



Preliminary Hydraulics Report

South Avenue Bridge

BR 9032(65)

UPN 6296

Missoula County, MT
July 15, 2016



DRAFT



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Memorandum

Subject:	DRAFT Bridge Opening Recommendation Memo – South Avenue Bridge UPN: 6296, BR 9032(65)
Date:	July 15, 2016
To:	Erik Dickson, P.E.
From:	Ben Fennelly, P.E., CFM – HDR Engineering, Project Engineer
Thru:	Dan Harmon, P.E. – HDR Engineering, Project Manager

Purpose

Missoula County is proposing to construct a new bridge across the Bitterroot River, located at the western terminus of South Avenue and connecting with River Pines Road immediately west of the river. The project consists of the new South Avenue Bridge, roadway reconstruction at the new bridge approaches on River Pines Road and South Avenue and removal of the existing Maclay Bridge, located approximately 2200-feet downstream of the proposed South Avenue Bridge location. The proposed bridge will be approximately 740-feet long (multiple spans) with two traffic lanes that provide for bicycle/pedestrian accommodations separated from vehicular traffic. The low chord elevation will be established such that hydraulic requirements are satisfied.

The purpose of the project is to enhance the operational characteristics, increase safety, and improve physical conditions for the traveling public for the foreseeable future by constructing a new river crossing that meets current design standards as well as meeting the current and future traffic demands for the area.

This *Draft Bridge Opening Recommendation Memo* presents our preliminary hydraulics results for the new South Avenue Bridge over the Bitterroot River.

Existing Bridge and Previous Studies

The existing Maclay Bridge is a 4-span composed of a steel through truss main span, pony truss span, and two pre-stressed concrete T-beam approach spans. The existing bridge was constructed circa 1935 and provides a single 14-foot wide roadway width. A FEMA approved study and floodplain map have been adopted by both Montana Department of Natural Resources (DNRC) and Missoula County.

South Avenue Bridge Project

The recommendations contained in this report are for a proposed bridge to be located 2200 feet upstream of the existing Maclay Bridge. The preliminary analysis yielded two potential span arrangements for South Avenue Bridge: Alternative 1A and Alternative 1B. The new bridge ends will be located outside of the floodway boundary with some roadway approach fill in the floodplain in order to connect to the existing approach roadways and perpetuate access to existing properties. In accordance with Missoula County floodplain regulations, both alternatives provide 2-ft of freeboard between the bridge low chord and the 100-year flood event. Design parameters are listed in Table 1.

Table 1: Bridge Opening Design Parameters

Design Parameter	Existing Conditions	Proposed Alternative 1A ⁵	Proposed Alternative 1B ⁵
Channel Drainage Area ¹	2,842 mi ²	2,842 mi ²	2,842 mi ²
Centerline of Channel ²	5,100 feet	5,100 feet	5,100 feet
Channel Bottom Width (ft)	300 ft	300 ft	300 ft
Channel Invert Elevation (ft)	3101.62 ft	3101.62 ft	3101.62 ft
Channel Slope	0.0008 ft/ft	0.0008 ft/ft	0.0008 ft/ft
Design Flow (100-year) (cfs)	31,800	31,800	31,800
Design Stage Elevation ³ (ft)	3115.64	3115.64	3115.63
Design Elevation at Bridge (ft)	3115.56	3115.53	3115.51
Design Velocity ⁴ (fps)	N/A	4.51	4.64
Change in WSEL (ft)	N/A	0.00	-0.01
Base Flood (100-year) (cfs)	31,800	31,800	31,800
Base Flood Stage Elevation ³ (ft)	3115.64	3115.64	3115.63
Base Flood Elevation at Bridge (ft)	3115.56	3115.53	3115.51
Base Flood Velocity ⁴ (fps)	N/A	4.51	4.64
Change in WSEL (ft)	N/A	0.00	-0.01
500-year flow (cfs)	42,000	42,000	42,000
500-year Stage Elevation ³ (ft)	3116.41	3116.55	3116.53
500-year Elevation at Bridge (ft)	3116.34	3116.52	3116.48
500-year Velocity ⁴ (fps)	N/A	4.97	5.15
Change in WSEL (ft)	N/A	0.14	0.12
10-year Flow (cfs)	20,900	20,900	20,900
10-year Stage Elevation ³ (ft)	3114.42	3114.28	3114.28
10-year Elevation at Bridge (ft)	3114.38	3114.26	3114.26
2-year Flow (cfs)	14,580	14,580	14,580
2-year Stage Elevation ³ (ft)	3112.32	3111.96	3111.96
2-year Elevation at Bridge (ft)	3112.26	3111.91	3111.92
Pier Skew to flow (degrees)	N/A	0	0
Abutment Protection	N/A	Class II	Class II
Abutment Slope	N/A	2:1	2:1
Low Chord Elevation (ft)	N/A	3118.12	3118.22
Notes:			
1. The indicated drainage area is at the confluence of the Bitterroot River and Clark Fork, as reported in the effective Missoula County Flood Insurance Study.			
2. Stream distance in feet above the confluence with the Clark Fork as defined by the Missoula County FIS.			
3. Water surface elevations are shown at RS 5230 located 115 feet upstream of proposed bridge face.			
4. Velocities are shown at cross section 5100 Inside BR U (upstream face).			
5. Results for alternatives include proposed excavation			

Preliminary pier and contraction scour depth calculations were completed for the 200-year design flood event. Scour results are summarized in Table 2. The scour calculations were performed for the preliminary design that the piers each consist of two round 6 feet diameter drilled shafts aligned with the direction of flow. The final pier geometry may be modified as the design process develops and will depend on the final geotechnical recommendations.

Table 2: 200-yr Scour Summary

Location	Contraction (ft)	Local (ft)	Total (ft)
<i>Alternative 1A</i>			
Left Abutment	0.0	7.8	7.8
Channel Piers	0.0	11.4	11.4
Right Abutment	0.2	23.2	23.4
<i>Alternative 1B</i>			
Left Abutment	0.0	7.8	7.8
Channel Piers	0.0	11.4	11.4
Right Abutment	0.2	24.1	24.3

The total scour depth at the abutments and piers must be taken into consideration during final pier design and determination of pile depth.

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Appendix I – Proposed Conditions HEC-RAS Model Output Files

Appendix J – Interim Construction HEC-RAS Model Output Files

Appendix K – Scour and Abutment Protection Calculations

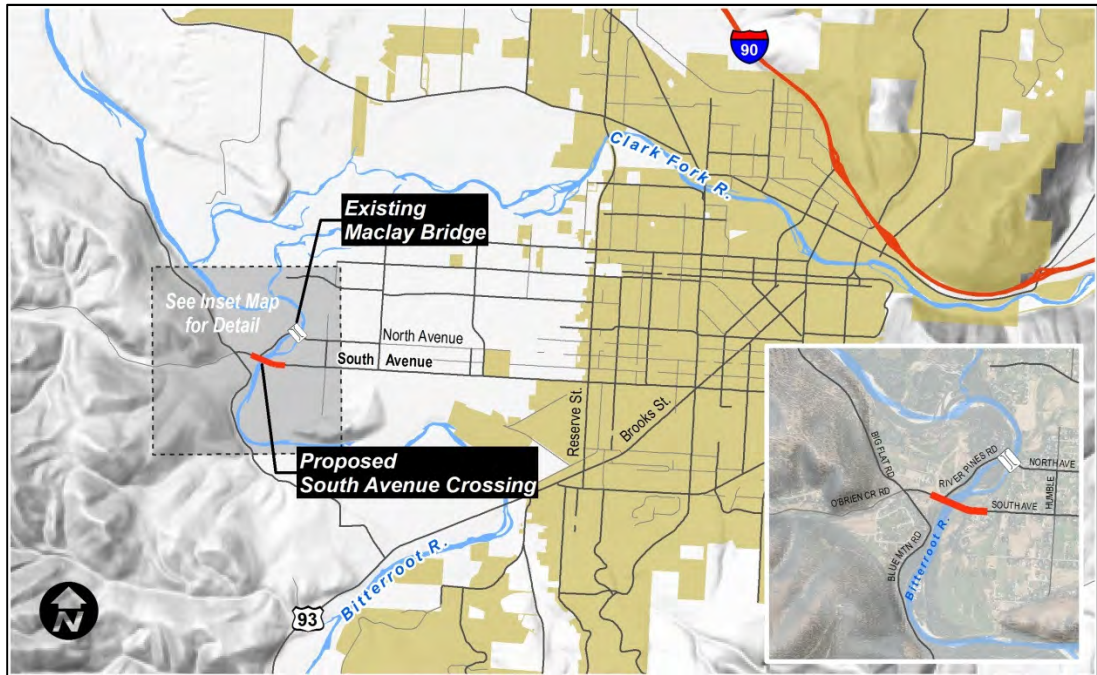
Appendix L – Preliminary Bridge Layouts

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1 Introduction

Missoula County, in cooperation with the Montana Department of Transportation (MDT) and Federal Highway Administration (FHWA), is proposing to construct a new bridge across the Bitterroot River, located at the western terminus of South Avenue and connecting with River Pines Road immediately west of the river. The project scope also includes roadway reconstruction at the new bridge approaches on River Pines Road and South Avenue and removal of the existing Maclay Bridge, located approximately 2200-feet downstream of the proposed South Avenue Bridge location. A Vicinity Map is provided in Figure 1-1.

