conditions	144.76	445.80	447.25		447.42	0.008568	3.32	53.96	72.17	0.55
Reach 1	1396.13*	50YR	US 21 70480 Nat	124.38	445.60	446.96		447.10	0.008668	3.14	49.84	71.96	0.54
Reach 1	1396.13*	50YR	US 21 70480 Proposed Conditions	124.38	445.60	446.96		447.10	0.008668	3.14	49.84	71.96	0.54
Reach 1	1396.13*	100YR	US 21 70480 Nat	144.76	445.60	447.04		447.20	0.008720	3.32	56.07	73.73	0.55
Reach 1	1396.13*	100YR	US 21 70480 Proposed Conditions	144.76	445.60	447.04		447.20	0.008718	3.32	56.08	73.73	0.55
Reach 1	1371.44*	50YR	US 21 70480 Nat	124.38	445.40	446.75		446.89	0.008828	3.13	51.74	72.87	0.55
Reach 1	1371.44*	50YR	US 21 70480 Proposed Conditions	124.38	445.40	446.75		446.89	0.008828	3.13	51.74	72.87	0.55
Reach 1	1371.44*	100YR	US 21 70480 Nat	144.76	445.40	446.83		446.98	0.008857	3.31	57.97	74.22	0.56
Reach 1	1371.44*	100YR	US 21 70480 Proposed Conditions	144.76	445.40	446.83		446.98	0.008856	3.31	57.97	74.23	0.56
Reach 1	1346.75*	50YR	US 21 70480 Nat	124.38	445.20	446.53		446.67	0.008931	3.11	53.76	73.37	0.55
Reach 1	1346.75*	50YR	US 21 70480 Proposed Conditions	124.38	445.20	446.53		446.67	0.008931	3.11	53.76	73.37	0.55
Reach 1	1346.75*	100YR	US 21 70480 Nat	144.76	445.20	446.62		446.76	0.008940	3.29	60.00	74.64	0.56
Reach 1	1346.75*	100YR	US 21 70480 Proposed Conditions	144.76	445.20	446.62		446.76	0.008940	3.29	60.00	74.64	0.56
Reach 1	1322.06*	50YR	US 21 70480 Nat	124.38	445.00	446.32		446.44	0.008926	3.07	55.95	73.73	0.55
Reach 1	1322.06*	50YR	US 21 70480 Proposed Conditions	124.38	445.00	446.32		446.44	0.008926	3.07	55.95	73.73	0.55
Reach 1	1322.06*	100YR	US 21 70480 Nat	144.76	445.00	446.40		446.54	0.008936	3.25	62.20	75.04	0.56
Reach 1	1322.06*	100YR	US 21 70480 Proposed Conditions	144.76	445.00	446.40		446.54	0.008937	3.25	62.20	75.04	0.56
Reach 1	1297.38*	50YR	US 21 70480 Nat	124.38	444.80	446.11		446.22	0.008890	3.02	58.17	74.17	0.54
Reach 1	1297.38*	50YR	US 21 70480 Proposed Conditions	124.38	444.80	446.11		446.22	0.008890	3.02	58.17	74.17	0.54
Reach 1	1297.38*	100YR	US 21 70480 Nat	144.76	444.80	446.19		446.32	0.008880	3.19	64.49	75.40	0.55
Reach 1	1297.38*	100YR	US 21 70480 Proposed Conditions	144.76	444.80	446.19		446.32	0.008882	3.19	64.49	75.40	0.55
Reach 1	1272.69*	50YR	US 21 70480 Nat	124.38	444.60	445.90		446.00	0.008441	2.92	61.21	74.59	0.53
Reach 1	1272.69*	50YR	US 21 70480 Proposed Conditions	124.38	444.60	445.90		446.00	0.008444	2.92	61.20	74.59	0.53
Reach 1	1272.69*	100YR	US 21 70480 Nat	144.76	444.60	445.99		446.10	0.008438	3.09	67.64	75.79	0.54
Reach 1	1272.69*	100YR	US 21 70480 Proposed Conditions	144.76	444.60	445.99		446.10	0.008443	3.09	67.63	75.79	0.54
Reach 1	1248	50YR	US 21 70480 Nat	124.38	444.40	445.72		445.80	0.007373	2.74	65.94	75.19	0.50
Reach 1	1248	50YR	US 21 70480 Proposed Conditions	124.38	444.40	445.72		445.80	0.007378	2.74	65.92	75.18	0.50
Reach 1	1248	100YR	US 21 70480 Nat	144.76	444.40	445.80		445.90	0.007497	2.92	72.29	76.31	0.51
Reach 1	1248	100YR	US 21 70480 Proposed Conditions	144.76	444.40	445.80		445.90	0.007505	2.92	72.26	76.31	0.51
Reach 1	1223.94*	50YR	US 21 70480 Nat	124.38	444.20	445.53		445.62	0.007641	2.77	62.52	78.27	0.50
Reach 1	1223.94*	50YR	US 21 70480 Proposed Conditions	124.38	444.20	445.53		445.62	0.007660	2.76	62.51	78.31	0.50
Reach 1	1223.94*	100YR	US 21 70480 Nat	144.76	444.20	445.61		445.71	0.007733	2.94	68.87	79.41	0.51
Reach 1	1223.94*	100YR	US 21 70480 Proposed Conditions	144.76	444.20	445.61		445.71	0.007753	2.94	68.85	79.45	0.51
Reach 1	1199.89*	50YR	US 21 70480 Nat	124.38	444.00	445.33		445.43	0.008002	2.79	58.58	80.69	0.51
Reach 1	1199.89*	50YR	US 21 70480 Proposed Conditions	124.38	444.00	445.33		445.43	0.007966	2.78	58.74	80.87	0.51

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1199.89*	100YR	US 21 70480 Nat	144.76	444.00	445.41		445.52	0.008036	2.95	65.00	81.95	0.52
Reach 1	1199.89*	100YR	US 21 70480 Proposed Conditions	144.76	444.00	445.41		445.52	0.008004	2.94	65.16	82.13	0.52
Reach 1	1175.83*	50YR	US 21 70480 Nat	124.38	443.81	445.13		445.24	0.008341	2.78	54.54	80.25	0.52
Reach 1	1175.83*	50YR	US 21 70480 Proposed Conditions	124.38	443.81	445.13		445.24	0.008356	2.77	54.65	80.46	0.52
Reach 1	1175.83*	100YR	US 21 70480 Nat	144.76	443.81	445.20		445.33	0.008413	2.95	60.75	82.76	0.53
Reach 1	1175.83*	100YR	US 21 70480 Proposed Conditions	144.76	443.81	445.20		445.33	0.008425	2.94	60.86	82.99	0.53
Reach 1	1151.78*	50YR	US 21 70480 Nat	124.38	443.61	444.92		445.03	0.008554	2.74	51.63	78.67	0.52
Reach 1	1151.78*	50YR	US 21 70480 Proposed Conditions	124.38	443.61	444.92		445.03	0.008525	2.73	51.86	78.95	0.52
Reach 1	1151.78*	100YR	US 21 70480 Nat	144.76	443.61	445.00		445.12	0.008596	2.91	57.57	80.44	0.53
Reach 1	1151.78*	100YR	US 21 70480 Proposed Conditions	144.76	443.61	445.00		445.12	0.008558	2.89	57.83	80.74	0.53
Reach 1	1127.72*	50YR	US 21 70480 Nat	124.38	443.41	444.72		444.83	0.008594	2.68	49.80	76.78	0.52
Reach 1	1127.72*	50YR	US 21 70480 Proposed Conditions	124.38	443.41	444.72		444.83	0.008648	2.67	49.92	77.12	0.52
Reach 1	1127.72*	100YR	US 21 70480 Nat	144.76	443.41	444.79		444.91	0.008654	2.85	55.53	79.95	0.53
Reach 1	1127.72*	100YR	US 21 70480 Proposed Conditions	144.76	443.41	444.79		444.91	0.008661	2.84	55.75	80.35	0.53
Reach 1	1103.67*	50YR	US 21 70480 Nat	124.38	443.21	444.52		444.62	0.008509	2.60	49.40	74.07	0.52
Reach 1	1103.67*	50YR	US 21 70480 Proposed Conditions	124.38	443.21	444.52		444.62	0.008545	2.60	49.41	74.20	0.52
Reach 1	1103.67*	100YR	US 21 70480 Nat	144.76	443.21	444.59		444.71	0.008576	2.77	54.82	77.49	0.53
Reach 1	1103.67*	100YR	US 21 70480 Proposed Conditions	144.76	443.21	444.59		444.71	0.008612	2.76	55.01	77.91	0.53
Reach 1	1079.61*	50YR	US 21 70480 Nat	124.38	443.02	444.32		444.42	0.008481	2.53	49.80	72.02	0.51
Reach 1	1079.61*	50YR	US 21 70480 Proposed Conditions	124.38	443.02	444.32		444.41	0.008463	2.53	49.84	72.00	0.51
Reach 1	1079.61*	100YR	US 21 70480 Nat	144.76	443.02	444.39		444.50	0.008530	2.69	55.03	75.67	0.52
Reach 1	1079.61*	100YR	US 21 70480 Proposed Conditions	144.76	443.02	444.39		444.50	0.008546	2.68	55.18	75.92	0.52
Reach 1	1055.56*	50YR	US 21 70480 Nat	124.38	442.82	444.12		444.21	0.008306	2.45	51.04	72.19	0.50
Reach 1	1055.56*	50YR	US 21 70480 Proposed Conditions	124.38	442.82	444.12		444.21	0.008311	2.45	51.07	72.32	0.50
Reach 1	1055.56*	100YR	US 21 70480 Nat	144.76	442.82	444.19		444.29	0.008375	2.60	56.13	74.24	0.51
Reach 1	1055.56*	100YR	US 21 70480 Proposed Conditions	144.76	442.82	444.19		444.29	0.008392	2.60	56.20	74.44	0.51
Reach 1	1031.50*	50YR	US 21 70480 Nat	124.38	442.62	443.92		444.01	0.008260	2.39	52.23	75.25	0.50
Reach 1	1031.50*	50YR	US 21 70480 Proposed Conditions	124.38	442.62	443.92		444.01	0.008241	2.38	52.30	75.33	0.50
Reach 1	1031.50*	100YR	US 21 70480 Nat	144.76	442.62	443.99		444.09	0.008328	2.53	57.40	76.86	0.51
Reach 1	1031.50*	100YR	US 21 70480 Proposed Conditions	144.76	442.62	443.99		444.09	0.008308	2.53	57.47	76.95	0.51
Reach 1	1007.44*	50YR	US 21 70480 Nat	124.38	442.42	443.73		443.82	0.008113	2.32	53.67	78.66	0.49
Reach 1	1007.44*	50YR	US 21 70480 Proposed Conditions	124.38	442.42	443.73		443.82	0.008092	2.32	53.73	78.70	0.49
Reach 1	1007.44*	100YR	US 21 70480 Nat	144.76	442.42	443.80		443.89	0.008186	2.46	58.89	80.12	0.50
Reach 1	1007.44*	100YR	US 21 70480 Proposed Conditions	144.76	442.42	443.80		443.89	0.008166	2.46	58.94	80.15	0.50
Reach 1	983.39*	50YR	US 21 70480 Nat	124.38	442.22	443.54		443.62	0.007992	2.26	55.07	82.32	0.49
Reach 1	983.39*	50YR	US 21 70480 Proposed Conditions	124.38	442.22	443.54		443.62	0.007979	2.26	55.13	82.46	0.49
Reach 1	983.39*	100YR	US 21 70480 Nat	144.76	442.22	443.61		443.70	0.008016	2.40	60.47	83.66	0.49

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	983.39*	100YR	US 21 70480 Proposed Conditions	144.76	442.22	443.61		443.70	0.008009	2.39	60.53	83.80	0.49
Reach 1	959.33*	50YR	US 21 70480 Nat	124.38	442.03	443.36		443.43	0.007975	2.21	56.16	86.14	0.48
Reach 1	959.33*	50YR	US 21 70480 Proposed Conditions	124.38	442.03	443.36		443.43	0.007906	2.21	56.33	86.25	0.48
Reach 1	959.33*	100YR	US 21 70480 Nat	144.76	442.03	443.42		443.51	0.007993	2.34	61.77	87.48	0.49
Reach 1	959.33*	100YR	US 21 70480 Proposed Conditions	144.76	442.03	443.42		443.51	0.007924	2.34	61.96	87.59	0.49
Reach 1	935.28*	50YR	US 21 70480 Nat	124.38	441.83	443.16		443.24	0.008059	2.18	56.94	89.86	0.48
Reach 1	935.28*	50YR	US 21 70480 Proposed Conditions	124.38	441.83	443.17		443.24	0.007932	2.17	57.24	89.99	0.48
Reach 1	935.28*	100YR	US 21 70480 Nat	144.76	441.83	443.23		443.31	0.007988	2.30	62.92	91.28	0.49
Reach 1	935.28*	100YR	US 21 70480 Proposed Conditions	144.76	441.83	443.23		443.32	0.007883	2.29	63.21	91.42	0.49
Reach 1	911.22*	50YR	US 21 70480 Nat	124.38	441.63	442.97		443.04	0.008288	2.17	57.38	93.59	0.49
Reach 1	911.22*	50YR	US 21 70480 Proposed Conditions	124.38	441.63	442.98		443.05	0.008002	2.14	58.05	93.81	0.48
Reach 1	911.22*	100YR	US 21 70480 Nat	144.76	441.63	443.04		443.12	0.008045	2.27	63.82	95.07	0.49
Reach 1	911.22*	100YR	US 21 70480 Proposed Conditions	144.76	441.63	443.05		443.13	0.007630	2.23	64.93	95.39	0.48
Reach 1	887.17*	50YR	US 21 70480 Nat	124.38	441.43	442.77		442.84	0.008589	2.19	56.81	93.74	0.50
Reach 1	887.17*	50YR	US 21 70480 Proposed Conditions	124.38	441.43	442.79		442.86	0.007944	2.12	58.65	95.72	0.48
Reach 1	887.17*	100YR	US 21 70480 Nat	144.76	441.43	442.84		442.92	0.008376	2.26	63.97	98.58	0.50
Reach 1	887.17*	100YR	US 21 70480 Proposed Conditions	144.76	441.43	442.88		442.95	0.006976	2.13	67.83	99.48	0.46
Reach 1	863.11*	50YR	US 21 70480 Nat	124.38	441.24	442.55		442.63	0.008969	2.27	54.88	88.78	0.51
Reach 1	863.11*	50YR	US 21 70480 Proposed Conditions	124.38	441.24	442.61	442.26	442.68	0.007219	2.07	60.11	94.74	0.46
Reach 1	863.11*	100YR	US 21 70480 Nat	144.76	441.24	442.63		442.72	0.008967	2.32	62.30	97.10	0.51
Reach 1	863.11*	100YR	US 21 70480 Proposed Conditions	144.76	441.24	442.74	442.31	442.80	0.005792	1.98	73.07	104.21	0.42
Reach 1	839.06*	50YR	US 21 70480 Nat	124.38	441.04	442.33		442.42	0.008927	2.31	53.78	84.12	0.51
Reach 1	839.06*	50YR	US 21 70480 Proposed Conditions	124.38	441.04	442.46	442.06	442.52	0.005579	1.90	65.52	96.86	0.41
Reach 1	839.06*	100YR	US 21 70480 Nat	144.76	441.04	442.41		442.50	0.009232	2.41	60.17	90.97	0.52
Reach 1	839.06*	100YR	US 21 70480 Proposed Conditions	144.76	441.04	442.63	442.11	442.68	0.004054	1.74	83.05	109.85	0.35
Reach 1	815	50YR	US 21 70480 Nat	124.38	440.84	442.04		442.15	0.013552	2.67	46.60	80.41	0.62
Reach 1	815	50YR	US 21 70480 Proposed Conditions	124.38	440.84	442.36	441.85	442.41	0.003848	1.65	75.36	104.00	0.34
Reach 1	815	100YR	US 21 70480 Nat	144.76	440.84	442.11		442.23	0.013408	2.78	51.99	83.53	0.62
Reach 1	815	100YR	US 21 70480 Proposed Conditions	144.76	440.84	442.57	441.91	442.60	0.002518	1.48	97.99	116.24	0.28
Reach 1	790.33*	50YR	US 21 70480 Nat	124.38	440.54	441.72		441.83	0.013185	2.58	48.14	85.48	0.61
Reach 1	790.33*	100YR	US 21 70480 Nat	144.76	440.54	441.78		441.90	0.013496	2.73	53.10	88.51	0.62
Reach 1	765.67*	50YR	US 21 70480 Nat	124.38	440.24	441.40		441.50	0.013447	2.55	48.80	89.74	0.61
Reach 1	765.67*	100YR	US 21 70480 Nat	144.76	440.24	441.46		441.57	0.013061	2.63	54.97	94.18	0.61
Reach 1	741.00*	50YR	US 21 70480 Nat	124.38	439.95	441.08		441.17	0.012926	2.47	50.32	94.08	0.60
Reach 1	741.00*	100YR	US 21 70480 Nat	144.76	439.95	441.14		441.24	0.013403	2.56	56.63	103.49	0.61

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	716.33*	50YR	US 21 70480 Nat	124.38	439.65	440.76		440.85	0.013267	2.40	51.92	103.82	0.60
Reach 1	716.33*	100YR	US 21 70480 Nat	144.76	439.65	440.82		440.92	0.012751	2.45	58.99	110.38	0.59
Reach 1	691.67*	50YR	US 21 70480 Nat	124.38	439.35	440.44		440.53	0.012591	2.29	54.32	111.77	0.58
Reach 1	691.67*	100YR	US 21 70480 Nat	144.76	439.35	440.50		440.59	0.013884	2.35	61.53	130.80	0.60
Reach 1	667.00*	50YR	US 21 70480 Nat	124.38	439.05	440.12		440.20	0.013660	2.20	56.45	130.78	0.59
Reach 1	667.00*	100YR	US 21 70480 Nat	144.76	439.05	440.17		440.25	0.013609	2.31	62.73	135.24	0.60
Reach 1	642.33*	50YR	US 21 70480 Nat	124.38	438.75	439.78		439.85	0.014303	2.23	55.84	131.78	0.60
Reach 1	642.33*	100YR	US 21 70480 Nat	144.76	438.75	439.83		439.91	0.013764	2.29	63.14	138.65	0.60
Reach 1	617.67*	50YR	US 21 70480 Nat	124.38	438.45	439.43		439.51	0.013819	2.27	54.86	122.85	0.60
Reach 1	617.67*	100YR	US 21 70480 Nat	144.76	438.45	439.47		439.56	0.014190	2.37	61.05	130.36	0.61
Reach 1	593.00*	50YR	US 21 70480 Nat	124.38	438.15	439.07		439.15	0.014294	2.31	53.77	119.85	0.61
Reach 1	593.00*	100YR	US 21 70480 Nat	144.76	438.15	439.13		439.21	0.014098	2.38	60.90	128.94	0.61
Reach 1	568.33*	50YR	US 21 70480 Nat	124.38	437.86	438.72		438.80	0.013900	2.29	54.22	119.81	0.60
Reach 1	568.33*	100YR	US 21 70480 Nat	144.76	437.86	438.77		438.86	0.014431	2.41	60.17	127.33	0.62
Reach 1	543.67*	50YR	US 21 70480 Nat	124.38	437.56	438.35		438.44	0.015743	2.40	51.84	117.57	0.64
Reach 1	543.67*	100YR	US 21 70480 Nat	144.76	437.56	438.42		438.51	0.014254	2.43	59.50	122.68	0.62
Reach 1	519	50YR	US 21 70480 Nat	124.38	437.26	438.14		438.19	0.006832	1.80	69.01	128.56	0.43
Reach 1	519	50YR	US 21 70480 Proposed Conditions	124.38	437.26	438.14	437.89	438.19	0.006740	1.81	68.78	128.37	0.43
Reach 1	519	100YR	US 21 70480 Nat	144.76	437.26	438.20		438.25	0.007166	1.86	77.73	142.87	0.45
Reach 1	519	100YR	US 21 70480 Proposed Conditions	144.76	437.26	438.19	437.92	438.25	0.006836	1.90	76.33	142.03	0.44
Reach 1	494.26*	50YR	US 21 70480 Nat	124.38	437.09	437.97		438.02	0.006814	1.81	68.53	126.07	0.43
Reach 1	494.26*	50YR	US 21 70480 Proposed Conditions	124.38	437.09	437.97	437.72	438.02	0.006808	1.81	68.55	126.08	0.43
Reach 1	494.26*	100YR	US 21 70480 Nat	144.76	437.09	438.02		438.08	0.006810	1.92	75.50	127.86	0.44
Reach 1	494.26*	100YR	US 21 70480 Proposed Conditions	144.76	437.09	438.02	437.76	438.08	0.006804	1.92	75.52	127.87	0.44
Reach 1	469.53*	50YR	US 21 70480 Nat	124.38	436.91	437.80		437.85	0.006856	1.82	68.44	126.23	0.44
Reach 1	469.53*	50YR	US 21 70480 Proposed Conditions	124.38	436.91	437.80	437.55	437.85	0.006830	1.82	68.52	126.25	0.43
Reach 1	469.53*	100YR	US 21 70480 Nat	144.76	436.91	437.85		437.91	0.006825	1.92	75.49	128.02	0.44
Reach 1	469.53*	100YR	US 21 70480 Proposed Conditions	144.76	436.91	437.85	437.58	437.91	0.006801	1.92	75.57	128.04	0.44
Reach 1	444.79*	50YR	US 21 70480 Nat	124.38	436.74	437.63		437.68	0.006940	1.83	67.99	125.31	0.44
Reach 1	444.79*	50YR	US 21 70480 Proposed Conditions	124.38	436.74	437.63		437.68	0.006918	1.83	68.06	125.34	0.44
Reach 1	444.79*	100YR	US 21 70480 Nat	144.76	436.74	437.68		437.74	0.006930	1.93	75.08	127.75	0.44
Reach 1	444.79*	100YR	US 21 70480 Proposed Conditions	144.76	436.74	437.68		437.74	0.006909	1.93	75.15	127.78	0.44
Reach 1	420.05*	50YR	US 21 70480 Nat	124.38	436.57	437.45		437.51	0.007017	1.84	67.54	124.29	0.44
Reach 1	420.05*	50YR	US 21 70480 Proposed Conditions	124.38	436.57	437.45		437.51	0.006982	1.84	67.65	124.33	0.44

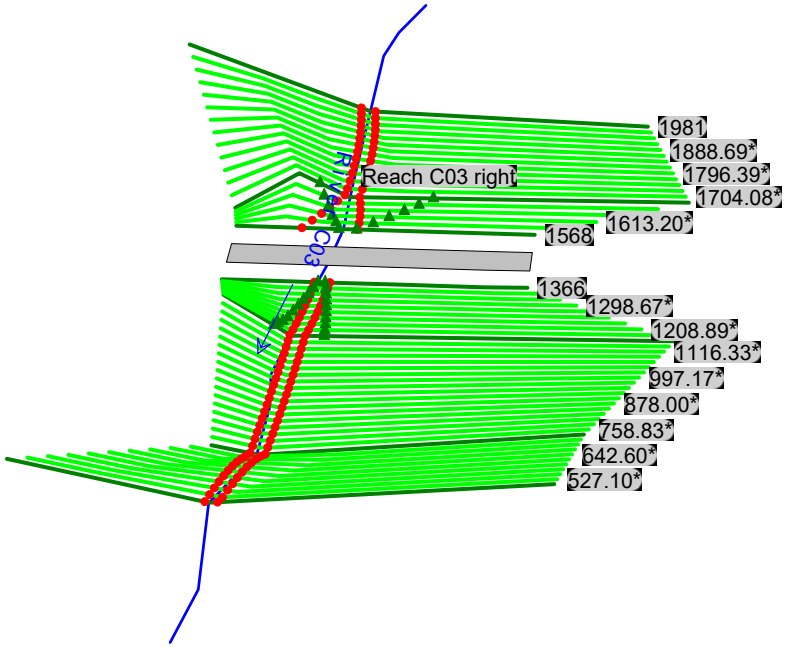
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

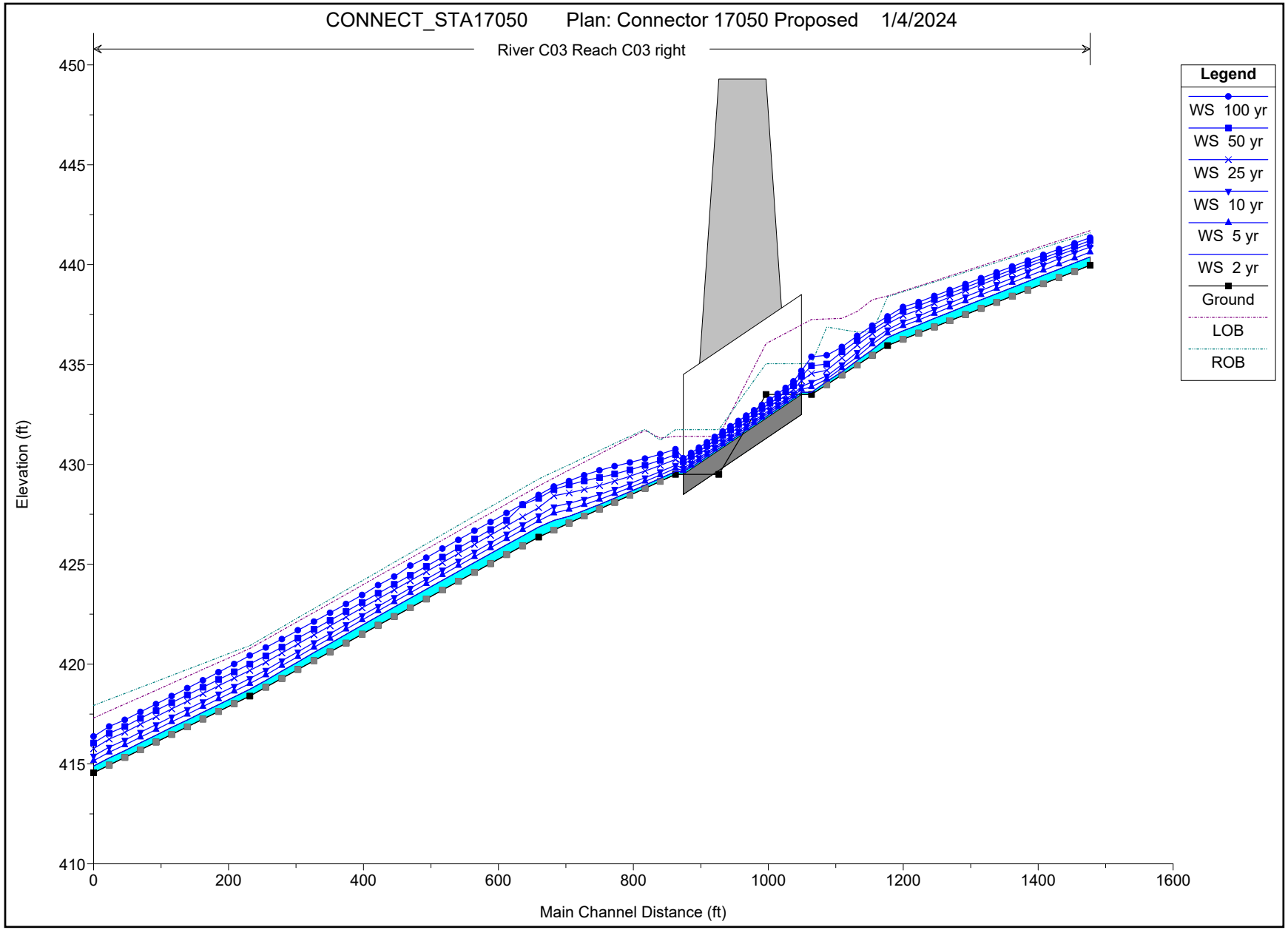
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	420.05*	100YR	US 21 70480 Nat	144.76	436.57	437.51		437.57	0.007006	1.94	74.58	126.69	0.45
Reach 1	420.05*	100YR	US 21 70480 Proposed Conditions	144.76	436.57	437.51		437.57	0.006971	1.94	74.70	126.73	0.44
Reach 1	395.32*	50YR	US 21 70480 Nat	124.38	436.39	437.28		437.33	0.007030	1.84	67.43	123.95	0.44
Reach 1	395.32*	50YR	US 21 70480 Proposed Conditions	124.38	436.39	437.28		437.33	0.007015	1.84	67.48	123.96	0.44
Reach 1	395.32*	100YR	US 21 70480 Nat	144.76	436.39	437.34		437.40	0.007011	1.94	74.44	126.14	0.45
Reach 1	395.32*	100YR	US 21 70480 Proposed Conditions	144.76	436.39	437.34		437.40	0.007000	1.94	74.47	126.15	0.45
Reach 1	370.58*	50YR	US 21 70480 Nat	124.38	436.22	437.11		437.16	0.007017	1.85	67.37	123.51	0.44
Reach 1	370.58*	50YR	US 21 70480 Proposed Conditions	124.38	436.22	437.11		437.16	0.006995	1.84	67.44	123.53	0.44
Reach 1	370.58*	100YR	US 21 70480 Nat	144.76	436.22	437.16		437.22	0.007006	1.95	74.33	125.60	0.45
Reach 1	370.58*	100YR	US 21 70480 Proposed Conditions	144.76	436.22	437.16		437.22	0.006988	1.95	74.39	125.62	0.45
Reach 1	345.84*	50YR	US 21 70480 Nat	124.38	436.05	436.93		436.99	0.007196	1.86	66.79	123.17	0.45
Reach 1	345.84*	50YR	US 21 70480 Proposed Conditions	124.38	436.05	436.93		436.99	0.007173	1.86	66.86	123.19	0.45
Reach 1	345.84*	100YR	US 21 70480 Nat	144.76	436.05	436.99		437.05	0.007098	1.96	73.95	125.26	0.45
Reach 1	345.84*	100YR	US 21 70480 Proposed Conditions	144.76	436.05	436.99		437.05	0.007077	1.96	74.03	125.29	0.45
Reach 1	321.11*	50YR	US 21 70480 Nat	124.38	435.87	436.75		436.81	0.007116	1.87	66.56	121.08	0.44
Reach 1	321.11*	50YR	US 21 70480 Proposed Conditions	124.38	435.87	436.75		436.81	0.007111	1.87	66.58	121.09	0.44
Reach 1	321.11*	100YR	US 21 70480 Nat	144.76	435.87	436.81		436.87	0.007109	1.96	73.90	125.17	0.45
Reach 1	321.11*	100YR	US 21 70480 Proposed Conditions	144.76	435.87	436.81		436.87	0.007097	1.96	73.94	125.18	0.45
Reach 1	296.37*	50YR	US 21 70480 Nat	124.38	435.70	436.58		436.63	0.007079	1.87	66.36	119.72	0.44
Reach 1	296.37*	50YR	US 21 70480 Proposed Conditions	124.38	435.70	436.58		436.63	0.007072	1.87	66.38	119.74	0.44
Reach 1	296.37*	100YR	US 21 70480 Nat	144.76	435.70	436.64		436.70	0.007123	1.97	73.51	123.73	0.45
Reach 1	296.37*	100YR	US 21 70480 Proposed Conditions	144.76	435.70	436.64		436.70	0.007114	1.97	73.55	123.75	0.45
Reach 1	271.63*	50YR	US 21 70480 Nat	124.38	435.53	436.40		436.46	0.007105	1.88	66.28	119.68	0.44
Reach 1	271.63*	50YR	US 21 70480 Proposed Conditions	124.38	435.53	436.40		436.46	0.007093	1.88	66.32	119.69	0.44
Reach 1	271.63*	100YR	US 21 70480 Nat	144.76	435.53	436.46		436.52	0.007145	1.98	73.17	122.54	0.45
Reach 1	271.63*	100YR	US 21 70480 Proposed Conditions	144.76	435.53	436.46		436.52	0.007134	1.98	73.20	122.56	0.45
Reach 1	246.89*	50YR	US 21 70480 Nat	124.38	435.36	436.23		436.28	0.007127	1.87	66.41	120.54	0.44
Reach 1	246.89*	50YR	US 21 70480 Proposed Conditions	124.38	435.36	436.23		436.28	0.007112	1.87	66.45	120.55	0.44
Reach 1	246.89*	100YR	US 21 70480 Nat	144.76	435.36	436.28		436.34	0.007129	1.98	73.24	122.63	0.45
Reach 1	246.89*	100YR	US 21 70480 Proposed Conditions	144.76	435.36	436.28		436.34	0.007116	1.98	73.28	122.65	0.45
Reach 1	222.16*	50YR	US 21 70480 Nat	124.38	435.18	436.05		436.11	0.007072	1.86	66.72	121.24	0.44
Reach 1	222.16*	50YR	US 21 70480 Proposed Conditions	124.38	435.18	436.05		436.11	0.007064	1.86	66.74	121.25	0.44
Reach 1	222.16*	100YR	US 21 70480 Nat	144.76	435.18	436.11		436.17	0.007083	1.97	73.48	123.06	0.45
Reach 1	222.16*	100YR	US 21 70480 Proposed Conditions	144.76	435.18	436.11		436.17	0.007076	1.97	73.51	123.07	0.45
Reach 1	197.42*	50YR	US 21 70480 Nat	124.38	435.01	435.88		435.93	0.007060	1.86	66.94	122.11	0.44
Reach 1	197.42*	50YR	US 21 70480 Proposed Conditions	124.38	435.01	435.88		435.93	0.007055	1.86	66.96	122.11	0.44
Reach 1	197.42*	100YR	US 21 70480 Nat	144.76	435.01	435.93		435.99	0.007076	1.96	73.69	123.84	0.45

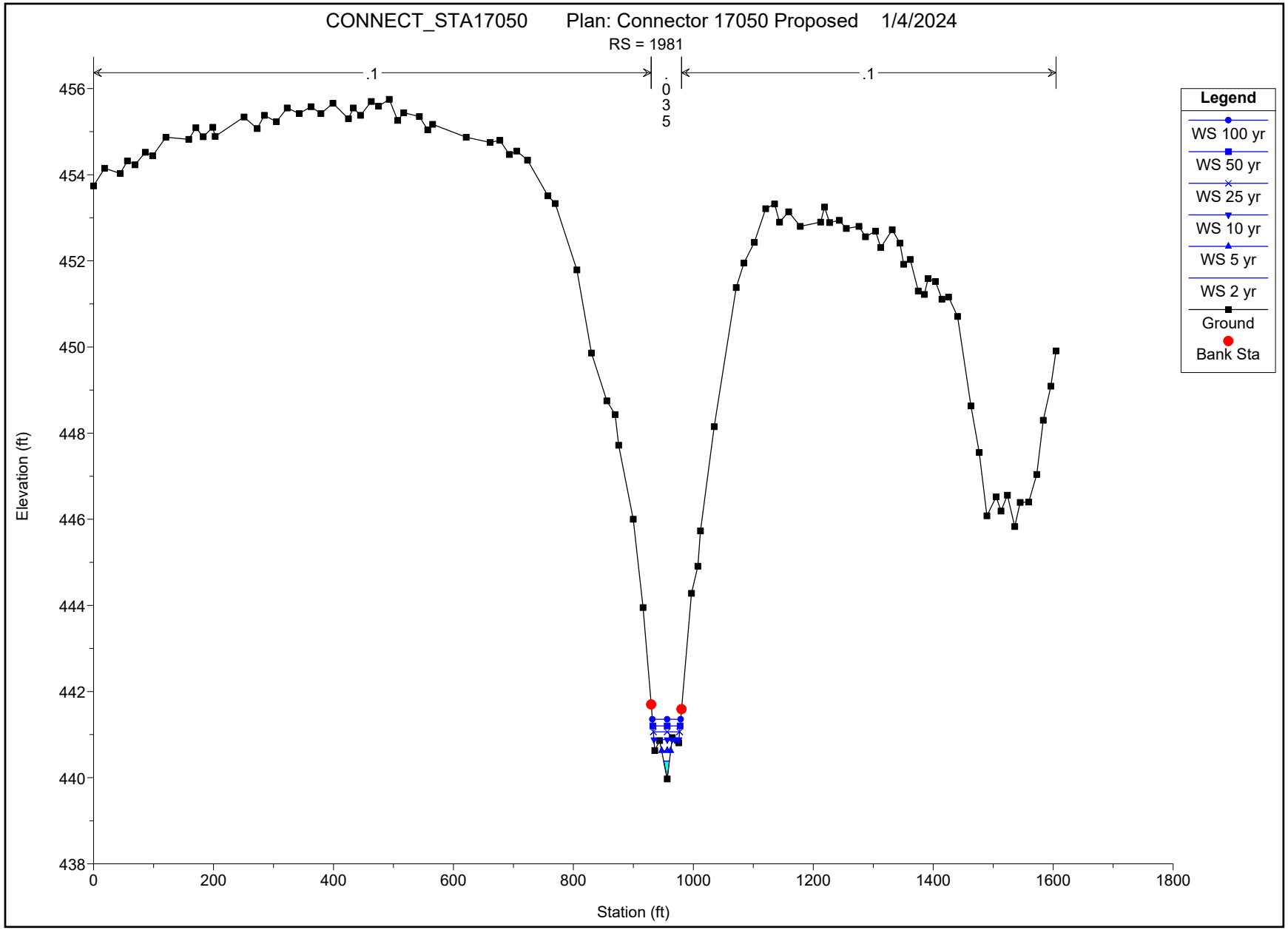
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

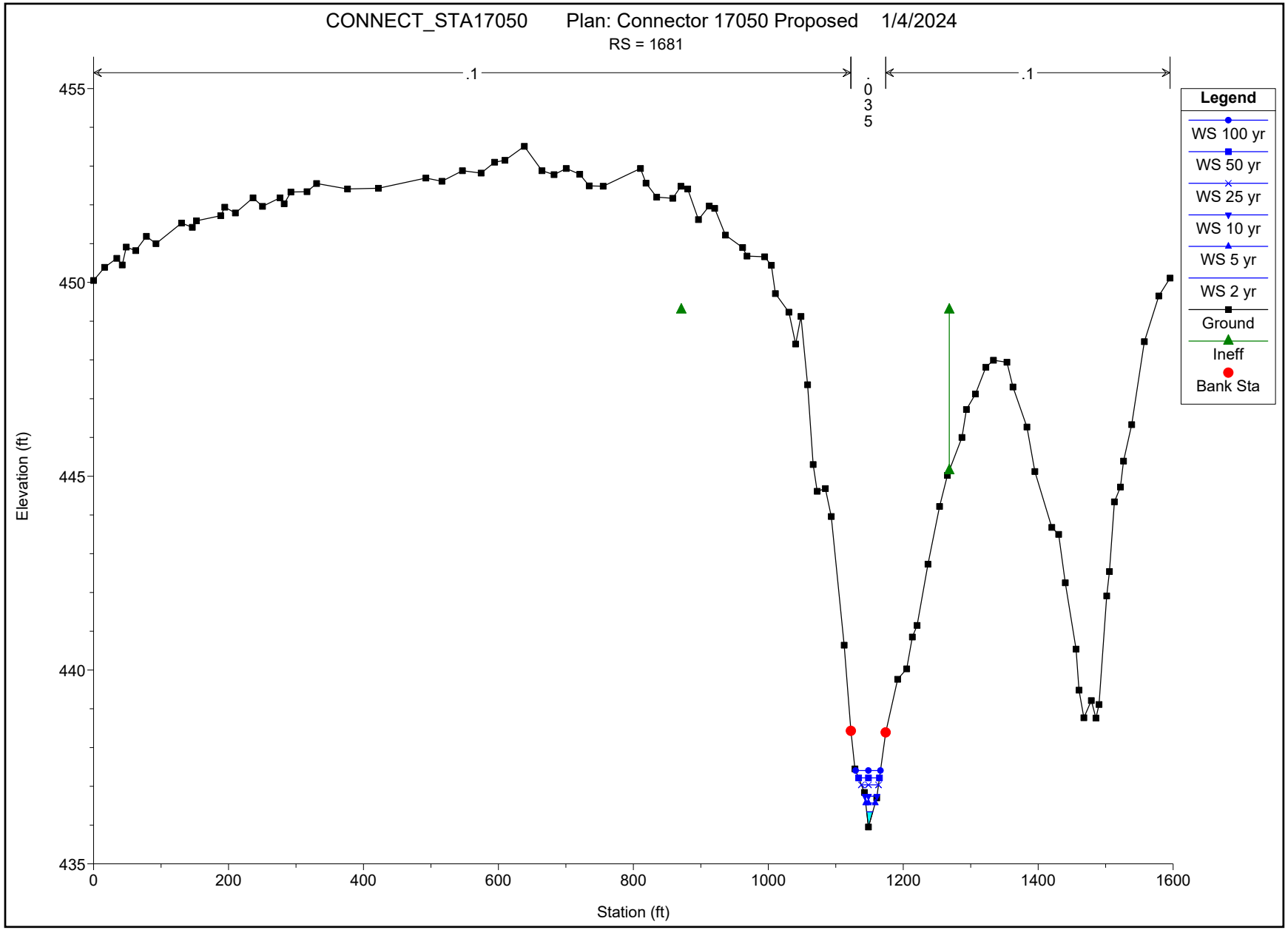
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	197.42*	100YR	US 21 70480 Proposed Conditions	144.76	435.01	435.93		435.99	0.007069	1.96	73.71	123.85	0.45
Reach 1	172.68*	50YR	US 21 70480 Nat	124.38	434.84	435.70		435.76	0.007125	1.86	66.98	123.14	0.44
Reach 1	172.68*	50YR	US 21 70480 Proposed Conditions	124.38	434.84	435.70		435.76	0.007109	1.86	67.03	123.15	0.44
Reach 1	172.68*	100YR	US 21 70480 Nat	144.76	434.84	435.76		435.82	0.007121	1.96	73.78	124.82	0.45
Reach 1	172.68*	100YR	US 21 70480 Proposed Conditions	144.76	434.84	435.76		435.82	0.007108	1.96	73.82	124.83	0.45
Reach 1	147.95*	50YR	US 21 70480 Nat	124.38	434.66	435.53		435.58	0.007071	1.85	67.34	124.07	0.44
Reach 1	147.95*	50YR	US 21 70480 Proposed Conditions	124.38	434.66	435.53		435.58	0.007065	1.85	67.36	124.07	0.44
Reach 1	147.95*	100YR	US 21 70480 Nat	144.76	434.66	435.58		435.64	0.007094	1.95	74.07	125.68	0.45
Reach 1	147.95*	100YR	US 21 70480 Proposed Conditions	144.76	434.66	435.58		435.64	0.007088	1.95	74.09	125.68	0.45
Reach 1	123.21*	50YR	US 21 70480 Nat	124.38	434.49	435.36		435.41	0.007084	1.84	67.53	125.10	0.44
Reach 1	123.21*	50YR	US 21 70480 Proposed Conditions	124.38	434.49	435.36		435.41	0.007068	1.84	67.58	125.11	0.44
Reach 1	123.21*	100YR	US 21 70480 Nat	144.76	434.49	435.41		435.47	0.007121	1.95	74.21	126.63	0.45
Reach 1	123.21*	100YR	US 21 70480 Proposed Conditions	144.76	434.49	435.41		435.47	0.007104	1.95	74.26	126.64	0.45
Reach 1	98.47*	50YR	US 21 70480 Nat	124.38	434.32	435.18		435.23	0.007117	1.84	67.69	126.27	0.44
Reach 1	98.47*	50YR	US 21 70480 Proposed Conditions	124.38	434.32	435.18		435.23	0.007112	1.84	67.70	126.28	0.44
Reach 1	98.47*	100YR	US 21 70480 Nat	144.76	434.32	435.23		435.29	0.007160	1.95	74.35	127.75	0.45
Reach 1	98.47*	100YR	US 21 70480 Proposed Conditions	144.76	434.32	435.23		435.29	0.007143	1.95	74.40	127.76	0.45
Reach 1	73.74*	50YR	US 21 70480 Nat	124.38	434.14	435.00		435.06	0.007144	1.83	67.84	127.37	0.44
Reach 1	73.74*	50YR	US 21 70480 Proposed Conditions	124.38	434.14	435.01		435.06	0.007072	1.83	68.06	127.42	0.44
Reach 1	73.74*	100YR	US 21 70480 Nat	144.76	434.14	435.05		435.11	0.007272	1.95	74.23	128.74	0.45
Reach 1	73.74*	100YR	US 21 70480 Proposed Conditions	144.76	434.14	435.06		435.11	0.007189	1.94	74.50	128.80	0.45
Reach 1	49	50YR	US 21 70480 Nat	124.38	433.97	434.81	434.59	434.86	0.008301	1.92	64.95	127.83	0.47
Reach 1	49	50YR	US 21 70480 Proposed Conditions	124.38	433.97	434.81	434.59	434.86	0.008301	1.92	64.95	127.83	0.47
Reach 1	49	100YR	US 21 70480 Nat	144.76	433.97	434.86	434.63	434.92	0.008312	2.03	71.41	129.18	0.48
Reach 1	49	100YR	US 21 70480 Proposed Conditions	144.76	433.97	434.86	434.63	434.92	0.008312	2.03	71.41	129.18	0.48

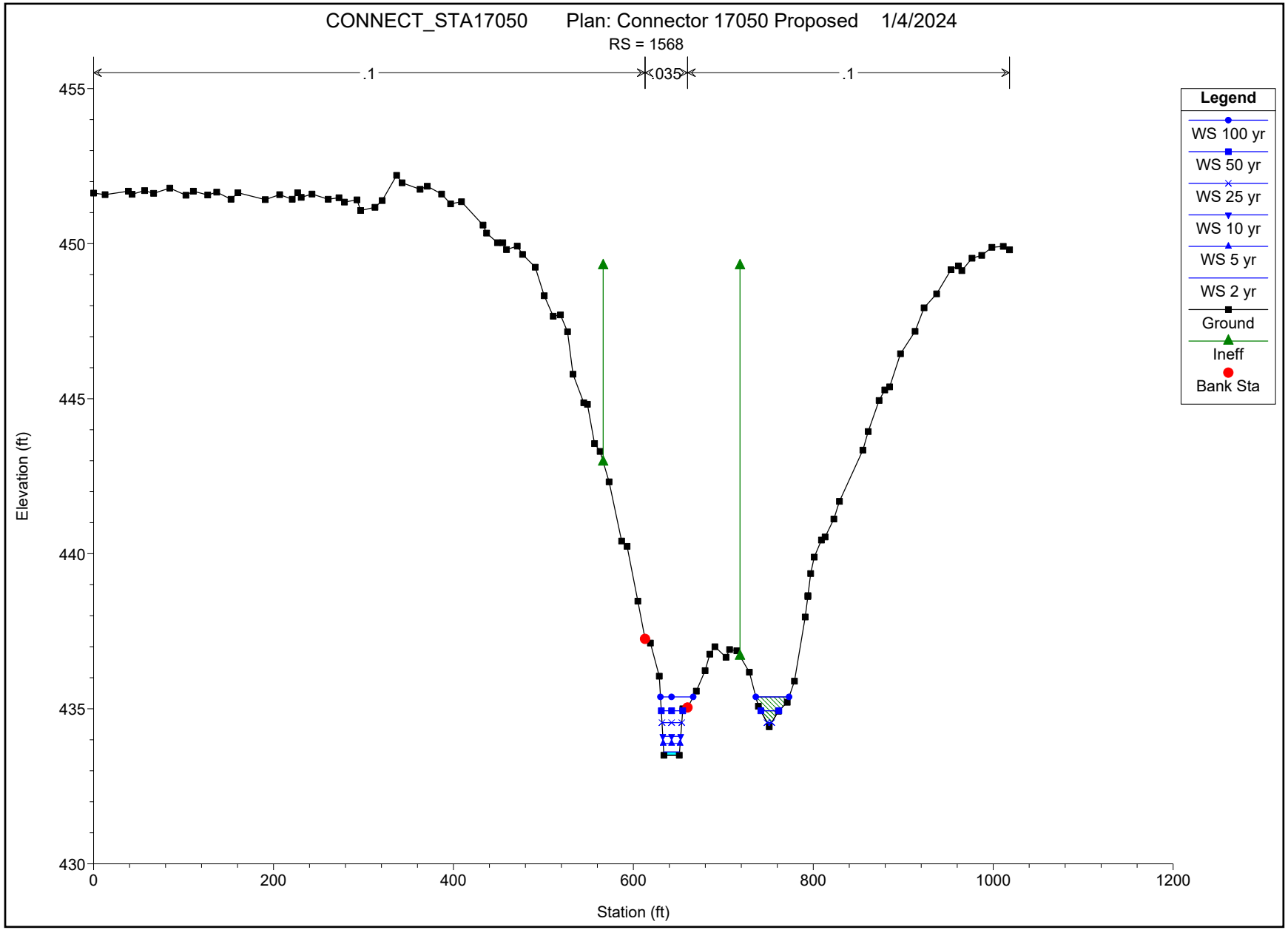
CONNECTOR 170+50 PROPOSED PLAN

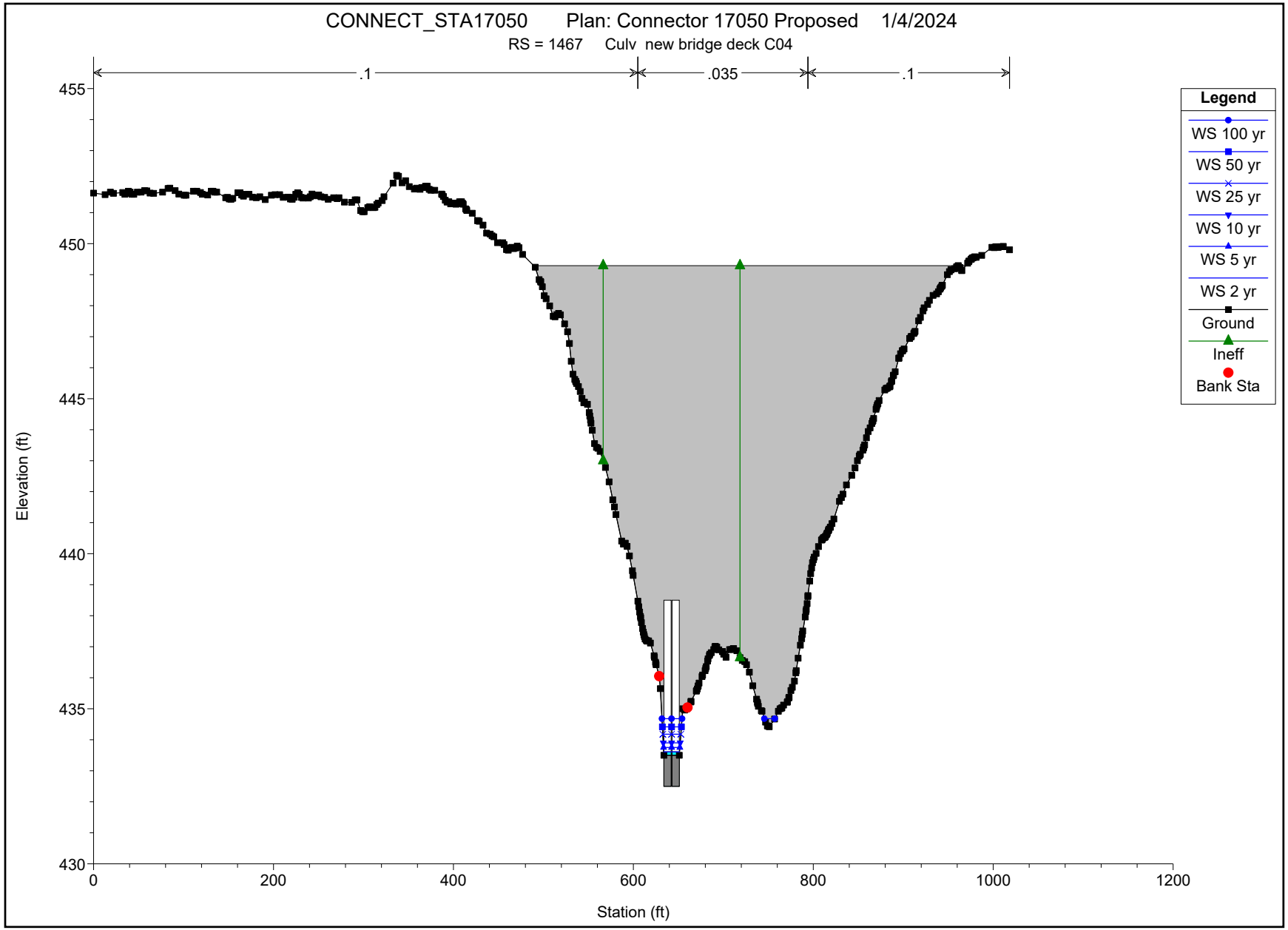


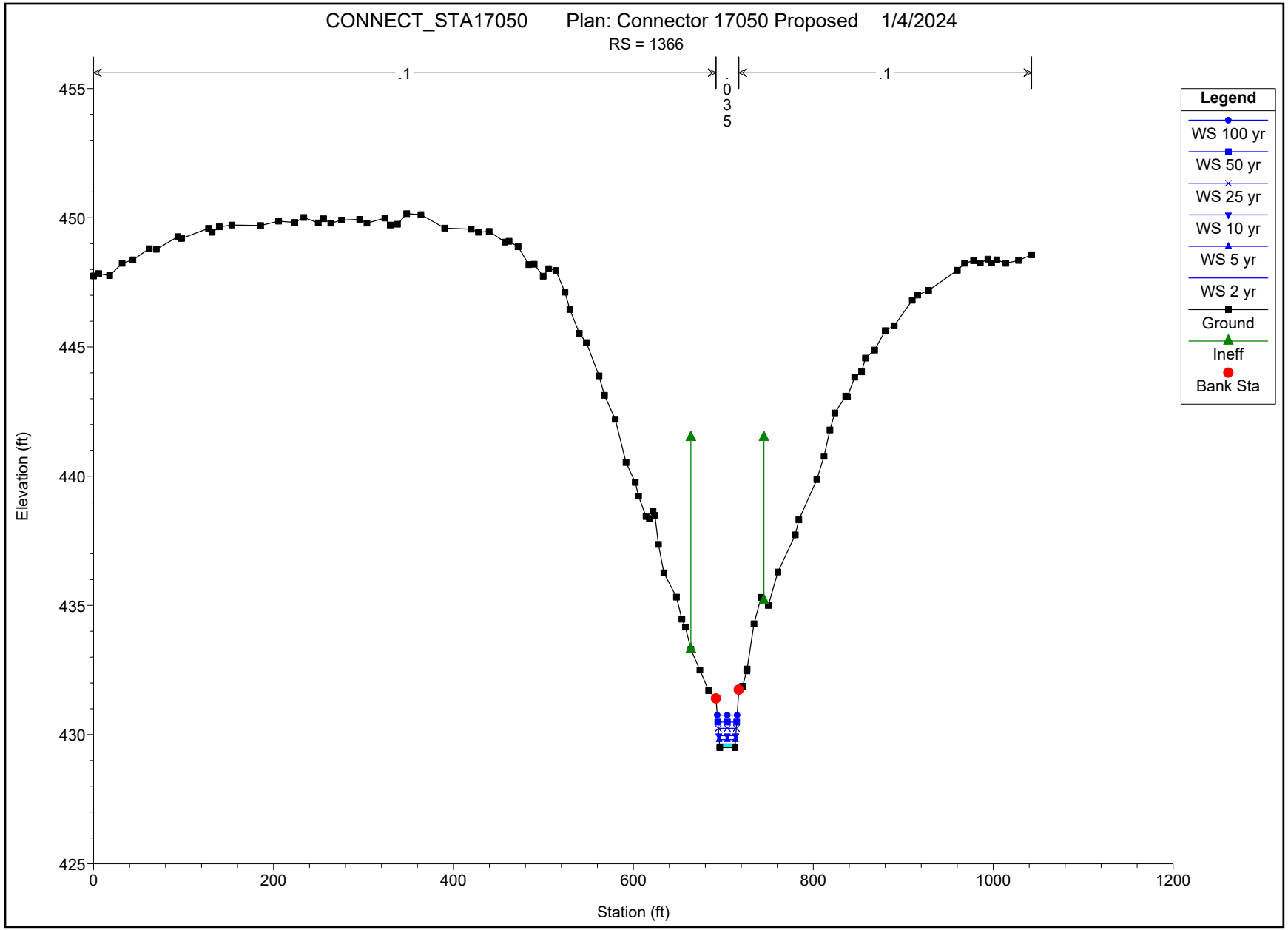

CONNECT_STA17050 Plan: Connector 17050 Proposed 1/4/2024
River C03 Reach C03 right
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
LOB
ROB
Elevation (ft)
Main Channel Distance (ft)
450
445
440
435
430
425
420
415
410
0
200
400
600
800
1000
1200
1400
1600

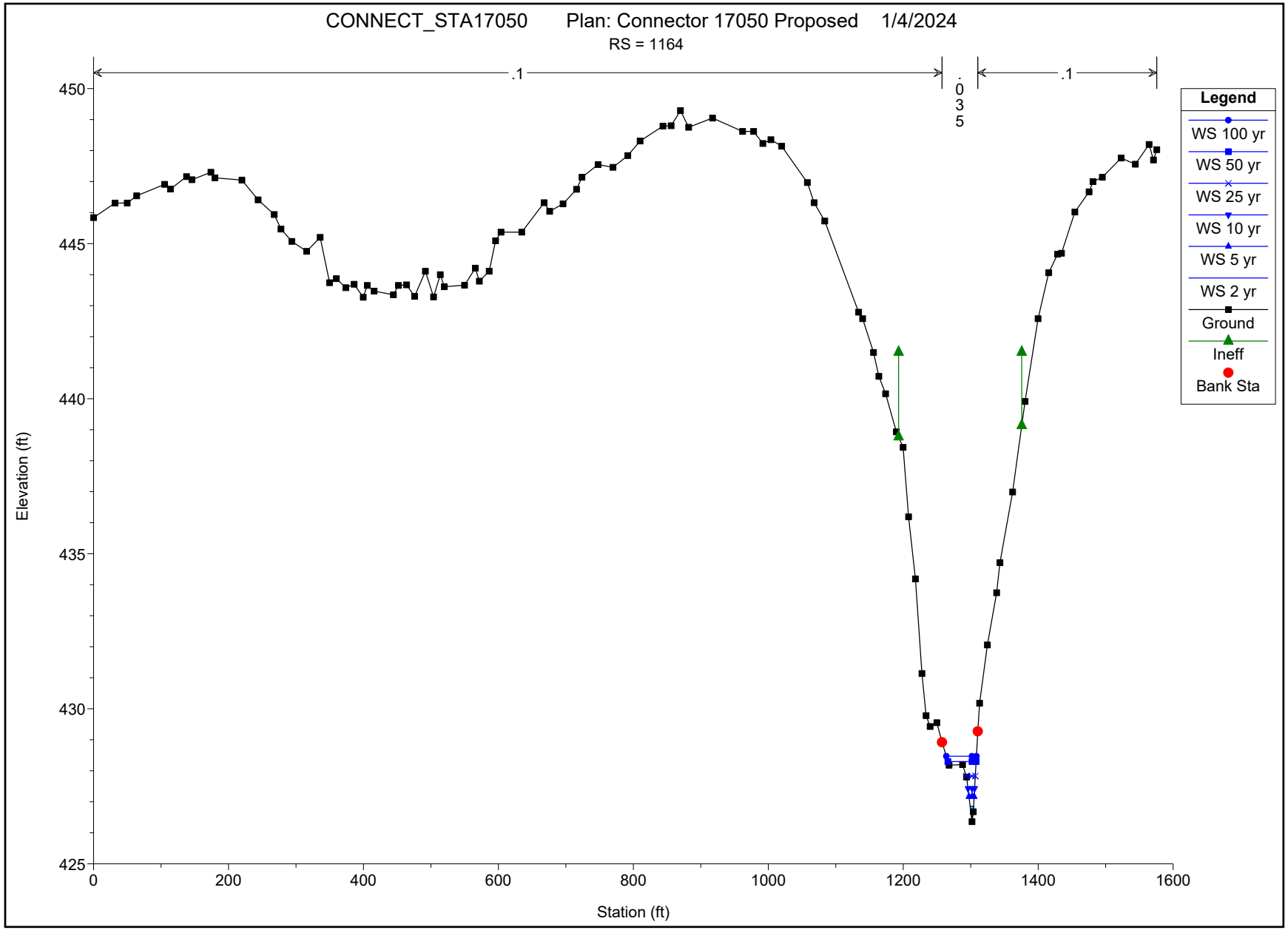

CONNECT_STA17050 Plan: Connector 17050 Proposed 1/4/2024
RS = 1981
.1
.035
.1
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
438
440
442
444
446
448
450
452
454
456
0
200
400
600
800
1000
1200
1400
1600
1800

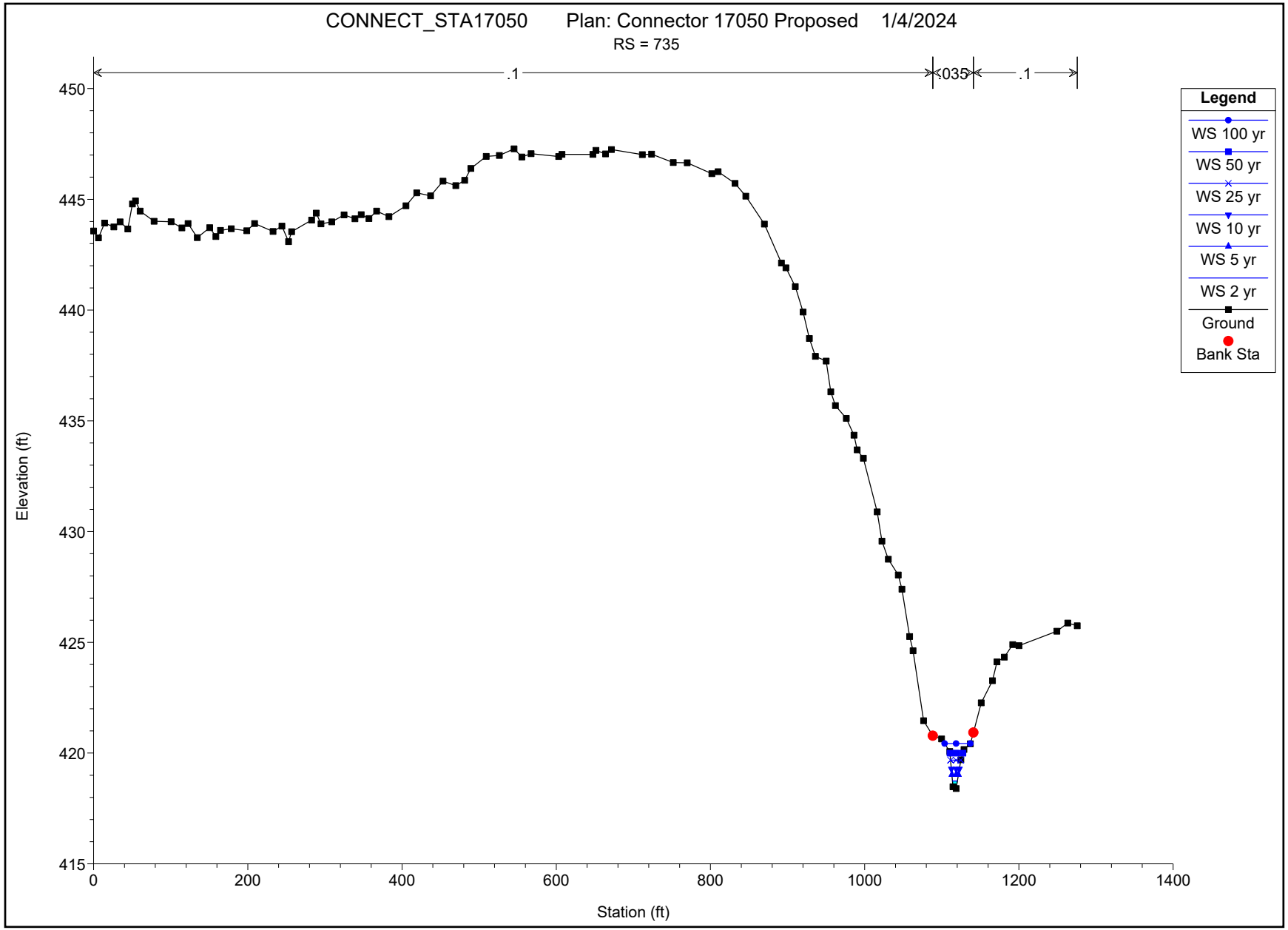

CONNECT_STA17050 Plan: Connector 17050 Proposed 1/4/2024
RS = 1681
.1
.035
.1
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
Elevation (ft)
455
450
445
440
435
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

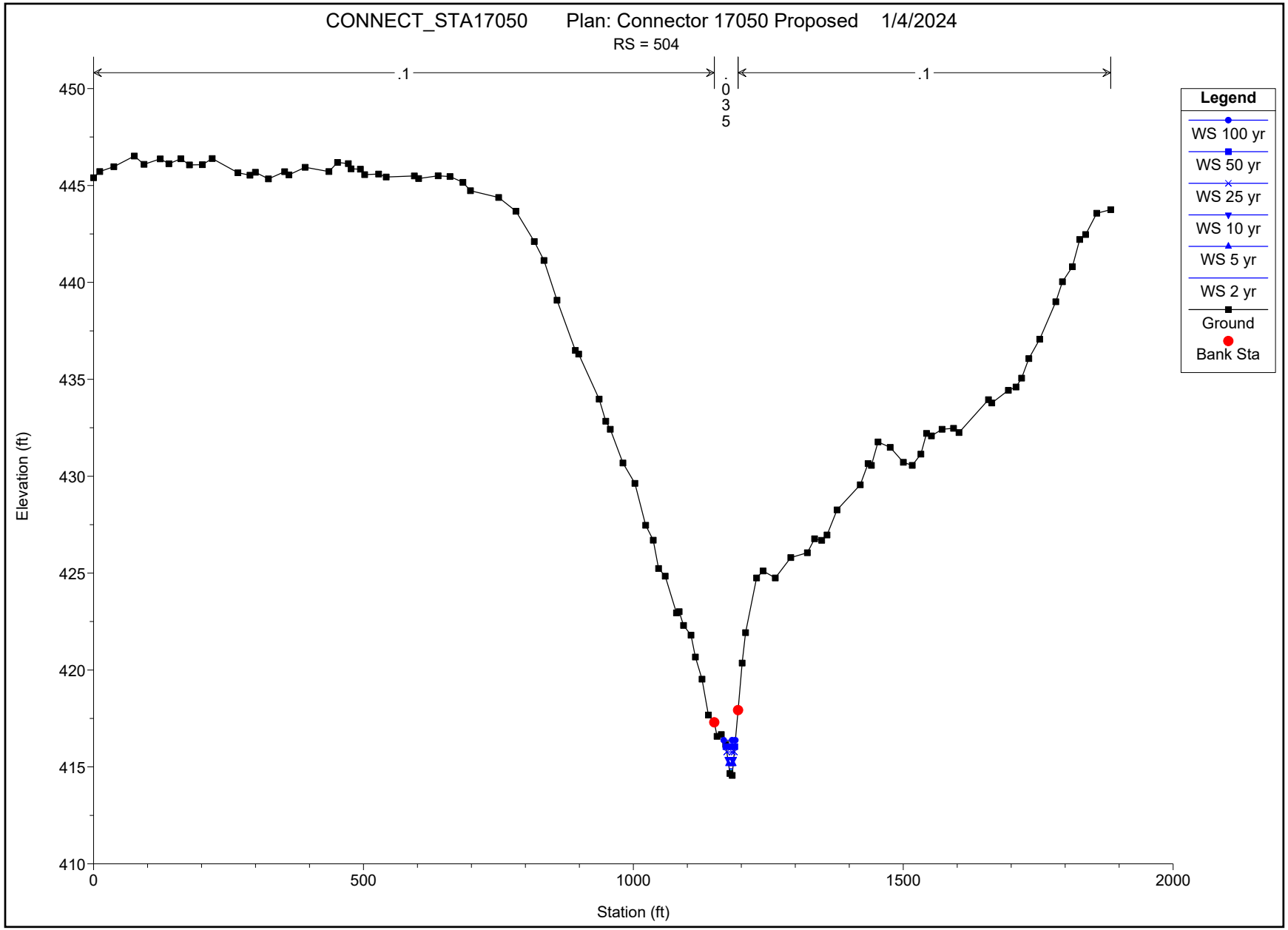

CONNECT_STA17050 Plan: Connector 17050 Proposed 1/4/2024
RS = 1568
.1
.035
.1
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
Elevation (ft)
455
450
445
440
435
430
0
200
400
600
800
1000
1200
Station (ft)


CONNECT_STA17050 Plan: Connector 17050 Proposed 1/4/2024
RS = 1467 Culv new bridge deck C04
.1
.035
.1
455
450
445
440
435
430
Elevation (ft)
0
200
400
600
800
1000
1200
Station (ft)
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta


CONNECT_STA17050 Plan: Connector 17050 Proposed 1/4/2024
RS = 1366
.1
.035
.1
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
Elevation (ft)
455
450
445
440
435
430
425
0
200
400
600
800
1000
1200
Station (ft)


CONNECT_STA17050 Plan: Connector 17050 Proposed 1/4/2024
RS = 1164
.1
.035
.1
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
450
445
440
435
430
425
0
200
400
600
800
1000
1200
1400
1600


CONNECT_STA17050 Plan: Connector 17050 Proposed 1/4/2024
RS = 735
.1
.035
.1
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
445
440
435
430
425
420
415
0
200
400
600
800
1000
1200
1400


CONNECT_STA17050 Plan: Connector 17050 Proposed 1/4/2024
RS = 504
.1
.035
.1
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
445
440
435
430
425
420
415
410
0
500
1000
1500
2000

HEC-RAS River: River C03 Reach: Reach C03 right

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1981	25 yr	Conn 17050 Prop	50.77	439.97	441.06		441.18	0.012582	2.70	18.78	43.77	0.73
Reach C03 right	1981	25 yr	Conn 17050 Nat	49.75	439.97	441.06		441.17	0.012569	2.68	18.55	43.71	0.73
Reach C03 right	1981	100 yr	Conn 17050 Prop	116.63	439.97	441.35		441.56	0.012481	3.65	31.96	47.14	0.78
Reach C03 right	1981	100 yr	Conn 17050 Nat	114.87	439.97	441.35		441.55	0.012485	3.63	31.64	47.07	0.78
Reach C03 right	1957.92*	25 yr	Conn 17050 Prop	50.77	439.66	440.77		440.89	0.012496	2.71	18.74	43.29	0.73
Reach C03 right	1957.92*	25 yr	Conn 17050 Nat	49.75	439.66	440.77		440.88	0.012492	2.69	18.50	43.23	0.72
Reach C03 right	1957.92*	100 yr	Conn 17050 Prop	116.63	439.66	441.07		441.27	0.012387	3.65	31.92	46.74	0.78
Reach C03 right	1957.92*	100 yr	Conn 17050 Nat	114.87	439.66	441.06		441.27	0.012389	3.63	31.60	46.66	0.78
Reach C03 right	1934.85*	25 yr	Conn 17050 Prop	50.77	439.35	440.48		440.60	0.012574	2.73	18.60	42.74	0.73
Reach C03 right	1934.85*	25 yr	Conn 17050 Nat	49.75	439.35	440.48		440.59	0.012567	2.71	18.37	42.67	0.73
Reach C03 right	1934.85*	100 yr	Conn 17050 Prop	116.63	439.35	440.78		440.99	0.012439	3.67	31.74	46.25	0.78
Reach C03 right	1934.85*	100 yr	Conn 17050 Nat	114.87	439.35	440.77		440.98	0.012445	3.66	31.42	46.17	0.78
Reach C03 right	1911.77*	25 yr	Conn 17050 Prop	50.77	439.04	440.19		440.31	0.012498	2.74	18.55	42.23	0.73
Reach C03 right	1911.77*	25 yr	Conn 17050 Nat	49.75	439.04	440.19		440.30	0.012499	2.72	18.31	42.16	0.73
Reach C03 right	1911.77*	100 yr	Conn 17050 Prop	116.63	439.04	440.49		440.70	0.012388	3.68	31.66	45.82	0.78
Reach C03 right	1911.77*	100 yr	Conn 17050 Nat	114.87	439.04	440.48		440.69	0.012393	3.66	31.34	45.73	0.78
Reach C03 right	1888.69*	25 yr	Conn 17050 Prop	50.77	438.73	439.90		440.01	0.012823	2.78	18.29	41.57	0.74
Reach C03 right	1888.69*	25 yr	Conn 17050 Nat	49.75	438.73	439.89		440.01	0.012817	2.75	18.06	41.51	0.74
Reach C03 right	1888.69*	100 yr	Conn 17050 Prop	116.63	438.73	440.20		440.41	0.012627	3.72	31.32	45.26	0.79
Reach C03 right	1888.69*	100 yr	Conn 17050 Nat	114.87	438.73	440.19		440.40	0.012632	3.70	31.01	45.17	0.79
Reach C03 right	1865.62*	25 yr	Conn 17050 Prop	50.77	438.42	439.60		439.72	0.012813	2.81	18.08	40.37	0.74
Reach C03 right	1865.62*	25 yr	Conn 17050 Nat	49.75	438.42	439.59		439.71	0.012870	2.79	17.80	40.17	0.74
Reach C03 right	1865.62*	100 yr	Conn 17050 Prop	116.63	438.42	439.90		440.12	0.012515	3.73	31.26	44.75	0.79
Reach C03 right	1865.62*	100 yr	Conn 17050 Nat	114.87	438.42	439.90		440.11	0.012521	3.71	30.95	44.66	0.79
Reach C03 right	1842.54*	25 yr	Conn 17050 Prop	50.77	438.11	439.30		439.42	0.012859	2.85	17.81	39.00	0.74
Reach C03 right	1842.54*	25 yr	Conn 17050 Nat	49.75	438.11	439.29		439.41	0.012748	2.82	17.62	38.88	0.74
Reach C03 right	1842.54*	100 yr	Conn 17050 Prop	116.63	438.11	439.61		439.83	0.012534	3.75	31.09	44.19	0.79
Reach C03 right	1842.54*	100 yr	Conn 17050 Nat	114.87	438.11	439.60		439.82	0.012539	3.73	30.78	44.10	0.79
Reach C03 right	1819.46*	25 yr	Conn 17050 Prop	50.77	437.81	439.00		439.13	0.012809	2.87	17.67	38.12	0.74
Reach C03 right	1819.46*	25 yr	Conn 17050 Nat	49.75	437.81	438.99		439.12	0.012975	2.87	17.36	37.95	0.75
Reach C03 right	1819.46*	100 yr	Conn 17050 Prop	116.63	437.81	439.32		439.54	0.012560	3.77	30.90	43.61	0.79
Reach C03 right	1819.46*	100 yr	Conn 17050 Nat	114.87	437.81	439.31		439.53	0.012568	3.75	30.59	43.52	0.79
Reach C03 right	1796.39*	25 yr	Conn 17050 Prop	50.77	437.50	438.70		438.83	0.013023	2.91	17.43	37.28	0.75
Reach C03 right	1796.39*	25 yr	Conn 17050 Nat	49.75	437.50	438.69		438.82	0.013100	2.90	17.16	37.14	0.75
Reach C03 right	1796.39*	100 yr	Conn 17050 Prop	116.63	437.50	439.02		439.25	0.012595	3.80	30.69	42.96	0.79
Reach C03 right	1796.39*	100 yr	Conn 17050 Nat	114.87	437.50	439.02		439.24	0.012598	3.78	30.39	42.87	0.79

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1773.31*	25 yr	Conn 17050 Prop	50.77	437.19	438.37		438.52	0.013455	3.06	16.62	33.91	0.77
Reach C03 right	1773.31*	25 yr	Conn 17050 Nat	49.75	437.19	438.37		438.51	0.013489	3.05	16.29	33.32	0.77
Reach C03 right	1773.31*	100 yr	Conn 17050 Prop	116.63	437.19	438.73		438.96	0.012778	3.84	30.38	42.32	0.80
Reach C03 right	1773.31*	100 yr	Conn 17050 Nat	114.87	437.19	438.72		438.95	0.012788	3.82	30.07	42.22	0.80
Reach C03 right	1750.23*	25 yr	Conn 17050 Prop	50.77	436.88	438.06		438.21	0.013216	3.13	16.22	31.46	0.77
Reach C03 right	1750.23*	25 yr	Conn 17050 Nat	49.75	436.88	438.05		438.20	0.013191	3.12	15.94	31.03	0.77
Reach C03 right	1750.23*	100 yr	Conn 17050 Prop	116.63	436.88	438.43		438.66	0.012660	3.86	30.23	41.49	0.80
Reach C03 right	1750.23*	100 yr	Conn 17050 Nat	114.87	436.88	438.42		438.65	0.012667	3.84	29.91	41.37	0.80
Reach C03 right	1727.15*	25 yr	Conn 17050 Prop	50.77	436.57	437.73		437.90	0.013725	3.25	15.61	29.43	0.79
Reach C03 right	1727.15*	25 yr	Conn 17050 Nat	49.75	436.57	437.72		437.89	0.013830	3.25	15.30	28.99	0.79
Reach C03 right	1727.15*	100 yr	Conn 17050 Prop	116.63	436.57	438.13		438.36	0.012945	3.92	29.77	40.60	0.81
Reach C03 right	1727.15*	100 yr	Conn 17050 Nat	114.87	436.57	438.12		438.35	0.012953	3.90	29.46	40.48	0.81
Reach C03 right	1704.08*	25 yr	Conn 17050 Prop	50.77	436.26	437.45		437.60	0.011732	3.10	16.39	29.52	0.73
Reach C03 right	1704.08*	25 yr	Conn 17050 Nat	49.75	436.26	437.43		437.59	0.012164	3.13	15.88	28.91	0.75
Reach C03 right	1704.08*	100 yr	Conn 17050 Prop	116.63	436.26	437.88		438.09	0.010333	3.66	31.85	40.60	0.73
Reach C03 right	1704.08*	100 yr	Conn 17050 Nat	114.87	436.26	437.87		438.08	0.010274	3.64	31.59	40.50	0.73
Reach C03 right	1681	25 yr	Conn 17050 Prop	50.77	435.95	437.04	437.00	437.26	0.018565	3.78	13.45	25.40	0.91
Reach C03 right	1681	25 yr	Conn 17050 Nat	49.75	435.95	437.05	436.98	437.25	0.016797	3.61	13.78	25.79	0.87
Reach C03 right	1681	100 yr	Conn 17050 Prop	116.63	435.95	437.41	437.41	437.75	0.020525	4.68	24.92	36.77	1.00
Reach C03 right	1681	100 yr	Conn 17050 Nat	114.87	435.95	437.39	437.39	437.74	0.020906	4.70	24.45	36.37	1.01
Reach C03 right	1658.40*	25 yr	Conn 17050 Prop	50.77	435.46	436.55	436.52	436.79	0.022134	3.95	12.87	25.87	0.99
Reach C03 right	1658.40*	25 yr	Conn 17050 Nat	49.75	435.63	436.74		436.88	0.014706	3.07	16.19	35.01	0.80
Reach C03 right	1658.40*	100 yr	Conn 17050 Prop	116.63	435.46	436.94	436.94	437.27	0.017858	4.67	27.79	49.26	0.95
Reach C03 right	1658.40*	100 yr	Conn 17050 Nat	114.87	435.63	437.09		437.28	0.013258	3.49	32.90	54.40	0.79
Reach C03 right	1635.80*	25 yr	Conn 17050 Prop	50.77	434.97	435.97	435.97	436.26	0.022203	4.32	11.76	20.60	1.01
Reach C03 right	1635.80*	25 yr	Conn 17050 Nat	49.75	435.31	436.36		436.52	0.017535	3.21	15.50	35.85	0.86
Reach C03 right	1635.80*	100 yr	Conn 17050 Prop	116.63	434.97	436.44	436.44	436.82	0.018323	4.98	24.74	39.83	0.97
Reach C03 right	1635.80*	100 yr	Conn 17050 Nat	114.87	435.31	436.69	436.66	436.91	0.020699	3.70	31.01	65.48	0.95
Reach C03 right	1613.20*	25 yr	Conn 17050 Prop	50.77	434.48	435.32	435.32	435.68	0.020657	4.79	10.61	14.98	1.00
Reach C03 right	1613.20*	25 yr	Conn 17050 Nat	49.75	434.99	435.98		436.12	0.017253	2.97	16.76	43.04	0.84
Reach C03 right	1613.20*	100 yr	Conn 17050 Prop	116.63	434.48	435.88	435.88	436.29	0.019365	5.12	22.79	39.57	1.00
Reach C03 right	1613.20*	100 yr	Conn 17050 Nat	114.87	434.99	436.27	436.22	436.47	0.017754	3.65	31.49	60.64	0.89
Reach C03 right	1590.60*	25 yr	Conn 17050 Prop	50.77	433.99	434.71	434.71	435.03	0.021221	4.56	11.12	17.27	1.00
Reach C03 right	1590.60*	25 yr	Conn 17050 Nat	49.75	434.67	435.55	435.52	435.69	0.020531	2.99	16.66	48.34	0.90
Reach C03 right	1590.60*	100 yr	Conn 17050 Prop	116.63	433.99	435.46	435.27	435.75	0.011591	4.32	26.97	46.62	0.79

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1590.60*	100 yr	Conn 17050 Nat	114.87	434.67	435.78	435.77	436.02	0.022978	3.89	29.56	62.84	1.00
Reach C03 right	1568	25 yr	Conn 17050 Prop	50.77	433.50	434.55	434.13	434.65	0.003826	2.48	20.50	27.07	0.45
Reach C03 right	1568	25 yr	Conn 17050 Nat	49.75	434.35	435.12		435.24	0.018690	2.76	18.04	54.98	0.85
Reach C03 right	1568	100 yr	Conn 17050 Prop	116.63	433.50	435.38	434.58	435.50	0.002795	2.77	43.16	73.30	0.41
Reach C03 right	1568	100 yr	Conn 17050 Nat	114.87	434.35	435.37	435.31	435.55	0.017472	3.46	33.15	68.17	0.88
Reach C03 right	1545.56*	25 yr	Conn 17050 Nat	49.75	433.83	434.71		434.83	0.018292	2.83	17.60	50.85	0.85
Reach C03 right	1545.56*	100 yr	Conn 17050 Nat	114.87	433.83	434.96	434.91	435.15	0.018282	3.57	32.17	65.40	0.90
Reach C03 right	1523.11*	25 yr	Conn 17050 Nat	49.75	433.31	434.26		434.40	0.019691	3.06	16.25	43.96	0.89
Reach C03 right	1523.11*	100 yr	Conn 17050 Nat	114.87	433.31	434.55	434.50	434.75	0.017915	3.63	31.68	61.94	0.89
Reach C03 right	1500.67*	25 yr	Conn 17050 Nat	49.75	432.79	433.80	433.75	433.96	0.019399	3.27	15.23	36.94	0.90
Reach C03 right	1500.67*	100 yr	Conn 17050 Nat	114.87	432.79	434.12	434.07	434.34	0.018423	3.77	30.45	57.30	0.91
Reach C03 right	1478.22*	25 yr	Conn 17050 Nat	49.75	432.27	433.23	433.22	433.49	0.022675	4.08	12.21	23.85	1.00
Reach C03 right	1478.22*	100 yr	Conn 17050 Nat	114.87	432.27	433.69	433.64	433.93	0.018283	3.92	29.34	51.87	0.92
Reach C03 right	1467			Culvert									
Reach C03 right	1455.78*	25 yr	Conn 17050 Nat	49.75	431.76	432.74	432.72	433.00	0.021126	4.09	12.16	22.38	0.98
Reach C03 right	1455.78*	100 yr	Conn 17050 Nat	114.87	431.76	433.25	433.21	433.52	0.018407	4.16	27.63	44.85	0.93
Reach C03 right	1433.33*	25 yr	Conn 17050 Nat	49.75	431.24	432.23	432.22	432.51	0.021871	4.29	11.59	20.36	1.00
Reach C03 right	1433.33*	100 yr	Conn 17050 Nat	114.87	431.24	432.75	432.71	433.09	0.018744	4.67	24.61	33.95	0.97
Reach C03 right	1410.89*	25 yr	Conn 17050 Nat	49.75	430.72	431.76	431.74	432.05	0.019902	4.30	11.57	18.83	0.97
Reach C03 right	1410.89*	100 yr	Conn 17050 Nat	114.87	430.72	432.26	432.26	432.65	0.019610	5.02	22.90	29.28	1.00
Reach C03 right	1388.44*	25 yr	Conn 17050 Nat	49.75	430.20	431.30	431.27	431.61	0.019162	4.45	11.18	16.76	0.96
Reach C03 right	1388.44*	100 yr	Conn 17050 Nat	114.87	430.20	431.92	431.83	432.25	0.015040	4.58	25.10	30.17	0.88
Reach C03 right	1366	25 yr	Conn 17050 Prop	50.77	429.50	430.25	430.13	430.46	0.012647	3.68	13.79	20.03	0.78
Reach C03 right	1366	25 yr	Conn 17050 Nat	49.75	429.68	430.91	430.84	431.21	0.015849	4.40	11.31	14.87	0.89
Reach C03 right	1366	100 yr	Conn 17050 Prop	116.63	429.50	430.75	430.59	431.11	0.011310	4.76	24.52	22.10	0.80
Reach C03 right	1366	100 yr	Conn 17050 Nat	114.87	429.68	431.54	431.47	431.90	0.015844	4.77	24.10	28.22	0.91
Reach C03 right	1343.56*	25 yr	Conn 17050 Prop	50.77	429.15	429.95	429.83	430.17	0.012286	3.75	13.54	18.70	0.78
Reach C03 right	1343.56*	25 yr	Conn 17050 Nat	49.75	429.31	430.57	430.49	430.86	0.015375	4.32	11.51	15.20	0.88
Reach C03 right	1343.56*	100 yr	Conn 17050 Prop	116.63	429.15	430.51	430.30	430.86	0.010473	4.72	24.69	21.20	0.77
Reach C03 right	1343.56*	100 yr	Conn 17050 Nat	114.87	429.31	431.21	431.11	431.54	0.015318	4.62	24.89	29.87	0.89
Reach C03 right	1321.11*	25 yr	Conn 17050 Prop	50.77	428.80	429.67	429.54	429.89	0.011819	3.80	13.35	17.50	0.77