Figure 1-1. Project Vicinity



The purpose of the South Avenue Bridge project is to enhance the operational characteristics, increase safety, and improve physical conditions for the traveling public for the foreseeable future by constructing a new river crossing that meets current design standards as well as meeting the current and future traffic demands for the area. The proposed bridge will be approximately 740-feet long (multiple spans) with two traffic lanes and provides for bicycle/pedestrian accommodations separated from vehicular traffic. The low chord elevation will be established such that hydraulic requirements are satisfied according to the Missoula County regulations.

The purpose of this Preliminary Hydraulics Report is to document the project design criteria, assess the hydrology at the site, assess hydraulics of the Bitterroot River through the project area, and provide recommendations on the preferred bridge alternate that will

advance into final design. Note that unless otherwise noted, all elevations contained within this report reference the North American Vertical Datum of 1988 (NAVD 88).

2 Hydrology

Given that the proposed bridge is located at a new location within a Zone AE Special Flood Hazard Area (SFHA), the 100-yr event will be used as the design flow. The effective FEMA Flood Insurance Rate Map (FIRM) is provided in Appendix A. A summary of the effective FIRM panels covering the study reach is presented in Table 2-1.

Table 2-1. Effective DFIRM Panels

Community	Community No:	Panels	Effective Date
Missoula County, MT Unincorporated Areas	300048	1455E	7/6/2015
City of Missoula, MT	300049	1455E	7/6/2015

The hydrologic analysis for the Bitterroot River is summarized in this section. This study includes the 50-, 10-, 4-, 2-, 1- and 0.2-percent annual chance (2-, 10-, 25-, 50-, 100-, and 500-year return interval) flood events.

2.1 Basin Description

Missoula County's location between the Bitterroot Range and the Continental Divide results in a climate classification that is neither continental nor maritime. The county may experience weather that is characteristic of both types of climate. Most of the time, the climate has characteristics of the Pacific Maritime. The valleys generally have warmer annual temperatures than most of Montana, largely because many of the winter polar air invasions that penetrate the area east of the Continental Divide do not extend as far west as Missoula County. As is the case in most of Montana, the wettest month of the year is June, followed closely by May. Characteristically, there are large variations in the average annual precipitation between the valleys and mountains, and also between the lower and higher valleys. Precipitation averages approximately 13 inches annually within Missoula County, but some locations have annual averages of nearly 65 inches. It is probable that larger amounts of precipitation fall in some sections of the mountains. Snowfall accumulations commonly reach several hundred inches in the mountain ranges. Average annual snowfall for parts of the Bitterroot Range is approximately 500 to 600 inches (Reference 7 and 10).

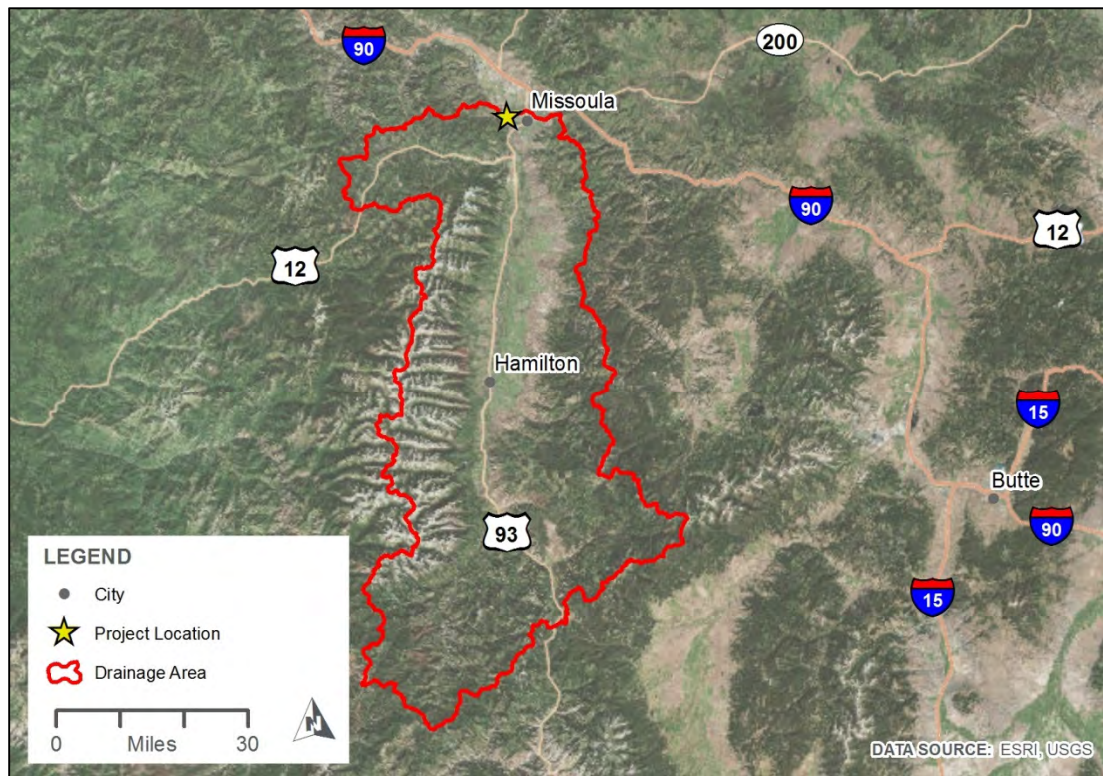
Spring and early summer are generally cool and cloudy, and there is frequent rain in the valleys. Some snow falls in the mountains as late as July. In late summer and early autumn, there are clear skies and warm days, interrupted occasionally by afternoon showers or thunderstorms. Thunderstorms during summer may result in energetic squalls. Hail has been observed in summer, but it is seldom large enough or widespread enough to cause much damage. Mountain areas generally receive their first snowfall before the end of September, and autumn is marked by considerably cloudy, damp, and occasionally foggy weather. By late autumn or early winter, snow begins to accumulate

in mountain areas; and until early spring, nearly all of the precipitation is snow above approximately 4,500 feet (Reference 7, Reference 9).

Tributary streams come from the Bitterroot Range on the western side of the river valley and from the Sapphire Mountains to the east. Peak elevations are above 10,000 feet in the Bitterroot Mountains, and streambed slopes decrease sharply as tributaries reach the valley floor. The Bitterroot River empties into Clark Fork just downstream of the project site at an elevation of approximately 3,100 feet and has an average slope of 4.1 feet per mile (0.0008 foot per foot) through the Missoula County study reach.

The drainage area of Bitterroot River at the project site was calculated to be 2,855 square miles, as shown in Figure 2-1. The weighted-average annual precipitation over the entire drainage area is 33 inches, most of which is snow in the higher elevations (Reference 7, Reference 9).

Figure 2-1. Bitterroot River Watershed at Project Location



2.2 Principal Flood Problems

Warming periods and snow melt, which may be accompanied by rainfall, cause the Bitterroot River's tributaries to swell rapidly. The resulting flood flows may be localized or basin wide and may last from hours to several days depending on temperature, amount of rainfall, soil moisture content, and soil permeability. Flooding along the Bitterroot drainage generally occurs in May and June as the winter snow accumulation in the higher elevations begins to melt. Discharge may be increased by moderate to high rainfall occurring at the same time.

2.3 Existing Peak Discharge Estimates

2.3.1 Existing Peak Discharge Estimates from Missoula County FIS

A Bitterroot River flood study was completed by the United States Army Corps of Engineers (USACE) in 1975 (Reference 18). For that study, peak-flow data from an old stream gage site near the mouth (Gage No. 3525; period of record, 1900-1904) were combined with data from the gage near Darby (Gage No. 3440; period of record, 1937-1975) by using a transfer technique suggested by the USGS (Reference 19) to move the Darby information to the mouth. A historically weighted log-Pearson Type III distribution analysis (Reference 20) was run on these data. As a second method, a 10-year period of record for Bitterroot River was synthesized by subtracting flows gaged on Clark Fork above Missoula and Rattlesnake Creek at Missoula from the Clark Fork gage below the confluence with Bitterroot River. By correlation with a Clark Fork gage at St. Regis, this 10-year period was extended to 19 years; and the log-Pearson Type III analysis was performed (Reference 20). These two approaches were weighted according to significance and reliability in order to obtain values for the 10-, 2-, 1- and 0.2-percent annual chance peak discharges for the Bitterroot River at the confluence with the Clark Fork River. These values have been adopted as part of the effective Flood Insurance Study (FIS) (Reference 11) and are presented in Table 2-2.

Table 2-2. FIS Flow Rates (Based on data though early 1970s)

Study	Flooding Source/Location	Peak Discharges (cfs)			
		10-Percent Annual Chance/ 10-yr	2-Percent Annual Chance/ 50-yr	1-Percent Annual Chance/ 100-yr	0.2-Percent Annual Chance/ 500-yr
FEMA FIS	Bitterroot/confluence with Clark Fork	20,900	29,700	31,800	42,000

2.3.2 Existing Peak Discharge Estimates from USGS Report

USGS Water-Resources Investigations Report (WRIR) 03-4308 contains published stream gage data analysis for 660 gaged sites in Montana and in adjacent areas of Idaho, Wyoming, and Canada based on data through water year 1998 (Reference 15). Gaging station 12352500, located near the project site, was assessed for the 14 years of data available at the time of the study. Results presented in Table 2 of USGS WRIR 03-4308 are provided in Table 2-3.

Table 2-3. USGS Published Flow Rates

Study	Flooding Source/Location	Drainage Area (mi ²)	Peak Discharges (cfs)					
			2-yr	10-yr	25-yr	50-yr	100-yr	500-yr
USGS WRIR 03-4308	USGS Gage 12352500	2,824	14,500	23,400	27,300	30,000	32,500	38,000

2.4 Stream Gage Data Availability

The proposed South Avenue Bridge site is located approximately four miles downstream of USGS gaging station 12352500 Bitterroot River near Missoula MT (See Figure 2-2). The gaging station has 30 years of discontinuous flow records from 1899 -1904 and 1990 - present. Data was downloaded in June 2015 from the USGS website (http://nwis.waterdata.usgs.gov/mt/nwis/peak/?site_no=12352500). Key data for the gaging station are presented in Table 2-4 with annual peak flow data presented in Table 2-5. Statistical analysis of the current data set is discussed in Section 2.5.

Note that the drainage basin area change from the project site to gaging station 12352500 is approximately 1% (2,855 vs. 2,824 square miles). Therefore, no adjustments were considered necessary for change in drainage basin size and the gaging station data was used for the South Avenue Bridge hydrologic assessment.

Figure 2-2. Location of USGS Gage 12352500

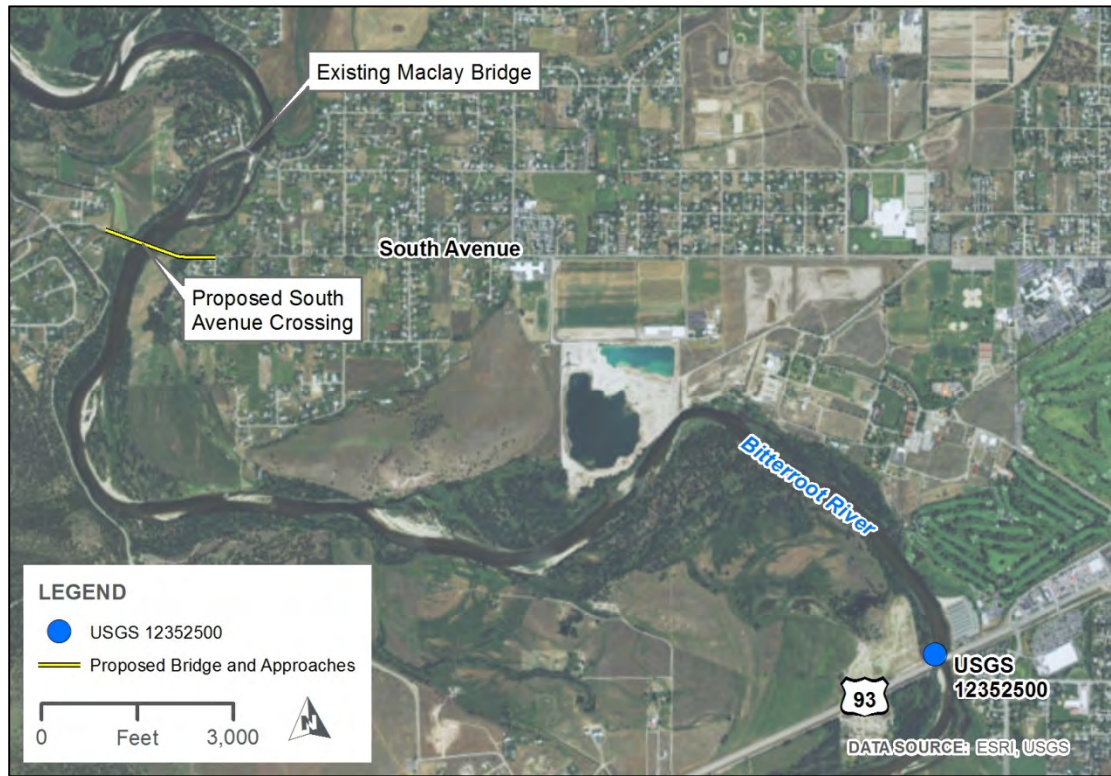


Table 2-4. USGS Gaging Station Information

Station No.	Station Name	Period of Record	Number of Annual Peaks	Drainage Area (mi ²)
12352500	Bitterroot River Near Missoula MT	1899-1904, 1990-2014	30	2,824

Table 2-5. USGS Gaging Station 12352500 Peak Flow Rate Data

Date	Peak Flow Rate (cfs)	Gage Height (ft)	Date	Peak Flow Rate (cfs)	Gage Height (ft)
6/20/1899	38,300	11.55	5/29/2000	8,550	7.6
5/13/1900	18,200		5/15/2001	8,610	7.68
5/30/1901	18,400		6/1/2002	14,900	10.33
6/5/1903	19,700		6/1/2003	21,600	12.65
5/25/1904	18,300		6/7/2004	8,830	7.92
5/31/1990	10,200	8.13	5/20/2005	9,100	7.94
6/7/1991	15,200	9.76	5/21/2006	17,500	11.24
5/1/1992	6,370	6.54	11/8/2006	12,200	9.27
5/22/1993	11,800	8.71	5/21/2008	19,600	11.97
4/23/1994	7,900	7.22	6/1/2009	17,900	11.38
6/4/1995	14,400	9.53	6/6/2010	13,900	9.94
6/10/1996	20,300	11.83	6/9/2011	18,600	11.37
5/18/1997	24,800	13.11	4/28/2012	17,600	11.09
5/27/1998	10,000	8.4	5/15/2013	14,900	10.24
6/4/1999	15,700	10.65	5/25/2014	17,900	11.11

2.5 Statistical Gage Analysis

Gage analyses were performed utilizing the assumptions and procedures outlined in Guidelines for Determining Flood Flow Frequency, Bulletin 17B (B17B) of the Interagency Advisory Committee on Water Data (Reference 4), which codifies the standard methodology for conducting flood-frequency studies in the United States. B17B specifies that annual peak-flow data are to be fit to a log-Pearson Type III distribution. Specific methods are also prescribed for improving skew estimates using regional skew information, tests for high and low outliers, adjustments for low outliers and zero flows, and procedures for incorporating historical flood information.

The authors of B17B identified various needs for methodological improvement and recommended additional study. In response to these needs, the Advisory Committee on Water Information (ACWI, successor to IACWD), Subcommittee on Hydrology, Hydrologic Frequency Analysis Work Group has recommended modest changes to

B17B. These changes include adoption of a generalized method-of-moments estimator, the Expected Moments Algorithm (EMA) (Reference 2), and a generalized version of the Grubbs-Beck test for low outliers (Reference 1). The USGS has implemented these changes in the latest version of the PeakFQ computer program (Version 7.1), which was used to conduct the stream gage analyses for this project.

Note that the PeakFQ software analyzes the peak flow data using two methods, Systematic Record and Bulletin 17B Estimate. The annual peak-flow data fall into two classes: systematic and historic. The difference between the two analyses is how historical peaks are treated. The Systematic Record assumes that all historical peaks are included and that years with no values were not significant floods. Bulletin 17B makes no assumptions about the unrecorded years. For further information concerning the differences between these two methods see Reference 21.

2.5.1 Duplicate Stream Gage Analysis

Prior to the establishment of the updated flood flow frequency estimates proposed for this study, a baseline analysis was performed in an effort to duplicate the results listed in WRIR 03-4308 for USGS gaging station 12352500. This involved the establishment of the Generalized Skew Standard Error utilized for WRIR 03-4308. A weighted skew was calculated using a Generalized Skew Standard Error value of 0.64. The Generalized Skew Standard Error value of 0.64 was referenced from Table 3 of WRIR 03-4308. The 14 years of data were then analyzed using USGS PeakFQ version 7.1 software (Reference 20).

The results of the baseline analysis and the analysis performed for WRIR 03-4308 are compared in Table 2-6, which shows that the results nearly duplicate those listed in WRIR 03-4308 (<1% difference for the 1% annual chance event). The slight differences are from the changes to the PeakFQ computer program analysis algorithm mentioned above. The PeakFQ input and output files for the baseline analysis are included in Appendix B.

2.5.2 Full Dataset Stream Gage Analysis

An updated flood flow frequency analysis was conducted using the full 30 year period of record for USGS gaging station 12352500. PeakFQ software was used to conduct the analysis, and a Generalized Skew Standard Error value of 0.64 was used as recommended by USGS (Reference 8 and Reference 15). The results of this analysis are provided in Table 2-6. PeakFQ output data is provided in Appendix C.

2.6 Discussion of Results

Table 2-3 presents a summary of the 50-, 10-, 4-, 2-, 1-, and 0.2-percent annual chance (2-, 10-, 25-, 50-, 100-, and 500-year) peak discharges resulting from each method used throughout the hydrology analysis. Comparison of 1-percent annual chance (100-year) flow rates leads to the following observations and comments:

- PeakFQ results show higher values using the Systematic Record vs. the Bulletin 17B Estimate due to the treatment of historical peaks of years 1899 through 1904. (Systematic Record vs. Bulletin 17B Estimate is discussed in Section 2.5).

- Computed values using the 30 years of available peak flow data utilizing the B17B method are lower than that presented in the FIS and in WRIR 03-4308. This is due to a more extensive period of record and a difference in computational methods. These discrepancies and reasoning was confirmed with Pete McCarthy of USGS.
- Comparison of WRIR 03-4308 results with PeakFQ software results from the same period of record produces results within 1 percent. The difference is due to slight changes in the analytical methods in the updated USGS PeakFQ software.