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1321.11*	25 yr	Conn 17050 Nat	49.75	428.94	430.22	430.15	430.51	0.015459	4.31	11.53	15.35	0.88
Reach C03 right	1321.11*	100 yr	Conn 17050 Prop	116.63	428.80	430.29	430.03	430.62	0.009464	4.64	25.13	20.51	0.74
Reach C03 right	1321.11*	100 yr	Conn 17050 Nat	114.87	428.94	430.87	430.77	431.19	0.015605	4.49	25.57	32.46	0.89
Reach C03 right	1298.67*	25 yr	Conn 17050 Prop	50.77	428.45	429.40	429.25	429.63	0.011205	3.83	13.25	16.48	0.75
Reach C03 right	1298.67*	25 yr	Conn 17050 Nat	49.75	428.57	429.88	429.80	430.16	0.015284	4.28	11.62	15.53	0.87
Reach C03 right	1298.67*	100 yr	Conn 17050 Prop	116.63	428.45	430.09	429.78	430.41	0.008395	4.51	25.86	20.10	0.70
Reach C03 right	1298.67*	100 yr	Conn 17050 Nat	114.87	428.57	430.54	430.44	430.83	0.015509	4.35	26.43	35.13	0.88
Reach C03 right	1276.22*	25 yr	Conn 17050 Prop	50.77	428.10	429.16	428.98	429.39	0.010222	3.79	13.38	15.75	0.73
Reach C03 right	1276.22*	25 yr	Conn 17050 Nat	49.75	428.20	429.55		429.83	0.014542	4.20	11.86	15.73	0.85
Reach C03 right	1276.22*	100 yr	Conn 17050 Prop	116.63	428.10	429.91	429.53	430.20	0.008526	4.34	26.86	22.46	0.70
Reach C03 right	1276.22*	100 yr	Conn 17050 Nat	114.87	428.20	430.20	430.11	430.48	0.015196	4.21	27.29	37.50	0.87
Reach C03 right	1253.78*	25 yr	Conn 17050 Prop	50.77	427.76	428.94	428.73	429.16	0.009424	3.75	13.53	15.20	0.70
Reach C03 right	1253.78*	25 yr	Conn 17050 Nat	49.75	427.84	429.21		429.49	0.014871	4.23	11.77	15.69	0.86
Reach C03 right	1253.78*	100 yr	Conn 17050 Prop	116.63	427.76	429.70	429.32	429.97	0.010030	4.16	28.02	28.41	0.74
Reach C03 right	1253.78*	100 yr	Conn 17050 Nat	114.87	427.84	429.86	429.78	430.13	0.015660	4.15	27.67	39.73	0.88
Reach C03 right	1231.33*	25 yr	Conn 17050 Prop	50.77	427.41	428.75	428.47	428.95	0.008417	3.61	14.05	15.33	0.67
Reach C03 right	1231.33*	25 yr	Conn 17050 Nat	49.75	427.47	428.89		429.16	0.014493	4.19	11.87	15.72	0.85
Reach C03 right	1231.33*	100 yr	Conn 17050 Prop	116.63	427.41	429.45	429.11	429.70	0.012980	3.96	29.42	39.13	0.81
Reach C03 right	1231.33*	100 yr	Conn 17050 Nat	114.87	427.47	429.52	429.45	429.78	0.015456	4.07	28.20	41.22	0.87
Reach C03 right	1208.89*	25 yr	Conn 17050 Prop	50.77	427.06	428.58	428.24	428.76	0.007212	3.41	14.90	15.82	0.62
Reach C03 right	1208.89*	25 yr	Conn 17050 Nat	49.75	427.10	428.57		428.84	0.013882	4.14	12.03	15.70	0.83
Reach C03 right	1208.89*	100 yr	Conn 17050 Prop	116.63	427.06	429.16	429.05	429.39	0.013201	3.86	30.24	42.52	0.81
Reach C03 right	1208.89*	100 yr	Conn 17050 Nat	114.87	427.10	429.17	429.11	429.43	0.015826	4.05	28.33	42.45	0.87
Reach C03 right	1186.44*	25 yr	Conn 17050 Prop	50.77	426.71	428.43	428.03	428.58	0.006603	3.11	16.32	18.64	0.59
Reach C03 right	1186.44*	25 yr	Conn 17050 Nat	49.75	426.73	428.31		428.54	0.011817	3.87	12.85	16.36	0.77
Reach C03 right	1186.44*	100 yr	Conn 17050 Prop	116.63	426.71	428.89	428.75	429.09	0.011262	3.60	32.41	44.90	0.75
Reach C03 right	1186.44*	100 yr	Conn 17050 Nat	114.87	426.73	428.86		429.09	0.013458	3.80	30.26	44.28	0.81
Reach C03 right	1164	25 yr	Conn 17050 Prop	50.77	426.36	427.83	427.82	428.21	0.019466	4.89	10.39	13.49	0.98
Reach C03 right	1164	25 yr	Conn 17050 Nat	49.75	426.36	427.82	427.80	428.19	0.019566	4.90	10.15	13.18	0.98
Reach C03 right	1164	100 yr	Conn 17050 Prop	116.63	426.36	428.47	428.42	428.74	0.017881	4.14	28.17	44.70	0.92
Reach C03 right	1164	100 yr	Conn 17050 Nat	114.87	426.36	428.45	428.41	428.73	0.019194	4.22	27.24	44.36	0.95
Reach C03 right	1140.17*	25 yr	Conn 17050 Prop	50.77	425.92	427.38	427.36	427.74	0.019399	4.82	10.54	13.99	0.98
Reach C03 right	1140.17*	25 yr	Conn 17050 Nat	49.75	425.92	427.36	427.34	427.72	0.019455	4.81	10.33	13.76	0.98
Reach C03 right	1140.17*	100 yr	Conn 17050 Prop	116.63	425.92	428.01	427.97	428.29	0.019236	4.26	27.40	44.11	0.95
Reach C03 right	1140.17*	100 yr	Conn 17050 Nat	114.87	425.92	428.01	427.96	428.28	0.018362	4.17	27.55	44.17	0.93

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1116.33*	25 yr	Conn 17050 Prop	50.77	425.48	426.91	426.90	427.27	0.019507	4.79	10.61	14.30	0.98
Reach C03 right	1116.33*	25 yr	Conn 17050 Nat	49.75	425.48	426.89	426.88	427.25	0.019833	4.81	10.35	14.05	0.99
Reach C03 right	1116.33*	100 yr	Conn 17050 Prop	116.63	425.48	427.57	427.52	427.84	0.018166	4.19	27.81	43.87	0.93
Reach C03 right	1116.33*	100 yr	Conn 17050 Nat	114.87	425.48	427.55	427.52	427.83	0.019147	4.25	27.04	43.55	0.95
Reach C03 right	1092.50*	25 yr	Conn 17050 Prop	50.77	425.03	426.45	426.43	426.80	0.019207	4.73	10.73	14.57	0.97
Reach C03 right	1092.50*	25 yr	Conn 17050 Nat	49.75	425.03	426.44	426.42	426.78	0.019286	4.72	10.53	14.40	0.97
Reach C03 right	1092.50*	100 yr	Conn 17050 Prop	116.63	425.03	427.11	427.08	427.40	0.019174	4.28	27.22	43.34	0.95
Reach C03 right	1092.50*	100 yr	Conn 17050 Nat	114.87	425.03	427.11	427.07	427.39	0.018434	4.21	27.30	43.38	0.93
Reach C03 right	1068.67*	25 yr	Conn 17050 Prop	50.77	424.59	425.99	425.97	426.34	0.019220	4.71	10.79	14.80	0.97
Reach C03 right	1068.67*	25 yr	Conn 17050 Nat	49.75	424.59	425.98	425.96	426.32	0.019450	4.71	10.56	14.61	0.98
Reach C03 right	1068.67*	100 yr	Conn 17050 Prop	116.63	424.59	426.68	426.63	426.95	0.017955	4.21	27.70	43.13	0.93
Reach C03 right	1068.67*	100 yr	Conn 17050 Nat	114.87	424.59	426.66	426.62	426.94	0.018965	4.27	26.91	42.75	0.95
Reach C03 right	1044.83*	25 yr	Conn 17050 Prop	50.77	424.15	425.54	425.51	425.88	0.019043	4.68	10.85	14.94	0.97
Reach C03 right	1044.83*	25 yr	Conn 17050 Nat	49.75	424.15	425.53	425.50	425.86	0.018918	4.65	10.71	14.82	0.96
Reach C03 right	1044.83*	100 yr	Conn 17050 Prop	116.63	424.15	426.22	426.18	426.51	0.019101	4.32	27.03	42.47	0.95
Reach C03 right	1044.83*	100 yr	Conn 17050 Nat	114.87	424.15	426.22	426.18	426.50	0.018403	4.24	27.09	42.51	0.94
Reach C03 right	1021.00*	25 yr	Conn 17050 Prop	50.77	423.71	425.09	425.06	425.42	0.019123	4.67	10.87	15.06	0.97
Reach C03 right	1021.00*	25 yr	Conn 17050 Nat	49.75	423.71	425.07	425.05	425.41	0.019267	4.66	10.67	14.90	0.97
Reach C03 right	1021.00*	100 yr	Conn 17050 Prop	116.63	423.71	425.78	425.73	426.06	0.017952	4.24	27.50	42.36	0.93
Reach C03 right	1021.00*	100 yr	Conn 17050 Nat	114.87	423.71	425.77	425.74	426.05	0.018889	4.30	26.73	41.95	0.95
Reach C03 right	997.17*	25 yr	Conn 17050 Prop	50.77	423.26	424.62	424.60	424.96	0.019158	4.69	10.84	14.96	0.97
Reach C03 right	997.17*	25 yr	Conn 17050 Nat	49.75	423.26	424.61	424.59	424.95	0.019321	4.68	10.63	14.79	0.97
Reach C03 right	997.17*	100 yr	Conn 17050 Prop	116.63	423.26	425.33	425.28	425.62	0.018964	4.35	26.84	41.54	0.95
Reach C03 right	997.17*	100 yr	Conn 17050 Nat	114.87	423.26	425.33	425.29	425.61	0.018265	4.27	26.91	41.58	0.94
Reach C03 right	973.33*	25 yr	Conn 17050 Prop	50.77	422.82	424.17	424.15	424.51	0.018856	4.65	10.91	15.05	0.96
Reach C03 right	973.33*	25 yr	Conn 17050 Nat	49.75	422.82	424.16	424.14	424.50	0.018771	4.62	10.76	14.94	0.96
Reach C03 right	973.33*	100 yr	Conn 17050 Prop	116.63	422.82	424.93	424.81	425.18	0.015224	4.03	28.92	42.45	0.86
Reach C03 right	973.33*	100 yr	Conn 17050 Nat	114.87	422.82	424.83	424.83	425.16	0.018956	4.65	24.71	34.51	0.97
Reach C03 right	949.50*	25 yr	Conn 17050 Prop	50.77	422.38	423.72	423.69	424.06	0.019142	4.69	10.84	14.96	0.97
Reach C03 right	949.50*	25 yr	Conn 17050 Nat	49.75	422.38	423.70	423.68	424.04	0.019374	4.68	10.62	14.81	0.97
Reach C03 right	949.50*	100 yr	Conn 17050 Prop	116.63	422.38	424.38	424.35	424.73	0.018865	4.75	24.56	33.08	0.97
Reach C03 right	949.50*	100 yr	Conn 17050 Nat	114.87	422.38	424.35	424.33	424.71	0.019180	4.81	23.87	31.90	0.98
Reach C03 right	925.67*	25 yr	Conn 17050 Prop	50.77	421.94	423.27	423.24	423.60	0.018481	4.63	10.97	15.01	0.95
Reach C03 right	925.67*	25 yr	Conn 17050 Nat	49.75	421.94	423.26	423.23	423.59	0.018319	4.59	10.84	14.92	0.95
Reach C03 right	925.67*	100 yr	Conn 17050 Prop	116.63	421.94	423.95	423.88	424.28	0.017157	4.59	25.39	33.48	0.93
Reach C03 right	925.67*	100 yr	Conn 17050 Nat	114.87	421.94	423.90	423.87	424.27	0.018718	4.84	23.75	30.93	0.97

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	901.83*	25 yr	Conn 17050 Prop	50.77	421.50	422.81	422.79	423.16	0.019090	4.70	10.81	14.82	0.97
Reach C03 right	901.83*	25 yr	Conn 17050 Nat	49.75	421.50	422.80	422.78	423.14	0.019365	4.70	10.59	14.67	0.98
Reach C03 right	901.83*	100 yr	Conn 17050 Prop	116.63	421.50	423.46	423.43	423.83	0.018832	4.91	23.78	30.43	0.98
Reach C03 right	901.83*	100 yr	Conn 17050 Nat	114.87	421.50	423.44	423.42	423.82	0.018913	4.93	23.30	29.67	0.98
Reach C03 right	878.00*	25 yr	Conn 17050 Prop	50.77	421.05	422.36	422.33	422.70	0.018842	4.70	10.81	14.66	0.96
Reach C03 right	878.00*	25 yr	Conn 17050 Nat	49.75	421.05	422.35	422.32	422.69	0.018594	4.65	10.69	14.58	0.96
Reach C03 right	878.00*	100 yr	Conn 17050 Prop	116.63	421.05	423.01	422.98	423.39	0.018689	4.95	23.56	29.56	0.98
Reach C03 right	878.00*	100 yr	Conn 17050 Nat	114.87	421.05	422.99	422.97	423.38	0.018764	4.97	23.10	28.87	0.98
Reach C03 right	854.17*	25 yr	Conn 17050 Prop	50.77	420.61	421.91	421.88	422.26	0.018635	4.70	10.80	14.51	0.96
Reach C03 right	854.17*	25 yr	Conn 17050 Nat	49.75	420.61	421.89	421.87	422.24	0.019062	4.72	10.54	14.32	0.97
Reach C03 right	854.17*	100 yr	Conn 17050 Prop	116.63	420.61	422.56	422.53	422.94	0.018522	4.94	23.61	29.49	0.97
Reach C03 right	854.17*	100 yr	Conn 17050 Nat	114.87	420.61	422.55	422.52	422.93	0.018544	4.95	23.20	28.91	0.97
Reach C03 right	830.33*	25 yr	Conn 17050 Prop	50.77	420.17	421.46	421.44	421.81	0.018768	4.74	10.71	14.27	0.96
Reach C03 right	830.33*	25 yr	Conn 17050 Nat	49.75	420.17	421.46	421.42	421.80	0.018167	4.66	10.68	14.25	0.95
Reach C03 right	830.33*	100 yr	Conn 17050 Prop	116.63	420.17	422.12	422.09	422.50	0.018429	4.92	23.70	29.65	0.97
Reach C03 right	830.33*	100 yr	Conn 17050 Nat	114.87	420.17	422.11	422.08	422.49	0.018601	4.95	23.19	28.94	0.98
Reach C03 right	806.50*	25 yr	Conn 17050 Prop	50.77	419.73	421.01	420.98	421.36	0.018925	4.79	10.59	13.94	0.97
Reach C03 right	806.50*	25 yr	Conn 17050 Nat	49.75	419.73	420.99	420.97	421.35	0.019407	4.82	10.32	13.73	0.98
Reach C03 right	806.50*	100 yr	Conn 17050 Prop	116.63	419.73	421.70	421.65	422.06	0.017919	4.84	24.10	30.26	0.96
Reach C03 right	806.50*	100 yr	Conn 17050 Nat	114.87	419.73	421.68	421.64	422.05	0.018152	4.88	23.55	29.50	0.96
Reach C03 right	782.67*	25 yr	Conn 17050 Prop	50.77	419.28	420.55	420.53	420.91	0.018679	4.82	10.54	13.61	0.97
Reach C03 right	782.67*	25 yr	Conn 17050 Nat	49.75	419.28	420.56	420.51	420.90	0.017807	4.71	10.57	13.64	0.94
Reach C03 right	782.67*	100 yr	Conn 17050 Prop	116.63	419.28	421.25	421.21	421.62	0.018183	4.87	23.93	30.04	0.96
Reach C03 right	782.67*	100 yr	Conn 17050 Nat	114.87	419.28	421.23	421.20	421.61	0.018378	4.91	23.39	29.26	0.97
Reach C03 right	758.83*	25 yr	Conn 17050 Prop	50.77	418.84	420.10	420.07	420.47	0.018758	4.89	10.39	13.14	0.97
Reach C03 right	758.83*	25 yr	Conn 17050 Nat	49.75	418.84	420.07	420.06	420.45	0.019754	4.95	10.04	12.95	0.99
Reach C03 right	758.83*	100 yr	Conn 17050 Prop	116.63	418.84	420.83	420.78	421.18	0.017761	4.77	24.43	31.07	0.95
Reach C03 right	758.83*	100 yr	Conn 17050 Nat	114.87	418.84	420.80	420.77	421.17	0.018401	4.88	23.55	29.77	0.97
Reach C03 right	735	25 yr	Conn 17050 Prop	50.77	418.40	419.68	419.62	420.03	0.016468	4.68	10.84	13.23	0.91
Reach C03 right	735	25 yr	Conn 17050 Nat	49.75	418.40	419.67	419.61	420.01	0.016495	4.66	10.67	13.14	0.91
Reach C03 right	735	100 yr	Conn 17050 Prop	116.63	418.40	420.43	420.35	420.75	0.016518	4.54	25.68	33.35	0.91
Reach C03 right	735	100 yr	Conn 17050 Nat	114.87	418.40	420.42	420.34	420.74	0.016696	4.55	25.22	32.86	0.92
Reach C03 right	711.90*	25 yr	Conn 17050 Prop	50.77	418.02	419.30	419.23	419.64	0.016798	4.70	10.80	13.32	0.92
Reach C03 right	711.90*	25 yr	Conn 17050 Nat	49.75	418.02	419.28	419.22	419.62	0.016789	4.68	10.62	13.17	0.92
Reach C03 right	711.90*	100 yr	Conn 17050 Prop	116.63	418.02	420.01	419.94	420.36	0.016910	4.79	24.36	29.72	0.93

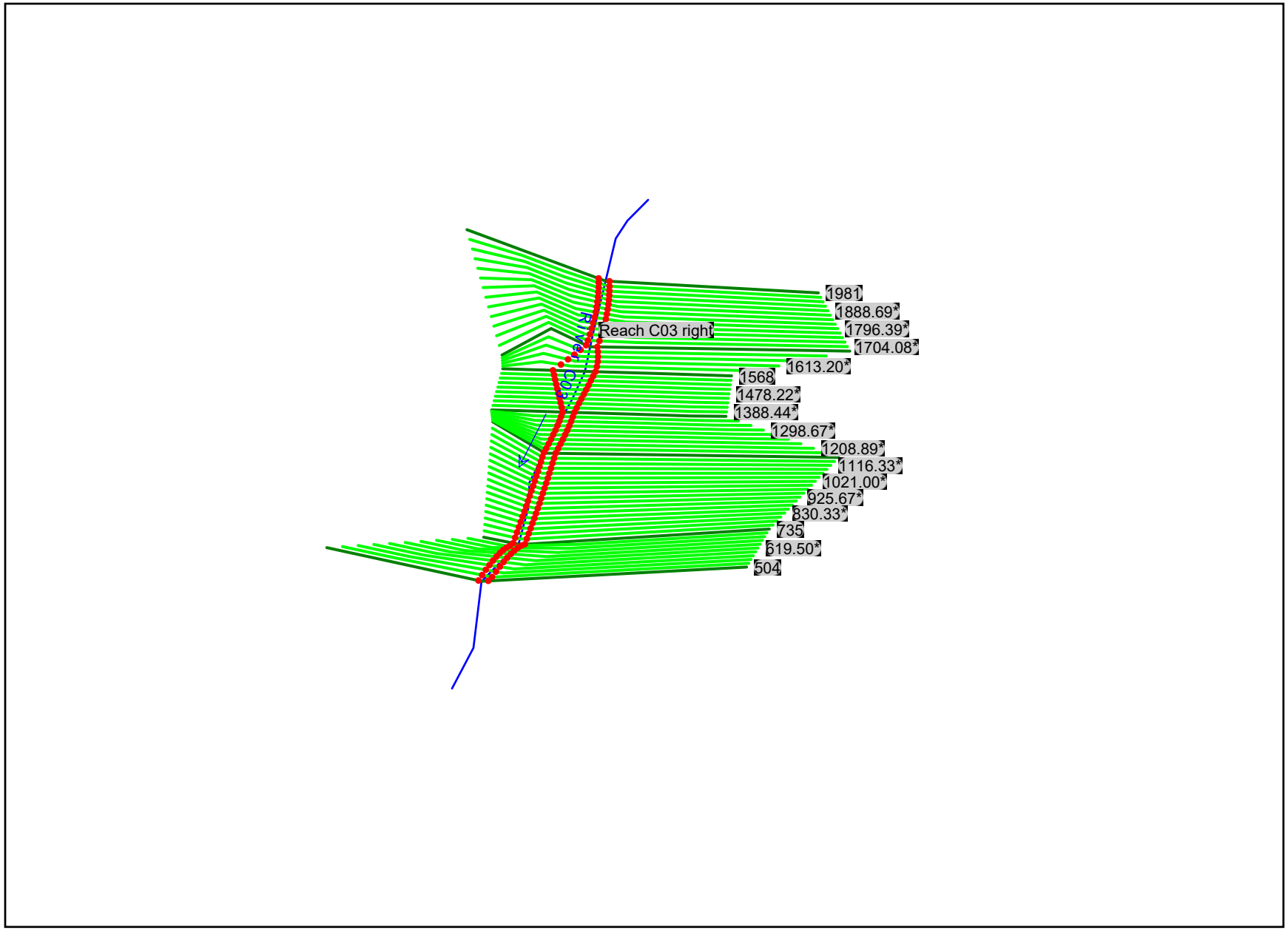
HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

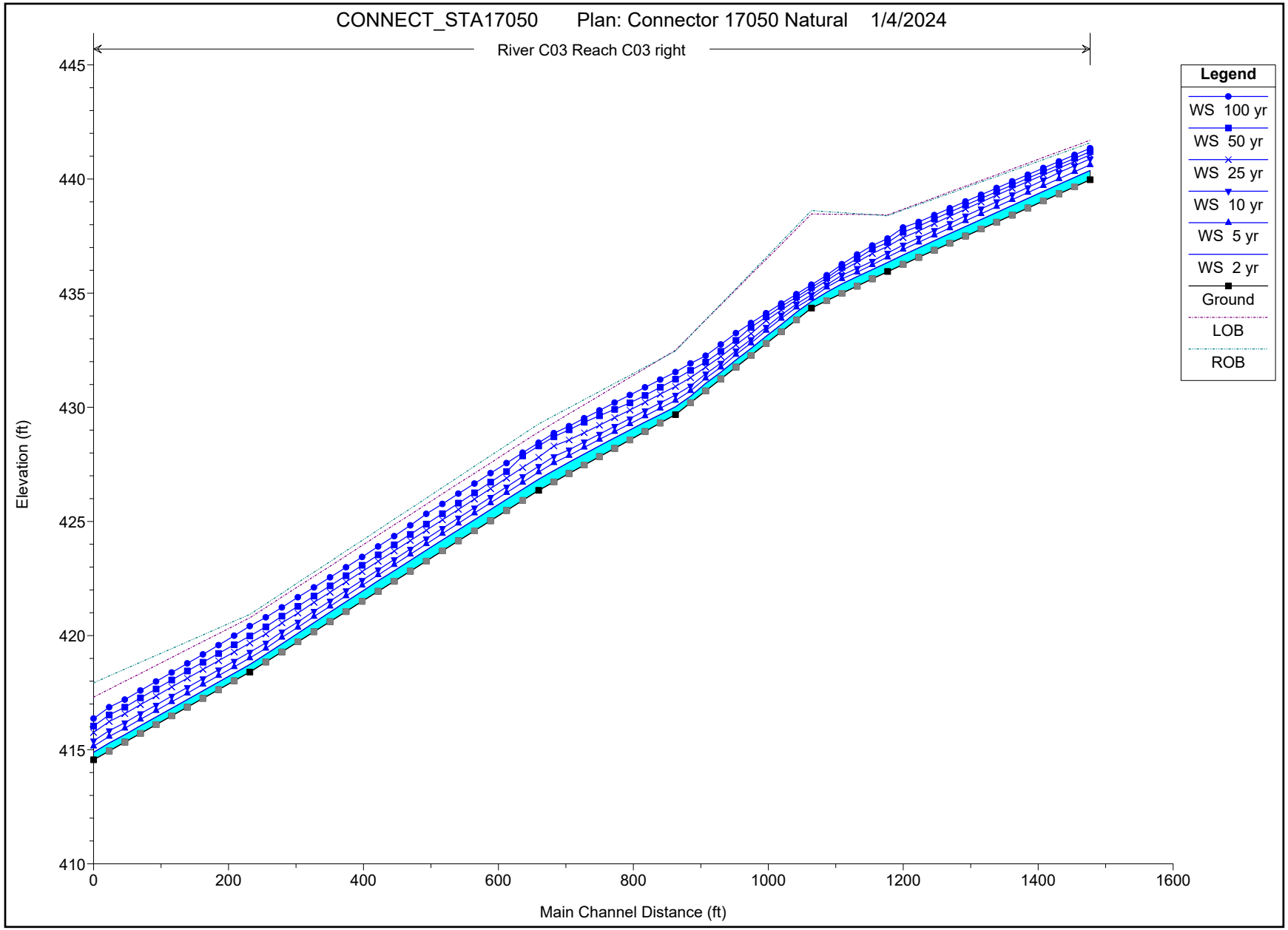
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	711.90*	100 yr	Conn 17050 Nat	114.87	418.02	419.99	419.93	420.35	0.016936	4.80	23.95	29.16	0.93
Reach C03 right	688.80*	25 yr	Conn 17050 Prop	50.77	417.63	418.91	418.85	419.25	0.016595	4.66	10.89	13.50	0.91
Reach C03 right	688.80*	25 yr	Conn 17050 Nat	49.75	417.63	418.90	418.84	419.24	0.016580	4.64	10.72	13.37	0.91
Reach C03 right	688.80*	100 yr	Conn 17050 Prop	116.63	417.63	419.59	419.54	419.97	0.016969	4.93	23.67	27.73	0.94
Reach C03 right	688.80*	100 yr	Conn 17050 Nat	114.87	417.63	419.58	419.52	419.96	0.016983	4.93	23.29	27.25	0.94
Reach C03 right	665.70*	25 yr	Conn 17050 Prop	50.77	417.25	418.53	418.47	418.86	0.016904	4.67	10.87	13.66	0.92
Reach C03 right	665.70*	25 yr	Conn 17050 Nat	49.75	417.25	418.51	418.45	418.85	0.016902	4.65	10.70	13.53	0.92
Reach C03 right	665.70*	100 yr	Conn 17050 Prop	116.63	417.25	419.19	419.13	419.58	0.017037	5.03	23.18	26.37	0.95
Reach C03 right	665.70*	100 yr	Conn 17050 Nat	114.87	417.25	419.17	419.12	419.57	0.017051	5.03	22.82	25.96	0.95
Reach C03 right	642.60*	25 yr	Conn 17050 Prop	50.77	416.86	418.14	418.08	418.48	0.016520	4.62	10.99	13.80	0.91
Reach C03 right	642.60*	25 yr	Conn 17050 Nat	49.75	416.86	418.13	418.07	418.46	0.016516	4.60	10.83	13.69	0.91
Reach C03 right	642.60*	100 yr	Conn 17050 Prop	116.63	416.86	418.79	418.73	419.19	0.016677	5.06	23.03	25.55	0.94
Reach C03 right	642.60*	100 yr	Conn 17050 Nat	114.87	416.86	418.78	418.72	419.18	0.016679	5.06	22.69	25.18	0.94
Reach C03 right	619.50*	25 yr	Conn 17050 Prop	50.77	416.48	417.76	417.70	418.09	0.016596	4.62	11.00	13.87	0.91
Reach C03 right	619.50*	25 yr	Conn 17050 Nat	49.75	416.48	417.75	417.69	418.08	0.016584	4.59	10.83	13.76	0.91
Reach C03 right	619.50*	100 yr	Conn 17050 Prop	116.63	416.48	418.40	418.34	418.81	0.016867	5.14	22.70	24.84	0.95
Reach C03 right	619.50*	100 yr	Conn 17050 Nat	114.87	416.48	418.38	418.33	418.79	0.016869	5.13	22.37	24.51	0.95
Reach C03 right	596.40*	25 yr	Conn 17050 Prop	50.77	416.10	417.37	417.31	417.70	0.016988	4.65	10.93	13.90	0.92
Reach C03 right	596.40*	25 yr	Conn 17050 Nat	49.75	416.10	417.36	417.30	417.69	0.017000	4.62	10.76	13.79	0.92
Reach C03 right	596.40*	100 yr	Conn 17050 Prop	116.63	416.10	418.00	417.95	418.42	0.016966	5.20	22.42	24.19	0.95
Reach C03 right	596.40*	100 yr	Conn 17050 Nat	114.87	416.10	417.98	417.93	418.40	0.016979	5.20	22.10	23.87	0.95
Reach C03 right	573.30*	25 yr	Conn 17050 Prop	50.77	415.71	416.99	416.92	417.31	0.016510	4.57	11.12	14.23	0.91
Reach C03 right	573.30*	25 yr	Conn 17050 Nat	49.75	415.71	416.98	416.91	417.30	0.016500	4.55	10.94	14.09	0.91
Reach C03 right	573.30*	100 yr	Conn 17050 Prop	116.63	415.71	417.60	417.55	418.03	0.016776	5.23	22.32	23.69	0.95
Reach C03 right	573.30*	100 yr	Conn 17050 Nat	114.87	415.71	417.59	417.54	418.01	0.016785	5.22	22.00	23.39	0.95
Reach C03 right	550.20*	25 yr	Conn 17050 Prop	50.77	415.33	416.59	416.54	416.92	0.017358	4.64	10.95	14.22	0.93
Reach C03 right	550.20*	25 yr	Conn 17050 Nat	49.75	415.33	416.58	416.52	416.91	0.017353	4.61	10.78	14.10	0.93
Reach C03 right	550.20*	100 yr	Conn 17050 Prop	116.63	415.33	417.21	417.16	417.64	0.016857	5.28	22.09	23.16	0.95
Reach C03 right	550.20*	100 yr	Conn 17050 Nat	114.87	415.33	417.20	417.15	417.63	0.016860	5.27	21.78	22.88	0.95
Reach C03 right	527.10*	25 yr	Conn 17050 Prop	50.77	414.94	416.25	416.15	416.54	0.014675	4.35	11.68	14.74	0.86
Reach C03 right	527.10*	25 yr	Conn 17050 Nat	49.75	414.94	416.23	416.14	416.53	0.014681	4.32	11.50	14.63	0.86
Reach C03 right	527.10*	100 yr	Conn 17050 Prop	116.63	414.94	416.88	416.77	417.26	0.014727	5.00	23.31	23.92	0.89
Reach C03 right	527.10*	100 yr	Conn 17050 Nat	114.87	414.94	416.86	416.76	417.25	0.014728	5.00	22.99	23.66	0.89
Reach C03 right	504	25 yr	Conn 17050 Prop	50.77	414.56	415.77	415.76	416.14	0.020009	4.87	10.42	13.96	0.99
Reach C03 right	504	25 yr	Conn 17050 Nat	49.75	414.56	415.76	415.75	416.12	0.020009	4.85	10.26	13.86	0.99

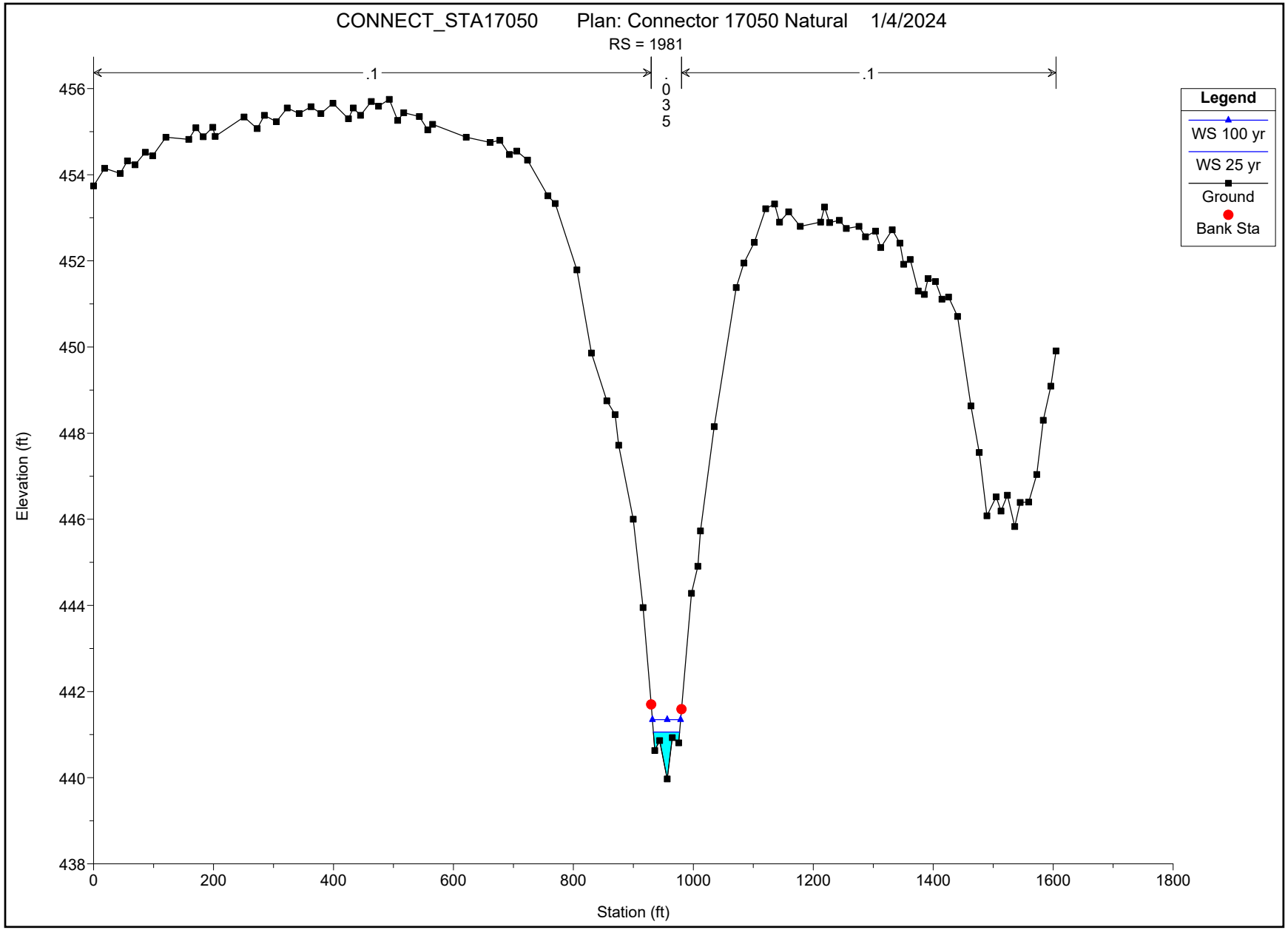
HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	504	100 yr	Conn 17050 Prop	116.63	414.56	416.38	416.38	416.87	0.018772	5.62	20.76	21.46	1.01
Reach C03 right	504	100 yr	Conn 17050 Nat	114.87	414.56	416.36	416.36	416.85	0.018793	5.61	20.47	21.19	1.01

CONNECTOR 170+50 NATURAL PLAN




CONNECT_STA17050 Plan: Connector 17050 Natural 1/4/2024
River C03 Reach C03 right
Legend
WS 100 yr
WS 50 yr
WS 25 yr
WS 10 yr
WS 5 yr
WS 2 yr
Ground
LOB
ROB
Elevation (ft)
445
440
435
430
425
420
415
410
0
200
400
600
800
1000
1200
1400
1600
Main Channel Distance (ft)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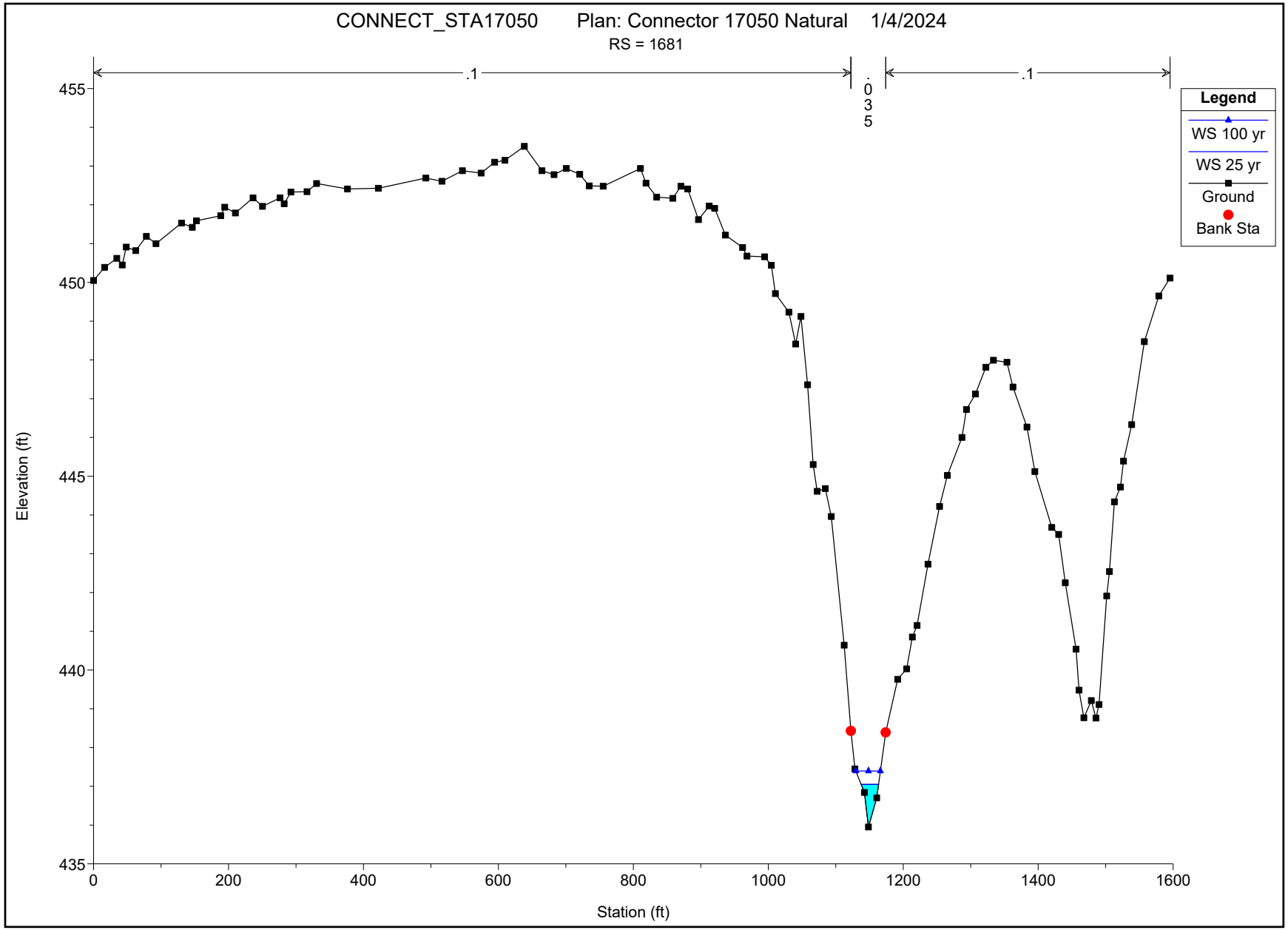
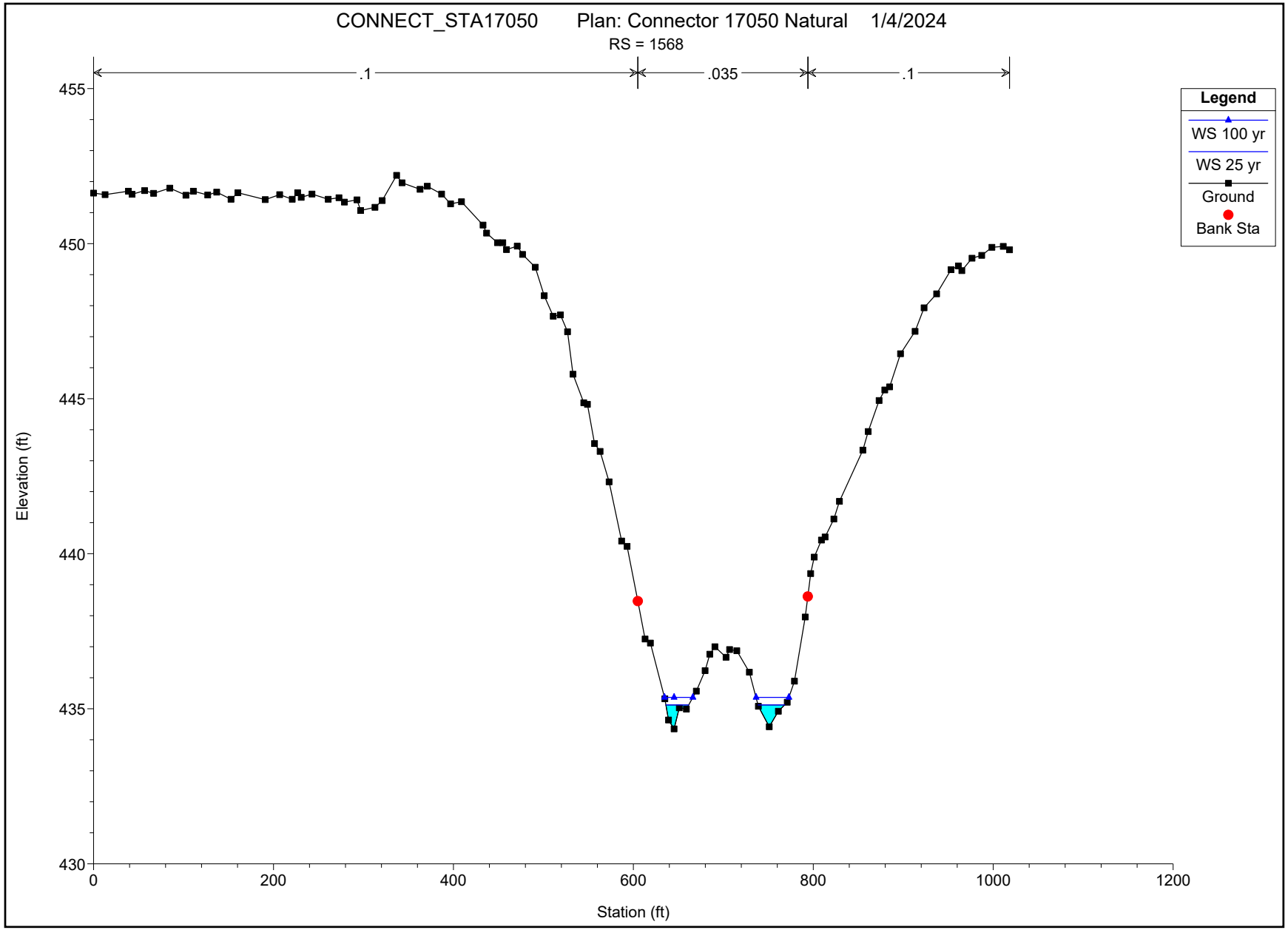
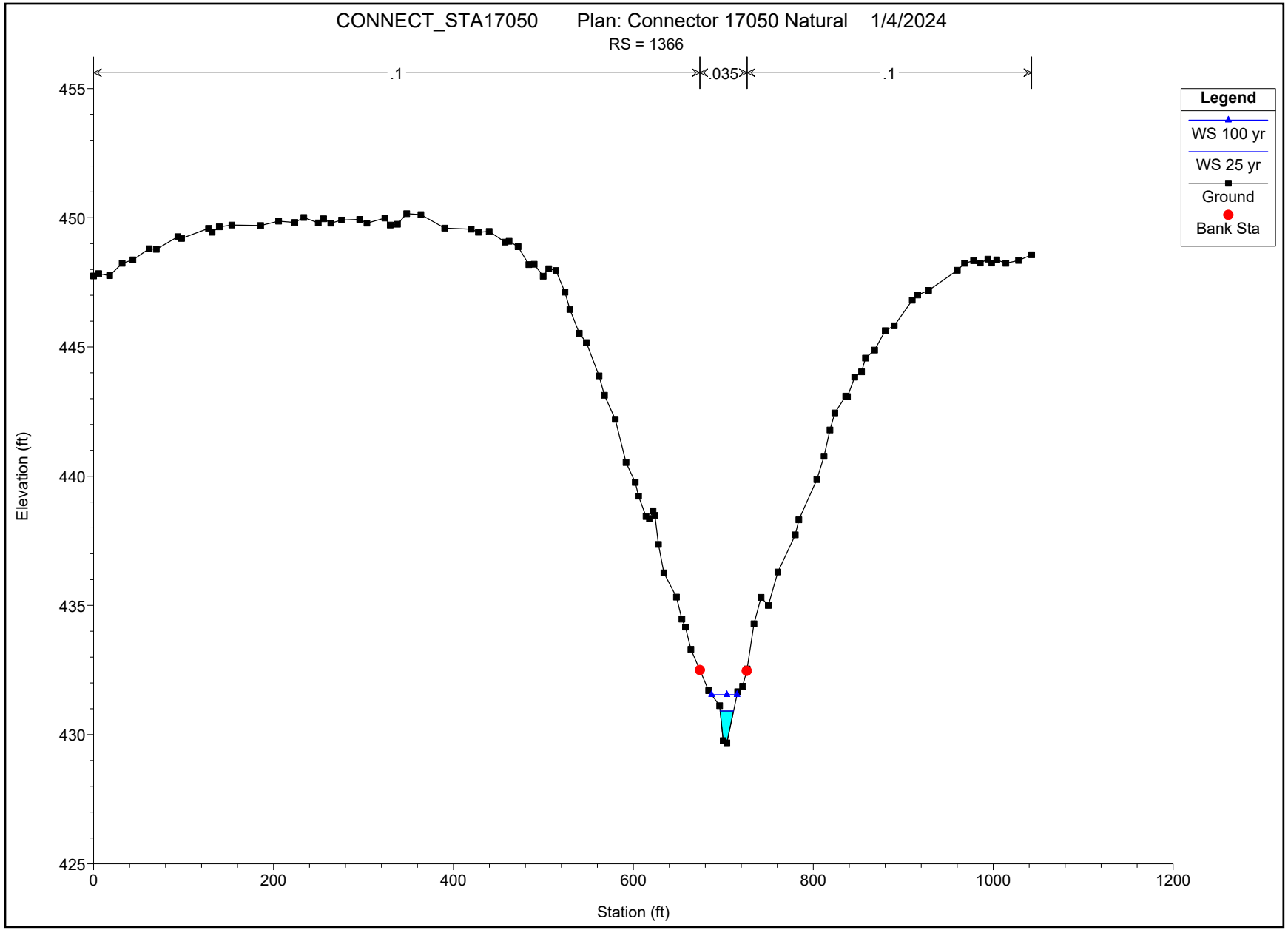
RS = 1981
.1
.035
.1
Legend
WS 100 yr
WS 25 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
438
440
442
444
446
448
450
452
454
456
0
200
400
600
800
1000
1200
1400
1600
1800


CONNECT_STA17050 Plan: Connector 17050 Natural 1/4/2024
RS = 1681
.1
.035
.1
Legend
WS 100 yr
WS 25 yr
Ground
Bank Sta
Elevation (ft)
455
450
445
440
435
0
200
400
600
800
1000
1200
1400
1600
Station (ft)


CONNECT_STA17050 Plan: Connector 17050 Natural 1/4/2024
RS = 1568
.1
.035
.1
Legend
WS 100 yr
WS 25 yr
Ground
Bank Sta
Elevation (ft)
455
450
445
440
435
430
0
200
400
600
800
1000
1200
Station (ft)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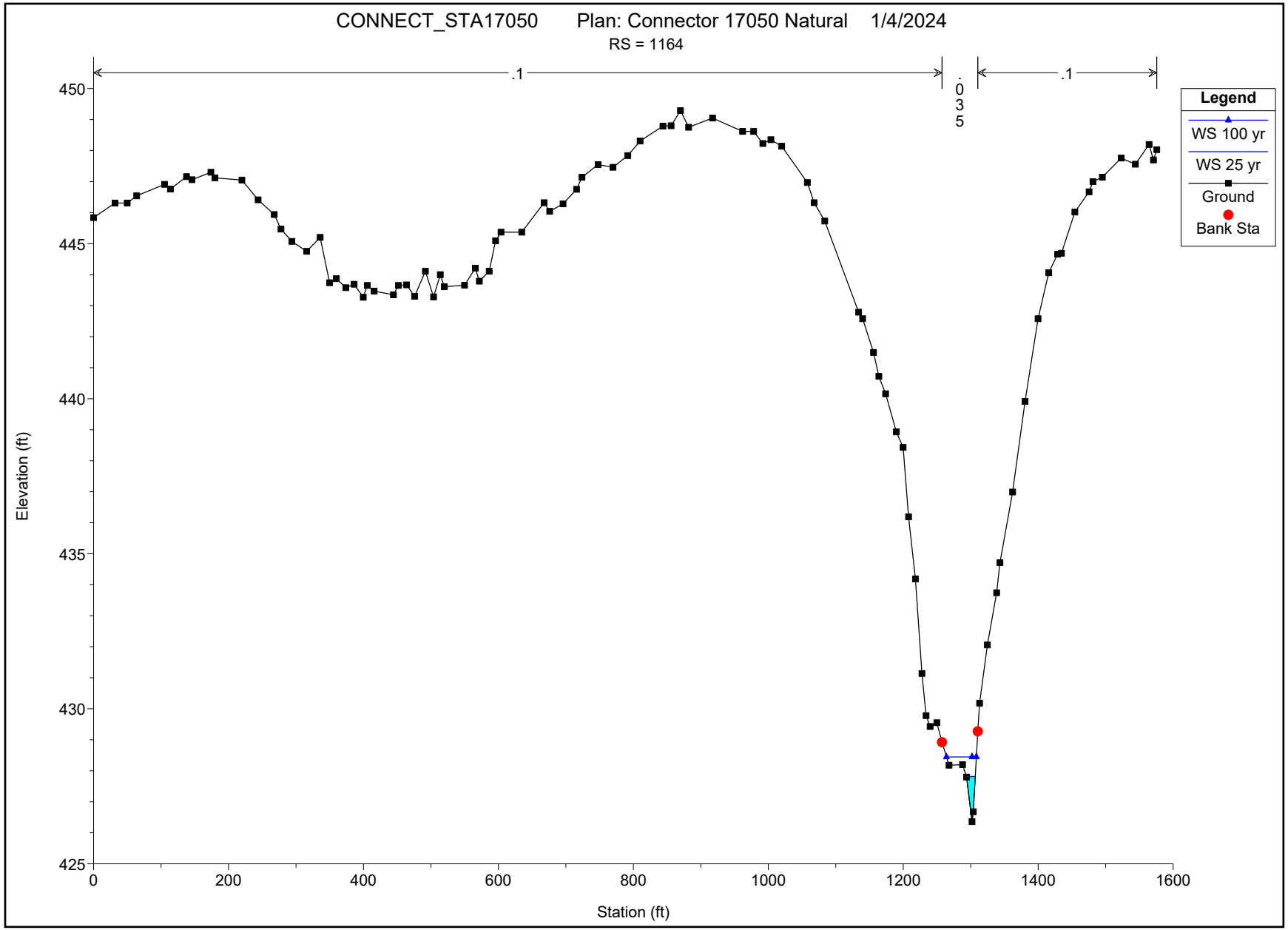
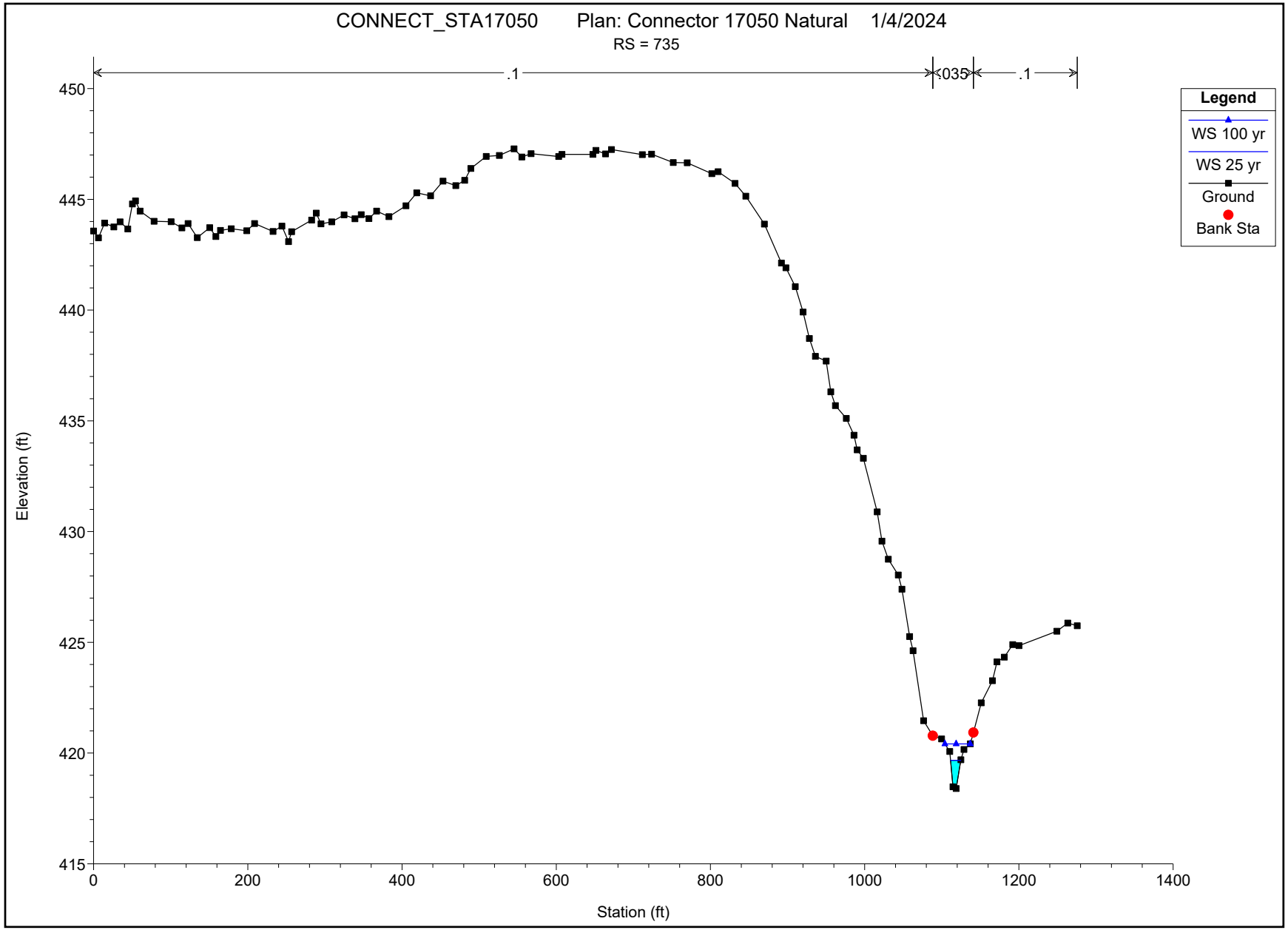
RS = 1366
.1
.035
.1
Legend
WS 100 yr
WS 25 yr
Ground
Bank Sta
Elevation (ft)
455
450
445
440
435
430
425
0
200
400
600
800
1000
1200
Station (ft)


CONNECT_STA17050 Plan: Connector 17050 Natural 1/4/2024
RS = 1164
.1
.035
.1
Legend
WS 100 yr
WS 25 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
445
440
435
430
425
0
200
400
600
800
1000
1200
1400
1600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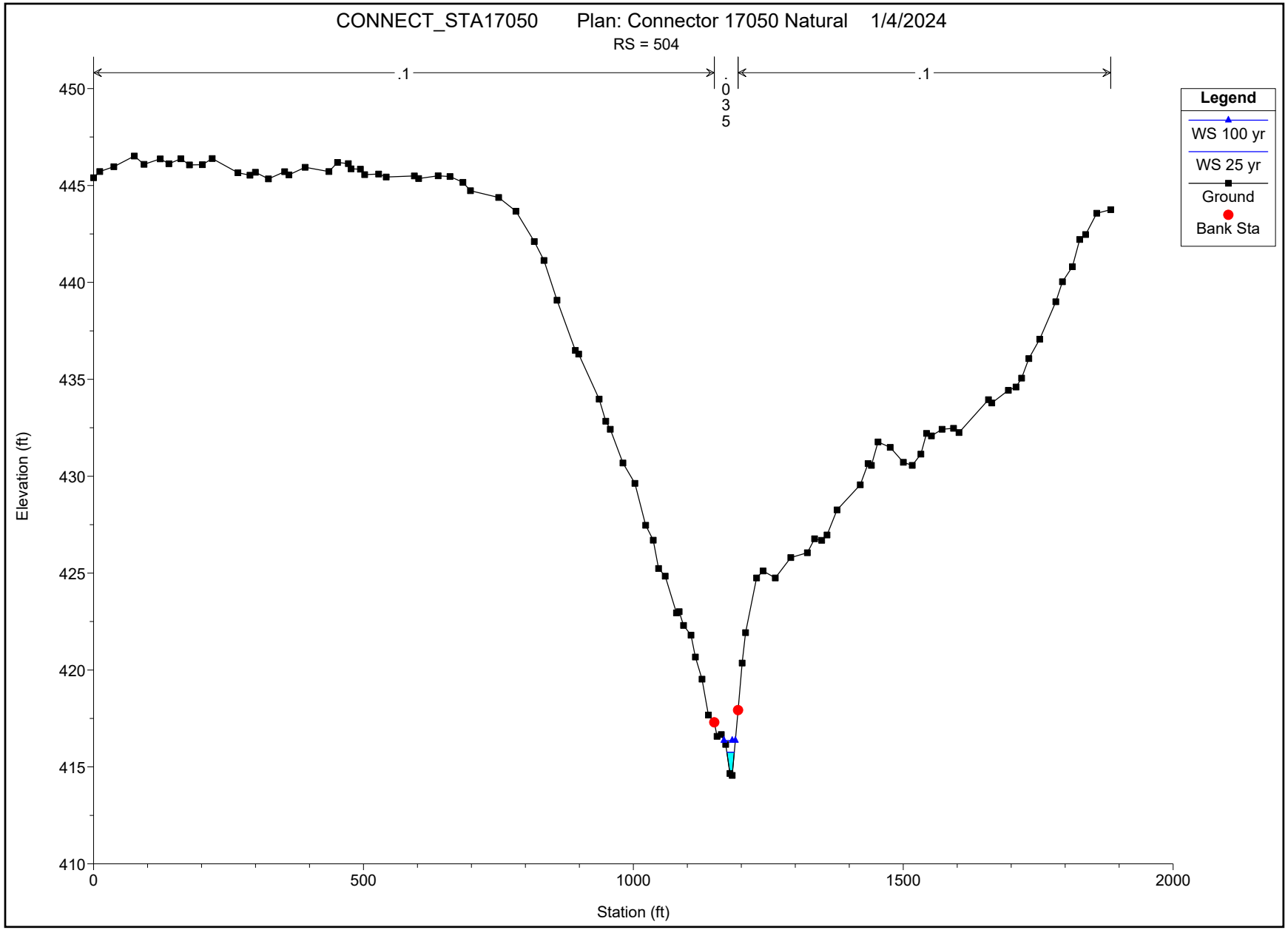
RS = 735
.1
.035
.1
Legend
WS 100 yr
WS 25 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
445
440
435
430
425
420
415
0
200
400
600
800
1000
1200
1400


CONNECT_STA17050 Plan: Connector 17050 Natural 1/4/2024
RS = 504
.1
.035
.1
Legend
WS 100 yr
WS 25 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
445
440
435
430
425
420
415
410
0
500
1000
1500
2000

HEC-RAS River: River C03 Reach: Reach C03 right

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1981	25 yr	Conn 17050 Prop	50.77	439.97	441.06		441.18	0.012582	2.70	18.78	43.77	0.73
Reach C03 right	1981	25 yr	Conn 17050 Nat	49.75	439.97	441.06		441.17	0.012569	2.68	18.55	43.71	0.73
Reach C03 right	1981	100 yr	Conn 17050 Prop	116.63	439.97	441.35		441.56	0.012481	3.65	31.96	47.14	0.78
Reach C03 right	1981	100 yr	Conn 17050 Nat	114.87	439.97	441.35		441.55	0.012485	3.63	31.64	47.07	0.78
Reach C03 right	1957.92*	25 yr	Conn 17050 Prop	50.77	439.66	440.77		440.89	0.012496	2.71	18.74	43.29	0.73
Reach C03 right	1957.92*	25 yr	Conn 17050 Nat	49.75	439.66	440.77		440.88	0.012492	2.69	18.50	43.23	0.72
Reach C03 right	1957.92*	100 yr	Conn 17050 Prop	116.63	439.66	441.07		441.27	0.012387	3.65	31.92	46.74	0.78
Reach C03 right	1957.92*	100 yr	Conn 17050 Nat	114.87	439.66	441.06		441.27	0.012389	3.63	31.60	46.66	0.78
Reach C03 right	1934.85*	25 yr	Conn 17050 Prop	50.77	439.35	440.48		440.60	0.012574	2.73	18.60	42.74	0.73
Reach C03 right	1934.85*	25 yr	Conn 17050 Nat	49.75	439.35	440.48		440.59	0.012567	2.71	18.37	42.67	0.73
Reach C03 right	1934.85*	100 yr	Conn 17050 Prop	116.63	439.35	440.78		440.99	0.012439	3.67	31.74	46.25	0.78
Reach C03 right	1934.85*	100 yr	Conn 17050 Nat	114.87	439.35	440.77		440.98	0.012445	3.66	31.42	46.17	0.78
Reach C03 right	1911.77*	25 yr	Conn 17050 Prop	50.77	439.04	440.19		440.31	0.012498	2.74	18.55	42.23	0.73
Reach C03 right	1911.77*	25 yr	Conn 17050 Nat	49.75	439.04	440.19		440.30	0.012499	2.72	18.31	42.16	0.73
Reach C03 right	1911.77*	100 yr	Conn 17050 Prop	116.63	439.04	440.49		440.70	0.012388	3.68	31.66	45.82	0.78
Reach C03 right	1911.77*	100 yr	Conn 17050 Nat	114.87	439.04	440.48		440.69	0.012393	3.66	31.34	45.73	0.78
Reach C03 right	1888.69*	25 yr	Conn 17050 Prop	50.77	438.73	439.90		440.01	0.012823	2.78	18.29	41.57	0.74
Reach C03 right	1888.69*	25 yr	Conn 17050 Nat	49.75	438.73	439.89		440.01	0.012817	2.75	18.06	41.51	0.74
Reach C03 right	1888.69*	100 yr	Conn 17050 Prop	116.63	438.73	440.20		440.41	0.012627	3.72	31.32	45.26	0.79
Reach C03 right	1888.69*	100 yr	Conn 17050 Nat	114.87	438.73	440.19		440.40	0.012632	3.70	31.01	45.17	0.79
Reach C03 right	1865.62*	25 yr	Conn 17050 Prop	50.77	438.42	439.60		439.72	0.012813	2.81	18.08	40.37	0.74
Reach C03 right	1865.62*	25 yr	Conn 17050 Nat	49.75	438.42	439.59		439.71	0.012870	2.79	17.80	40.17	0.74
Reach C03 right	1865.62*	100 yr	Conn 17050 Prop	116.63	438.42	439.90		440.12	0.012515	3.73	31.26	44.75	0.79
Reach C03 right	1865.62*	100 yr	Conn 17050 Nat	114.87	438.42	439.90		440.11	0.012521	3.71	30.95	44.66	0.79
Reach C03 right	1842.54*	25 yr	Conn 17050 Prop	50.77	438.11	439.30		439.42	0.012859	2.85	17.81	39.00	0.74
Reach C03 right	1842.54*	25 yr	Conn 17050 Nat	49.75	438.11	439.29		439.41	0.012748	2.82	17.62	38.88	0.74
Reach C03 right	1842.54*	100 yr	Conn 17050 Prop	116.63	438.11	439.61		439.83	0.012534	3.75	31.09	44.19	0.79
Reach C03 right	1842.54*	100 yr	Conn 17050 Nat	114.87	438.11	439.60		439.82	0.012539	3.73	30.78	44.10	0.79
Reach C03 right	1819.46*	25 yr	Conn 17050 Prop	50.77	437.81	439.00		439.13	0.012809	2.87	17.67	38.12	0.74
Reach C03 right	1819.46*	25 yr	Conn 17050 Nat	49.75	437.81	438.99		439.12	0.012975	2.87	17.36	37.95	0.75
Reach C03 right	1819.46*	100 yr	Conn 17050 Prop	116.63	437.81	439.32		439.54	0.012560	3.77	30.90	43.61	0.79
Reach C03 right	1819.46*	100 yr	Conn 17050 Nat	114.87	437.81	439.31		439.53	0.012568	3.75	30.59	43.52	0.79
Reach C03 right	1796.39*	25 yr	Conn 17050 Prop	50.77	437.50	438.70		438.83	0.013023	2.91	17.43	37.28	0.75
Reach C03 right	1796.39*	25 yr	Conn 17050 Nat	49.75	437.50	438.69		438.82	0.013100	2.90	17.16	37.14	0.75
Reach C03 right	1796.39*	100 yr	Conn 17050 Prop	116.63	437.50	439.02		439.25	0.012595	3.80	30.69	42.96	0.79
Reach C03 right	1796.39*	100 yr	Conn 17050 Nat	114.87	437.50	439.02		439.24	0.012598	3.78	30.39	42.87	0.79

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1773.31*	25 yr	Conn 17050 Prop	50.77	437.19	438.37		438.52	0.013455	3.06	16.62	33.91	0.77
Reach C03 right	1773.31*	25 yr	Conn 17050 Nat	49.75	437.19	438.37		438.51	0.013489	3.05	16.29	33.32	0.77
Reach C03 right	1773.31*	100 yr	Conn 17050 Prop	116.63	437.19	438.73		438.96	0.012778	3.84	30.38	42.32	0.80
Reach C03 right	1773.31*	100 yr	Conn 17050 Nat	114.87	437.19	438.72		438.95	0.012788	3.82	30.07	42.22	0.80
Reach C03 right	1750.23*	25 yr	Conn 17050 Prop	50.77	436.88	438.06		438.21	0.013216	3.13	16.22	31.46	0.77
Reach C03 right	1750.23*	25 yr	Conn 17050 Nat	49.75	436.88	438.05		438.20	0.013191	3.12	15.94	31.03	0.77
Reach C03 right	1750.23*	100 yr	Conn 17050 Prop	116.63	436.88	438.43		438.66	0.012660	3.86	30.23	41.49	0.80
Reach C03 right	1750.23*	100 yr	Conn 17050 Nat	114.87	436.88	438.42		438.65	0.012667	3.84	29.91	41.37	0.80
Reach C03 right	1727.15*	25 yr	Conn 17050 Prop	50.77	436.57	437.73		437.90	0.013725	3.25	15.61	29.43	0.79
Reach C03 right	1727.15*	25 yr	Conn 17050 Nat	49.75	436.57	437.72		437.89	0.013830	3.25	15.30	28.99	0.79
Reach C03 right	1727.15*	100 yr	Conn 17050 Prop	116.63	436.57	438.13		438.36	0.012945	3.92	29.77	40.60	0.81
Reach C03 right	1727.15*	100 yr	Conn 17050 Nat	114.87	436.57	438.12		438.35	0.012953	3.90	29.46	40.48	0.81
Reach C03 right	1704.08*	25 yr	Conn 17050 Prop	50.77	436.26	437.45		437.60	0.011732	3.10	16.39	29.52	0.73
Reach C03 right	1704.08*	25 yr	Conn 17050 Nat	49.75	436.26	437.43		437.59	0.012164	3.13	15.88	28.91	0.75
Reach C03 right	1704.08*	100 yr	Conn 17050 Prop	116.63	436.26	437.88		438.09	0.010333	3.66	31.85	40.60	0.73
Reach C03 right	1704.08*	100 yr	Conn 17050 Nat	114.87	436.26	437.87		438.08	0.010274	3.64	31.59	40.50	0.73
Reach C03 right	1681	25 yr	Conn 17050 Prop	50.77	435.95	437.04	437.00	437.26	0.018565	3.78	13.45	25.40	0.91
Reach C03 right	1681	25 yr	Conn 17050 Nat	49.75	435.95	437.05	436.98	437.25	0.016797	3.61	13.78	25.79	0.87
Reach C03 right	1681	100 yr	Conn 17050 Prop	116.63	435.95	437.41	437.41	437.75	0.020525	4.68	24.92	36.77	1.00
Reach C03 right	1681	100 yr	Conn 17050 Nat	114.87	435.95	437.39	437.39	437.74	0.020906	4.70	24.45	36.37	1.01
Reach C03 right	1658.40*	25 yr	Conn 17050 Prop	50.77	435.46	436.55	436.52	436.79	0.022134	3.95	12.87	25.87	0.99
Reach C03 right	1658.40*	25 yr	Conn 17050 Nat	49.75	435.63	436.74		436.88	0.014706	3.07	16.19	35.01	0.80
Reach C03 right	1658.40*	100 yr	Conn 17050 Prop	116.63	435.46	436.94	436.94	437.27	0.017858	4.67	27.79	49.26	0.95
Reach C03 right	1658.40*	100 yr	Conn 17050 Nat	114.87	435.63	437.09		437.28	0.013258	3.49	32.90	54.40	0.79
Reach C03 right	1635.80*	25 yr	Conn 17050 Prop	50.77	434.97	435.97	435.97	436.26	0.022203	4.32	11.76	20.60	1.01
Reach C03 right	1635.80*	25 yr	Conn 17050 Nat	49.75	435.31	436.36		436.52	0.017535	3.21	15.50	35.85	0.86
Reach C03 right	1635.80*	100 yr	Conn 17050 Prop	116.63	434.97	436.44	436.44	436.82	0.018323	4.98	24.74	39.83	0.97
Reach C03 right	1635.80*	100 yr	Conn 17050 Nat	114.87	435.31	436.69	436.66	436.91	0.020699	3.70	31.01	65.48	0.95
Reach C03 right	1613.20*	25 yr	Conn 17050 Prop	50.77	434.48	435.32	435.32	435.68	0.020657	4.79	10.61	14.98	1.00
Reach C03 right	1613.20*	25 yr	Conn 17050 Nat	49.75	434.99	435.98		436.12	0.017253	2.97	16.76	43.04	0.84
Reach C03 right	1613.20*	100 yr	Conn 17050 Prop	116.63	434.48	435.88	435.88	436.29	0.019365	5.12	22.79	39.57	1.00
Reach C03 right	1613.20*	100 yr	Conn 17050 Nat	114.87	434.99	436.27	436.22	436.47	0.017754	3.65	31.49	60.64	0.89
Reach C03 right	1590.60*	25 yr	Conn 17050 Prop	50.77	433.99	434.71	434.71	435.03	0.021221	4.56	11.12	17.27	1.00
Reach C03 right	1590.60*	25 yr	Conn 17050 Nat	49.75	434.67	435.55	435.52	435.69	0.020531	2.99	16.66	48.34	0.90
Reach C03 right	1590.60*	100 yr	Conn 17050 Prop	116.63	433.99	435.46	435.27	435.75	0.011591	4.32	26.97	46.62	0.79

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1590.60*	100 yr	Conn 17050 Nat	114.87	434.67	435.78	435.77	436.02	0.022978	3.89	29.56	62.84	1.00
Reach C03 right	1568	25 yr	Conn 17050 Prop	50.77	433.50	434.55	434.13	434.65	0.003826	2.48	20.50	27.07	0.45
Reach C03 right	1568	25 yr	Conn 17050 Nat	49.75	434.35	435.12		435.24	0.018690	2.76	18.04	54.98	0.85
Reach C03 right	1568	100 yr	Conn 17050 Prop	116.63	433.50	435.38	434.58	435.50	0.002795	2.77	43.16	73.30	0.41
Reach C03 right	1568	100 yr	Conn 17050 Nat	114.87	434.35	435.37	435.31	435.55	0.017472	3.46	33.15	68.17	0.88
Reach C03 right	1545.56*	25 yr	Conn 17050 Nat	49.75	433.83	434.71		434.83	0.018292	2.83	17.60	50.85	0.85
Reach C03 right	1545.56*	100 yr	Conn 17050 Nat	114.87	433.83	434.96	434.91	435.15	0.018282	3.57	32.17	65.40	0.90
Reach C03 right	1523.11*	25 yr	Conn 17050 Nat	49.75	433.31	434.26		434.40	0.019691	3.06	16.25	43.96	0.89
Reach C03 right	1523.11*	100 yr	Conn 17050 Nat	114.87	433.31	434.55	434.50	434.75	0.017915	3.63	31.68	61.94	0.89
Reach C03 right	1500.67*	25 yr	Conn 17050 Nat	49.75	432.79	433.80	433.75	433.96	0.019399	3.27	15.23	36.94	0.90
Reach C03 right	1500.67*	100 yr	Conn 17050 Nat	114.87	432.79	434.12	434.07	434.34	0.018423	3.77	30.45	57.30	0.91
Reach C03 right	1478.22*	25 yr	Conn 17050 Nat	49.75	432.27	433.23	433.22	433.49	0.022675	4.08	12.21	23.85	1.00
Reach C03 right	1478.22*	100 yr	Conn 17050 Nat	114.87	432.27	433.69	433.64	433.93	0.018283	3.92	29.34	51.87	0.92
Reach C03 right	1467			Culvert									
Reach C03 right	1455.78*	25 yr	Conn 17050 Nat	49.75	431.76	432.74	432.72	433.00	0.021126	4.09	12.16	22.38	0.98
Reach C03 right	1455.78*	100 yr	Conn 17050 Nat	114.87	431.76	433.25	433.21	433.52	0.018407	4.16	27.63	44.85	0.93
Reach C03 right	1433.33*	25 yr	Conn 17050 Nat	49.75	431.24	432.23	432.22	432.51	0.021871	4.29	11.59	20.36	1.00
Reach C03 right	1433.33*	100 yr	Conn 17050 Nat	114.87	431.24	432.75	432.71	433.09	0.018744	4.67	24.61	33.95	0.97
Reach C03 right	1410.89*	25 yr	Conn 17050 Nat	49.75	430.72	431.76	431.74	432.05	0.019902	4.30	11.57	18.83	0.97
Reach C03 right	1410.89*	100 yr	Conn 17050 Nat	114.87	430.72	432.26	432.26	432.65	0.019610	5.02	22.90	29.28	1.00
Reach C03 right	1388.44*	25 yr	Conn 17050 Nat	49.75	430.20	431.30	431.27	431.61	0.019162	4.45	11.18	16.76	0.96
Reach C03 right	1388.44*	100 yr	Conn 17050 Nat	114.87	430.20	431.92	431.83	432.25	0.015040	4.58	25.10	30.17	0.88
Reach C03 right	1366	25 yr	Conn 17050 Prop	50.77	429.50	430.25	430.13	430.46	0.012647	3.68	13.79	20.03	0.78
Reach C03 right	1366	25 yr	Conn 17050 Nat	49.75	429.68	430.91	430.84	431.21	0.015849	4.40	11.31	14.87	0.89
Reach C03 right	1366	100 yr	Conn 17050 Prop	116.63	429.50	430.75	430.59	431.11	0.011310	4.76	24.52	22.10	0.80
Reach C03 right	1366	100 yr	Conn 17050 Nat	114.87	429.68	431.54	431.47	431.90	0.015844	4.77	24.10	28.22	0.91
Reach C03 right	1343.56*	25 yr	Conn 17050 Prop	50.77	429.15	429.95	429.83	430.17	0.012286	3.75	13.54	18.70	0.78
Reach C03 right	1343.56*	25 yr	Conn 17050 Nat	49.75	429.31	430.57	430.49	430.86	0.015375	4.32	11.51	15.20	0.88
Reach C03 right	1343.56*	100 yr	Conn 17050 Prop	116.63	429.15	430.51	430.30	430.86	0.010473	4.72	24.69	21.20	0.77
Reach C03 right	1343.56*	100 yr	Conn 17050 Nat	114.87	429.31	431.21	431.11	431.54	0.015318	4.62	24.89	29.87	0.89
Reach C03 right	1321.11*	25 yr	Conn 17050 Prop	50.77	428.80	429.67	429.54	429.89	0.011819	3.80	13.35	17.50	0.77

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1321.11*	25 yr	Conn 17050 Nat	49.75	428.94	430.22	430.15	430.51	0.015459	4.31	11.53	15.35	0.88
Reach C03 right	1321.11*	100 yr	Conn 17050 Prop	116.63	428.80	430.29	430.03	430.62	0.009464	4.64	25.13	20.51	0.74
Reach C03 right	1321.11*	100 yr	Conn 17050 Nat	114.87	428.94	430.87	430.77	431.19	0.015605	4.49	25.57	32.46	0.89
Reach C03 right	1298.67*	25 yr	Conn 17050 Prop	50.77	428.45	429.40	429.25	429.63	0.011205	3.83	13.25	16.48	0.75
Reach C03 right	1298.67*	25 yr	Conn 17050 Nat	49.75	428.57	429.88	429.80	430.16	0.015284	4.28	11.62	15.53	0.87
Reach C03 right	1298.67*	100 yr	Conn 17050 Prop	116.63	428.45	430.09	429.78	430.41	0.008395	4.51	25.86	20.10	0.70
Reach C03 right	1298.67*	100 yr	Conn 17050 Nat	114.87	428.57	430.54	430.44	430.83	0.015509	4.35	26.43	35.13	0.88
Reach C03 right	1276.22*	25 yr	Conn 17050 Prop	50.77	428.10	429.16	428.98	429.39	0.010222	3.79	13.38	15.75	0.73
Reach C03 right	1276.22*	25 yr	Conn 17050 Nat	49.75	428.20	429.55		429.83	0.014542	4.20	11.86	15.73	0.85
Reach C03 right	1276.22*	100 yr	Conn 17050 Prop	116.63	428.10	429.91	429.53	430.20	0.008526	4.34	26.86	22.46	0.70
Reach C03 right	1276.22*	100 yr	Conn 17050 Nat	114.87	428.20	430.20	430.11	430.48	0.015196	4.21	27.29	37.50	0.87
Reach C03 right	1253.78*	25 yr	Conn 17050 Prop	50.77	427.76	428.94	428.73	429.16	0.009424	3.75	13.53	15.20	0.70
Reach C03 right	1253.78*	25 yr	Conn 17050 Nat	49.75	427.84	429.21		429.49	0.014871	4.23	11.77	15.69	0.86
Reach C03 right	1253.78*	100 yr	Conn 17050 Prop	116.63	427.76	429.70	429.32	429.97	0.010030	4.16	28.02	28.41	0.74
Reach C03 right	1253.78*	100 yr	Conn 17050 Nat	114.87	427.84	429.86	429.78	430.13	0.015660	4.15	27.67	39.73	0.88
Reach C03 right	1231.33*	25 yr	Conn 17050 Prop	50.77	427.41	428.75	428.47	428.95	0.008417	3.61	14.05	15.33	0.67
Reach C03 right	1231.33*	25 yr	Conn 17050 Nat	49.75	427.47	428.89		429.16	0.014493	4.19	11.87	15.72	0.85
Reach C03 right	1231.33*	100 yr	Conn 17050 Prop	116.63	427.41	429.45	429.11	429.70	0.012980	3.96	29.42	39.13	0.81
Reach C03 right	1231.33*	100 yr	Conn 17050 Nat	114.87	427.47	429.52	429.45	429.78	0.015456	4.07	28.20	41.22	0.87
Reach C03 right	1208.89*	25 yr	Conn 17050 Prop	50.77	427.06	428.58	428.24	428.76	0.007212	3.41	14.90	15.82	0.62
Reach C03 right	1208.89*	25 yr	Conn 17050 Nat	49.75	427.10	428.57		428.84	0.013882	4.14	12.03	15.70	0.83
Reach C03 right	1208.89*	100 yr	Conn 17050 Prop	116.63	427.06	429.16	429.05	429.39	0.013201	3.86	30.24	42.52	0.81
Reach C03 right	1208.89*	100 yr	Conn 17050 Nat	114.87	427.10	429.17	429.11	429.43	0.015826	4.05	28.33	42.45	0.87
Reach C03 right	1186.44*	25 yr	Conn 17050 Prop	50.77	426.71	428.43	428.03	428.58	0.006603	3.11	16.32	18.64	0.59
Reach C03 right	1186.44*	25 yr	Conn 17050 Nat	49.75	426.73	428.31		428.54	0.011817	3.87	12.85	16.36	0.77
Reach C03 right	1186.44*	100 yr	Conn 17050 Prop	116.63	426.71	428.89	428.75	429.09	0.011262	3.60	32.41	44.90	0.75
Reach C03 right	1186.44*	100 yr	Conn 17050 Nat	114.87	426.73	428.86		429.09	0.013458	3.80	30.26	44.28	0.81
Reach C03 right	1164	25 yr	Conn 17050 Prop	50.77	426.36	427.83	427.82	428.21	0.019466	4.89	10.39	13.49	0.98
Reach C03 right	1164	25 yr	Conn 17050 Nat	49.75	426.36	427.82	427.80	428.19	0.019566	4.90	10.15	13.18	0.98
Reach C03 right	1164	100 yr	Conn 17050 Prop	116.63	426.36	428.47	428.42	428.74	0.017881	4.14	28.17	44.70	0.92
Reach C03 right	1164	100 yr	Conn 17050 Nat	114.87	426.36	428.45	428.41	428.73	0.019194	4.22	27.24	44.36	0.95
Reach C03 right	1140.17*	25 yr	Conn 17050 Prop	50.77	425.92	427.38	427.36	427.74	0.019399	4.82	10.54	13.99	0.98
Reach C03 right	1140.17*	25 yr	Conn 17050 Nat	49.75	425.92	427.36	427.34	427.72	0.019455	4.81	10.33	13.76	0.98
Reach C03 right	1140.17*	100 yr	Conn 17050 Prop	116.63	425.92	428.01	427.97	428.29	0.019236	4.26	27.40	44.11	0.95
Reach C03 right	1140.17*	100 yr	Conn 17050 Nat	114.87	425.92	428.01	427.96	428.28	0.018362	4.17	27.55	44.17	0.93

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	1116.33*	25 yr	Conn 17050 Prop	50.77	425.48	426.91	426.90	427.27	0.019507	4.79	10.61	14.30	0.98
Reach C03 right	1116.33*	25 yr	Conn 17050 Nat	49.75	425.48	426.89	426.88	427.25	0.019833	4.81	10.35	14.05	0.99
Reach C03 right	1116.33*	100 yr	Conn 17050 Prop	116.63	425.48	427.57	427.52	427.84	0.018166	4.19	27.81	43.87	0.93
Reach C03 right	1116.33*	100 yr	Conn 17050 Nat	114.87	425.48	427.55	427.52	427.83	0.019147	4.25	27.04	43.55	0.95
Reach C03 right	1092.50*	25 yr	Conn 17050 Prop	50.77	425.03	426.45	426.43	426.80	0.019207	4.73	10.73	14.57	0.97
Reach C03 right	1092.50*	25 yr	Conn 17050 Nat	49.75	425.03	426.44	426.42	426.78	0.019286	4.72	10.53	14.40	0.97
Reach C03 right	1092.50*	100 yr	Conn 17050 Prop	116.63	425.03	427.11	427.08	427.40	0.019174	4.28	27.22	43.34	0.95
Reach C03 right	1092.50*	100 yr	Conn 17050 Nat	114.87	425.03	427.11	427.07	427.39	0.018434	4.21	27.30	43.38	0.93
Reach C03 right	1068.67*	25 yr	Conn 17050 Prop	50.77	424.59	425.99	425.97	426.34	0.019220	4.71	10.79	14.80	0.97
Reach C03 right	1068.67*	25 yr	Conn 17050 Nat	49.75	424.59	425.98	425.96	426.32	0.019450	4.71	10.56	14.61	0.98
Reach C03 right	1068.67*	100 yr	Conn 17050 Prop	116.63	424.59	426.68	426.63	426.95	0.017955	4.21	27.70	43.13	0.93
Reach C03 right	1068.67*	100 yr	Conn 17050 Nat	114.87	424.59	426.66	426.62	426.94	0.018965	4.27	26.91	42.75	0.95
Reach C03 right	1044.83*	25 yr	Conn 17050 Prop	50.77	424.15	425.54	425.51	425.88	0.019043	4.68	10.85	14.94	0.97
Reach C03 right	1044.83*	25 yr	Conn 17050 Nat	49.75	424.15	425.53	425.50	425.86	0.018918	4.65	10.71	14.82	0.96
Reach C03 right	1044.83*	100 yr	Conn 17050 Prop	116.63	424.15	426.22	426.18	426.51	0.019101	4.32	27.03	42.47	0.95
Reach C03 right	1044.83*	100 yr	Conn 17050 Nat	114.87	424.15	426.22	426.18	426.50	0.018403	4.24	27.09	42.51	0.94
Reach C03 right	1021.00*	25 yr	Conn 17050 Prop	50.77	423.71	425.09	425.06	425.42	0.019123	4.67	10.87	15.06	0.97
Reach C03 right	1021.00*	25 yr	Conn 17050 Nat	49.75	423.71	425.07	425.05	425.41	0.019267	4.66	10.67	14.90	0.97
Reach C03 right	1021.00*	100 yr	Conn 17050 Prop	116.63	423.71	425.78	425.73	426.06	0.017952	4.24	27.50	42.36	0.93
Reach C03 right	1021.00*	100 yr	Conn 17050 Nat	114.87	423.71	425.77	425.74	426.05	0.018889	4.30	26.73	41.95	0.95
Reach C03 right	997.17*	25 yr	Conn 17050 Prop	50.77	423.26	424.62	424.60	424.96	0.019158	4.69	10.84	14.96	0.97
Reach C03 right	997.17*	25 yr	Conn 17050 Nat	49.75	423.26	424.61	424.59	424.95	0.019321	4.68	10.63	14.79	0.97
Reach C03 right	997.17*	100 yr	Conn 17050 Prop	116.63	423.26	425.33	425.28	425.62	0.018964	4.35	26.84	41.54	0.95
Reach C03 right	997.17*	100 yr	Conn 17050 Nat	114.87	423.26	425.33	425.29	425.61	0.018265	4.27	26.91	41.58	0.94
Reach C03 right	973.33*	25 yr	Conn 17050 Prop	50.77	422.82	424.17	424.15	424.51	0.018856	4.65	10.91	15.05	0.96
Reach C03 right	973.33*	25 yr	Conn 17050 Nat	49.75	422.82	424.16	424.14	424.50	0.018771	4.62	10.76	14.94	0.96
Reach C03 right	973.33*	100 yr	Conn 17050 Prop	116.63	422.82	424.93	424.81	425.18	0.015224	4.03	28.92	42.45	0.86
Reach C03 right	973.33*	100 yr	Conn 17050 Nat	114.87	422.82	424.83	424.83	425.16	0.018956	4.65	24.71	34.51	0.97
Reach C03 right	949.50*	25 yr	Conn 17050 Prop	50.77	422.38	423.72	423.69	424.06	0.019142	4.69	10.84	14.96	0.97
Reach C03 right	949.50*	25 yr	Conn 17050 Nat	49.75	422.38	423.70	423.68	424.04	0.019374	4.68	10.62	14.81	0.97
Reach C03 right	949.50*	100 yr	Conn 17050 Prop	116.63	422.38	424.38	424.35	424.73	0.018865	4.75	24.56	33.08	0.97
Reach C03 right	949.50*	100 yr	Conn 17050 Nat	114.87	422.38	424.35	424.33	424.71	0.019180	4.81	23.87	31.90	0.98
Reach C03 right	925.67*	25 yr	Conn 17050 Prop	50.77	421.94	423.27	423.24	423.60	0.018481	4.63	10.97	15.01	0.95
Reach C03 right	925.67*	25 yr	Conn 17050 Nat	49.75	421.94	423.26	423.23	423.59	0.018319	4.59	10.84	14.92	0.95
Reach C03 right	925.67*	100 yr	Conn 17050 Prop	116.63	421.94	423.95	423.88	424.28	0.017157	4.59	25.39	33.48	0.93
Reach C03 right	925.67*	100 yr	Conn 17050 Nat	114.87	421.94	423.90	423.87	424.27	0.018718	4.84	23.75	30.93	0.97

HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	901.83*	25 yr	Conn 17050 Prop	50.77	421.50	422.81	422.79	423.16	0.019090	4.70	10.81	14.82	0.97
Reach C03 right	901.83*	25 yr	Conn 17050 Nat	49.75	421.50	422.80	422.78	423.14	0.019365	4.70	10.59	14.67	0.98
Reach C03 right	901.83*	100 yr	Conn 17050 Prop	116.63	421.50	423.46	423.43	423.83	0.018832	4.91	23.78	30.43	0.98
Reach C03 right	901.83*	100 yr	Conn 17050 Nat	114.87	421.50	423.44	423.42	423.82	0.018913	4.93	23.30	29.67	0.98
Reach C03 right	878.00*	25 yr	Conn 17050 Prop	50.77	421.05	422.36	422.33	422.70	0.018842	4.70	10.81	14.66	0.96
Reach C03 right	878.00*	25 yr	Conn 17050 Nat	49.75	421.05	422.35	422.32	422.69	0.018594	4.65	10.69	14.58	0.96
Reach C03 right	878.00*	100 yr	Conn 17050 Prop	116.63	421.05	423.01	422.98	423.39	0.018689	4.95	23.56	29.56	0.98
Reach C03 right	878.00*	100 yr	Conn 17050 Nat	114.87	421.05	422.99	422.97	423.38	0.018764	4.97	23.10	28.87	0.98
Reach C03 right	854.17*	25 yr	Conn 17050 Prop	50.77	420.61	421.91	421.88	422.26	0.018635	4.70	10.80	14.51	0.96
Reach C03 right	854.17*	25 yr	Conn 17050 Nat	49.75	420.61	421.89	421.87	422.24	0.019062	4.72	10.54	14.32	0.97
Reach C03 right	854.17*	100 yr	Conn 17050 Prop	116.63	420.61	422.56	422.53	422.94	0.018522	4.94	23.61	29.49	0.97
Reach C03 right	854.17*	100 yr	Conn 17050 Nat	114.87	420.61	422.55	422.52	422.93	0.018544	4.95	23.20	28.91	0.97
Reach C03 right	830.33*	25 yr	Conn 17050 Prop	50.77	420.17	421.46	421.44	421.81	0.018768	4.74	10.71	14.27	0.96
Reach C03 right	830.33*	25 yr	Conn 17050 Nat	49.75	420.17	421.46	421.42	421.80	0.018167	4.66	10.68	14.25	0.95
Reach C03 right	830.33*	100 yr	Conn 17050 Prop	116.63	420.17	422.12	422.09	422.50	0.018429	4.92	23.70	29.65	0.97
Reach C03 right	830.33*	100 yr	Conn 17050 Nat	114.87	420.17	422.11	422.08	422.49	0.018601	4.95	23.19	28.94	0.98
Reach C03 right	806.50*	25 yr	Conn 17050 Prop	50.77	419.73	421.01	420.98	421.36	0.018925	4.79	10.59	13.94	0.97
Reach C03 right	806.50*	25 yr	Conn 17050 Nat	49.75	419.73	420.99	420.97	421.35	0.019407	4.82	10.32	13.73	0.98
Reach C03 right	806.50*	100 yr	Conn 17050 Prop	116.63	419.73	421.70	421.65	422.06	0.017919	4.84	24.10	30.26	0.96
Reach C03 right	806.50*	100 yr	Conn 17050 Nat	114.87	419.73	421.68	421.64	422.05	0.018152	4.88	23.55	29.50	0.96
Reach C03 right	782.67*	25 yr	Conn 17050 Prop	50.77	419.28	420.55	420.53	420.91	0.018679	4.82	10.54	13.61	0.97
Reach C03 right	782.67*	25 yr	Conn 17050 Nat	49.75	419.28	420.56	420.51	420.90	0.017807	4.71	10.57	13.64	0.94
Reach C03 right	782.67*	100 yr	Conn 17050 Prop	116.63	419.28	421.25	421.21	421.62	0.018183	4.87	23.93	30.04	0.96
Reach C03 right	782.67*	100 yr	Conn 17050 Nat	114.87	419.28	421.23	421.20	421.61	0.018378	4.91	23.39	29.26	0.97
Reach C03 right	758.83*	25 yr	Conn 17050 Prop	50.77	418.84	420.10	420.07	420.47	0.018758	4.89	10.39	13.14	0.97
Reach C03 right	758.83*	25 yr	Conn 17050 Nat	49.75	418.84	420.07	420.06	420.45	0.019754	4.95	10.04	12.95	0.99
Reach C03 right	758.83*	100 yr	Conn 17050 Prop	116.63	418.84	420.83	420.78	421.18	0.017761	4.77	24.43	31.07	0.95
Reach C03 right	758.83*	100 yr	Conn 17050 Nat	114.87	418.84	420.80	420.77	421.17	0.018401	4.88	23.55	29.77	0.97
Reach C03 right	735	25 yr	Conn 17050 Prop	50.77	418.40	419.68	419.62	420.03	0.016468	4.68	10.84	13.23	0.91
Reach C03 right	735	25 yr	Conn 17050 Nat	49.75	418.40	419.67	419.61	420.01	0.016495	4.66	10.67	13.14	0.91
Reach C03 right	735	100 yr	Conn 17050 Prop	116.63	418.40	420.43	420.35	420.75	0.016518	4.54	25.68	33.35	0.91
Reach C03 right	735	100 yr	Conn 17050 Nat	114.87	418.40	420.42	420.34	420.74	0.016696	4.55	25.22	32.86	0.92
Reach C03 right	711.90*	25 yr	Conn 17050 Prop	50.77	418.02	419.30	419.23	419.64	0.016798	4.70	10.80	13.32	0.92
Reach C03 right	711.90*	25 yr	Conn 17050 Nat	49.75	418.02	419.28	419.22	419.62	0.016789	4.68	10.62	13.17	0.92
Reach C03 right	711.90*	100 yr	Conn 17050 Prop	116.63	418.02	420.01	419.94	420.36	0.016910	4.79	24.36	29.72	0.93

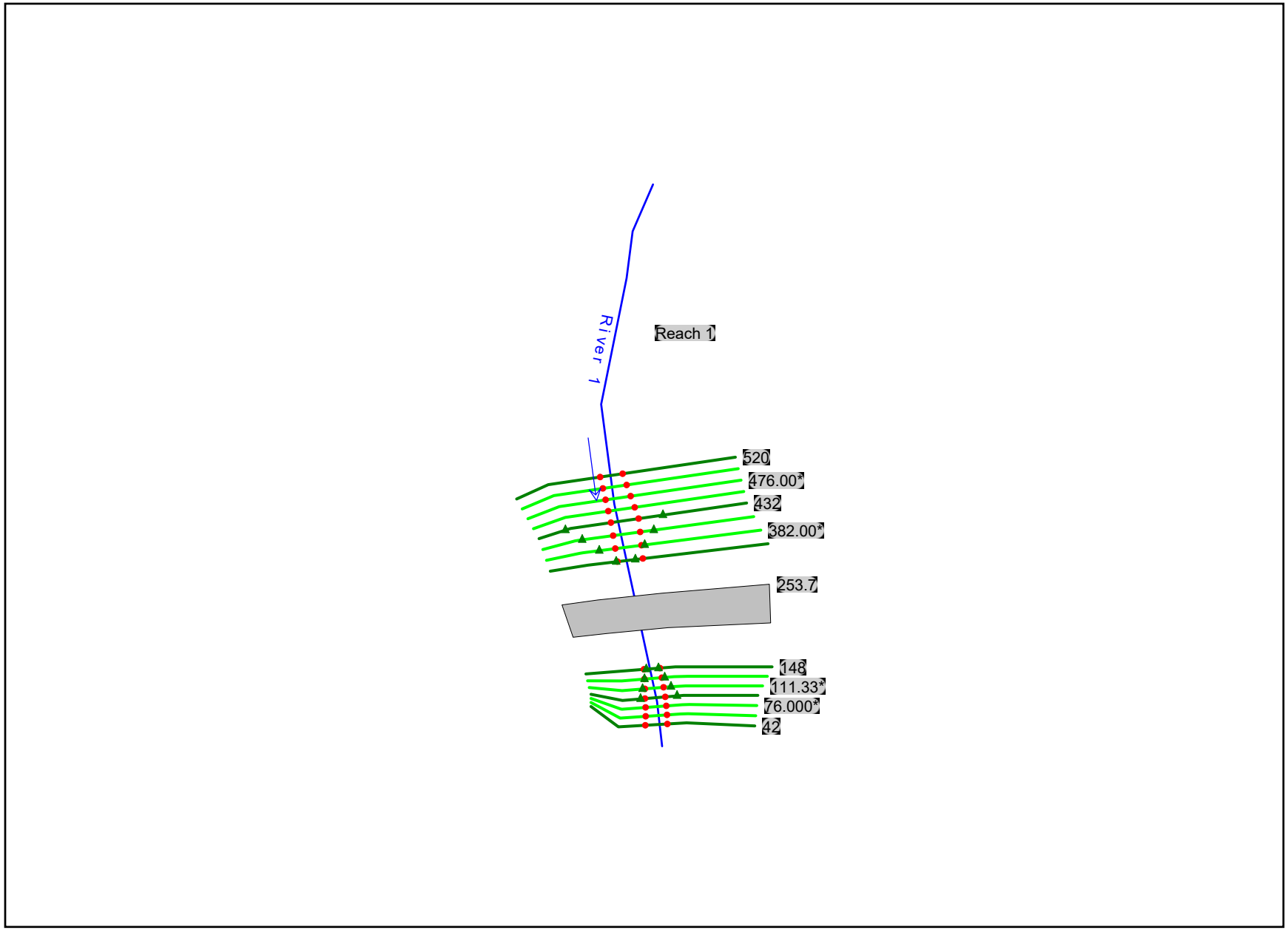
HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

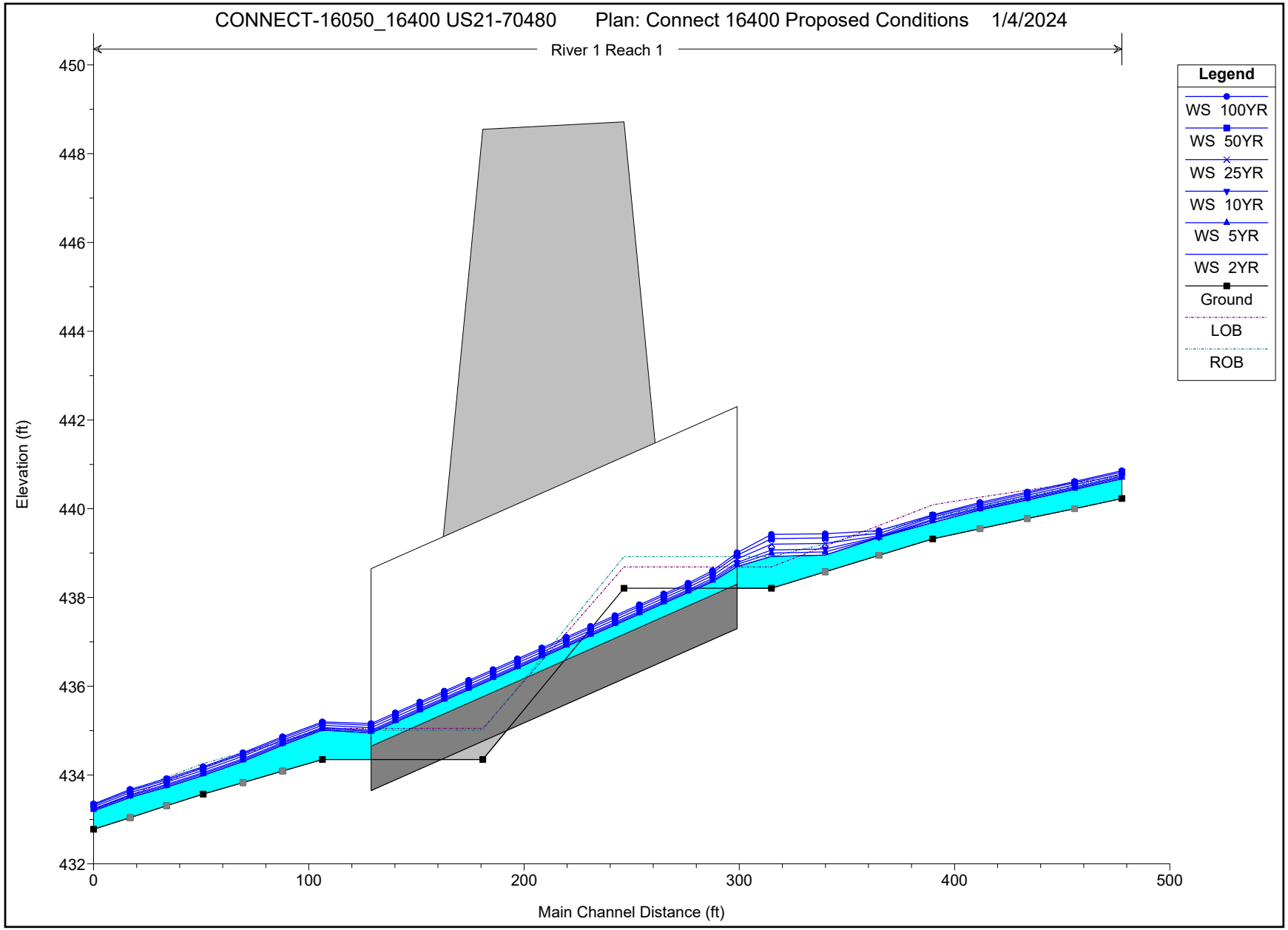
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	711.90*	100 yr	Conn 17050 Nat	114.87	418.02	419.99	419.93	420.35	0.016936	4.80	23.95	29.16	0.93
Reach C03 right	688.80*	25 yr	Conn 17050 Prop	50.77	417.63	418.91	418.85	419.25	0.016595	4.66	10.89	13.50	0.91
Reach C03 right	688.80*	25 yr	Conn 17050 Nat	49.75	417.63	418.90	418.84	419.24	0.016580	4.64	10.72	13.37	0.91
Reach C03 right	688.80*	100 yr	Conn 17050 Prop	116.63	417.63	419.59	419.54	419.97	0.016969	4.93	23.67	27.73	0.94
Reach C03 right	688.80*	100 yr	Conn 17050 Nat	114.87	417.63	419.58	419.52	419.96	0.016983	4.93	23.29	27.25	0.94
Reach C03 right	665.70*	25 yr	Conn 17050 Prop	50.77	417.25	418.53	418.47	418.86	0.016904	4.67	10.87	13.66	0.92
Reach C03 right	665.70*	25 yr	Conn 17050 Nat	49.75	417.25	418.51	418.45	418.85	0.016902	4.65	10.70	13.53	0.92
Reach C03 right	665.70*	100 yr	Conn 17050 Prop	116.63	417.25	419.19	419.13	419.58	0.017037	5.03	23.18	26.37	0.95
Reach C03 right	665.70*	100 yr	Conn 17050 Nat	114.87	417.25	419.17	419.12	419.57	0.017051	5.03	22.82	25.96	0.95
Reach C03 right	642.60*	25 yr	Conn 17050 Prop	50.77	416.86	418.14	418.08	418.48	0.016520	4.62	10.99	13.80	0.91
Reach C03 right	642.60*	25 yr	Conn 17050 Nat	49.75	416.86	418.13	418.07	418.46	0.016516	4.60	10.83	13.69	0.91
Reach C03 right	642.60*	100 yr	Conn 17050 Prop	116.63	416.86	418.79	418.73	419.19	0.016677	5.06	23.03	25.55	0.94
Reach C03 right	642.60*	100 yr	Conn 17050 Nat	114.87	416.86	418.78	418.72	419.18	0.016679	5.06	22.69	25.18	0.94
Reach C03 right	619.50*	25 yr	Conn 17050 Prop	50.77	416.48	417.76	417.70	418.09	0.016596	4.62	11.00	13.87	0.91
Reach C03 right	619.50*	25 yr	Conn 17050 Nat	49.75	416.48	417.75	417.69	418.08	0.016584	4.59	10.83	13.76	0.91
Reach C03 right	619.50*	100 yr	Conn 17050 Prop	116.63	416.48	418.40	418.34	418.81	0.016867	5.14	22.70	24.84	0.95
Reach C03 right	619.50*	100 yr	Conn 17050 Nat	114.87	416.48	418.38	418.33	418.79	0.016869	5.13	22.37	24.51	0.95
Reach C03 right	596.40*	25 yr	Conn 17050 Prop	50.77	416.10	417.37	417.31	417.70	0.016988	4.65	10.93	13.90	0.92
Reach C03 right	596.40*	25 yr	Conn 17050 Nat	49.75	416.10	417.36	417.30	417.69	0.017000	4.62	10.76	13.79	0.92
Reach C03 right	596.40*	100 yr	Conn 17050 Prop	116.63	416.10	418.00	417.95	418.42	0.016966	5.20	22.42	24.19	0.95
Reach C03 right	596.40*	100 yr	Conn 17050 Nat	114.87	416.10	417.98	417.93	418.40	0.016979	5.20	22.10	23.87	0.95
Reach C03 right	573.30*	25 yr	Conn 17050 Prop	50.77	415.71	416.99	416.92	417.31	0.016510	4.57	11.12	14.23	0.91
Reach C03 right	573.30*	25 yr	Conn 17050 Nat	49.75	415.71	416.98	416.91	417.30	0.016500	4.55	10.94	14.09	0.91
Reach C03 right	573.30*	100 yr	Conn 17050 Prop	116.63	415.71	417.60	417.55	418.03	0.016776	5.23	22.32	23.69	0.95
Reach C03 right	573.30*	100 yr	Conn 17050 Nat	114.87	415.71	417.59	417.54	418.01	0.016785	5.22	22.00	23.39	0.95
Reach C03 right	550.20*	25 yr	Conn 17050 Prop	50.77	415.33	416.59	416.54	416.92	0.017358	4.64	10.95	14.22	0.93
Reach C03 right	550.20*	25 yr	Conn 17050 Nat	49.75	415.33	416.58	416.52	416.91	0.017353	4.61	10.78	14.10	0.93
Reach C03 right	550.20*	100 yr	Conn 17050 Prop	116.63	415.33	417.21	417.16	417.64	0.016857	5.28	22.09	23.16	0.95
Reach C03 right	550.20*	100 yr	Conn 17050 Nat	114.87	415.33	417.20	417.15	417.63	0.016860	5.27	21.78	22.88	0.95
Reach C03 right	527.10*	25 yr	Conn 17050 Prop	50.77	414.94	416.25	416.15	416.54	0.014675	4.35	11.68	14.74	0.86
Reach C03 right	527.10*	25 yr	Conn 17050 Nat	49.75	414.94	416.23	416.14	416.53	0.014681	4.32	11.50	14.63	0.86
Reach C03 right	527.10*	100 yr	Conn 17050 Prop	116.63	414.94	416.88	416.77	417.26	0.014727	5.00	23.31	23.92	0.89
Reach C03 right	527.10*	100 yr	Conn 17050 Nat	114.87	414.94	416.86	416.76	417.25	0.014728	5.00	22.99	23.66	0.89
Reach C03 right	504	25 yr	Conn 17050 Prop	50.77	414.56	415.77	415.76	416.14	0.020009	4.87	10.42	13.96	0.99
Reach C03 right	504	25 yr	Conn 17050 Nat	49.75	414.56	415.76	415.75	416.12	0.020009	4.85	10.26	13.86	0.99

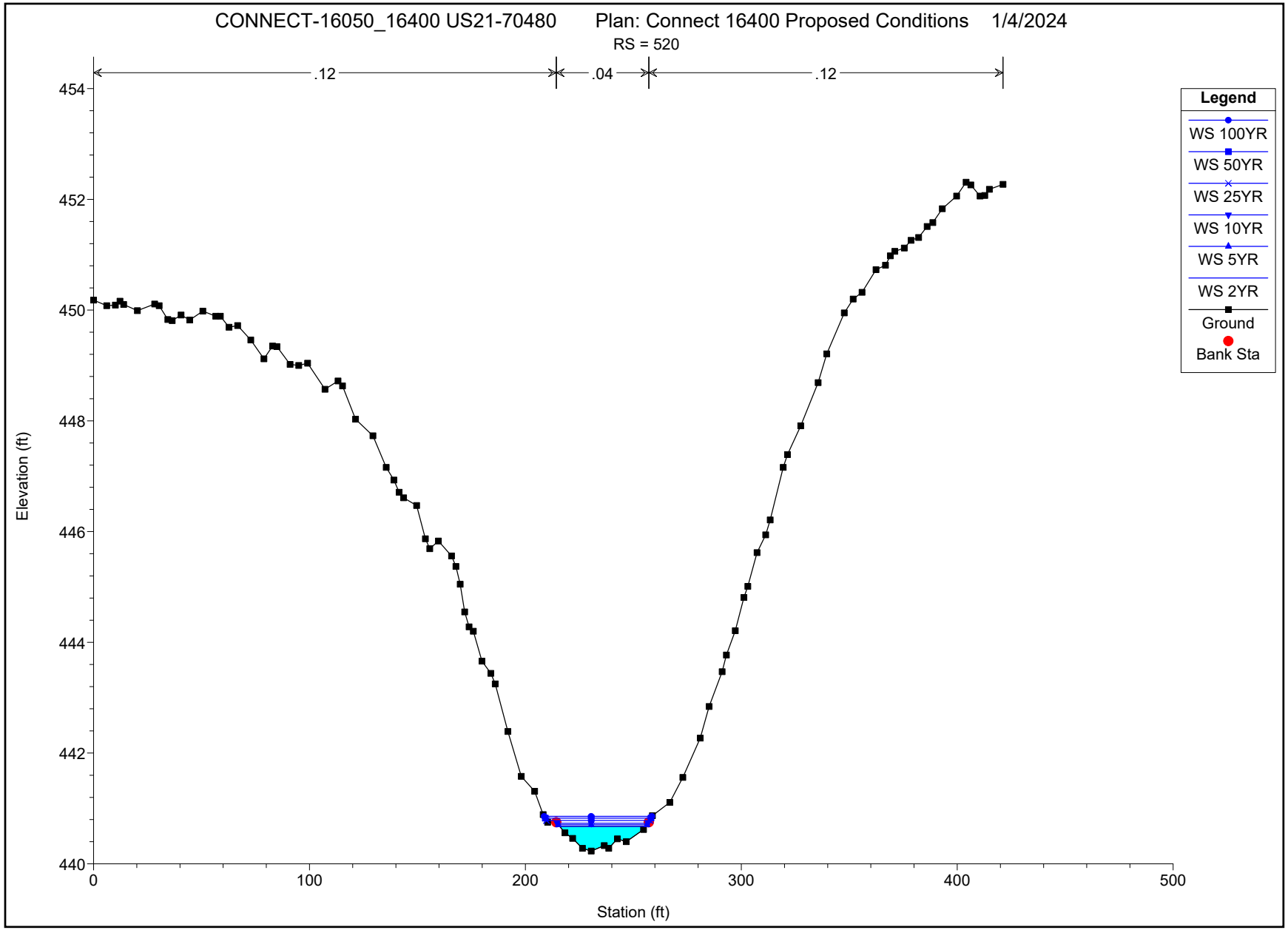
HEC-RAS River: River C03 Reach: Reach C03 right (Continued)

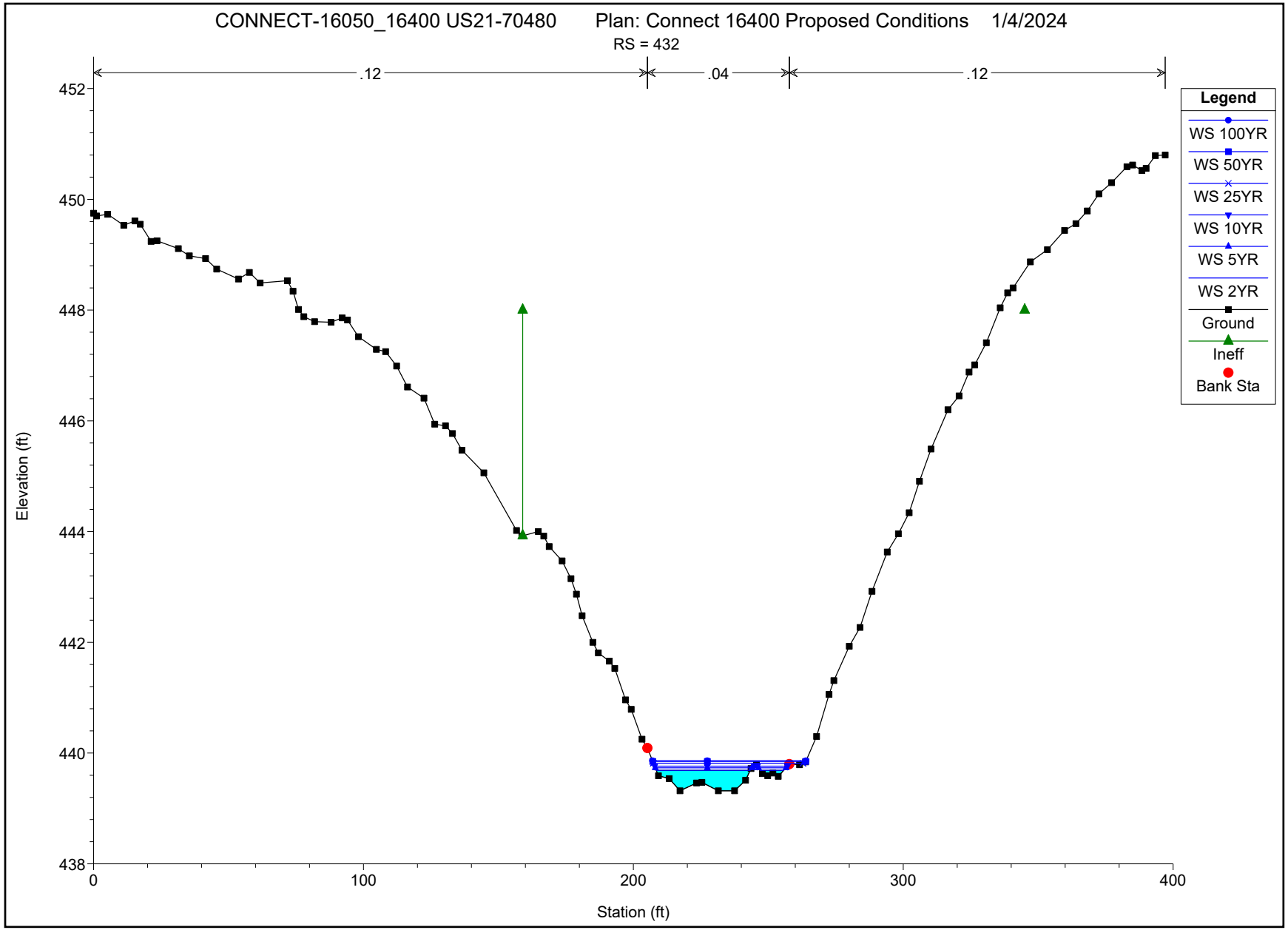
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach C03 right	504	100 yr	Conn 17050 Prop	116.63	414.56	416.38	416.38	416.87	0.018772	5.62	20.76	21.46	1.01
Reach C03 right	504	100 yr	Conn 17050 Nat	114.87	414.56	416.36	416.36	416.85	0.018793	5.61	20.47	21.19	1.01

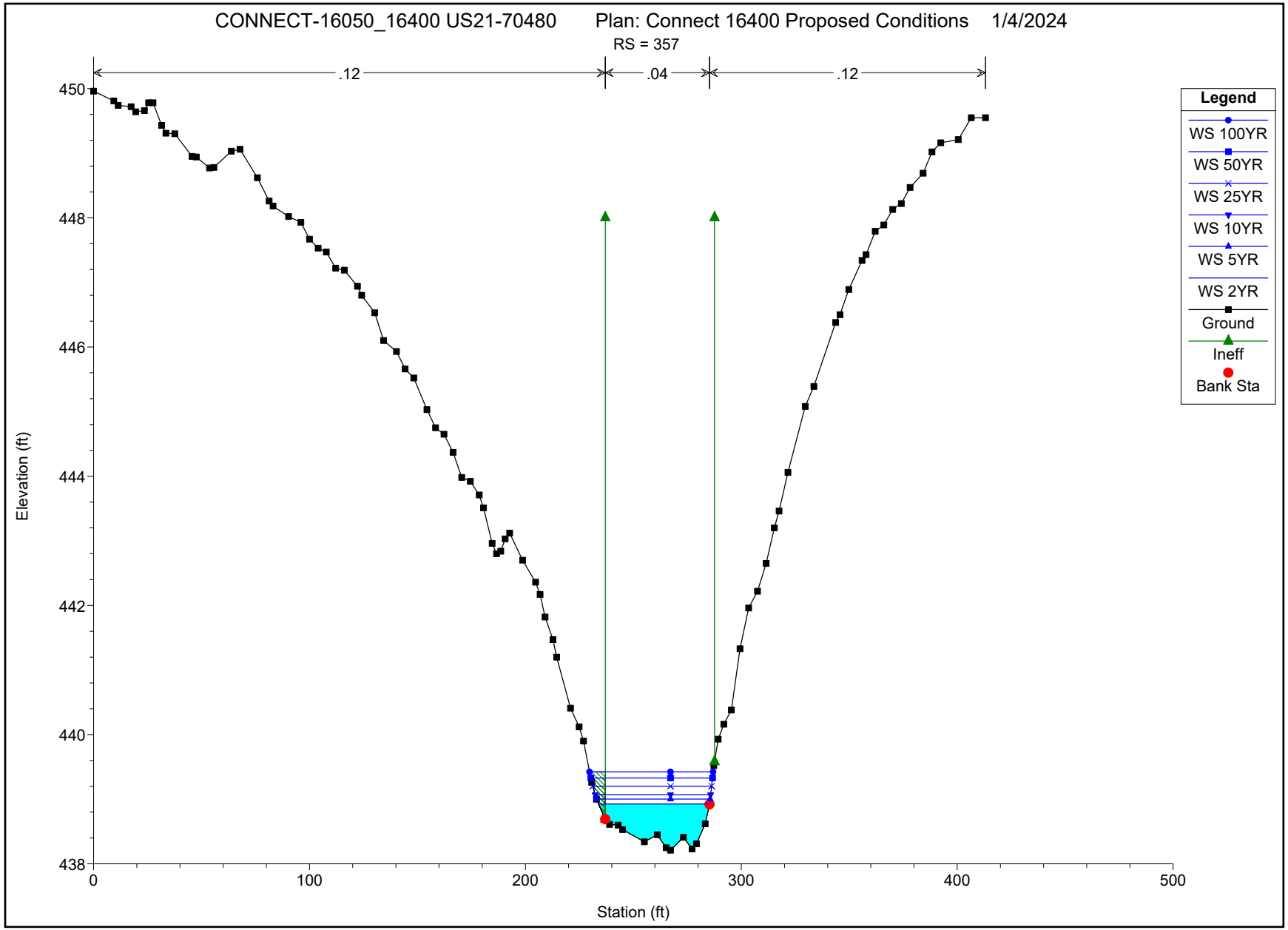
CONNECTOR 164+00 PROPOSED PLAN

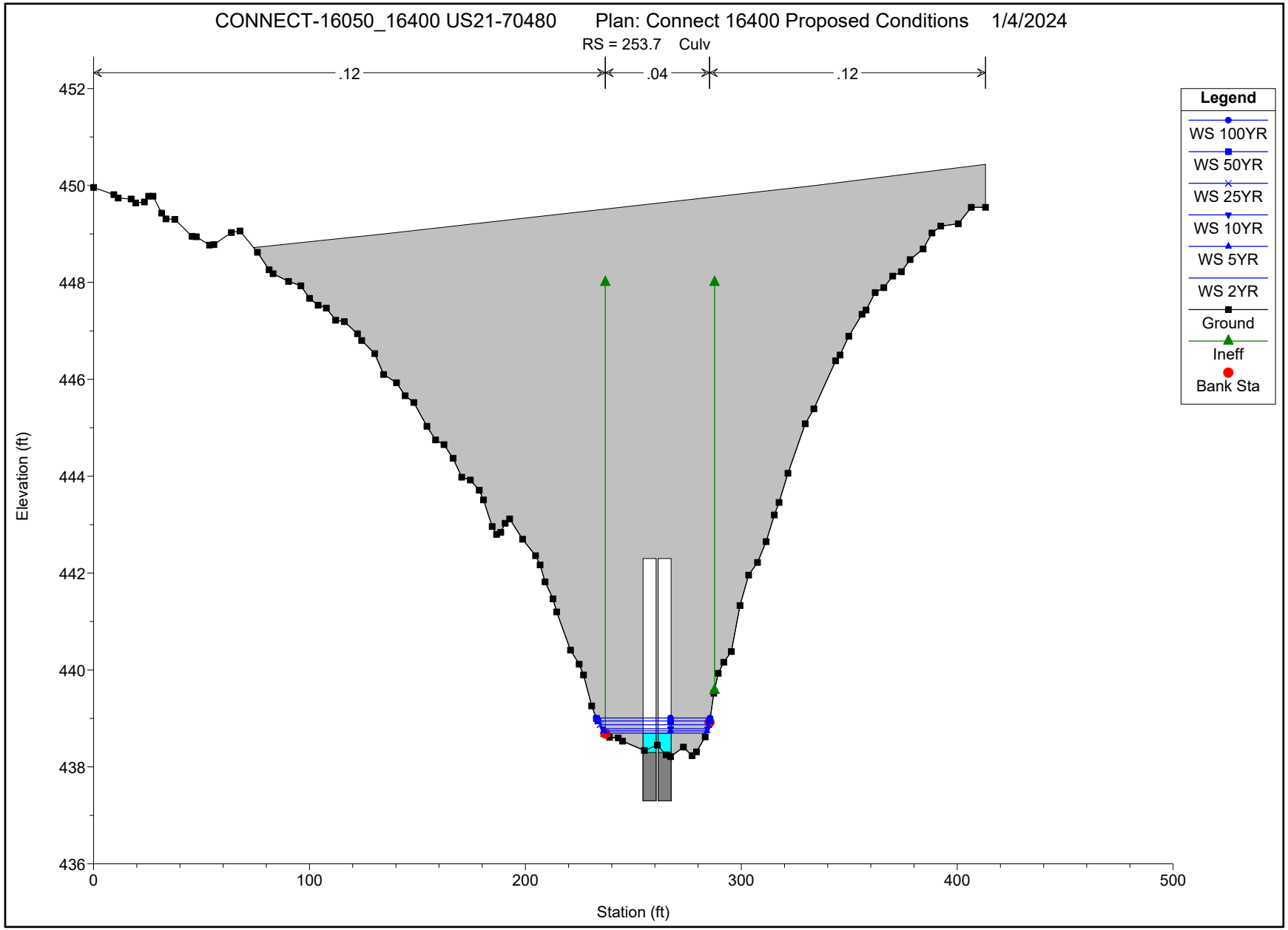


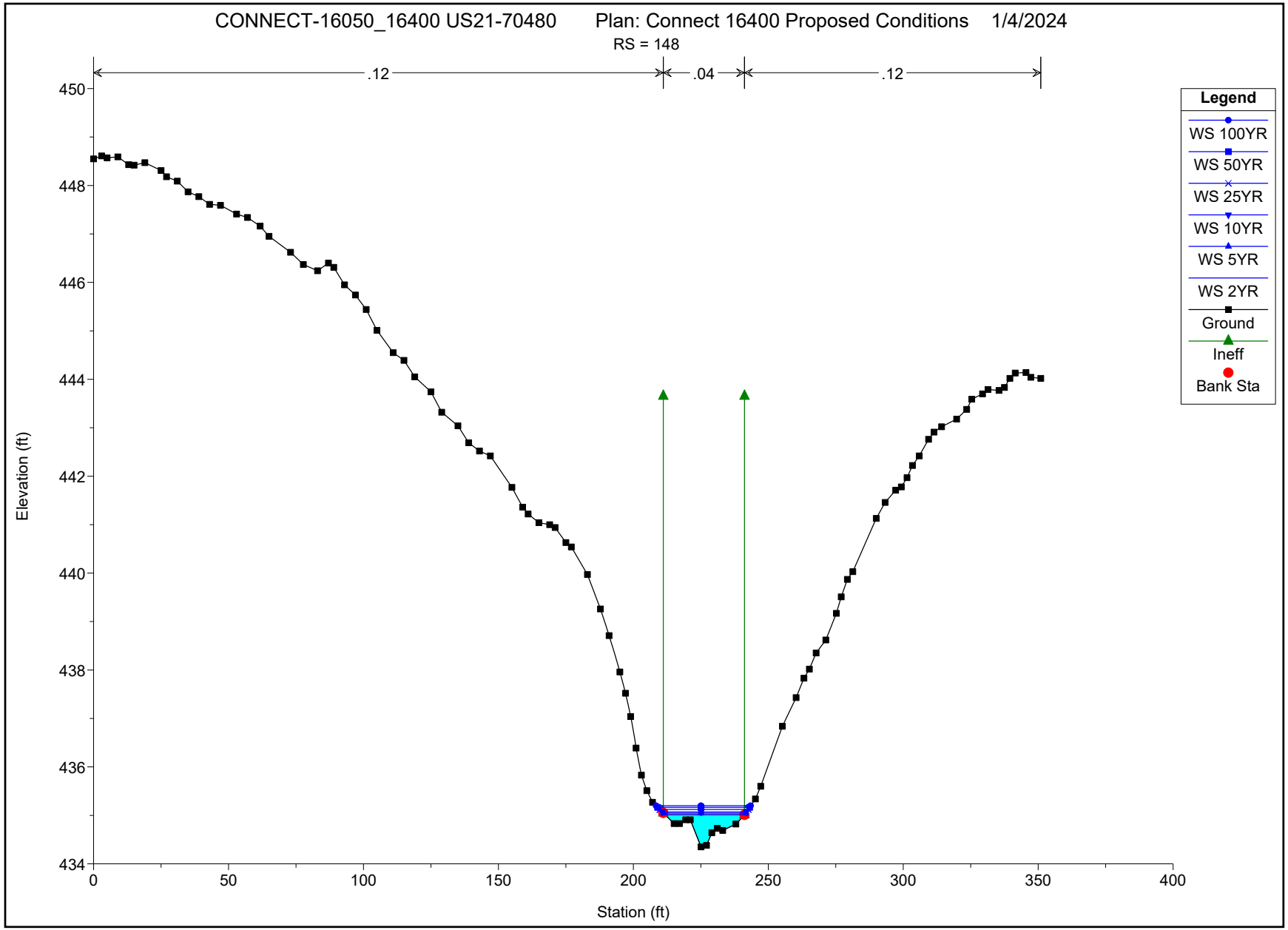

CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Proposed Conditions 1/4/2024
River 1 Reach 1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
LOB
ROB
Elevation (ft)
450
448
446
444
442
440
438
436
434
432
0
100
200
300
400
500
Main Channel Distance (ft)

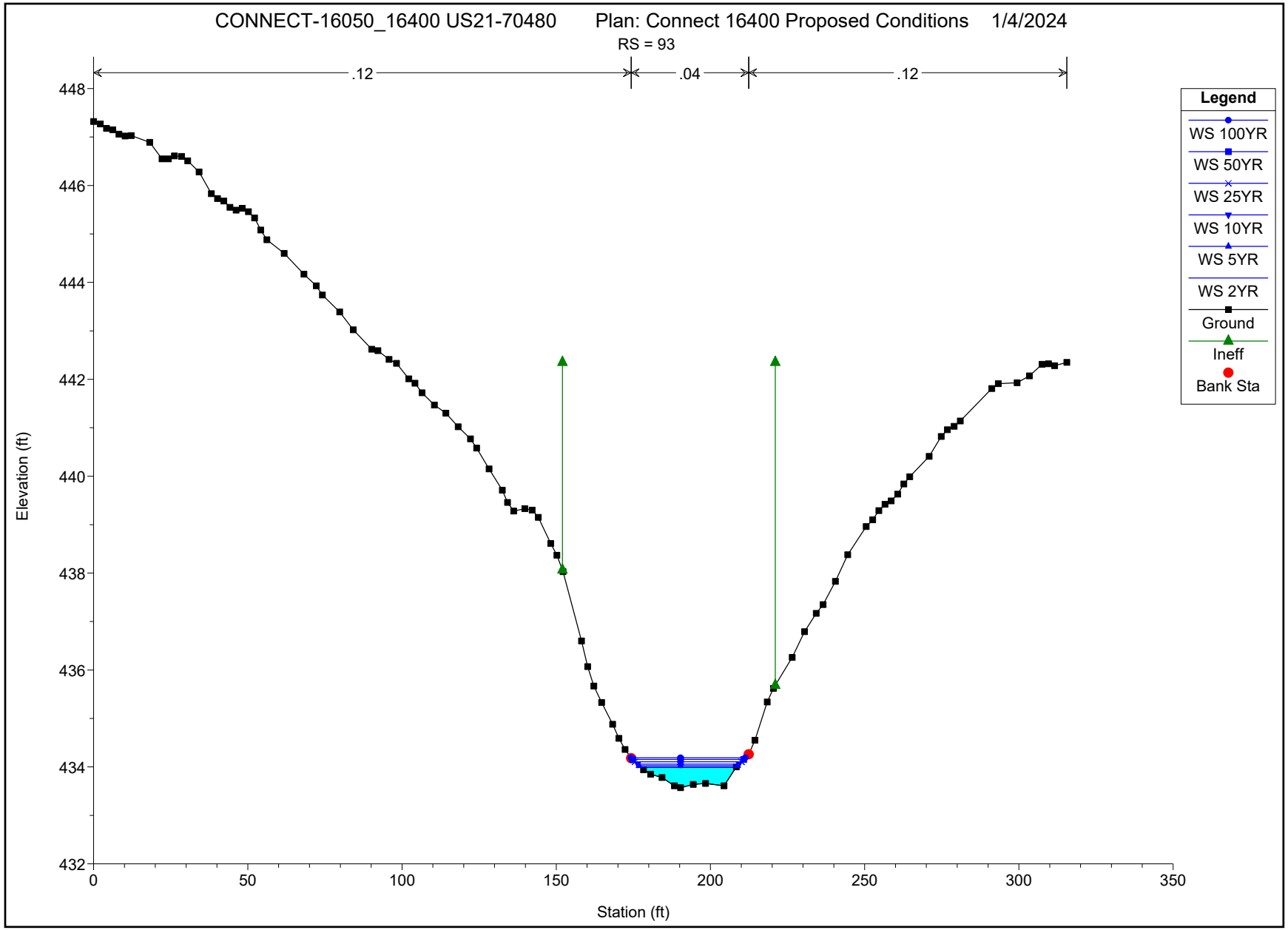

CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Proposed Conditions 1/4/2024
RS = 520
.12
.04
.12
454
452
450
448
446
444
442
440
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta

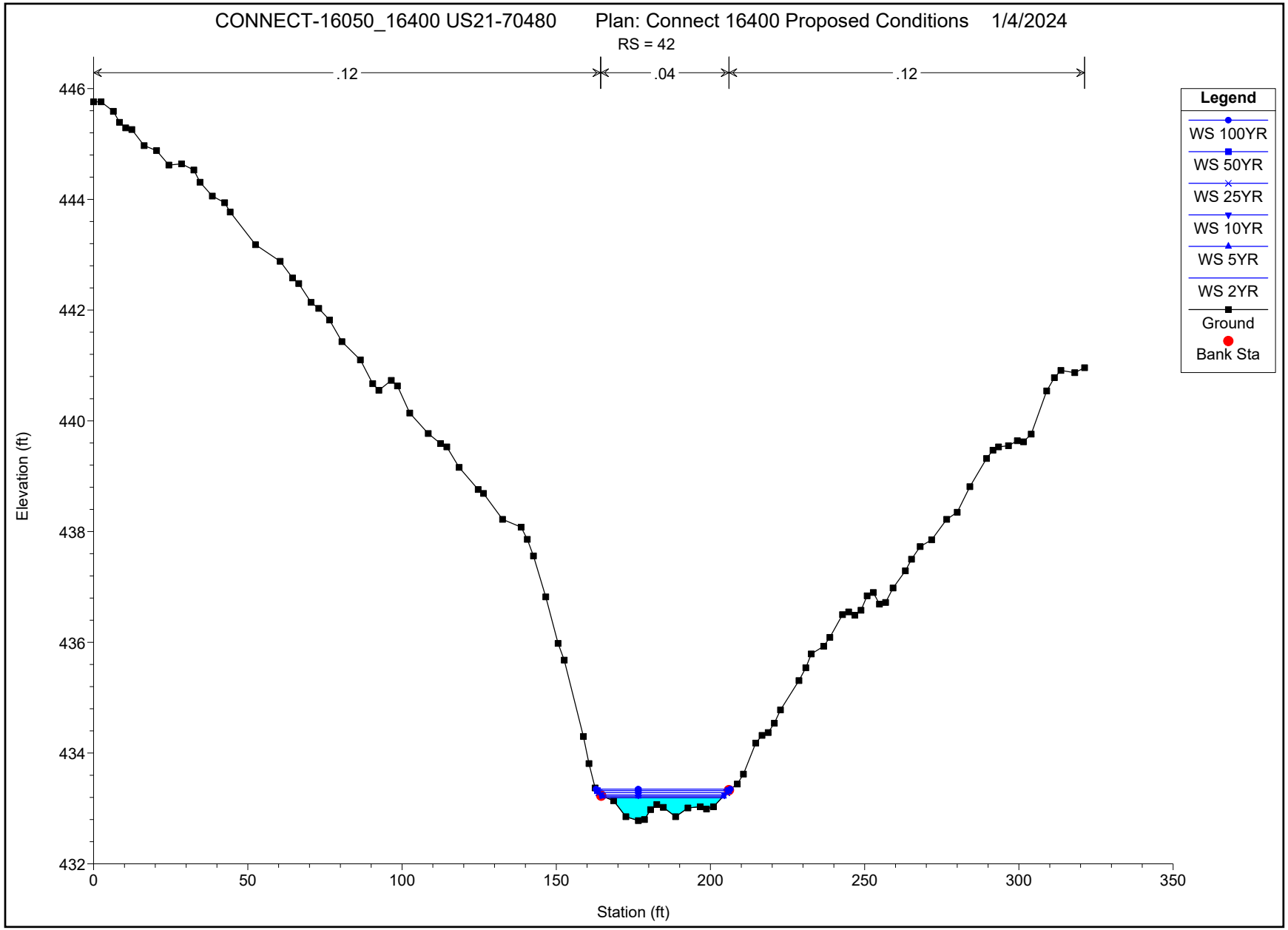

CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Proposed Conditions 1/4/2024
RS = 432
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
452
450
448
446
444
442
440
438
0
100
200
300
400
Station (ft)


CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Proposed Conditions 1/4/2024
RS = 357
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
450
448
446
444
442
440
438
0
100
200
300
400
500


CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Proposed Conditions 1/4/2024
RS = 253.7 Culv
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
452
450
448
446
444
442
440
438
436
0
100
200
300
400
500
Station (ft)


CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Proposed Conditions 1/4/2024
RS = 148
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
450
448
446
444
442
440
438
436
434
0
50
100
150
200
250
300
350
400


CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Proposed Conditions 1/4/2024
RS = 93
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
448
446
444
442
440
438
436
434
432
0
50
100
150
200
250
300
350


CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Proposed Conditions 1/4/2024
RS = 42
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
446
444
442
440
438
436
434
432
0
50
100
150
200
250
300
350

HEC-RAS River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	520	25YR	Conn 16400 Nat	29.28	440.23	440.78		440.84	0.011254	1.95	15.11	47.75	0.58
Reach 1	520	25YR	Connect 16400 Proposed Conditions	29.28	440.23	440.78		440.84	0.010924	1.94	15.26	47.84	0.58
Reach 1	520	100YR	Conn 16400 Nat	40.62	440.23	440.86		440.93	0.011142	2.22	18.84	49.91	0.60
Reach 1	520	100YR	Connect 16400 Proposed Conditions	40.62	440.23	440.86		440.93	0.011110	2.22	18.86	49.92	0.60
Reach 1	498.00*	25YR	Conn 16400 Nat	29.28	440.00	440.54		440.59	0.011272	1.93	15.22	45.31	0.58
Reach 1	498.00*	25YR	Connect 16400 Proposed Conditions	29.28	440.00	440.54		440.60	0.011199	1.92	15.26	45.15	0.58
Reach 1	498.00*	100YR	Conn 16400 Nat	40.62	440.00	440.61		440.69	0.011147	2.17	18.86	49.38	0.60
Reach 1	498.00*	100YR	Connect 16400 Proposed Conditions	40.62	440.00	440.62		440.69	0.011144	2.17	18.82	49.38	0.60
Reach 1	476.00*	25YR	Conn 16400 Nat	29.28	439.78	440.30		440.35	0.011164	1.89	15.48	46.73	0.58
Reach 1	476.00*	25YR	Connect 16400 Proposed Conditions	29.28	439.78	440.30		440.36	0.010857	1.88	15.63	47.06	0.57
Reach 1	476.00*	100YR	Conn 16400 Nat	40.62	439.78	440.37		440.44	0.010966	2.13	19.26	51.73	0.59
Reach 1	476.00*	100YR	Connect 16400 Proposed Conditions	40.62	439.78	440.38		440.45	0.010983	2.13	19.26	51.54	0.59
Reach 1	454.00*	25YR	Conn 16400 Nat	29.28	439.55	440.07		440.12	0.009949	1.80	16.35	51.65	0.54
Reach 1	454.00*	25YR	Connect 16400 Proposed Conditions	29.28	439.55	440.07		440.12	0.010308	1.81	16.16	50.68	0.55
Reach 1	454.00*	100YR	Conn 16400 Nat	40.62	439.55	440.14		440.21	0.010221	2.05	20.17	55.27	0.57
Reach 1	454.00*	100YR	Connect 16400 Proposed Conditions	40.62	439.55	440.14		440.21	0.010294	2.05	20.12	55.30	0.57
Reach 1	432	25YR	Conn 16400 Nat	29.28	439.32	439.80		439.86	0.014830	1.99	14.69	52.30	0.65
Reach 1	432	25YR	Connect 16400 Proposed Conditions	29.28	439.32	439.82	439.71	439.87	0.011613	1.85	15.93	55.40	0.58
Reach 1	432	100YR	Conn 16400 Nat	40.62	439.32	439.86		439.94	0.014555	2.25	18.40	56.92	0.66
Reach 1	432	100YR	Connect 16400 Proposed Conditions	40.62	439.32	439.86	439.77	439.94	0.014384	2.24	18.47	56.94	0.66
Reach 1	407.00*	25YR	Conn 16400 Nat	29.28	438.95	439.43		439.49	0.014225	2.02	14.51	47.15	0.64
Reach 1	407.00*	25YR	Connect 16400 Proposed Conditions	29.28	438.95	439.39	439.35	439.47	0.023725	2.38	12.31	45.90	0.81
Reach 1	407.00*	100YR	Conn 16400 Nat	40.62	438.95	439.50		439.58	0.014124	2.26	18.01	49.30	0.66
Reach 1	407.00*	100YR	Connect 16400 Proposed Conditions	40.62	438.95	439.51	439.41	439.59	0.014131	2.25	18.04	49.50	0.66
Reach 1	382.00*	25YR	Conn 16400 Nat	29.28	438.58	439.09		439.15	0.013605	1.99	14.74	47.47	0.63
Reach 1	382.00*	25YR	Connect 16400 Proposed Conditions	29.28	438.58	439.22	438.99	439.25	0.004161	1.37	21.45	50.58	0.37
Reach 1	382.00*	100YR	Conn 16400 Nat	40.62	438.58	439.16		439.24	0.013439	2.22	18.29	49.37	0.64
Reach 1	382.00*	100YR	Connect 16400 Proposed Conditions	40.62	438.58	439.44	439.05	439.46	0.002062	1.26	32.77	54.24	0.28
Reach 1	357	25YR	Conn 16400 Nat	29.28	438.21	438.71		438.78	0.016811	2.13	13.77	47.15	0.69
Reach 1	357	25YR	Connect 16400 Proposed Conditions	29.28	438.21	439.20	438.64	439.21	0.000623	0.78	37.56	55.05	0.16
Reach 1	357	100YR	Conn 16400 Nat	40.62	438.21	438.77		438.86	0.016882	2.42	16.84	48.43	0.72
Reach 1	357	100YR	Connect 16400 Proposed Conditions	40.62	438.21	439.42	438.70	439.43	0.000519	0.84	48.52	57.24	0.15
Reach 1	333.78*	25YR	Conn 16400 Nat	29.28	437.78	438.31		438.38	0.017864	2.20	13.30	45.25	0.71
Reach 1	333.78*	100YR	Conn 16400 Nat	40.62	437.78	438.38		438.47	0.017155	2.47	16.51	46.72	0.72
Reach 1	310.56*	25YR	Conn 16400 Nat	29.28	437.35	437.92		437.99	0.016735	2.19	13.36	43.79	0.70
Reach 1	310.56*	100YR	Conn 16400 Nat	40.62	437.35	437.99		438.08	0.016854	2.49	16.36	45.23	0.72

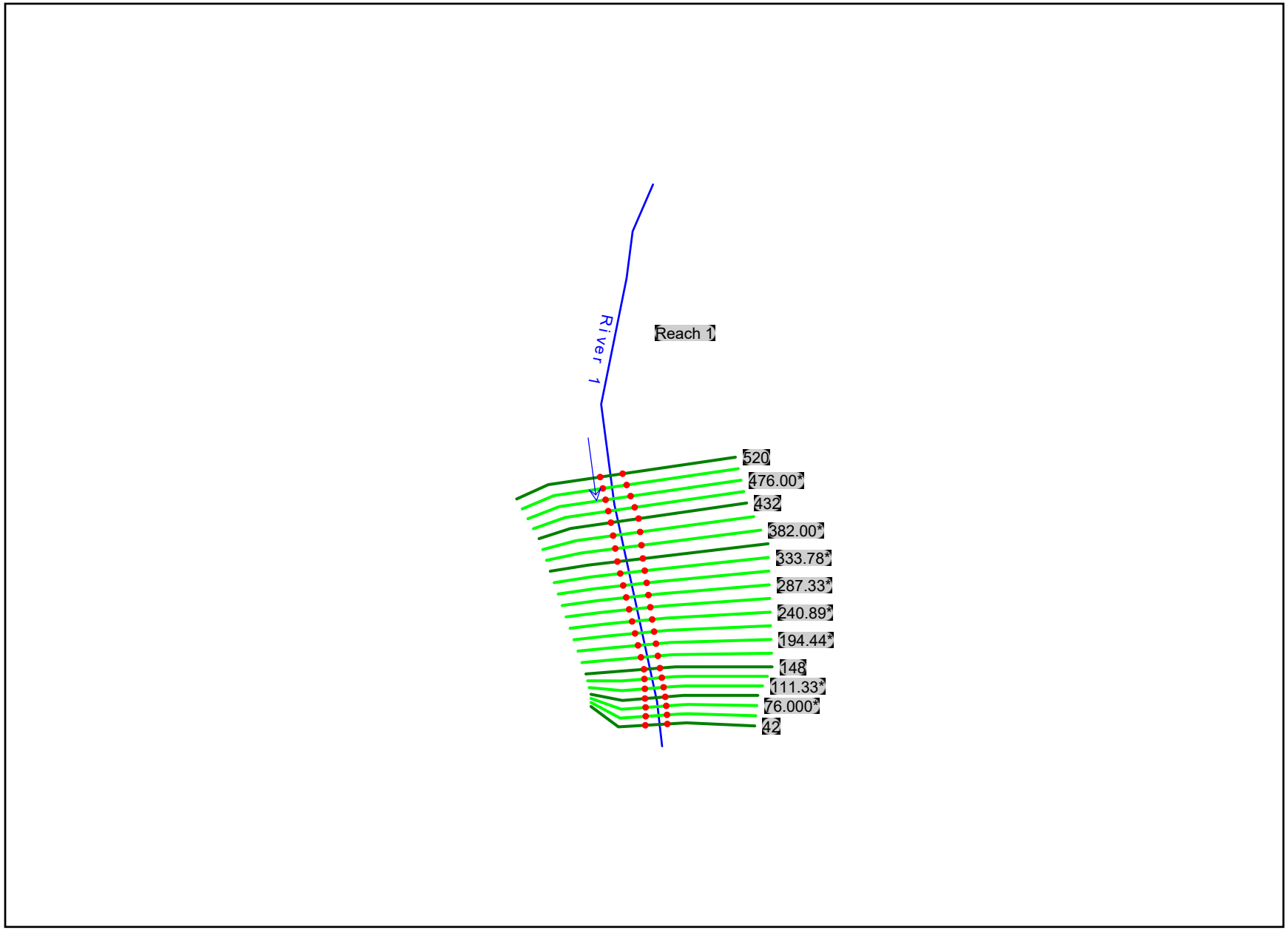
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

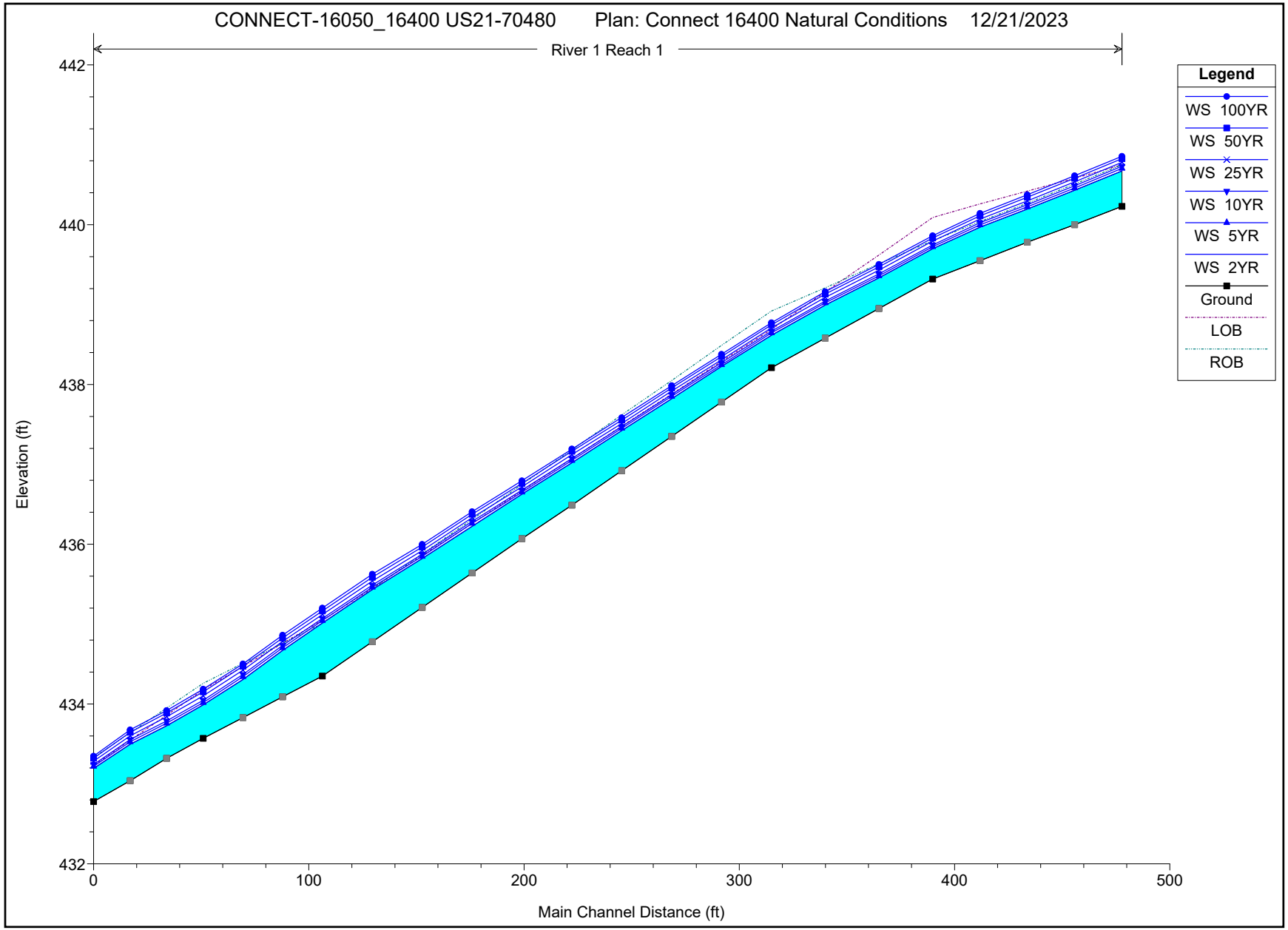
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	287.33*	25YR	Conn 16400 Nat	29.28	436.92	437.51		437.59	0.018028	2.28	12.83	41.83	0.72
Reach 1	287.33*	100YR	Conn 16400 Nat	40.62	436.92	437.59		437.69	0.017349	2.56	15.95	43.49	0.73
Reach 1	264.11*	25YR	Conn 16400 Nat	29.28	436.49	437.12		437.20	0.016504	2.26	12.98	40.50	0.70
Reach 1	264.11*	100YR	Conn 16400 Nat	40.62	436.49	437.19		437.30	0.016604	2.57	15.93	42.13	0.72
Reach 1	240.89*	25YR	Conn 16400 Nat	29.28	436.07	436.72		436.81	0.017793	2.36	12.45	38.68	0.72
Reach 1	240.89*	100YR	Conn 16400 Nat	40.62	436.07	436.79		436.90	0.017282	2.65	15.43	40.42	0.74
Reach 1	217.67*	25YR	Conn 16400 Nat	29.28	435.64	436.33		436.42	0.016260	2.34	12.58	37.43	0.70
Reach 1	217.67*	100YR	Conn 16400 Nat	40.62	435.64	436.41		436.52	0.016240	2.66	15.45	39.04	0.72
Reach 1	194.44*	25YR	Conn 16400 Nat	29.28	435.21	435.92		436.02	0.018451	2.48	11.83	35.48	0.74
Reach 1	194.44*	100YR	Conn 16400 Nat	40.62	435.21	436.00		436.12	0.018005	2.81	14.67	37.39	0.76
Reach 1	171.22*	25YR	Conn 16400 Nat	29.28	434.78	435.54		435.63	0.015580	2.42	12.22	34.62	0.69
Reach 1	171.22*	100YR	Conn 16400 Nat	40.62	434.78	435.63		435.74	0.015105	2.73	15.28	36.89	0.71
Reach 1	148	25YR	Conn 16400 Nat	29.28	434.35	435.12		435.23	0.019240	2.64	11.19	32.72	0.77
Reach 1	148	25YR	Connect 16400 Proposed Conditions	29.28	434.35	435.12	435.06	435.23	0.019196	2.64	11.09	32.74	0.77
Reach 1	148	100YR	Conn 16400 Nat	40.62	434.35	435.20		435.34	0.018943	2.99	13.95	35.19	0.79
Reach 1	148	100YR	Connect 16400 Proposed Conditions	40.62	434.35	435.20	435.13	435.34	0.019579	3.03	13.42	35.08	0.80
Reach 1	129.67*	25YR	Conn 16400 Nat	29.28	434.09	434.78		434.88	0.018076	2.51	11.68	33.44	0.74
Reach 1	129.67*	25YR	Connect 16400 Proposed Conditions	29.28	434.09	434.79	434.71	434.88	0.017972	2.50	11.70	33.44	0.74
Reach 1	129.67*	100YR	Conn 16400 Nat	40.62	434.09	434.86		434.99	0.017925	2.85	14.39	35.61	0.76
Reach 1	129.67*	100YR	Connect 16400 Proposed Conditions	40.62	434.09	434.86	434.79	434.99	0.017900	2.85	14.34	35.39	0.76
Reach 1	111.33*	25YR	Conn 16400 Nat	29.28	433.83	434.42		434.53	0.020532	2.59	11.31	33.30	0.78
Reach 1	111.33*	25YR	Connect 16400 Proposed Conditions	29.28	433.83	434.42	434.37	434.53	0.020886	2.60	11.24	33.24	0.79
Reach 1	111.33*	100YR	Conn 16400 Nat	40.62	433.83	434.50		434.63	0.020747	2.89	14.05	35.73	0.81
Reach 1	111.33*	100YR	Connect 16400 Proposed Conditions	40.62	433.83	434.50	434.44	434.63	0.020920	2.90	14.02	35.78	0.81
Reach 1	93	25YR	Conn 16400 Nat	29.28	433.57	434.10		434.19	0.015948	2.37	12.36	34.40	0.70
Reach 1	93	25YR	Connect 16400 Proposed Conditions	29.28	433.57	434.11	434.01	434.19	0.015540	2.35	12.47	34.50	0.69
Reach 1	93	100YR	Conn 16400 Nat	40.62	433.57	434.19		434.30	0.016302	2.64	15.38	37.07	0.72
Reach 1	93	100YR	Connect 16400 Proposed Conditions	40.62	433.57	434.19	434.09	434.30	0.016037	2.63	15.46	37.13	0.72
Reach 1	76.000*	25YR	Conn 16400 Nat	29.28	433.32	433.84		433.92	0.016025	2.30	12.71	37.07	0.69
Reach 1	76.000*	25YR	Connect 16400 Proposed Conditions	29.28	433.31	433.84		433.92	0.016223	2.31	12.66	37.05	0.70
Reach 1	76.000*	100YR	Conn 16400 Nat	40.62	433.32	433.92		434.02	0.016094	2.58	15.74	39.38	0.71
Reach 1	76.000*	100YR	Connect 16400 Proposed Conditions	40.62	433.31	433.92		434.02	0.016257	2.59	15.70	39.39	0.72
Reach 1	59.000*	25YR	Conn 16400 Nat	29.28	433.04	433.60		433.67	0.013268	2.12	13.84	40.33	0.63
Reach 1	59.000*	25YR	Connect 16400 Proposed Conditions	29.28	433.04	433.60		433.67	0.013260	2.12	13.84	40.30	0.63
Reach 1	59.000*	100YR	Conn 16400 Nat	40.62	433.04	433.68		433.77	0.013483	2.41	16.95	42.50	0.66

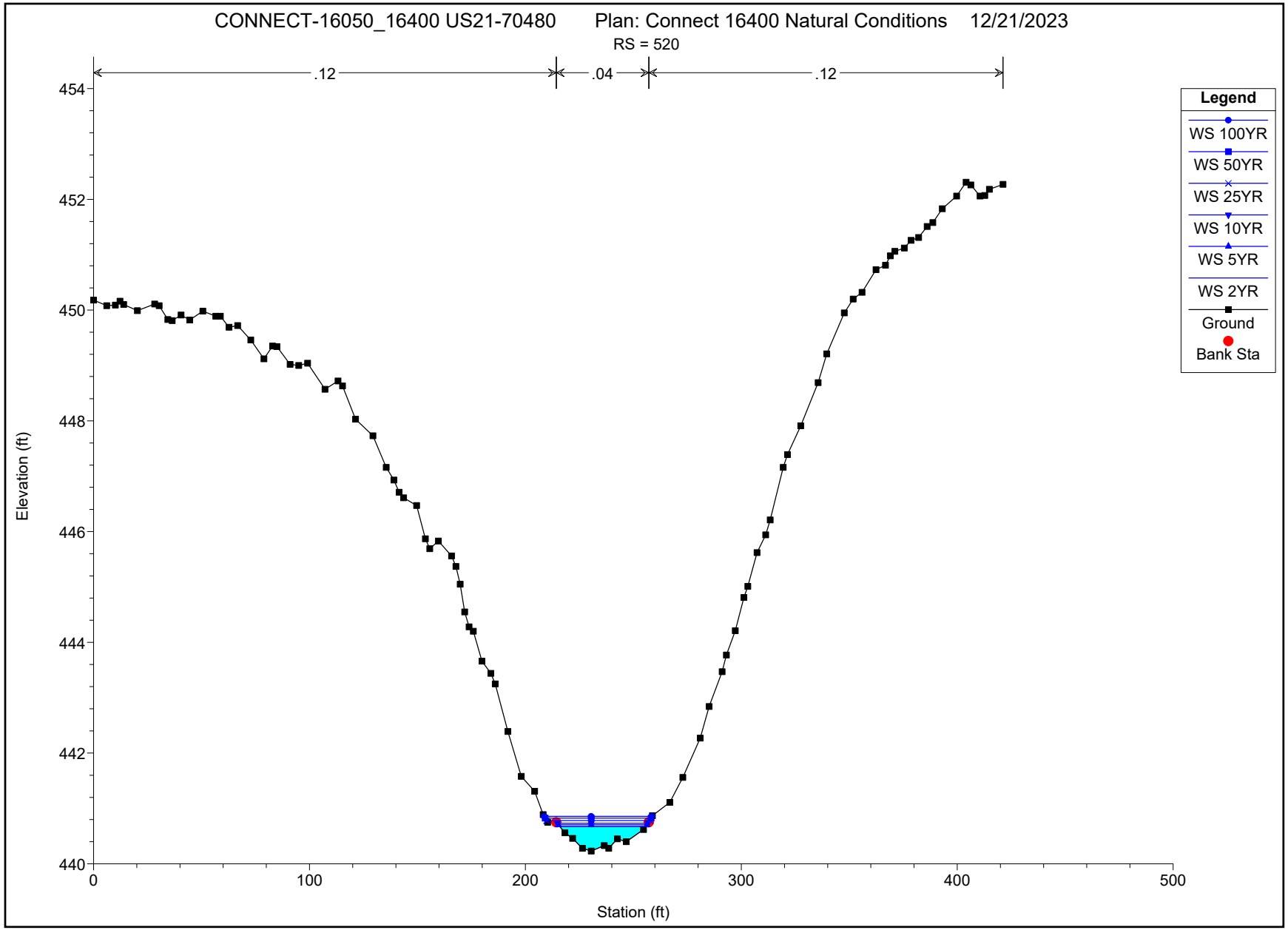
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

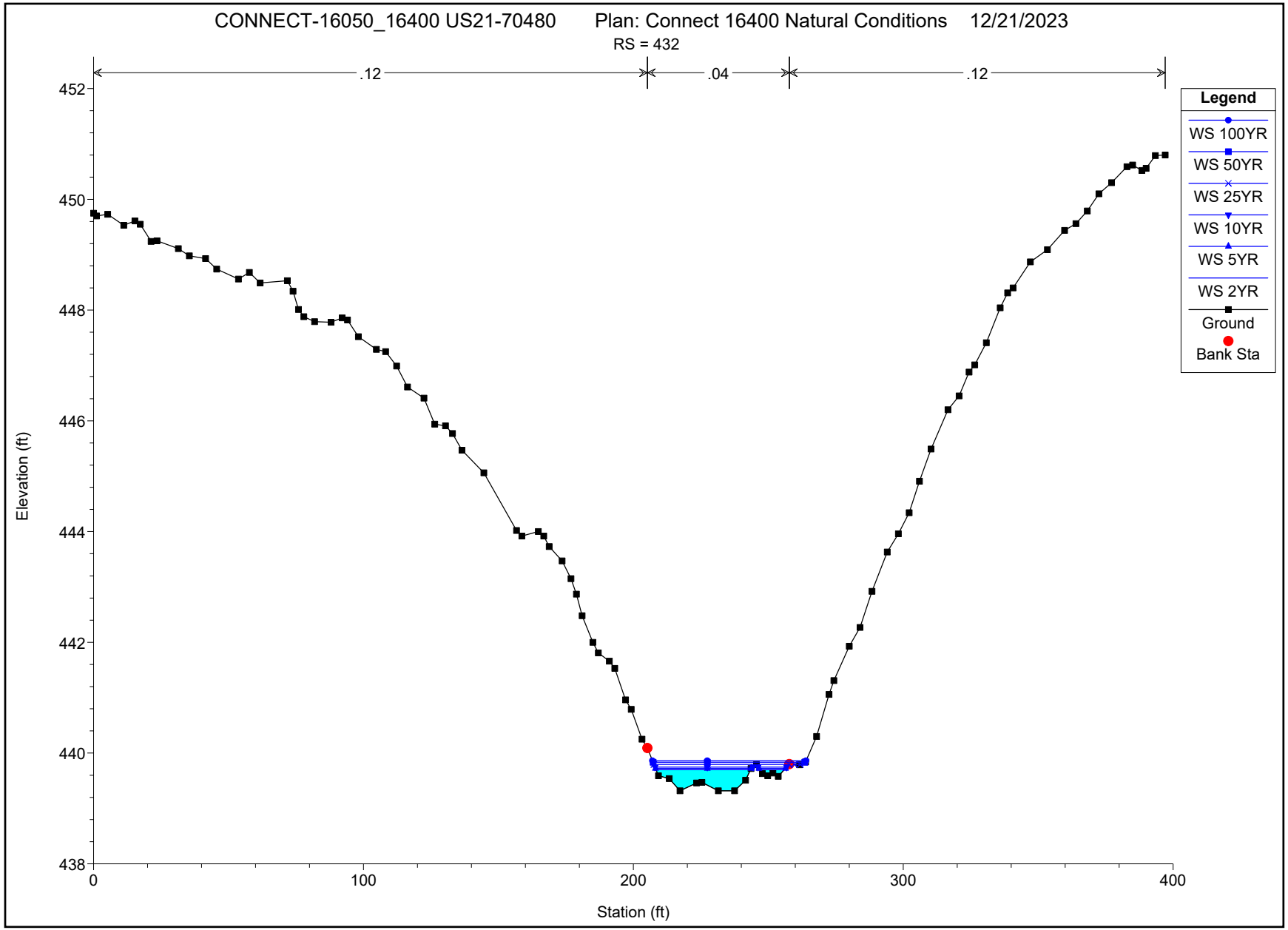
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	59.000*	100YR	Connect 16400 Proposed Conditions	40.62	433.04	433.68		433.77	0.013485	2.41	16.95	42.42	0.66
Reach 1	42	25YR	Conn 16400 Nat	29.28	432.78	433.28	433.24	433.38	0.023100	2.48	11.84	41.35	0.81
Reach 1	42	25YR	Connect 16400 Proposed Conditions	29.28	432.78	433.28	433.24	433.38	0.023100	2.48	11.84	41.35	0.81
Reach 1	42	100YR	Conn 16400 Nat	40.62	432.78	433.35	433.31	433.47	0.023132	2.80	14.58	43.55	0.84
Reach 1	42	100YR	Connect 16400 Proposed Conditions	40.62	432.78	433.35	433.31	433.47	0.023132	2.80	14.58	43.55	0.84

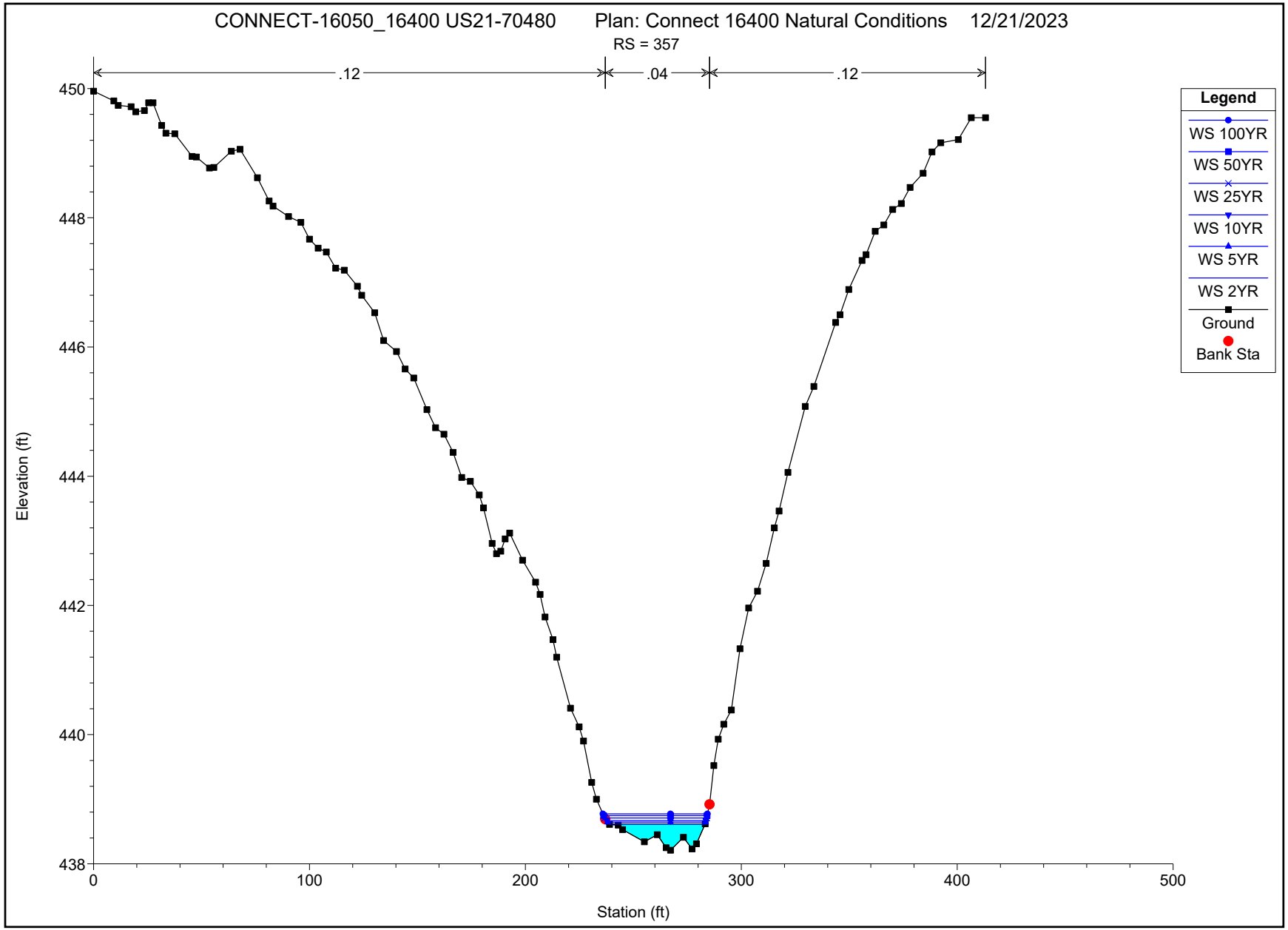
CONNECTOR 164+00 NATURAL PLAN

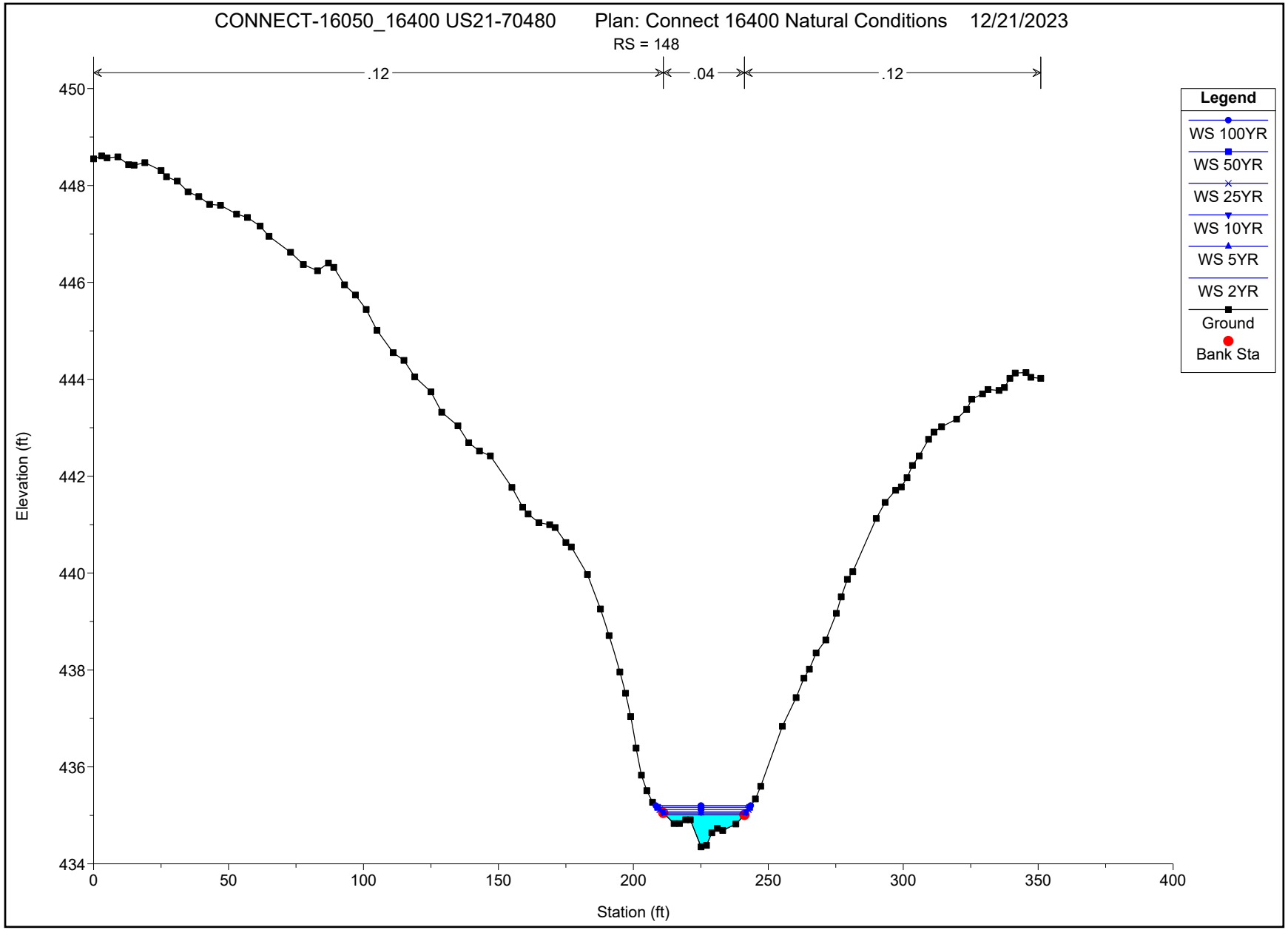


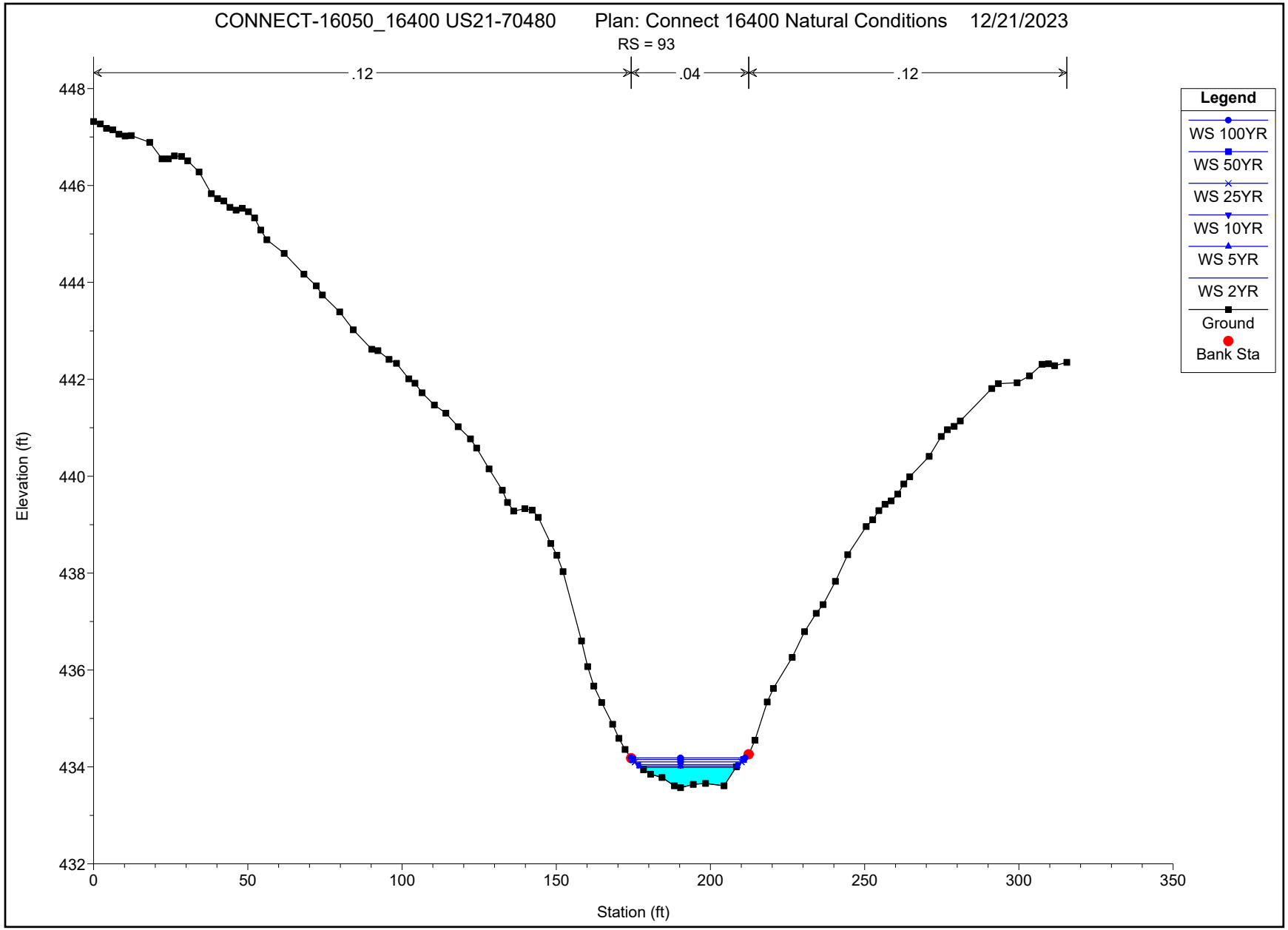

CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Natural Conditions 12/21/2023
River 1 Reach 1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
LOB
ROB
Elevation (ft)
442
440
438
436
434
432
0
100
200
300
400
500
Main Channel Distance (ft)

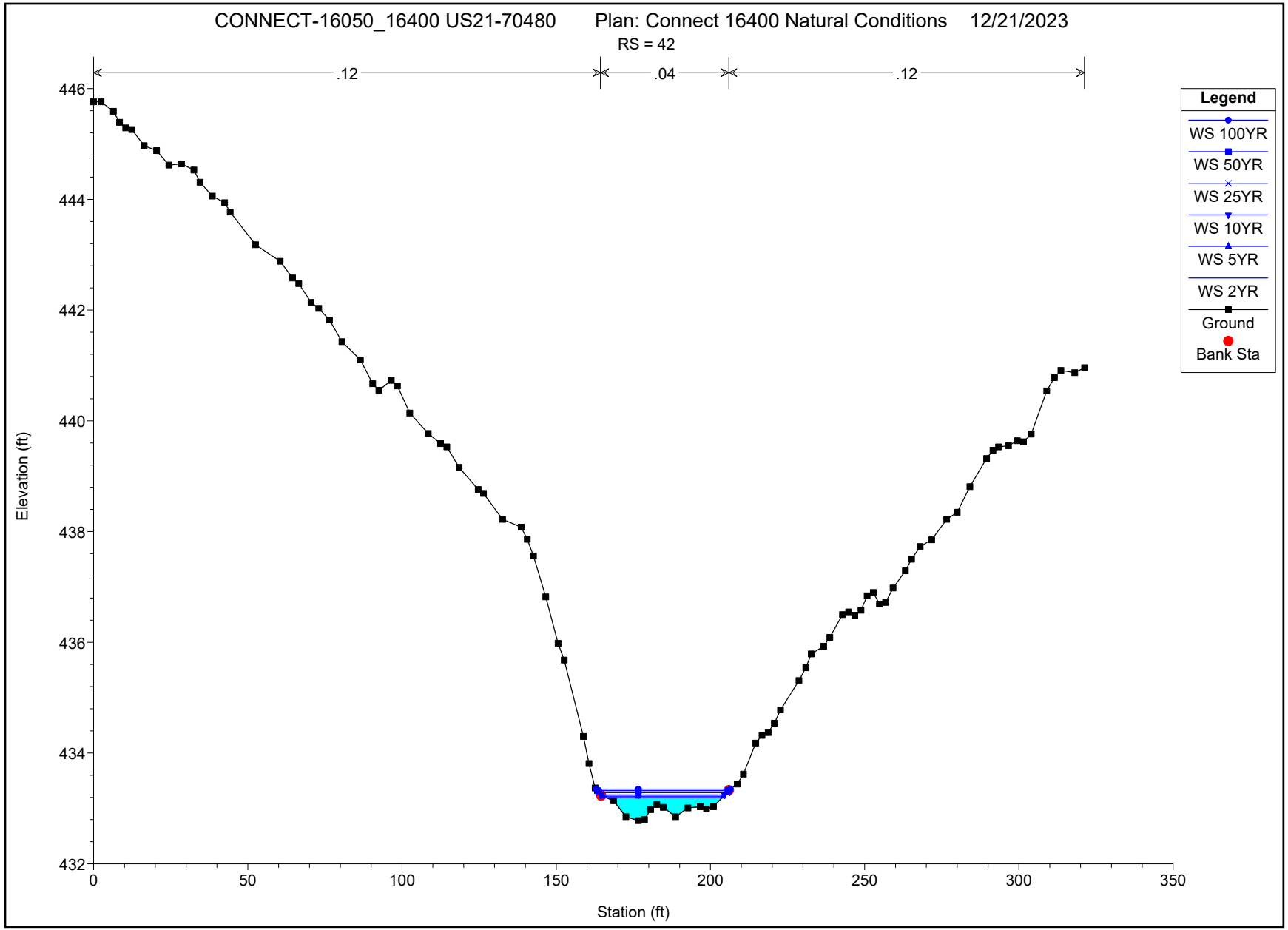

CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Natural Conditions 12/21/2023
RS = 520
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
454
452
450
448
446
444
442
440
0
100
200
300
400
500
Station (ft)


CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Natural Conditions 12/21/2023
RS = 432
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
452
450
448
446
444
442
440
438
0
100
200
300
400
Station (ft)


CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Natural Conditions 12/21/2023
RS = 357
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
450
448
446
444
442
440
438
0
100
200
300
400
500
Station (ft)


CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Natural Conditions 12/21/2023
RS = 148
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
448
446
444
442
440
438
436
434
0
50
100
150
200
250
300
350
400


CONNECT-16050_16400 US21-70480 Plan: Connect 16400 Natural Conditions 12/21/2023
RS = 93
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
448
446
444
442
440
438
436
434
432
0
50
100
150
200
250
300
350
Station (ft)


CONNECT-16050_16400 US21-70480
Plan: Connect 16400 Natural Conditions
12/21/2023
RS = 42
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
446
444
442
440
438
436
434
432
0
50
100
150
200
250
300
350

HEC-RAS River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	520	25YR	Conn 16400 Nat	29.28	440.23	440.78		440.84	0.011254	1.95	15.11	47.75	0.58
Reach 1	520	25YR	Connect 16400 Proposed Conditions	29.28	440.23	440.78		440.84	0.010924	1.94	15.26	47.84	0.58
Reach 1	520	100YR	Conn 16400 Nat	40.62	440.23	440.86		440.93	0.011142	2.22	18.84	49.91	0.60
Reach 1	520	100YR	Connect 16400 Proposed Conditions	40.62	440.23	440.86		440.93	0.011110	2.22	18.86	49.92	0.60
Reach 1	498.00*	25YR	Conn 16400 Nat	29.28	440.00	440.54		440.59	0.011272	1.93	15.22	45.31	0.58
Reach 1	498.00*	25YR	Connect 16400 Proposed Conditions	29.28	440.00	440.54		440.60	0.011199	1.92	15.26	45.15	0.58
Reach 1	498.00*	100YR	Conn 16400 Nat	40.62	440.00	440.61		440.69	0.011147	2.17	18.86	49.38	0.60
Reach 1	498.00*	100YR	Connect 16400 Proposed Conditions	40.62	440.00	440.62		440.69	0.011144	2.17	18.82	49.38	0.60
Reach 1	476.00*	25YR	Conn 16400 Nat	29.28	439.78	440.30		440.35	0.011164	1.89	15.48	46.73	0.58
Reach 1	476.00*	25YR	Connect 16400 Proposed Conditions	29.28	439.78	440.30		440.36	0.010857	1.88	15.63	47.06	0.57
Reach 1	476.00*	100YR	Conn 16400 Nat	40.62	439.78	440.37		440.44	0.010966	2.13	19.26	51.73	0.59
Reach 1	476.00*	100YR	Connect 16400 Proposed Conditions	40.62	439.78	440.38		440.45	0.010983	2.13	19.26	51.54	0.59
Reach 1	454.00*	25YR	Conn 16400 Nat	29.28	439.55	440.07		440.12	0.009949	1.80	16.35	51.65	0.54
Reach 1	454.00*	25YR	Connect 16400 Proposed Conditions	29.28	439.55	440.07		440.12	0.010308	1.81	16.16	50.68	0.55
Reach 1	454.00*	100YR	Conn 16400 Nat	40.62	439.55	440.14		440.21	0.010221	2.05	20.17	55.27	0.57
Reach 1	454.00*	100YR	Connect 16400 Proposed Conditions	40.62	439.55	440.14		440.21	0.010294	2.05	20.12	55.30	0.57
Reach 1	432	25YR	Conn 16400 Nat	29.28	439.32	439.80		439.86	0.014830	1.99	14.69	52.30	0.65
Reach 1	432	25YR	Connect 16400 Proposed Conditions	29.28	439.32	439.82	439.71	439.87	0.011613	1.85	15.93	55.40	0.58
Reach 1	432	100YR	Conn 16400 Nat	40.62	439.32	439.86		439.94	0.014555	2.25	18.40	56.92	0.66
Reach 1	432	100YR	Connect 16400 Proposed Conditions	40.62	439.32	439.86	439.77	439.94	0.014384	2.24	18.47	56.94	0.66
Reach 1	407.00*	25YR	Conn 16400 Nat	29.28	438.95	439.43		439.49	0.014225	2.02	14.51	47.15	0.64
Reach 1	407.00*	25YR	Connect 16400 Proposed Conditions	29.28	438.95	439.39	439.35	439.47	0.023725	2.38	12.31	45.90	0.81
Reach 1	407.00*	100YR	Conn 16400 Nat	40.62	438.95	439.50		439.58	0.014124	2.26	18.01	49.30	0.66
Reach 1	407.00*	100YR	Connect 16400 Proposed Conditions	40.62	438.95	439.51	439.41	439.59	0.014131	2.25	18.04	49.50	0.66
Reach 1	382.00*	25YR	Conn 16400 Nat	29.28	438.58	439.09		439.15	0.013605	1.99	14.74	47.47	0.63
Reach 1	382.00*	25YR	Connect 16400 Proposed Conditions	29.28	438.58	439.22	438.99	439.25	0.004161	1.37	21.45	50.58	0.37
Reach 1	382.00*	100YR	Conn 16400 Nat	40.62	438.58	439.16		439.24	0.013439	2.22	18.29	49.37	0.64
Reach 1	382.00*	100YR	Connect 16400 Proposed Conditions	40.62	438.58	439.44	439.05	439.46	0.002062	1.26	32.77	54.24	0.28
Reach 1	357	25YR	Conn 16400 Nat	29.28	438.21	438.71		438.78	0.016811	2.13	13.77	47.15	0.69
Reach 1	357	25YR	Connect 16400 Proposed Conditions	29.28	438.21	439.20	438.64	439.21	0.000623	0.78	37.56	55.05	0.16
Reach 1	357	100YR	Conn 16400 Nat	40.62	438.21	438.77		438.86	0.016882	2.42	16.84	48.43	0.72
Reach 1	357	100YR	Connect 16400 Proposed Conditions	40.62	438.21	439.42	438.70	439.43	0.000519	0.84	48.52	57.24	0.15
Reach 1	333.78*	25YR	Conn 16400 Nat	29.28	437.78	438.31		438.38	0.017864	2.20	13.30	45.25	0.71
Reach 1	333.78*	100YR	Conn 16400 Nat	40.62	437.78	438.38		438.47	0.017155	2.47	16.51	46.72	0.72
Reach 1	310.56*	25YR	Conn 16400 Nat	29.28	437.35	437.92		437.99	0.016735	2.19	13.36	43.79	0.70
Reach 1	310.56*	100YR	Conn 16400 Nat	40.62	437.35	437.99		438.08	0.016854	2.49	16.36	45.23	0.72

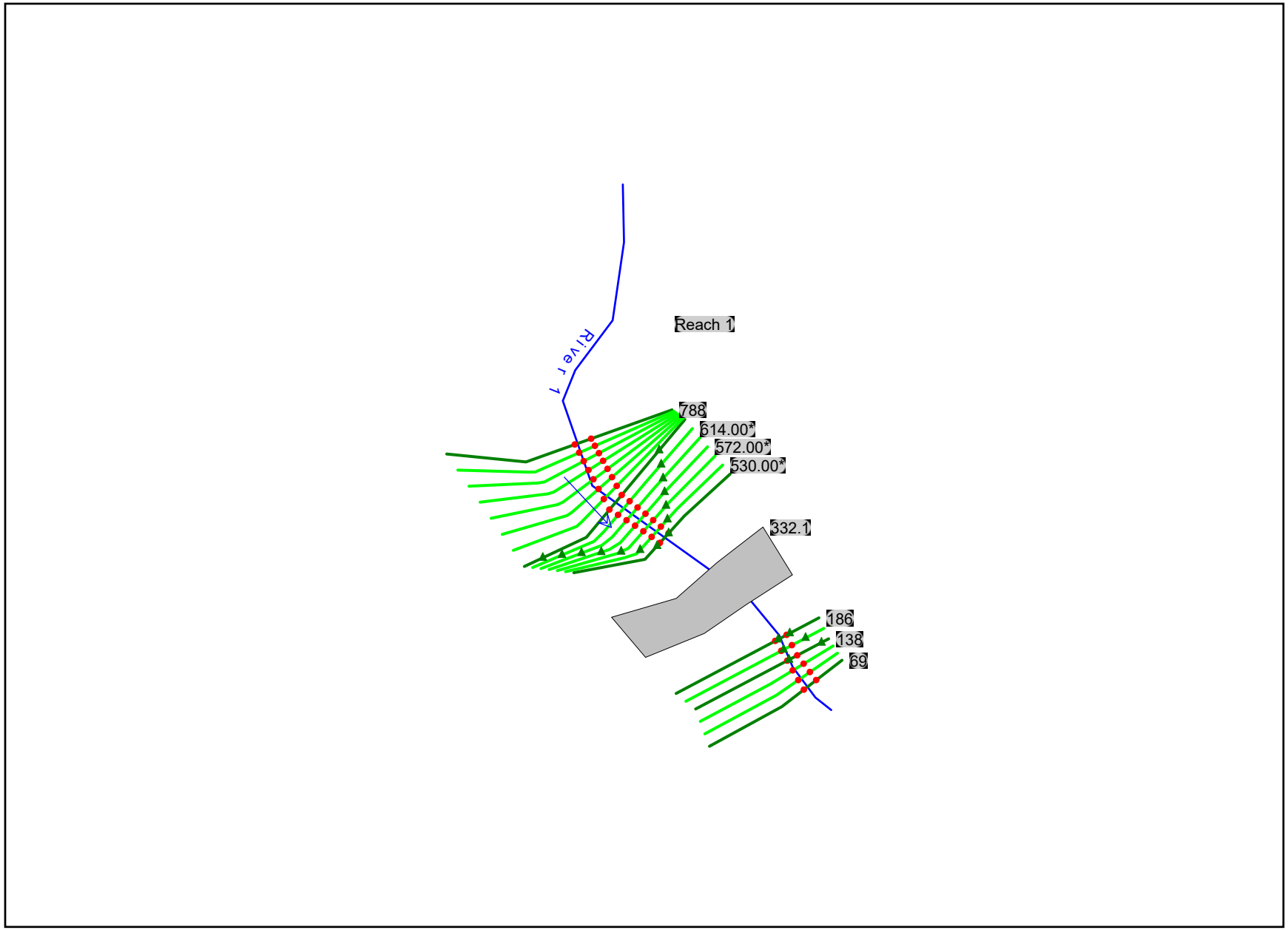
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

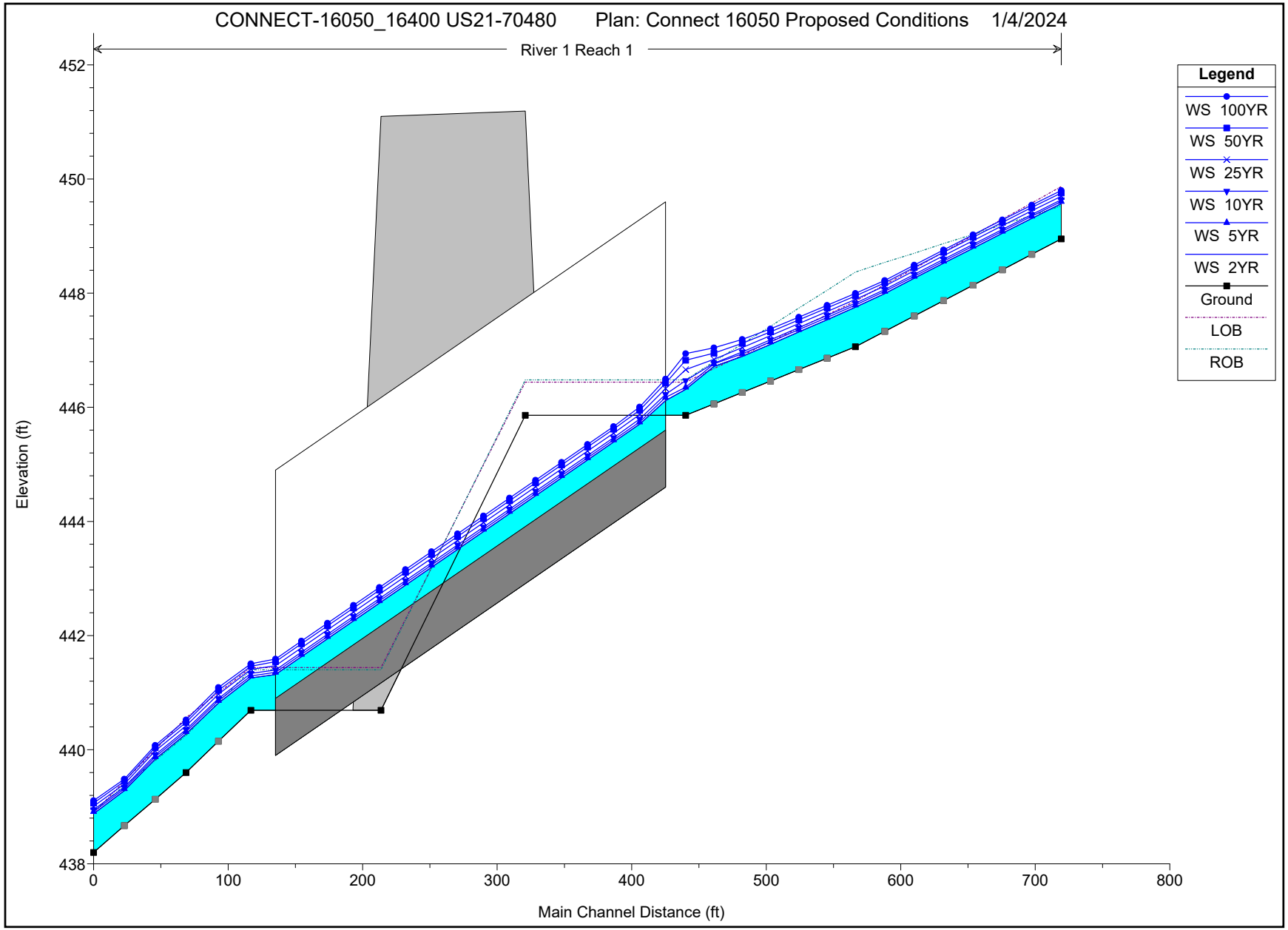
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	287.33*	25YR	Conn 16400 Nat	29.28	436.92	437.51		437.59	0.018028	2.28	12.83	41.83	0.72
Reach 1	287.33*	100YR	Conn 16400 Nat	40.62	436.92	437.59		437.69	0.017349	2.56	15.95	43.49	0.73
Reach 1	264.11*	25YR	Conn 16400 Nat	29.28	436.49	437.12		437.20	0.016504	2.26	12.98	40.50	0.70
Reach 1	264.11*	100YR	Conn 16400 Nat	40.62	436.49	437.19		437.30	0.016604	2.57	15.93	42.13	0.72
Reach 1	240.89*	25YR	Conn 16400 Nat	29.28	436.07	436.72		436.81	0.017793	2.36	12.45	38.68	0.72
Reach 1	240.89*	100YR	Conn 16400 Nat	40.62	436.07	436.79		436.90	0.017282	2.65	15.43	40.42	0.74
Reach 1	217.67*	25YR	Conn 16400 Nat	29.28	435.64	436.33		436.42	0.016260	2.34	12.58	37.43	0.70
Reach 1	217.67*	100YR	Conn 16400 Nat	40.62	435.64	436.41		436.52	0.016240	2.66	15.45	39.04	0.72
Reach 1	194.44*	25YR	Conn 16400 Nat	29.28	435.21	435.92		436.02	0.018451	2.48	11.83	35.48	0.74
Reach 1	194.44*	100YR	Conn 16400 Nat	40.62	435.21	436.00		436.12	0.018005	2.81	14.67	37.39	0.76
Reach 1	171.22*	25YR	Conn 16400 Nat	29.28	434.78	435.54		435.63	0.015580	2.42	12.22	34.62	0.69
Reach 1	171.22*	100YR	Conn 16400 Nat	40.62	434.78	435.63		435.74	0.015105	2.73	15.28	36.89	0.71
Reach 1	148	25YR	Conn 16400 Nat	29.28	434.35	435.12		435.23	0.019240	2.64	11.19	32.72	0.77
Reach 1	148	25YR	Connect 16400 Proposed Conditions	29.28	434.35	435.12	435.06	435.23	0.019196	2.64	11.09	32.74	0.77
Reach 1	148	100YR	Conn 16400 Nat	40.62	434.35	435.20		435.34	0.018943	2.99	13.95	35.19	0.79
Reach 1	148	100YR	Connect 16400 Proposed Conditions	40.62	434.35	435.20	435.13	435.34	0.019579	3.03	13.42	35.08	0.80
Reach 1	129.67*	25YR	Conn 16400 Nat	29.28	434.09	434.78		434.88	0.018076	2.51	11.68	33.44	0.74
Reach 1	129.67*	25YR	Connect 16400 Proposed Conditions	29.28	434.09	434.79	434.71	434.88	0.017972	2.50	11.70	33.44	0.74
Reach 1	129.67*	100YR	Conn 16400 Nat	40.62	434.09	434.86		434.99	0.017925	2.85	14.39	35.61	0.76
Reach 1	129.67*	100YR	Connect 16400 Proposed Conditions	40.62	434.09	434.86	434.79	434.99	0.017900	2.85	14.34	35.39	0.76
Reach 1	111.33*	25YR	Conn 16400 Nat	29.28	433.83	434.42		434.53	0.020532	2.59	11.31	33.30	0.78
Reach 1	111.33*	25YR	Connect 16400 Proposed Conditions	29.28	433.83	434.42	434.37	434.53	0.020886	2.60	11.24	33.24	0.79
Reach 1	111.33*	100YR	Conn 16400 Nat	40.62	433.83	434.50		434.63	0.020747	2.89	14.05	35.73	0.81
Reach 1	111.33*	100YR	Connect 16400 Proposed Conditions	40.62	433.83	434.50	434.44	434.63	0.020920	2.90	14.02	35.78	0.81
Reach 1	93	25YR	Conn 16400 Nat	29.28	433.57	434.10		434.19	0.015948	2.37	12.36	34.40	0.70
Reach 1	93	25YR	Connect 16400 Proposed Conditions	29.28	433.57	434.11	434.01	434.19	0.015540	2.35	12.47	34.50	0.69
Reach 1	93	100YR	Conn 16400 Nat	40.62	433.57	434.19		434.30	0.016302	2.64	15.38	37.07	0.72
Reach 1	93	100YR	Connect 16400 Proposed Conditions	40.62	433.57	434.19	434.09	434.30	0.016037	2.63	15.46	37.13	0.72
Reach 1	76.000*	25YR	Conn 16400 Nat	29.28	433.32	433.84		433.92	0.016025	2.30	12.71	37.07	0.69
Reach 1	76.000*	25YR	Connect 16400 Proposed Conditions	29.28	433.31	433.84		433.92	0.016223	2.31	12.66	37.05	0.70
Reach 1	76.000*	100YR	Conn 16400 Nat	40.62	433.32	433.92		434.02	0.016094	2.58	15.74	39.38	0.71
Reach 1	76.000*	100YR	Connect 16400 Proposed Conditions	40.62	433.31	433.92		434.02	0.016257	2.59	15.70	39.39	0.72
Reach 1	59.000*	25YR	Conn 16400 Nat	29.28	433.04	433.60		433.67	0.013268	2.12	13.84	40.33	0.63
Reach 1	59.000*	25YR	Connect 16400 Proposed Conditions	29.28	433.04	433.60		433.67	0.013260	2.12	13.84	40.30	0.63
Reach 1	59.000*	100YR	Conn 16400 Nat	40.62	433.04	433.68		433.77	0.013483	2.41	16.95	42.50	0.66

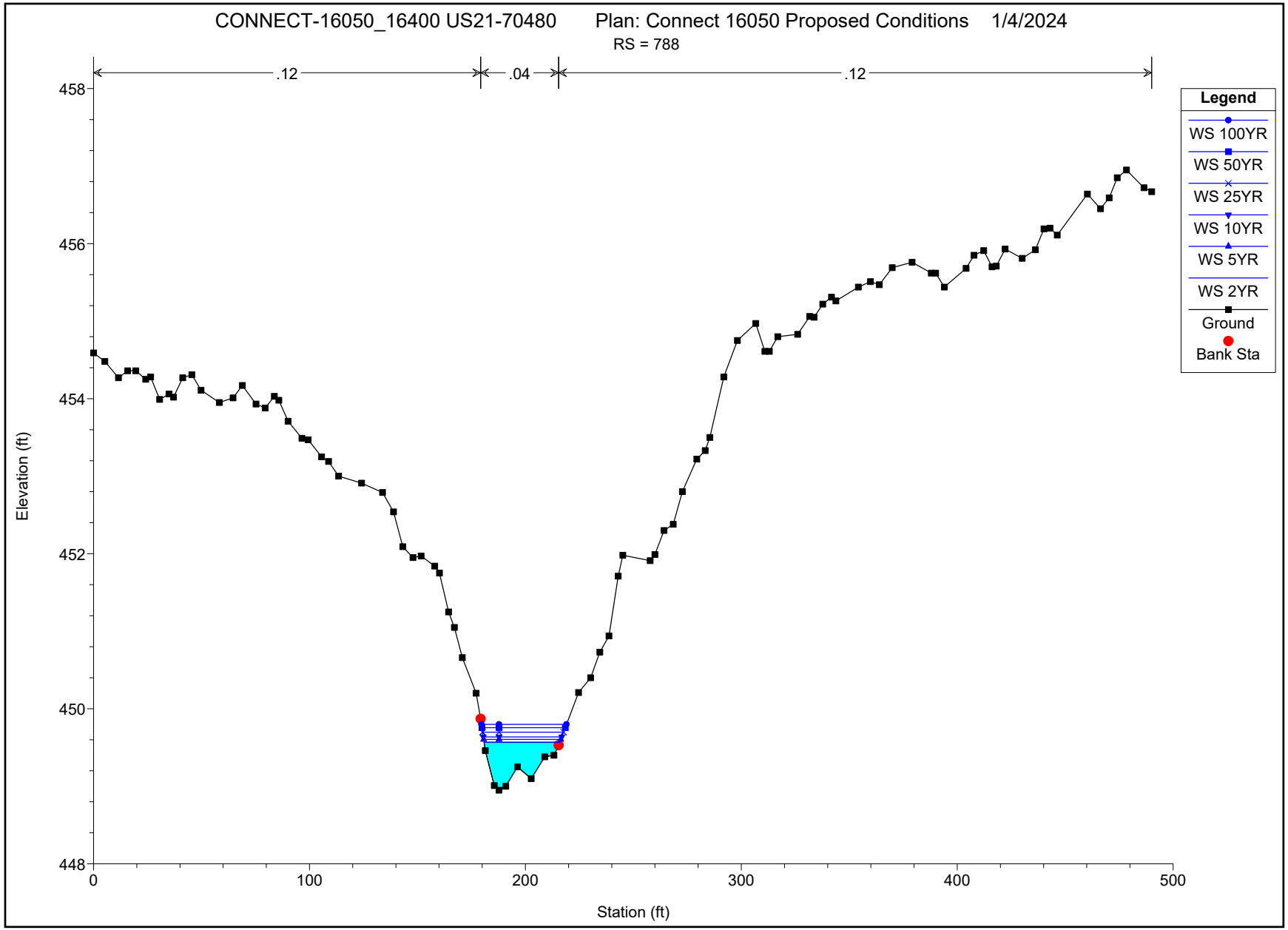
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

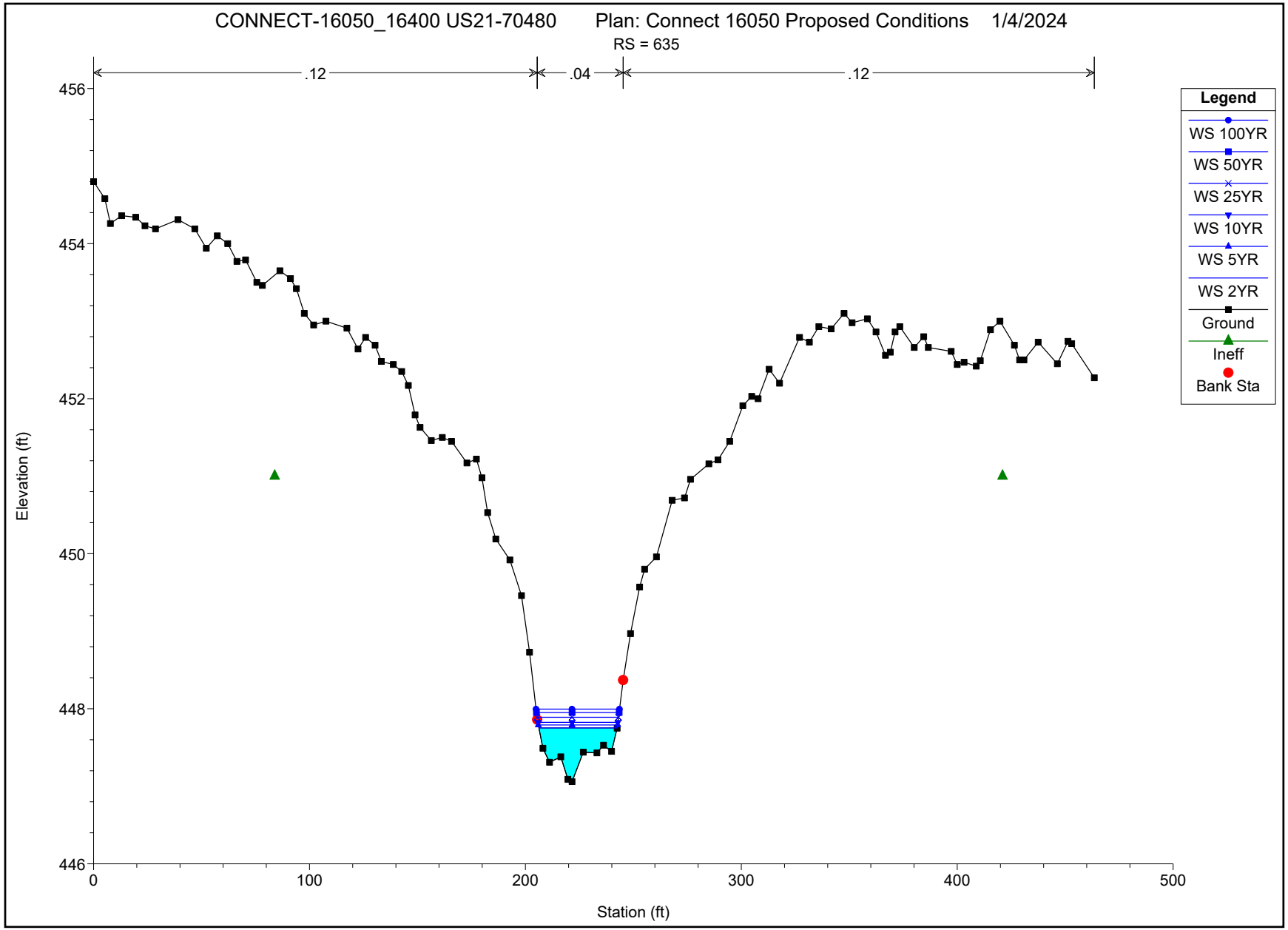
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	59.000*	100YR	Connect 16400 Proposed Conditions	40.62	433.04	433.68		433.77	0.013485	2.41	16.95	42.42	0.66
Reach 1	42	25YR	Conn 16400 Nat	29.28	432.78	433.28	433.24	433.38	0.023100	2.48	11.84	41.35	0.81
Reach 1	42	25YR	Connect 16400 Proposed Conditions	29.28	432.78	433.28	433.24	433.38	0.023100	2.48	11.84	41.35	0.81
Reach 1	42	100YR	Conn 16400 Nat	40.62	432.78	433.35	433.31	433.47	0.023132	2.80	14.58	43.55	0.84
Reach 1	42	100YR	Connect 16400 Proposed Conditions	40.62	432.78	433.35	433.31	433.47	0.023132	2.80	14.58	43.55	0.84

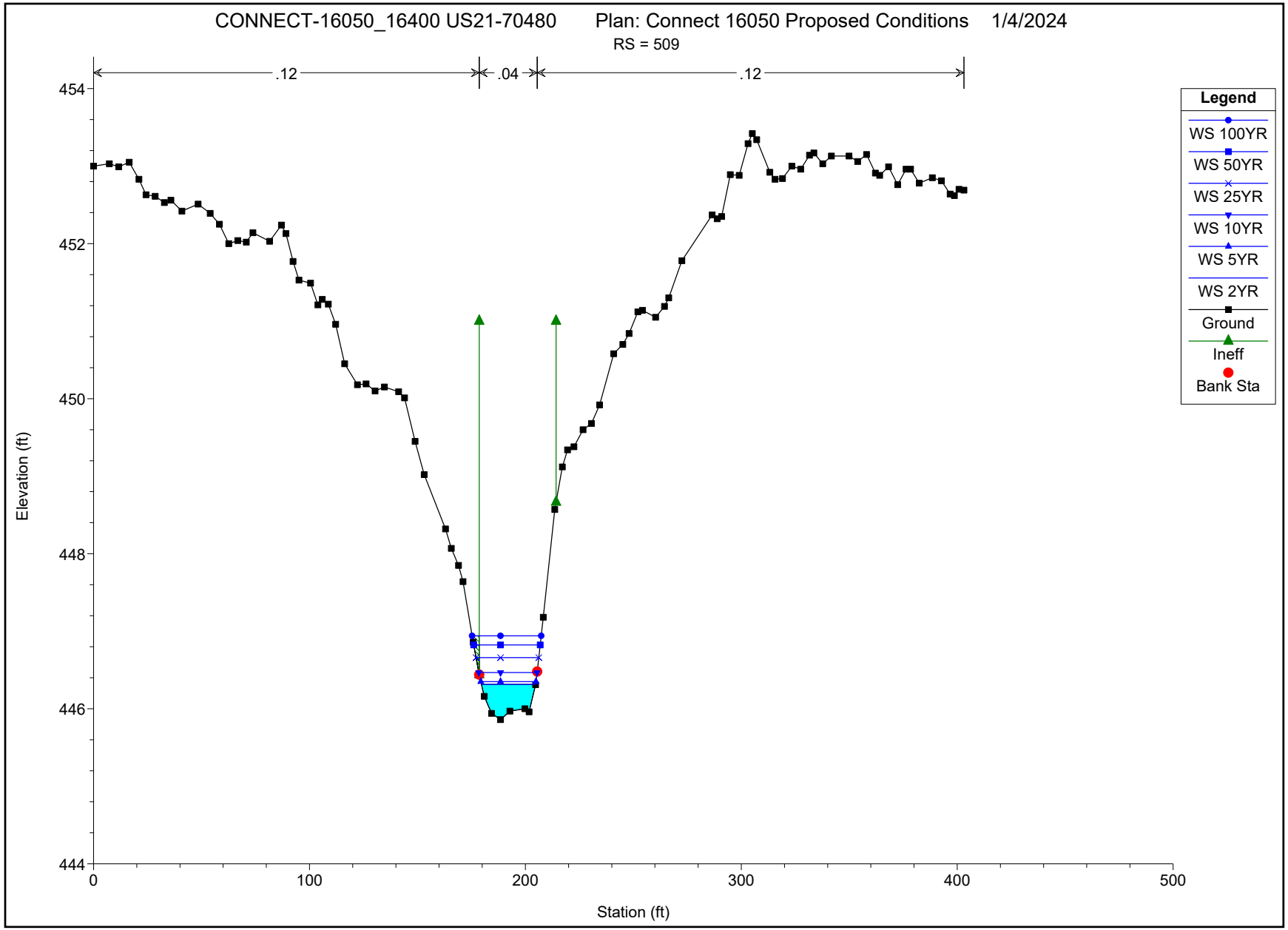
CONNECTOR 160+50 PROPOSED PLAN

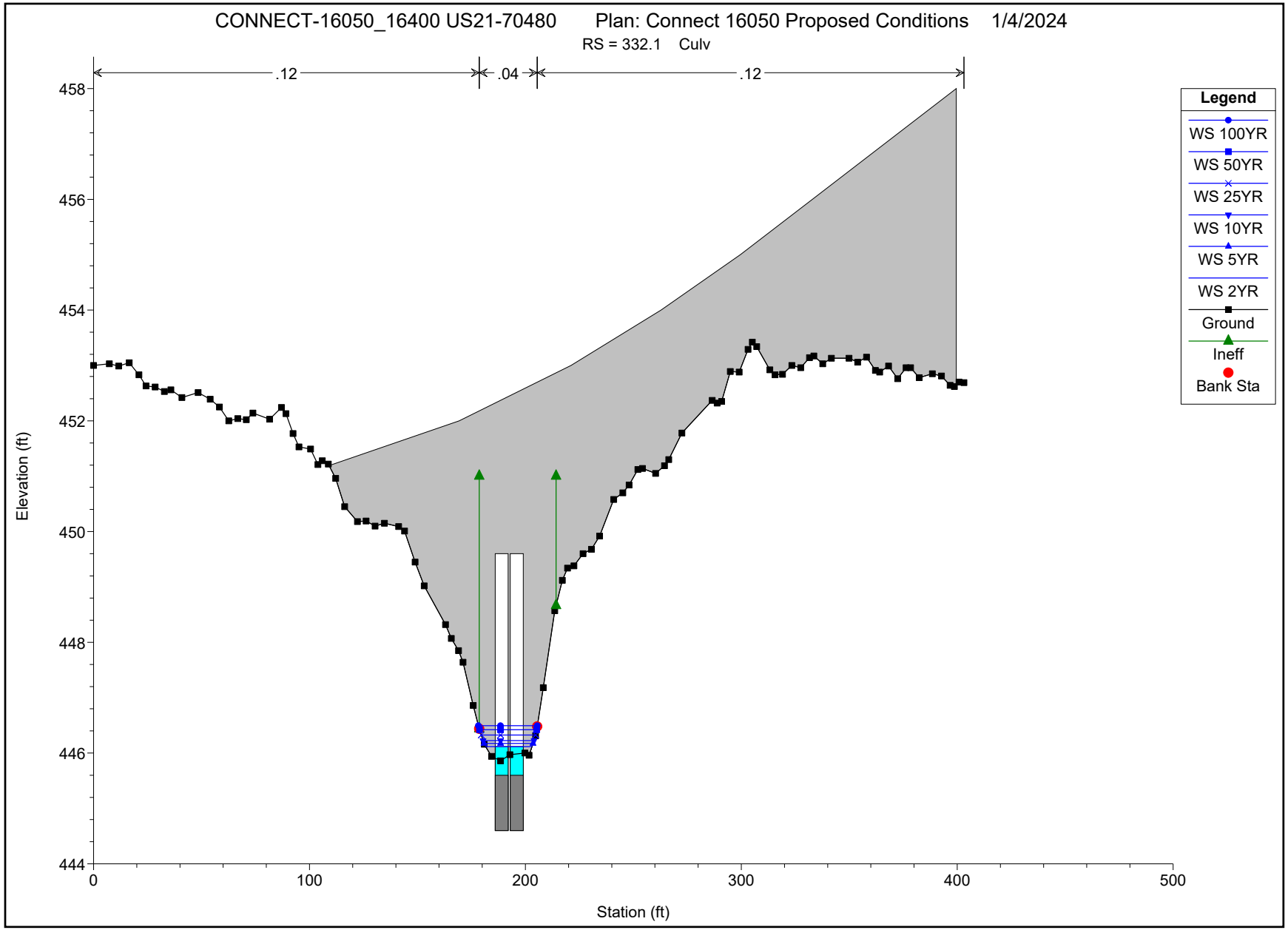


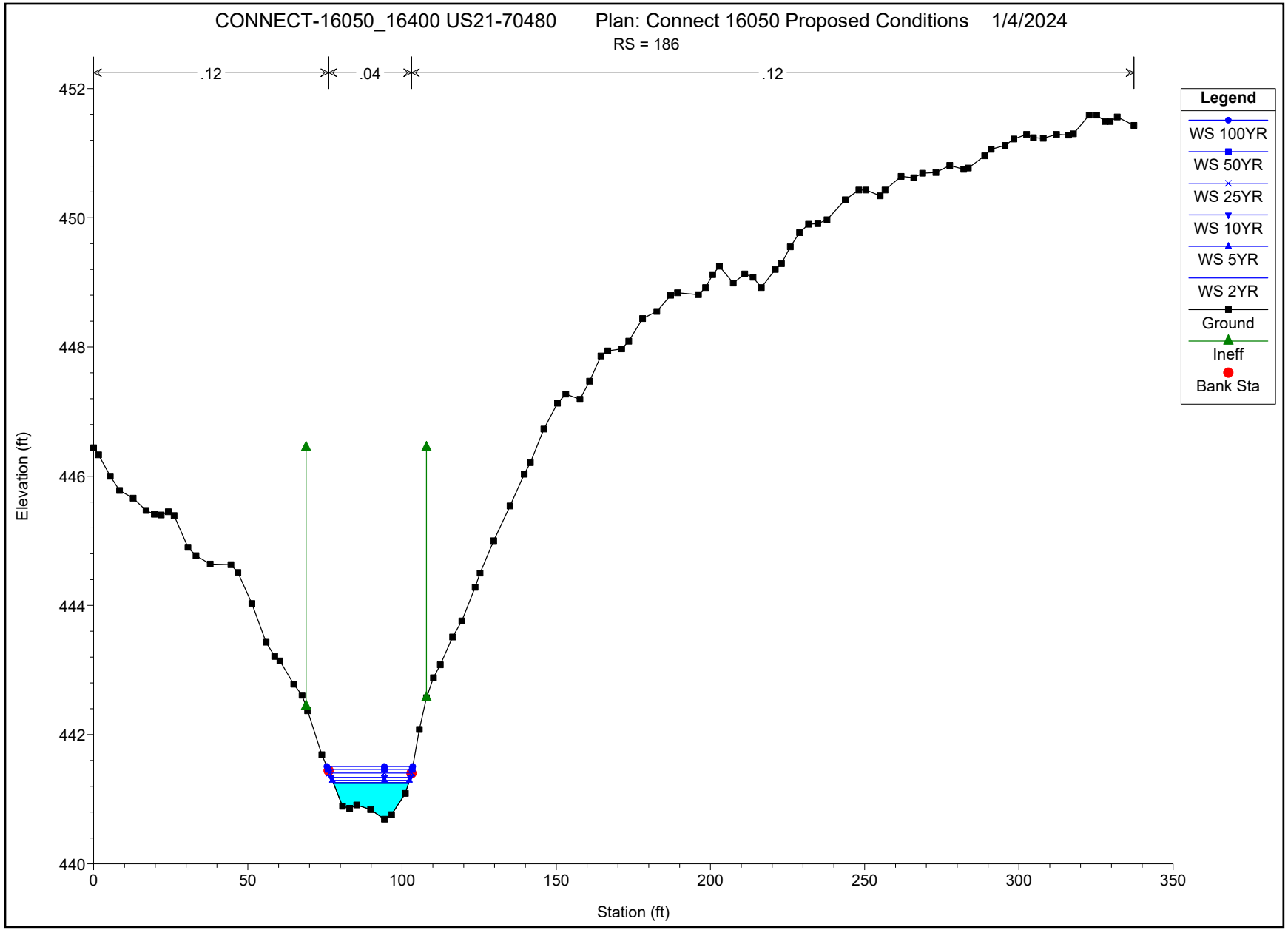

CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Proposed Conditions 1/4/2024
River 1 Reach 1
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
LOB
ROB
Elevation (ft)
Main Channel Distance (ft)
452
450
448
446
444
442
440
438
0
100
200
300
400
500
600
700
800

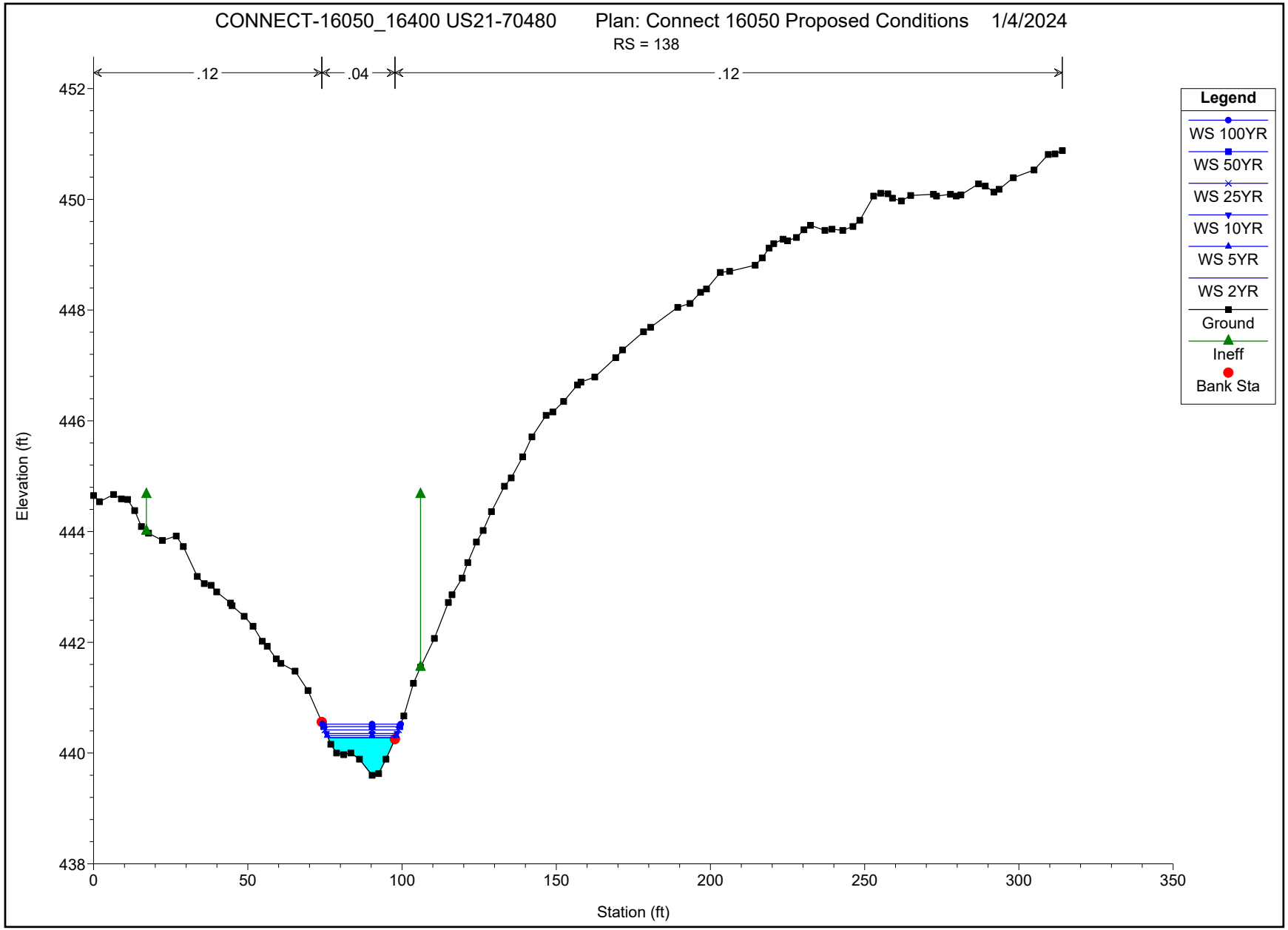

CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Proposed Conditions 1/4/2024
RS = 788
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
458
456
454
452
450
448
0
100
200
300
400
500
Station (ft)

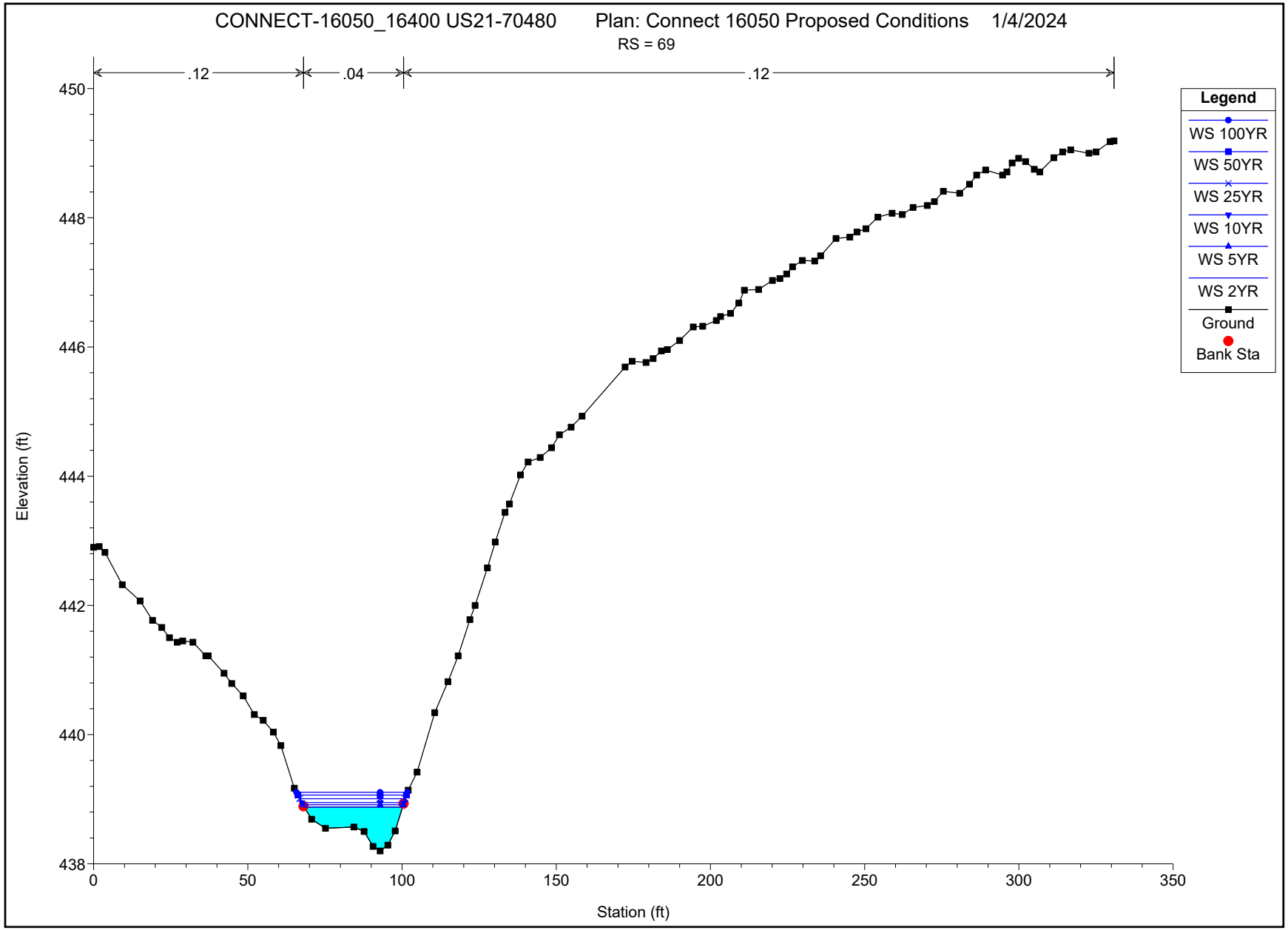

CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Proposed Conditions 1/4/2024
RS = 635
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
456
454
452
450
448
446
0
100
200
300
400
500


CONNECT-16050_16400 US21-70480
Plan: Connect 16050 Proposed Conditions
1/4/2024
RS = 509
.12
.04
.12
454
452
450
448
446
444
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta


CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Proposed Conditions 1/4/2024
RS = 332.1 Culv
.12
.04
.12
458
456
454
452
450
448
446
444
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta


CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Proposed Conditions 1/4/2024
RS = 186
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
452
450
448
446
444
442
440
0
50
100
150
200
250
300
350


CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Proposed Conditions 1/4/2024
RS = 138
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
452
450
448
446
444
442
440
438
0
50
100
150
200
250
300
350


CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Proposed Conditions 1/4/2024
RS = 69
.12
.04
.12
Legend
WS 100YR
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
448
446
444
442
440
438
0
50
100
150
200
250
300
350

HEC-RAS River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	788	25YR	Conn 16050 Nat	42.17	448.95	449.69		449.79	0.011892	2.52	17.03	37.51	0.63
Reach 1	788	25YR	Connect 16050 Proposed Conditions	42.17	448.95	449.70		449.79	0.011652	2.47	17.25	37.50	0.63
Reach 1	788	100YR	Conn 16050 Nat	57.53	448.95	449.79		449.92	0.012054	2.86	20.77	39.38	0.66
Reach 1	788	100YR	Connect 16050 Proposed Conditions	57.53	448.95	449.80		449.92	0.011728	2.78	21.10	39.37	0.65
Reach 1	766.14*	25YR	Conn 16050 Nat	42.17	448.68	449.43		449.53	0.012051	2.52	16.96	37.19	0.64
Reach 1	766.14*	25YR	Connect 16050 Proposed Conditions	42.17	448.68	449.45		449.54	0.011601	2.45	17.26	36.87	0.62
Reach 1	766.14*	100YR	Conn 16050 Nat	57.53	448.68	449.53		449.65	0.012099	2.85	20.69	38.83	0.66
Reach 1	766.14*	100YR	Connect 16050 Proposed Conditions	57.53	448.68	449.54		449.66	0.011729	2.76	20.99	38.56	0.65
Reach 1	744.29*	25YR	Conn 16050 Nat	42.17	448.41	449.17		449.27	0.011878	2.50	17.05	37.06	0.63
Reach 1	744.29*	25YR	Connect 16050 Proposed Conditions	42.17	448.41	449.18		449.28	0.012244	2.48	17.02	36.29	0.64
Reach 1	744.29*	100YR	Conn 16050 Nat	57.53	448.41	449.27		449.39	0.011996	2.84	20.71	38.45	0.66
Reach 1	744.29*	100YR	Connect 16050 Proposed Conditions	57.53	448.41	449.29		449.40	0.011966	2.76	20.86	37.93	0.65
Reach 1	722.43*	25YR	Conn 16050 Nat	42.17	448.14	448.91		449.01	0.011989	2.50	17.03	36.99	0.63
Reach 1	722.43*	25YR	Connect 16050 Proposed Conditions	42.17	448.14	448.92		449.02	0.012074	2.47	17.08	36.23	0.63
Reach 1	722.43*	100YR	Conn 16050 Nat	57.53	448.14	449.00		449.13	0.012213	2.84	20.59	38.20	0.66
Reach 1	722.43*	100YR	Connect 16050 Proposed Conditions	57.53	448.14	449.02		449.14	0.012084	2.75	20.89	37.69	0.65
Reach 1	700.57*	25YR	Conn 16050 Nat	42.17	447.87	448.65		448.74	0.012059	2.49	17.04	37.06	0.64
Reach 1	700.57*	25YR	Connect 16050 Proposed Conditions	42.17	447.87	448.66		448.75	0.012267	2.48	17.02	36.36	0.64
Reach 1	700.57*	100YR	Conn 16050 Nat	57.53	447.87	448.74		448.87	0.012053	2.82	20.71	38.17	0.66
Reach 1	700.57*	100YR	Connect 16050 Proposed Conditions	57.53	447.87	448.76		448.88	0.012220	2.77	20.78	37.64	0.66
Reach 1	678.71*	25YR	Conn 16050 Nat	42.17	447.60	448.38		448.48	0.012312	2.50	16.97	37.11	0.64
Reach 1	678.71*	25YR	Connect 16050 Proposed Conditions	42.17	447.60	448.39		448.49	0.012197	2.47	17.11	36.66	0.64
Reach 1	678.71*	100YR	Conn 16050 Nat	57.53	447.60	448.48		448.60	0.012247	2.82	20.63	38.13	0.66
Reach 1	678.71*	100YR	Connect 16050 Proposed Conditions	57.53	447.60	448.49		448.61	0.012249	2.77	20.78	37.78	0.66
Reach 1	656.86*	25YR	Conn 16050 Nat	42.17	447.33	448.12		448.22	0.012124	2.47	17.10	37.25	0.64
Reach 1	656.86*	25YR	Connect 16050 Proposed Conditions	42.17	447.33	448.12		448.22	0.012400	2.47	17.08	36.98	0.64
Reach 1	656.86*	100YR	Conn 16050 Nat	57.53	447.33	448.22		448.34	0.012085	2.80	20.75	38.17	0.65
Reach 1	656.86*	100YR	Connect 16050 Proposed Conditions	57.53	447.33	448.22		448.34	0.012362	2.77	20.77	37.98	0.66
Reach 1	635	25YR	Conn 16050 Nat	42.17	447.06	447.89		447.97	0.009919	2.32	18.24	37.64	0.58
Reach 1	635	25YR	Connect 16050 Proposed Conditions	42.17	447.06	447.89	447.73	447.97	0.009951	2.29	18.38	37.76	0.58
Reach 1	635	100YR	Conn 16050 Nat	57.53	447.06	447.99		448.10	0.009767	2.61	22.22	38.56	0.59
Reach 1	635	100YR	Connect 16050 Proposed Conditions	57.53	447.06	448.00	447.82	448.10	0.009792	2.57	22.40	38.67	0.59
Reach 1	614.00*	25YR	Conn 16050 Nat	42.17	446.86	447.68		447.76	0.009819	2.36	17.97	36.08	0.58
Reach 1	614.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.86	447.68	447.51	447.76	0.009807	2.33	18.12	36.14	0.58
Reach 1	614.00*	100YR	Conn 16050 Nat	57.53	446.86	447.78		447.89	0.009668	2.65	21.91	37.05	0.59
Reach 1	614.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.86	447.79	447.60	447.89	0.009628	2.61	22.13	37.15	0.59
Reach 1	593.00*	25YR	Conn 16050 Nat	42.17	446.66	447.46		447.55	0.009860	2.40	17.62	34.52	0.58

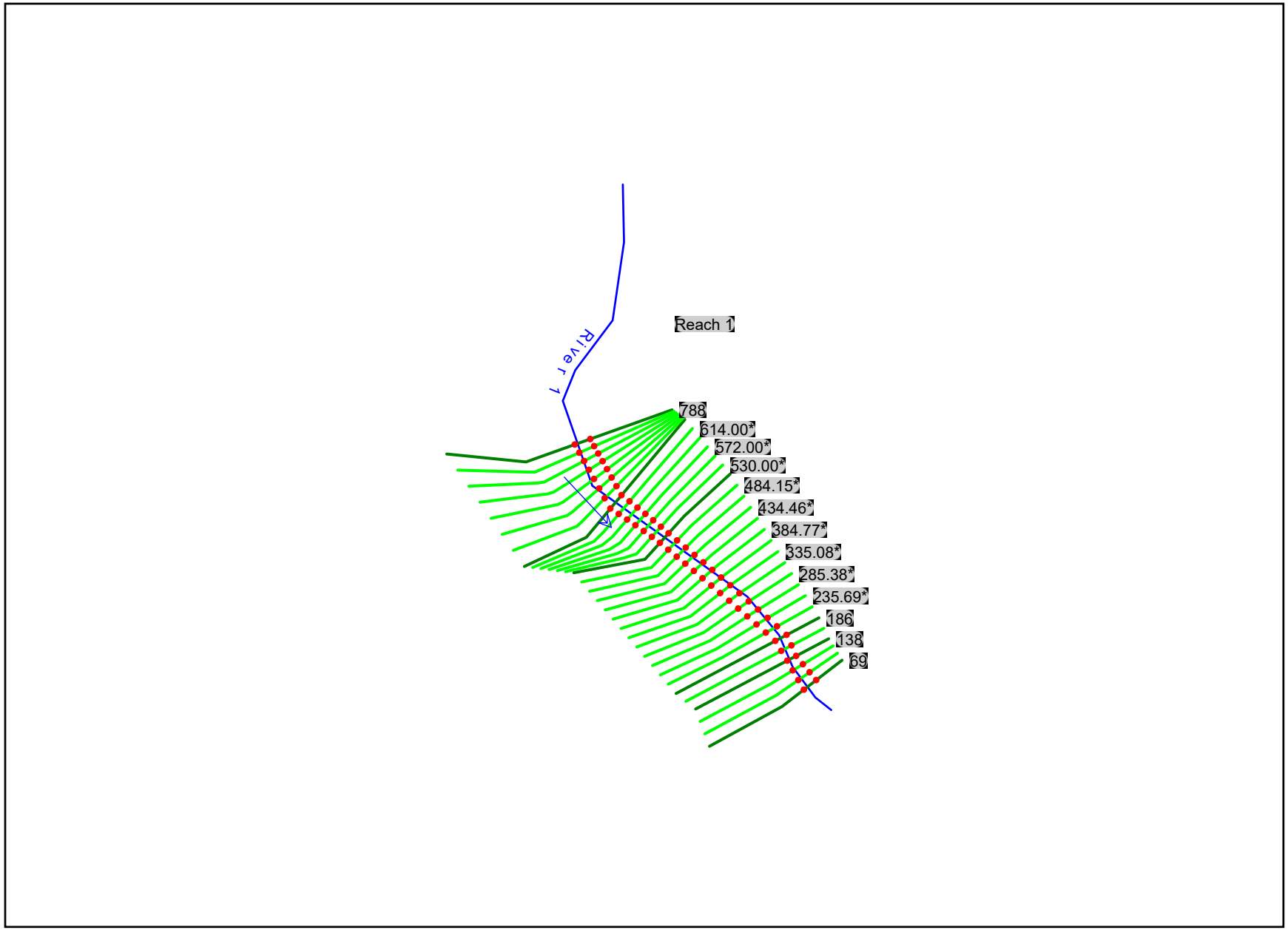
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

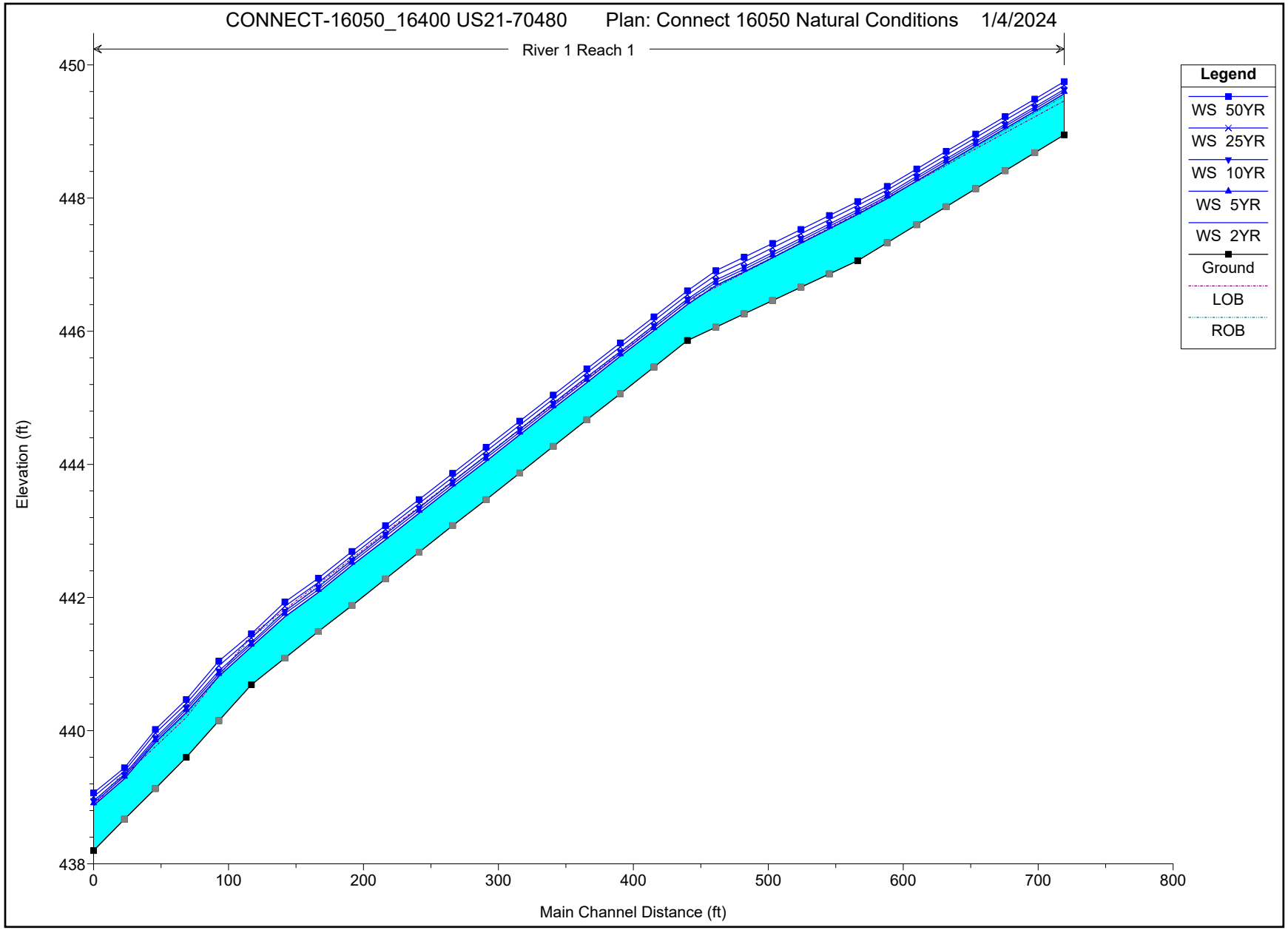
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	593.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.66	447.47	447.30	447.55	0.009786	2.37	17.80	34.58	0.58
Reach 1	593.00*	100YR	Conn 16050 Nat	57.53	446.66	447.58		447.69	0.009684	2.71	21.51	35.54	0.60
Reach 1	593.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.66	447.58	447.39	447.69	0.009611	2.65	21.76	35.65	0.59
Reach 1	572.00*	25YR	Conn 16050 Nat	42.17	446.46	447.25		447.35	0.009787	2.45	17.34	33.06	0.58
Reach 1	572.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.46	447.26	447.09	447.35	0.009803	2.42	17.45	33.09	0.58
Reach 1	572.00*	100YR	Conn 16050 Nat	57.53	446.46	447.37		447.49	0.009546	2.75	21.23	34.13	0.60
Reach 1	572.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.46	447.37	447.18	447.49	0.009483	2.69	21.47	34.26	0.59
Reach 1	551.00*	25YR	Conn 16050 Nat	42.17	446.26	447.04		447.14	0.009764	2.49	17.01	31.55	0.59
Reach 1	551.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.26	447.05	446.87	447.14	0.009726	2.47	17.15	31.65	0.58
Reach 1	551.00*	100YR	Conn 16050 Nat	57.53	446.26	447.16		447.28	0.009437	2.79	20.91	32.70	0.60
Reach 1	551.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.26	447.19	446.97	447.30	0.008460	2.67	21.78	33.07	0.57
Reach 1	530.00*	25YR	Conn 16050 Nat	42.17	446.06	446.84		446.94	0.009339	2.52	16.89	30.16	0.58
Reach 1	530.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.06	446.84	446.66	446.94	0.009363	2.50	16.96	30.19	0.58
Reach 1	530.00*	100YR	Conn 16050 Nat	57.53	446.06	446.96		447.09	0.009340	2.85	20.57	31.34	0.60
Reach 1	530.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.06	447.04	446.76	447.14	0.006458	2.53	23.21	32.24	0.50
Reach 1	509	25YR	Conn 16050 Nat	42.17	445.86	446.55		446.69	0.015511	3.00	14.11	27.84	0.73
Reach 1	509	25YR	Connect 16050 Proposed Conditions	42.17	445.86	446.66	446.45	446.75	0.008065	2.46	17.18	29.09	0.54
Reach 1	509	100YR	Conn 16050 Nat	57.53	445.86	446.65		446.83	0.015759	3.41	17.05	28.90	0.76
Reach 1	509	100YR	Connect 16050 Proposed Conditions	57.53	445.86	446.94	446.54	447.03	0.004420	2.33	25.09	32.03	0.43
Reach 1	484.15*	25YR	Conn 16050 Nat	42.17	445.46	446.16		446.30	0.015746	3.01	14.04	27.77	0.74
Reach 1	484.15*	100YR	Conn 16050 Nat	57.53	445.46	446.26		446.44	0.015898	3.42	17.00	28.85	0.76
Reach 1	459.31*	25YR	Conn 16050 Nat	42.17	445.06	445.76		445.90	0.015702	3.01	14.05	27.73	0.73
Reach 1	459.31*	100YR	Conn 16050 Nat	57.53	445.06	445.87		446.05	0.015517	3.39	17.12	28.85	0.75
Reach 1	434.46*	25YR	Conn 16050 Nat	42.17	444.67	445.37		445.51	0.015638	3.01	14.06	27.70	0.73
Reach 1	434.46*	100YR	Conn 16050 Nat	57.53	444.67	445.48		445.66	0.015934	3.42	16.97	28.78	0.76
Reach 1	409.62*	25YR	Conn 16050 Nat	42.17	444.27	444.98		445.12	0.015626	3.00	14.06	27.68	0.73
Reach 1	409.62*	100YR	Conn 16050 Nat	57.53	444.27	445.09		445.27	0.015851	3.42	17.00	28.76	0.76
Reach 1	384.77*	25YR	Conn 16050 Nat	42.17	443.87	444.59		444.73	0.015793	3.01	14.01	27.60	0.74
Reach 1	384.77*	100YR	Conn 16050 Nat	57.53	443.87	444.69		444.88	0.015919	3.42	16.96	28.71	0.76
Reach 1	359.92*	25YR	Conn 16050 Nat	42.17	443.47	444.20		444.34	0.015722	3.01	14.03	27.56	0.74
Reach 1	359.92*	100YR	Conn 16050 Nat	57.53	443.47	444.30		444.48	0.015627	3.40	17.06	28.71	0.76
Reach 1	335.08*	25YR	Conn 16050 Nat	42.17	443.08	443.81		443.95	0.015671	3.01	14.04	27.54	0.73
Reach 1	335.08*	100YR	Conn 16050 Nat	57.53	443.08	443.91		444.09	0.015940	3.42	16.94	28.64	0.76
Reach 1	310.23*	25YR	Conn 16050 Nat	42.17	442.68	443.41		443.55	0.015685	3.01	14.04	27.51	0.73

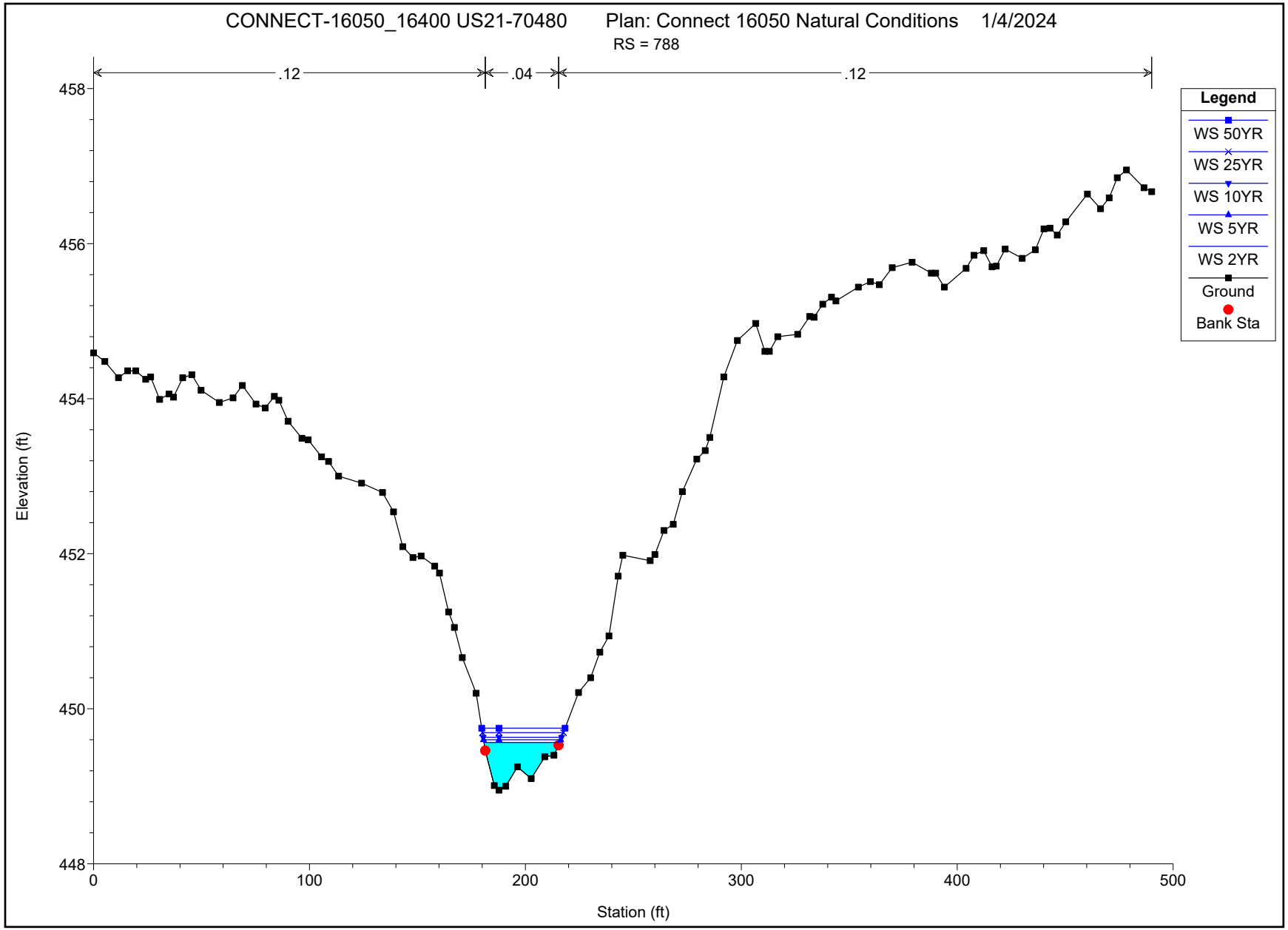
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	310.23*	100YR	Conn 16050 Nat	57.53	442.68	443.52		443.70	0.015875	3.42	16.96	28.64	0.76
Reach 1	285.38*	25YR	Conn 16050 Nat	42.17	442.28	443.02		443.16	0.015771	3.01	14.01	27.41	0.74
Reach 1	285.38*	100YR	Conn 16050 Nat	57.53	442.28	443.12		443.31	0.015945	3.42	16.93	28.56	0.76
Reach 1	260.54*	25YR	Conn 16050 Nat	42.17	441.88	442.63		442.77	0.015364	2.99	14.12	27.42	0.73
Reach 1	260.54*	100YR	Conn 16050 Nat	57.53	441.88	442.74		442.92	0.015333	3.38	17.13	28.62	0.75
Reach 1	235.69*	25YR	Conn 16050 Nat	42.17	441.49	442.23		442.37	0.016843	3.07	13.73	27.20	0.76
Reach 1	235.69*	100YR	Conn 16050 Nat	57.53	441.49	442.34		442.52	0.016436	3.45	16.76	28.47	0.77
Reach 1	210.85*	25YR	Conn 16050 Nat	42.17	441.09	441.87		442.00	0.013327	2.86	14.74	27.59	0.68
Reach 1	210.85*	100YR	Conn 16050 Nat	57.53	441.09	441.97		442.14	0.013830	3.28	17.69	28.82	0.72
Reach 1	186	25YR	Conn 16050 Nat	42.17	440.69	441.39		441.57	0.022293	3.36	12.54	26.50	0.86
Reach 1	186	25YR	Connect 16050 Proposed Conditions	42.17	440.69	441.41	441.35	441.57	0.020759	3.29	12.84	26.64	0.83
Reach 1	186	100YR	Conn 16050 Nat	57.53	440.69	441.50	441.45	441.72	0.021551	3.75	15.39	27.79	0.87
Reach 1	186	100YR	Connect 16050 Proposed Conditions	57.53	440.69	441.51	441.45	441.72	0.020855	3.71	15.55	27.86	0.86
Reach 1	162.00*	25YR	Conn 16050 Nat	42.17	440.15	440.98		441.13	0.015247	3.12	13.65	25.92	0.73
Reach 1	162.00*	25YR	Connect 16050 Proposed Conditions	42.17	440.15	440.97	440.87	441.12	0.016052	3.11	13.59	25.78	0.75
Reach 1	162.00*	100YR	Conn 16050 Nat	57.53	440.15	441.10		441.29	0.014777	3.50	16.87	27.45	0.75
Reach 1	162.00*	100YR	Connect 16050 Proposed Conditions	57.53	440.15	441.09	440.98	441.28	0.015538	3.48	16.72	27.31	0.76
Reach 1	138	25YR	Conn 16050 Nat	42.17	439.60	440.41	440.39	440.64	0.026700	3.88	11.07	23.69	0.96
Reach 1	138	25YR	Connect 16050 Proposed Conditions	42.17	439.60	440.42	440.40	440.64	0.026015	3.75	11.34	23.84	0.94
Reach 1	138	100YR	Conn 16050 Nat	57.53	439.60	440.51	440.51	440.81	0.026279	4.37	13.68	25.20	0.98
Reach 1	138	100YR	Connect 16050 Proposed Conditions	57.53	439.60	440.52	440.51	440.80	0.026427	4.20	13.91	25.32	0.97
Reach 1	115.00*	25YR	Conn 16050 Nat	42.17	439.13	439.96	439.88	440.12	0.017922	3.23	13.28	27.50	0.79
Reach 1	115.00*	25YR	Connect 16050 Proposed Conditions	42.17	439.13	439.98	439.89	440.13	0.017665	3.14	13.52	27.55	0.78
Reach 1	115.00*	100YR	Conn 16050 Nat	57.53	439.13	440.05	439.99	440.27	0.019522	3.75	15.83	28.87	0.84
Reach 1	115.00*	100YR	Connect 16050 Proposed Conditions	57.53	439.13	440.08	440.00	440.28	0.018250	3.58	16.32	29.16	0.81
Reach 1	92.00*	25YR	Conn 16050 Nat	42.17	438.67	439.39	439.39	439.59	0.029866	3.56	11.87	29.40	0.98
Reach 1	92.00*	25YR	Connect 16050 Proposed Conditions	42.17	438.67	439.40	439.39	439.60	0.030743	3.57	11.80	29.17	0.99
Reach 1	92.00*	100YR	Conn 16050 Nat	57.53	438.67	439.48	439.48	439.73	0.029025	3.99	14.54	30.84	0.99
Reach 1	92.00*	100YR	Connect 16050 Proposed Conditions	57.53	438.67	439.49	439.49	439.74	0.030504	4.01	14.41	30.66	1.01
Reach 1	69	25YR	Conn 16050 Nat	42.17	438.20	439.01	438.89	439.12	0.013713	2.68	15.81	34.22	0.68
Reach 1	69	25YR	Connect 16050 Proposed Conditions	42.17	438.20	439.01	438.89	439.12	0.013713	2.68	15.81	34.22	0.68
Reach 1	69	100YR	Conn 16050 Nat	57.53	438.20	439.11	438.98	439.25	0.013705	3.03	19.28	35.98	0.70
Reach 1	69	100YR	Connect 16050 Proposed Conditions	57.53	438.20	439.11	438.98	439.25	0.013705	3.03	19.28	35.98	0.70

CONNECTOR 160+50 NATURAL PLAN




CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Natural Conditions 1/4/2024
River 1 Reach 1
Legend
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
LOB
ROB
Elevation (ft)
450
448
446
444
442
440
438
0
100
200
300
400
500
600
700
800
Main Channel Distance (ft)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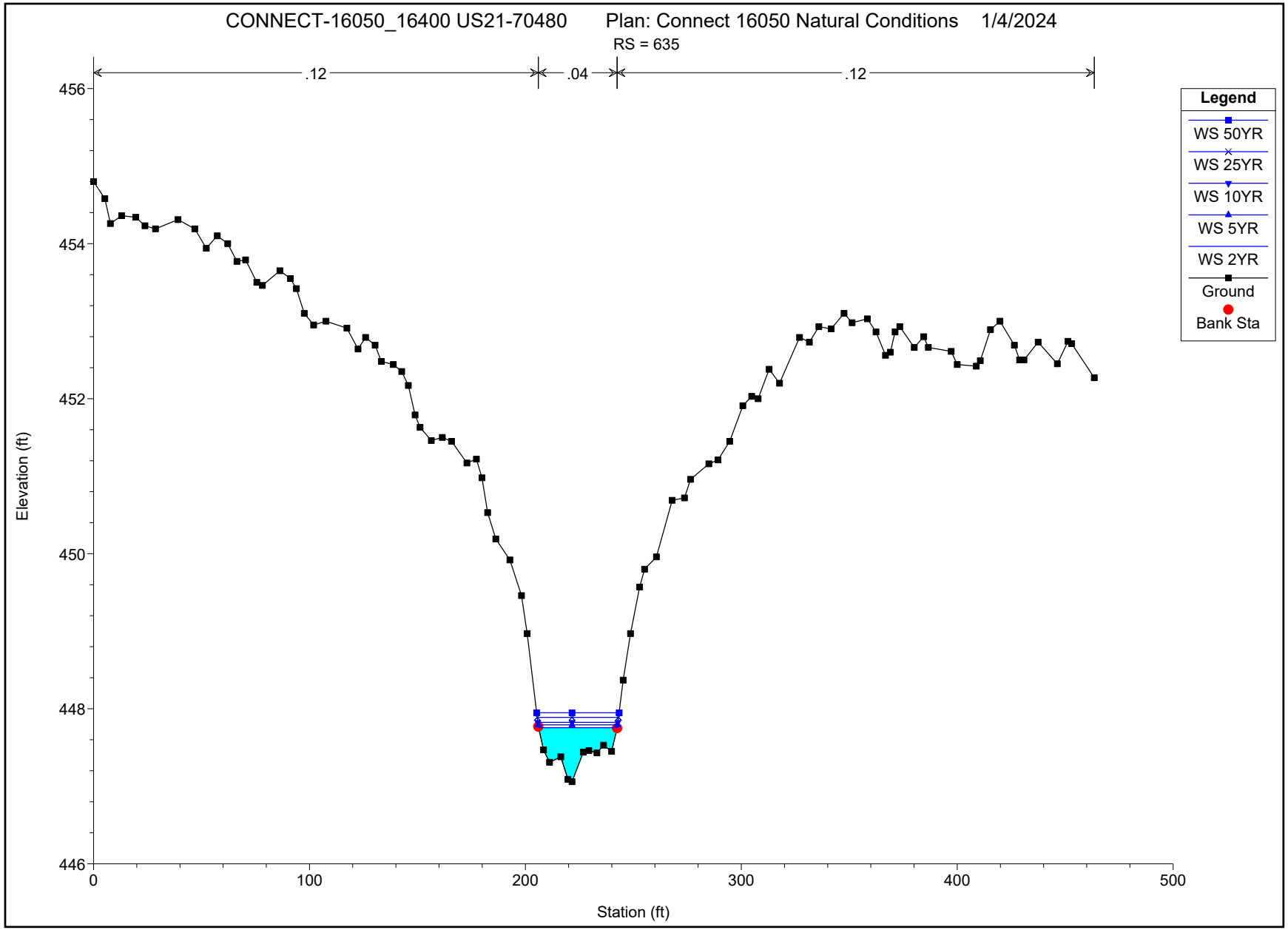
RS = 788
.12
.04
.12
458
456
454
452
450
448
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta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.04
.12
Legend
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
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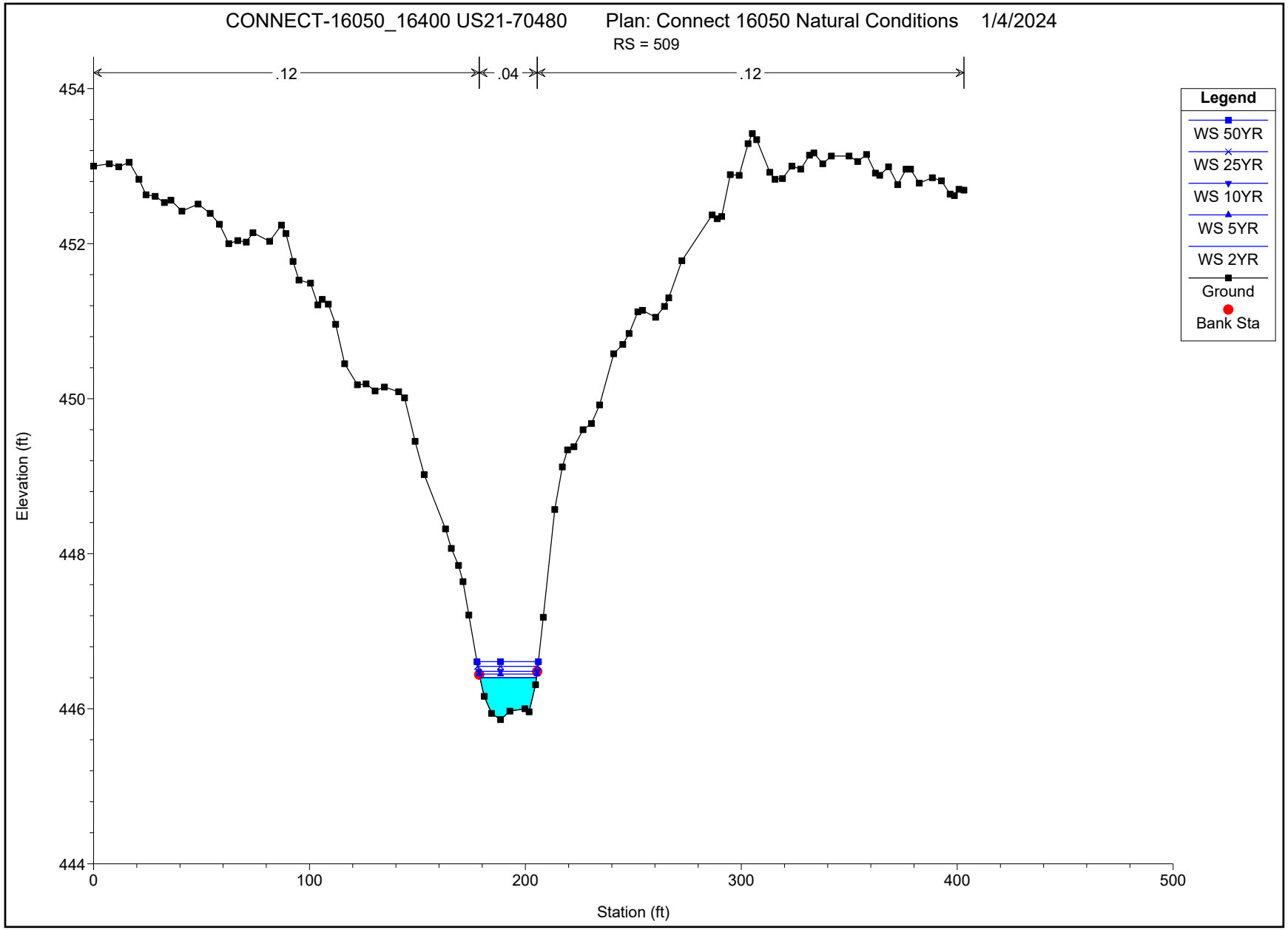
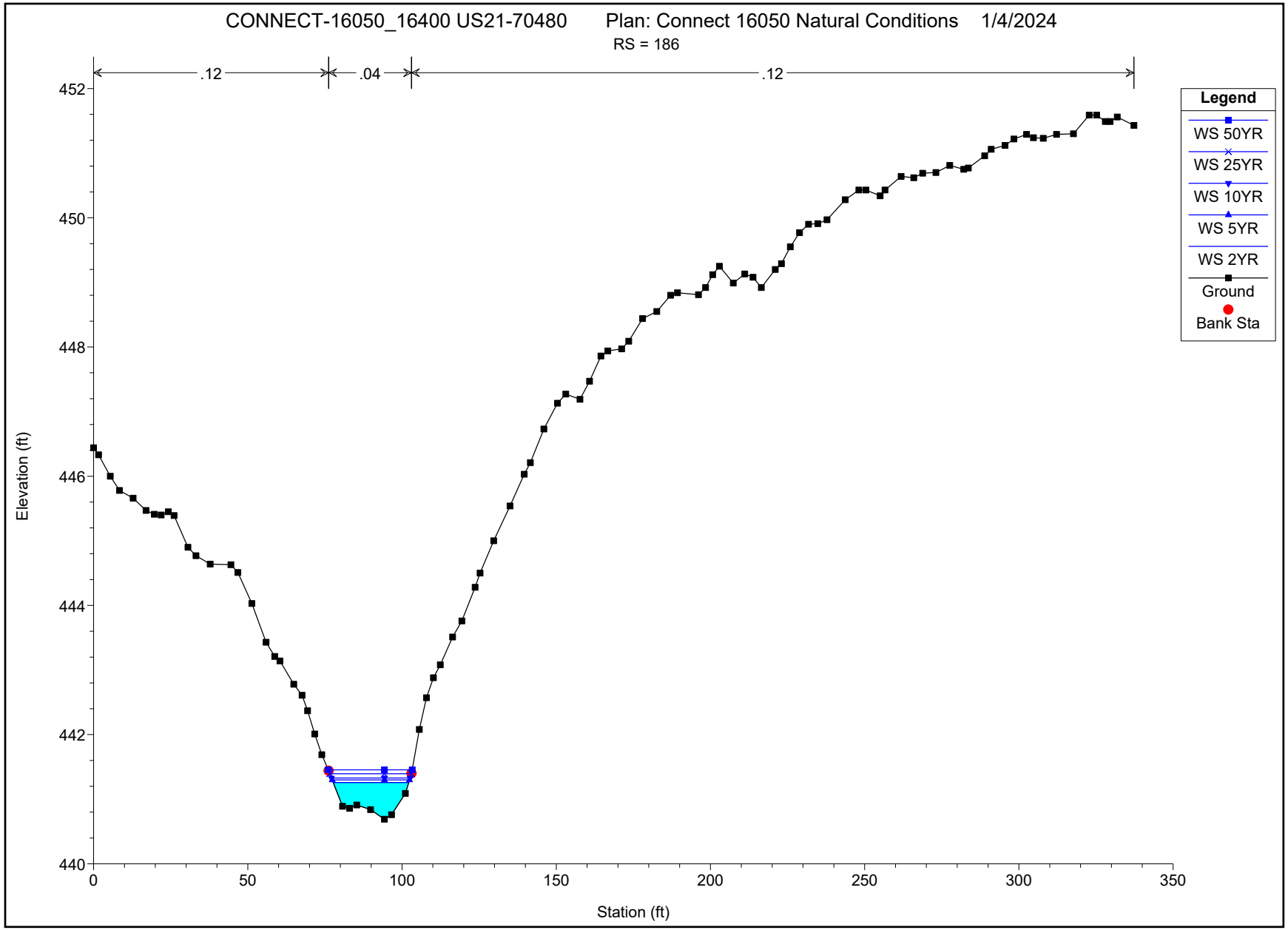
454
452
450
448
446
0
100
200
300
400
500
Station (ft)