Table 2-6. Summary of Discharges

Location	Method	Drainage Area (mi ²)	Years of Record	Peak Discharges (cfs)					
				2-yr	10-yr	25-yr	50-yr	100-yr	500-yr
Confluence with Clark Fork River	FEMA FIS ¹	2,842	N/A	N/A	20,900	N/A	29,700	31,800	42,000
USGS Gage 12352500	WRIR 03-4308 ²	2,814	14	14,500	23,400	27,300	30,000	32,500	38,000
USGS Gage 12352500: Duplicate Analysis ³	Bulletin 17B Estimate	2,824	14	14,530	23,310	27,160	29,800	32,290	37,580
	Systematic Record	2,824	14	15,100	27,630	34,390	39,590	44,910	57,900
USGS Gage 12352500: Full Dataset ⁴	Bulletin 17B Estimate	2,824	30	14,580	22,190	25,410	27,590	29,610	33,860
	Systematic Record	2,824	30	14,690	24,030	28,620	31,990	35,320	43,030

¹ Missoula County FIS Data (July 6, 2015)

² From Table 2 of USGS WRIR 03-4308. See Reference 14.

³ Shortened record for comparison with WRIR 03-4308

⁴ Full record results using PeakFQ Version 7.1

2.7 Recommended Discharges

It is recommended that the FIS flow rates be utilized for the hydraulic analysis due to slightly more conservative (higher) values for the 1-percent annual chance event and consistency with flows used for the FEMA effective hydraulic model upstream of the project area. If less conservative values were used, flows presented in the FIS would decrease in the downstream direction. This recommendation is made after discussion with Missoula County and receiving their concurrence. Recommended discharges from the effective FIS are presented in Table 2-7. It should be noted that the FIS does not list discharges for the 2- and 25-yr events. Hence, the respective discharges were estimated from a discharge-frequency curve developed from the discharge listed in the FIS.

Table 2-7. Recommended Discharges

Location	Method	Drainage Area (mi ²)	Years of Record	Peak Discharges (cfs)						
				2-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
Confluence with Clark Fork River	FEMA FIS	2,842	N/A	13,100	20,900	24,900	29,700	31,800	36,000	42,000

3 Hydraulics

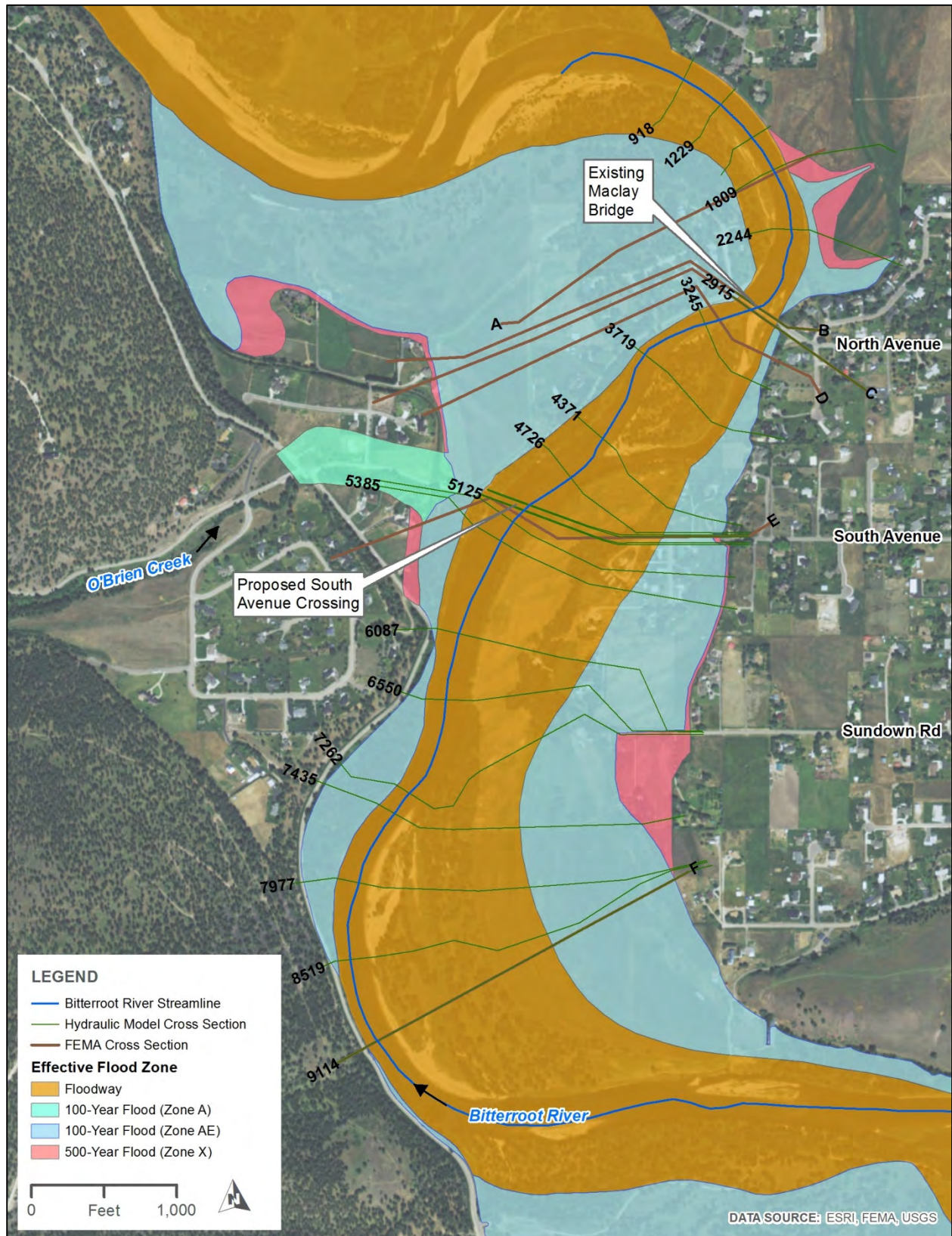
The project reach extends from 1,970 feet downstream of the Maclay Bridge to 6,220 feet upstream of the Maclay Bridge (Figure 3-1). Throughout the project reach, the Bitterroot River is effectively mapped as a detailed Zone AE with a floodway. According to the HEC-2 microfiche received through a FEMA data request, the study was performed in 1974 by the USACE. The Flood Boundary and Floodway Map (FBFM) detailing the results of the 1974 study are presented in Figure D-1 (Appendix D). The results of the study were later remapped utilizing LiDAR data and have a current effective date of July 6, 2015 (Panel 30063C1455E, see Appendix A). FEMA’s effective National Flood Hazard Layer (NFHL) is illustrated on Figure D-2 (Appendix D).

3.1 Hydraulic Analysis Overview and Procedures

Several hydraulic models were created in order to properly assess the hydraulics of the Bitterroot River and size the proposed structure. Water surface elevations (WSELs) were calculated with HEC-RAS, Version 5.0.1 hydraulic modeling software (Reference 16). Cross sections were placed with Arc Map 10.2 (Reference 3) at key locations associated with the existing FEMA model locations and relative to the existing and proposed structures. HEC-RAS, for steady flow analysis, performs the standard step energy balance calculation between cross sections, starting at the most downstream cross section and moving upstream for a fully subcritical analysis.

To begin the hydraulic analysis, the effective model was obtained through a FEMA data request and was duplicated in HEC-RAS 5.0.1 (Duplicate Effective Model). Creation of the Corrected Effective and Existing Conditions Models consisted of correcting model geometry parameters and incorporating present day survey and additional cross sections within the analyzed reach. Additional details of the methods, techniques, and results for each section of the hydraulic analysis are presented in the following sections.

Figure 3-1. Hydraulics Overview Map



3.2 Duplicate Effective Model

As noted above, a hard copy version of HEC-2 input data from the effective model was obtained. The effective model has six cross sections through the project reach, beginning with Section A (River Station 1837, HEC-2 Station 0.52) located upstream of the confluence of the Bitterroot River and Clark Fork River, and ending at Section F at River Station 9114 (HEC-2 Station 1.89) (a total length of 1.38 river miles). During the review of the geometry for the Effective Model, it was noted that Section F had duplicate station-elevation point at station 1939 of the cross sectional geometry. This point was removed in order to get the model to perform the simulation.

3.2.1 Vertical Datum Conversion

The Effective HEC-2 model references the NGVD29 vertical datum while the 2015 FIS references NAVD88; therefore, the model was adjusted to maintain consistency with the effective FIS. In order to do this, the entire model geometry was raised by 3.5 feet as the 2015 FIS specifies a 3.5 foot difference between NGVD29 and NAVD88 for this particular reach of the Bitterroot River in Missoula County.

3.2.2 Model Results and Comparison

Comparison of the WSELs for the original HEC-2 analysis and the Duplicate Effective Model are summarized in Table 3-1. The requirements listed in the FEMA MT-2 forms state that the WSEL should be within 0.1 feet of the Effective Model, 0.05 feet accounts for rounding. Of the six total sections within the project reach, all WSELs were able to be duplicated within 0.05 feet. The output for the HEC-2 Effective Model and HEC-RAS Duplicate Effective Model can be found in Appendix F and Appendix G, respectively.