CONNECT-16050_16400 US21-70480
Plan: Connect 16050 Natural Conditions
1/4/2024
RS = 509
.12
.04
.12
454
452
450
448
446
444
Elevation (ft)
0
100
200
300
400
500
Station (ft)
Legend
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta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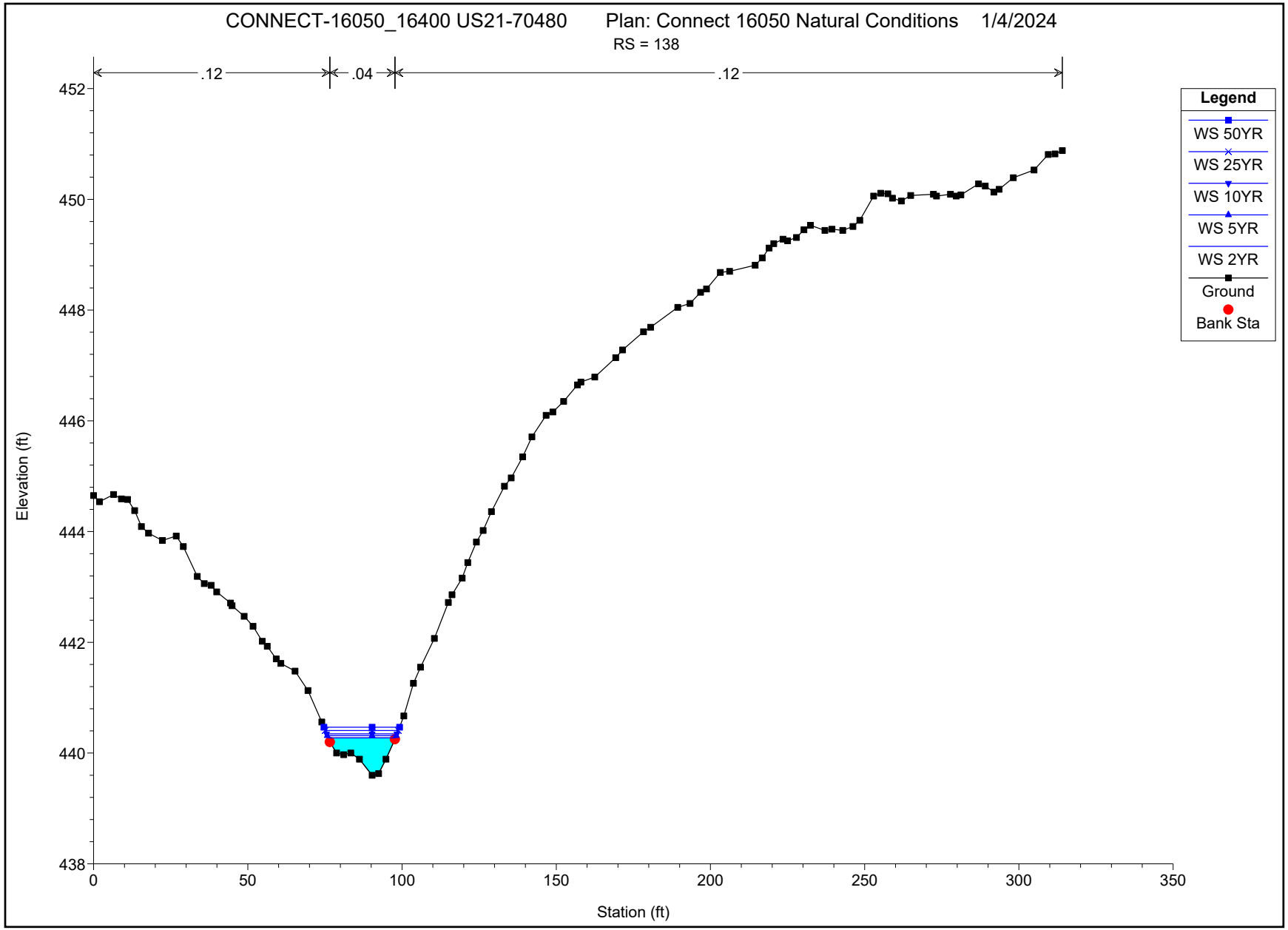
.04
.12
Legend
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
452
450
448
446
444
442
440
0
50
100
150
200
250
300
350


CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Natural Conditions 1/4/2024
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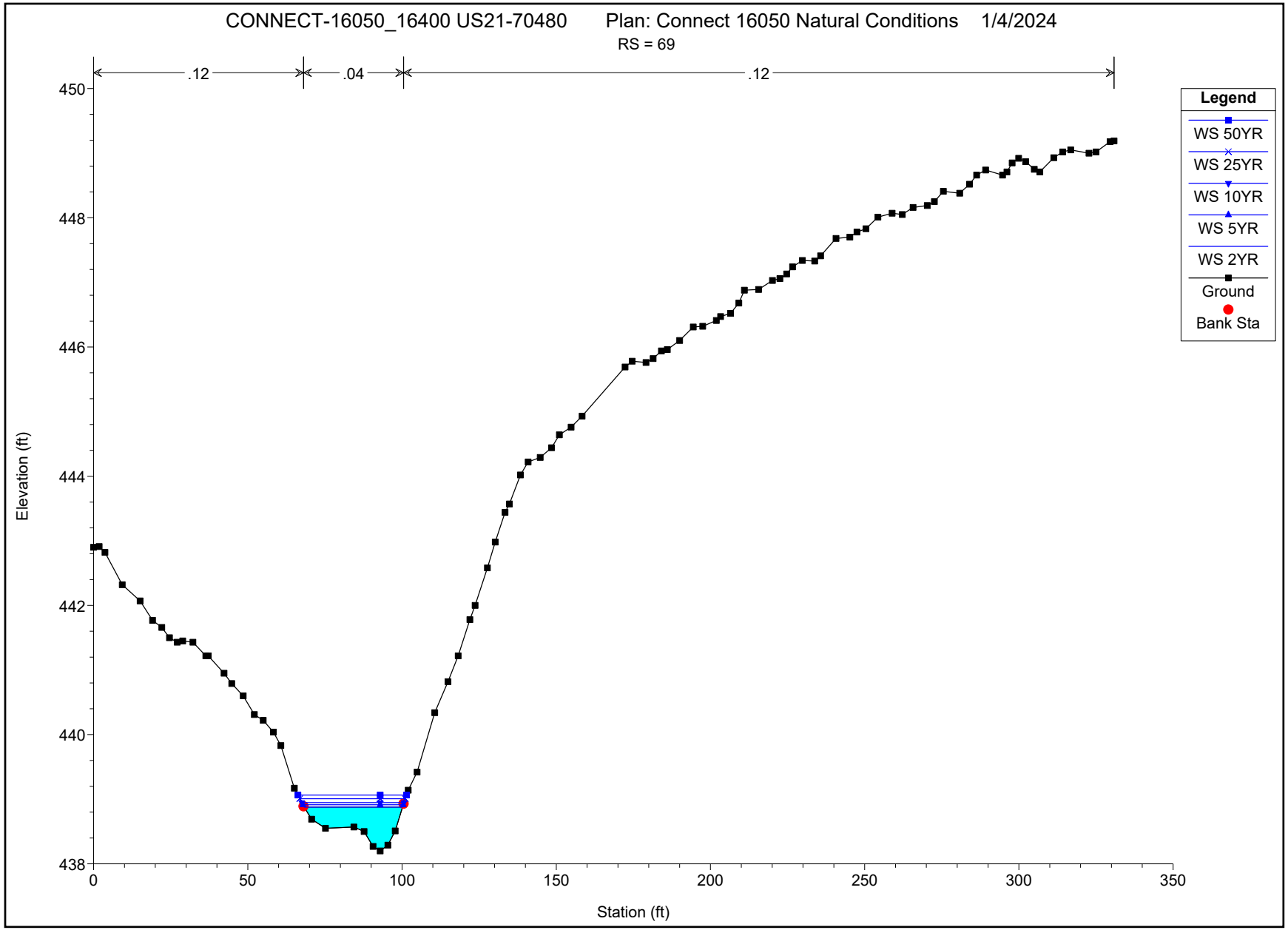
.12
.04
.12
Legend
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
452
450
448
446
444
442
440
438
0
50
100
150
200
250
300
350


CONNECT-16050_16400 US21-70480 Plan: Connect 16050 Natural Conditions 1/4/2024
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.12
.04
.12
Legend
WS 50YR
WS 25YR
WS 10YR
WS 5YR
WS 2YR
Ground
Bank Sta
Elevation (ft)
Station (ft)
450
448
446
444
442
440
438
0
50
100
150
200
250
300
350

HEC-RAS River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	788	25YR	Conn 16050 Nat	42.17	448.95	449.69		449.79	0.011892	2.52	17.03	37.51	0.63
Reach 1	788	25YR	Connect 16050 Proposed Conditions	42.17	448.95	449.70		449.79	0.011652	2.47	17.25	37.50	0.63
Reach 1	788	100YR	Conn 16050 Nat	57.53	448.95	449.79		449.92	0.012054	2.86	20.77	39.38	0.66
Reach 1	788	100YR	Connect 16050 Proposed Conditions	57.53	448.95	449.80		449.92	0.011728	2.78	21.10	39.37	0.65
Reach 1	766.14*	25YR	Conn 16050 Nat	42.17	448.68	449.43		449.53	0.012051	2.52	16.96	37.19	0.64
Reach 1	766.14*	25YR	Connect 16050 Proposed Conditions	42.17	448.68	449.45		449.54	0.011601	2.45	17.26	36.87	0.62
Reach 1	766.14*	100YR	Conn 16050 Nat	57.53	448.68	449.53		449.65	0.012099	2.85	20.69	38.83	0.66
Reach 1	766.14*	100YR	Connect 16050 Proposed Conditions	57.53	448.68	449.54		449.66	0.011729	2.76	20.99	38.56	0.65
Reach 1	744.29*	25YR	Conn 16050 Nat	42.17	448.41	449.17		449.27	0.011878	2.50	17.05	37.06	0.63
Reach 1	744.29*	25YR	Connect 16050 Proposed Conditions	42.17	448.41	449.18		449.28	0.012244	2.48	17.02	36.29	0.64
Reach 1	744.29*	100YR	Conn 16050 Nat	57.53	448.41	449.27		449.39	0.011996	2.84	20.71	38.45	0.66
Reach 1	744.29*	100YR	Connect 16050 Proposed Conditions	57.53	448.41	449.29		449.40	0.011966	2.76	20.86	37.93	0.65
Reach 1	722.43*	25YR	Conn 16050 Nat	42.17	448.14	448.91		449.01	0.011989	2.50	17.03	36.99	0.63
Reach 1	722.43*	25YR	Connect 16050 Proposed Conditions	42.17	448.14	448.92		449.02	0.012074	2.47	17.08	36.23	0.63
Reach 1	722.43*	100YR	Conn 16050 Nat	57.53	448.14	449.00		449.13	0.012213	2.84	20.59	38.20	0.66
Reach 1	722.43*	100YR	Connect 16050 Proposed Conditions	57.53	448.14	449.02		449.14	0.012084	2.75	20.89	37.69	0.65
Reach 1	700.57*	25YR	Conn 16050 Nat	42.17	447.87	448.65		448.74	0.012059	2.49	17.04	37.06	0.64
Reach 1	700.57*	25YR	Connect 16050 Proposed Conditions	42.17	447.87	448.66		448.75	0.012267	2.48	17.02	36.36	0.64
Reach 1	700.57*	100YR	Conn 16050 Nat	57.53	447.87	448.74		448.87	0.012053	2.82	20.71	38.17	0.66
Reach 1	700.57*	100YR	Connect 16050 Proposed Conditions	57.53	447.87	448.76		448.88	0.012220	2.77	20.78	37.64	0.66
Reach 1	678.71*	25YR	Conn 16050 Nat	42.17	447.60	448.38		448.48	0.012312	2.50	16.97	37.11	0.64
Reach 1	678.71*	25YR	Connect 16050 Proposed Conditions	42.17	447.60	448.39		448.49	0.012197	2.47	17.11	36.66	0.64
Reach 1	678.71*	100YR	Conn 16050 Nat	57.53	447.60	448.48		448.60	0.012247	2.82	20.63	38.13	0.66
Reach 1	678.71*	100YR	Connect 16050 Proposed Conditions	57.53	447.60	448.49		448.61	0.012249	2.77	20.78	37.78	0.66
Reach 1	656.86*	25YR	Conn 16050 Nat	42.17	447.33	448.12		448.22	0.012124	2.47	17.10	37.25	0.64
Reach 1	656.86*	25YR	Connect 16050 Proposed Conditions	42.17	447.33	448.12		448.22	0.012400	2.47	17.08	36.98	0.64
Reach 1	656.86*	100YR	Conn 16050 Nat	57.53	447.33	448.22		448.34	0.012085	2.80	20.75	38.17	0.65
Reach 1	656.86*	100YR	Connect 16050 Proposed Conditions	57.53	447.33	448.22		448.34	0.012362	2.77	20.77	37.98	0.66
Reach 1	635	25YR	Conn 16050 Nat	42.17	447.06	447.89		447.97	0.009919	2.32	18.24	37.64	0.58
Reach 1	635	25YR	Connect 16050 Proposed Conditions	42.17	447.06	447.89	447.73	447.97	0.009951	2.29	18.38	37.76	0.58
Reach 1	635	100YR	Conn 16050 Nat	57.53	447.06	447.99		448.10	0.009767	2.61	22.22	38.56	0.59
Reach 1	635	100YR	Connect 16050 Proposed Conditions	57.53	447.06	448.00	447.82	448.10	0.009792	2.57	22.40	38.67	0.59
Reach 1	614.00*	25YR	Conn 16050 Nat	42.17	446.86	447.68		447.76	0.009819	2.36	17.97	36.08	0.58
Reach 1	614.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.86	447.68	447.51	447.76	0.009807	2.33	18.12	36.14	0.58
Reach 1	614.00*	100YR	Conn 16050 Nat	57.53	446.86	447.78		447.89	0.009668	2.65	21.91	37.05	0.59
Reach 1	614.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.86	447.79	447.60	447.89	0.009628	2.61	22.13	37.15	0.59
Reach 1	593.00*	25YR	Conn 16050 Nat	42.17	446.66	447.46		447.55	0.009860	2.40	17.62	34.52	0.58

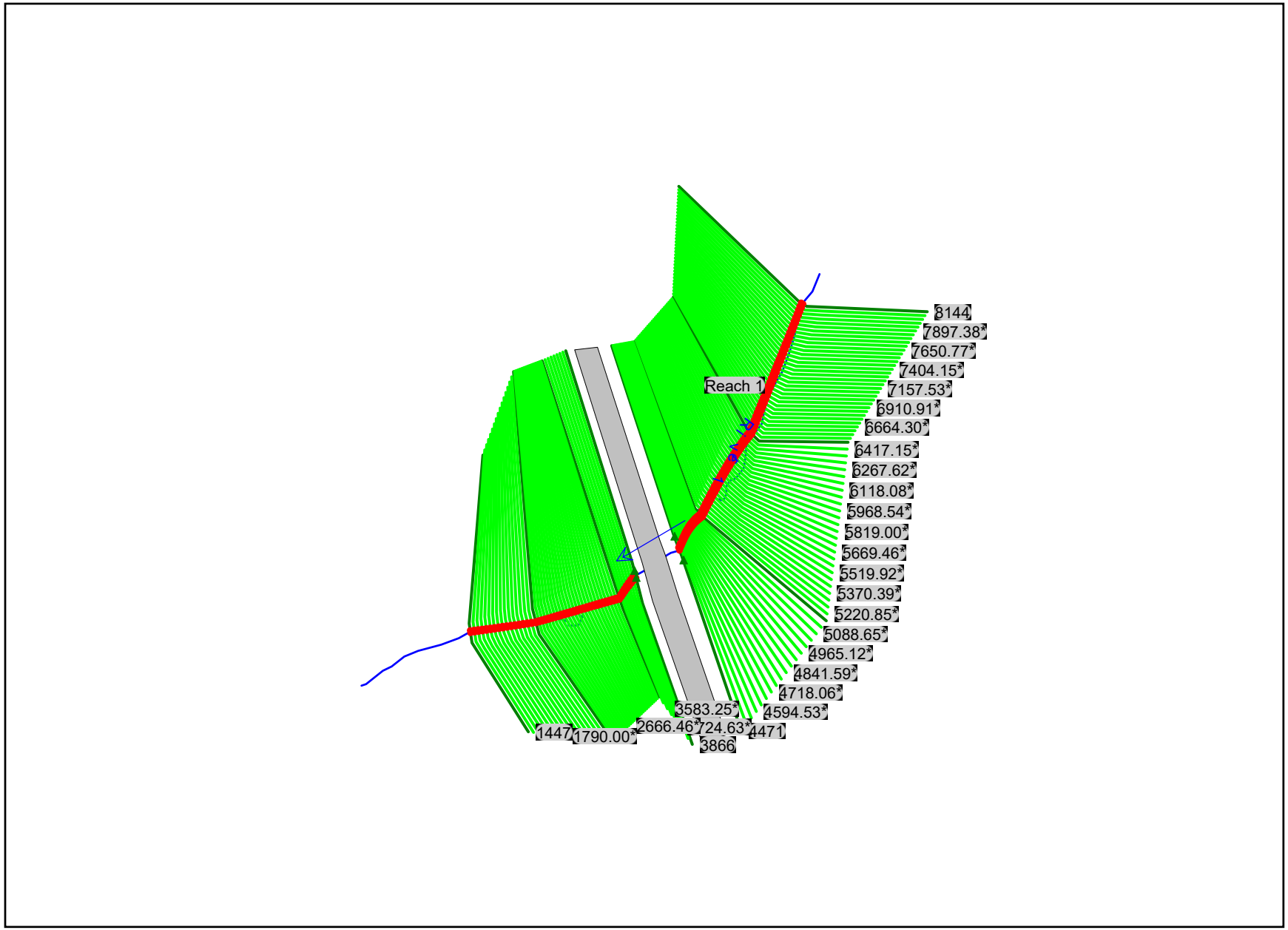
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

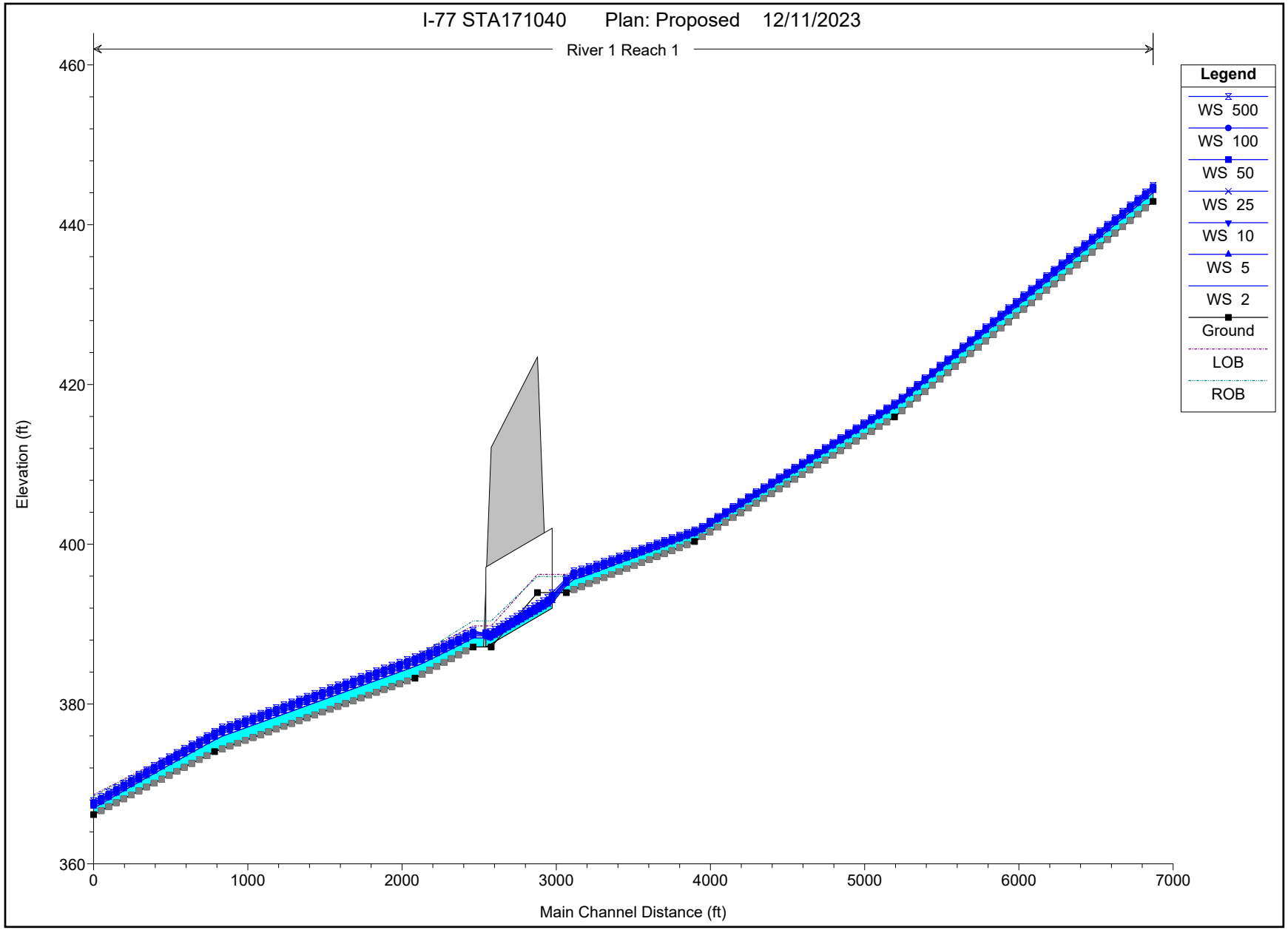
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	593.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.66	447.47	447.30	447.55	0.009786	2.37	17.80	34.58	0.58
Reach 1	593.00*	100YR	Conn 16050 Nat	57.53	446.66	447.58		447.69	0.009684	2.71	21.51	35.54	0.60
Reach 1	593.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.66	447.58	447.39	447.69	0.009611	2.65	21.76	35.65	0.59
Reach 1	572.00*	25YR	Conn 16050 Nat	42.17	446.46	447.25		447.35	0.009787	2.45	17.34	33.06	0.58
Reach 1	572.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.46	447.26	447.09	447.35	0.009803	2.42	17.45	33.09	0.58
Reach 1	572.00*	100YR	Conn 16050 Nat	57.53	446.46	447.37		447.49	0.009546	2.75	21.23	34.13	0.60
Reach 1	572.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.46	447.37	447.18	447.49	0.009483	2.69	21.47	34.26	0.59
Reach 1	551.00*	25YR	Conn 16050 Nat	42.17	446.26	447.04		447.14	0.009764	2.49	17.01	31.55	0.59
Reach 1	551.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.26	447.05	446.87	447.14	0.009726	2.47	17.15	31.65	0.58
Reach 1	551.00*	100YR	Conn 16050 Nat	57.53	446.26	447.16		447.28	0.009437	2.79	20.91	32.70	0.60
Reach 1	551.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.26	447.19	446.97	447.30	0.008460	2.67	21.78	33.07	0.57
Reach 1	530.00*	25YR	Conn 16050 Nat	42.17	446.06	446.84		446.94	0.009339	2.52	16.89	30.16	0.58
Reach 1	530.00*	25YR	Connect 16050 Proposed Conditions	42.17	446.06	446.84	446.66	446.94	0.009363	2.50	16.96	30.19	0.58
Reach 1	530.00*	100YR	Conn 16050 Nat	57.53	446.06	446.96		447.09	0.009340	2.85	20.57	31.34	0.60
Reach 1	530.00*	100YR	Connect 16050 Proposed Conditions	57.53	446.06	447.04	446.76	447.14	0.006458	2.53	23.21	32.24	0.50
Reach 1	509	25YR	Conn 16050 Nat	42.17	445.86	446.55		446.69	0.015511	3.00	14.11	27.84	0.73
Reach 1	509	25YR	Connect 16050 Proposed Conditions	42.17	445.86	446.66	446.45	446.75	0.008065	2.46	17.18	29.09	0.54
Reach 1	509	100YR	Conn 16050 Nat	57.53	445.86	446.65		446.83	0.015759	3.41	17.05	28.90	0.76
Reach 1	509	100YR	Connect 16050 Proposed Conditions	57.53	445.86	446.94	446.54	447.03	0.004420	2.33	25.09	32.03	0.43
Reach 1	484.15*	25YR	Conn 16050 Nat	42.17	445.46	446.16		446.30	0.015746	3.01	14.04	27.77	0.74
Reach 1	484.15*	100YR	Conn 16050 Nat	57.53	445.46	446.26		446.44	0.015898	3.42	17.00	28.85	0.76
Reach 1	459.31*	25YR	Conn 16050 Nat	42.17	445.06	445.76		445.90	0.015702	3.01	14.05	27.73	0.73
Reach 1	459.31*	100YR	Conn 16050 Nat	57.53	445.06	445.87		446.05	0.015517	3.39	17.12	28.85	0.75
Reach 1	434.46*	25YR	Conn 16050 Nat	42.17	444.67	445.37		445.51	0.015638	3.01	14.06	27.70	0.73
Reach 1	434.46*	100YR	Conn 16050 Nat	57.53	444.67	445.48		445.66	0.015934	3.42	16.97	28.78	0.76
Reach 1	409.62*	25YR	Conn 16050 Nat	42.17	444.27	444.98		445.12	0.015626	3.00	14.06	27.68	0.73
Reach 1	409.62*	100YR	Conn 16050 Nat	57.53	444.27	445.09		445.27	0.015851	3.42	17.00	28.76	0.76
Reach 1	384.77*	25YR	Conn 16050 Nat	42.17	443.87	444.59		444.73	0.015793	3.01	14.01	27.60	0.74
Reach 1	384.77*	100YR	Conn 16050 Nat	57.53	443.87	444.69		444.88	0.015919	3.42	16.96	28.71	0.76
Reach 1	359.92*	25YR	Conn 16050 Nat	42.17	443.47	444.20		444.34	0.015722	3.01	14.03	27.56	0.74
Reach 1	359.92*	100YR	Conn 16050 Nat	57.53	443.47	444.30		444.48	0.015627	3.40	17.06	28.71	0.76
Reach 1	335.08*	25YR	Conn 16050 Nat	42.17	443.08	443.81		443.95	0.015671	3.01	14.04	27.54	0.73
Reach 1	335.08*	100YR	Conn 16050 Nat	57.53	443.08	443.91		444.09	0.015940	3.42	16.94	28.64	0.76
Reach 1	310.23*	25YR	Conn 16050 Nat	42.17	442.68	443.41		443.55	0.015685	3.01	14.04	27.51	0.73

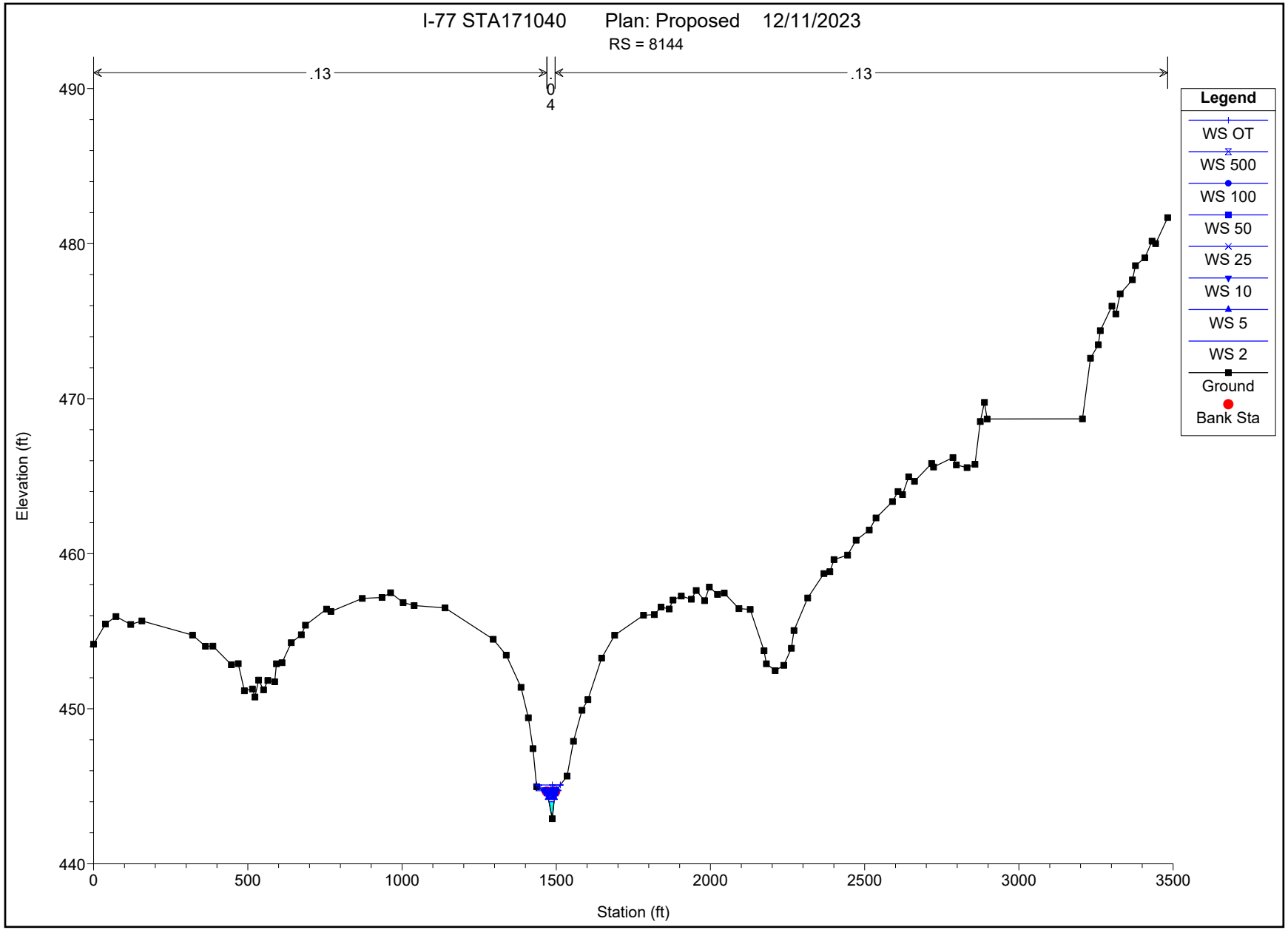
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	310.23*	100YR	Conn 16050 Nat	57.53	442.68	443.52		443.70	0.015875	3.42	16.96	28.64	0.76
Reach 1	285.38*	25YR	Conn 16050 Nat	42.17	442.28	443.02		443.16	0.015771	3.01	14.01	27.41	0.74
Reach 1	285.38*	100YR	Conn 16050 Nat	57.53	442.28	443.12		443.31	0.015945	3.42	16.93	28.56	0.76
Reach 1	260.54*	25YR	Conn 16050 Nat	42.17	441.88	442.63		442.77	0.015364	2.99	14.12	27.42	0.73
Reach 1	260.54*	100YR	Conn 16050 Nat	57.53	441.88	442.74		442.92	0.015333	3.38	17.13	28.62	0.75
Reach 1	235.69*	25YR	Conn 16050 Nat	42.17	441.49	442.23		442.37	0.016843	3.07	13.73	27.20	0.76
Reach 1	235.69*	100YR	Conn 16050 Nat	57.53	441.49	442.34		442.52	0.016436	3.45	16.76	28.47	0.77
Reach 1	210.85*	25YR	Conn 16050 Nat	42.17	441.09	441.87		442.00	0.013327	2.86	14.74	27.59	0.68
Reach 1	210.85*	100YR	Conn 16050 Nat	57.53	441.09	441.97		442.14	0.013830	3.28	17.69	28.82	0.72
Reach 1	186	25YR	Conn 16050 Nat	42.17	440.69	441.39		441.57	0.022293	3.36	12.54	26.50	0.86
Reach 1	186	25YR	Connect 16050 Proposed Conditions	42.17	440.69	441.41	441.35	441.57	0.020759	3.29	12.84	26.64	0.83
Reach 1	186	100YR	Conn 16050 Nat	57.53	440.69	441.50	441.45	441.72	0.021551	3.75	15.39	27.79	0.87
Reach 1	186	100YR	Connect 16050 Proposed Conditions	57.53	440.69	441.51	441.45	441.72	0.020855	3.71	15.55	27.86	0.86
Reach 1	162.00*	25YR	Conn 16050 Nat	42.17	440.15	440.98		441.13	0.015247	3.12	13.65	25.92	0.73
Reach 1	162.00*	25YR	Connect 16050 Proposed Conditions	42.17	440.15	440.97	440.87	441.12	0.016052	3.11	13.59	25.78	0.75
Reach 1	162.00*	100YR	Conn 16050 Nat	57.53	440.15	441.10		441.29	0.014777	3.50	16.87	27.45	0.75
Reach 1	162.00*	100YR	Connect 16050 Proposed Conditions	57.53	440.15	441.09	440.98	441.28	0.015538	3.48	16.72	27.31	0.76
Reach 1	138	25YR	Conn 16050 Nat	42.17	439.60	440.41	440.39	440.64	0.026700	3.88	11.07	23.69	0.96
Reach 1	138	25YR	Connect 16050 Proposed Conditions	42.17	439.60	440.42	440.40	440.64	0.026015	3.75	11.34	23.84	0.94
Reach 1	138	100YR	Conn 16050 Nat	57.53	439.60	440.51	440.51	440.81	0.026279	4.37	13.68	25.20	0.98
Reach 1	138	100YR	Connect 16050 Proposed Conditions	57.53	439.60	440.52	440.51	440.80	0.026427	4.20	13.91	25.32	0.97
Reach 1	115.00*	25YR	Conn 16050 Nat	42.17	439.13	439.96	439.88	440.12	0.017922	3.23	13.28	27.50	0.79
Reach 1	115.00*	25YR	Connect 16050 Proposed Conditions	42.17	439.13	439.98	439.89	440.13	0.017665	3.14	13.52	27.55	0.78
Reach 1	115.00*	100YR	Conn 16050 Nat	57.53	439.13	440.05	439.99	440.27	0.019522	3.75	15.83	28.87	0.84
Reach 1	115.00*	100YR	Connect 16050 Proposed Conditions	57.53	439.13	440.08	440.00	440.28	0.018250	3.58	16.32	29.16	0.81
Reach 1	92.00*	25YR	Conn 16050 Nat	42.17	438.67	439.39	439.39	439.59	0.029866	3.56	11.87	29.40	0.98
Reach 1	92.00*	25YR	Connect 16050 Proposed Conditions	42.17	438.67	439.40	439.39	439.60	0.030743	3.57	11.80	29.17	0.99
Reach 1	92.00*	100YR	Conn 16050 Nat	57.53	438.67	439.48	439.48	439.73	0.029025	3.99	14.54	30.84	0.99
Reach 1	92.00*	100YR	Connect 16050 Proposed Conditions	57.53	438.67	439.49	439.49	439.74	0.030504	4.01	14.41	30.66	1.01
Reach 1	69	25YR	Conn 16050 Nat	42.17	438.20	439.01	438.89	439.12	0.013713	2.68	15.81	34.22	0.68
Reach 1	69	25YR	Connect 16050 Proposed Conditions	42.17	438.20	439.01	438.89	439.12	0.013713	2.68	15.81	34.22	0.68
Reach 1	69	100YR	Conn 16050 Nat	57.53	438.20	439.11	438.98	439.25	0.013705	3.03	19.28	35.98	0.70
Reach 1	69	100YR	Connect 16050 Proposed Conditions	57.53	438.20	439.11	438.98	439.25	0.013705	3.03	19.28	35.98	0.70

I-77 1710+40 PROPOSED PLAN




I-77 STA171040 Plan: Proposed 12/11/2023
River 1 Reach 1
Legend
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
LOB
ROB
Elevation (ft)
460
440
420
400
380
360
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)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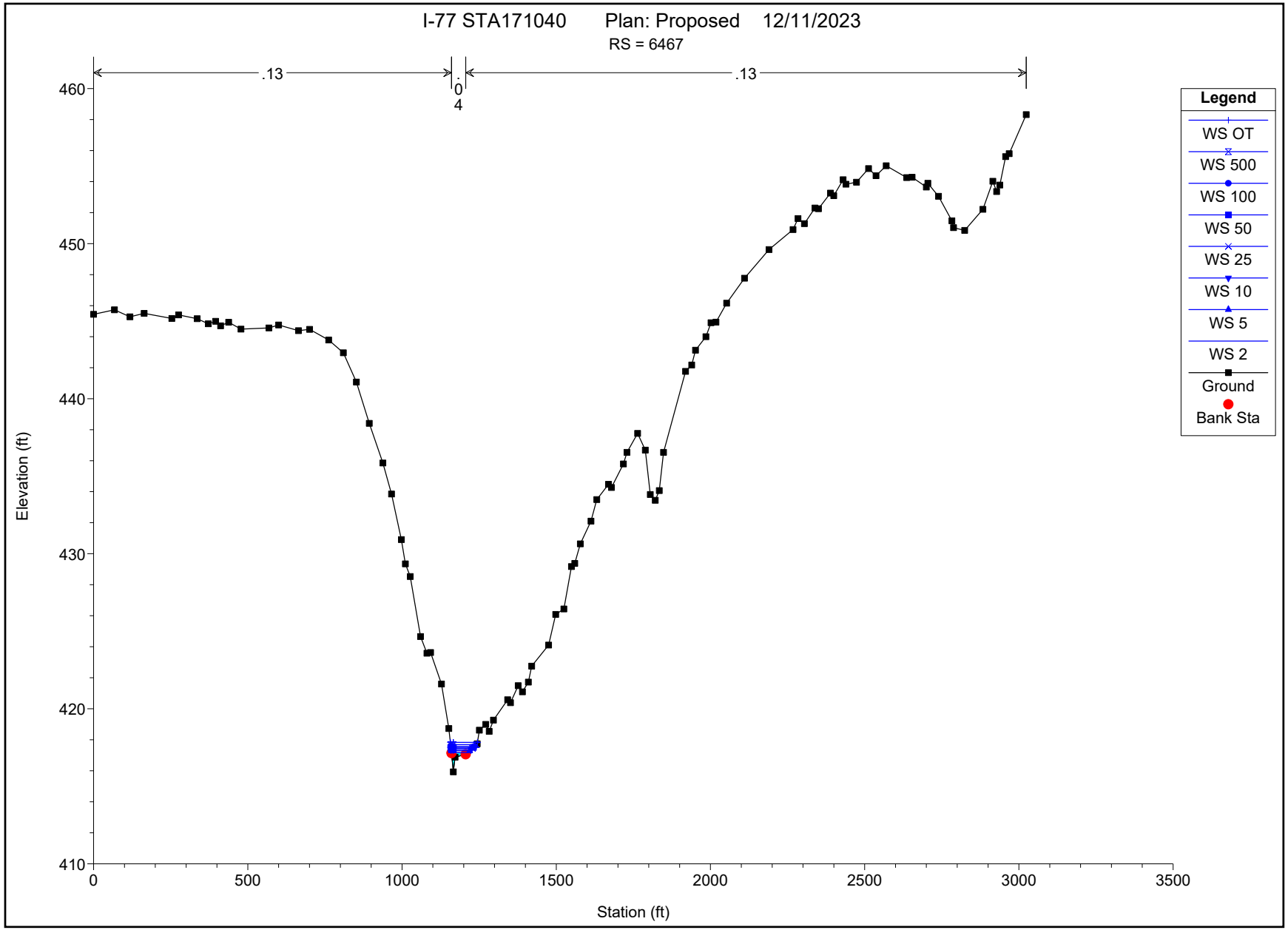
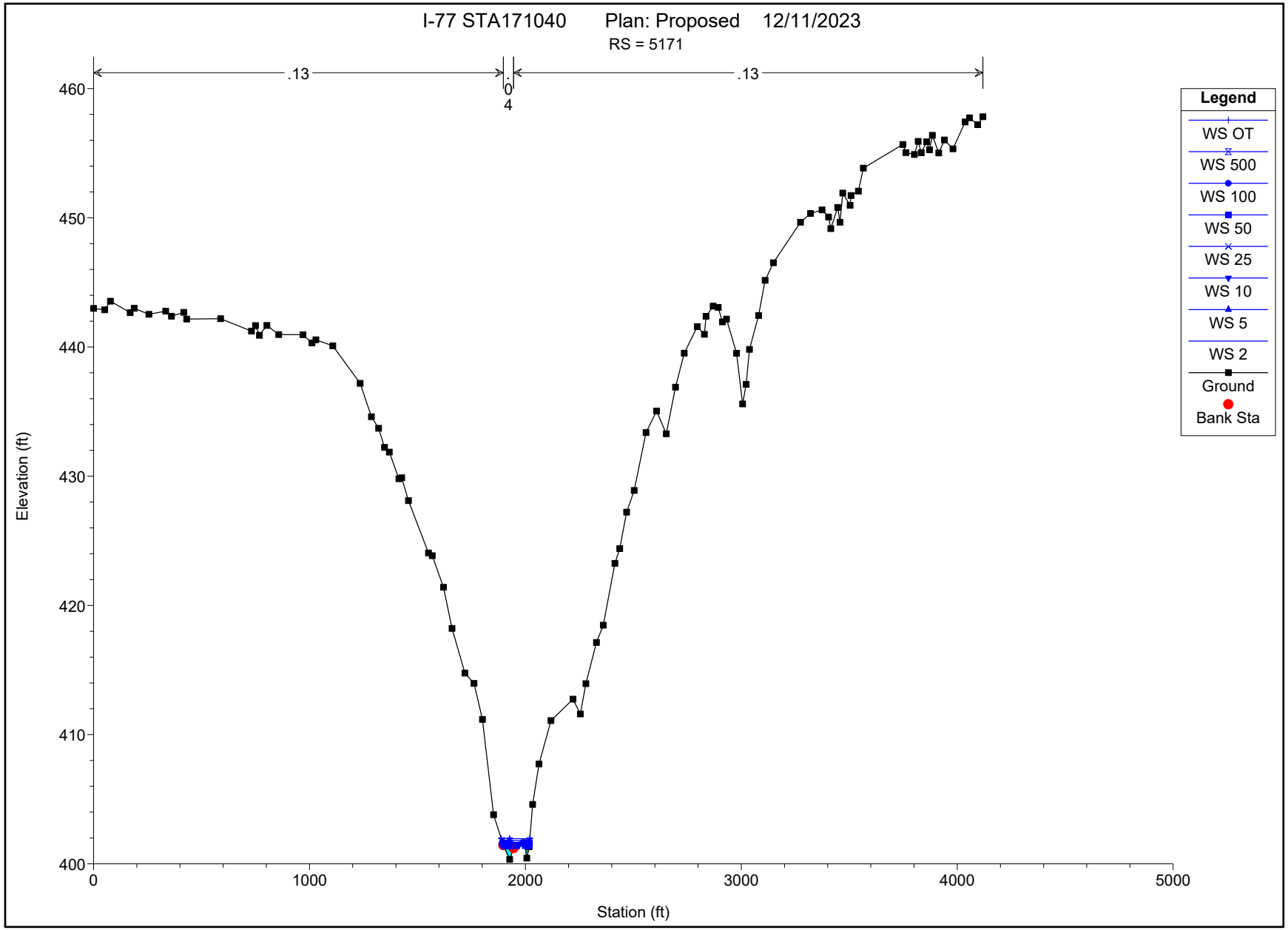
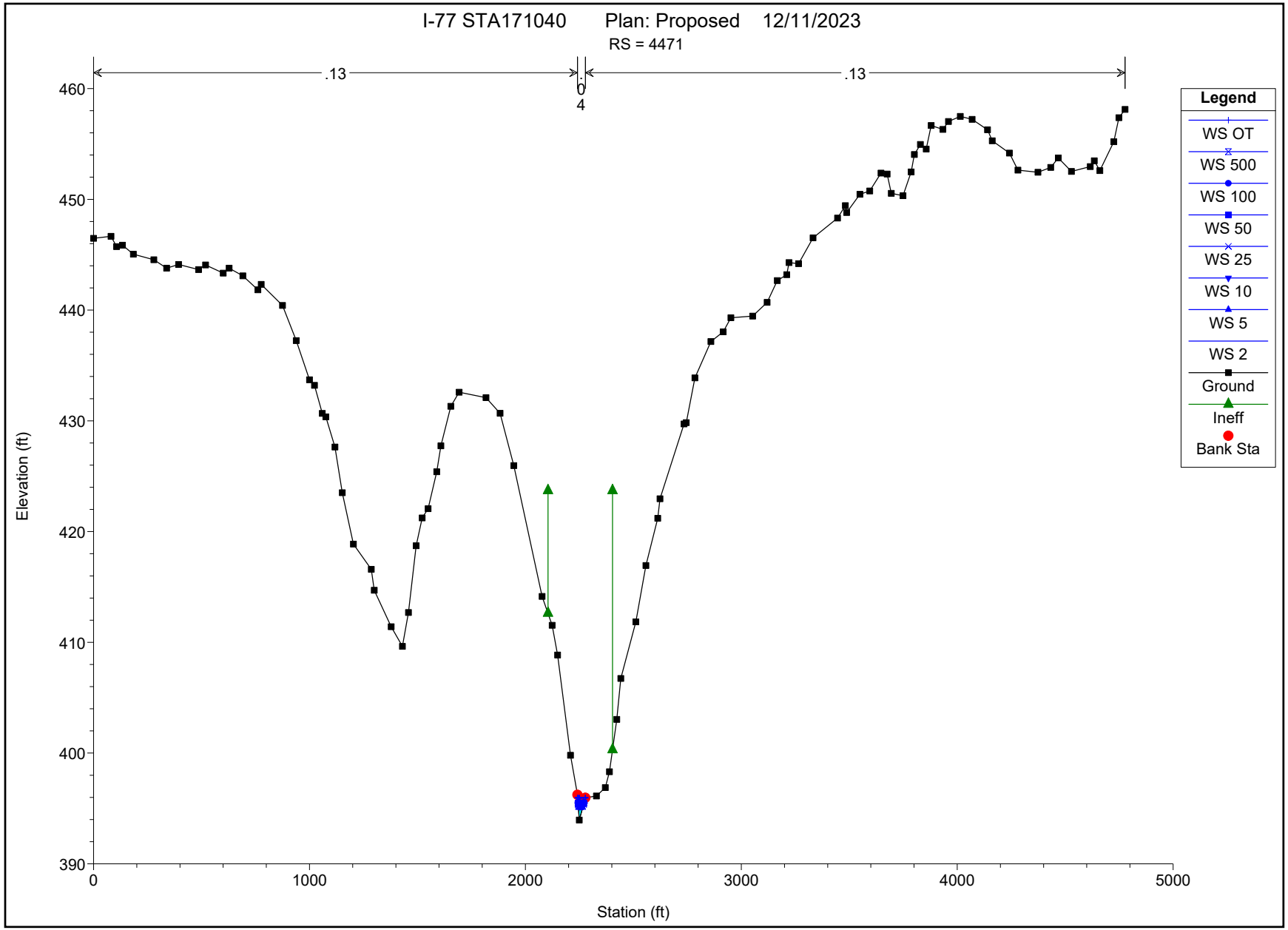
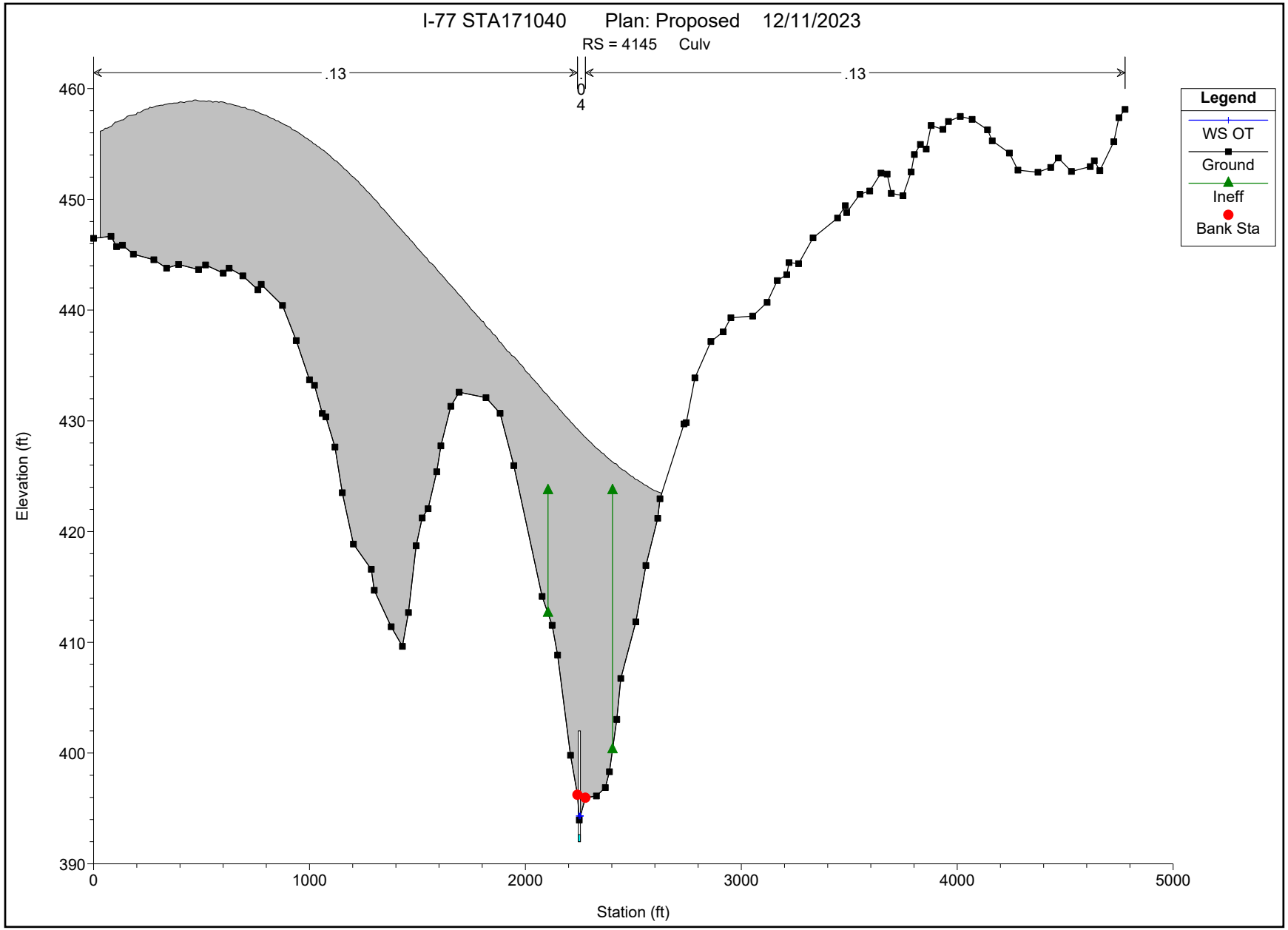
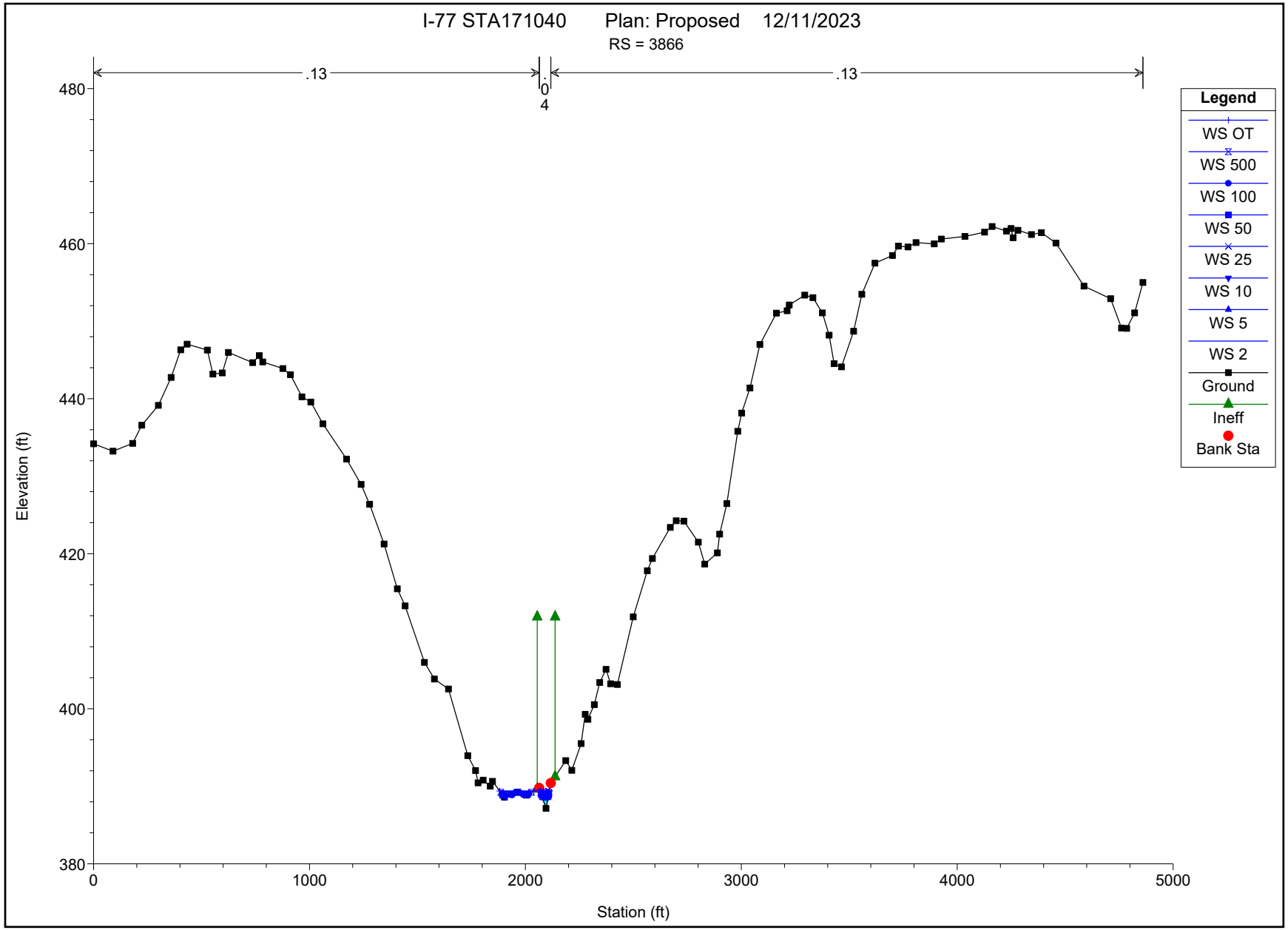
RS = 8144
.13
.0
4
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
490
480
470
460
450
440
0
500
1000
1500
2000
2500
3000
3500
Station (ft)

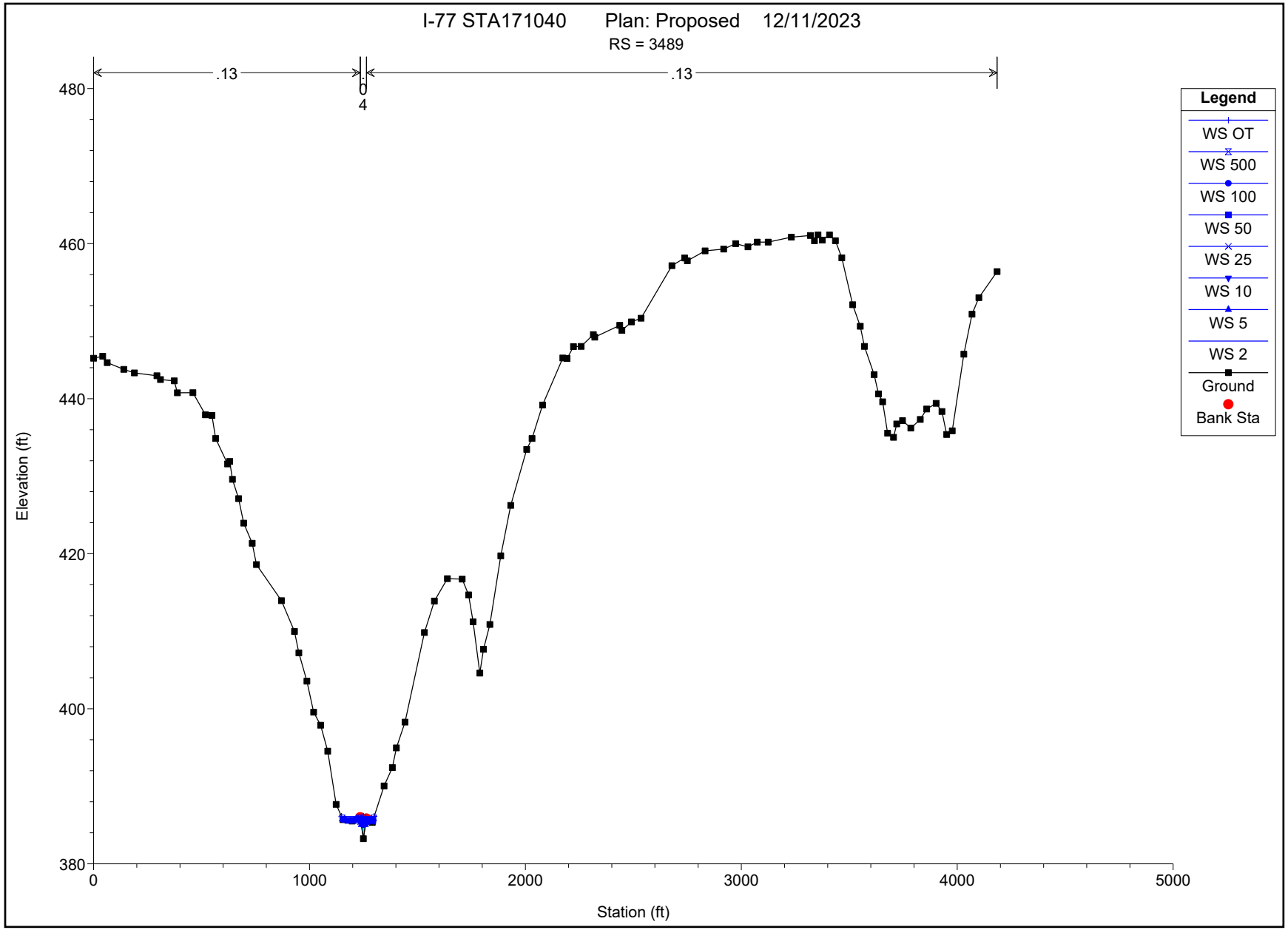

I-77 STA171040 Plan: Proposed 12/11/2023
RS = 6467
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
460
450
440
430
420
410
0
500
1000
1500
2000
2500
3000
3500
Station (ft)

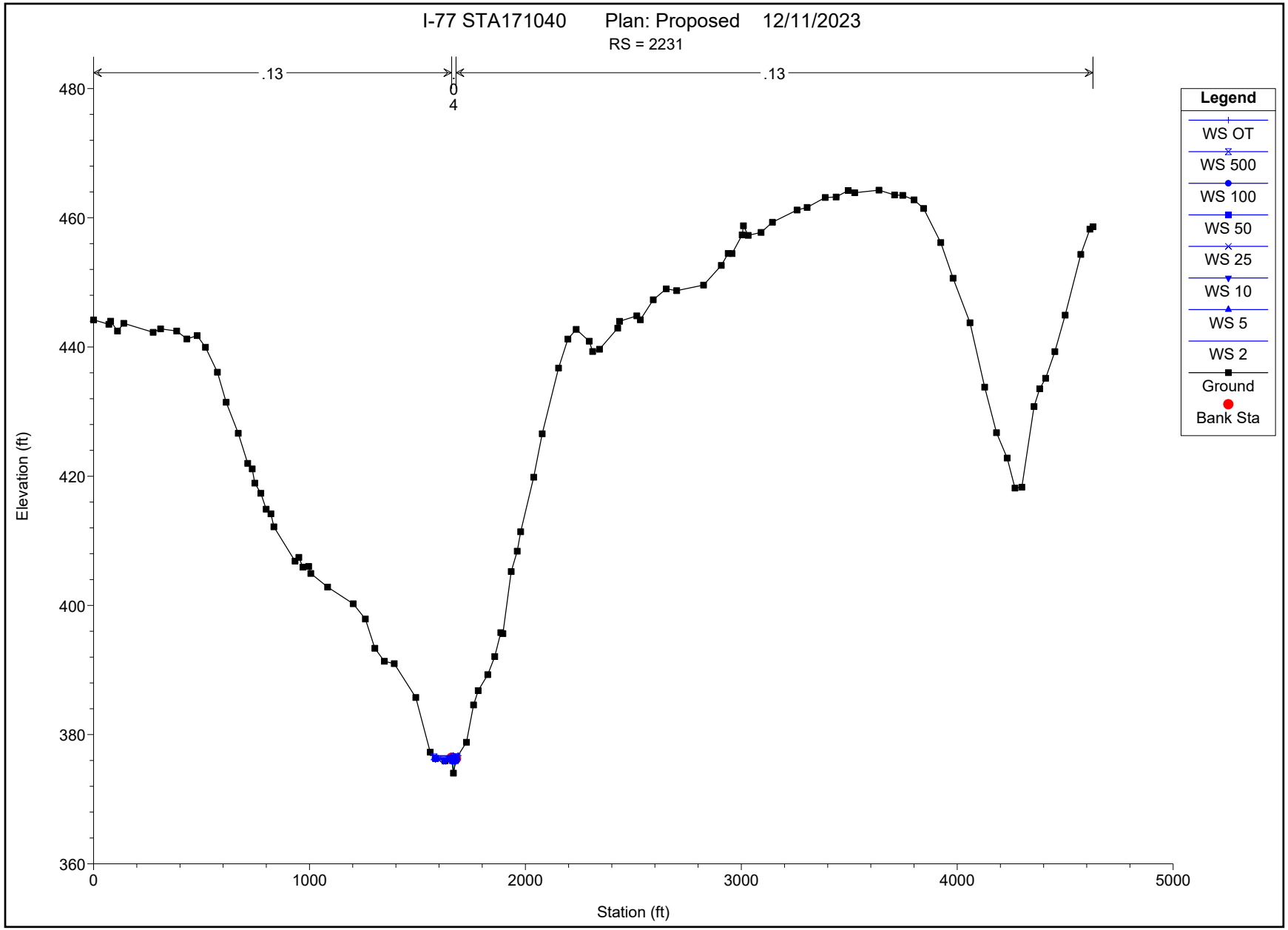

I-77 STA171040 Plan: Proposed 12/11/2023
RS = 5171
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
460
450
440
430
420
410
400
0
1000
2000
3000
4000
5000
Station (ft)

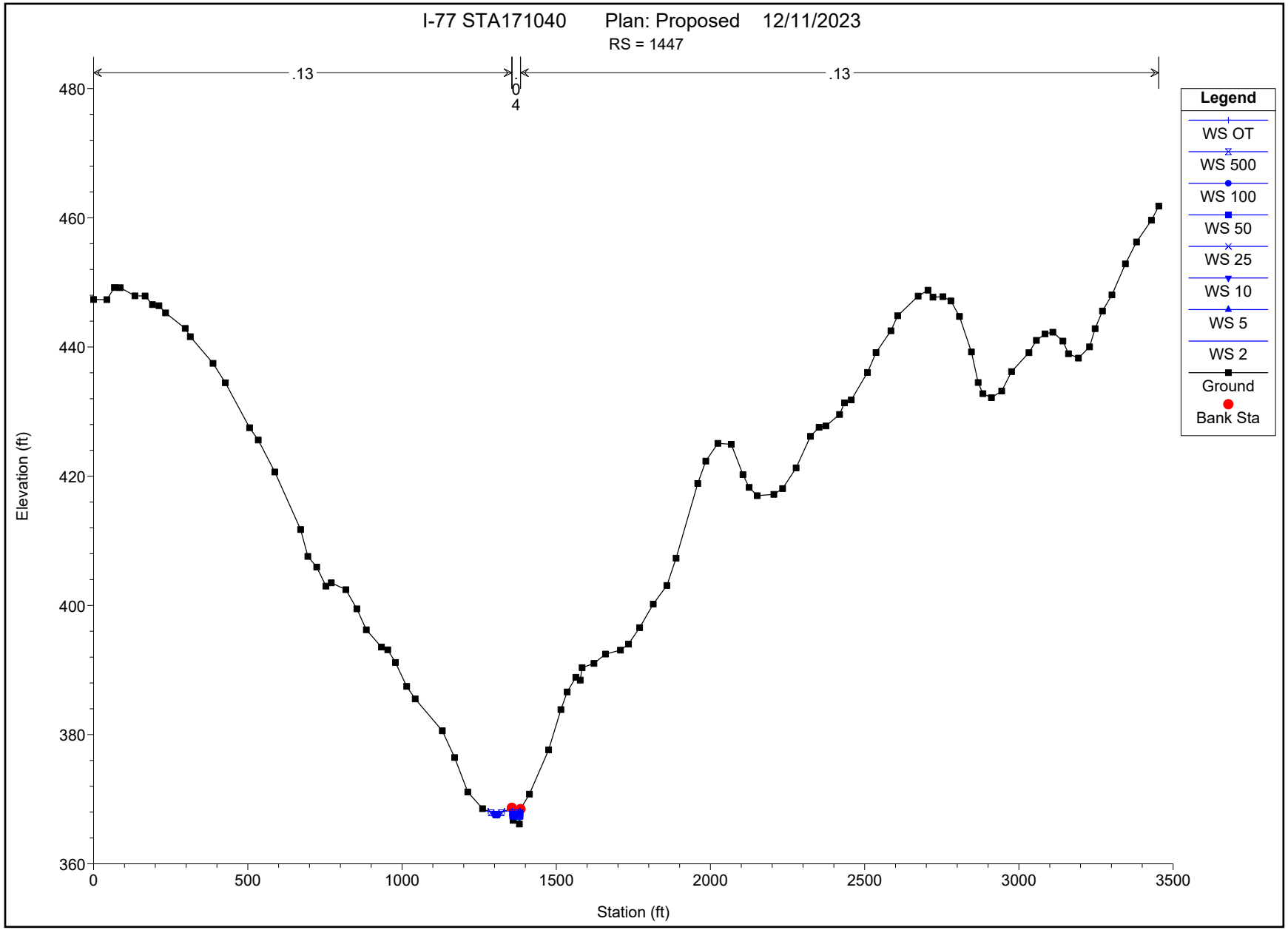

I-77 STA171040 Plan: Proposed 12/11/2023
RS = 4471
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Ineff
Bank Sta
Elevation (ft)
460
450
440
430
420
410
400
390
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: Proposed 12/11/2023
RS = 4145 Culv
.13
.04
.13
Legend
WS OT
Ground
Ineff
Bank Sta
Elevation (ft)
460
450
440
430
420
410
400
390
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: Proposed 12/11/2023
RS = 3866
.13
0
4
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Ineff
Bank Sta
Elevation (ft)
480
460
440
420
400
380
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: Proposed 12/11/2023
RS = 3489
.13
0
4
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
480
460
440
420
400
380
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: Proposed 12/11/2023
RS = 2231
.13
0
4
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
480
460
440
420
400
380
360
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: Proposed 12/11/2023
RS = 1447
.13
0
4
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
480
460
440
420
400
380
360
0
500
1000
1500
2000
2500
3000
3500
Station (ft)

HEC-RAS River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	8144	50	Existing	101.00	442.91	444.85	444.74	445.14	0.016495	4.34	25.73	54.12	0.82
Reach 1	8144	50	Nat	101.00	442.91	444.85	444.74	445.14	0.016495	4.34	25.73	54.12	0.82
Reach 1	8144	50	Prop	101.00	442.91	444.66		444.96	0.016625	4.37	23.13	27.16	0.82
Reach 1	8144	100	Existing	116.00	442.91	444.91	444.84	445.24	0.016597	4.58	29.85	64.30	0.83
Reach 1	8144	100	Nat	116.00	442.91	444.91	444.84	445.24	0.016597	4.58	29.85	64.30	0.83
Reach 1	8144	100	Prop	116.00	442.91	444.74	444.61	445.07	0.016619	4.61	25.61	38.25	0.83
Reach 1	8094.68*	50	Existing	101.00	442.12	444.02	443.91	444.31	0.016835	4.34	24.92	47.40	0.82
Reach 1	8094.68*	50	Nat	101.00	442.12	444.02	443.91	444.31	0.016835	4.34	24.92	47.40	0.82
Reach 1	8094.68*	50	Prop	101.00	442.12	443.85		444.14	0.016574	4.33	23.35	27.90	0.82
Reach 1	8094.68*	100	Existing	116.00	442.12	444.10	443.99	444.41	0.016437	4.54	28.96	56.86	0.83
Reach 1	8094.68*	100	Nat	116.00	442.12	444.10	443.99	444.41	0.016437	4.54	28.96	56.86	0.83
Reach 1	8094.68*	100	Prop	116.00	442.12	443.92	443.80	444.25	0.016713	4.58	25.67	36.07	0.83
Reach 1	8045.35*	50	Existing	101.00	441.33	443.20	443.09	443.49	0.016866	4.31	24.73	44.37	0.82
Reach 1	8045.35*	50	Nat	101.00	441.33	443.20	443.09	443.49	0.016866	4.31	24.73	44.37	0.82
Reach 1	8045.35*	50	Prop	101.00	441.32	443.05		443.33	0.016136	4.26	23.74	29.12	0.81
Reach 1	8045.35*	100	Existing	116.00	441.33	443.27	443.17	443.59	0.016539	4.51	28.42	52.49	0.83
Reach 1	8045.35*	100	Nat	116.00	441.33	443.27	443.17	443.59	0.016539	4.51	28.42	52.49	0.83
Reach 1	8045.35*	100	Prop	116.00	441.32	443.12	442.99	443.44	0.016546	4.53	25.93	35.67	0.83
Reach 1	7996.03*	50	Existing	101.00	440.54	442.39	442.27	442.66	0.016182	4.22	25.11	43.49	0.81
Reach 1	7996.03*	50	Nat	101.00	440.54	442.39	442.27	442.66	0.016182	4.22	25.11	43.49	0.81
Reach 1	7996.03*	50	Prop	101.00	440.53	442.24		442.52	0.016583	4.26	23.75	29.38	0.82
Reach 1	7996.03*	100	Existing	116.00	440.54	442.46	442.34	442.76	0.016431	4.47	28.26	49.96	0.82
Reach 1	7996.03*	100	Nat	116.00	440.54	442.46	442.34	442.76	0.016431	4.47	28.26	49.96	0.82
Reach 1	7996.03*	100	Prop	116.00	440.53	442.32	442.19	442.63	0.016078	4.46	26.42	36.32	0.82
Reach 1	7946.71*	50	Existing	101.00	439.75	441.56	441.45	441.84	0.016995	4.25	24.60	40.94	0.82
Reach 1	7946.71*	50	Nat	101.00	439.75	441.56	441.45	441.84	0.016995	4.25	24.60	40.94	0.82
Reach 1	7946.71*	50	Prop	101.00	439.74	441.43		441.71	0.016502	4.22	23.98	30.44	0.81
Reach 1	7946.71*	100	Existing	116.00	439.75	441.63	441.53	441.94	0.016843	4.47	27.80	47.49	0.83
Reach 1	7946.71*	100	Nat	116.00	439.75	441.63	441.53	441.94	0.016843	4.47	27.80	47.49	0.83
Reach 1	7946.71*	100	Prop	116.00	439.74	441.50	441.38	441.81	0.016848	4.48	26.18	35.68	0.83
Reach 1	7897.38*	50	Existing	101.00	438.96	440.75	440.63	441.02	0.016348	4.17	25.11	41.26	0.81
Reach 1	7897.38*	50	Nat	101.00	438.96	440.75	440.63	441.02	0.016348	4.17	25.11	41.26	0.81
Reach 1	7897.38*	50	Prop	101.00	438.94	440.62		440.89	0.016393	4.17	24.23	31.34	0.81
Reach 1	7897.38*	100	Existing	116.00	438.96	440.82	440.71	441.12	0.016772	4.43	27.89	46.53	0.83
Reach 1	7897.38*	100	Nat	116.00	438.96	440.82	440.71	441.12	0.016772	4.43	27.89	46.53	0.83
Reach 1	7897.38*	100	Prop	116.00	438.94	440.70	440.57	441.00	0.016230	4.40	26.75	36.71	0.82

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	7848.06*	50	Existing	101.00	438.17	439.93	439.82	440.20	0.016716	4.16	25.03	40.71	0.81
Reach 1	7848.06*	50	Nat	101.00	438.17	439.93	439.82	440.20	0.016716	4.16	25.03	40.71	0.81
Reach 1	7848.06*	50	Prop	101.00	438.15	439.82		440.08	0.016582	4.16	24.35	32.16	0.81
Reach 1	7848.06*	100	Existing	116.00	438.17	440.00	439.89	440.30	0.016681	4.39	28.04	46.17	0.82
Reach 1	7848.06*	100	Nat	116.00	438.17	440.00	439.89	440.30	0.016681	4.39	28.04	46.17	0.82
Reach 1	7848.06*	100	Prop	116.00	438.15	439.89	439.77	440.19	0.016217	4.36	27.00	37.42	0.81
Reach 1	7798.74*	50	Existing	101.00	437.38	439.13	439.01	439.39	0.016382	4.10	25.37	40.98	0.81
Reach 1	7798.74*	50	Nat	101.00	437.38	439.13	439.01	439.39	0.016382	4.10	25.37	40.98	0.81
Reach 1	7798.74*	50	Prop	101.00	437.36	439.02		439.28	0.016309	4.10	24.69	33.48	0.80
Reach 1	7798.74*	100	Existing	116.00	437.38	439.20	439.08	439.49	0.016222	4.32	28.47	46.17	0.81
Reach 1	7798.74*	100	Nat	116.00	437.38	439.20	439.08	439.49	0.016222	4.32	28.47	46.17	0.81
Reach 1	7798.74*	100	Prop	116.00	437.36	439.08	438.97	439.38	0.016627	4.36	26.99	37.77	0.82
Reach 1	7749.41*	50	Existing	101.00	436.59	438.31	438.20	438.57	0.016521	4.08	25.47	41.26	0.81
Reach 1	7749.41*	50	Nat	101.00	436.59	438.31	438.20	438.57	0.016521	4.08	25.47	41.26	0.81
Reach 1	7749.41*	50	Prop	101.00	436.56	438.22		438.47	0.015998	4.05	25.04	34.50	0.80
Reach 1	7749.41*	100	Existing	116.00	436.59	438.37	438.27	438.67	0.016838	4.34	28.20	45.65	0.83
Reach 1	7749.41*	100	Nat	116.00	436.59	438.37	438.27	438.67	0.016838	4.34	28.20	45.65	0.83
Reach 1	7749.41*	100	Prop	116.00	436.56	438.28	438.16	438.57	0.016216	4.30	27.45	38.72	0.81
Reach 1	7700.09*	50	Existing	101.00	435.80	437.50	437.39	437.76	0.016371	4.04	25.74	42.00	0.80
Reach 1	7700.09*	50	Nat	101.00	435.80	437.50	437.39	437.76	0.016371	4.04	25.74	42.00	0.80
Reach 1	7700.09*	50	Prop	101.00	435.77	437.41		437.66	0.016596	4.06	24.95	34.98	0.81
Reach 1	7700.09*	100	Existing	116.00	435.80	437.57	437.45	437.85	0.016316	4.26	28.74	46.30	0.81
Reach 1	7700.09*	100	Nat	116.00	435.80	437.57	437.45	437.85	0.016316	4.26	28.74	46.30	0.81
Reach 1	7700.09*	100	Prop	116.00	435.77	437.48	437.36	437.76	0.016419	4.28	27.58	39.42	0.81
Reach 1	7650.77*	50	Existing	101.00	435.01	436.69	436.58	436.94	0.016429	4.02	25.93	42.92	0.80
Reach 1	7650.77*	50	Nat	101.00	435.01	436.69	436.58	436.94	0.016429	4.02	25.93	42.92	0.80
Reach 1	7650.77*	50	Prop	101.00	434.97	436.61		436.86	0.016084	4.00	25.43	36.40	0.79
Reach 1	7650.77*	100	Existing	116.00	435.01	436.76	436.65	437.04	0.016179	4.22	29.06	46.82	0.81
Reach 1	7650.77*	100	Nat	116.00	435.01	436.76	436.65	437.04	0.016179	4.22	29.06	46.82	0.81
Reach 1	7650.77*	100	Prop	116.00	434.97	436.68	436.56	436.96	0.016167	4.23	27.97	40.45	0.81
Reach 1	7601.44*	50	Existing	101.00	434.22	435.89	435.77	436.13	0.016118	3.97	26.34	43.97	0.79
Reach 1	7601.44*	50	Nat	101.00	434.22	435.89	435.77	436.13	0.016118	3.97	26.34	43.97	0.79
Reach 1	7601.44*	50	Prop	101.00	434.18	435.81	435.69	436.06	0.016002	3.96	25.70	37.63	0.79
Reach 1	7601.44*	100	Existing	116.00	434.22	435.94	435.84	436.22	0.016714	4.23	28.90	46.62	0.82
Reach 1	7601.44*	100	Nat	116.00	434.22	435.94	435.84	436.22	0.016714	4.23	28.90	46.62	0.82
Reach 1	7601.44*	100	Prop	116.00	434.18	435.87	435.76	436.15	0.016646	4.23	27.94	41.05	0.82

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	7552.12*	50	Existing	101.00	433.43	435.08	434.97	435.32	0.016359	3.95	26.44	44.70	0.80
Reach 1	7552.12*	50	Nat	101.00	433.43	435.08	434.97	435.32	0.016359	3.95	26.44	44.70	0.80
Reach 1	7552.12*	50	Prop	101.00	433.39	435.00	434.89	435.25	0.016476	3.97	25.66	38.22	0.80
Reach 1	7552.12*	100	Existing	116.00	433.43	435.14	435.03	435.41	0.016266	4.17	29.48	47.59	0.81
Reach 1	7552.12*	100	Nat	116.00	433.43	435.14	435.03	435.41	0.016266	4.17	29.48	47.59	0.81
Reach 1	7552.12*	100	Prop	116.00	433.39	435.07	434.95	435.34	0.016239	4.17	28.44	42.29	0.81
Reach 1	7502.79*	50	Existing	101.00	432.64	434.27		434.51	0.016105	3.91	26.87	45.57	0.79
Reach 1	7502.79*	50	Nat	101.00	432.64	434.27		434.51	0.016105	3.91	26.87	45.57	0.79
Reach 1	7502.79*	50	Prop	101.00	432.59	434.21	434.09	434.44	0.016073	3.91	26.13	39.88	0.79
Reach 1	7502.79*	100	Existing	116.00	432.64	434.33	434.22	434.60	0.016459	4.15	29.62	47.93	0.81
Reach 1	7502.79*	100	Nat	116.00	432.64	434.33	434.22	434.60	0.016459	4.15	29.62	47.93	0.81
Reach 1	7502.79*	100	Prop	116.00	432.59	434.27		434.54	0.016032	4.13	28.88	43.70	0.80
Reach 1	7453.47*	50	Existing	101.00	431.85	433.46	433.36	433.70	0.016353	3.90	26.99	46.36	0.80
Reach 1	7453.47*	50	Nat	101.00	431.85	433.46	433.36	433.70	0.016353	3.90	26.99	46.36	0.80
Reach 1	7453.47*	50	Prop	101.00	431.80	433.40	433.29	433.64	0.016526	3.92	26.12	40.75	0.80
Reach 1	7453.47*	100	Existing	116.00	431.85	433.53	433.42	433.79	0.016301	4.11	30.02	48.77	0.80
Reach 1	7453.47*	100	Nat	116.00	431.85	433.53	433.42	433.79	0.016301	4.11	30.02	48.77	0.80
Reach 1	7453.47*	100	Prop	116.00	431.80	433.46	433.35	433.73	0.016540	4.14	28.83	44.42	0.81
Reach 1	7404.15*	50	Existing	101.00	431.06	432.66		432.89	0.016190	3.86	27.36	47.23	0.79
Reach 1	7404.15*	50	Nat	101.00	431.06	432.66		432.89	0.016190	3.86	27.36	47.23	0.79
Reach 1	7404.15*	50	Prop	101.00	431.01	432.60		432.84	0.016110	3.86	26.58	42.12	0.79
Reach 1	7404.15*	100	Existing	116.00	431.06	432.71	432.61	432.98	0.016918	4.13	29.87	48.99	0.82
Reach 1	7404.15*	100	Nat	116.00	431.06	432.71	432.61	432.98	0.016918	4.13	29.87	48.99	0.82
Reach 1	7404.15*	100	Prop	116.00	431.01	432.67		432.93	0.016087	4.08	29.40	45.77	0.80
Reach 1	7354.82*	50	Existing	101.00	430.27	431.85	431.74	432.08	0.016498	3.86	27.42	47.93	0.80
Reach 1	7354.82*	50	Nat	101.00	430.27	431.85	431.74	432.08	0.016498	3.86	27.42	47.93	0.80
Reach 1	7354.82*	50	Prop	101.00	430.21	431.80	431.69	432.03	0.016313	3.85	26.71	43.12	0.79
Reach 1	7354.82*	100	Existing	116.00	430.27	431.92	431.81	432.17	0.015902	4.03	30.87	50.21	0.79
Reach 1	7354.82*	100	Nat	116.00	430.27	431.92	431.81	432.17	0.015902	4.03	30.87	50.21	0.79
Reach 1	7354.82*	100	Prop	116.00	430.21	431.86	431.75	432.12	0.016326	4.07	29.52	46.66	0.80
Reach 1	7305.50*	50	Existing	101.00	429.48	431.05		431.28	0.016243	3.81	27.91	49.05	0.79
Reach 1	7305.50*	50	Nat	101.00	429.48	431.05		431.28	0.016243	3.81	27.91	49.05	0.79
Reach 1	7305.50*	50	Prop	101.00	429.42	431.01	430.89	431.23	0.016098	3.81	27.10	44.58	0.79
Reach 1	7305.50*	100	Existing	116.00	429.48	431.11	431.01	431.36	0.016547	4.05	30.76	50.84	0.81
Reach 1	7305.50*	100	Nat	116.00	429.48	431.11	431.01	431.36	0.016547	4.05	30.76	50.84	0.81
Reach 1	7305.50*	100	Prop	116.00	429.42	431.07		431.32	0.015966	4.01	30.08	48.19	0.79

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	7256.18*	50	Existing	101.00	428.68	430.24	430.14	430.47	0.016285	3.79	28.15	49.79	0.79
Reach 1	7256.18*	50	Nat	101.00	428.68	430.24	430.14	430.47	0.016285	3.79	28.15	49.79	0.79
Reach 1	7256.18*	50	Prop	101.00	428.63	430.21		430.43	0.016178	3.79	27.34	45.94	0.79
Reach 1	7256.18*	100	Existing	116.00	428.68	430.31		430.55	0.016060	3.98	31.38	51.71	0.79
Reach 1	7256.18*	100	Nat	116.00	428.68	430.31		430.55	0.016060	3.98	31.38	51.71	0.79
Reach 1	7256.18*	100	Prop	116.00	428.63	430.27	430.16	430.52	0.016596	4.03	29.98	49.09	0.81
Reach 1	7206.85*	50	Existing	101.00	427.89	429.45	429.34	429.66	0.016280	3.76	28.50	50.80	0.79
Reach 1	7206.85*	50	Nat	101.00	427.89	429.45	429.34	429.66	0.016280	3.76	28.50	50.80	0.79
Reach 1	7206.85*	50	Prop	101.00	427.83	429.41	429.29	429.63	0.016252	3.77	27.54	46.93	0.79
Reach 1	7206.85*	100	Existing	116.00	427.89	429.50		429.75	0.016320	3.98	31.57	52.55	0.80
Reach 1	7206.85*	100	Nat	116.00	427.89	429.50		429.75	0.016320	3.98	31.57	52.55	0.80
Reach 1	7206.85*	100	Prop	116.00	427.83	429.47	429.36	429.71	0.016091	3.97	30.61	50.48	0.79
Reach 1	7157.53*	50	Existing	101.00	427.10	428.64	428.54	428.86	0.016596	3.76	28.54	51.38	0.79
Reach 1	7157.53*	50	Nat	101.00	427.10	428.64	428.54	428.86	0.016596	3.76	28.54	51.38	0.79
Reach 1	7157.53*	50	Prop	101.00	427.04	428.61	428.50	428.83	0.016052	3.73	27.96	48.48	0.78
Reach 1	7157.53*	100	Existing	116.00	427.10	428.70		428.94	0.016106	3.93	31.97	53.29	0.79
Reach 1	7157.53*	100	Nat	116.00	427.10	428.70		428.94	0.016106	3.93	31.97	53.29	0.79
Reach 1	7157.53*	100	Prop	116.00	427.04	428.68	428.56	428.92	0.015780	3.92	31.19	52.08	0.79
Reach 1	7108.21*	50	Existing	101.00	426.31	427.85		428.05	0.015747	3.68	29.41	52.57	0.77
Reach 1	7108.21*	50	Nat	101.00	426.31	427.85		428.05	0.015747	3.68	29.41	52.57	0.77
Reach 1	7108.21*	50	Prop	101.00	426.25	427.81	427.70	428.03	0.016511	3.74	27.99	49.57	0.79
Reach 1	7108.21*	100	Existing	116.00	426.31	427.90	427.80	428.13	0.016266	3.92	32.18	54.05	0.79
Reach 1	7108.21*	100	Nat	116.00	426.31	427.90	427.80	428.13	0.016266	3.92	32.18	54.05	0.79
Reach 1	7108.21*	100	Prop	116.00	426.25	427.87	427.77	428.11	0.016437	3.94	31.07	52.95	0.80
Reach 1	7058.88*	50	Existing	101.00	425.52	427.03	426.93	427.25	0.016643	3.72	29.19	53.14	0.79
Reach 1	7058.88*	50	Nat	101.00	425.52	427.03	426.93	427.25	0.016643	3.72	29.19	53.14	0.79
Reach 1	7058.88*	50	Prop	101.00	425.45	427.01		427.22	0.016089	3.69	28.56	51.14	0.78
Reach 1	7058.88*	100	Existing	116.00	425.52	427.10	426.99	427.33	0.016176	3.89	32.64	54.90	0.79
Reach 1	7058.88*	100	Nat	116.00	425.52	427.10	426.99	427.33	0.016176	3.89	32.64	54.90	0.79
Reach 1	7058.88*	100	Prop	116.00	425.45	427.07	426.97	427.31	0.016393	3.92	31.45	54.18	0.80
Reach 1	7009.56*	50	Existing	101.00	424.73	426.24	426.13	426.44	0.016012	3.65	29.93	54.23	0.78
Reach 1	7009.56*	50	Nat	101.00	424.73	426.24	426.13	426.44	0.016012	3.65	29.93	54.23	0.78
Reach 1	7009.56*	50	Prop	101.00	424.66	426.22	426.11	426.43	0.016193	3.67	28.85	52.67	0.78
Reach 1	7009.56*	100	Existing	116.00	424.73	426.29	426.19	426.52	0.016349	3.88	32.85	55.66	0.79
Reach 1	7009.56*	100	Nat	116.00	424.73	426.29	426.19	426.52	0.016349	3.88	32.85	55.66	0.79
Reach 1	7009.56*	100	Prop	116.00	424.66	426.27	426.17	426.51	0.016316	3.88	31.92	55.85	0.79

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	6960.24*	50	Existing	101.00	423.94	425.44	425.33	425.64	0.016366	3.65	30.08	55.11	0.78
Reach 1	6960.24*	50	Nat	101.00	423.94	425.44	425.33	425.64	0.016366	3.65	30.08	55.11	0.78
Reach 1	6960.24*	50	Prop	101.00	423.87	425.42	425.31	425.63	0.016070	3.64	29.29	54.24	0.78
Reach 1	6960.24*	100	Existing	116.00	423.94	425.50	425.39	425.72	0.016385	3.85	33.24	56.59	0.79
Reach 1	6960.24*	100	Nat	116.00	423.94	425.50	425.39	425.72	0.016385	3.85	33.24	56.59	0.79
Reach 1	6960.24*	100	Prop	116.00	423.87	425.49	425.38	425.71	0.015835	3.82	32.70	57.67	0.78
Reach 1	6910.91*	50	Existing	101.00	423.15	424.64	424.54	424.84	0.016184	3.61	30.54	56.03	0.78
Reach 1	6910.91*	50	Nat	101.00	423.15	424.64	424.54	424.84	0.016184	3.61	30.54	56.03	0.78
Reach 1	6910.91*	50	Prop	101.00	423.07	424.62	424.52	424.83	0.016381	3.64	29.43	55.47	0.78
Reach 1	6910.91*	100	Existing	116.00	423.15	424.70	424.59	424.92	0.016184	3.81	33.75	57.46	0.79
Reach 1	6910.91*	100	Nat	116.00	423.15	424.70	424.59	424.92	0.016184	3.81	33.75	57.46	0.79
Reach 1	6910.91*	100	Prop	116.00	423.07	424.68	424.58	424.91	0.016401	3.84	32.66	58.67	0.79
Reach 1	6861.59*	50	Existing	101.00	422.36	423.84		424.04	0.016246	3.59	30.91	56.99	0.78
Reach 1	6861.59*	50	Nat	101.00	422.36	423.84		424.04	0.016246	3.59	30.91	56.99	0.78
Reach 1	6861.59*	50	Prop	101.00	422.28	423.83	423.72	424.03	0.015961	3.59	30.05	57.08	0.77
Reach 1	6861.59*	100	Existing	116.00	422.36	423.90	423.79	424.12	0.016257	3.79	34.12	58.38	0.79
Reach 1	6861.59*	100	Nat	116.00	422.36	423.90	423.79	424.12	0.016257	3.79	34.12	58.38	0.79
Reach 1	6861.59*	100	Prop	116.00	422.28	423.88	423.79	424.11	0.016385	3.82	33.04	59.98	0.79
Reach 1	6812.27*	50	Existing	101.00	421.57	423.04	422.94	423.24	0.016449	3.58	31.13	57.81	0.78
Reach 1	6812.27*	50	Nat	101.00	421.57	423.04	422.94	423.24	0.016449	3.58	31.13	57.81	0.78
Reach 1	6812.27*	50	Prop	101.00	421.48	423.03	422.93	423.23	0.016215	3.58	30.28	58.61	0.78
Reach 1	6812.27*	100	Existing	116.00	421.57	423.10	422.99	423.31	0.016468	3.78	34.34	59.15	0.79
Reach 1	6812.27*	100	Nat	116.00	421.57	423.10	422.99	423.31	0.016468	3.78	34.34	59.15	0.79
Reach 1	6812.27*	100	Prop	116.00	421.48	423.09	422.99	423.31	0.016264	3.78	33.60	61.79	0.79
Reach 1	6762.94*	50	Existing	101.00	420.78	422.25		422.44	0.015830	3.52	31.93	58.85	0.77
Reach 1	6762.94*	50	Nat	101.00	420.78	422.25		422.44	0.015830	3.52	31.93	58.85	0.77
Reach 1	6762.94*	50	Prop	101.00	420.69	422.24	422.13	422.44	0.016091	3.55	30.79	60.32	0.77
Reach 1	6762.94*	100	Existing	116.00	420.78	422.31		422.51	0.015816	3.71	35.22	60.17	0.78
Reach 1	6762.94*	100	Nat	116.00	420.78	422.31		422.51	0.015816	3.71	35.22	60.17	0.78
Reach 1	6762.94*	100	Prop	116.00	420.69	422.30	422.20	422.51	0.016027	3.74	34.26	63.57	0.78
Reach 1	6713.62*	50	Existing	101.00	419.99	421.44		421.64	0.016705	3.56	31.75	59.56	0.78
Reach 1	6713.62*	50	Nat	101.00	419.99	421.44		421.64	0.016705	3.56	31.75	59.56	0.78
Reach 1	6713.62*	50	Prop	101.00	419.90	421.44	421.34	421.63	0.016523	3.56	30.86	61.45	0.78
Reach 1	6713.62*	100	Existing	116.00	419.99	421.50	421.40	421.71	0.016782	3.76	34.93	60.79	0.80
Reach 1	6713.62*	100	Nat	116.00	419.99	421.50	421.40	421.71	0.016782	3.76	34.93	60.79	0.80
Reach 1	6713.62*	100	Prop	116.00	419.90	421.49	421.40	421.71	0.016661	3.77	34.17	64.52	0.79

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	6664.30*	50	Prop	101.00	419.10	420.65	420.54	420.84	0.015675	3.48	31.97	63.69	0.76
Reach 1	6664.30*	100	Prop	116.00	419.10	420.71	420.60	420.91	0.015458	3.66	35.71	67.00	0.77
Reach 1	6664.29*	50	Existing	101.00	419.20	420.66		420.84	0.015583	3.46	32.90	60.63	0.76
Reach 1	6664.29*	50	Nat	101.00	419.20	420.66		420.84	0.015583	3.46	32.90	60.63	0.76
Reach 1	6664.29*	100	Existing	116.00	419.20	420.71		420.91	0.015438	3.64	36.35	61.91	0.77
Reach 1	6664.29*	100	Nat	116.00	419.20	420.71		420.91	0.015438	3.64	36.35	61.91	0.77
Reach 1	6614.97*	50	Existing	101.00	418.41	419.85	419.75	420.03	0.017066	3.53	32.32	61.22	0.79
Reach 1	6614.97*	50	Nat	101.00	418.41	419.85	419.75	420.03	0.017066	3.53	32.32	61.22	0.79
Reach 1	6614.97*	50	Prop	101.00	418.31	419.84	419.74	420.03	0.016869	3.54	31.56	64.60	0.79
Reach 1	6614.97*	100	Existing	116.00	418.41	419.90	419.80	420.11	0.017288	3.74	35.41	62.33	0.80
Reach 1	6614.97*	100	Nat	116.00	418.41	419.90	419.80	420.11	0.017288	3.74	35.41	62.33	0.80
Reach 1	6614.97*	100	Prop	116.00	418.31	419.89	419.81	420.11	0.017186	3.75	34.81	67.46	0.80
Reach 1	6565.65*	50	Existing	101.00	417.62	419.08		419.25	0.014491	3.34	34.58	62.73	0.73
Reach 1	6565.65*	50	Nat	101.00	417.62	419.08		419.25	0.014491	3.34	34.58	62.73	0.73
Reach 1	6565.65*	50	Prop	101.00	417.52	419.08		419.25	0.014543	3.36	33.96	68.26	0.73
Reach 1	6565.65*	100	Existing	116.00	417.62	419.13		419.32	0.014643	3.53	37.90	63.87	0.74
Reach 1	6565.65*	100	Nat	116.00	417.62	419.13		419.32	0.014643	3.53	37.90	63.87	0.74
Reach 1	6565.65*	100	Prop	116.00	417.52	419.13	419.01	419.32	0.014648	3.55	37.66	71.40	0.75
Reach 1	6516.32*	50	Existing	101.00	416.83	418.23	418.18	418.43	0.019081	3.61	31.92	62.58	0.83
Reach 1	6516.32*	50	Nat	101.00	416.83	418.23	418.18	418.43	0.019081	3.61	31.92	62.58	0.83
Reach 1	6516.32*	50	Prop	101.00	416.72	418.23	418.15	418.43	0.018961	3.62	31.12	66.86	0.83
Reach 1	6516.32*	100	Existing	116.00	416.83	418.29	418.21	418.50	0.018673	3.78	35.33	63.73	0.83
Reach 1	6516.32*	100	Nat	116.00	416.83	418.29	418.21	418.50	0.018673	3.78	35.33	63.73	0.83
Reach 1	6516.32*	100	Prop	116.00	416.72	418.28	418.21	418.50	0.018657	3.80	34.76	70.04	0.83
Reach 1	6467	50	Existing	101.00	416.04	417.52		417.66	0.012452	3.15	37.32	65.07	0.68
Reach 1	6467	50	Nat	101.00	416.04	417.52		417.66	0.012452	3.15	37.32	65.07	0.68
Reach 1	6467	50	Prop	101.00	415.93	417.52		417.67	0.012429	3.16	37.11	73.33	0.68
Reach 1	6467	100	Existing	116.00	416.04	417.57		417.73	0.012618	3.33	40.82	66.18	0.69
Reach 1	6467	100	Nat	116.00	416.04	417.57		417.73	0.012618	3.33	40.82	66.18	0.69
Reach 1	6467	100	Prop	116.00	415.93	417.57		417.74	0.012516	3.34	41.17	76.60	0.69
Reach 1	6417.15*	50	Existing	101.00	415.44	416.89		417.04	0.012547	3.16	37.04	65.20	0.68
Reach 1	6417.15*	50	Nat	101.00	415.44	416.89		417.04	0.012547	3.16	37.04	65.20	0.68
Reach 1	6417.15*	50	Prop	101.00	415.33	416.89		417.05	0.012331	3.16	37.03	73.26	0.68
Reach 1	6417.15*	100	Existing	116.00	415.44	416.95		417.11	0.012531	3.33	40.74	66.44	0.69
Reach 1	6417.15*	100	Nat	116.00	415.44	416.95		417.11	0.012531	3.33	40.74	66.44	0.69
Reach 1	6417.15*	100	Prop	116.00	415.33	416.94		417.11	0.012658	3.36	40.79	76.37	0.70

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	6367.31*	50	Existing	101.00	414.83	416.27		416.42	0.012527	3.16	36.91	65.23	0.68
Reach 1	6367.31*	50	Nat	101.00	414.83	416.27		416.42	0.012527	3.16	36.91	65.23	0.68
Reach 1	6367.31*	50	Prop	101.00	414.73	416.27		416.42	0.012470	3.17	36.68	72.97	0.68
Reach 1	6367.31*	100	Existing	116.00	414.83	416.33		416.49	0.012239	3.31	40.92	66.60	0.69
Reach 1	6367.31*	100	Nat	116.00	414.83	416.33		416.49	0.012239	3.31	40.92	66.60	0.69
Reach 1	6367.31*	100	Prop	116.00	414.73	416.33		416.49	0.012242	3.32	41.14	76.74	0.69
Reach 1	6317.46*	50	Existing	101.00	414.23	415.65		415.80	0.012563	3.16	36.71	65.40	0.68
Reach 1	6317.46*	50	Nat	101.00	414.23	415.65		415.80	0.012563	3.16	36.71	65.40	0.68
Reach 1	6317.46*	50	Prop	101.00	414.13	415.65		415.80	0.012431	3.17	36.56	72.88	0.68
Reach 1	6317.46*	100	Existing	116.00	414.23	415.70		415.87	0.012515	3.33	40.46	66.76	0.69
Reach 1	6317.46*	100	Nat	116.00	414.23	415.70		415.87	0.012515	3.33	40.46	66.76	0.69
Reach 1	6317.46*	100	Prop	116.00	414.13	415.70		415.87	0.012573	3.35	40.54	76.34	0.69
Reach 1	6267.62*	50	Existing	101.00	413.62	415.03		415.18	0.012126	3.13	37.03	65.60	0.67
Reach 1	6267.62*	50	Nat	101.00	413.62	415.03		415.18	0.012126	3.13	37.03	65.60	0.67
Reach 1	6267.62*	50	Prop	101.00	413.53	415.02		415.17	0.012476	3.17	36.34	72.85	0.68
Reach 1	6267.62*	100	Existing	116.00	413.62	415.08		415.25	0.012355	3.32	40.51	66.89	0.69
Reach 1	6267.62*	100	Nat	116.00	413.62	415.08		415.25	0.012355	3.32	40.51	66.89	0.69
Reach 1	6267.62*	100	Prop	116.00	413.53	415.08		415.25	0.012368	3.34	40.64	76.73	0.69
Reach 1	6217.77*	50	Existing	101.00	413.02	414.40		414.55	0.012522	3.16	36.47	65.64	0.68
Reach 1	6217.77*	50	Nat	101.00	413.02	414.40		414.55	0.012522	3.16	36.47	65.64	0.68
Reach 1	6217.77*	50	Prop	101.00	412.93	414.40		414.55	0.012494	3.17	36.17	72.74	0.68
Reach 1	6217.77*	100	Existing	116.00	413.02	414.46		414.63	0.012499	3.34	40.20	67.11	0.69
Reach 1	6217.77*	100	Nat	116.00	413.02	414.46		414.63	0.012499	3.34	40.20	67.11	0.69
Reach 1	6217.77*	100	Prop	116.00	412.93	414.45		414.62	0.012731	3.37	40.03	76.32	0.70
Reach 1	6167.92*	50	Existing	101.00	412.42	413.79		413.94	0.012310	3.15	36.60	65.85	0.68
Reach 1	6167.92*	50	Nat	101.00	412.42	413.79		413.94	0.012310	3.15	36.60	65.85	0.68
Reach 1	6167.92*	50	Prop	101.00	412.33	413.79		413.94	0.012101	3.14	36.50	73.14	0.67
Reach 1	6167.92*	100	Existing	116.00	412.42	413.84		414.01	0.012432	3.33	40.20	67.32	0.69
Reach 1	6167.92*	100	Nat	116.00	412.42	413.84		414.01	0.012432	3.33	40.20	67.32	0.69
Reach 1	6167.92*	100	Prop	116.00	412.33	413.84		414.01	0.012278	3.33	40.48	76.91	0.69
Reach 1	6118.08*	50	Existing	101.00	411.81	413.17		413.32	0.012474	3.16	36.28	66.03	0.68
Reach 1	6118.08*	50	Nat	101.00	411.81	413.17		413.32	0.012474	3.16	36.28	66.03	0.68
Reach 1	6118.08*	50	Prop	101.00	411.73	413.16		413.32	0.012654	3.19	35.69	72.49	0.69
Reach 1	6118.08*	100	Existing	116.00	411.81	413.22		413.39	0.012502	3.34	39.99	67.63	0.69
Reach 1	6118.08*	100	Nat	116.00	411.81	413.22		413.39	0.012502	3.34	39.99	67.63	0.69
Reach 1	6118.08*	100	Prop	116.00	411.73	413.22		413.39	0.012597	3.36	39.90	76.67	0.70

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	6068.23*	50	Existing	101.00	411.21	412.55		412.70	0.012594	3.17	36.11	66.29	0.69
Reach 1	6068.23*	50	Nat	101.00	411.21	412.55		412.70	0.012594	3.17	36.11	66.29	0.69
Reach 1	6068.23*	50	Prop	101.00	411.13	412.55		412.70	0.012331	3.16	35.94	72.85	0.68
Reach 1	6068.23*	100	Existing	116.00	411.21	412.61		412.77	0.012110	3.31	40.41	68.22	0.68
Reach 1	6068.23*	100	Nat	116.00	411.21	412.61		412.77	0.012110	3.31	40.41	68.22	0.68
Reach 1	6068.23*	100	Prop	116.00	411.13	412.61		412.77	0.012108	3.32	40.43	77.39	0.68
Reach 1	6018.39*	50	Existing	101.00	410.61	411.94		412.09	0.012204	3.14	36.43	66.66	0.68
Reach 1	6018.39*	50	Nat	101.00	410.61	411.94		412.09	0.012204	3.14	36.43	66.66	0.68
Reach 1	6018.39*	50	Prop	101.00	410.53	411.93		412.08	0.012543	3.18	35.62	72.63	0.68
Reach 1	6018.39*	100	Existing	116.00	410.61	411.99		412.16	0.012627	3.35	39.74	68.21	0.70
Reach 1	6018.39*	100	Nat	116.00	410.61	411.99		412.16	0.012627	3.35	39.74	68.21	0.70
Reach 1	6018.39*	100	Prop	116.00	410.53	411.98		412.15	0.012498	3.35	39.84	77.03	0.69
Reach 1	5968.54*	50	Existing	101.00	410.00	411.31		411.47	0.012465	3.16	36.10	66.86	0.68
Reach 1	5968.54*	50	Nat	101.00	410.00	411.31		411.47	0.012465	3.16	36.10	66.86	0.68
Reach 1	5968.54*	50	Prop	101.00	409.93	411.32		411.47	0.011929	3.13	36.26	73.50	0.67
Reach 1	5968.54*	100	Existing	116.00	410.00	411.37		411.54	0.012342	3.33	40.04	68.80	0.69
Reach 1	5968.54*	100	Nat	116.00	410.00	411.37		411.54	0.012342	3.33	40.04	68.80	0.69
Reach 1	5968.54*	100	Prop	116.00	409.93	411.37		411.54	0.012246	3.33	40.11	77.58	0.69
Reach 1	5918.69*	50	Existing	101.00	409.40	410.70		410.85	0.012320	3.15	36.12	67.06	0.68
Reach 1	5918.69*	50	Nat	101.00	409.40	410.70		410.85	0.012320	3.15	36.12	67.06	0.68
Reach 1	5918.69*	50	Prop	101.00	409.33	410.69		410.84	0.012751	3.19	35.24	72.51	0.69
Reach 1	5918.69*	100	Existing	116.00	409.40	410.75		410.92	0.012555	3.34	39.66	68.90	0.69
Reach 1	5918.69*	100	Nat	116.00	409.40	410.75		410.92	0.012555	3.34	39.66	68.90	0.69
Reach 1	5918.69*	100	Prop	116.00	409.33	410.75		410.92	0.012435	3.34	39.79	77.51	0.69
Reach 1	5868.85*	50	Existing	101.00	408.79	410.09		410.24	0.011937	3.12	36.50	67.64	0.67
Reach 1	5868.85*	50	Nat	101.00	408.79	410.09		410.24	0.011937	3.12	36.50	67.64	0.67
Reach 1	5868.85*	50	Prop	101.00	408.73	410.08		410.23	0.012247	3.15	35.76	73.54	0.68
Reach 1	5868.85*	100	Existing	116.00	408.79	410.14		410.31	0.012194	3.31	40.06	69.58	0.69
Reach 1	5868.85*	100	Nat	116.00	408.79	410.14		410.31	0.012194	3.31	40.06	69.58	0.69
Reach 1	5868.85*	100	Prop	116.00	408.73	410.13		410.30	0.012318	3.33	39.92	78.25	0.69
Reach 1	5819.00*	50	Existing	101.00	408.19	409.46		409.62	0.012652	3.18	35.63	67.41	0.69
Reach 1	5819.00*	50	Nat	101.00	408.19	409.46		409.62	0.012652	3.18	35.63	67.41	0.69
Reach 1	5819.00*	50	Prop	101.00	408.14	409.46		409.61	0.012570	3.18	35.42	73.53	0.69
Reach 1	5819.00*	100	Existing	116.00	408.19	409.52		409.69	0.012469	3.34	39.65	69.74	0.69
Reach 1	5819.00*	100	Nat	116.00	408.19	409.52		409.69	0.012469	3.34	39.65	69.74	0.69
Reach 1	5819.00*	100	Prop	116.00	408.14	409.52		409.69	0.012418	3.34	39.84	78.67	0.69

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	5769.15*	50	Existing	101.00	407.59	408.85		409.00	0.012219	3.14	36.09	68.17	0.68
Reach 1	5769.15*	50	Nat	101.00	407.59	408.85		409.00	0.012219	3.14	36.09	68.17	0.68
Reach 1	5769.15*	50	Prop	101.00	407.54	408.85		409.00	0.012379	3.16	35.60	74.02	0.68
Reach 1	5769.15*	100	Existing	116.00	407.59	408.91		409.07	0.012317	3.32	39.86	70.91	0.69
Reach 1	5769.15*	100	Nat	116.00	407.59	408.91		409.07	0.012317	3.32	39.86	70.91	0.69
Reach 1	5769.15*	100	Prop	116.00	407.54	408.91		409.07	0.012094	3.31	40.26	80.12	0.68
Reach 1	5719.31*	50	Existing	101.00	406.98	408.24		408.39	0.012188	3.14	36.03	69.60	0.68
Reach 1	5719.31*	50	Nat	101.00	406.98	408.24		408.39	0.012188	3.14	36.03	69.60	0.68
Reach 1	5719.31*	50	Prop	101.00	406.94	408.23		408.38	0.012510	3.17	35.49	75.54	0.68
Reach 1	5719.31*	100	Existing	116.00	406.98	408.29		408.46	0.012426	3.33	39.74	73.27	0.69
Reach 1	5719.31*	100	Nat	116.00	406.98	408.29		408.46	0.012426	3.33	39.74	73.27	0.69
Reach 1	5719.31*	100	Prop	116.00	406.94	408.28		408.46	0.012569	3.35	39.79	82.47	0.69
Reach 1	5669.46*	50	Existing	101.00	406.38	407.62		407.77	0.012237	3.14	36.11	72.32	0.68
Reach 1	5669.46*	50	Nat	101.00	406.38	407.62		407.77	0.012237	3.14	36.11	72.32	0.68
Reach 1	5669.46*	50	Prop	101.00	406.34	407.62		407.77	0.012043	3.13	36.30	79.65	0.67
Reach 1	5669.46*	100	Existing	116.00	406.38	407.68		407.84	0.012382	3.33	40.07	76.21	0.69
Reach 1	5669.46*	100	Nat	116.00	406.38	407.68		407.84	0.012382	3.33	40.07	76.21	0.69
Reach 1	5669.46*	100	Prop	116.00	406.34	407.67		407.84	0.012277	3.32	40.59	86.25	0.69
Reach 1	5619.62*	50	Existing	101.00	405.77	407.01		407.16	0.012260	3.14	36.42	74.66	0.68
Reach 1	5619.62*	50	Nat	101.00	405.77	407.01		407.16	0.012260	3.14	36.42	74.66	0.68
Reach 1	5619.62*	50	Prop	101.00	405.74	407.00		407.16	0.012409	3.16	36.30	81.79	0.68
Reach 1	5619.62*	100	Existing	116.00	405.77	407.06		407.23	0.012137	3.31	40.88	80.50	0.68
Reach 1	5619.62*	100	Nat	116.00	405.77	407.06		407.23	0.012137	3.31	40.88	80.50	0.68
Reach 1	5619.62*	100	Prop	116.00	405.74	407.06		407.23	0.012139	3.31	41.40	89.48	0.68
Reach 1	5569.77*	50	Existing	101.00	405.17	406.39		406.54	0.012284	3.14	36.83	76.86	0.68
Reach 1	5569.77*	50	Nat	101.00	405.17	406.39		406.54	0.012284	3.14	36.83	76.86	0.68
Reach 1	5569.77*	50	Prop	101.00	405.14	406.39		406.54	0.012600	3.17	36.74	84.24	0.69
Reach 1	5569.77*	100	Existing	116.00	405.17	406.45		406.62	0.012047	3.30	41.58	83.91	0.68
Reach 1	5569.77*	100	Nat	116.00	405.17	406.45		406.62	0.012047	3.30	41.58	83.91	0.68
Reach 1	5569.77*	100	Prop	116.00	405.14	406.44	406.30	406.61	0.012770	3.35	41.26	90.99	0.70
Reach 1	5519.92*	50	Existing	101.00	404.57	405.78		405.93	0.012261	3.14	37.43	79.16	0.68
Reach 1	5519.92*	50	Nat	101.00	404.57	405.78		405.93	0.012261	3.14	37.43	79.16	0.68
Reach 1	5519.92*	50	Prop	101.00	404.54	405.78		405.93	0.011937	3.11	38.22	87.56	0.67
Reach 1	5519.92*	100	Existing	116.00	404.57	405.83		406.00	0.012557	3.33	41.57	85.91	0.69
Reach 1	5519.92*	100	Nat	116.00	404.57	405.83		406.00	0.012557	3.33	41.57	85.91	0.69
Reach 1	5519.92*	100	Prop	116.00	404.54	405.83		406.00	0.012096	3.29	42.96	94.47	0.68

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	5470.08*	50	Existing	101.00	403.96	405.17		405.32	0.012288	3.13	37.91	81.03	0.68
Reach 1	5470.08*	50	Nat	101.00	403.96	405.17		405.32	0.012288	3.13	37.91	81.03	0.68
Reach 1	5470.08*	50	Prop	101.00	403.94	405.16		405.31	0.012457	3.14	38.39	89.48	0.68
Reach 1	5470.08*	100	Existing	116.00	403.96	405.23		405.39	0.012171	3.29	42.78	90.11	0.68
Reach 1	5470.08*	100	Nat	116.00	403.96	405.23		405.39	0.012171	3.29	42.78	90.11	0.68
Reach 1	5470.08*	100	Prop	116.00	403.94	405.22		405.38	0.012167	3.29	43.87	97.66	0.68
Reach 1	5420.23*	50	Existing	101.00	403.36	404.55		404.70	0.012453	3.14	38.57	83.65	0.68
Reach 1	5420.23*	50	Nat	101.00	403.36	404.55		404.70	0.012453	3.14	38.57	83.65	0.68
Reach 1	5420.23*	50	Prop	101.00	403.34	404.55		404.70	0.012532	3.14	39.32	91.64	0.68
Reach 1	5420.23*	100	Existing	116.00	403.36	404.61		404.77	0.012407	3.30	43.45	93.01	0.69
Reach 1	5420.23*	100	Nat	116.00	403.36	404.61		404.77	0.012407	3.30	43.45	93.01	0.69
Reach 1	5420.23*	100	Prop	116.00	403.34	404.60		404.76	0.012456	3.30	44.54	99.41	0.69
Reach 1	5370.39*	50	Existing	101.00	402.76	403.95		404.09	0.012087	3.10	39.73	86.90	0.67
Reach 1	5370.39*	50	Nat	101.00	402.76	403.95		404.09	0.012087	3.10	39.73	86.90	0.67
Reach 1	5370.39*	50	Prop	101.00	402.74	403.94		404.08	0.012058	3.09	40.96	94.64	0.67
Reach 1	5370.39*	100	Existing	116.00	402.76	404.00		404.16	0.012197	3.28	44.55	95.84	0.68
Reach 1	5370.39*	100	Nat	116.00	402.76	404.00		404.16	0.012197	3.28	44.55	95.84	0.68
Reach 1	5370.39*	100	Prop	116.00	402.74	403.99		404.15	0.012202	3.27	46.00	102.09	0.68
Reach 1	5320.54*	50	Existing	101.00	402.15	403.32		403.47	0.012971	3.15	39.49	87.86	0.69
Reach 1	5320.54*	50	Nat	101.00	402.15	403.32		403.47	0.012975	3.15	39.49	87.85	0.69
Reach 1	5320.54*	50	Prop	101.00	402.14	403.31		403.46	0.013128	3.15	40.67	94.38	0.70
Reach 1	5320.54*	100	Existing	116.00	402.15	403.37		403.54	0.012817	3.31	44.62	96.89	0.70
Reach 1	5320.54*	100	Nat	116.00	402.15	403.37		403.54	0.012817	3.31	44.62	96.89	0.70
Reach 1	5320.54*	100	Prop	116.00	402.14	403.37		403.53	0.012848	3.30	46.21	102.60	0.70
Reach 1	5270.69*	50	Existing	101.00	401.55	402.74		402.87	0.011120	2.99	43.11	95.67	0.65
Reach 1	5270.69*	50	Nat	101.00	401.55	402.74		402.87	0.011118	2.99	43.11	95.68	0.65
Reach 1	5270.69*	50	Prop	101.00	401.54	402.73		402.86	0.010923	2.96	45.17	100.99	0.64
Reach 1	5270.69*	100	Existing	116.00	401.55	402.79		402.93	0.011243	3.17	48.35	103.89	0.66
Reach 1	5270.69*	100	Nat	116.00	401.55	402.79		402.93	0.011247	3.17	48.34	103.88	0.66
Reach 1	5270.69*	100	Prop	116.00	401.54	402.78		402.92	0.011433	3.16	49.85	107.50	0.66
Reach 1	5220.85*	50	Existing	101.00	400.94	402.06		402.22	0.015440	3.30	38.49	87.98	0.75
Reach 1	5220.85*	50	Nat	101.00	400.94	402.06		402.22	0.015445	3.30	38.48	87.97	0.75
Reach 1	5220.85*	50	Prop	101.00	400.94	402.05		402.21	0.015505	3.27	40.13	92.73	0.75
Reach 1	5220.85*	100	Existing	116.00	400.94	402.12	402.00	402.29	0.014926	3.44	43.73	96.94	0.75
Reach 1	5220.85*	100	Nat	116.00	400.94	402.12	402.00	402.29	0.014916	3.44	43.74	96.96	0.75
Reach 1	5220.85*	100	Prop	116.00	400.94	402.11	401.99	402.27	0.014885	3.41	45.65	101.20	0.74

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	5171	50	Existing	101.00	400.34	401.61		401.70	0.006594	2.52	56.50	116.84	0.51
Reach 1	5171	50	Nat	101.00	400.34	401.61		401.70	0.006589	2.52	56.52	116.87	0.51
Reach 1	5171	50	Prop	101.00	400.34	401.60		401.69	0.006706	2.51	58.26	118.56	0.51
Reach 1	5171	100	Existing	116.00	400.34	401.68		401.78	0.006591	2.66	64.41	122.10	0.52
Reach 1	5171	100	Nat	116.00	400.34	401.68		401.78	0.006605	2.66	64.35	122.08	0.52
Reach 1	5171	100	Prop	116.00	400.34	401.67		401.76	0.006693	2.65	66.64	125.56	0.52
Reach 1	5129.82*	50	Existing	101.00	399.96	401.30		401.39	0.006410	2.53	55.61	114.87	0.50
Reach 1	5129.82*	50	Nat	101.00	399.96	401.29		401.39	0.006428	2.53	55.54	114.80	0.50
Reach 1	5129.82*	50	Prop	101.00	399.96	401.27		401.36	0.006544	2.52	57.06	117.49	0.51
Reach 1	5129.82*	100	Existing	116.00	399.96	401.36		401.46	0.006536	2.68	62.83	120.51	0.51
Reach 1	5129.82*	100	Nat	116.00	399.96	401.36		401.46	0.006536	2.68	62.83	120.51	0.51
Reach 1	5129.82*	100	Prop	116.00	399.96	401.33		401.43	0.006751	2.69	64.41	124.60	0.52
Reach 1	5088.65*	50	Existing	101.00	399.59	400.97		401.07	0.006558	2.57	53.77	112.64	0.51
Reach 1	5088.65*	50	Nat	101.00	399.59	400.97		401.07	0.006561	2.57	53.76	112.63	0.51
Reach 1	5088.65*	50	Prop	101.00	399.59	400.94		401.03	0.006721	2.57	54.81	114.99	0.51
Reach 1	5088.65*	100	Existing	116.00	399.59	401.04		401.14	0.006482	2.69	61.30	119.17	0.51
Reach 1	5088.65*	100	Nat	116.00	399.59	401.03		401.14	0.006563	2.70	60.96	118.88	0.52
Reach 1	5088.65*	100	Prop	116.00	399.59	401.00		401.10	0.006744	2.71	62.03	122.75	0.52
Reach 1	5047.47*	50	Existing	101.00	399.21	400.65		400.75	0.006464	2.59	52.55	111.31	0.51
Reach 1	5047.47*	50	Nat	101.00	399.21	400.65		400.75	0.006475	2.59	52.51	111.28	0.51
Reach 1	5047.47*	50	Prop	101.00	399.21	400.61		400.71	0.006607	2.59	53.20	112.95	0.51
Reach 1	5047.47*	100	Existing	116.00	399.21	400.72		400.82	0.006447	2.72	59.84	117.37	0.51
Reach 1	5047.47*	100	Nat	116.00	399.21	400.72		400.82	0.006468	2.72	59.75	117.30	0.51
Reach 1	5047.47*	100	Prop	116.00	399.21	400.68		400.78	0.006579	2.72	60.66	121.47	0.52
Reach 1	5006.29*	50	Existing	101.00	398.84	400.33		400.43	0.006544	2.62	50.87	109.51	0.51
Reach 1	5006.29*	50	Nat	101.00	398.84	400.33		400.43	0.006596	2.63	50.68	109.36	0.51
Reach 1	5006.29*	50	Prop	101.00	398.84	400.28		400.38	0.006727	2.63	50.92	110.06	0.52
Reach 1	5006.29*	100	Existing	116.00	398.84	400.40		400.51	0.006517	2.75	58.12	115.13	0.52
Reach 1	5006.29*	100	Nat	116.00	398.84	400.39		400.50	0.006576	2.76	57.88	114.95	0.52
Reach 1	5006.29*	100	Prop	116.00	398.84	400.34		400.46	0.006700	2.77	58.30	119.38	0.52
Reach 1	4965.12*	50	Existing	101.00	398.46	400.01		400.11	0.006453	2.63	49.52	107.70	0.51
Reach 1	4965.12*	50	Nat	101.00	398.46	400.01		400.11	0.006518	2.64	49.28	107.51	0.51
Reach 1	4965.12*	50	Prop	101.00	398.46	399.95		400.05	0.006734	2.66	48.76	106.54	0.52
Reach 1	4965.12*	100	Existing	116.00	398.46	400.08		400.19	0.006434	2.77	56.73	113.10	0.52
Reach 1	4965.12*	100	Nat	116.00	398.46	400.07		400.19	0.006497	2.78	56.47	112.91	0.52
Reach 1	4965.12*	100	Prop	116.00	398.46	400.01		400.13	0.006648	2.79	56.34	116.94	0.52

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	4923.94*	50	Existing	101.00	398.08	399.69		399.80	0.006462	2.66	48.06	105.61	0.51
Reach 1	4923.94*	50	Nat	101.00	398.08	399.69		399.80	0.006478	2.66	48.00	105.57	0.51
Reach 1	4923.94*	50	Prop	101.00	398.08	399.62		399.72	0.006674	2.68	47.00	102.84	0.52
Reach 1	4923.94*	100	Existing	116.00	398.08	399.76		399.87	0.006400	2.79	55.40	111.14	0.51
Reach 1	4923.94*	100	Nat	116.00	398.08	399.75		399.87	0.006465	2.80	55.13	110.94	0.52
Reach 1	4923.94*	100	Prop	116.00	398.08	399.68		399.80	0.006612	2.82	54.46	114.94	0.52
Reach 1	4882.77*	50	Existing	101.00	397.71	399.37		399.48	0.006543	2.69	46.49	103.07	0.51
Reach 1	4882.77*	50	Nat	101.00	397.71	399.37		399.48	0.006596	2.70	46.30	102.91	0.52
Reach 1	4882.77*	50	Prop	101.00	397.71	399.28		399.39	0.006812	2.74	44.41	97.39	0.52
Reach 1	4882.77*	100	Existing	116.00	397.71	399.44		399.55	0.006504	2.82	53.64	108.63	0.52
Reach 1	4882.77*	100	Nat	116.00	397.71	399.44		399.55	0.006511	2.82	53.62	108.61	0.52
Reach 1	4882.77*	100	Prop	116.00	397.71	399.35		399.47	0.006753	2.86	51.87	111.71	0.53
Reach 1	4841.59*	50	Existing	101.00	397.33	399.05		399.16	0.006376	2.69	45.95	100.30	0.51
Reach 1	4841.59*	50	Nat	101.00	397.33	399.05		399.16	0.006400	2.69	45.86	100.22	0.51
Reach 1	4841.59*	50	Prop	101.00	397.33	398.95		399.06	0.006627	2.74	42.87	93.81	0.52
Reach 1	4841.59*	100	Existing	116.00	397.33	399.12		399.24	0.006308	2.82	53.20	106.36	0.51
Reach 1	4841.59*	100	Nat	116.00	397.33	399.12		399.24	0.006379	2.83	52.90	106.12	0.52
Reach 1	4841.59*	100	Prop	116.00	397.33	399.02		399.15	0.006538	2.86	50.64	109.73	0.52
Reach 1	4800.41*	50	Existing	101.00	396.96	398.73		398.84	0.006574	2.73	44.30	94.69	0.52
Reach 1	4800.41*	50	Nat	101.00	396.96	398.73		398.84	0.006622	2.74	44.14	94.53	0.52
Reach 1	4800.41*	50	Prop	101.00	396.96	398.61		398.73	0.006853	2.80	40.15	86.04	0.53
Reach 1	4800.41*	100	Existing	116.00	396.96	398.80		398.92	0.006543	2.87	51.11	101.91	0.52
Reach 1	4800.41*	100	Nat	116.00	396.96	398.80		398.92	0.006544	2.87	51.11	101.91	0.52
Reach 1	4800.41*	100	Prop	116.00	396.96	398.69		398.82	0.006784	2.92	47.79	105.87	0.53
Reach 1	4759.24*	50	Existing	101.00	396.58	398.41		398.53	0.006425	2.73	44.11	90.79	0.51
Reach 1	4759.24*	50	Nat	101.00	396.58	398.41		398.53	0.006477	2.74	43.93	90.72	0.51
Reach 1	4759.24*	50	Prop	101.00	396.58	398.27		398.40	0.006781	2.82	38.41	77.88	0.53
Reach 1	4759.24*	100	Existing	116.00	396.58	398.48		398.61	0.006409	2.87	50.61	95.43	0.52
Reach 1	4759.24*	100	Nat	116.00	396.58	398.48		398.61	0.006419	2.87	50.57	95.40	0.52
Reach 1	4759.24*	100	Prop	116.00	396.58	398.36		398.49	0.006708	2.94	45.69	99.69	0.53
Reach 1	4718.06*	50	Existing	101.00	396.21	398.10		398.21	0.006425	2.75	43.89	90.50	0.51
Reach 1	4718.06*	50	Nat	101.00	396.21	398.10		398.21	0.006436	2.75	43.85	90.48	0.51
Reach 1	4718.06*	50	Prop	101.00	396.21	397.93		398.06	0.006896	2.86	36.67	66.84	0.53
Reach 1	4718.06*	100	Existing	116.00	396.21	398.17		398.29	0.006414	2.89	50.34	92.85	0.52
Reach 1	4718.06*	100	Nat	116.00	396.21	398.17		398.29	0.006423	2.89	50.31	92.84	0.52
Reach 1	4718.06*	100	Prop	116.00	396.21	398.02		398.16	0.006808	2.98	43.32	91.03	0.54

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	4676.88*	50	Existing	101.00	395.83	397.78		397.90	0.006452	2.77	43.57	90.11	0.51
Reach 1	4676.88*	50	Nat	101.00	395.83	397.78		397.90	0.006448	2.77	43.59	90.12	0.51
Reach 1	4676.88*	50	Prop	101.00	395.83	397.59		397.72	0.006901	2.89	35.73	57.05	0.53
Reach 1	4676.88*	100	Existing	116.00	395.83	397.85		397.98	0.006420	2.91	50.11	92.37	0.52
Reach 1	4676.88*	100	Nat	116.00	395.83	397.85		397.98	0.006433	2.91	50.07	92.35	0.52
Reach 1	4676.88*	100	Prop	116.00	395.83	397.68		397.82	0.006856	3.02	41.38	78.92	0.54
Reach 1	4635.71*	50	Existing	101.00	395.45	397.47		397.58	0.006325	2.77	43.76	89.97	0.51
Reach 1	4635.71*	50	Nat	101.00	395.45	397.46		397.58	0.006418	2.78	43.44	89.86	0.51
Reach 1	4635.71*	50	Prop	101.00	395.45	397.26		397.39	0.006786	2.89	35.30	51.43	0.53
Reach 1	4635.71*	100	Existing	116.00	395.45	397.54		397.67	0.006277	2.90	50.44	92.15	0.52
Reach 1	4635.71*	100	Nat	116.00	395.45	397.54		397.66	0.006367	2.92	50.09	92.03	0.52
Reach 1	4635.71*	100	Prop	116.00	395.45	397.34		397.49	0.006739	3.03	40.60	72.19	0.54
Reach 1	4594.53*	50	Existing	101.00	395.08	397.16		397.28	0.006149	2.76	44.57	90.20	0.50
Reach 1	4594.53*	50	Nat	101.00	395.08	397.15		397.27	0.006423	2.80	43.58	89.89	0.51
Reach 1	4594.53*	50	Prop	101.00	395.08	396.93		397.06	0.006642	2.89	35.13	47.60	0.53
Reach 1	4594.53*	100	Existing	116.00	395.08	397.24		397.36	0.006064	2.89	51.50	92.34	0.51
Reach 1	4594.53*	100	Nat	116.00	395.08	397.22		397.35	0.006397	2.94	50.18	91.94	0.52
Reach 1	4594.53*	100	Prop	116.00	395.08	397.02		397.16	0.006560	3.02	40.41	71.38	0.53
Reach 1	4553.35*	50	Existing	101.00	394.70	396.88		396.99	0.005364	2.66	47.50	90.83	0.47
Reach 1	4553.35*	50	Nat	101.00	394.70	396.84		396.96	0.006202	2.78	44.12	89.83	0.51
Reach 1	4553.35*	50	Prop	101.00	394.70	396.62		396.74	0.006021	2.82	36.03	47.88	0.50
Reach 1	4553.35*	100	Existing	116.00	394.70	396.96		397.07	0.005262	2.78	54.91	92.99	0.48
Reach 1	4553.35*	100	Nat	116.00	394.70	396.92		397.04	0.006173	2.92	50.83	91.81	0.51
Reach 1	4553.35*	100	Prop	116.00	394.70	396.71		396.85	0.005936	2.95	41.64	74.03	0.51
Reach 1	4512.18*	50	Existing	101.00	394.33	396.66		396.74	0.003902	2.41	55.69	92.89	0.41
Reach 1	4512.18*	50	Nat	101.00	394.33	396.55		396.66	0.005881	2.75	45.49	90.03	0.50
Reach 1	4512.18*	50	Prop	101.00	394.33	396.36		396.47	0.004753	2.63	39.58	63.98	0.45
Reach 1	4512.18*	100	Existing	116.00	394.33	396.74	396.23	396.83	0.003881	2.53	63.52	95.03	0.42
Reach 1	4512.18*	100	Nat	116.00	394.33	396.62		396.75	0.005844	2.89	52.39	91.97	0.50
Reach 1	4512.18*	100	Prop	116.00	394.33	396.46		396.58	0.004692	2.75	47.06	88.46	0.46
Reach 1	4471	50	Existing	101.00	393.95	395.82	395.82	396.18	0.026303	4.81	20.99	29.06	1.00
Reach 1	4471	50	Nat	101.00	393.95	396.07	395.82	396.25	0.011444	3.44	31.07	69.78	0.67
Reach 1	4471	50	Prop	101.00	393.95	395.47	395.47	395.85	0.026038	4.96	20.38	26.86	1.00
Reach 1	4471	100	Existing	116.00	393.95	395.92	395.92	396.28	0.026338	4.79	24.24	33.90	1.00
Reach 1	4471	100	Nat	116.00	393.95	396.13	395.91	396.34	0.011447	3.61	36.60	87.53	0.68
Reach 1	4471	100	Prop	116.00	393.95	395.56	395.56	395.96	0.025419	5.08	22.82	28.42	1.00

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	4424.46*	50	Nat	101.00	393.43	395.52		395.70	0.011924	3.47	29.14	36.55	0.68
Reach 1	4424.46*	100	Nat	116.00	393.43	395.60		395.80	0.011458	3.59	32.72	48.73	0.68
Reach 1	4377.92*	50	Nat	101.00	392.90	394.94		395.14	0.012103	3.62	27.90	33.17	0.70
Reach 1	4377.92*	100	Nat	116.00	392.90	395.04		395.25	0.012036	3.68	31.50	36.36	0.70
Reach 1	4331.39*	50	Nat	101.00	392.38	394.37		394.58	0.011870	3.66	27.60	31.82	0.69
Reach 1	4331.39*	100	Nat	116.00	392.38	394.48		394.69	0.011828	3.74	31.05	34.63	0.70
Reach 1	4284.85*	50	Nat	101.00	391.86	393.81		394.02	0.012062	3.72	27.12	30.83	0.70
Reach 1	4284.85*	100	Nat	116.00	391.86	393.91		394.13	0.012067	3.82	30.40	33.35	0.70
Reach 1	4238.31*	50	Nat	101.00	391.33	393.25		393.46	0.011815	3.72	27.16	30.47	0.69
Reach 1	4238.31*	100	Nat	116.00	391.33	393.35		393.57	0.011823	3.82	30.37	32.77	0.70
Reach 1	4191.77*	50	Nat	101.00	390.81	392.69		392.91	0.011882	3.73	27.06	30.33	0.70
Reach 1	4191.77*	100	Nat	116.00	390.81	392.79		393.02	0.011907	3.84	30.19	32.48	0.70
Reach 1	4145.23*	50	Nat	101.00	390.29	392.14		392.36	0.011709	3.71	27.24	30.53	0.69
Reach 1	4145.23*	100	Nat	116.00	390.29	392.24		392.47	0.011706	3.82	30.38	32.57	0.70
Reach 1	4145			Culvert									
Reach 1	4098.69*	50	Nat	101.00	389.77	391.59		391.81	0.011874	3.72	27.16	30.63	0.70
Reach 1	4098.69*	100	Nat	116.00	389.77	391.69		391.92	0.011913	3.84	30.21	32.56	0.70
Reach 1	4052.15*	50	Nat	101.00	389.24	391.05		391.26	0.011640	3.68	27.44	30.96	0.69
Reach 1	4052.15*	100	Nat	116.00	389.24	391.14		391.37	0.011596	3.79	30.57	32.86	0.69
Reach 1	4005.62*	50	Nat	101.00	388.72	390.50		390.71	0.011701	3.68	27.48	31.21	0.69
Reach 1	4005.62*	100	Nat	116.00	388.72	390.60		390.82	0.011745	3.80	30.50	33.01	0.70
Reach 1	3959.08*	50	Nat	101.00	388.20	389.96		390.17	0.011615	3.65	27.70	31.66	0.69
Reach 1	3959.08*	100	Nat	116.00	388.20	390.06		390.28	0.011480	3.75	30.90	33.51	0.69
Reach 1	3912.54*	50	Nat	101.00	387.67	389.40		389.62	0.012114	3.69	27.34	31.64	0.70
Reach 1	3912.54*	100	Nat	116.00	387.67	389.49		389.72	0.012498	3.87	30.00	33.17	0.72
Reach 1	3866	50	Existing	101.00	387.15	388.94	388.64	389.12	0.009546	3.36	30.06	88.66	0.63
Reach 1	3866	50	Nat	101.00	387.15	388.95	388.64	389.11	0.008988	3.26	37.97	89.73	0.61
Reach 1	3866	50	Prop	101.00	387.15	388.94	388.64	389.12	0.009546	3.36	30.06	88.66	0.63

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	3866	100	Existing	116.00	387.15	389.04	388.72	389.23	0.009600	3.49	33.27	117.60	0.63
Reach 1	3866	100	Nat	116.00	387.15	389.04	388.73	389.20	0.008793	3.34	47.31	117.61	0.61
Reach 1	3866	100	Prop	116.00	387.15	389.04	388.72	389.23	0.009604	3.49	33.27	117.56	0.63
Reach 1	3818.88*	50	Existing	101.00	386.66	388.50	388.17	388.67	0.009257	3.37	32.31	72.59	0.62
Reach 1	3818.88*	50	Nat	101.00	386.66	388.50	388.17	388.67	0.009306	3.37	32.19	72.04	0.62
Reach 1	3818.88*	50	Prop	101.00	386.66	388.50	388.17	388.67	0.009255	3.36	32.37	73.24	0.62
Reach 1	3818.88*	100	Existing	116.00	386.66	388.60	388.27	388.78	0.008926	3.42	41.28	104.85	0.61
Reach 1	3818.88*	100	Nat	116.00	386.66	388.60	388.27	388.78	0.009018	3.44	40.94	103.80	0.62
Reach 1	3818.88*	100	Prop	116.00	386.66	388.60	388.27	388.78	0.008915	3.42	41.42	105.53	0.61
Reach 1	3771.75*	50	Existing	101.00	386.17	388.05		388.23	0.009267	3.42	29.61	36.50	0.62
Reach 1	3771.75*	50	Nat	101.00	386.17	388.05		388.23	0.009275	3.42	29.60	36.43	0.62
Reach 1	3771.75*	50	Prop	101.00	386.17	388.05		388.23	0.009267	3.42	29.61	36.55	0.62
Reach 1	3771.75*	100	Existing	116.00	386.17	388.16	387.81	388.35	0.009122	3.51	35.94	89.95	0.62
Reach 1	3771.75*	100	Nat	116.00	386.17	388.15	387.81	388.35	0.009146	3.52	35.86	89.64	0.62
Reach 1	3771.75*	100	Prop	116.00	386.17	388.16	387.81	388.35	0.009129	3.51	35.93	90.10	0.62
Reach 1	3724.63*	50	Existing	101.00	385.68	387.62		387.80	0.009000	3.43	29.42	30.33	0.61
Reach 1	3724.63*	50	Nat	101.00	385.68	387.62		387.80	0.009038	3.44	29.37	30.31	0.62
Reach 1	3724.63*	50	Prop	101.00	385.68	387.62		387.80	0.008999	3.43	29.43	32.48	0.61
Reach 1	3724.63*	100	Existing	116.00	385.68	387.72	387.36	387.92	0.008930	3.54	34.06	62.43	0.62
Reach 1	3724.63*	100	Nat	116.00	385.68	387.72	387.36	387.92	0.008970	3.55	33.96	61.67	0.62
Reach 1	3724.63*	100	Prop	116.00	385.68	387.72	387.36	387.92	0.008924	3.54	34.17	63.36	0.62
Reach 1	3677.50*	50	Existing	101.00	385.20	387.19		387.37	0.009013	3.49	28.96	29.17	0.62
Reach 1	3677.50*	50	Nat	101.00	385.20	387.18		387.37	0.009041	3.49	28.92	29.15	0.62
Reach 1	3677.50*	50	Prop	101.00	385.20	387.19		387.37	0.009012	3.49	28.96	29.17	0.62
Reach 1	3677.50*	100	Existing	116.00	385.20	387.29	386.92	387.49	0.008924	3.60	33.36	52.19	0.62
Reach 1	3677.50*	100	Nat	116.00	385.20	387.29	386.92	387.49	0.008954	3.60	33.29	51.92	0.62
Reach 1	3677.50*	100	Prop	116.00	385.20	387.29	386.92	387.49	0.008929	3.60	33.36	52.51	0.62
Reach 1	3630.38*	50	Existing	101.00	384.71	386.76		386.95	0.008863	3.53	28.64	27.97	0.61
Reach 1	3630.38*	50	Nat	101.00	384.71	386.76		386.95	0.008886	3.53	28.61	27.96	0.62
Reach 1	3630.38*	50	Prop	101.00	384.71	386.76		386.95	0.008864	3.53	28.63	27.97	0.61
Reach 1	3630.38*	100	Existing	116.00	384.71	386.87	386.48	387.08	0.008769	3.64	32.88	50.22	0.62
Reach 1	3630.38*	100	Nat	116.00	384.71	386.87	386.48	387.07	0.008801	3.64	32.81	49.91	0.62
Reach 1	3630.38*	100	Prop	116.00	384.71	386.87	386.48	387.08	0.008763	3.63	32.97	51.27	0.62
Reach 1	3583.25*	50	Existing	101.00	384.22	386.34		386.54	0.008624	3.56	28.40	26.79	0.61
Reach 1	3583.25*	50	Nat	101.00	384.22	386.34		386.54	0.008666	3.56	28.34	26.76	0.61
Reach 1	3583.25*	50	Prop	101.00	384.22	386.34		386.54	0.008625	3.56	28.39	26.79	0.61

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	3583.25*	100	Existing	116.00	384.22	386.45	386.05	386.66	0.008606	3.68	32.65	51.47	0.61
Reach 1	3583.25*	100	Nat	116.00	384.22	386.45	386.05	386.66	0.008656	3.69	32.53	50.90	0.62
Reach 1	3583.25*	100	Prop	116.00	384.22	386.45	386.05	386.66	0.008613	3.68	32.65	51.91	0.61
Reach 1	3536.13*	50	Existing	101.00	383.73	385.95		386.14	0.008063	3.54	28.59	29.79	0.59
Reach 1	3536.13*	50	Nat	101.00	383.73	385.94		386.14	0.008102	3.54	28.53	29.27	0.59
Reach 1	3536.13*	50	Prop	101.00	383.73	385.95		386.14	0.008067	3.54	28.59	30.36	0.59
Reach 1	3536.13*	100	Existing	116.00	383.73	386.06	385.62	386.27	0.008123	3.67	33.55	58.34	0.60
Reach 1	3536.13*	100	Nat	116.00	383.73	386.05	385.62	386.26	0.008232	3.69	33.23	56.95	0.60
Reach 1	3536.13*	100	Prop	116.00	383.73	386.06	385.62	386.27	0.008135	3.67	33.63	59.69	0.60
Reach 1	3489	50	Existing	101.00	383.24	385.60		385.78	0.006915	3.41	32.53	66.03	0.55
Reach 1	3489	50	Nat	101.00	383.24	385.60		385.78	0.006925	3.41	32.49	65.81	0.55
Reach 1	3489	50	Prop	101.00	383.24	385.60		385.78	0.006917	3.41	32.62	67.46	0.55
Reach 1	3489	100	Existing	116.00	383.24	385.71	385.22	385.90	0.006884	3.51	42.31	104.98	0.56
Reach 1	3489	100	Nat	116.00	383.24	385.71	385.22	385.90	0.006899	3.51	42.23	104.85	0.56
Reach 1	3489	100	Prop	116.00	383.24	385.71	385.21	385.90	0.006898	3.51	42.54	107.82	0.56
Reach 1	3440.62*	50	Existing	101.00	382.89	385.25	384.76	385.43	0.007022	3.43	31.83	64.53	0.56
Reach 1	3440.62*	50	Nat	101.00	382.89	385.24	384.76	385.43	0.007025	3.43	31.81	64.47	0.56
Reach 1	3440.62*	50	Prop	101.00	382.89	385.24	384.75	385.43	0.007030	3.43	31.95	66.71	0.56
Reach 1	3440.62*	100	Existing	116.00	382.89	385.36	384.87	385.55	0.006999	3.53	41.15	99.36	0.56
Reach 1	3440.62*	100	Nat	116.00	382.89	385.36	384.87	385.55	0.007005	3.54	41.12	99.27	0.56
Reach 1	3440.62*	100	Prop	116.00	382.89	385.36	384.86	385.55	0.007023	3.54	41.47	102.86	0.56
Reach 1	3392.23*	50	Existing	101.00	382.53	384.90		385.08	0.006914	3.42	31.78	64.79	0.55
Reach 1	3392.23*	50	Nat	101.00	382.53	384.90		385.08	0.006924	3.42	31.74	64.61	0.55
Reach 1	3392.23*	50	Prop	101.00	382.53	384.90		385.08	0.006907	3.41	32.14	69.02	0.55
Reach 1	3392.23*	100	Existing	116.00	382.53	385.01	384.50	385.20	0.006888	3.52	41.16	98.57	0.56
Reach 1	3392.23*	100	Nat	116.00	382.53	385.01	384.50	385.20	0.006902	3.52	41.08	98.31	0.56
Reach 1	3392.23*	100	Prop	116.00	382.53	385.01	384.51	385.20	0.006886	3.52	41.97	104.36	0.56
Reach 1	3343.85*	50	Existing	101.00	382.18	384.54	384.05	384.73	0.007049	3.45	31.23	60.65	0.56
Reach 1	3343.85*	50	Nat	101.00	382.18	384.54	384.05	384.73	0.007050	3.45	31.23	60.64	0.56
Reach 1	3343.85*	50	Prop	101.00	382.18	384.54	384.06	384.73	0.007050	3.45	31.48	65.38	0.56
Reach 1	3343.85*	100	Existing	116.00	382.18	384.66	384.17	384.85	0.007014	3.55	40.23	94.02	0.56
Reach 1	3343.85*	100	Nat	116.00	382.18	384.66	384.17	384.85	0.007032	3.55	40.13	93.73	0.56
Reach 1	3343.85*	100	Prop	116.00	382.18	384.66	384.16	384.85	0.007048	3.55	40.86	100.70	0.56
Reach 1	3295.46*	50	Existing	101.00	381.82	384.20		384.38	0.006949	3.43	31.65	58.58	0.56
Reach 1	3295.46*	50	Nat	101.00	381.82	384.20		384.38	0.006955	3.43	31.63	58.50	0.56
Reach 1	3295.46*	50	Prop	101.00	381.82	384.20	383.70	384.38	0.006952	3.43	31.86	65.20	0.56

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	3295.46*	100	Existing	116.00	381.82	384.31	383.80	384.50	0.006973	3.55	39.97	89.12	0.56
Reach 1	3295.46*	100	Nat	116.00	381.82	384.31	383.80	384.50	0.006977	3.55	39.95	89.06	0.56
Reach 1	3295.46*	100	Prop	116.00	381.82	384.31	383.81	384.50	0.006953	3.54	41.23	101.38	0.56
Reach 1	3247.08*	50	Existing	101.00	381.47	383.85		384.03	0.006974	3.44	32.26	62.48	0.56
Reach 1	3247.08*	50	Nat	101.00	381.47	383.85		384.03	0.006977	3.44	32.25	62.44	0.56
Reach 1	3247.08*	50	Prop	101.00	381.47	383.85		384.03	0.006982	3.44	32.39	63.92	0.56
Reach 1	3247.08*	100	Existing	116.00	381.47	383.96		384.15	0.006987	3.55	40.29	84.41	0.56
Reach 1	3247.08*	100	Nat	116.00	381.47	383.96		384.15	0.006992	3.55	40.27	84.33	0.56
Reach 1	3247.08*	100	Prop	116.00	381.47	383.96	383.46	384.15	0.006992	3.55	41.28	100.70	0.56
Reach 1	3198.69*	50	Existing	101.00	381.12	383.49		383.68	0.007057	3.46	32.35	63.12	0.56
Reach 1	3198.69*	50	Nat	101.00	381.12	383.49		383.68	0.007062	3.46	32.33	63.08	0.56
Reach 1	3198.69*	50	Prop	101.00	381.12	383.49	383.01	383.68	0.007058	3.46	32.62	65.65	0.56
Reach 1	3198.69*	100	Existing	116.00	381.12	383.61	383.12	383.80	0.007076	3.57	40.18	77.15	0.56
Reach 1	3198.69*	100	Nat	116.00	381.12	383.61	383.12	383.80	0.007081	3.57	40.16	77.11	0.56
Reach 1	3198.69*	100	Prop	116.00	381.12	383.61	383.12	383.80	0.007066	3.57	41.08	96.90	0.56
Reach 1	3150.31*	50	Existing	101.00	380.76	383.15		383.33	0.006944	3.44	33.13	65.17	0.56
Reach 1	3150.31*	50	Nat	101.00	380.76	383.15		383.33	0.006951	3.44	33.10	65.12	0.56
Reach 1	3150.31*	50	Prop	101.00	380.76	383.15	382.65	383.33	0.006949	3.44	33.36	68.05	0.56
Reach 1	3150.31*	100	Existing	116.00	380.76	383.26	382.75	383.45	0.006977	3.55	41.02	77.87	0.56
Reach 1	3150.31*	100	Nat	116.00	380.76	383.26	382.75	383.45	0.006983	3.55	40.99	77.83	0.56
Reach 1	3150.31*	100	Prop	116.00	380.76	383.26	382.75	383.45	0.006986	3.55	41.68	84.16	0.56
Reach 1	3101.92*	50	Existing	101.00	380.41	382.80		382.98	0.006985	3.45	33.67	66.77	0.56
Reach 1	3101.92*	50	Nat	101.00	380.41	382.80		382.98	0.006990	3.45	33.65	66.74	0.56
Reach 1	3101.92*	50	Prop	101.00	380.41	382.80		382.98	0.006990	3.45	34.00	70.72	0.56
Reach 1	3101.92*	100	Existing	116.00	380.41	382.91		383.10	0.007011	3.56	41.57	78.68	0.56
Reach 1	3101.92*	100	Nat	116.00	380.41	382.91		383.10	0.007017	3.56	41.55	78.63	0.56
Reach 1	3101.92*	100	Prop	116.00	380.41	382.90		383.10	0.007018	3.56	42.45	86.94	0.56
Reach 1	3053.54*	50	Existing	101.00	380.06	382.44		382.63	0.007065	3.47	33.82	67.30	0.56
Reach 1	3053.54*	50	Nat	101.00	380.06	382.44		382.63	0.007076	3.47	33.78	67.24	0.56
Reach 1	3053.54*	50	Prop	101.00	380.06	382.44	381.96	382.63	0.007073	3.47	34.21	71.97	0.56
Reach 1	3053.54*	100	Existing	116.00	380.06	382.55	382.07	382.74	0.007104	3.59	41.54	79.05	0.57
Reach 1	3053.54*	100	Nat	116.00	380.06	382.55	382.07	382.74	0.007115	3.59	41.50	78.97	0.57
Reach 1	3053.54*	100	Prop	116.00	380.06	382.55	382.07	382.74	0.007122	3.59	42.52	89.08	0.57
Reach 1	3005.15*	50	Existing	101.00	379.70	382.09		382.28	0.006994	3.46	34.52	68.73	0.56
Reach 1	3005.15*	50	Nat	101.00	379.70	382.09		382.28	0.006996	3.46	34.52	68.72	0.56
Reach 1	3005.15*	50	Prop	101.00	379.70	382.09		382.27	0.007001	3.46	35.05	74.45	0.56

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	3005.15*	100	Existing	116.00	379.70	382.20		382.39	0.007021	3.58	42.24	80.09	0.56
Reach 1	3005.15*	100	Nat	116.00	379.70	382.20		382.39	0.007027	3.58	42.22	80.06	0.56
Reach 1	3005.15*	100	Prop	116.00	379.70	382.19	381.71	382.39	0.007034	3.58	43.47	91.59	0.56
Reach 1	2956.77*	50	Existing	101.00	379.35	381.74	381.25	381.92	0.007077	3.47	34.80	69.53	0.56
Reach 1	2956.77*	50	Nat	101.00	379.35	381.74	381.25	381.92	0.007083	3.47	34.78	69.50	0.56
Reach 1	2956.77*	50	Prop	101.00	379.35	381.74	381.25	381.92	0.007081	3.47	35.45	76.10	0.56
Reach 1	2956.77*	100	Existing	116.00	379.35	381.84	381.36	382.04	0.007118	3.61	42.36	80.31	0.57
Reach 1	2956.77*	100	Nat	116.00	379.35	381.84	381.36	382.04	0.007129	3.61	42.31	80.25	0.57
Reach 1	2956.77*	100	Prop	116.00	379.35	381.84	381.37	382.03	0.007142	3.61	43.71	92.61	0.57
Reach 1	2908.39*	50	Existing	101.00	378.99	381.39		381.57	0.006972	3.46	35.70	70.55	0.56
Reach 1	2908.39*	50	Nat	101.00	378.99	381.39		381.57	0.006976	3.46	35.68	70.54	0.56
Reach 1	2908.39*	50	Prop	101.00	378.99	381.39	380.91	381.57	0.006970	3.45	36.56	78.37	0.56
Reach 1	2908.39*	100	Existing	116.00	378.99	381.49		381.68	0.007015	3.60	43.17	80.95	0.56
Reach 1	2908.39*	100	Nat	116.00	378.99	381.49		381.68	0.007017	3.60	43.17	80.94	0.56
Reach 1	2908.39*	100	Prop	116.00	378.99	381.49	381.02	381.68	0.007010	3.59	44.94	94.79	0.56
Reach 1	2860.00*	50	Existing	101.00	378.64	381.04		381.22	0.006959	3.46	36.54	72.01	0.56
Reach 1	2860.00*	50	Nat	101.00	378.64	381.04		381.22	0.006969	3.46	36.50	71.96	0.56
Reach 1	2860.00*	50	Prop	101.00	378.64	381.04		381.22	0.006989	3.46	37.30	80.16	0.56
Reach 1	2860.00*	100	Existing	116.00	378.64	381.14		381.33	0.006977	3.60	44.04	82.08	0.56
Reach 1	2860.00*	100	Nat	116.00	378.64	381.14		381.33	0.006987	3.60	44.00	82.03	0.56
Reach 1	2860.00*	100	Prop	116.00	378.64	381.13	380.67	381.33	0.007023	3.60	45.66	96.18	0.56
Reach 1	2811.62*	50	Existing	101.00	378.29	380.69		380.87	0.007096	3.48	36.70	72.55	0.56
Reach 1	2811.62*	50	Nat	101.00	378.29	380.69		380.87	0.007109	3.49	36.65	72.50	0.56
Reach 1	2811.62*	50	Prop	101.00	378.29	380.69	380.21	380.87	0.007089	3.48	37.91	82.01	0.56
Reach 1	2811.62*	100	Existing	116.00	378.29	380.79		380.98	0.007099	3.63	44.20	82.18	0.57
Reach 1	2811.62*	100	Nat	116.00	378.29	380.78		380.98	0.007112	3.63	44.15	82.12	0.57
Reach 1	2811.62*	100	Prop	116.00	378.29	380.78	380.32	380.97	0.007100	3.62	46.38	97.25	0.57
Reach 1	2763.23*	50	Existing	101.00	377.93	380.33		380.52	0.007032	3.48	37.22	73.50	0.56
Reach 1	2763.23*	50	Nat	101.00	377.93	380.33		380.52	0.007036	3.48	37.21	73.48	0.56
Reach 1	2763.23*	50	Prop	101.00	377.93	380.33		380.51	0.007053	3.48	38.40	83.81	0.56
Reach 1	2763.23*	100	Existing	116.00	377.93	380.43		380.63	0.007049	3.63	44.73	82.63	0.57
Reach 1	2763.23*	100	Nat	116.00	377.93	380.43		380.63	0.007050	3.63	44.73	82.63	0.57
Reach 1	2763.23*	100	Prop	116.00	377.93	380.42	379.96	380.62	0.007078	3.63	46.92	98.49	0.57
Reach 1	2714.85*	50	Existing	101.00	377.58	379.98		380.16	0.007089	3.50	37.63	74.38	0.56
Reach 1	2714.85*	50	Nat	101.00	377.58	379.98		380.16	0.007105	3.50	37.58	74.32	0.56
Reach 1	2714.85*	50	Prop	101.00	377.58	379.98	379.52	380.16	0.007106	3.50	39.07	85.99	0.56

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2714.85*	100	Existing	116.00	377.58	380.08		380.27	0.007089	3.64	45.24	83.05	0.57
Reach 1	2714.85*	100	Nat	116.00	377.58	380.08		380.27	0.007102	3.64	45.19	82.99	0.57
Reach 1	2714.85*	100	Prop	116.00	377.58	380.07	379.61	380.26	0.007114	3.64	47.75	99.91	0.57
Reach 1	2666.46*	50	Existing	101.00	377.22	379.63		379.81	0.007046	3.50	38.10	75.19	0.56
Reach 1	2666.46*	50	Nat	101.00	377.22	379.63		379.81	0.007051	3.50	38.08	75.17	0.56
Reach 1	2666.46*	50	Prop	101.00	377.22	379.62	379.15	379.80	0.007071	3.50	39.69	87.89	0.56
Reach 1	2666.46*	100	Existing	116.00	377.22	379.72		379.92	0.007063	3.65	45.69	83.38	0.57
Reach 1	2666.46*	100	Nat	116.00	377.22	379.72		379.92	0.007068	3.65	45.67	83.36	0.57
Reach 1	2666.46*	100	Prop	116.00	377.22	379.71	379.25	379.91	0.007095	3.64	48.44	101.19	0.57
Reach 1	2618.08*	50	Existing	101.00	376.87	379.28		379.46	0.006973	3.50	39.02	76.62	0.56
Reach 1	2618.08*	50	Nat	101.00	376.87	379.28		379.46	0.006982	3.50	38.99	76.58	0.56
Reach 1	2618.08*	50	Prop	101.00	376.87	379.27		379.45	0.006966	3.49	41.07	90.90	0.56
Reach 1	2618.08*	100	Existing	116.00	376.87	379.37		379.57	0.006991	3.64	46.64	84.52	0.56
Reach 1	2618.08*	100	Nat	116.00	376.87	379.37		379.57	0.007002	3.65	46.60	84.47	0.56
Reach 1	2618.08*	100	Prop	116.00	376.87	379.36		379.56	0.006991	3.63	49.96	103.24	0.56
Reach 1	2569.69*	50	Existing	101.00	376.52	378.92		379.11	0.007095	3.52	39.26	77.00	0.56
Reach 1	2569.69*	50	Nat	101.00	376.52	378.92		379.11	0.007108	3.53	39.21	76.95	0.56
Reach 1	2569.69*	50	Prop	101.00	376.52	378.92	378.47	379.10	0.007153	3.53	41.14	91.67	0.56
Reach 1	2569.69*	100	Existing	116.00	376.52	379.02		379.21	0.007104	3.68	46.81	84.67	0.57
Reach 1	2569.69*	100	Nat	116.00	376.52	379.02		379.21	0.007118	3.68	46.75	84.62	0.57
Reach 1	2569.69*	100	Prop	116.00	376.52	379.00	378.58	379.20	0.007188	3.67	49.84	102.74	0.57
Reach 1	2521.31*	50	Existing	101.00	376.16	378.57		378.75	0.007061	3.53	39.70	77.53	0.56
Reach 1	2521.31*	50	Nat	101.00	376.16	378.57		378.75	0.007071	3.53	39.67	77.50	0.56
Reach 1	2521.31*	50	Prop	101.00	376.16	378.56	378.11	378.74	0.007080	3.52	42.15	93.65	0.56
Reach 1	2521.31*	100	Existing	116.00	376.16	378.66		378.86	0.007083	3.69	47.15	84.91	0.57
Reach 1	2521.31*	100	Nat	116.00	376.16	378.66		378.86	0.007094	3.69	47.11	84.87	0.57
Reach 1	2521.31*	100	Prop	116.00	376.16	378.65	378.23	378.84	0.007120	3.67	50.80	103.07	0.57
Reach 1	2472.92*	50	Existing	101.00	375.81	378.22		378.40	0.006993	3.52	40.80	78.66	0.56
Reach 1	2472.92*	50	Nat	101.00	375.81	378.22		378.40	0.006993	3.52	40.80	78.66	0.56
Reach 1	2472.92*	50	Prop	101.00	375.81	378.21		378.39	0.007041	3.52	43.32	95.82	0.56
Reach 1	2472.92*	100	Existing	116.00	375.81	378.31		378.50	0.007001	3.68	48.27	85.87	0.57
Reach 1	2472.92*	100	Nat	116.00	375.81	378.31		378.50	0.006998	3.68	48.28	85.88	0.57
Reach 1	2472.92*	100	Prop	116.00	375.81	378.30		378.49	0.007060	3.67	51.98	103.57	0.57
Reach 1	2424.54*	50	Existing	101.00	375.46	377.86		378.05	0.007100	3.55	40.91	78.97	0.56
Reach 1	2424.54*	50	Nat	101.00	375.46	377.86		378.05	0.007129	3.56	40.80	78.87	0.56
Reach 1	2424.54*	50	Prop	101.00	375.46	377.85	377.42	378.04	0.007126	3.54	43.84	96.61	0.56

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2424.54*	100	Existing	116.00	375.46	377.95		378.15	0.007111	3.71	48.35	86.08	0.57
Reach 1	2424.54*	100	Nat	116.00	375.46	377.95		378.15	0.007141	3.72	48.23	85.97	0.57
Reach 1	2424.54*	100	Prop	116.00	375.46	377.94	377.59	378.13	0.007167	3.70	52.35	103.70	0.57
Reach 1	2376.15*	50	Existing	101.00	375.10	377.51		377.70	0.006953	3.53	41.96	80.02	0.56
Reach 1	2376.15*	50	Nat	101.00	375.10	377.51		377.69	0.007018	3.55	41.71	79.80	0.56
Reach 1	2376.15*	50	Prop	101.00	375.10	377.50	377.06	377.68	0.007052	3.54	44.79	98.46	0.56
Reach 1	2376.15*	100	Existing	116.00	375.10	377.60		377.80	0.006942	3.70	49.50	87.05	0.56
Reach 1	2376.15*	100	Nat	116.00	375.10	377.60		377.80	0.007029	3.71	49.14	86.72	0.57
Reach 1	2376.15*	100	Prop	116.00	375.10	377.59		377.78	0.006995	3.68	53.67	104.30	0.56
Reach 1	2327.77*	50	Existing	101.00	374.75	377.17		377.35	0.006755	3.51	43.47	81.54	0.55
Reach 1	2327.77*	50	Nat	101.00	374.75	377.16		377.34	0.006956	3.54	42.72	80.85	0.56
Reach 1	2327.77*	50	Prop	101.00	374.75	377.16		377.33	0.006795	3.50	47.12	101.02	0.55
Reach 1	2327.77*	100	Existing	116.00	374.75	377.26		377.45	0.006706	3.66	51.29	88.51	0.56
Reach 1	2327.77*	100	Nat	116.00	374.75	377.25		377.45	0.006930	3.70	50.34	87.69	0.56
Reach 1	2327.77*	100	Prop	116.00	374.75	377.25		377.43	0.006732	3.64	55.99	105.15	0.55
Reach 1	2279.39*	50	Existing	101.00	374.39	376.86		377.02	0.005952	3.38	47.05	84.90	0.52
Reach 1	2279.39*	50	Nat	101.00	374.39	376.83		377.00	0.006418	3.46	45.02	83.09	0.54
Reach 1	2279.39*	50	Prop	101.00	374.39	376.85		377.00	0.005788	3.32	52.45	103.51	0.51
Reach 1	2279.39*	100	Existing	116.00	374.39	376.95		377.12	0.005907	3.53	55.43	91.96	0.52
Reach 1	2279.39*	100	Nat	116.00	374.39	376.92		377.11	0.006385	3.62	53.03	89.99	0.54
Reach 1	2279.39*	100	Prop	116.00	374.39	376.94		377.10	0.005700	3.45	62.02	107.73	0.51
Reach 1	2231	50	Existing	101.00	374.04	376.32	376.04	376.57	0.010621	4.14	33.22	73.09	0.68
Reach 1	2231	50	Nat	101.00	374.04	376.32	376.04	376.57	0.010621	4.14	33.22	73.09	0.68
Reach 1	2231	50	Prop	101.00	374.04	376.31	376.06	376.56	0.010529	4.11	35.82	89.05	0.68
Reach 1	2231	100	Existing	116.00	374.04	376.41	376.21	376.68	0.010626	4.31	39.96	78.75	0.69
Reach 1	2231	100	Nat	116.00	374.04	376.41	376.21	376.68	0.010626	4.31	39.96	78.75	0.69
Reach 1	2231	100	Prop	116.00	374.04	376.40	376.24	376.66	0.010506	4.27	43.86	98.94	0.68
Reach 1	2182.00*	50	Existing	101.00	373.55	375.79	375.50	376.05	0.010892	4.15	32.33	71.73	0.69
Reach 1	2182.00*	50	Nat	101.00	373.55	375.79	375.50	376.05	0.010892	4.15	32.33	71.73	0.69
Reach 1	2182.00*	50	Prop	101.00	373.55	375.78	375.51	376.04	0.010848	4.14	34.21	84.70	0.69
Reach 1	2182.00*	100	Existing	116.00	373.55	375.87	375.69	376.15	0.010861	4.32	38.94	77.42	0.69
Reach 1	2182.00*	100	Nat	116.00	373.55	375.87	375.69	376.15	0.010861	4.32	38.94	77.42	0.69
Reach 1	2182.00*	100	Prop	116.00	373.55	375.87	375.71	376.14	0.010801	4.30	41.91	94.44	0.69
Reach 1	2133.00*	50	Existing	101.00	373.05	375.25	374.96	375.51	0.010836	4.14	31.88	70.66	0.69
Reach 1	2133.00*	50	Nat	101.00	373.05	375.25	374.96	375.51	0.010836	4.14	31.88	70.66	0.69
Reach 1	2133.00*	50	Prop	101.00	373.05	375.25	374.96	375.51	0.010783	4.13	33.34	81.71	0.68

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2133.00*	100	Existing	116.00	373.05	375.35	375.15	375.62	0.010805	4.29	38.63	76.40	0.69
Reach 1	2133.00*	100	Nat	116.00	373.05	375.35	375.15	375.62	0.010805	4.29	38.63	76.40	0.69
Reach 1	2133.00*	100	Prop	116.00	373.05	375.34	375.17	375.61	0.010731	4.27	41.11	91.32	0.69
Reach 1	2084.00*	50	Existing	101.00	372.56	374.72	374.43	374.98	0.010862	4.14	31.08	69.28	0.69
Reach 1	2084.00*	50	Nat	101.00	372.56	374.72	374.43	374.98	0.010862	4.14	31.08	69.28	0.69
Reach 1	2084.00*	50	Prop	101.00	372.56	374.72	374.43	374.98	0.010826	4.14	32.06	77.99	0.69
Reach 1	2084.00*	100	Existing	116.00	372.56	374.82	374.60	375.09	0.010821	4.28	38.07	75.22	0.69
Reach 1	2084.00*	100	Nat	116.00	372.56	374.82	374.60	375.09	0.010821	4.28	38.07	75.22	0.69
Reach 1	2084.00*	100	Prop	116.00	372.56	374.81	374.62	375.08	0.010766	4.26	39.95	87.38	0.69
Reach 1	2035.00*	50	Existing	101.00	372.07	374.18	373.89	374.44	0.010991	4.16	30.04	67.59	0.69
Reach 1	2035.00*	50	Nat	101.00	372.07	374.18	373.89	374.44	0.010991	4.16	30.04	67.59	0.69
Reach 1	2035.00*	50	Prop	101.00	372.07	374.18	373.89	374.44	0.010966	4.15	30.66	74.26	0.69
Reach 1	2035.00*	100	Existing	116.00	372.07	374.28	374.05	374.55	0.010959	4.29	36.90	73.64	0.70
Reach 1	2035.00*	100	Nat	116.00	372.07	374.28	374.05	374.55	0.010959	4.29	36.90	73.64	0.70
Reach 1	2035.00*	100	Prop	116.00	372.07	374.28	374.06	374.55	0.010914	4.28	38.26	83.63	0.69
Reach 1	1986.00*	50	Existing	101.00	371.58	373.65	373.36	373.91	0.010890	4.13	29.50	66.44	0.69
Reach 1	1986.00*	50	Nat	101.00	371.58	373.65	373.36	373.91	0.010890	4.13	29.50	66.44	0.69
Reach 1	1986.00*	50	Prop	101.00	371.58	373.65	373.36	373.91	0.010874	4.13	29.85	71.16	0.69
Reach 1	1986.00*	100	Existing	116.00	371.58	373.74	373.46	374.02	0.010853	4.28	36.29	72.65	0.69
Reach 1	1986.00*	100	Nat	116.00	371.58	373.74	373.46	374.02	0.010853	4.28	36.29	72.65	0.69
Reach 1	1986.00*	100	Prop	116.00	371.58	373.74	373.46	374.02	0.010819	4.27	37.22	80.47	0.69
Reach 1	1937.00*	50	Existing	101.00	371.09	373.10	372.82	373.37	0.011188	4.17	28.07	63.39	0.70
Reach 1	1937.00*	50	Nat	101.00	371.09	373.10	372.82	373.37	0.011188	4.17	28.07	63.39	0.70
Reach 1	1937.00*	50	Prop	101.00	371.09	373.10	372.82	373.37	0.011185	4.17	28.19	66.10	0.70
Reach 1	1937.00*	100	Existing	116.00	371.09	373.20	372.92	373.48	0.011123	4.31	34.70	70.35	0.70
Reach 1	1937.00*	100	Nat	116.00	371.09	373.20	372.92	373.48	0.011123	4.31	34.70	70.35	0.70
Reach 1	1937.00*	100	Prop	116.00	371.09	373.20	372.92	373.48	0.011105	4.31	35.24	76.10	0.70
Reach 1	1888.00*	50	Existing	101.00	370.59	372.55	372.27	372.82	0.011105	4.15	27.19	60.60	0.69
Reach 1	1888.00*	50	Nat	101.00	370.59	372.55	372.27	372.82	0.011105	4.15	27.19	60.60	0.69
Reach 1	1888.00*	50	Prop	101.00	370.59	372.55	372.27	372.82	0.011101	4.15	27.21	61.54	0.69
Reach 1	1888.00*	100	Existing	116.00	370.59	372.65	372.37	372.93	0.011059	4.30	33.62	68.30	0.70
Reach 1	1888.00*	100	Nat	116.00	370.59	372.65	372.37	372.93	0.011059	4.30	33.62	68.30	0.70
Reach 1	1888.00*	100	Prop	116.00	370.59	372.65	372.37	372.93	0.011046	4.30	33.89	72.01	0.70
Reach 1	1839.00*	50	Existing	101.00	370.10	372.00	371.73	372.27	0.011224	4.15	26.22	53.96	0.70
Reach 1	1839.00*	50	Nat	101.00	370.10	372.00	371.73	372.27	0.011224	4.15	26.22	53.96	0.70
Reach 1	1839.00*	50	Prop	101.00	370.10	372.00	371.73	372.27	0.011232	4.15	26.21	53.89	0.70

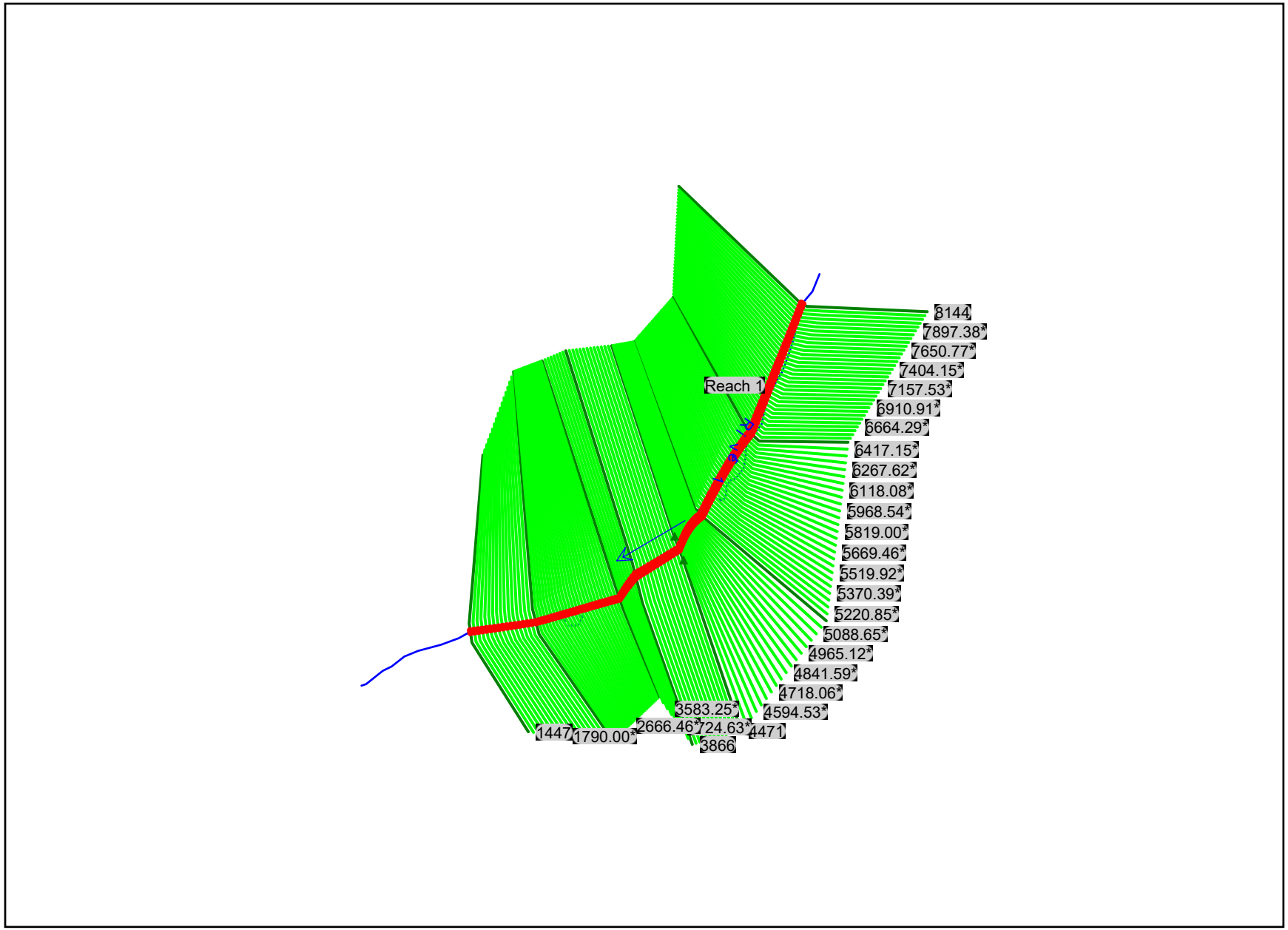
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

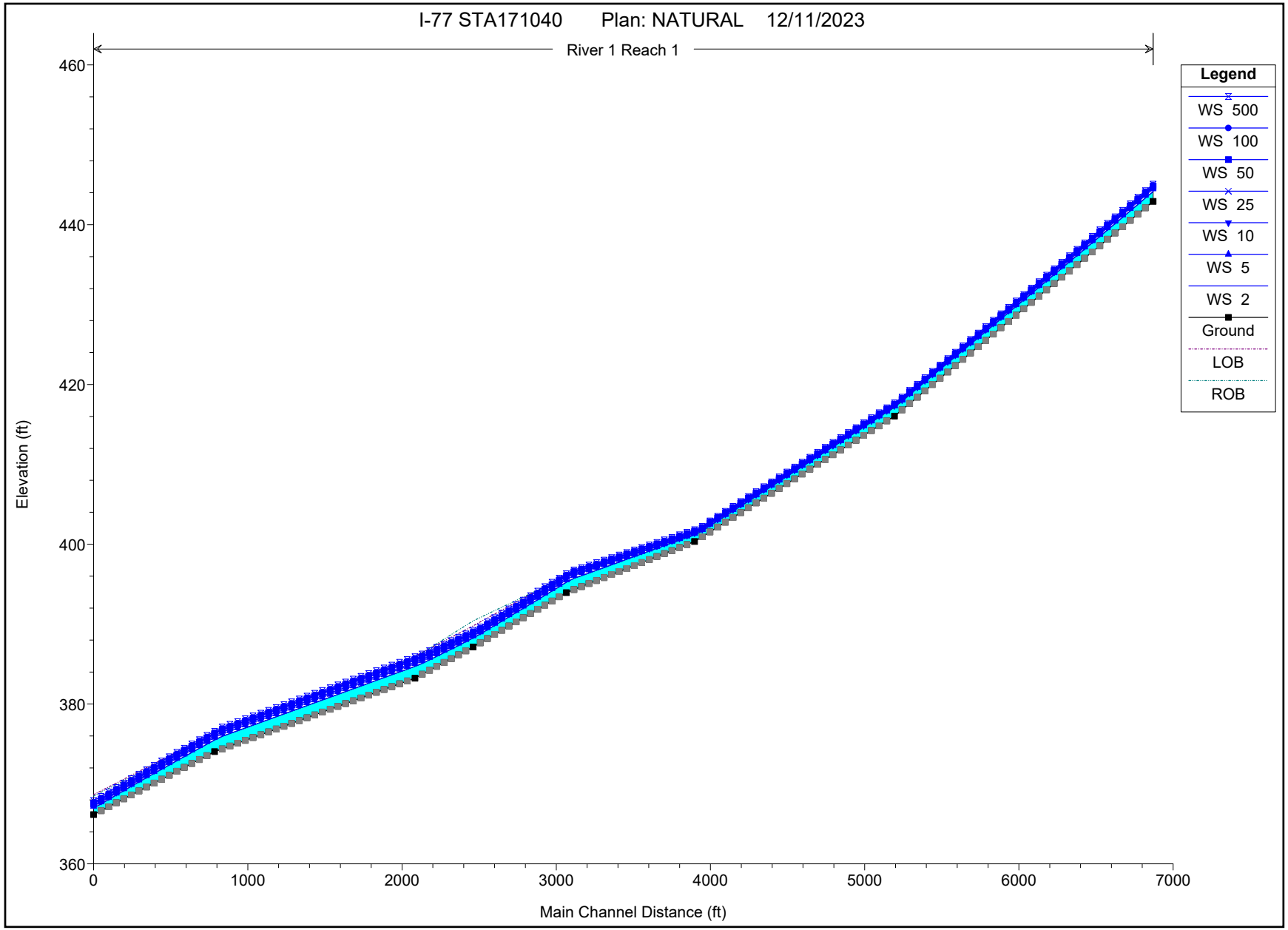
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1839.00*	100	Existing	116.00	370.10	372.11	371.83	372.39	0.011131	4.31	32.52	66.26	0.70
Reach 1	1839.00*	100	Nat	116.00	370.10	372.11	371.83	372.39	0.011131	4.31	32.52	66.26	0.70
Reach 1	1839.00*	100	Prop	116.00	370.10	372.11	371.83	372.39	0.011138	4.31	32.58	68.12	0.70
Reach 1	1790.00*	50	Existing	101.00	369.61	371.46	371.18	371.72	0.011243	4.14	25.72	45.85	0.70
Reach 1	1790.00*	50	Nat	101.00	369.61	371.46	371.18	371.72	0.011243	4.14	25.72	45.85	0.70
Reach 1	1790.00*	50	Prop	101.00	369.61	371.46	371.18	371.72	0.011226	4.14	25.74	45.95	0.70
Reach 1	1790.00*	100	Existing	116.00	369.61	371.56	371.28	371.84	0.011159	4.30	31.47	63.79	0.70
Reach 1	1790.00*	100	Nat	116.00	369.61	371.56	371.28	371.84	0.011159	4.30	31.47	63.79	0.70
Reach 1	1790.00*	100	Prop	116.00	369.61	371.56	371.28	371.84	0.011152	4.30	31.49	64.25	0.70
Reach 1	1741.00*	50	Existing	101.00	369.12	370.90	370.64	371.17	0.011356	4.14	25.29	39.95	0.70
Reach 1	1741.00*	50	Nat	101.00	369.12	370.90	370.64	371.17	0.011356	4.14	25.29	39.95	0.70
Reach 1	1741.00*	50	Prop	101.00	369.12	370.90	370.64	371.17	0.011385	4.14	25.26	39.79	0.70
Reach 1	1741.00*	100	Existing	116.00	369.12	371.00	370.72	371.29	0.011328	4.31	30.23	57.10	0.70
Reach 1	1741.00*	100	Nat	116.00	369.12	371.00	370.72	371.29	0.011328	4.31	30.23	57.10	0.70
Reach 1	1741.00*	100	Prop	116.00	369.12	371.00	370.72	371.29	0.011348	4.31	30.19	57.01	0.71
Reach 1	1692.00*	50	Existing	101.00	368.62	370.34	370.08	370.61	0.011435	4.13	24.99	35.38	0.70
Reach 1	1692.00*	50	Nat	101.00	368.62	370.34	370.08	370.61	0.011435	4.13	24.99	35.38	0.70
Reach 1	1692.00*	50	Prop	101.00	368.62	370.35	370.08	370.61	0.011386	4.12	25.05	35.62	0.70
Reach 1	1692.00*	100	Existing	116.00	368.62	370.45	370.17	370.73	0.011428	4.31	29.33	50.87	0.71
Reach 1	1692.00*	100	Nat	116.00	368.62	370.45	370.17	370.73	0.011428	4.31	29.33	50.87	0.71
Reach 1	1692.00*	100	Prop	116.00	368.62	370.45	370.17	370.73	0.011387	4.31	29.40	51.04	0.71
Reach 1	1643.00*	50	Existing	101.00	368.13	369.79		370.05	0.011342	4.09	25.08	33.34	0.70
Reach 1	1643.00*	50	Nat	101.00	368.13	369.79		370.05	0.011342	4.09	25.08	33.34	0.70
Reach 1	1643.00*	50	Prop	101.00	368.13	369.79		370.05	0.011399	4.10	25.02	33.11	0.70
Reach 1	1643.00*	100	Existing	116.00	368.13	369.89	369.62	370.18	0.011331	4.28	29.08	46.60	0.70
Reach 1	1643.00*	100	Nat	116.00	368.13	369.89	369.62	370.18	0.011331	4.28	29.08	46.60	0.70
Reach 1	1643.00*	100	Prop	116.00	368.13	369.89	369.62	370.17	0.011379	4.29	29.01	46.40	0.70
Reach 1	1594.00*	50	Existing	101.00	367.64	369.24		369.49	0.011456	4.08	24.97	30.69	0.70
Reach 1	1594.00*	50	Nat	101.00	367.64	369.24		369.49	0.011456	4.08	24.97	30.69	0.70
Reach 1	1594.00*	50	Prop	101.00	367.64	369.24		369.50	0.011357	4.07	25.06	31.05	0.70
Reach 1	1594.00*	100	Existing	116.00	367.64	369.33	369.07	369.62	0.011456	4.28	28.58	42.46	0.71
Reach 1	1594.00*	100	Nat	116.00	367.64	369.33	369.07	369.62	0.011456	4.28	28.58	42.46	0.71
Reach 1	1594.00*	100	Prop	116.00	367.64	369.34	369.07	369.62	0.011358	4.26	28.71	42.83	0.70
Reach 1	1545.00*	50	Existing	101.00	367.14	368.68		368.93	0.011375	4.05	25.06	28.81	0.69
Reach 1	1545.00*	50	Nat	101.00	367.14	368.68		368.93	0.011375	4.05	25.06	28.81	0.69
Reach 1	1545.00*	50	Prop	101.00	367.15	368.68		368.94	0.011483	4.06	25.00	29.00	0.70