Table 3-1. Duplicate Effective Model Comparison

Cross Section	WSEL (ft NGVD29)		Difference (ft)	WSEL (ft NAVD88)		Difference (ft)
	Effective HEC-2 Results	Duplicate Effective HEC-RAS Results ¹		Duplicate Effective HEC-RAS Results ²	2015 FIS	
A	3108.25	3108.25	0.00	3111.75	3111.80	0.05
B	3109.69	3109.70	0.01	3113.20	3112.90	-0.30
	<i>Existing Maclay Bridge</i>			<i>Existing Maclay Bridge</i>		
C	3109.74	3109.75	0.01	3113.25	3112.90	-0.35
D	3110.51	3110.55	0.04	3114.05	3113.80	-0.25
E	3112.00	3112.02	0.02	3115.52	3115.40	-0.12
F	3114.97	3114.98	0.01	3118.48	3118.50	0.02
¹ Prior to datum conversion (NGVD29) ² Post datum conversion (NAVD88)						

In review of the results listed in Table 3-1, the Duplicate Effective Model and Effective HEC-2 Model do not share the same results. In researching the HEC-2 model received from FEMA, it was discovered that the results listed in the FWDT of the FIS do not match

the results in the HEC-2 model. A comparison of the HEC-2 results with those of the FIS is provided in Table 3-2.

Table 3-2. Comparison of Effective Model with FIS

Cross Section	WSEL (ft NAVD88)		Difference (ft)
	Effective HEC-2 Results ¹	2015 FIS	
A	3111.75	3111.8	0.05
B	3113.19	3112.9	-0.29
<i>Existing Maclay Bridge</i>			
C	3113.24	3112.9	-0.34
D	3114.01	3113.8	-0.21
E	3115.50	3115.4	-0.10
F	3118.47	3118.5	0.03

¹These elevations have been converted from the NGVD29 datum to NAVD88 datum utilizing the conversion of 3.5' stated in the FIS

In review of the HEC-2 microfiche received from FEMA, it appears that different boundary conditions were utilized for the without and with encroachment (i.e. floodway) models of the HEC-2 analysis, resulting in different WSELs for the downstream cross sections. In speaking with the State Floodplain Manager (Steve Story, January 21, 2016), it was recommended that since the error is due to a discrepancy in the downstream boundary condition, all future modeling efforts be performed utilizing a normal depth boundary condition rather than those utilized in the Effective HEC-2 Model.

3.3 Corrected Effective Model

A Corrected Effective Model was created by revising the Duplicate Effective Model to correct the description of the existing Maclay Bridge geometry as well as the contraction and expansion coefficients. The specific details of the modifications are described as follows:

- Conveyance calculations set to breaks in n values, not HEC-2 method.
- Corrected contraction and expansion coefficients to equal 0.1 and 0.3 for normal sections. At sections where flow exhibits greater contraction and expansion due to the bridge, the contraction and expansion coefficients were assigned values equal to 0.3 and 0.5, respectively.

3.4 Existing Conditions Model

Creation of the Existing Conditions Model consisted of updating the Corrected Effective Model by incorporating present day survey and additional cross sections within the analyzed reach. A major component of the Existing Conditions Model was the incorporation of lateral weirs along the crest of River Pines Road and a 2-dimensional (2-D) model domain located in the west overbank. The inclusion of River Pines Road and 2-D domain within the hydraulic model allows for the realistic representation of the discharge accessing the left overbank west of River Pines Road.

3.4.1 Topographic Data Updates

Topographic data consisting of Light Detection and Ranging (LiDAR) as well as cross sectional survey data consisting of overbank and bathymetry data was collected and processed by DJ&A during the summer of 2015. The data was delivered to HDR in August of 2015.

The geometries of the cross sections utilized within the analyzed reach were updated based on the topographic and bathymetric data collected for the project. Additional cross sections were deemed necessary to accurately model differences in the existing and proposed conditions and to meet FEMA guidelines for cross section spacing. LiDAR data was used to augment the field survey for the additional cross sections. Where necessary, the HEC-RAS cross section interpolation tool was used to interpolate channel bathymetry between surveyed cross sections to ensure each LiDAR cross section contained realistic channel geometry and slope throughout the entire reach. The HEC-RAS Graphical XS Editor was used to merge the interpolated bathymetric data with LiDAR data to obtain the additional cross sectional geometries.

All cross sections are shown in the Hydraulic Work Map (Figure D-3, Appendix D). Cross section plots illustrating geometries are included in Appendix D.

3.4.2 Floodplain Geometry Revisions

Review of the Duplicate Effective Model revealed that the Effective hydraulic analysis assumes that Bitterroot River is contained by River Pines Road (see Figure D-3). In order to determine if this is an appropriate assumption, River Pines Road was added to the model through the use of lateral weirs along its crest, which revealed that the left overbank located west of the roadway would likely be accessed by flood discharges overtopping River Pines Road during certain flood events.

Furthermore, discussion with County personnel revealed that the May 1997 flood events came within inches of overtopping River Pines Road. Review of USGS stream gage data shows that the peak discharge during the 1997 event was 24,800 cfs. Based on the effective discharges utilized for the present study, the 1997 discharge correlates to a 6-percent annual chance (approximate 17-year) event. Given the accounts witnessed at the location in 1997, it is reasonable to assume that the simulated 1-percent annual chance discharge of 31,800 cfs would easily overtop River Pines Road, further supporting the preliminary model results of the present study and confirming that the inclusion of River Pines Road within the hydraulic model allows for the realistic representation of the discharge accessing the left overbank west of River Pines Road.

3.4.3 Maclay Bridge Geometry

The existing Maclay Bridge is a 4-span composed of a steel through truss main span, pony truss span, and two pre-stressed concrete T-beam approach spans. The existing bridge was constructed circa 1935 and provides a single 14-foot wide roadway width. The existing piers are normal to the roadway and flow. The existing bridge plans for Maclay Bridge can be found in Appendix E.

In the Effective HEC-2 Model, the Maclay Bridge was described as a two span bridge with a single 7' wide square nose pier. For the Existing Conditions Model, the geometry

of the bridge was updated to reflect the existing four span structure with varying span lengths and pier widths.

3.4.4 Boundary Conditions Adjustment

The Effective HEC-2 model referenced the NGVD29 vertical datum and utilized beginning water surface elevations (WSEL) as the downstream boundary condition for the 10-, 50-, 100-, and 500-year flood events at Section A, which is located approximately 1970 feet downstream of the existing Maclay Bridge. However, as previously mentioned, the State Floodplain Engineer recommended that the analysis be performed utilizing a normal depth boundary condition. The resultant WSELs at Section A for each flood event under existing conditions are compared to effective values in Table 3-3.

Table 3-3. Peak Flows and Downstream Boundary Conditions

Event	Flow (cfs)	Starting WSEL ¹ (ft NAVD88)	Starting WSEL ² (ft NAVD88)	Difference (ft NAVD88)
10-yr	20,900	3106.88	3107.65	0.77
50-yr	29,700	3107.05	3108.96	1.91
100-yr	31,800	3111.75	3109.19	-2.56
100-yr Encroached	31,800	3111.75	3109.56	-2.19
500-yr	42,000	3111.75	3110.18	-1.57

¹Duplicate and Corrected Effective Models utilize Known Water Surface Elevations for the downstream boundary conditions

²Existing Conditions model simulated under normal depth boundary condition, S=0.001 ft/ft

3.4.5 Model Calibration

As previously mentioned, local community officials noted that during 1997, the river nearly overtopped the River Pines Road. Review of USGS stream gage data shows that the peak discharge during the 1997 event was 24,800 cfs. Based on the effective discharges utilized for the present study, the 1997 discharge correlates to a 6-percent annual chance (approximate 17-year) event. This recount closely approximates the results of the existing model, providing further confidence to the modeling inputs and results.

3.4.6 Existing Conditions Model Results and Comparison

The WSELs between the Duplicate Effective Model and the Existing Conditions Model differ by varying amounts. The differences, displayed in Table 3-4, are primarily attributed to the aforementioned differences in the downstream boundary condition, the differences in the cross sectional and bridge geometries, the correction of model inputs (i.e. expansion and contraction coefficients), and the differences in modeling software. Additionally, the Existing Conditions Model and 2015 FIS differ by varying amounts at each cross section as shown in Table 3-4. These differences in WSELs are attributed to the use of more accurate survey data, more cross sections, and the representation of River Pines Road (as described above) in the Existing Conditions Model compared to the 2015 FIS. Appendix H contains the HEC-RAS output for the Existing Conditions Model.

Table 3-4. Existing Conditions Model Comparison

Cross Section	WSEL		Difference (ft)	WSEL		Difference (ft)
	Corrected Effective HEC-RAS Results	Existing Condition HEC-RAS Results		Existing Condition HEC-RAS Results	2015 FIS	
A	3111.75	3110.18	-1.57	3110.18	3111.80	1.62
B	3113.21	3111.65	-1.56	3111.65	3112.90	1.25
<i>Existing Maclay Bridge</i>			<i>Existing Maclay Bridge</i>			
C	3113.26	3112.90	-0.36	3112.90	3112.90	0.00
D	3114.18	3113.58	-0.60	3113.58	3113.80	0.22
E	3115.61	3115.56	-0.05	3115.56	3115.40	-0.16
F	3118.55	3118.12	-0.43	3118.12	3118.50	0.38

Comparison of the 1-percent annual chance floodplain extents for the effective and existing conditions analyses show minimal differences, as shown in the comparison of the floodplain extents displayed in Figure D-4 (Appendix D)

3.4.7 Floodway Encroachment Scenario

Following the development of the Existing Conditions Model, the effective floodway limits, as defined by the Floodway Data Table and the NFHL, were incorporated into the model. Enforcing the effective floodway limits constrains the discharge from overtopping River Pines Road. By keeping the flood flows from accessing the left overbank, the discharge within the floodway area is greatly increased when compared to the base scenario. This increase in discharge and reduction in conveyance due to the floodway encroachments results in floodway rises greater than one foot when compared with the Existing Conditions Model. The results of the Floodway Analysis utilizing the original floodway extents are illustrated in Table 3-5.

Table 3-5. Floodway Analysis using Effective Encroachments

Cross Section	100-Year WSEL		Difference (ft)
	Existing Conditions	Existing Conditions, Floodway Only	
A	3110.18	3112.37	2.19
B	3111.65	3114.03	2.38
<i>Existing Maclay Bridge</i>			
C	3112.90	3115.17	2.27
D	3113.58	3115.90	2.32
E	3115.56	3117.66	2.10
F	3118.12	3119.59	1.47

Due to the effective encroachments violating the maximum allowable floodway limits as defined by FEMA (1' rise) and by the State of Montana (0.5' rise), a new encroachment analysis was necessitated. Initially, the encroachment analysis for the modeled reach was performed utilizing the Method 4 Encroachment Analysis available within HEC-RAS with an equal conveyance reduction. However, this is only possible in the 1-D reach as HEC-RAS does not have the capability to perform an encroachment analysis within a 2-D domain. Therefore, as recommended by HEC, an extremely high Manning's value ($n=100$) was used to effectively create a zone with negligible conveyance outside of the floodway within the 2-D domain. Once, preliminary encroachment limits were iterated upon, minor adjustments were made to the limits to ensure that the updated floodway would tie into the effective encroachment limits at the upstream end of the reach as defined in the FIS (Effective Cross Section F). Results of the floodway analysis are listed in Table 3-6 **Error! Reference source not found.** The modified preliminary limits of the floodway are displayed in the Hydraulic Work Map (Figure D-3, Appendix D).

Table 3-6. Floodway Analysis using Updated Encroachments

Hydraulic Model Cross Section	FEMA Cross Section	100-Year WSEL		Difference (ft)
		Existing Conditions	Existing Conditions, Floodway Only	
918		3109.19	3109.56	0.37
1229		3109.44	3109.86	0.42
1542		3109.90	3110.36	0.46
1809	A	3110.18	3110.61	0.43
2244		3110.93	3111.28	0.35
2865	B	3111.65	3111.94	0.29
2890		Existing Maclay Bridge		
2915	C	3112.90	3113.18	0.28
3245	D	3113.58	3113.83	0.25
3719		3114.67	3114.86	0.19
4371		3115.37	3115.51	0.14
4726		3115.44	3115.52	0.08
5061		3115.58	3115.73	0.15
5125	E	3115.56	3115.82	0.26
5230		3115.64	3115.95	0.31
5385		3115.75	3116.13	0.38
6087		3116.29	3116.72	0.43
6550		3116.74	3117.15	0.41
7262		3117.33	3117.69	0.36
7435		3117.51	3117.83	0.32
7977		3117.71	3118.05	0.34
8519		3117.90	3118.27	0.37
9114	F	3118.12	3118.62	0.50

3.5 Proposed Conditions Models

Based on the previously discussed Existing Conditions Model, the river floodway and floodplain are approximately 720-ft and 2100-ft wide respectively at the proposed bridge site. River Pines Road and the west end of South Avenue are currently located within the mapped floodplain at the project site. Additionally, there are several homes that are constructed within the floodplain at the west end of South Avenue. Bridge options that span over the floodplain would eliminate access to some of the existing homes on South Avenue; therefore, spanning the entire floodplain is not a practical option. The new

bridge ends will be located outside of the floodway boundary with some roadway approach fill in the floodplain in order to connect to the existing approach roadways and perpetuate access to existing properties.

Several proposed conditions alternatives have been assessed in order to determine the most appropriate bridge configuration for this project. Each of the Proposed Conditions Models were based on the Existing Conditions Model and modified to represent the proposed bridge configurations. As a result of the preliminary analysis there are two potential span arrangements for South Avenue Bridge: Alternative 1A and Alternative 1B. The Energy, Momentum, and Yarnell Methods were used for low flow analyses. All proposed pier types are preliminarily designed to be circular in shape resulting in a Coefficient of Drag (Cd) equal to 1.2 and a Yarnell K coefficient of 0.9. Due to the roadway being overtopped in the right overbank, the conveyance through the bridge opening and overtopping the roadway were modeled utilizing the Multiple Opening Approach.

Per Chapter 10 of the MDT Design Manual, the minimum required clearance between the base flood water surface elevation and the low chord of the bridge is 1 foot; however, Missoula County Floodplain regulations require 2-ft of freeboard between the bridge low chord and the 100-year flood event. As such, the proposed bridge low chord has been set to achieve a freeboard of at least two feet. In addition to the low chord criteria, it is the intent of the design that the proposed bridge limit the increase to floodway elevations and the base flood elevation to the furthest extent feasible. Both Alternatives 1A and 1B meet the 2-ft freeboard criteria. Modeling details and results are discussed below.

3.5.1 Alternative 1A

Bridge Alternate 1A has a total length of 742 feet, consisting of two, two span continuous welded steel plate girder superstructures. The larger two-span frame is centered over the main river channel with the shorter frame spanning the floodplain to the east. A single pier is centered on the active channel which provides a large separation from O'Brien Creek and accommodates for recreational navigation along the river banks and two additional piers are located within the right overbank. Each of the three piers are preliminarily designed to be composed of two circular drilled shafts 6 feet in diameter. The HEC-RAS results for bridge Alternative 1A as well as a comparison to the Existing Conditions Model can be found in Table 3-7 and Table 3-8. HEC-RAS Output is provided in Appendix I.

Table 3-7. Alternative 1A Hydraulic Summary

Flood Event	Flow (cfs)	Existing Condition WSEL ¹	Alternative 1A WSEL ¹	Difference Between Existing and Alternative 1A (ft)	Alternative 1A Maximum Velocity ² (ft/s)
100-yr	31,800	3115.64	3115.67	0.03	4.83
100-yr Encroached	31,800	3115.95	3115.83	-0.12	5.91
500-yr	42,000	3116.41	3116.58	0.17	5.25

¹ Upstream WSEL reported at XS 5230 (115' U/S of Alternative 1A South Avenue Bridge)

² Velocity reported at 5100 - BR U for the main channel



Table 3-8. Alternative 1A - Hydraulic Comparison for 100-yr Flood Event

Hydraulic Model Cross Section	FEMA Cross Section	100-Year WSEL (ft)		Difference (ft)
		Existing Conditions	Alternative 1A	
918		3109.19	3109.52	0.33
1229		3109.44	3109.73	0.29
1542		3109.90	3110.16	0.26
1809	A	3110.18	3110.47	0.29
2244		3110.93	3111.27	0.34
2865	B	3111.65	3112.04	0.39
2890		Existing Maclay Bridge		
2915	C	3112.90	3111.95	-0.95
3245	D	3113.58	3112.96	-0.62
3719		3114.67	3114.51	-0.16
4371		3115.37	3115.34	-0.03
4726		3115.44	3115.40	-0.04
5061		3115.58	3115.57	-0.01
5100		Proposed Bridge		
5125	E	3115.56	3115.48	-0.08
5230		3115.64	3115.67	0.03
5385		3115.75	3115.77	0.02
6087		3116.29	3116.30	0.01
6550		3116.74	3116.75	0.01
7262		3117.33	3117.34	0.01
7435		3117.51	3117.52	0.01
7977		3117.71	3117.72	0.01
8519		3117.90	3117.91	0.01
9114	F	3118.12	3118.13	0.01

As witnessed in Table 3-8, Alternative 1A does not provide a no-rise condition through the reach. In order to rid the reach of a rise in the floodplain and floodway, multiple mitigation options were reviewed. These options included additional spans, changes in pier geometry, and excavation of the overbank. Different pier geometries resulted in little difference to the results. Adding a span to the right overbank allows for an increase in the bridge conveyance but decreases the conveyance available over the east approach as the vertical curve is modified to meet the extra span. Excavation of the overbank is a more financially feasible option compared to an additional bridge span and achieves the mitigation goal with no adverse impact to the surrounding insurable structures. Modifications of the right overbank through the bridge such that the ground elevation is

excavated to 3109.5' results in a no-rise condition upstream of the proposed bridge. Results of Alternative 1A with additional excavation are shown in Table 3-9

Table 3-9. Alternative 1A with Excavation - Hydraulic Comparison for 100-yr Flood Event

Hydraulic Model Cross Section	FEMA Cross Section	100-Year WSEL (ft)		Difference (ft)
		Existing Conditions	Alternative 1A	
918		3109.19	3109.52	0.33
1229		3109.44	3109.72	0.28
1542		3109.90	3110.16	0.26
1809	A	3110.18	3110.47	0.29
2244		3110.93	3111.27	0.34
2865	B	3111.65	3112.04	0.39
2890		Existing Maclay Bridge		
2915	C	3112.90	3111.95	-0.95
3245	D	3113.58	3112.96	-0.62
3719		3114.67	3114.51	-0.16
4371		3115.37	3115.34	-0.03
4726		3115.44	3115.40	-0.04
5061		3115.58	3115.57	-0.01
5100		Proposed Bridge		
5125	E	3115.56	3115.53	-0.03
5230		3115.64	3115.64	0.00
5385		3115.75	3115.73	-0.02
6087		3116.29	3116.28	-0.01
6550		3116.74	3116.73	-0.01
7262		3117.33	3117.32	-0.01
7435		3117.51	3117.51	0.00
7977		3117.71	3117.71	0.00
8519		3117.90	3117.90	0.00
9114	F	3118.12	3118.12	0.00

The increase in the WSEL for the proposed scenario is due to an increase in discharge associated with the removal of the existing Maclay Bridge. Under existing conditions, Maclay Bridge backs water up to a higher elevation causing a greater percentage of the discharge to overtop River Pines Road. Under the proposed conditions, Maclay Bridge will be removed and more discharge will be allowed to pass through the Bitterroot River with less overtopping River Pines Road. This increase in discharge results in a higher WSEL on the river but a decrease in discharge realized in the left floodplain.