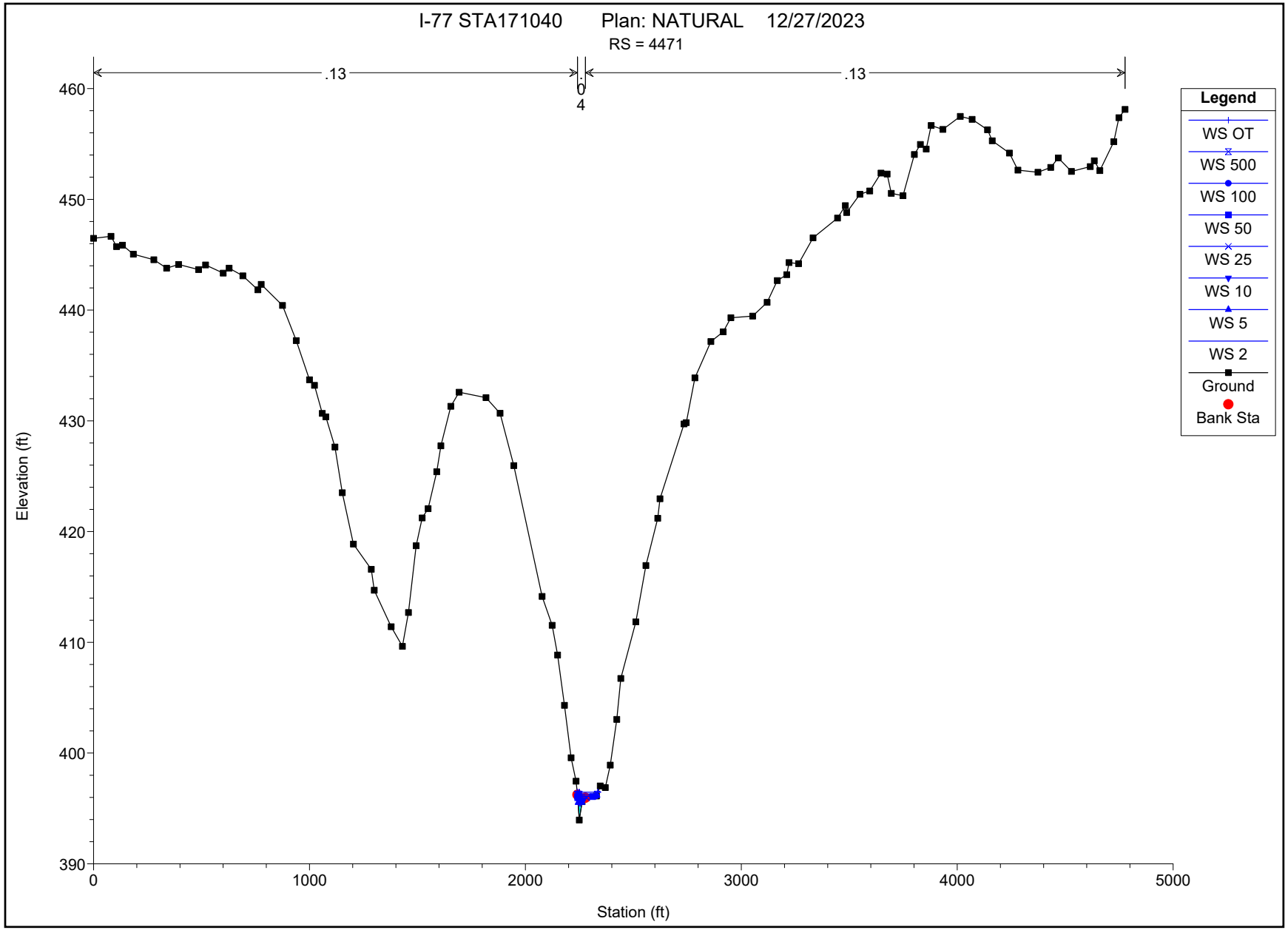
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

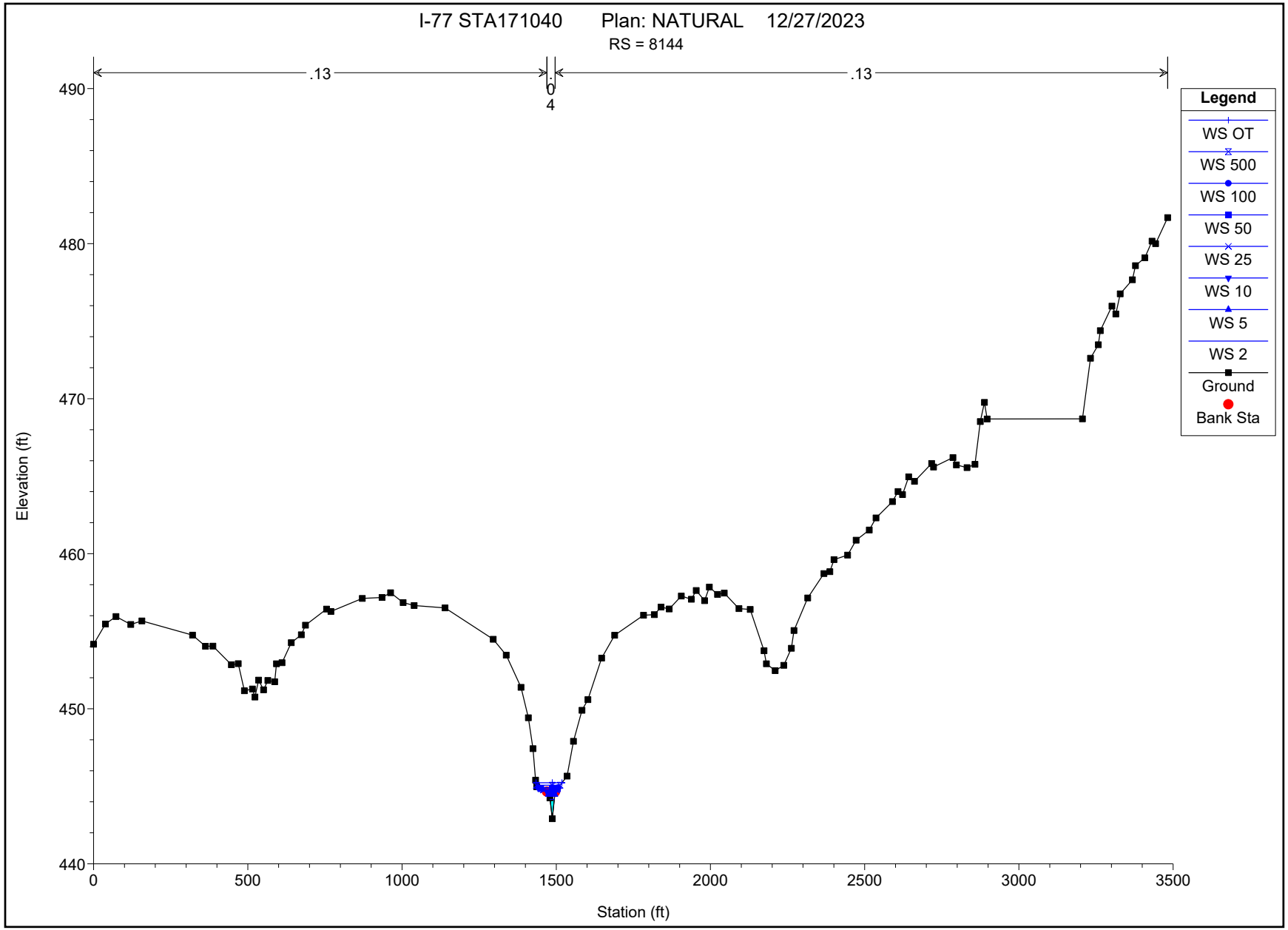
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1545.00*	100	Existing	116.00	367.14	368.78	368.51	369.06	0.011377	4.25	28.42	39.75	0.70
Reach 1	1545.00*	100	Nat	116.00	367.14	368.78	368.51	369.06	0.011377	4.25	28.42	39.75	0.70
Reach 1	1545.00*	100	Prop	116.00	367.15	368.78	368.52	369.06	0.011477	4.26	28.37	39.93	0.71
Reach 1	1496.00*	50	Existing	101.00	366.65	368.12		368.38	0.011410	4.03	25.13	27.25	0.69
Reach 1	1496.00*	50	Nat	101.00	366.65	368.12		368.38	0.011410	4.03	25.13	27.25	0.69
Reach 1	1496.00*	50	Prop	101.00	366.65	368.12		368.38	0.011409	4.03	25.13	27.25	0.69
Reach 1	1496.00*	100	Existing	116.00	366.65	368.22	367.96	368.50	0.011407	4.22	28.26	37.16	0.70
Reach 1	1496.00*	100	Nat	116.00	366.65	368.22	367.96	368.50	0.011407	4.22	28.26	37.16	0.70
Reach 1	1496.00*	100	Prop	116.00	366.65	368.22	367.96	368.50	0.011407	4.22	28.26	37.16	0.70
Reach 1	1447	50	Existing	101.00	366.16	367.60	367.33	367.83	0.010512	3.89	26.03	28.69	0.67
Reach 1	1447	50	Nat	101.00	366.16	367.60	367.33	367.83	0.010512	3.89	26.03	28.69	0.67
Reach 1	1447	50	Prop	101.00	366.16	367.60	367.32	367.83	0.010511	3.89	26.03	28.69	0.67
Reach 1	1447	100	Existing	116.00	366.16	367.69	367.41	367.95	0.010509	4.09	29.28	37.90	0.67
Reach 1	1447	100	Nat	116.00	366.16	367.69	367.41	367.95	0.010509	4.09	29.28	37.90	0.67
Reach 1	1447	100	Prop	116.00	366.16	367.69	367.41	367.95	0.010509	4.09	29.28	37.90	0.67

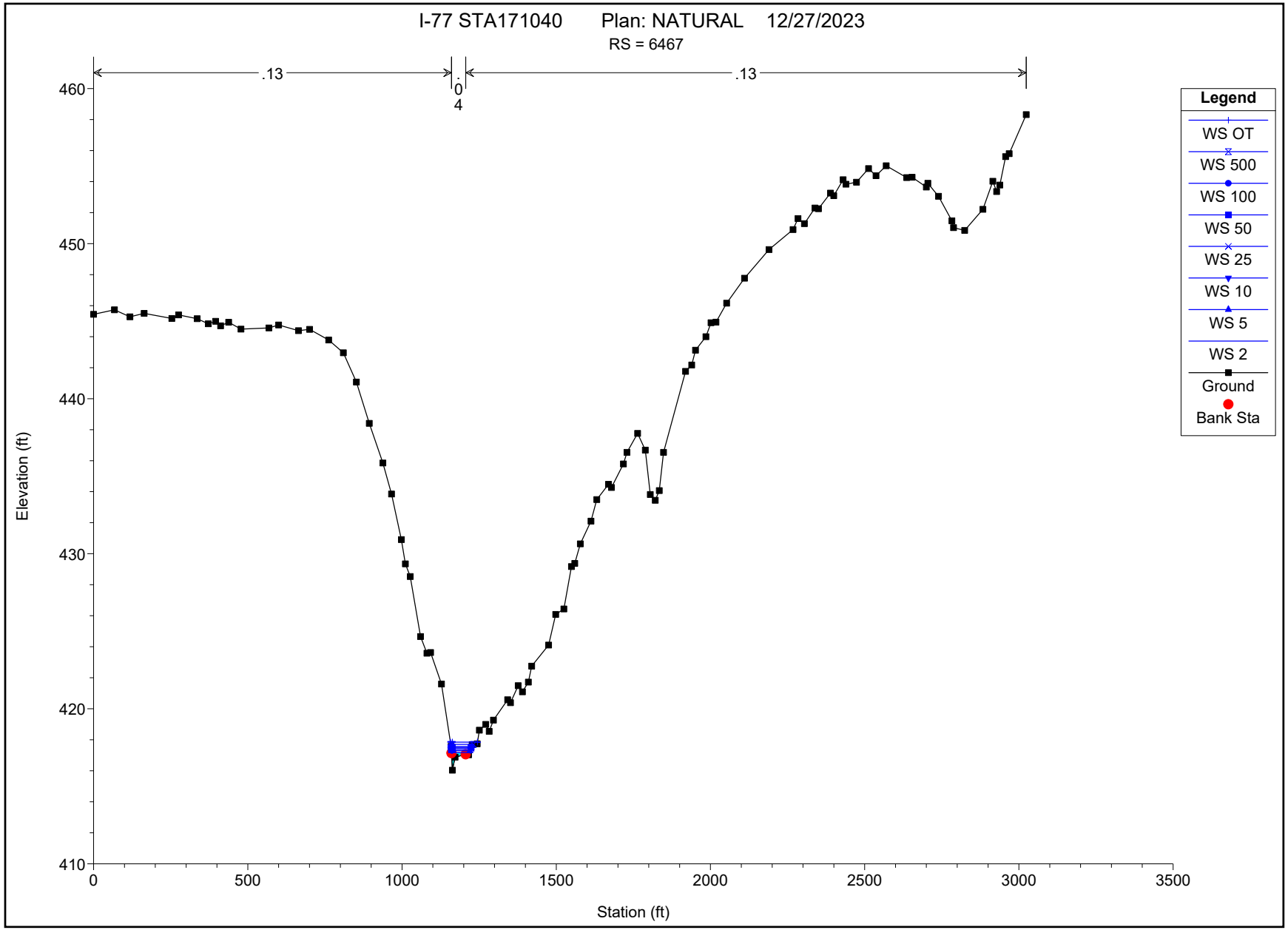
I-77 1710+40 NATURAL PLAN

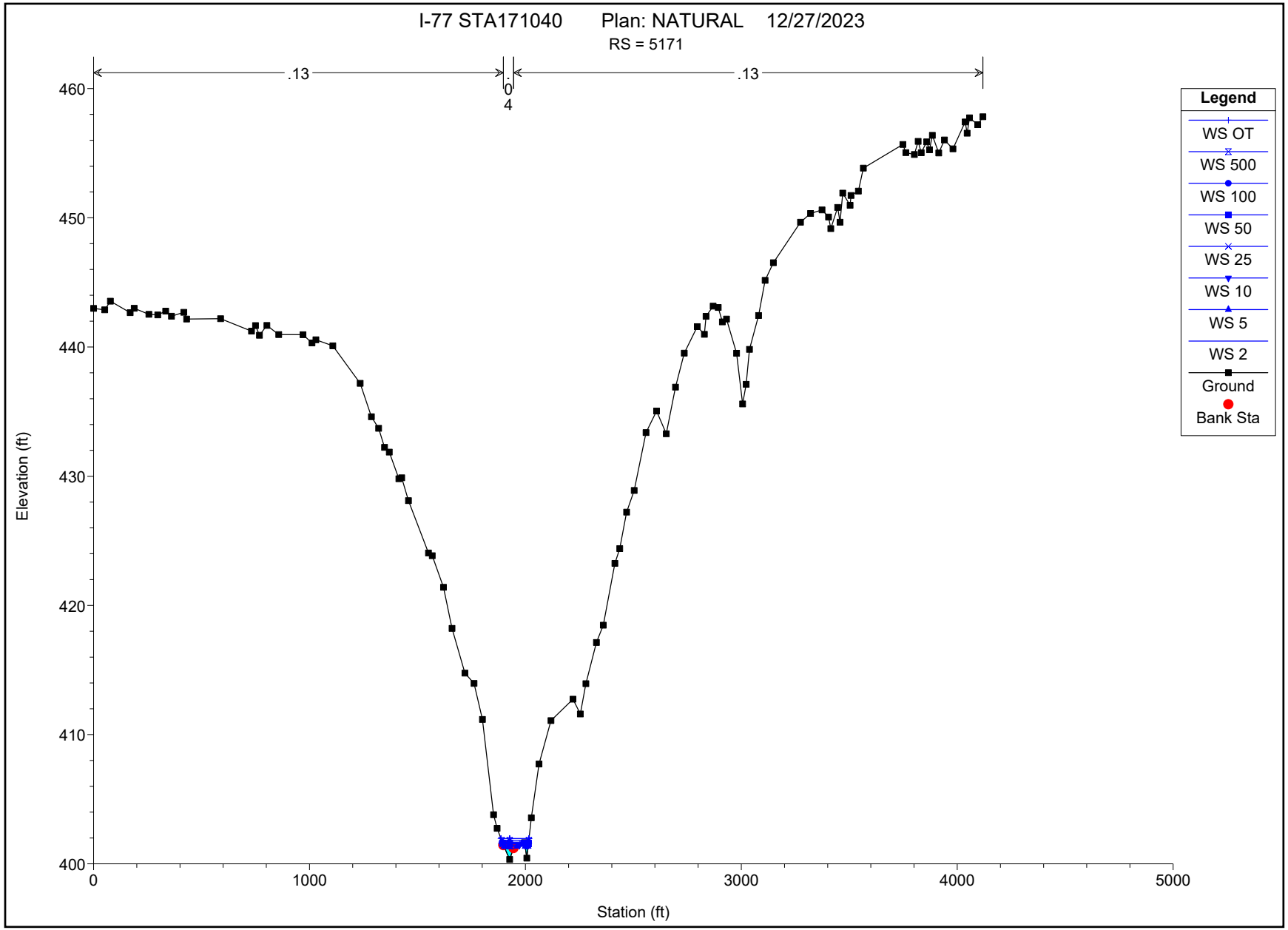


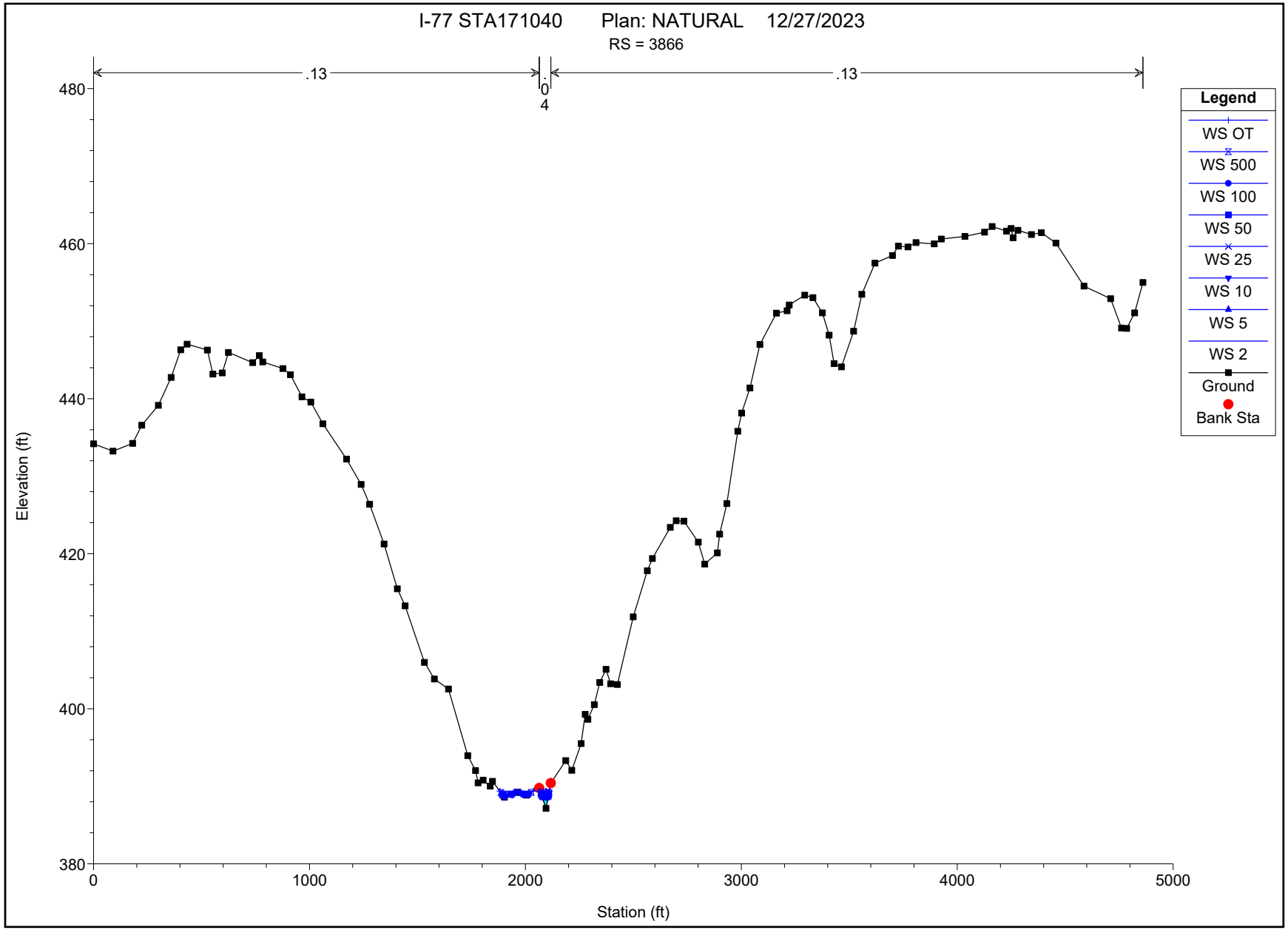

I-77 STA171040 Plan: NATURAL 12/11/2023
River 1 Reach 1
Legend
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
LOB
ROB
Elevation (ft)
460
440
420
400
380
360
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)

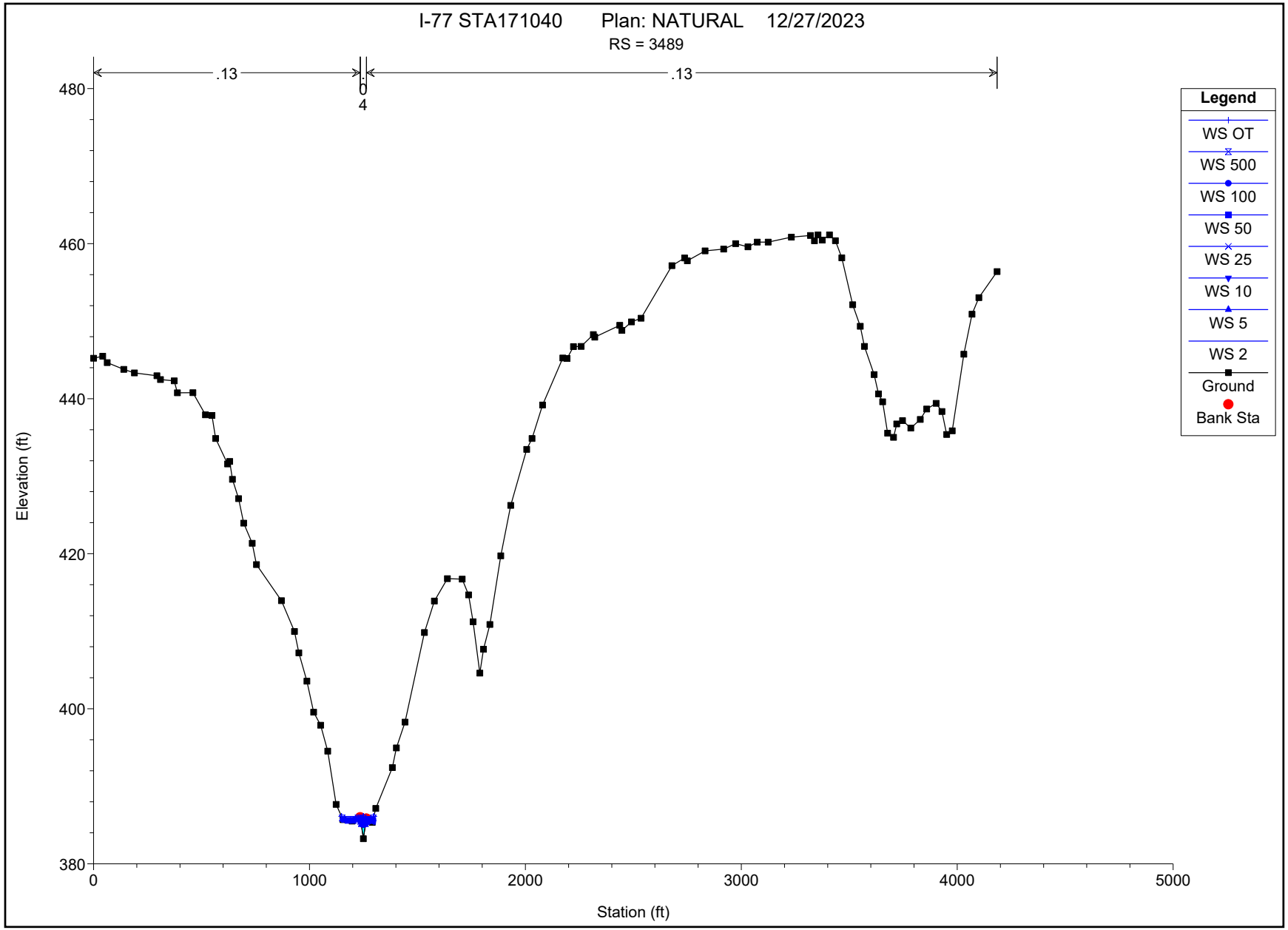

I-77 STA171040 Plan: NATURAL 12/27/2023
RS = 4471
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
460
450
440
430
420
410
400
390
0
1000
2000
3000
4000
5000
Station (ft)

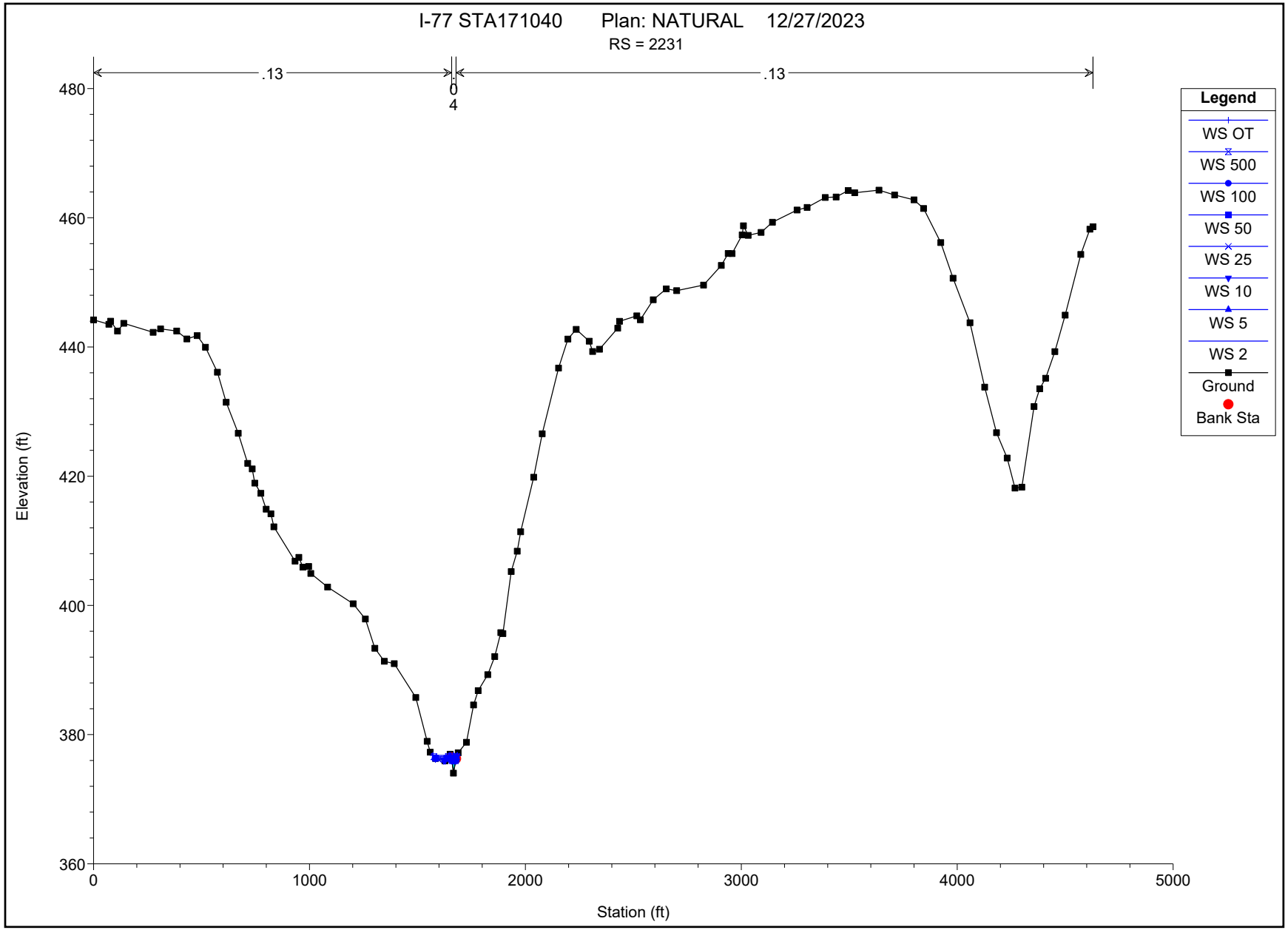

I-77 STA171040 Plan: NATURAL 12/27/2023
RS = 8144
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
490
480
470
460
450
440
0
500
1000
1500
2000
2500
3000
3500
Station (ft)

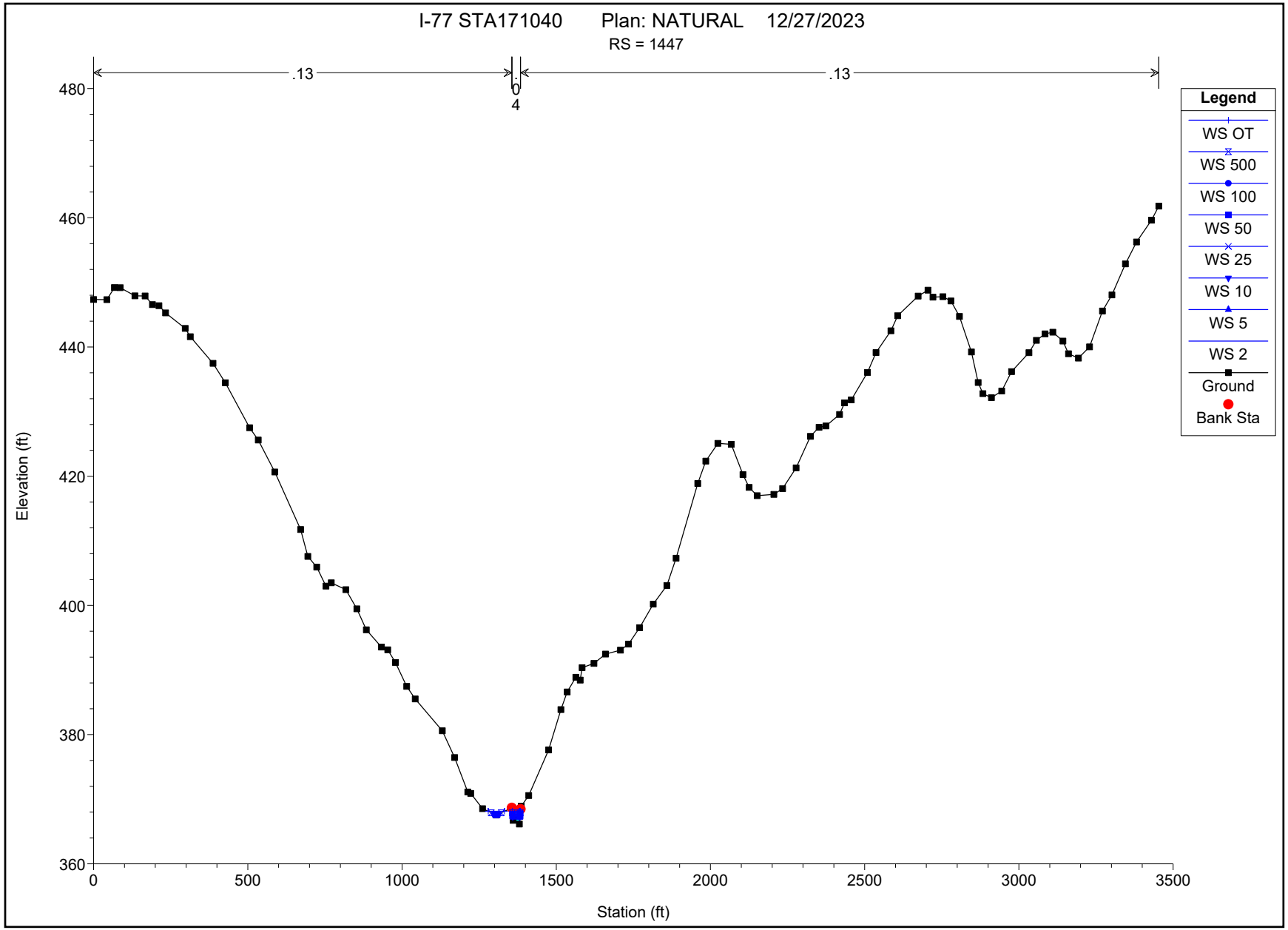

I-77 STA171040 Plan: NATURAL 12/27/2023
RS = 6467
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
460
450
440
430
420
410
0
500
1000
1500
2000
2500
3000
3500
Station (ft)


I-77 STA171040 Plan: NATURAL 12/27/2023
RS = 5171
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
460
450
440
430
420
410
400
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: NATURAL 12/27/2023
RS = 3866
.13
0
4
.13
480
460
440
420
400
380
Elevation (ft)
0
1000
2000
3000
4000
5000
Station (ft)
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta


I-77 STA171040 Plan: NATURAL 12/27/2023
RS = 3489
.13
0
4
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
480
460
440
420
400
380
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: NATURAL 12/27/2023
RS = 2231
.13
0
4
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
480
460
440
420
400
380
360
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: NATURAL 12/27/2023
RS = 1447
.13
0
4
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
480
460
440
420
400
380
360
0
500
1000
1500
2000
2500
3000
3500
Station (ft)

HEC-RAS River: River 1 Reach: Reach 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	8144	50	Existing	101.00	442.91	444.85	444.74	445.14	0.016495	4.34	25.73	54.12	0.82
Reach 1	8144	50	Nat	101.00	442.91	444.85	444.74	445.14	0.016495	4.34	25.73	54.12	0.82
Reach 1	8144	50	Prop	101.00	442.91	444.66		444.96	0.016625	4.37	23.13	27.16	0.82
Reach 1	8144	100	Existing	116.00	442.91	444.91	444.84	445.24	0.016597	4.58	29.85	64.30	0.83
Reach 1	8144	100	Nat	116.00	442.91	444.91	444.84	445.24	0.016597	4.58	29.85	64.30	0.83
Reach 1	8144	100	Prop	116.00	442.91	444.74	444.61	445.07	0.016619	4.61	25.61	38.25	0.83
Reach 1	8094.68*	50	Existing	101.00	442.12	444.02	443.91	444.31	0.016835	4.34	24.92	47.40	0.82
Reach 1	8094.68*	50	Nat	101.00	442.12	444.02	443.91	444.31	0.016835	4.34	24.92	47.40	0.82
Reach 1	8094.68*	50	Prop	101.00	442.12	443.85		444.14	0.016574	4.33	23.35	27.90	0.82
Reach 1	8094.68*	100	Existing	116.00	442.12	444.10	443.99	444.41	0.016437	4.54	28.96	56.86	0.83
Reach 1	8094.68*	100	Nat	116.00	442.12	444.10	443.99	444.41	0.016437	4.54	28.96	56.86	0.83
Reach 1	8094.68*	100	Prop	116.00	442.12	443.92	443.80	444.25	0.016713	4.58	25.67	36.07	0.83
Reach 1	8045.35*	50	Existing	101.00	441.33	443.20	443.09	443.49	0.016866	4.31	24.73	44.37	0.82
Reach 1	8045.35*	50	Nat	101.00	441.33	443.20	443.09	443.49	0.016866	4.31	24.73	44.37	0.82
Reach 1	8045.35*	50	Prop	101.00	441.32	443.05		443.33	0.016136	4.26	23.74	29.12	0.81
Reach 1	8045.35*	100	Existing	116.00	441.33	443.27	443.17	443.59	0.016539	4.51	28.42	52.49	0.83
Reach 1	8045.35*	100	Nat	116.00	441.33	443.27	443.17	443.59	0.016539	4.51	28.42	52.49	0.83
Reach 1	8045.35*	100	Prop	116.00	441.32	443.12	442.99	443.44	0.016546	4.53	25.93	35.67	0.83
Reach 1	7996.03*	50	Existing	101.00	440.54	442.39	442.27	442.66	0.016182	4.22	25.11	43.49	0.81
Reach 1	7996.03*	50	Nat	101.00	440.54	442.39	442.27	442.66	0.016182	4.22	25.11	43.49	0.81
Reach 1	7996.03*	50	Prop	101.00	440.53	442.24		442.52	0.016583	4.26	23.75	29.38	0.82
Reach 1	7996.03*	100	Existing	116.00	440.54	442.46	442.34	442.76	0.016431	4.47	28.26	49.96	0.82
Reach 1	7996.03*	100	Nat	116.00	440.54	442.46	442.34	442.76	0.016431	4.47	28.26	49.96	0.82
Reach 1	7996.03*	100	Prop	116.00	440.53	442.32	442.19	442.63	0.016078	4.46	26.42	36.32	0.82
Reach 1	7946.71*	50	Existing	101.00	439.75	441.56	441.45	441.84	0.016995	4.25	24.60	40.94	0.82
Reach 1	7946.71*	50	Nat	101.00	439.75	441.56	441.45	441.84	0.016995	4.25	24.60	40.94	0.82
Reach 1	7946.71*	50	Prop	101.00	439.74	441.43		441.71	0.016502	4.22	23.98	30.44	0.81
Reach 1	7946.71*	100	Existing	116.00	439.75	441.63	441.53	441.94	0.016843	4.47	27.80	47.49	0.83
Reach 1	7946.71*	100	Nat	116.00	439.75	441.63	441.53	441.94	0.016843	4.47	27.80	47.49	0.83
Reach 1	7946.71*	100	Prop	116.00	439.74	441.50	441.38	441.81	0.016848	4.48	26.18	35.68	0.83
Reach 1	7897.38*	50	Existing	101.00	438.96	440.75	440.63	441.02	0.016348	4.17	25.11	41.26	0.81
Reach 1	7897.38*	50	Nat	101.00	438.96	440.75	440.63	441.02	0.016348	4.17	25.11	41.26	0.81
Reach 1	7897.38*	50	Prop	101.00	438.94	440.62		440.89	0.016393	4.17	24.23	31.34	0.81
Reach 1	7897.38*	100	Existing	116.00	438.96	440.82	440.71	441.12	0.016772	4.43	27.89	46.53	0.83
Reach 1	7897.38*	100	Nat	116.00	438.96	440.82	440.71	441.12	0.016772	4.43	27.89	46.53	0.83
Reach 1	7897.38*	100	Prop	116.00	438.94	440.70	440.57	441.00	0.016230	4.40	26.75	36.71	0.82

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	7848.06*	50	Existing	101.00	438.17	439.93	439.82	440.20	0.016716	4.16	25.03	40.71	0.81
Reach 1	7848.06*	50	Nat	101.00	438.17	439.93	439.82	440.20	0.016716	4.16	25.03	40.71	0.81
Reach 1	7848.06*	50	Prop	101.00	438.15	439.82		440.08	0.016582	4.16	24.35	32.16	0.81
Reach 1	7848.06*	100	Existing	116.00	438.17	440.00	439.89	440.30	0.016681	4.39	28.04	46.17	0.82
Reach 1	7848.06*	100	Nat	116.00	438.17	440.00	439.89	440.30	0.016681	4.39	28.04	46.17	0.82
Reach 1	7848.06*	100	Prop	116.00	438.15	439.89	439.77	440.19	0.016217	4.36	27.00	37.42	0.81
Reach 1	7798.74*	50	Existing	101.00	437.38	439.13	439.01	439.39	0.016382	4.10	25.37	40.98	0.81
Reach 1	7798.74*	50	Nat	101.00	437.38	439.13	439.01	439.39	0.016382	4.10	25.37	40.98	0.81
Reach 1	7798.74*	50	Prop	101.00	437.36	439.02		439.28	0.016309	4.10	24.69	33.48	0.80
Reach 1	7798.74*	100	Existing	116.00	437.38	439.20	439.08	439.49	0.016222	4.32	28.47	46.17	0.81
Reach 1	7798.74*	100	Nat	116.00	437.38	439.20	439.08	439.49	0.016222	4.32	28.47	46.17	0.81
Reach 1	7798.74*	100	Prop	116.00	437.36	439.08	438.97	439.38	0.016627	4.36	26.99	37.77	0.82
Reach 1	7749.41*	50	Existing	101.00	436.59	438.31	438.20	438.57	0.016521	4.08	25.47	41.26	0.81
Reach 1	7749.41*	50	Nat	101.00	436.59	438.31	438.20	438.57	0.016521	4.08	25.47	41.26	0.81
Reach 1	7749.41*	50	Prop	101.00	436.56	438.22		438.47	0.015998	4.05	25.04	34.50	0.80
Reach 1	7749.41*	100	Existing	116.00	436.59	438.37	438.27	438.67	0.016838	4.34	28.20	45.65	0.83
Reach 1	7749.41*	100	Nat	116.00	436.59	438.37	438.27	438.67	0.016838	4.34	28.20	45.65	0.83
Reach 1	7749.41*	100	Prop	116.00	436.56	438.28	438.16	438.57	0.016216	4.30	27.45	38.72	0.81
Reach 1	7700.09*	50	Existing	101.00	435.80	437.50	437.39	437.76	0.016371	4.04	25.74	42.00	0.80
Reach 1	7700.09*	50	Nat	101.00	435.80	437.50	437.39	437.76	0.016371	4.04	25.74	42.00	0.80
Reach 1	7700.09*	50	Prop	101.00	435.77	437.41		437.66	0.016596	4.06	24.95	34.98	0.81
Reach 1	7700.09*	100	Existing	116.00	435.80	437.57	437.45	437.85	0.016316	4.26	28.74	46.30	0.81
Reach 1	7700.09*	100	Nat	116.00	435.80	437.57	437.45	437.85	0.016316	4.26	28.74	46.30	0.81
Reach 1	7700.09*	100	Prop	116.00	435.77	437.48	437.36	437.76	0.016419	4.28	27.58	39.42	0.81
Reach 1	7650.77*	50	Existing	101.00	435.01	436.69	436.58	436.94	0.016429	4.02	25.93	42.92	0.80
Reach 1	7650.77*	50	Nat	101.00	435.01	436.69	436.58	436.94	0.016429	4.02	25.93	42.92	0.80
Reach 1	7650.77*	50	Prop	101.00	434.97	436.61		436.86	0.016084	4.00	25.43	36.40	0.79
Reach 1	7650.77*	100	Existing	116.00	435.01	436.76	436.65	437.04	0.016179	4.22	29.06	46.82	0.81
Reach 1	7650.77*	100	Nat	116.00	435.01	436.76	436.65	437.04	0.016179	4.22	29.06	46.82	0.81
Reach 1	7650.77*	100	Prop	116.00	434.97	436.68	436.56	436.96	0.016167	4.23	27.97	40.45	0.81
Reach 1	7601.44*	50	Existing	101.00	434.22	435.89	435.77	436.13	0.016118	3.97	26.34	43.97	0.79
Reach 1	7601.44*	50	Nat	101.00	434.22	435.89	435.77	436.13	0.016118	3.97	26.34	43.97	0.79
Reach 1	7601.44*	50	Prop	101.00	434.18	435.81	435.69	436.06	0.016002	3.96	25.70	37.63	0.79
Reach 1	7601.44*	100	Existing	116.00	434.22	435.94	435.84	436.22	0.016714	4.23	28.90	46.62	0.82
Reach 1	7601.44*	100	Nat	116.00	434.22	435.94	435.84	436.22	0.016714	4.23	28.90	46.62	0.82
Reach 1	7601.44*	100	Prop	116.00	434.18	435.87	435.76	436.15	0.016646	4.23	27.94	41.05	0.82

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	7552.12*	50	Existing	101.00	433.43	435.08	434.97	435.32	0.016359	3.95	26.44	44.70	0.80
Reach 1	7552.12*	50	Nat	101.00	433.43	435.08	434.97	435.32	0.016359	3.95	26.44	44.70	0.80
Reach 1	7552.12*	50	Prop	101.00	433.39	435.00	434.89	435.25	0.016476	3.97	25.66	38.22	0.80
Reach 1	7552.12*	100	Existing	116.00	433.43	435.14	435.03	435.41	0.016266	4.17	29.48	47.59	0.81
Reach 1	7552.12*	100	Nat	116.00	433.43	435.14	435.03	435.41	0.016266	4.17	29.48	47.59	0.81
Reach 1	7552.12*	100	Prop	116.00	433.39	435.07	434.95	435.34	0.016239	4.17	28.44	42.29	0.81
Reach 1	7502.79*	50	Existing	101.00	432.64	434.27		434.51	0.016105	3.91	26.87	45.57	0.79
Reach 1	7502.79*	50	Nat	101.00	432.64	434.27		434.51	0.016105	3.91	26.87	45.57	0.79
Reach 1	7502.79*	50	Prop	101.00	432.59	434.21	434.09	434.44	0.016073	3.91	26.13	39.88	0.79
Reach 1	7502.79*	100	Existing	116.00	432.64	434.33	434.22	434.60	0.016459	4.15	29.62	47.93	0.81
Reach 1	7502.79*	100	Nat	116.00	432.64	434.33	434.22	434.60	0.016459	4.15	29.62	47.93	0.81
Reach 1	7502.79*	100	Prop	116.00	432.59	434.27		434.54	0.016032	4.13	28.88	43.70	0.80
Reach 1	7453.47*	50	Existing	101.00	431.85	433.46	433.36	433.70	0.016353	3.90	26.99	46.36	0.80
Reach 1	7453.47*	50	Nat	101.00	431.85	433.46	433.36	433.70	0.016353	3.90	26.99	46.36	0.80
Reach 1	7453.47*	50	Prop	101.00	431.80	433.40	433.29	433.64	0.016526	3.92	26.12	40.75	0.80
Reach 1	7453.47*	100	Existing	116.00	431.85	433.53	433.42	433.79	0.016301	4.11	30.02	48.77	0.80
Reach 1	7453.47*	100	Nat	116.00	431.85	433.53	433.42	433.79	0.016301	4.11	30.02	48.77	0.80
Reach 1	7453.47*	100	Prop	116.00	431.80	433.46	433.35	433.73	0.016540	4.14	28.83	44.42	0.81
Reach 1	7404.15*	50	Existing	101.00	431.06	432.66		432.89	0.016190	3.86	27.36	47.23	0.79
Reach 1	7404.15*	50	Nat	101.00	431.06	432.66		432.89	0.016190	3.86	27.36	47.23	0.79
Reach 1	7404.15*	50	Prop	101.00	431.01	432.60		432.84	0.016110	3.86	26.58	42.12	0.79
Reach 1	7404.15*	100	Existing	116.00	431.06	432.71	432.61	432.98	0.016918	4.13	29.87	48.99	0.82
Reach 1	7404.15*	100	Nat	116.00	431.06	432.71	432.61	432.98	0.016918	4.13	29.87	48.99	0.82
Reach 1	7404.15*	100	Prop	116.00	431.01	432.67		432.93	0.016087	4.08	29.40	45.77	0.80
Reach 1	7354.82*	50	Existing	101.00	430.27	431.85	431.74	432.08	0.016498	3.86	27.42	47.93	0.80
Reach 1	7354.82*	50	Nat	101.00	430.27	431.85	431.74	432.08	0.016498	3.86	27.42	47.93	0.80
Reach 1	7354.82*	50	Prop	101.00	430.21	431.80	431.69	432.03	0.016313	3.85	26.71	43.12	0.79
Reach 1	7354.82*	100	Existing	116.00	430.27	431.92	431.81	432.17	0.015902	4.03	30.87	50.21	0.79
Reach 1	7354.82*	100	Nat	116.00	430.27	431.92	431.81	432.17	0.015902	4.03	30.87	50.21	0.79
Reach 1	7354.82*	100	Prop	116.00	430.21	431.86	431.75	432.12	0.016326	4.07	29.52	46.66	0.80
Reach 1	7305.50*	50	Existing	101.00	429.48	431.05		431.28	0.016243	3.81	27.91	49.05	0.79
Reach 1	7305.50*	50	Nat	101.00	429.48	431.05		431.28	0.016243	3.81	27.91	49.05	0.79
Reach 1	7305.50*	50	Prop	101.00	429.42	431.01	430.89	431.23	0.016098	3.81	27.10	44.58	0.79
Reach 1	7305.50*	100	Existing	116.00	429.48	431.11	431.01	431.36	0.016547	4.05	30.76	50.84	0.81
Reach 1	7305.50*	100	Nat	116.00	429.48	431.11	431.01	431.36	0.016547	4.05	30.76	50.84	0.81
Reach 1	7305.50*	100	Prop	116.00	429.42	431.07		431.32	0.015966	4.01	30.08	48.19	0.79

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	7256.18*	50	Existing	101.00	428.68	430.24	430.14	430.47	0.016285	3.79	28.15	49.79	0.79
Reach 1	7256.18*	50	Nat	101.00	428.68	430.24	430.14	430.47	0.016285	3.79	28.15	49.79	0.79
Reach 1	7256.18*	50	Prop	101.00	428.63	430.21		430.43	0.016178	3.79	27.34	45.94	0.79
Reach 1	7256.18*	100	Existing	116.00	428.68	430.31		430.55	0.016060	3.98	31.38	51.71	0.79
Reach 1	7256.18*	100	Nat	116.00	428.68	430.31		430.55	0.016060	3.98	31.38	51.71	0.79
Reach 1	7256.18*	100	Prop	116.00	428.63	430.27	430.16	430.52	0.016596	4.03	29.98	49.09	0.81
Reach 1	7206.85*	50	Existing	101.00	427.89	429.45	429.34	429.66	0.016280	3.76	28.50	50.80	0.79
Reach 1	7206.85*	50	Nat	101.00	427.89	429.45	429.34	429.66	0.016280	3.76	28.50	50.80	0.79
Reach 1	7206.85*	50	Prop	101.00	427.83	429.41	429.29	429.63	0.016252	3.77	27.54	46.93	0.79
Reach 1	7206.85*	100	Existing	116.00	427.89	429.50		429.75	0.016320	3.98	31.57	52.55	0.80
Reach 1	7206.85*	100	Nat	116.00	427.89	429.50		429.75	0.016320	3.98	31.57	52.55	0.80
Reach 1	7206.85*	100	Prop	116.00	427.83	429.47	429.36	429.71	0.016091	3.97	30.61	50.48	0.79
Reach 1	7157.53*	50	Existing	101.00	427.10	428.64	428.54	428.86	0.016596	3.76	28.54	51.38	0.79
Reach 1	7157.53*	50	Nat	101.00	427.10	428.64	428.54	428.86	0.016596	3.76	28.54	51.38	0.79
Reach 1	7157.53*	50	Prop	101.00	427.04	428.61	428.50	428.83	0.016052	3.73	27.96	48.48	0.78
Reach 1	7157.53*	100	Existing	116.00	427.10	428.70		428.94	0.016106	3.93	31.97	53.29	0.79
Reach 1	7157.53*	100	Nat	116.00	427.10	428.70		428.94	0.016106	3.93	31.97	53.29	0.79
Reach 1	7157.53*	100	Prop	116.00	427.04	428.68	428.56	428.92	0.015780	3.92	31.19	52.08	0.79
Reach 1	7108.21*	50	Existing	101.00	426.31	427.85		428.05	0.015747	3.68	29.41	52.57	0.77
Reach 1	7108.21*	50	Nat	101.00	426.31	427.85		428.05	0.015747	3.68	29.41	52.57	0.77
Reach 1	7108.21*	50	Prop	101.00	426.25	427.81	427.70	428.03	0.016511	3.74	27.99	49.57	0.79
Reach 1	7108.21*	100	Existing	116.00	426.31	427.90	427.80	428.13	0.016266	3.92	32.18	54.05	0.79
Reach 1	7108.21*	100	Nat	116.00	426.31	427.90	427.80	428.13	0.016266	3.92	32.18	54.05	0.79
Reach 1	7108.21*	100	Prop	116.00	426.25	427.87	427.77	428.11	0.016437	3.94	31.07	52.95	0.80
Reach 1	7058.88*	50	Existing	101.00	425.52	427.03	426.93	427.25	0.016643	3.72	29.19	53.14	0.79
Reach 1	7058.88*	50	Nat	101.00	425.52	427.03	426.93	427.25	0.016643	3.72	29.19	53.14	0.79
Reach 1	7058.88*	50	Prop	101.00	425.45	427.01		427.22	0.016089	3.69	28.56	51.14	0.78
Reach 1	7058.88*	100	Existing	116.00	425.52	427.10	426.99	427.33	0.016176	3.89	32.64	54.90	0.79
Reach 1	7058.88*	100	Nat	116.00	425.52	427.10	426.99	427.33	0.016176	3.89	32.64	54.90	0.79
Reach 1	7058.88*	100	Prop	116.00	425.45	427.07	426.97	427.31	0.016393	3.92	31.45	54.18	0.80
Reach 1	7009.56*	50	Existing	101.00	424.73	426.24	426.13	426.44	0.016012	3.65	29.93	54.23	0.78
Reach 1	7009.56*	50	Nat	101.00	424.73	426.24	426.13	426.44	0.016012	3.65	29.93	54.23	0.78
Reach 1	7009.56*	50	Prop	101.00	424.66	426.22	426.11	426.43	0.016193	3.67	28.85	52.67	0.78
Reach 1	7009.56*	100	Existing	116.00	424.73	426.29	426.19	426.52	0.016349	3.88	32.85	55.66	0.79
Reach 1	7009.56*	100	Nat	116.00	424.73	426.29	426.19	426.52	0.016349	3.88	32.85	55.66	0.79
Reach 1	7009.56*	100	Prop	116.00	424.66	426.27	426.17	426.51	0.016316	3.88	31.92	55.85	0.79

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	6960.24*	50	Existing	101.00	423.94	425.44	425.33	425.64	0.016366	3.65	30.08	55.11	0.78
Reach 1	6960.24*	50	Nat	101.00	423.94	425.44	425.33	425.64	0.016366	3.65	30.08	55.11	0.78
Reach 1	6960.24*	50	Prop	101.00	423.87	425.42	425.31	425.63	0.016070	3.64	29.29	54.24	0.78
Reach 1	6960.24*	100	Existing	116.00	423.94	425.50	425.39	425.72	0.016385	3.85	33.24	56.59	0.79
Reach 1	6960.24*	100	Nat	116.00	423.94	425.50	425.39	425.72	0.016385	3.85	33.24	56.59	0.79
Reach 1	6960.24*	100	Prop	116.00	423.87	425.49	425.38	425.71	0.015835	3.82	32.70	57.67	0.78
Reach 1	6910.91*	50	Existing	101.00	423.15	424.64	424.54	424.84	0.016184	3.61	30.54	56.03	0.78
Reach 1	6910.91*	50	Nat	101.00	423.15	424.64	424.54	424.84	0.016184	3.61	30.54	56.03	0.78
Reach 1	6910.91*	50	Prop	101.00	423.07	424.62	424.52	424.83	0.016381	3.64	29.43	55.47	0.78
Reach 1	6910.91*	100	Existing	116.00	423.15	424.70	424.59	424.92	0.016184	3.81	33.75	57.46	0.79
Reach 1	6910.91*	100	Nat	116.00	423.15	424.70	424.59	424.92	0.016184	3.81	33.75	57.46	0.79
Reach 1	6910.91*	100	Prop	116.00	423.07	424.68	424.58	424.91	0.016401	3.84	32.66	58.67	0.79
Reach 1	6861.59*	50	Existing	101.00	422.36	423.84		424.04	0.016246	3.59	30.91	56.99	0.78
Reach 1	6861.59*	50	Nat	101.00	422.36	423.84		424.04	0.016246	3.59	30.91	56.99	0.78
Reach 1	6861.59*	50	Prop	101.00	422.28	423.83	423.72	424.03	0.015961	3.59	30.05	57.08	0.77
Reach 1	6861.59*	100	Existing	116.00	422.36	423.90	423.79	424.12	0.016257	3.79	34.12	58.38	0.79
Reach 1	6861.59*	100	Nat	116.00	422.36	423.90	423.79	424.12	0.016257	3.79	34.12	58.38	0.79
Reach 1	6861.59*	100	Prop	116.00	422.28	423.88	423.79	424.11	0.016385	3.82	33.04	59.98	0.79
Reach 1	6812.27*	50	Existing	101.00	421.57	423.04	422.94	423.24	0.016449	3.58	31.13	57.81	0.78
Reach 1	6812.27*	50	Nat	101.00	421.57	423.04	422.94	423.24	0.016449	3.58	31.13	57.81	0.78
Reach 1	6812.27*	50	Prop	101.00	421.48	423.03	422.93	423.23	0.016215	3.58	30.28	58.61	0.78
Reach 1	6812.27*	100	Existing	116.00	421.57	423.10	422.99	423.31	0.016468	3.78	34.34	59.15	0.79
Reach 1	6812.27*	100	Nat	116.00	421.57	423.10	422.99	423.31	0.016468	3.78	34.34	59.15	0.79
Reach 1	6812.27*	100	Prop	116.00	421.48	423.09	422.99	423.31	0.016264	3.78	33.60	61.79	0.79
Reach 1	6762.94*	50	Existing	101.00	420.78	422.25		422.44	0.015830	3.52	31.93	58.85	0.77
Reach 1	6762.94*	50	Nat	101.00	420.78	422.25		422.44	0.015830	3.52	31.93	58.85	0.77
Reach 1	6762.94*	50	Prop	101.00	420.69	422.24	422.13	422.44	0.016091	3.55	30.79	60.32	0.77
Reach 1	6762.94*	100	Existing	116.00	420.78	422.31		422.51	0.015816	3.71	35.22	60.17	0.78
Reach 1	6762.94*	100	Nat	116.00	420.78	422.31		422.51	0.015816	3.71	35.22	60.17	0.78
Reach 1	6762.94*	100	Prop	116.00	420.69	422.30	422.20	422.51	0.016027	3.74	34.26	63.57	0.78
Reach 1	6713.62*	50	Existing	101.00	419.99	421.44		421.64	0.016705	3.56	31.75	59.56	0.78
Reach 1	6713.62*	50	Nat	101.00	419.99	421.44		421.64	0.016705	3.56	31.75	59.56	0.78
Reach 1	6713.62*	50	Prop	101.00	419.90	421.44	421.34	421.63	0.016523	3.56	30.86	61.45	0.78
Reach 1	6713.62*	100	Existing	116.00	419.99	421.50	421.40	421.71	0.016782	3.76	34.93	60.79	0.80
Reach 1	6713.62*	100	Nat	116.00	419.99	421.50	421.40	421.71	0.016782	3.76	34.93	60.79	0.80
Reach 1	6713.62*	100	Prop	116.00	419.90	421.49	421.40	421.71	0.016661	3.77	34.17	64.52	0.79

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	6664.30*	50	Prop	101.00	419.10	420.65	420.54	420.84	0.015675	3.48	31.97	63.69	0.76
Reach 1	6664.30*	100	Prop	116.00	419.10	420.71	420.60	420.91	0.015458	3.66	35.71	67.00	0.77
Reach 1	6664.29*	50	Existing	101.00	419.20	420.66		420.84	0.015583	3.46	32.90	60.63	0.76
Reach 1	6664.29*	50	Nat	101.00	419.20	420.66		420.84	0.015583	3.46	32.90	60.63	0.76
Reach 1	6664.29*	100	Existing	116.00	419.20	420.71		420.91	0.015438	3.64	36.35	61.91	0.77
Reach 1	6664.29*	100	Nat	116.00	419.20	420.71		420.91	0.015438	3.64	36.35	61.91	0.77
Reach 1	6614.97*	50	Existing	101.00	418.41	419.85	419.75	420.03	0.017066	3.53	32.32	61.22	0.79
Reach 1	6614.97*	50	Nat	101.00	418.41	419.85	419.75	420.03	0.017066	3.53	32.32	61.22	0.79
Reach 1	6614.97*	50	Prop	101.00	418.31	419.84	419.74	420.03	0.016869	3.54	31.56	64.60	0.79
Reach 1	6614.97*	100	Existing	116.00	418.41	419.90	419.80	420.11	0.017288	3.74	35.41	62.33	0.80
Reach 1	6614.97*	100	Nat	116.00	418.41	419.90	419.80	420.11	0.017288	3.74	35.41	62.33	0.80
Reach 1	6614.97*	100	Prop	116.00	418.31	419.89	419.81	420.11	0.017186	3.75	34.81	67.46	0.80
Reach 1	6565.65*	50	Existing	101.00	417.62	419.08		419.25	0.014491	3.34	34.58	62.73	0.73
Reach 1	6565.65*	50	Nat	101.00	417.62	419.08		419.25	0.014491	3.34	34.58	62.73	0.73
Reach 1	6565.65*	50	Prop	101.00	417.52	419.08		419.25	0.014543	3.36	33.96	68.26	0.73
Reach 1	6565.65*	100	Existing	116.00	417.62	419.13		419.32	0.014643	3.53	37.90	63.87	0.74
Reach 1	6565.65*	100	Nat	116.00	417.62	419.13		419.32	0.014643	3.53	37.90	63.87	0.74
Reach 1	6565.65*	100	Prop	116.00	417.52	419.13	419.01	419.32	0.014648	3.55	37.66	71.40	0.75
Reach 1	6516.32*	50	Existing	101.00	416.83	418.23	418.18	418.43	0.019081	3.61	31.92	62.58	0.83
Reach 1	6516.32*	50	Nat	101.00	416.83	418.23	418.18	418.43	0.019081	3.61	31.92	62.58	0.83
Reach 1	6516.32*	50	Prop	101.00	416.72	418.23	418.15	418.43	0.018961	3.62	31.12	66.86	0.83
Reach 1	6516.32*	100	Existing	116.00	416.83	418.29	418.21	418.50	0.018673	3.78	35.33	63.73	0.83
Reach 1	6516.32*	100	Nat	116.00	416.83	418.29	418.21	418.50	0.018673	3.78	35.33	63.73	0.83
Reach 1	6516.32*	100	Prop	116.00	416.72	418.28	418.21	418.50	0.018657	3.80	34.76	70.04	0.83
Reach 1	6467	50	Existing	101.00	416.04	417.52		417.66	0.012452	3.15	37.32	65.07	0.68
Reach 1	6467	50	Nat	101.00	416.04	417.52		417.66	0.012452	3.15	37.32	65.07	0.68
Reach 1	6467	50	Prop	101.00	415.93	417.52		417.67	0.012429	3.16	37.11	73.33	0.68
Reach 1	6467	100	Existing	116.00	416.04	417.57		417.73	0.012618	3.33	40.82	66.18	0.69
Reach 1	6467	100	Nat	116.00	416.04	417.57		417.73	0.012618	3.33	40.82	66.18	0.69
Reach 1	6467	100	Prop	116.00	415.93	417.57		417.74	0.012516	3.34	41.17	76.60	0.69
Reach 1	6417.15*	50	Existing	101.00	415.44	416.89		417.04	0.012547	3.16	37.04	65.20	0.68
Reach 1	6417.15*	50	Nat	101.00	415.44	416.89		417.04	0.012547	3.16	37.04	65.20	0.68
Reach 1	6417.15*	50	Prop	101.00	415.33	416.89		417.05	0.012331	3.16	37.03	73.26	0.68
Reach 1	6417.15*	100	Existing	116.00	415.44	416.95		417.11	0.012531	3.33	40.74	66.44	0.69
Reach 1	6417.15*	100	Nat	116.00	415.44	416.95		417.11	0.012531	3.33	40.74	66.44	0.69
Reach 1	6417.15*	100	Prop	116.00	415.33	416.94		417.11	0.012658	3.36	40.79	76.37	0.70

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	6367.31*	50	Existing	101.00	414.83	416.27		416.42	0.012527	3.16	36.91	65.23	0.68
Reach 1	6367.31*	50	Nat	101.00	414.83	416.27		416.42	0.012527	3.16	36.91	65.23	0.68
Reach 1	6367.31*	50	Prop	101.00	414.73	416.27		416.42	0.012470	3.17	36.68	72.97	0.68
Reach 1	6367.31*	100	Existing	116.00	414.83	416.33		416.49	0.012239	3.31	40.92	66.60	0.69
Reach 1	6367.31*	100	Nat	116.00	414.83	416.33		416.49	0.012239	3.31	40.92	66.60	0.69
Reach 1	6367.31*	100	Prop	116.00	414.73	416.33		416.49	0.012242	3.32	41.14	76.74	0.69
Reach 1	6317.46*	50	Existing	101.00	414.23	415.65		415.80	0.012563	3.16	36.71	65.40	0.68
Reach 1	6317.46*	50	Nat	101.00	414.23	415.65		415.80	0.012563	3.16	36.71	65.40	0.68
Reach 1	6317.46*	50	Prop	101.00	414.13	415.65		415.80	0.012431	3.17	36.56	72.88	0.68
Reach 1	6317.46*	100	Existing	116.00	414.23	415.70		415.87	0.012515	3.33	40.46	66.76	0.69
Reach 1	6317.46*	100	Nat	116.00	414.23	415.70		415.87	0.012515	3.33	40.46	66.76	0.69
Reach 1	6317.46*	100	Prop	116.00	414.13	415.70		415.87	0.012573	3.35	40.54	76.34	0.69
Reach 1	6267.62*	50	Existing	101.00	413.62	415.03		415.18	0.012126	3.13	37.03	65.60	0.67
Reach 1	6267.62*	50	Nat	101.00	413.62	415.03		415.18	0.012126	3.13	37.03	65.60	0.67
Reach 1	6267.62*	50	Prop	101.00	413.53	415.02		415.17	0.012476	3.17	36.34	72.85	0.68
Reach 1	6267.62*	100	Existing	116.00	413.62	415.08		415.25	0.012355	3.32	40.51	66.89	0.69
Reach 1	6267.62*	100	Nat	116.00	413.62	415.08		415.25	0.012355	3.32	40.51	66.89	0.69
Reach 1	6267.62*	100	Prop	116.00	413.53	415.08		415.25	0.012368	3.34	40.64	76.73	0.69
Reach 1	6217.77*	50	Existing	101.00	413.02	414.40		414.55	0.012522	3.16	36.47	65.64	0.68
Reach 1	6217.77*	50	Nat	101.00	413.02	414.40		414.55	0.012522	3.16	36.47	65.64	0.68
Reach 1	6217.77*	50	Prop	101.00	412.93	414.40		414.55	0.012494	3.17	36.17	72.74	0.68
Reach 1	6217.77*	100	Existing	116.00	413.02	414.46		414.63	0.012499	3.34	40.20	67.11	0.69
Reach 1	6217.77*	100	Nat	116.00	413.02	414.46		414.63	0.012499	3.34	40.20	67.11	0.69
Reach 1	6217.77*	100	Prop	116.00	412.93	414.45		414.62	0.012731	3.37	40.03	76.32	0.70
Reach 1	6167.92*	50	Existing	101.00	412.42	413.79		413.94	0.012310	3.15	36.60	65.85	0.68
Reach 1	6167.92*	50	Nat	101.00	412.42	413.79		413.94	0.012310	3.15	36.60	65.85	0.68
Reach 1	6167.92*	50	Prop	101.00	412.33	413.79		413.94	0.012101	3.14	36.50	73.14	0.67
Reach 1	6167.92*	100	Existing	116.00	412.42	413.84		414.01	0.012432	3.33	40.20	67.32	0.69
Reach 1	6167.92*	100	Nat	116.00	412.42	413.84		414.01	0.012432	3.33	40.20	67.32	0.69
Reach 1	6167.92*	100	Prop	116.00	412.33	413.84		414.01	0.012278	3.33	40.48	76.91	0.69
Reach 1	6118.08*	50	Existing	101.00	411.81	413.17		413.32	0.012474	3.16	36.28	66.03	0.68
Reach 1	6118.08*	50	Nat	101.00	411.81	413.17		413.32	0.012474	3.16	36.28	66.03	0.68
Reach 1	6118.08*	50	Prop	101.00	411.73	413.16		413.32	0.012654	3.19	35.69	72.49	0.69
Reach 1	6118.08*	100	Existing	116.00	411.81	413.22		413.39	0.012502	3.34	39.99	67.63	0.69
Reach 1	6118.08*	100	Nat	116.00	411.81	413.22		413.39	0.012502	3.34	39.99	67.63	0.69
Reach 1	6118.08*	100	Prop	116.00	411.73	413.22		413.39	0.012597	3.36	39.90	76.67	0.70

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	6068.23*	50	Existing	101.00	411.21	412.55		412.70	0.012594	3.17	36.11	66.29	0.69
Reach 1	6068.23*	50	Nat	101.00	411.21	412.55		412.70	0.012594	3.17	36.11	66.29	0.69
Reach 1	6068.23*	50	Prop	101.00	411.13	412.55		412.70	0.012331	3.16	35.94	72.85	0.68
Reach 1	6068.23*	100	Existing	116.00	411.21	412.61		412.77	0.012110	3.31	40.41	68.22	0.68
Reach 1	6068.23*	100	Nat	116.00	411.21	412.61		412.77	0.012110	3.31	40.41	68.22	0.68
Reach 1	6068.23*	100	Prop	116.00	411.13	412.61		412.77	0.012108	3.32	40.43	77.39	0.68
Reach 1	6018.39*	50	Existing	101.00	410.61	411.94		412.09	0.012204	3.14	36.43	66.66	0.68
Reach 1	6018.39*	50	Nat	101.00	410.61	411.94		412.09	0.012204	3.14	36.43	66.66	0.68
Reach 1	6018.39*	50	Prop	101.00	410.53	411.93		412.08	0.012543	3.18	35.62	72.63	0.68
Reach 1	6018.39*	100	Existing	116.00	410.61	411.99		412.16	0.012627	3.35	39.74	68.21	0.70
Reach 1	6018.39*	100	Nat	116.00	410.61	411.99		412.16	0.012627	3.35	39.74	68.21	0.70
Reach 1	6018.39*	100	Prop	116.00	410.53	411.98		412.15	0.012498	3.35	39.84	77.03	0.69
Reach 1	5968.54*	50	Existing	101.00	410.00	411.31		411.47	0.012465	3.16	36.10	66.86	0.68
Reach 1	5968.54*	50	Nat	101.00	410.00	411.31		411.47	0.012465	3.16	36.10	66.86	0.68
Reach 1	5968.54*	50	Prop	101.00	409.93	411.32		411.47	0.011929	3.13	36.26	73.50	0.67
Reach 1	5968.54*	100	Existing	116.00	410.00	411.37		411.54	0.012342	3.33	40.04	68.80	0.69
Reach 1	5968.54*	100	Nat	116.00	410.00	411.37		411.54	0.012342	3.33	40.04	68.80	0.69
Reach 1	5968.54*	100	Prop	116.00	409.93	411.37		411.54	0.012246	3.33	40.11	77.58	0.69
Reach 1	5918.69*	50	Existing	101.00	409.40	410.70		410.85	0.012320	3.15	36.12	67.06	0.68
Reach 1	5918.69*	50	Nat	101.00	409.40	410.70		410.85	0.012320	3.15	36.12	67.06	0.68
Reach 1	5918.69*	50	Prop	101.00	409.33	410.69		410.84	0.012751	3.19	35.24	72.51	0.69
Reach 1	5918.69*	100	Existing	116.00	409.40	410.75		410.92	0.012555	3.34	39.66	68.90	0.69
Reach 1	5918.69*	100	Nat	116.00	409.40	410.75		410.92	0.012555	3.34	39.66	68.90	0.69
Reach 1	5918.69*	100	Prop	116.00	409.33	410.75		410.92	0.012435	3.34	39.79	77.51	0.69
Reach 1	5868.85*	50	Existing	101.00	408.79	410.09		410.24	0.011937	3.12	36.50	67.64	0.67
Reach 1	5868.85*	50	Nat	101.00	408.79	410.09		410.24	0.011937	3.12	36.50	67.64	0.67
Reach 1	5868.85*	50	Prop	101.00	408.73	410.08		410.23	0.012247	3.15	35.76	73.54	0.68
Reach 1	5868.85*	100	Existing	116.00	408.79	410.14		410.31	0.012194	3.31	40.06	69.58	0.69
Reach 1	5868.85*	100	Nat	116.00	408.79	410.14		410.31	0.012194	3.31	40.06	69.58	0.69
Reach 1	5868.85*	100	Prop	116.00	408.73	410.13		410.30	0.012318	3.33	39.92	78.25	0.69
Reach 1	5819.00*	50	Existing	101.00	408.19	409.46		409.62	0.012652	3.18	35.63	67.41	0.69
Reach 1	5819.00*	50	Nat	101.00	408.19	409.46		409.62	0.012652	3.18	35.63	67.41	0.69
Reach 1	5819.00*	50	Prop	101.00	408.14	409.46		409.61	0.012570	3.18	35.42	73.53	0.69
Reach 1	5819.00*	100	Existing	116.00	408.19	409.52		409.69	0.012469	3.34	39.65	69.74	0.69
Reach 1	5819.00*	100	Nat	116.00	408.19	409.52		409.69	0.012469	3.34	39.65	69.74	0.69
Reach 1	5819.00*	100	Prop	116.00	408.14	409.52		409.69	0.012418	3.34	39.84	78.67	0.69

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	5769.15*	50	Existing	101.00	407.59	408.85		409.00	0.012219	3.14	36.09	68.17	0.68
Reach 1	5769.15*	50	Nat	101.00	407.59	408.85		409.00	0.012219	3.14	36.09	68.17	0.68
Reach 1	5769.15*	50	Prop	101.00	407.54	408.85		409.00	0.012379	3.16	35.60	74.02	0.68
Reach 1	5769.15*	100	Existing	116.00	407.59	408.91		409.07	0.012317	3.32	39.86	70.91	0.69
Reach 1	5769.15*	100	Nat	116.00	407.59	408.91		409.07	0.012317	3.32	39.86	70.91	0.69
Reach 1	5769.15*	100	Prop	116.00	407.54	408.91		409.07	0.012094	3.31	40.26	80.12	0.68
Reach 1	5719.31*	50	Existing	101.00	406.98	408.24		408.39	0.012188	3.14	36.03	69.60	0.68
Reach 1	5719.31*	50	Nat	101.00	406.98	408.24		408.39	0.012188	3.14	36.03	69.60	0.68
Reach 1	5719.31*	50	Prop	101.00	406.94	408.23		408.38	0.012510	3.17	35.49	75.54	0.68
Reach 1	5719.31*	100	Existing	116.00	406.98	408.29		408.46	0.012426	3.33	39.74	73.27	0.69
Reach 1	5719.31*	100	Nat	116.00	406.98	408.29		408.46	0.012426	3.33	39.74	73.27	0.69
Reach 1	5719.31*	100	Prop	116.00	406.94	408.28		408.46	0.012569	3.35	39.79	82.47	0.69
Reach 1	5669.46*	50	Existing	101.00	406.38	407.62		407.77	0.012237	3.14	36.11	72.32	0.68
Reach 1	5669.46*	50	Nat	101.00	406.38	407.62		407.77	0.012237	3.14	36.11	72.32	0.68
Reach 1	5669.46*	50	Prop	101.00	406.34	407.62		407.77	0.012043	3.13	36.30	79.65	0.67
Reach 1	5669.46*	100	Existing	116.00	406.38	407.68		407.84	0.012382	3.33	40.07	76.21	0.69
Reach 1	5669.46*	100	Nat	116.00	406.38	407.68		407.84	0.012382	3.33	40.07	76.21	0.69
Reach 1	5669.46*	100	Prop	116.00	406.34	407.67		407.84	0.012277	3.32	40.59	86.25	0.69
Reach 1	5619.62*	50	Existing	101.00	405.77	407.01		407.16	0.012260	3.14	36.42	74.66	0.68
Reach 1	5619.62*	50	Nat	101.00	405.77	407.01		407.16	0.012260	3.14	36.42	74.66	0.68
Reach 1	5619.62*	50	Prop	101.00	405.74	407.00		407.16	0.012409	3.16	36.30	81.79	0.68
Reach 1	5619.62*	100	Existing	116.00	405.77	407.06		407.23	0.012137	3.31	40.88	80.50	0.68
Reach 1	5619.62*	100	Nat	116.00	405.77	407.06		407.23	0.012137	3.31	40.88	80.50	0.68
Reach 1	5619.62*	100	Prop	116.00	405.74	407.06		407.23	0.012139	3.31	41.40	89.48	0.68
Reach 1	5569.77*	50	Existing	101.00	405.17	406.39		406.54	0.012284	3.14	36.83	76.86	0.68
Reach 1	5569.77*	50	Nat	101.00	405.17	406.39		406.54	0.012284	3.14	36.83	76.86	0.68
Reach 1	5569.77*	50	Prop	101.00	405.14	406.39		406.54	0.012600	3.17	36.74	84.24	0.69
Reach 1	5569.77*	100	Existing	116.00	405.17	406.45		406.62	0.012047	3.30	41.58	83.91	0.68
Reach 1	5569.77*	100	Nat	116.00	405.17	406.45		406.62	0.012047	3.30	41.58	83.91	0.68
Reach 1	5569.77*	100	Prop	116.00	405.14	406.44	406.30	406.61	0.012770	3.35	41.26	90.99	0.70
Reach 1	5519.92*	50	Existing	101.00	404.57	405.78		405.93	0.012261	3.14	37.43	79.16	0.68
Reach 1	5519.92*	50	Nat	101.00	404.57	405.78		405.93	0.012261	3.14	37.43	79.16	0.68
Reach 1	5519.92*	50	Prop	101.00	404.54	405.78		405.93	0.011937	3.11	38.22	87.56	0.67
Reach 1	5519.92*	100	Existing	116.00	404.57	405.83		406.00	0.012557	3.33	41.57	85.91	0.69
Reach 1	5519.92*	100	Nat	116.00	404.57	405.83		406.00	0.012557	3.33	41.57	85.91	0.69
Reach 1	5519.92*	100	Prop	116.00	404.54	405.83		406.00	0.012096	3.29	42.96	94.47	0.68

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	5470.08*	50	Existing	101.00	403.96	405.17		405.32	0.012288	3.13	37.91	81.03	0.68
Reach 1	5470.08*	50	Nat	101.00	403.96	405.17		405.32	0.012288	3.13	37.91	81.03	0.68
Reach 1	5470.08*	50	Prop	101.00	403.94	405.16		405.31	0.012457	3.14	38.39	89.48	0.68
Reach 1	5470.08*	100	Existing	116.00	403.96	405.23		405.39	0.012171	3.29	42.78	90.11	0.68
Reach 1	5470.08*	100	Nat	116.00	403.96	405.23		405.39	0.012171	3.29	42.78	90.11	0.68
Reach 1	5470.08*	100	Prop	116.00	403.94	405.22		405.38	0.012167	3.29	43.87	97.66	0.68
Reach 1	5420.23*	50	Existing	101.00	403.36	404.55		404.70	0.012453	3.14	38.57	83.65	0.68
Reach 1	5420.23*	50	Nat	101.00	403.36	404.55		404.70	0.012453	3.14	38.57	83.65	0.68
Reach 1	5420.23*	50	Prop	101.00	403.34	404.55		404.70	0.012532	3.14	39.32	91.64	0.68
Reach 1	5420.23*	100	Existing	116.00	403.36	404.61		404.77	0.012407	3.30	43.45	93.01	0.69
Reach 1	5420.23*	100	Nat	116.00	403.36	404.61		404.77	0.012407	3.30	43.45	93.01	0.69
Reach 1	5420.23*	100	Prop	116.00	403.34	404.60		404.76	0.012456	3.30	44.54	99.41	0.69
Reach 1	5370.39*	50	Existing	101.00	402.76	403.95		404.09	0.012087	3.10	39.73	86.90	0.67
Reach 1	5370.39*	50	Nat	101.00	402.76	403.95		404.09	0.012087	3.10	39.73	86.90	0.67
Reach 1	5370.39*	50	Prop	101.00	402.74	403.94		404.08	0.012058	3.09	40.96	94.64	0.67
Reach 1	5370.39*	100	Existing	116.00	402.76	404.00		404.16	0.012197	3.28	44.55	95.84	0.68
Reach 1	5370.39*	100	Nat	116.00	402.76	404.00		404.16	0.012197	3.28	44.55	95.84	0.68
Reach 1	5370.39*	100	Prop	116.00	402.74	403.99		404.15	0.012202	3.27	46.00	102.09	0.68
Reach 1	5320.54*	50	Existing	101.00	402.15	403.32		403.47	0.012971	3.15	39.49	87.86	0.69
Reach 1	5320.54*	50	Nat	101.00	402.15	403.32		403.47	0.012975	3.15	39.49	87.85	0.69
Reach 1	5320.54*	50	Prop	101.00	402.14	403.31		403.46	0.013128	3.15	40.67	94.38	0.70
Reach 1	5320.54*	100	Existing	116.00	402.15	403.37		403.54	0.012817	3.31	44.62	96.89	0.70
Reach 1	5320.54*	100	Nat	116.00	402.15	403.37		403.54	0.012817	3.31	44.62	96.89	0.70
Reach 1	5320.54*	100	Prop	116.00	402.14	403.37		403.53	0.012848	3.30	46.21	102.60	0.70
Reach 1	5270.69*	50	Existing	101.00	401.55	402.74		402.87	0.011120	2.99	43.11	95.67	0.65
Reach 1	5270.69*	50	Nat	101.00	401.55	402.74		402.87	0.011118	2.99	43.11	95.68	0.65
Reach 1	5270.69*	50	Prop	101.00	401.54	402.73		402.86	0.010923	2.96	45.17	100.99	0.64
Reach 1	5270.69*	100	Existing	116.00	401.55	402.79		402.93	0.011243	3.17	48.35	103.89	0.66
Reach 1	5270.69*	100	Nat	116.00	401.55	402.79		402.93	0.011247	3.17	48.34	103.88	0.66
Reach 1	5270.69*	100	Prop	116.00	401.54	402.78		402.92	0.011433	3.16	49.85	107.50	0.66
Reach 1	5220.85*	50	Existing	101.00	400.94	402.06		402.22	0.015440	3.30	38.49	87.98	0.75
Reach 1	5220.85*	50	Nat	101.00	400.94	402.06		402.22	0.015445	3.30	38.48	87.97	0.75
Reach 1	5220.85*	50	Prop	101.00	400.94	402.05		402.21	0.015505	3.27	40.13	92.73	0.75
Reach 1	5220.85*	100	Existing	116.00	400.94	402.12	402.00	402.29	0.014926	3.44	43.73	96.94	0.75
Reach 1	5220.85*	100	Nat	116.00	400.94	402.12	402.00	402.29	0.014916	3.44	43.74	96.96	0.75
Reach 1	5220.85*	100	Prop	116.00	400.94	402.11	401.99	402.27	0.014885	3.41	45.65	101.20	0.74

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	5171	50	Existing	101.00	400.34	401.61		401.70	0.006594	2.52	56.50	116.84	0.51
Reach 1	5171	50	Nat	101.00	400.34	401.61		401.70	0.006589	2.52	56.52	116.87	0.51
Reach 1	5171	50	Prop	101.00	400.34	401.60		401.69	0.006706	2.51	58.26	118.56	0.51
Reach 1	5171	100	Existing	116.00	400.34	401.68		401.78	0.006591	2.66	64.41	122.10	0.52
Reach 1	5171	100	Nat	116.00	400.34	401.68		401.78	0.006605	2.66	64.35	122.08	0.52
Reach 1	5171	100	Prop	116.00	400.34	401.67		401.76	0.006693	2.65	66.64	125.56	0.52
Reach 1	5129.82*	50	Existing	101.00	399.96	401.30		401.39	0.006410	2.53	55.61	114.87	0.50
Reach 1	5129.82*	50	Nat	101.00	399.96	401.29		401.39	0.006428	2.53	55.54	114.80	0.50
Reach 1	5129.82*	50	Prop	101.00	399.96	401.27		401.36	0.006544	2.52	57.06	117.49	0.51
Reach 1	5129.82*	100	Existing	116.00	399.96	401.36		401.46	0.006536	2.68	62.83	120.51	0.51
Reach 1	5129.82*	100	Nat	116.00	399.96	401.36		401.46	0.006536	2.68	62.83	120.51	0.51
Reach 1	5129.82*	100	Prop	116.00	399.96	401.33		401.43	0.006751	2.69	64.41	124.60	0.52
Reach 1	5088.65*	50	Existing	101.00	399.59	400.97		401.07	0.006558	2.57	53.77	112.64	0.51
Reach 1	5088.65*	50	Nat	101.00	399.59	400.97		401.07	0.006561	2.57	53.76	112.63	0.51
Reach 1	5088.65*	50	Prop	101.00	399.59	400.94		401.03	0.006721	2.57	54.81	114.99	0.51
Reach 1	5088.65*	100	Existing	116.00	399.59	401.04		401.14	0.006482	2.69	61.30	119.17	0.51
Reach 1	5088.65*	100	Nat	116.00	399.59	401.03		401.14	0.006563	2.70	60.96	118.88	0.52
Reach 1	5088.65*	100	Prop	116.00	399.59	401.00		401.10	0.006744	2.71	62.03	122.75	0.52
Reach 1	5047.47*	50	Existing	101.00	399.21	400.65		400.75	0.006464	2.59	52.55	111.31	0.51
Reach 1	5047.47*	50	Nat	101.00	399.21	400.65		400.75	0.006475	2.59	52.51	111.28	0.51
Reach 1	5047.47*	50	Prop	101.00	399.21	400.61		400.71	0.006607	2.59	53.20	112.95	0.51
Reach 1	5047.47*	100	Existing	116.00	399.21	400.72		400.82	0.006447	2.72	59.84	117.37	0.51
Reach 1	5047.47*	100	Nat	116.00	399.21	400.72		400.82	0.006468	2.72	59.75	117.30	0.51
Reach 1	5047.47*	100	Prop	116.00	399.21	400.68		400.78	0.006579	2.72	60.66	121.47	0.52
Reach 1	5006.29*	50	Existing	101.00	398.84	400.33		400.43	0.006544	2.62	50.87	109.51	0.51
Reach 1	5006.29*	50	Nat	101.00	398.84	400.33		400.43	0.006596	2.63	50.68	109.36	0.51
Reach 1	5006.29*	50	Prop	101.00	398.84	400.28		400.38	0.006727	2.63	50.92	110.06	0.52
Reach 1	5006.29*	100	Existing	116.00	398.84	400.40		400.51	0.006517	2.75	58.12	115.13	0.52
Reach 1	5006.29*	100	Nat	116.00	398.84	400.39		400.50	0.006576	2.76	57.88	114.95	0.52
Reach 1	5006.29*	100	Prop	116.00	398.84	400.34		400.46	0.006700	2.77	58.30	119.38	0.52
Reach 1	4965.12*	50	Existing	101.00	398.46	400.01		400.11	0.006453	2.63	49.52	107.70	0.51
Reach 1	4965.12*	50	Nat	101.00	398.46	400.01		400.11	0.006518	2.64	49.28	107.51	0.51
Reach 1	4965.12*	50	Prop	101.00	398.46	399.95		400.05	0.006734	2.66	48.76	106.54	0.52
Reach 1	4965.12*	100	Existing	116.00	398.46	400.08		400.19	0.006434	2.77	56.73	113.10	0.52
Reach 1	4965.12*	100	Nat	116.00	398.46	400.07		400.19	0.006497	2.78	56.47	112.91	0.52
Reach 1	4965.12*	100	Prop	116.00	398.46	400.01		400.13	0.006648	2.79	56.34	116.94	0.52