3.5.2 Alternative 1B

Bridge Alternate 1B is a 720 foot long, four span continuous welded steel plate girder bridge. The piers are located to provide structurally balanced span lengths and to avoid the deeper part of the existing channel. The balanced span configuration allows for a cost effective superstructure design and possibly more desirable visual appearance compared to unbalanced spans. Each of the three piers are preliminarily designed to each be two circular drilled shafts 6 feet in diameter. The HEC-RAS results for bridge Alternative 1B as well as a comparison to the Existing Conditions Model can be found in Table 3-10 and Table 3-11. HEC-RAS Output is provided in Appendix I.

Table 3-10. Alternative 1B Hydraulic Summary

Flood Event	Flow (cfs)	Existing Condition WSEL ¹	Alternative 1B WSEL ¹	Difference Between Existing and Alternative 1B	Alternative 1B Maximum Velocity ² (ft/s)
100-yr	31,800	3115.64	3115.67	0.03	5.00
100-yr Encroached	31,800	3115.95	3115.84	-0.11	5.96
500-yr	42,000	3116.41	3116.60	0.19	5.40

¹ Upstream WSEL reported at XS 5125 (9' U/S of Alternative 1B South Avenue Bridge)

² Velocity reported at 5100 - BR U for the main channel

Table 3-11. Alternative 1B - Hydraulic Comparison for 100-yr Flood Event

Hydraulic Model Cross Section	FEMA Cross Section	100-Year WSEL (ft)		Difference (ft)
		Existing Conditions	Alternative 1B	
918		3109.19	3109.53	0.34
1229		3109.44	3109.73	0.29
1542		3109.9	3110.17	0.27
1809	A	3110.18	3110.47	0.29
2244		3110.93	3111.28	0.35
2865	B	3111.65	3112.04	0.39
2890		Existing Maclay Bridge		
2915	C	3112.9	3111.96	-0.94
3245	D	3113.58	3112.97	-0.61
3719		3114.67	3114.52	-0.15
4371		3115.37	3115.35	-0.02
4726		3115.44	3115.41	-0.03
5061		3115.58	3115.58	0.00
5100		Proposed Bridge		
5125	E	3115.56	3115.46	-0.10
5230		3115.64	3115.67	0.03
5385		3115.75	3115.77	0.02
6087		3116.29	3116.3	0.01
6550		3116.74	3116.75	0.01
7262		3117.33	3117.34	0.01
7435		3117.51	3117.52	0.01
7977		3117.71	3117.72	0.01
8519		3117.9	3117.91	0.01
9114	F	3118.12	3118.13	0.01

As witnessed in Table 3-11, Alternative 1B does not provide a no-rise condition through the reach. Similar to the mitigation efforts described in Alternative 1A, modifications of the right overbank through the bridge such that the ground elevation is excavated to 3109.5' results in a no rise condition upstream of the proposed bridge. Results of Alternative 1B with additional excavation are shown in Table 3-12.



Table 3-12. Alternative 1B with Additional Excavation

Hydraulic Model Cross Section	FEMA Cross Section	100-Year WSEL (ft)		Difference (ft)
		Existing Conditions	Alternative 1B	
918		3109.19	3109.52	0.33
1229		3109.44	3109.73	0.29
1542		3109.9	3110.16	0.26
1809	A	3110.18	3110.47	0.29
2244		3110.93	3111.27	0.34
2865	B	3111.65	3112.04	0.39
2890		Existing Maclay Bridge		
2915	C	3112.90	3111.95	-0.95
3245	D	3113.58	3112.96	-0.62
3719		3114.67	3114.51	-0.16
4371		3115.37	3115.34	-0.03
4726		3115.44	3115.40	-0.04
5061		3115.58	3115.57	-0.01
5100		Proposed Bridge		
5125	E	3115.56	3115.51	-0.05
5230		3115.64	3115.63	-0.01
5385		3115.75	3115.73	-0.02
6087		3116.29	3116.27	-0.02
6550		3116.74	3116.73	-0.01
7262		3117.33	3117.32	-0.01
7435		3117.51	3117.51	0.00
7977		3117.71	3117.71	0.00
8519		3117.90	3117.89	-0.01
9114	F	3118.12	3118.12	0.00

3.6 Interim Construction Models

Maclay Bridge will be removed after construction of the new South Avenue Bridge is complete so that traffic can be maintained during the construction period. Interim condition models were developed to account for the temporary condition where the both the new and existing bridges are in the channel. The interim construction models for each proposed alternative were built off of the corresponding proposed options models. The results for the interim construction models can be found in Appendix J. These results show how the project limits will be affected by the interim construction phase. During the interim construction phase, Alternatives 1A and 1B result in increased WSELs

of 0.15 feet and 0.15 feet for the 100-year condition, respectively. It should be noted that the additional excavation was conservatively not included in the interim conditions analyses.

4 Scour

Scour was calculated using the various methods described in FHWA’s “Evaluating Scour at Bridges – Hydraulic Engineering Circular No. 18” (HEC-18) for Alternatives 1A and 1B. Contraction, pier, and abutment scour were evaluated for each option and are summarized in the following tables. The estimated median grain size (D_{50}) for bed material used in calculations was 51.65 mm for the Bitterroot River. Data for the bed material in the Bitterroot River was provided by the USGS from a previous pier scour evaluation (Reference 14). The provided information included both D_{50} and D_{95} values for the surface bed material and shallow-subsurface bed material needed for the scour calculations. No channel armoring was assumed. All other data was developed from HEC-RAS outputs, and supporting data for the scour calculations is included in Appendix K. Table 4-1 shows the Summary of Scour for the proposed bridge span configuration of Alternative 1A. Table 4-2 shows the Summary of Scour for the proposed bridge span configuration of Alternative 1B.

Table 4-1. Alternative 1A Summary of Scour

Flood Event	Contraction Scour	Pier Scour	Abutment Scour	
			Left (ft)	Right (ft)
100-yr	0.0	11.0	7.02	21.28
200-yr	0.0	11.4	7.83	23.24
500-yr	0.0	11.8	8.89	25.78

Table 4-2. Alternative 1B Summary of Scour

Flood Event	Contraction Scour	Pier Scour	Abutment Scour	
			Left (ft)	Right (ft)
100-yr	0.0	11.0	7.00	22.14
200-yr	0.0	11.4	7.84	24.09
500-yr	0.0	11.8	8.94	25.99

The proposed bridge spans far beyond the extents of the channel and allows for a considerable amount of discharge in the overbanks, resulting in no contraction scour. Pier scour ranged from 11.0 feet to 11.8 feet. The abutment scour calculations yield significant scour potential at the right abutment due to the encroachment. If the abutment slopes are protected with riprap revetment, the effective abutment scour anticipated at all structures will be zero, and the total scour will be comprised of contraction scour and pier scour only.

5 Abutment Protection

Riprap is necessary within this project to provide abutment protection. Required riprap size for both Alternatives was calculated using Equation 14.1 of FHWA’s “Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance” publication; HEC-23 (Reference 13). The 200-year recurrence interval peak flow was used in the equation and resulted in a D_{50} riprap size of 0.45 feet. Using MDT’s Class II riprap with a D_{50} of 1.32 feet, it is determined that the abutment blanket thickness needs to be approximately 3.0 feet. These calculations can be found in Appendix K.

Division 700 within MDT’s specifications (Item 701.06.2) (Reference 6) classifies rock according to the D_{50} of the sample. These classifications includes Class I riprap (D_{50} = 0.66 feet), Class II riprap (D_{50} = 1.32 feet), and Class III riprap (D_{50} = 2.00 feet). Due to the potential for scour, it is recommended the new bridge include Class II riprap on abutment slopes with a blanket thickness of 3.0 feet.

A toe trench should be constructed to key the riprap below the channel and allow stone to self-launch if scour occurs. The riprap protection should extend upstream and downstream, and should be keyed in at both terminations. The final riprap layout should be reviewed by the Hydraulic Engineer after road and bridge plans have been finalized.

6 Recommendations

Multiple possible span arrangements and alignments were investigated for the new Bitterroot River Bridge at South Avenue. For each alternative, there is no contraction scour anticipated on the Bitterroot River in the 100- or 500-year events. It was determined that Proposed Alternatives 1A and 1B satisfy the freeboard, and no-rise requirements. Proposed Alternatives 1A and 1B are hydraulically nearly identical. However, Alternative 1B is less expensive as specified in the TS&L report.

Hence, Alternative 1B (with excavation) is the recommended option because it is the least expensive of the two options that meet project criteria. The physical and hydraulic characteristics of the recommended Alternative 1B bridge are summarized in Table 6-1. Class II riprap is recommended at the abutments and keyed at all terminations.