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	4923.94*	50	Existing	101.00	398.08	399.69		399.80	0.006462	2.66	48.06	105.61	0.51
Reach 1	4923.94*	50	Nat	101.00	398.08	399.69		399.80	0.006478	2.66	48.00	105.57	0.51
Reach 1	4923.94*	50	Prop	101.00	398.08	399.62		399.72	0.006674	2.68	47.00	102.84	0.52
Reach 1	4923.94*	100	Existing	116.00	398.08	399.76		399.87	0.006400	2.79	55.40	111.14	0.51
Reach 1	4923.94*	100	Nat	116.00	398.08	399.75		399.87	0.006465	2.80	55.13	110.94	0.52
Reach 1	4923.94*	100	Prop	116.00	398.08	399.68		399.80	0.006612	2.82	54.46	114.94	0.52
Reach 1	4882.77*	50	Existing	101.00	397.71	399.37		399.48	0.006543	2.69	46.49	103.07	0.51
Reach 1	4882.77*	50	Nat	101.00	397.71	399.37		399.48	0.006596	2.70	46.30	102.91	0.52
Reach 1	4882.77*	50	Prop	101.00	397.71	399.28		399.39	0.006812	2.74	44.41	97.39	0.52
Reach 1	4882.77*	100	Existing	116.00	397.71	399.44		399.55	0.006504	2.82	53.64	108.63	0.52
Reach 1	4882.77*	100	Nat	116.00	397.71	399.44		399.55	0.006511	2.82	53.62	108.61	0.52
Reach 1	4882.77*	100	Prop	116.00	397.71	399.35		399.47	0.006753	2.86	51.87	111.71	0.53
Reach 1	4841.59*	50	Existing	101.00	397.33	399.05		399.16	0.006376	2.69	45.95	100.30	0.51
Reach 1	4841.59*	50	Nat	101.00	397.33	399.05		399.16	0.006400	2.69	45.86	100.22	0.51
Reach 1	4841.59*	50	Prop	101.00	397.33	398.95		399.06	0.006627	2.74	42.87	93.81	0.52
Reach 1	4841.59*	100	Existing	116.00	397.33	399.12		399.24	0.006308	2.82	53.20	106.36	0.51
Reach 1	4841.59*	100	Nat	116.00	397.33	399.12		399.24	0.006379	2.83	52.90	106.12	0.52
Reach 1	4841.59*	100	Prop	116.00	397.33	399.02		399.15	0.006538	2.86	50.64	109.73	0.52
Reach 1	4800.41*	50	Existing	101.00	396.96	398.73		398.84	0.006574	2.73	44.30	94.69	0.52
Reach 1	4800.41*	50	Nat	101.00	396.96	398.73		398.84	0.006622	2.74	44.14	94.53	0.52
Reach 1	4800.41*	50	Prop	101.00	396.96	398.61		398.73	0.006853	2.80	40.15	86.04	0.53
Reach 1	4800.41*	100	Existing	116.00	396.96	398.80		398.92	0.006543	2.87	51.11	101.91	0.52
Reach 1	4800.41*	100	Nat	116.00	396.96	398.80		398.92	0.006544	2.87	51.11	101.91	0.52
Reach 1	4800.41*	100	Prop	116.00	396.96	398.69		398.82	0.006784	2.92	47.79	105.87	0.53
Reach 1	4759.24*	50	Existing	101.00	396.58	398.41		398.53	0.006425	2.73	44.11	90.79	0.51
Reach 1	4759.24*	50	Nat	101.00	396.58	398.41		398.53	0.006477	2.74	43.93	90.72	0.51
Reach 1	4759.24*	50	Prop	101.00	396.58	398.27		398.40	0.006781	2.82	38.41	77.88	0.53
Reach 1	4759.24*	100	Existing	116.00	396.58	398.48		398.61	0.006409	2.87	50.61	95.43	0.52
Reach 1	4759.24*	100	Nat	116.00	396.58	398.48		398.61	0.006419	2.87	50.57	95.40	0.52
Reach 1	4759.24*	100	Prop	116.00	396.58	398.36		398.49	0.006708	2.94	45.69	99.69	0.53
Reach 1	4718.06*	50	Existing	101.00	396.21	398.10		398.21	0.006425	2.75	43.89	90.50	0.51
Reach 1	4718.06*	50	Nat	101.00	396.21	398.10		398.21	0.006436	2.75	43.85	90.48	0.51
Reach 1	4718.06*	50	Prop	101.00	396.21	397.93		398.06	0.006896	2.86	36.67	66.84	0.53
Reach 1	4718.06*	100	Existing	116.00	396.21	398.17		398.29	0.006414	2.89	50.34	92.85	0.52
Reach 1	4718.06*	100	Nat	116.00	396.21	398.17		398.29	0.006423	2.89	50.31	92.84	0.52
Reach 1	4718.06*	100	Prop	116.00	396.21	398.02		398.16	0.006808	2.98	43.32	91.03	0.54

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	4676.88*	50	Existing	101.00	395.83	397.78		397.90	0.006452	2.77	43.57	90.11	0.51
Reach 1	4676.88*	50	Nat	101.00	395.83	397.78		397.90	0.006448	2.77	43.59	90.12	0.51
Reach 1	4676.88*	50	Prop	101.00	395.83	397.59		397.72	0.006901	2.89	35.73	57.05	0.53
Reach 1	4676.88*	100	Existing	116.00	395.83	397.85		397.98	0.006420	2.91	50.11	92.37	0.52
Reach 1	4676.88*	100	Nat	116.00	395.83	397.85		397.98	0.006433	2.91	50.07	92.35	0.52
Reach 1	4676.88*	100	Prop	116.00	395.83	397.68		397.82	0.006856	3.02	41.38	78.92	0.54
Reach 1	4635.71*	50	Existing	101.00	395.45	397.47		397.58	0.006325	2.77	43.76	89.97	0.51
Reach 1	4635.71*	50	Nat	101.00	395.45	397.46		397.58	0.006418	2.78	43.44	89.86	0.51
Reach 1	4635.71*	50	Prop	101.00	395.45	397.26		397.39	0.006786	2.89	35.30	51.43	0.53
Reach 1	4635.71*	100	Existing	116.00	395.45	397.54		397.67	0.006277	2.90	50.44	92.15	0.52
Reach 1	4635.71*	100	Nat	116.00	395.45	397.54		397.66	0.006367	2.92	50.09	92.03	0.52
Reach 1	4635.71*	100	Prop	116.00	395.45	397.34		397.49	0.006739	3.03	40.60	72.19	0.54
Reach 1	4594.53*	50	Existing	101.00	395.08	397.16		397.28	0.006149	2.76	44.57	90.20	0.50
Reach 1	4594.53*	50	Nat	101.00	395.08	397.15		397.27	0.006423	2.80	43.58	89.89	0.51
Reach 1	4594.53*	50	Prop	101.00	395.08	396.93		397.06	0.006642	2.89	35.13	47.60	0.53
Reach 1	4594.53*	100	Existing	116.00	395.08	397.24		397.36	0.006064	2.89	51.50	92.34	0.51
Reach 1	4594.53*	100	Nat	116.00	395.08	397.22		397.35	0.006397	2.94	50.18	91.94	0.52
Reach 1	4594.53*	100	Prop	116.00	395.08	397.02		397.16	0.006560	3.02	40.41	71.38	0.53
Reach 1	4553.35*	50	Existing	101.00	394.70	396.88		396.99	0.005364	2.66	47.50	90.83	0.47
Reach 1	4553.35*	50	Nat	101.00	394.70	396.84		396.96	0.006202	2.78	44.12	89.83	0.51
Reach 1	4553.35*	50	Prop	101.00	394.70	396.62		396.74	0.006021	2.82	36.03	47.88	0.50
Reach 1	4553.35*	100	Existing	116.00	394.70	396.96		397.07	0.005262	2.78	54.91	92.99	0.48
Reach 1	4553.35*	100	Nat	116.00	394.70	396.92		397.04	0.006173	2.92	50.83	91.81	0.51
Reach 1	4553.35*	100	Prop	116.00	394.70	396.71		396.85	0.005936	2.95	41.64	74.03	0.51
Reach 1	4512.18*	50	Existing	101.00	394.33	396.66		396.74	0.003902	2.41	55.69	92.89	0.41
Reach 1	4512.18*	50	Nat	101.00	394.33	396.55		396.66	0.005881	2.75	45.49	90.03	0.50
Reach 1	4512.18*	50	Prop	101.00	394.33	396.36		396.47	0.004753	2.63	39.58	63.98	0.45
Reach 1	4512.18*	100	Existing	116.00	394.33	396.74	396.23	396.83	0.003881	2.53	63.52	95.03	0.42
Reach 1	4512.18*	100	Nat	116.00	394.33	396.62		396.75	0.005844	2.89	52.39	91.97	0.50
Reach 1	4512.18*	100	Prop	116.00	394.33	396.46		396.58	0.004692	2.75	47.06	88.46	0.46
Reach 1	4471	50	Existing	101.00	393.95	395.82	395.82	396.18	0.026303	4.81	20.99	29.06	1.00
Reach 1	4471	50	Nat	101.00	393.95	396.07	395.82	396.25	0.011444	3.44	31.07	69.78	0.67
Reach 1	4471	50	Prop	101.00	393.95	395.47	395.47	395.85	0.026038	4.96	20.38	26.86	1.00
Reach 1	4471	100	Existing	116.00	393.95	395.92	395.92	396.28	0.026338	4.79	24.24	33.90	1.00
Reach 1	4471	100	Nat	116.00	393.95	396.13	395.91	396.34	0.011447	3.61	36.60	87.53	0.68
Reach 1	4471	100	Prop	116.00	393.95	395.56	395.56	395.96	0.025419	5.08	22.82	28.42	1.00

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	4424.46*	50	Nat	101.00	393.43	395.52		395.70	0.011924	3.47	29.14	36.55	0.68
Reach 1	4424.46*	100	Nat	116.00	393.43	395.60		395.80	0.011458	3.59	32.72	48.73	0.68
Reach 1	4377.92*	50	Nat	101.00	392.90	394.94		395.14	0.012103	3.62	27.90	33.17	0.70
Reach 1	4377.92*	100	Nat	116.00	392.90	395.04		395.25	0.012036	3.68	31.50	36.36	0.70
Reach 1	4331.39*	50	Nat	101.00	392.38	394.37		394.58	0.011870	3.66	27.60	31.82	0.69
Reach 1	4331.39*	100	Nat	116.00	392.38	394.48		394.69	0.011828	3.74	31.05	34.63	0.70
Reach 1	4284.85*	50	Nat	101.00	391.86	393.81		394.02	0.012062	3.72	27.12	30.83	0.70
Reach 1	4284.85*	100	Nat	116.00	391.86	393.91		394.13	0.012067	3.82	30.40	33.35	0.70
Reach 1	4238.31*	50	Nat	101.00	391.33	393.25		393.46	0.011815	3.72	27.16	30.47	0.69
Reach 1	4238.31*	100	Nat	116.00	391.33	393.35		393.57	0.011823	3.82	30.37	32.77	0.70
Reach 1	4191.77*	50	Nat	101.00	390.81	392.69		392.91	0.011882	3.73	27.06	30.33	0.70
Reach 1	4191.77*	100	Nat	116.00	390.81	392.79		393.02	0.011907	3.84	30.19	32.48	0.70
Reach 1	4145.23*	50	Nat	101.00	390.29	392.14		392.36	0.011709	3.71	27.24	30.53	0.69
Reach 1	4145.23*	100	Nat	116.00	390.29	392.24		392.47	0.011706	3.82	30.38	32.57	0.70
Reach 1	4145			Culvert									
Reach 1	4098.69*	50	Nat	101.00	389.77	391.59		391.81	0.011874	3.72	27.16	30.63	0.70
Reach 1	4098.69*	100	Nat	116.00	389.77	391.69		391.92	0.011913	3.84	30.21	32.56	0.70
Reach 1	4052.15*	50	Nat	101.00	389.24	391.05		391.26	0.011640	3.68	27.44	30.96	0.69
Reach 1	4052.15*	100	Nat	116.00	389.24	391.14		391.37	0.011596	3.79	30.57	32.86	0.69
Reach 1	4005.62*	50	Nat	101.00	388.72	390.50		390.71	0.011701	3.68	27.48	31.21	0.69
Reach 1	4005.62*	100	Nat	116.00	388.72	390.60		390.82	0.011745	3.80	30.50	33.01	0.70
Reach 1	3959.08*	50	Nat	101.00	388.20	389.96		390.17	0.011615	3.65	27.70	31.66	0.69
Reach 1	3959.08*	100	Nat	116.00	388.20	390.06		390.28	0.011480	3.75	30.90	33.51	0.69
Reach 1	3912.54*	50	Nat	101.00	387.67	389.40		389.62	0.012114	3.69	27.34	31.64	0.70
Reach 1	3912.54*	100	Nat	116.00	387.67	389.49		389.72	0.012498	3.87	30.00	33.17	0.72
Reach 1	3866	50	Existing	101.00	387.15	388.94	388.64	389.12	0.009546	3.36	30.06	88.66	0.63
Reach 1	3866	50	Nat	101.00	387.15	388.95	388.64	389.11	0.008988	3.26	37.97	89.73	0.61
Reach 1	3866	50	Prop	101.00	387.15	388.94	388.64	389.12	0.009546	3.36	30.06	88.66	0.63

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	3866	100	Existing	116.00	387.15	389.04	388.72	389.23	0.009600	3.49	33.27	117.60	0.63
Reach 1	3866	100	Nat	116.00	387.15	389.04	388.73	389.20	0.008793	3.34	47.31	117.61	0.61
Reach 1	3866	100	Prop	116.00	387.15	389.04	388.72	389.23	0.009604	3.49	33.27	117.56	0.63
Reach 1	3818.88*	50	Existing	101.00	386.66	388.50	388.17	388.67	0.009257	3.37	32.31	72.59	0.62
Reach 1	3818.88*	50	Nat	101.00	386.66	388.50	388.17	388.67	0.009306	3.37	32.19	72.04	0.62
Reach 1	3818.88*	50	Prop	101.00	386.66	388.50	388.17	388.67	0.009255	3.36	32.37	73.24	0.62
Reach 1	3818.88*	100	Existing	116.00	386.66	388.60	388.27	388.78	0.008926	3.42	41.28	104.85	0.61
Reach 1	3818.88*	100	Nat	116.00	386.66	388.60	388.27	388.78	0.009018	3.44	40.94	103.80	0.62
Reach 1	3818.88*	100	Prop	116.00	386.66	388.60	388.27	388.78	0.008915	3.42	41.42	105.53	0.61
Reach 1	3771.75*	50	Existing	101.00	386.17	388.05		388.23	0.009267	3.42	29.61	36.50	0.62
Reach 1	3771.75*	50	Nat	101.00	386.17	388.05		388.23	0.009275	3.42	29.60	36.43	0.62
Reach 1	3771.75*	50	Prop	101.00	386.17	388.05		388.23	0.009267	3.42	29.61	36.55	0.62
Reach 1	3771.75*	100	Existing	116.00	386.17	388.16	387.81	388.35	0.009122	3.51	35.94	89.95	0.62
Reach 1	3771.75*	100	Nat	116.00	386.17	388.15	387.81	388.35	0.009146	3.52	35.86	89.64	0.62
Reach 1	3771.75*	100	Prop	116.00	386.17	388.16	387.81	388.35	0.009129	3.51	35.93	90.10	0.62
Reach 1	3724.63*	50	Existing	101.00	385.68	387.62		387.80	0.009000	3.43	29.42	30.33	0.61
Reach 1	3724.63*	50	Nat	101.00	385.68	387.62		387.80	0.009038	3.44	29.37	30.31	0.62
Reach 1	3724.63*	50	Prop	101.00	385.68	387.62		387.80	0.008999	3.43	29.43	32.48	0.61
Reach 1	3724.63*	100	Existing	116.00	385.68	387.72	387.36	387.92	0.008930	3.54	34.06	62.43	0.62
Reach 1	3724.63*	100	Nat	116.00	385.68	387.72	387.36	387.92	0.008970	3.55	33.96	61.67	0.62
Reach 1	3724.63*	100	Prop	116.00	385.68	387.72	387.36	387.92	0.008924	3.54	34.17	63.36	0.62
Reach 1	3677.50*	50	Existing	101.00	385.20	387.19		387.37	0.009013	3.49	28.96	29.17	0.62
Reach 1	3677.50*	50	Nat	101.00	385.20	387.18		387.37	0.009041	3.49	28.92	29.15	0.62
Reach 1	3677.50*	50	Prop	101.00	385.20	387.19		387.37	0.009012	3.49	28.96	29.17	0.62
Reach 1	3677.50*	100	Existing	116.00	385.20	387.29	386.92	387.49	0.008924	3.60	33.36	52.19	0.62
Reach 1	3677.50*	100	Nat	116.00	385.20	387.29	386.92	387.49	0.008954	3.60	33.29	51.92	0.62
Reach 1	3677.50*	100	Prop	116.00	385.20	387.29	386.92	387.49	0.008929	3.60	33.36	52.51	0.62
Reach 1	3630.38*	50	Existing	101.00	384.71	386.76		386.95	0.008863	3.53	28.64	27.97	0.61
Reach 1	3630.38*	50	Nat	101.00	384.71	386.76		386.95	0.008886	3.53	28.61	27.96	0.62
Reach 1	3630.38*	50	Prop	101.00	384.71	386.76		386.95	0.008864	3.53	28.63	27.97	0.61
Reach 1	3630.38*	100	Existing	116.00	384.71	386.87	386.48	387.08	0.008769	3.64	32.88	50.22	0.62
Reach 1	3630.38*	100	Nat	116.00	384.71	386.87	386.48	387.07	0.008801	3.64	32.81	49.91	0.62
Reach 1	3630.38*	100	Prop	116.00	384.71	386.87	386.48	387.08	0.008763	3.63	32.97	51.27	0.62
Reach 1	3583.25*	50	Existing	101.00	384.22	386.34		386.54	0.008624	3.56	28.40	26.79	0.61
Reach 1	3583.25*	50	Nat	101.00	384.22	386.34		386.54	0.008666	3.56	28.34	26.76	0.61
Reach 1	3583.25*	50	Prop	101.00	384.22	386.34		386.54	0.008625	3.56	28.39	26.79	0.61

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	3583.25*	100	Existing	116.00	384.22	386.45	386.05	386.66	0.008606	3.68	32.65	51.47	0.61
Reach 1	3583.25*	100	Nat	116.00	384.22	386.45	386.05	386.66	0.008656	3.69	32.53	50.90	0.62
Reach 1	3583.25*	100	Prop	116.00	384.22	386.45	386.05	386.66	0.008613	3.68	32.65	51.91	0.61
Reach 1	3536.13*	50	Existing	101.00	383.73	385.95		386.14	0.008063	3.54	28.59	29.79	0.59
Reach 1	3536.13*	50	Nat	101.00	383.73	385.94		386.14	0.008102	3.54	28.53	29.27	0.59
Reach 1	3536.13*	50	Prop	101.00	383.73	385.95		386.14	0.008067	3.54	28.59	30.36	0.59
Reach 1	3536.13*	100	Existing	116.00	383.73	386.06	385.62	386.27	0.008123	3.67	33.55	58.34	0.60
Reach 1	3536.13*	100	Nat	116.00	383.73	386.05	385.62	386.26	0.008232	3.69	33.23	56.95	0.60
Reach 1	3536.13*	100	Prop	116.00	383.73	386.06	385.62	386.27	0.008135	3.67	33.63	59.69	0.60
Reach 1	3489	50	Existing	101.00	383.24	385.60		385.78	0.006915	3.41	32.53	66.03	0.55
Reach 1	3489	50	Nat	101.00	383.24	385.60		385.78	0.006925	3.41	32.49	65.81	0.55
Reach 1	3489	50	Prop	101.00	383.24	385.60		385.78	0.006917	3.41	32.62	67.46	0.55
Reach 1	3489	100	Existing	116.00	383.24	385.71	385.22	385.90	0.006884	3.51	42.31	104.98	0.56
Reach 1	3489	100	Nat	116.00	383.24	385.71	385.22	385.90	0.006899	3.51	42.23	104.85	0.56
Reach 1	3489	100	Prop	116.00	383.24	385.71	385.21	385.90	0.006898	3.51	42.54	107.82	0.56
Reach 1	3440.62*	50	Existing	101.00	382.89	385.25	384.76	385.43	0.007022	3.43	31.83	64.53	0.56
Reach 1	3440.62*	50	Nat	101.00	382.89	385.24	384.76	385.43	0.007025	3.43	31.81	64.47	0.56
Reach 1	3440.62*	50	Prop	101.00	382.89	385.24	384.75	385.43	0.007030	3.43	31.95	66.71	0.56
Reach 1	3440.62*	100	Existing	116.00	382.89	385.36	384.87	385.55	0.006999	3.53	41.15	99.36	0.56
Reach 1	3440.62*	100	Nat	116.00	382.89	385.36	384.87	385.55	0.007005	3.54	41.12	99.27	0.56
Reach 1	3440.62*	100	Prop	116.00	382.89	385.36	384.86	385.55	0.007023	3.54	41.47	102.86	0.56
Reach 1	3392.23*	50	Existing	101.00	382.53	384.90		385.08	0.006914	3.42	31.78	64.79	0.55
Reach 1	3392.23*	50	Nat	101.00	382.53	384.90		385.08	0.006924	3.42	31.74	64.61	0.55
Reach 1	3392.23*	50	Prop	101.00	382.53	384.90		385.08	0.006907	3.41	32.14	69.02	0.55
Reach 1	3392.23*	100	Existing	116.00	382.53	385.01	384.50	385.20	0.006888	3.52	41.16	98.57	0.56
Reach 1	3392.23*	100	Nat	116.00	382.53	385.01	384.50	385.20	0.006902	3.52	41.08	98.31	0.56
Reach 1	3392.23*	100	Prop	116.00	382.53	385.01	384.51	385.20	0.006886	3.52	41.97	104.36	0.56
Reach 1	3343.85*	50	Existing	101.00	382.18	384.54	384.05	384.73	0.007049	3.45	31.23	60.65	0.56
Reach 1	3343.85*	50	Nat	101.00	382.18	384.54	384.05	384.73	0.007050	3.45	31.23	60.64	0.56
Reach 1	3343.85*	50	Prop	101.00	382.18	384.54	384.06	384.73	0.007050	3.45	31.48	65.38	0.56
Reach 1	3343.85*	100	Existing	116.00	382.18	384.66	384.17	384.85	0.007014	3.55	40.23	94.02	0.56
Reach 1	3343.85*	100	Nat	116.00	382.18	384.66	384.17	384.85	0.007032	3.55	40.13	93.73	0.56
Reach 1	3343.85*	100	Prop	116.00	382.18	384.66	384.16	384.85	0.007048	3.55	40.86	100.70	0.56
Reach 1	3295.46*	50	Existing	101.00	381.82	384.20		384.38	0.006949	3.43	31.65	58.58	0.56
Reach 1	3295.46*	50	Nat	101.00	381.82	384.20		384.38	0.006955	3.43	31.63	58.50	0.56
Reach 1	3295.46*	50	Prop	101.00	381.82	384.20	383.70	384.38	0.006952	3.43	31.86	65.20	0.56

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	3295.46*	100	Existing	116.00	381.82	384.31	383.80	384.50	0.006973	3.55	39.97	89.12	0.56
Reach 1	3295.46*	100	Nat	116.00	381.82	384.31	383.80	384.50	0.006977	3.55	39.95	89.06	0.56
Reach 1	3295.46*	100	Prop	116.00	381.82	384.31	383.81	384.50	0.006953	3.54	41.23	101.38	0.56
Reach 1	3247.08*	50	Existing	101.00	381.47	383.85		384.03	0.006974	3.44	32.26	62.48	0.56
Reach 1	3247.08*	50	Nat	101.00	381.47	383.85		384.03	0.006977	3.44	32.25	62.44	0.56
Reach 1	3247.08*	50	Prop	101.00	381.47	383.85		384.03	0.006982	3.44	32.39	63.92	0.56
Reach 1	3247.08*	100	Existing	116.00	381.47	383.96		384.15	0.006987	3.55	40.29	84.41	0.56
Reach 1	3247.08*	100	Nat	116.00	381.47	383.96		384.15	0.006992	3.55	40.27	84.33	0.56
Reach 1	3247.08*	100	Prop	116.00	381.47	383.96	383.46	384.15	0.006992	3.55	41.28	100.70	0.56
Reach 1	3198.69*	50	Existing	101.00	381.12	383.49		383.68	0.007057	3.46	32.35	63.12	0.56
Reach 1	3198.69*	50	Nat	101.00	381.12	383.49		383.68	0.007062	3.46	32.33	63.08	0.56
Reach 1	3198.69*	50	Prop	101.00	381.12	383.49	383.01	383.68	0.007058	3.46	32.62	65.65	0.56
Reach 1	3198.69*	100	Existing	116.00	381.12	383.61	383.12	383.80	0.007076	3.57	40.18	77.15	0.56
Reach 1	3198.69*	100	Nat	116.00	381.12	383.61	383.12	383.80	0.007081	3.57	40.16	77.11	0.56
Reach 1	3198.69*	100	Prop	116.00	381.12	383.61	383.12	383.80	0.007066	3.57	41.08	96.90	0.56
Reach 1	3150.31*	50	Existing	101.00	380.76	383.15		383.33	0.006944	3.44	33.13	65.17	0.56
Reach 1	3150.31*	50	Nat	101.00	380.76	383.15		383.33	0.006951	3.44	33.10	65.12	0.56
Reach 1	3150.31*	50	Prop	101.00	380.76	383.15	382.65	383.33	0.006949	3.44	33.36	68.05	0.56
Reach 1	3150.31*	100	Existing	116.00	380.76	383.26	382.75	383.45	0.006977	3.55	41.02	77.87	0.56
Reach 1	3150.31*	100	Nat	116.00	380.76	383.26	382.75	383.45	0.006983	3.55	40.99	77.83	0.56
Reach 1	3150.31*	100	Prop	116.00	380.76	383.26	382.75	383.45	0.006986	3.55	41.68	84.16	0.56
Reach 1	3101.92*	50	Existing	101.00	380.41	382.80		382.98	0.006985	3.45	33.67	66.77	0.56
Reach 1	3101.92*	50	Nat	101.00	380.41	382.80		382.98	0.006990	3.45	33.65	66.74	0.56
Reach 1	3101.92*	50	Prop	101.00	380.41	382.80		382.98	0.006990	3.45	34.00	70.72	0.56
Reach 1	3101.92*	100	Existing	116.00	380.41	382.91		383.10	0.007011	3.56	41.57	78.68	0.56
Reach 1	3101.92*	100	Nat	116.00	380.41	382.91		383.10	0.007017	3.56	41.55	78.63	0.56
Reach 1	3101.92*	100	Prop	116.00	380.41	382.90		383.10	0.007018	3.56	42.45	86.94	0.56
Reach 1	3053.54*	50	Existing	101.00	380.06	382.44		382.63	0.007065	3.47	33.82	67.30	0.56
Reach 1	3053.54*	50	Nat	101.00	380.06	382.44		382.63	0.007076	3.47	33.78	67.24	0.56
Reach 1	3053.54*	50	Prop	101.00	380.06	382.44	381.96	382.63	0.007073	3.47	34.21	71.97	0.56
Reach 1	3053.54*	100	Existing	116.00	380.06	382.55	382.07	382.74	0.007104	3.59	41.54	79.05	0.57
Reach 1	3053.54*	100	Nat	116.00	380.06	382.55	382.07	382.74	0.007115	3.59	41.50	78.97	0.57
Reach 1	3053.54*	100	Prop	116.00	380.06	382.55	382.07	382.74	0.007122	3.59	42.52	89.08	0.57
Reach 1	3005.15*	50	Existing	101.00	379.70	382.09		382.28	0.006994	3.46	34.52	68.73	0.56
Reach 1	3005.15*	50	Nat	101.00	379.70	382.09		382.28	0.006996	3.46	34.52	68.72	0.56
Reach 1	3005.15*	50	Prop	101.00	379.70	382.09		382.27	0.007001	3.46	35.05	74.45	0.56

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	3005.15*	100	Existing	116.00	379.70	382.20		382.39	0.007021	3.58	42.24	80.09	0.56
Reach 1	3005.15*	100	Nat	116.00	379.70	382.20		382.39	0.007027	3.58	42.22	80.06	0.56
Reach 1	3005.15*	100	Prop	116.00	379.70	382.19	381.71	382.39	0.007034	3.58	43.47	91.59	0.56
Reach 1	2956.77*	50	Existing	101.00	379.35	381.74	381.25	381.92	0.007077	3.47	34.80	69.53	0.56
Reach 1	2956.77*	50	Nat	101.00	379.35	381.74	381.25	381.92	0.007083	3.47	34.78	69.50	0.56
Reach 1	2956.77*	50	Prop	101.00	379.35	381.74	381.25	381.92	0.007081	3.47	35.45	76.10	0.56
Reach 1	2956.77*	100	Existing	116.00	379.35	381.84	381.36	382.04	0.007118	3.61	42.36	80.31	0.57
Reach 1	2956.77*	100	Nat	116.00	379.35	381.84	381.36	382.04	0.007129	3.61	42.31	80.25	0.57
Reach 1	2956.77*	100	Prop	116.00	379.35	381.84	381.37	382.03	0.007142	3.61	43.71	92.61	0.57
Reach 1	2908.39*	50	Existing	101.00	378.99	381.39		381.57	0.006972	3.46	35.70	70.55	0.56
Reach 1	2908.39*	50	Nat	101.00	378.99	381.39		381.57	0.006976	3.46	35.68	70.54	0.56
Reach 1	2908.39*	50	Prop	101.00	378.99	381.39	380.91	381.57	0.006970	3.45	36.56	78.37	0.56
Reach 1	2908.39*	100	Existing	116.00	378.99	381.49		381.68	0.007015	3.60	43.17	80.95	0.56
Reach 1	2908.39*	100	Nat	116.00	378.99	381.49		381.68	0.007017	3.60	43.17	80.94	0.56
Reach 1	2908.39*	100	Prop	116.00	378.99	381.49	381.02	381.68	0.007010	3.59	44.94	94.79	0.56
Reach 1	2860.00*	50	Existing	101.00	378.64	381.04		381.22	0.006959	3.46	36.54	72.01	0.56
Reach 1	2860.00*	50	Nat	101.00	378.64	381.04		381.22	0.006969	3.46	36.50	71.96	0.56
Reach 1	2860.00*	50	Prop	101.00	378.64	381.04		381.22	0.006989	3.46	37.30	80.16	0.56
Reach 1	2860.00*	100	Existing	116.00	378.64	381.14		381.33	0.006977	3.60	44.04	82.08	0.56
Reach 1	2860.00*	100	Nat	116.00	378.64	381.14		381.33	0.006987	3.60	44.00	82.03	0.56
Reach 1	2860.00*	100	Prop	116.00	378.64	381.13	380.67	381.33	0.007023	3.60	45.66	96.18	0.56
Reach 1	2811.62*	50	Existing	101.00	378.29	380.69		380.87	0.007096	3.48	36.70	72.55	0.56
Reach 1	2811.62*	50	Nat	101.00	378.29	380.69		380.87	0.007109	3.49	36.65	72.50	0.56
Reach 1	2811.62*	50	Prop	101.00	378.29	380.69	380.21	380.87	0.007089	3.48	37.91	82.01	0.56
Reach 1	2811.62*	100	Existing	116.00	378.29	380.79		380.98	0.007099	3.63	44.20	82.18	0.57
Reach 1	2811.62*	100	Nat	116.00	378.29	380.78		380.98	0.007112	3.63	44.15	82.12	0.57
Reach 1	2811.62*	100	Prop	116.00	378.29	380.78	380.32	380.97	0.007100	3.62	46.38	97.25	0.57
Reach 1	2763.23*	50	Existing	101.00	377.93	380.33		380.52	0.007032	3.48	37.22	73.50	0.56
Reach 1	2763.23*	50	Nat	101.00	377.93	380.33		380.52	0.007036	3.48	37.21	73.48	0.56
Reach 1	2763.23*	50	Prop	101.00	377.93	380.33		380.51	0.007053	3.48	38.40	83.81	0.56
Reach 1	2763.23*	100	Existing	116.00	377.93	380.43		380.63	0.007049	3.63	44.73	82.63	0.57
Reach 1	2763.23*	100	Nat	116.00	377.93	380.43		380.63	0.007050	3.63	44.73	82.63	0.57
Reach 1	2763.23*	100	Prop	116.00	377.93	380.42	379.96	380.62	0.007078	3.63	46.92	98.49	0.57
Reach 1	2714.85*	50	Existing	101.00	377.58	379.98		380.16	0.007089	3.50	37.63	74.38	0.56
Reach 1	2714.85*	50	Nat	101.00	377.58	379.98		380.16	0.007105	3.50	37.58	74.32	0.56
Reach 1	2714.85*	50	Prop	101.00	377.58	379.98	379.52	380.16	0.007106	3.50	39.07	85.99	0.56

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2714.85*	100	Existing	116.00	377.58	380.08		380.27	0.007089	3.64	45.24	83.05	0.57
Reach 1	2714.85*	100	Nat	116.00	377.58	380.08		380.27	0.007102	3.64	45.19	82.99	0.57
Reach 1	2714.85*	100	Prop	116.00	377.58	380.07	379.61	380.26	0.007114	3.64	47.75	99.91	0.57
Reach 1	2666.46*	50	Existing	101.00	377.22	379.63		379.81	0.007046	3.50	38.10	75.19	0.56
Reach 1	2666.46*	50	Nat	101.00	377.22	379.63		379.81	0.007051	3.50	38.08	75.17	0.56
Reach 1	2666.46*	50	Prop	101.00	377.22	379.62	379.15	379.80	0.007071	3.50	39.69	87.89	0.56
Reach 1	2666.46*	100	Existing	116.00	377.22	379.72		379.92	0.007063	3.65	45.69	83.38	0.57
Reach 1	2666.46*	100	Nat	116.00	377.22	379.72		379.92	0.007068	3.65	45.67	83.36	0.57
Reach 1	2666.46*	100	Prop	116.00	377.22	379.71	379.25	379.91	0.007095	3.64	48.44	101.19	0.57
Reach 1	2618.08*	50	Existing	101.00	376.87	379.28		379.46	0.006973	3.50	39.02	76.62	0.56
Reach 1	2618.08*	50	Nat	101.00	376.87	379.28		379.46	0.006982	3.50	38.99	76.58	0.56
Reach 1	2618.08*	50	Prop	101.00	376.87	379.27		379.45	0.006966	3.49	41.07	90.90	0.56
Reach 1	2618.08*	100	Existing	116.00	376.87	379.37		379.57	0.006991	3.64	46.64	84.52	0.56
Reach 1	2618.08*	100	Nat	116.00	376.87	379.37		379.57	0.007002	3.65	46.60	84.47	0.56
Reach 1	2618.08*	100	Prop	116.00	376.87	379.36		379.56	0.006991	3.63	49.96	103.24	0.56
Reach 1	2569.69*	50	Existing	101.00	376.52	378.92		379.11	0.007095	3.52	39.26	77.00	0.56
Reach 1	2569.69*	50	Nat	101.00	376.52	378.92		379.11	0.007108	3.53	39.21	76.95	0.56
Reach 1	2569.69*	50	Prop	101.00	376.52	378.92	378.47	379.10	0.007153	3.53	41.14	91.67	0.56
Reach 1	2569.69*	100	Existing	116.00	376.52	379.02		379.21	0.007104	3.68	46.81	84.67	0.57
Reach 1	2569.69*	100	Nat	116.00	376.52	379.02		379.21	0.007118	3.68	46.75	84.62	0.57
Reach 1	2569.69*	100	Prop	116.00	376.52	379.00	378.58	379.20	0.007188	3.67	49.84	102.74	0.57
Reach 1	2521.31*	50	Existing	101.00	376.16	378.57		378.75	0.007061	3.53	39.70	77.53	0.56
Reach 1	2521.31*	50	Nat	101.00	376.16	378.57		378.75	0.007071	3.53	39.67	77.50	0.56
Reach 1	2521.31*	50	Prop	101.00	376.16	378.56	378.11	378.74	0.007080	3.52	42.15	93.65	0.56
Reach 1	2521.31*	100	Existing	116.00	376.16	378.66		378.86	0.007083	3.69	47.15	84.91	0.57
Reach 1	2521.31*	100	Nat	116.00	376.16	378.66		378.86	0.007094	3.69	47.11	84.87	0.57
Reach 1	2521.31*	100	Prop	116.00	376.16	378.65	378.23	378.84	0.007120	3.67	50.80	103.07	0.57
Reach 1	2472.92*	50	Existing	101.00	375.81	378.22		378.40	0.006993	3.52	40.80	78.66	0.56
Reach 1	2472.92*	50	Nat	101.00	375.81	378.22		378.40	0.006993	3.52	40.80	78.66	0.56
Reach 1	2472.92*	50	Prop	101.00	375.81	378.21		378.39	0.007041	3.52	43.32	95.82	0.56
Reach 1	2472.92*	100	Existing	116.00	375.81	378.31		378.50	0.007001	3.68	48.27	85.87	0.57
Reach 1	2472.92*	100	Nat	116.00	375.81	378.31		378.50	0.006998	3.68	48.28	85.88	0.57
Reach 1	2472.92*	100	Prop	116.00	375.81	378.30		378.49	0.007060	3.67	51.98	103.57	0.57
Reach 1	2424.54*	50	Existing	101.00	375.46	377.86		378.05	0.007100	3.55	40.91	78.97	0.56
Reach 1	2424.54*	50	Nat	101.00	375.46	377.86		378.05	0.007129	3.56	40.80	78.87	0.56
Reach 1	2424.54*	50	Prop	101.00	375.46	377.85	377.42	378.04	0.007126	3.54	43.84	96.61	0.56

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2424.54*	100	Existing	116.00	375.46	377.95		378.15	0.007111	3.71	48.35	86.08	0.57
Reach 1	2424.54*	100	Nat	116.00	375.46	377.95		378.15	0.007141	3.72	48.23	85.97	0.57
Reach 1	2424.54*	100	Prop	116.00	375.46	377.94	377.59	378.13	0.007167	3.70	52.35	103.70	0.57
Reach 1	2376.15*	50	Existing	101.00	375.10	377.51		377.70	0.006953	3.53	41.96	80.02	0.56
Reach 1	2376.15*	50	Nat	101.00	375.10	377.51		377.69	0.007018	3.55	41.71	79.80	0.56
Reach 1	2376.15*	50	Prop	101.00	375.10	377.50	377.06	377.68	0.007052	3.54	44.79	98.46	0.56
Reach 1	2376.15*	100	Existing	116.00	375.10	377.60		377.80	0.006942	3.70	49.50	87.05	0.56
Reach 1	2376.15*	100	Nat	116.00	375.10	377.60		377.80	0.007029	3.71	49.14	86.72	0.57
Reach 1	2376.15*	100	Prop	116.00	375.10	377.59		377.78	0.006995	3.68	53.67	104.30	0.56
Reach 1	2327.77*	50	Existing	101.00	374.75	377.17		377.35	0.006755	3.51	43.47	81.54	0.55
Reach 1	2327.77*	50	Nat	101.00	374.75	377.16		377.34	0.006956	3.54	42.72	80.85	0.56
Reach 1	2327.77*	50	Prop	101.00	374.75	377.16		377.33	0.006795	3.50	47.12	101.02	0.55
Reach 1	2327.77*	100	Existing	116.00	374.75	377.26		377.45	0.006706	3.66	51.29	88.51	0.56
Reach 1	2327.77*	100	Nat	116.00	374.75	377.25		377.45	0.006930	3.70	50.34	87.69	0.56
Reach 1	2327.77*	100	Prop	116.00	374.75	377.25		377.43	0.006732	3.64	55.99	105.15	0.55
Reach 1	2279.39*	50	Existing	101.00	374.39	376.86		377.02	0.005952	3.38	47.05	84.90	0.52
Reach 1	2279.39*	50	Nat	101.00	374.39	376.83		377.00	0.006418	3.46	45.02	83.09	0.54
Reach 1	2279.39*	50	Prop	101.00	374.39	376.85		377.00	0.005788	3.32	52.45	103.51	0.51
Reach 1	2279.39*	100	Existing	116.00	374.39	376.95		377.12	0.005907	3.53	55.43	91.96	0.52
Reach 1	2279.39*	100	Nat	116.00	374.39	376.92		377.11	0.006385	3.62	53.03	89.99	0.54
Reach 1	2279.39*	100	Prop	116.00	374.39	376.94		377.10	0.005700	3.45	62.02	107.73	0.51
Reach 1	2231	50	Existing	101.00	374.04	376.32	376.04	376.57	0.010621	4.14	33.22	73.09	0.68
Reach 1	2231	50	Nat	101.00	374.04	376.32	376.04	376.57	0.010621	4.14	33.22	73.09	0.68
Reach 1	2231	50	Prop	101.00	374.04	376.31	376.06	376.56	0.010529	4.11	35.82	89.05	0.68
Reach 1	2231	100	Existing	116.00	374.04	376.41	376.21	376.68	0.010626	4.31	39.96	78.75	0.69
Reach 1	2231	100	Nat	116.00	374.04	376.41	376.21	376.68	0.010626	4.31	39.96	78.75	0.69
Reach 1	2231	100	Prop	116.00	374.04	376.40	376.24	376.66	0.010506	4.27	43.86	98.94	0.68
Reach 1	2182.00*	50	Existing	101.00	373.55	375.79	375.50	376.05	0.010892	4.15	32.33	71.73	0.69
Reach 1	2182.00*	50	Nat	101.00	373.55	375.79	375.50	376.05	0.010892	4.15	32.33	71.73	0.69
Reach 1	2182.00*	50	Prop	101.00	373.55	375.78	375.51	376.04	0.010848	4.14	34.21	84.70	0.69
Reach 1	2182.00*	100	Existing	116.00	373.55	375.87	375.69	376.15	0.010861	4.32	38.94	77.42	0.69
Reach 1	2182.00*	100	Nat	116.00	373.55	375.87	375.69	376.15	0.010861	4.32	38.94	77.42	0.69
Reach 1	2182.00*	100	Prop	116.00	373.55	375.87	375.71	376.14	0.010801	4.30	41.91	94.44	0.69
Reach 1	2133.00*	50	Existing	101.00	373.05	375.25	374.96	375.51	0.010836	4.14	31.88	70.66	0.69
Reach 1	2133.00*	50	Nat	101.00	373.05	375.25	374.96	375.51	0.010836	4.14	31.88	70.66	0.69
Reach 1	2133.00*	50	Prop	101.00	373.05	375.25	374.96	375.51	0.010783	4.13	33.34	81.71	0.68

HEC-RAS River: River 1 Reach: Reach 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	2133.00*	100	Existing	116.00	373.05	375.35	375.15	375.62	0.010805	4.29	38.63	76.40	0.69
Reach 1	2133.00*	100	Nat	116.00	373.05	375.35	375.15	375.62	0.010805	4.29	38.63	76.40	0.69
Reach 1	2133.00*	100	Prop	116.00	373.05	375.34	375.17	375.61	0.010731	4.27	41.11	91.32	0.69
Reach 1	2084.00*	50	Existing	101.00	372.56	374.72	374.43	374.98	0.010862	4.14	31.08	69.28	0.69
Reach 1	2084.00*	50	Nat	101.00	372.56	374.72	374.43	374.98	0.010862	4.14	31.08	69.28	0.69
Reach 1	2084.00*	50	Prop	101.00	372.56	374.72	374.43	374.98	0.010826	4.14	32.06	77.99	0.69
Reach 1	2084.00*	100	Existing	116.00	372.56	374.82	374.60	375.09	0.010821	4.28	38.07	75.22	0.69
Reach 1	2084.00*	100	Nat	116.00	372.56	374.82	374.60	375.09	0.010821	4.28	38.07	75.22	0.69
Reach 1	2084.00*	100	Prop	116.00	372.56	374.81	374.62	375.08	0.010766	4.26	39.95	87.38	0.69
Reach 1	2035.00*	50	Existing	101.00	372.07	374.18	373.89	374.44	0.010991	4.16	30.04	67.59	0.69
Reach 1	2035.00*	50	Nat	101.00	372.07	374.18	373.89	374.44	0.010991	4.16	30.04	67.59	0.69
Reach 1	2035.00*	50	Prop	101.00	372.07	374.18	373.89	374.44	0.010966	4.15	30.66	74.26	0.69
Reach 1	2035.00*	100	Existing	116.00	372.07	374.28	374.05	374.55	0.010959	4.29	36.90	73.64	0.70
Reach 1	2035.00*	100	Nat	116.00	372.07	374.28	374.05	374.55	0.010959	4.29	36.90	73.64	0.70
Reach 1	2035.00*	100	Prop	116.00	372.07	374.28	374.06	374.55	0.010914	4.28	38.26	83.63	0.69
Reach 1	1986.00*	50	Existing	101.00	371.58	373.65	373.36	373.91	0.010890	4.13	29.50	66.44	0.69
Reach 1	1986.00*	50	Nat	101.00	371.58	373.65	373.36	373.91	0.010890	4.13	29.50	66.44	0.69
Reach 1	1986.00*	50	Prop	101.00	371.58	373.65	373.36	373.91	0.010874	4.13	29.85	71.16	0.69
Reach 1	1986.00*	100	Existing	116.00	371.58	373.74	373.46	374.02	0.010853	4.28	36.29	72.65	0.69
Reach 1	1986.00*	100	Nat	116.00	371.58	373.74	373.46	374.02	0.010853	4.28	36.29	72.65	0.69
Reach 1	1986.00*	100	Prop	116.00	371.58	373.74	373.46	374.02	0.010819	4.27	37.22	80.47	0.69
Reach 1	1937.00*	50	Existing	101.00	371.09	373.10	372.82	373.37	0.011188	4.17	28.07	63.39	0.70
Reach 1	1937.00*	50	Nat	101.00	371.09	373.10	372.82	373.37	0.011188	4.17	28.07	63.39	0.70
Reach 1	1937.00*	50	Prop	101.00	371.09	373.10	372.82	373.37	0.011185	4.17	28.19	66.10	0.70
Reach 1	1937.00*	100	Existing	116.00	371.09	373.20	372.92	373.48	0.011123	4.31	34.70	70.35	0.70
Reach 1	1937.00*	100	Nat	116.00	371.09	373.20	372.92	373.48	0.011123	4.31	34.70	70.35	0.70
Reach 1	1937.00*	100	Prop	116.00	371.09	373.20	372.92	373.48	0.011105	4.31	35.24	76.10	0.70
Reach 1	1888.00*	50	Existing	101.00	370.59	372.55	372.27	372.82	0.011105	4.15	27.19	60.60	0.69
Reach 1	1888.00*	50	Nat	101.00	370.59	372.55	372.27	372.82	0.011105	4.15	27.19	60.60	0.69
Reach 1	1888.00*	50	Prop	101.00	370.59	372.55	372.27	372.82	0.011101	4.15	27.21	61.54	0.69
Reach 1	1888.00*	100	Existing	116.00	370.59	372.65	372.37	372.93	0.011059	4.30	33.62	68.30	0.70
Reach 1	1888.00*	100	Nat	116.00	370.59	372.65	372.37	372.93	0.011059	4.30	33.62	68.30	0.70
Reach 1	1888.00*	100	Prop	116.00	370.59	372.65	372.37	372.93	0.011046	4.30	33.89	72.01	0.70
Reach 1	1839.00*	50	Existing	101.00	370.10	372.00	371.73	372.27	0.011224	4.15	26.22	53.96	0.70
Reach 1	1839.00*	50	Nat	101.00	370.10	372.00	371.73	372.27	0.011224	4.15	26.22	53.96	0.70
Reach 1	1839.00*	50	Prop	101.00	370.10	372.00	371.73	372.27	0.011232	4.15	26.21	53.89	0.70

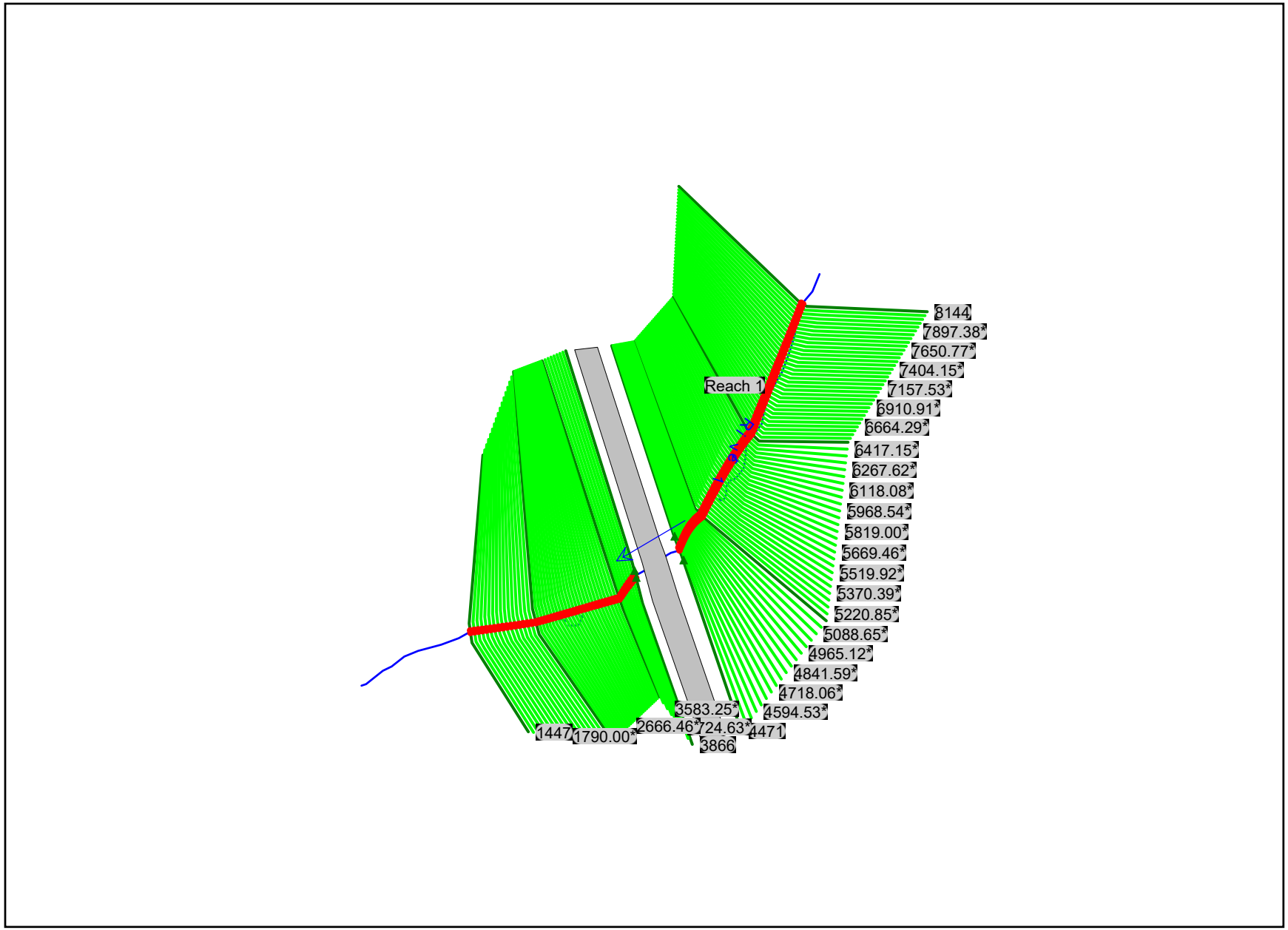
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

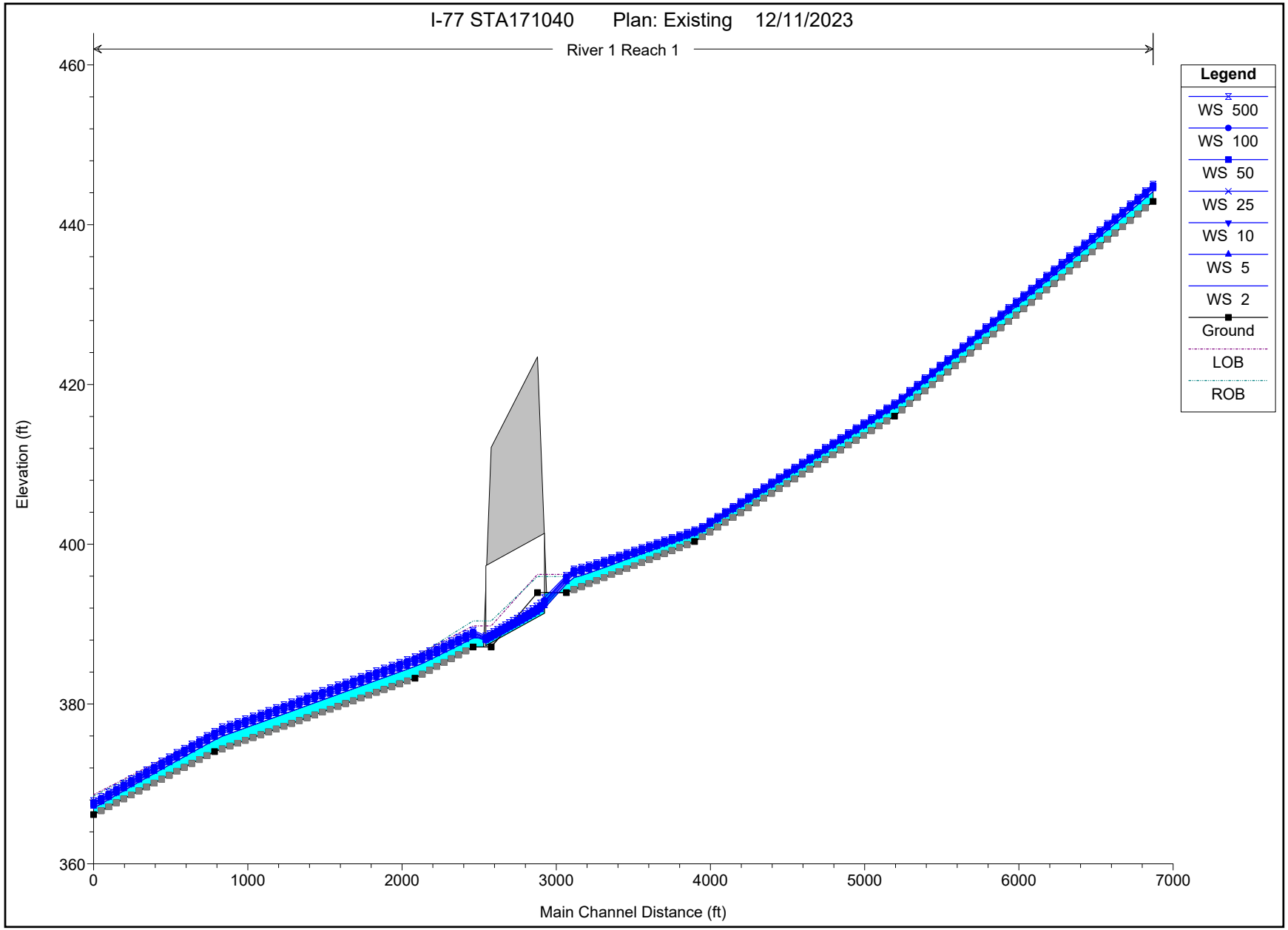
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1839.00*	100	Existing	116.00	370.10	372.11	371.83	372.39	0.011131	4.31	32.52	66.26	0.70
Reach 1	1839.00*	100	Nat	116.00	370.10	372.11	371.83	372.39	0.011131	4.31	32.52	66.26	0.70
Reach 1	1839.00*	100	Prop	116.00	370.10	372.11	371.83	372.39	0.011138	4.31	32.58	68.12	0.70
Reach 1	1790.00*	50	Existing	101.00	369.61	371.46	371.18	371.72	0.011243	4.14	25.72	45.85	0.70
Reach 1	1790.00*	50	Nat	101.00	369.61	371.46	371.18	371.72	0.011243	4.14	25.72	45.85	0.70
Reach 1	1790.00*	50	Prop	101.00	369.61	371.46	371.18	371.72	0.011226	4.14	25.74	45.95	0.70
Reach 1	1790.00*	100	Existing	116.00	369.61	371.56	371.28	371.84	0.011159	4.30	31.47	63.79	0.70
Reach 1	1790.00*	100	Nat	116.00	369.61	371.56	371.28	371.84	0.011159	4.30	31.47	63.79	0.70
Reach 1	1790.00*	100	Prop	116.00	369.61	371.56	371.28	371.84	0.011152	4.30	31.49	64.25	0.70
Reach 1	1741.00*	50	Existing	101.00	369.12	370.90	370.64	371.17	0.011356	4.14	25.29	39.95	0.70
Reach 1	1741.00*	50	Nat	101.00	369.12	370.90	370.64	371.17	0.011356	4.14	25.29	39.95	0.70
Reach 1	1741.00*	50	Prop	101.00	369.12	370.90	370.64	371.17	0.011385	4.14	25.26	39.79	0.70
Reach 1	1741.00*	100	Existing	116.00	369.12	371.00	370.72	371.29	0.011328	4.31	30.23	57.10	0.70
Reach 1	1741.00*	100	Nat	116.00	369.12	371.00	370.72	371.29	0.011328	4.31	30.23	57.10	0.70
Reach 1	1741.00*	100	Prop	116.00	369.12	371.00	370.72	371.29	0.011348	4.31	30.19	57.01	0.71
Reach 1	1692.00*	50	Existing	101.00	368.62	370.34	370.08	370.61	0.011435	4.13	24.99	35.38	0.70
Reach 1	1692.00*	50	Nat	101.00	368.62	370.34	370.08	370.61	0.011435	4.13	24.99	35.38	0.70
Reach 1	1692.00*	50	Prop	101.00	368.62	370.35	370.08	370.61	0.011386	4.12	25.05	35.62	0.70
Reach 1	1692.00*	100	Existing	116.00	368.62	370.45	370.17	370.73	0.011428	4.31	29.33	50.87	0.71
Reach 1	1692.00*	100	Nat	116.00	368.62	370.45	370.17	370.73	0.011428	4.31	29.33	50.87	0.71
Reach 1	1692.00*	100	Prop	116.00	368.62	370.45	370.17	370.73	0.011387	4.31	29.40	51.04	0.71
Reach 1	1643.00*	50	Existing	101.00	368.13	369.79		370.05	0.011342	4.09	25.08	33.34	0.70
Reach 1	1643.00*	50	Nat	101.00	368.13	369.79		370.05	0.011342	4.09	25.08	33.34	0.70
Reach 1	1643.00*	50	Prop	101.00	368.13	369.79		370.05	0.011399	4.10	25.02	33.11	0.70
Reach 1	1643.00*	100	Existing	116.00	368.13	369.89	369.62	370.18	0.011331	4.28	29.08	46.60	0.70
Reach 1	1643.00*	100	Nat	116.00	368.13	369.89	369.62	370.18	0.011331	4.28	29.08	46.60	0.70
Reach 1	1643.00*	100	Prop	116.00	368.13	369.89	369.62	370.17	0.011379	4.29	29.01	46.40	0.70
Reach 1	1594.00*	50	Existing	101.00	367.64	369.24		369.49	0.011456	4.08	24.97	30.69	0.70
Reach 1	1594.00*	50	Nat	101.00	367.64	369.24		369.49	0.011456	4.08	24.97	30.69	0.70
Reach 1	1594.00*	50	Prop	101.00	367.64	369.24		369.50	0.011357	4.07	25.06	31.05	0.70
Reach 1	1594.00*	100	Existing	116.00	367.64	369.33	369.07	369.62	0.011456	4.28	28.58	42.46	0.71
Reach 1	1594.00*	100	Nat	116.00	367.64	369.33	369.07	369.62	0.011456	4.28	28.58	42.46	0.71
Reach 1	1594.00*	100	Prop	116.00	367.64	369.34	369.07	369.62	0.011358	4.26	28.71	42.83	0.70
Reach 1	1545.00*	50	Existing	101.00	367.14	368.68		368.93	0.011375	4.05	25.06	28.81	0.69
Reach 1	1545.00*	50	Nat	101.00	367.14	368.68		368.93	0.011375	4.05	25.06	28.81	0.69
Reach 1	1545.00*	50	Prop	101.00	367.15	368.68		368.94	0.011483	4.06	25.00	29.00	0.70

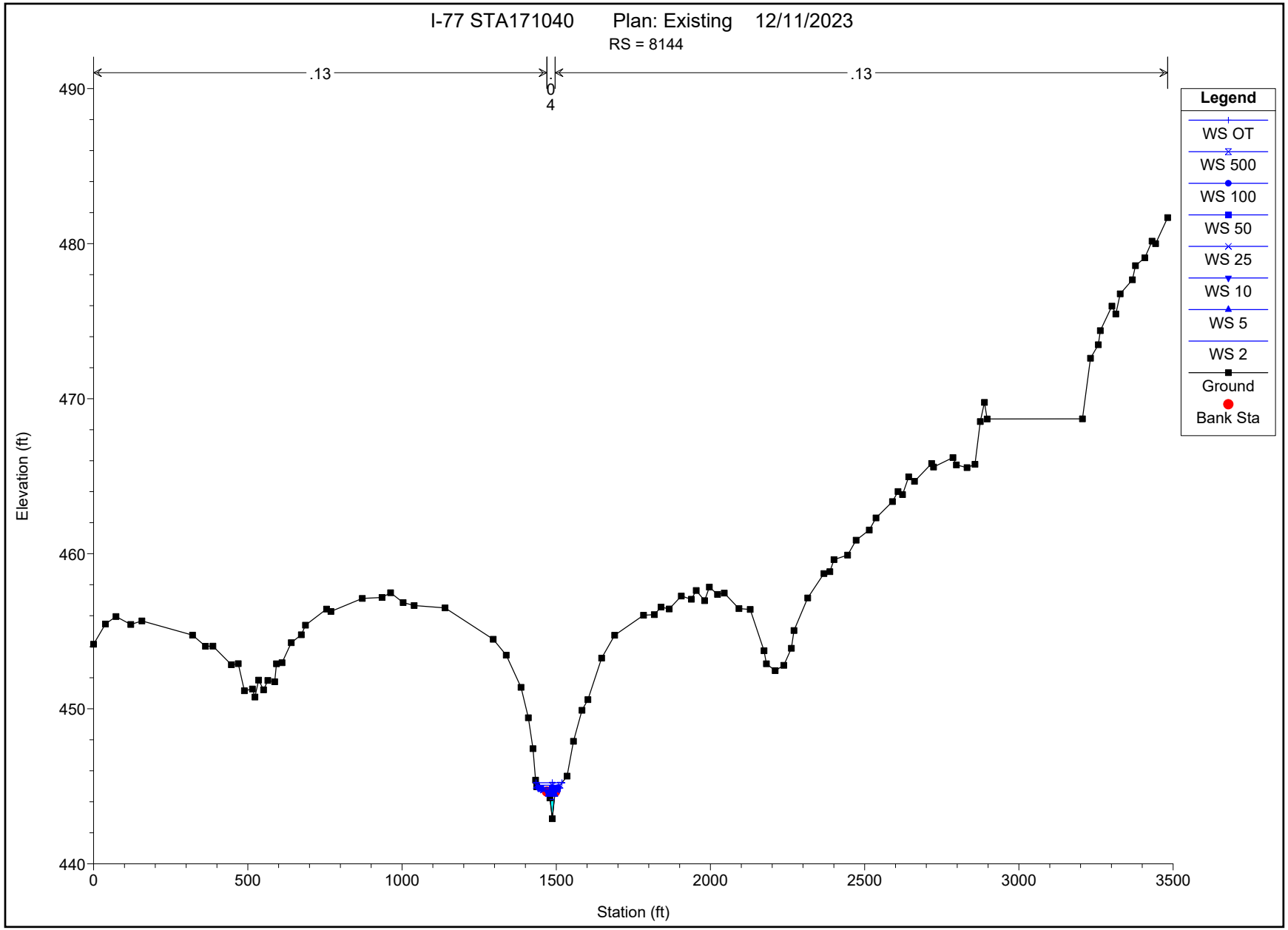
HEC-RAS River: River 1 Reach: Reach 1 (Continued)

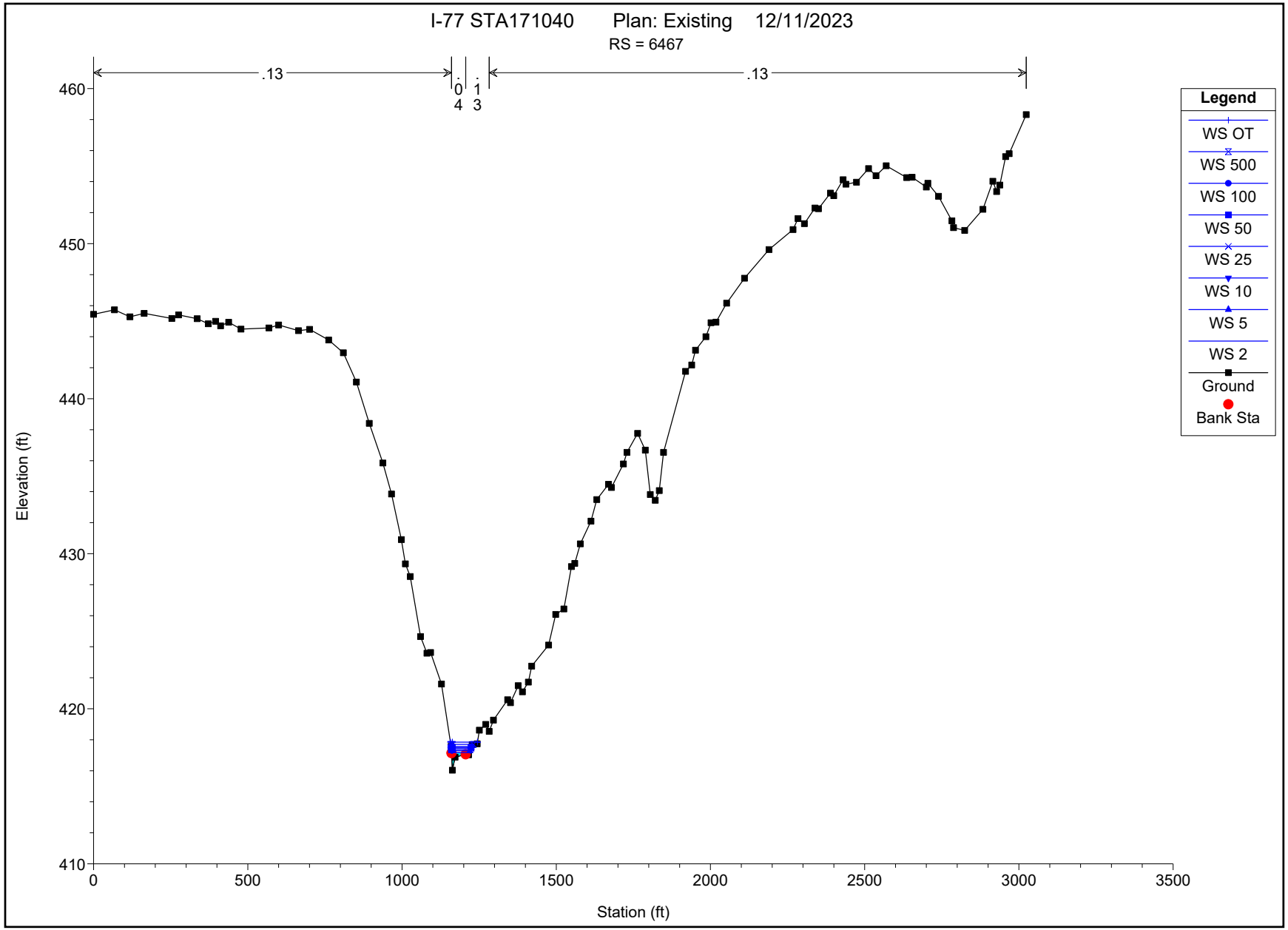
Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach 1	1545.00*	100	Existing	116.00	367.14	368.78	368.51	369.06	0.011377	4.25	28.42	39.75	0.70
Reach 1	1545.00*	100	Nat	116.00	367.14	368.78	368.51	369.06	0.011377	4.25	28.42	39.75	0.70
Reach 1	1545.00*	100	Prop	116.00	367.15	368.78	368.52	369.06	0.011477	4.26	28.37	39.93	0.71
Reach 1	1496.00*	50	Existing	101.00	366.65	368.12		368.38	0.011410	4.03	25.13	27.25	0.69
Reach 1	1496.00*	50	Nat	101.00	366.65	368.12		368.38	0.011410	4.03	25.13	27.25	0.69
Reach 1	1496.00*	50	Prop	101.00	366.65	368.12		368.38	0.011409	4.03	25.13	27.25	0.69
Reach 1	1496.00*	100	Existing	116.00	366.65	368.22	367.96	368.50	0.011407	4.22	28.26	37.16	0.70
Reach 1	1496.00*	100	Nat	116.00	366.65	368.22	367.96	368.50	0.011407	4.22	28.26	37.16	0.70
Reach 1	1496.00*	100	Prop	116.00	366.65	368.22	367.96	368.50	0.011407	4.22	28.26	37.16	0.70
Reach 1	1447	50	Existing	101.00	366.16	367.60	367.33	367.83	0.010512	3.89	26.03	28.69	0.67
Reach 1	1447	50	Nat	101.00	366.16	367.60	367.33	367.83	0.010512	3.89	26.03	28.69	0.67
Reach 1	1447	50	Prop	101.00	366.16	367.60	367.32	367.83	0.010511	3.89	26.03	28.69	0.67
Reach 1	1447	100	Existing	116.00	366.16	367.69	367.41	367.95	0.010509	4.09	29.28	37.90	0.67
Reach 1	1447	100	Nat	116.00	366.16	367.69	367.41	367.95	0.010509	4.09	29.28	37.90	0.67
Reach 1	1447	100	Prop	116.00	366.16	367.69	367.41	367.95	0.010509	4.09	29.28	37.90	0.67

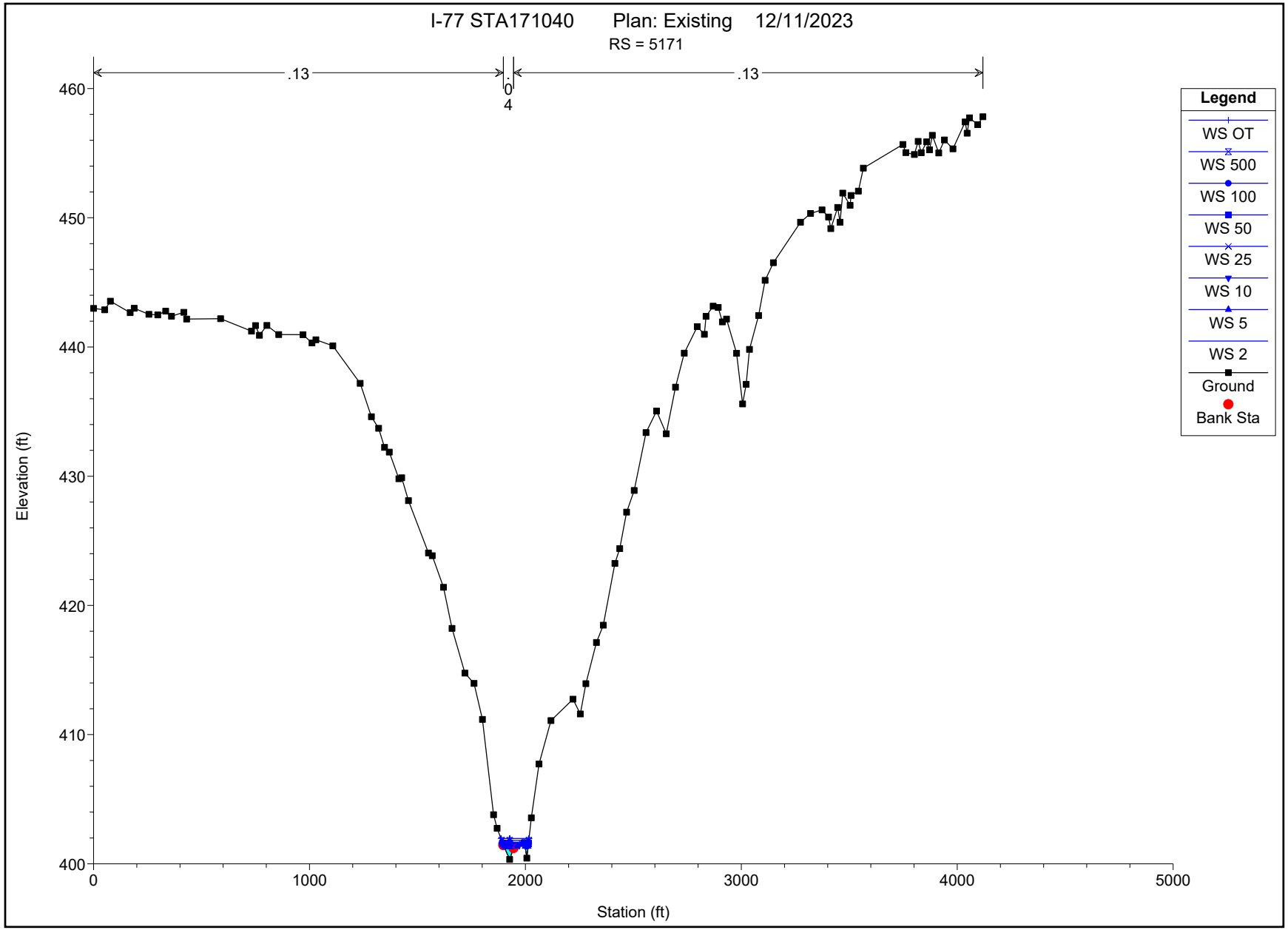
I-77 1710+40 EXISTING PLAN

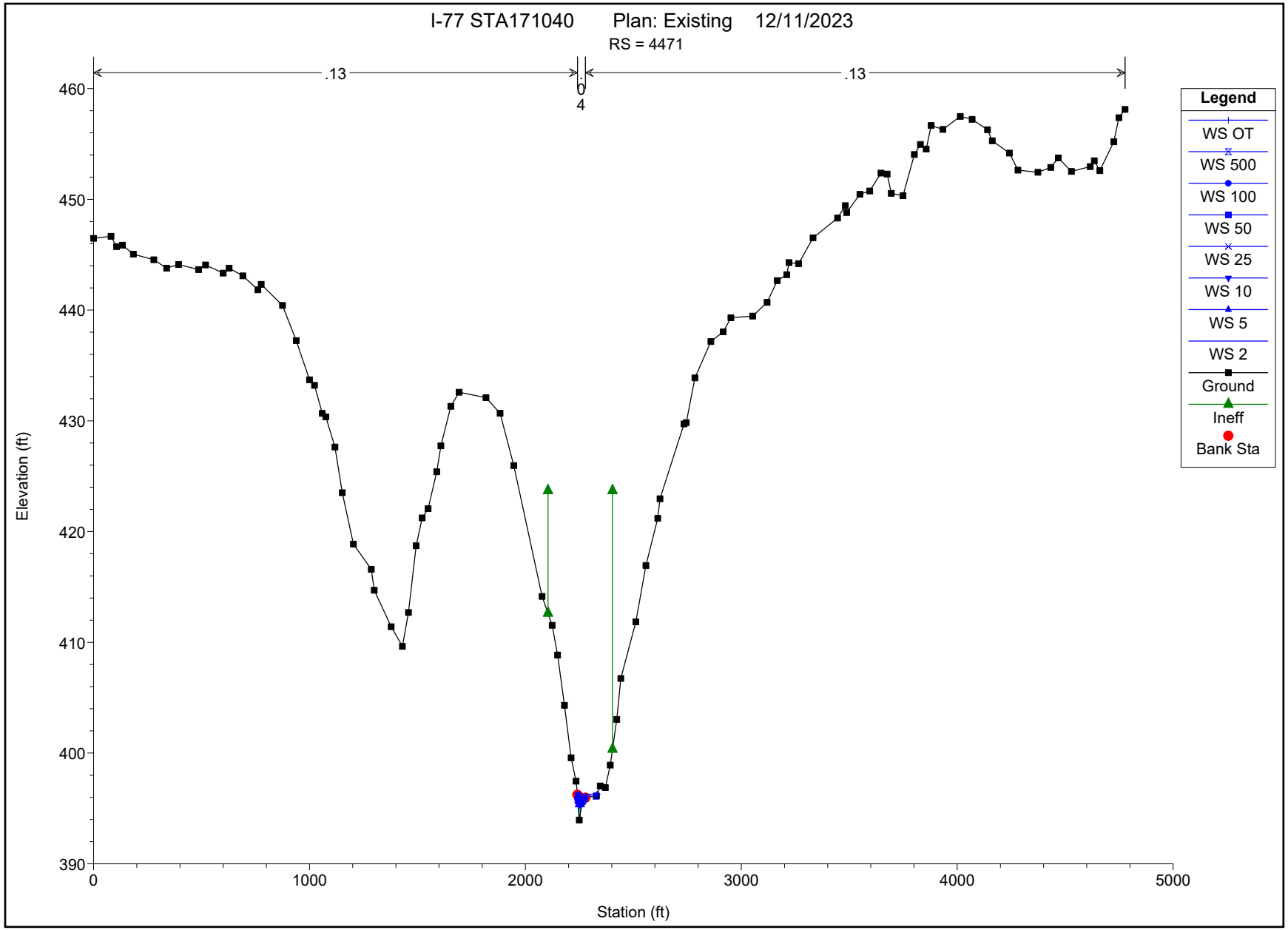


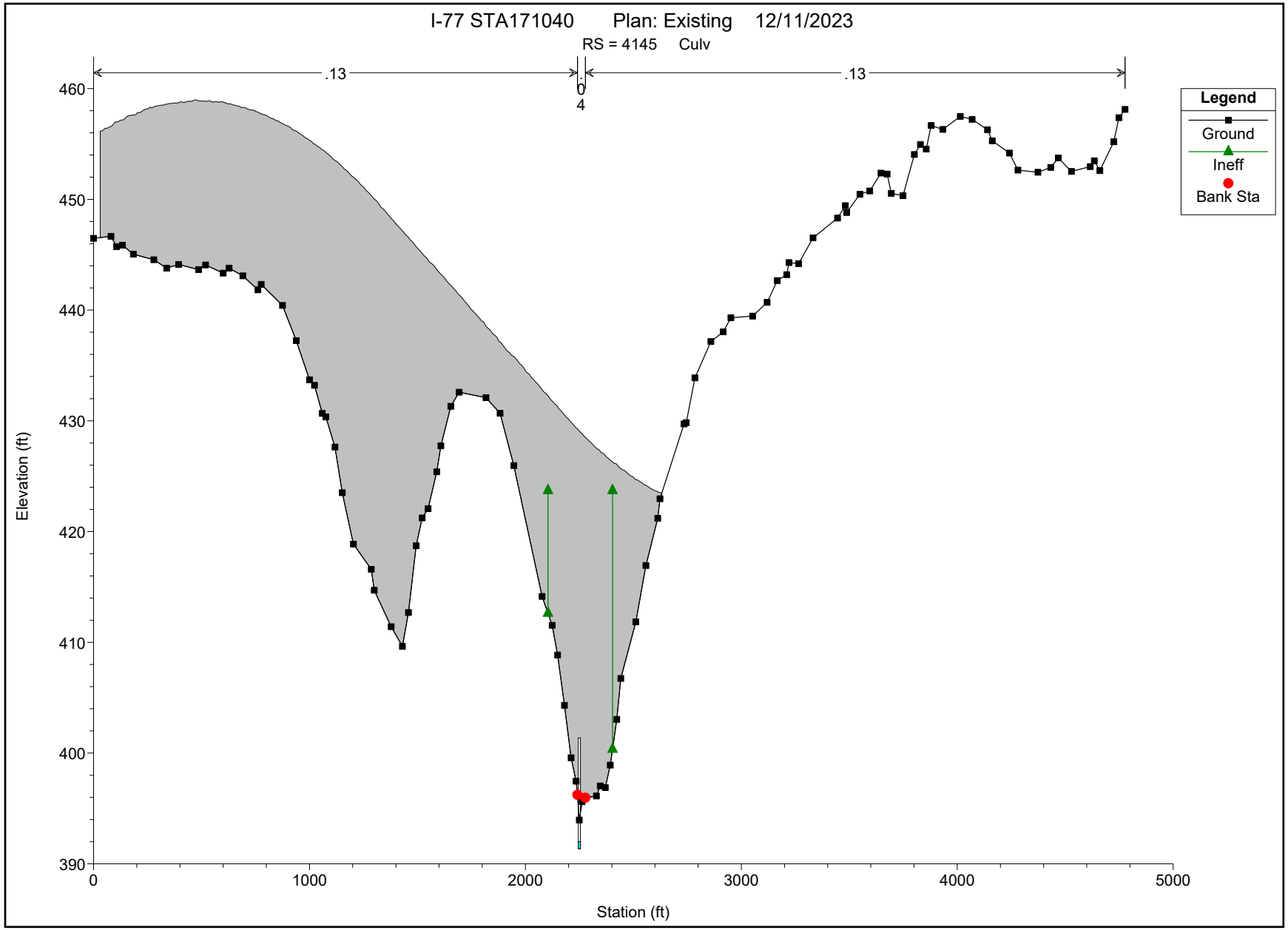

I-77 STA171040 Plan: Existing 12/11/2023
River 1 Reach 1
Legend
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
LOB
ROB
Elevation (ft)
460
440
420
400
380
360
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)

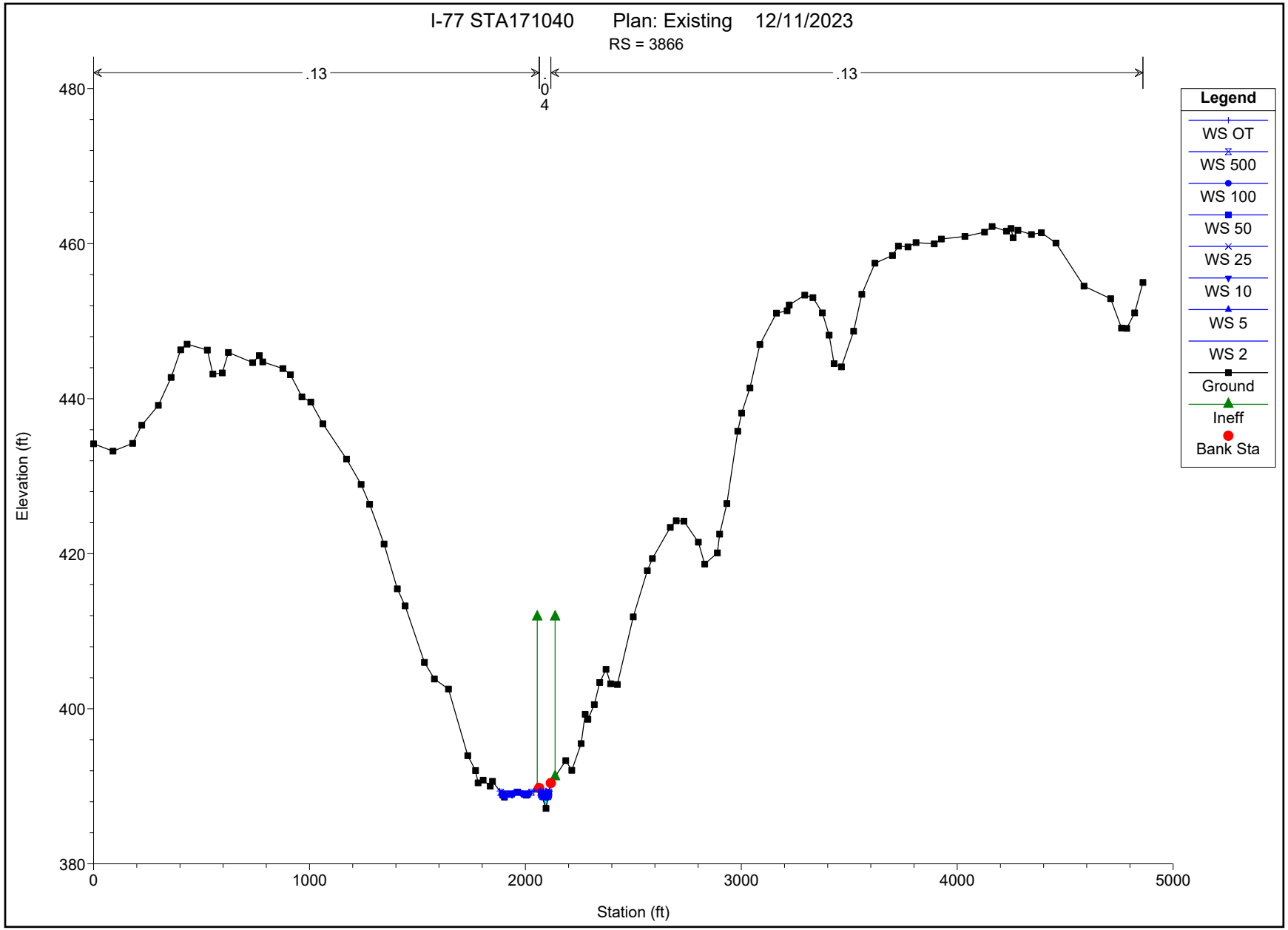

I-77 STA171040 Plan: Existing 12/11/2023
RS = 8144
.13
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
490
480
470
460
450
440
0
500
1000
1500
2000
2500
3000
3500


I-77 STA171040 Plan: Existing 12/11/2023
RS = 6467
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
Station (ft)
460
450
440
430
420
410
0
500
1000
1500
2000
2500
3000
3500


I-77 STA171040 Plan: Existing 12/11/2023
RS = 5171
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Bank Sta
Elevation (ft)
460
450
440
430
420
410
400
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: Existing 12/11/2023
RS = 4471
.13
.04
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Ineff
Bank Sta
Elevation (ft)
460
450
440
430
420
410
400
390
0
1000
2000
3000
4000
5000
Station (ft)


I-77 STA171040 Plan: Existing 12/11/2023
RS = 4145 Culv
.13
.13
Legend
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
460
450
440
430
420
410
400
390
0
1000
2000
3000
4000
5000


I-77 STA171040 Plan: Existing 12/11/2023
RS = 3866
.13
0
4
.13
Legend
WS OT
WS 500
WS 100
WS 50
WS 25
WS 10
WS 5
WS 2
Ground
Ineff
Bank Sta
Elevation (ft)
480
460
440
420
400
380
0
1000
2000
3000
4000
5000
Station (ft)