Table 6-1. Proposed Structure Data

Bridge Length	740 ft
Low Chord Elevation	3118.22 ft
Q_{100} HW	3115.63 ft
Q_{100} Freeboard	2.59 ft
Streambed Elevation at Entrance	3101.61 ft
200-yr Pier Scour	11.4 ft
200-yr Contraction Scour Depth	0 ft
Abutment Riprap Class	Class II

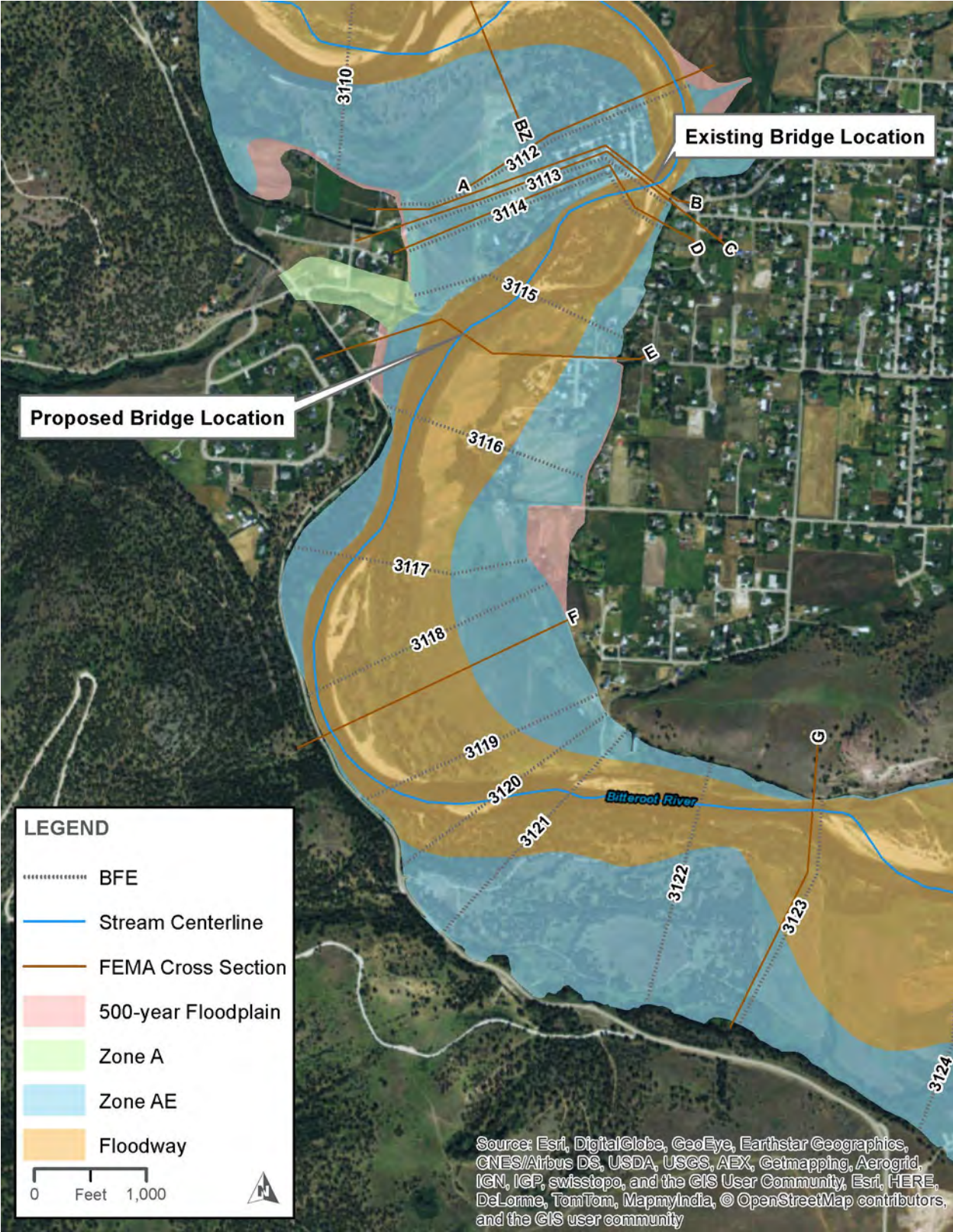
7 References

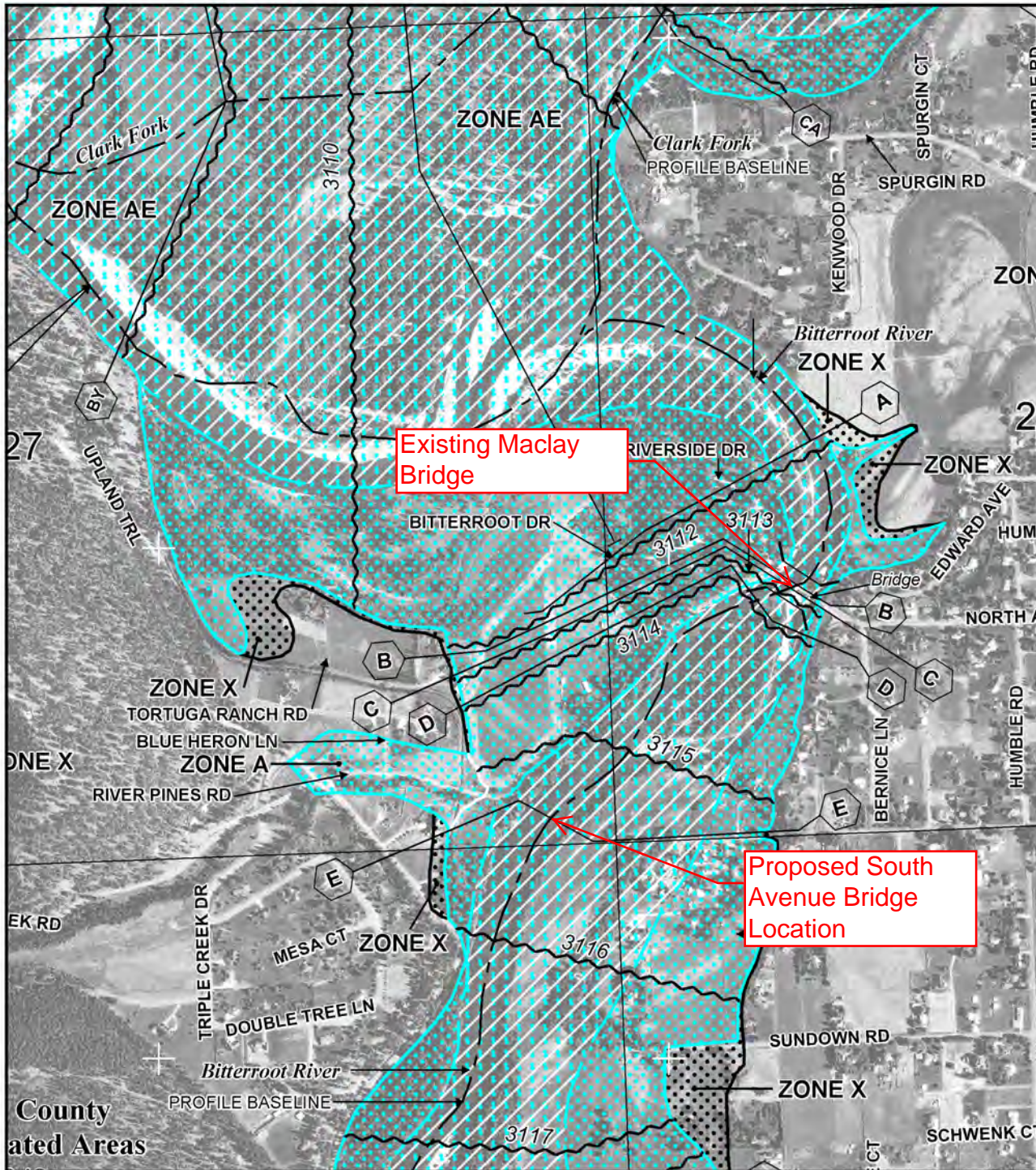
1. Cohn, T.A., England, J.F., Barenbrock, C.E., Mason, R.R., Stedinger, J.R., and Lamontagne, J.R., A generalized Grubbs-Beck Test statistic for detecting multiple potentially influential low outliers in flood series: *Water Resources Research*, v. 49, p. 1–12, 2013.
2. Cohn, T.A., Lane, W.L., Baier, W.G., *An algorithm for computing moments-based flood quantile estimates when historical flood information is available*, *Water Resources Research*, Vol. 33, No. 9, Pages 2089-2096, September 1997.
3. Environmental Systems Research Institute, Inc., ArcMap Version 10.2, 2013.
4. Interagency Advisory Committee on Water Data, *Guidelines for Determining Flood Flow Frequency*, Bulletin No. 17B of the Hydrology Subcommittee, 1982.
5. Montana Department of Transportation, Hydraulic Manual, Updated 9-08-2004.
6. Montana Department of Transportation, Specifications, Referenced July, 2016.
7. Montana State Engineer's Office, *Water Resources Survey for Missoula County, Montana*, June 1960.
8. Personal communication Pete McCarthy, USGS Helena, MT, telephone, June 2015.
9. U.S. Department of Agriculture, Soil Conservation Service, *Hydrology of Bitterroot River Drainage, Based on Mountain Precipitation as Determined from Snow Survey and Precipitation Gages*, Bozeman, March 1972.
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11. U.S. Department of Homeland Security, Federal Emergency Management Agency, *Missoula County, Montana and Incorporated Areas, Flood Insurance Study*, July 6, 2015.
12. U.S. Department of Transportation Federal Highways Administration. April 2013. Evaluating Scour at Bridges – Fifth Edition. Hydraulic Engineering Circular No. 18, FHWA-HIF-12-003.
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21. U.S. Department of Interior, Geological Survey, *User's Manual for Program PeakFQ, Annual Flood-Frequency Analysis Using Bulletin 17B Guidelines*, Chapter 4 of Book 4, Section B, Techniques and Methods 4-B4, Flynn, Kirby and Hummel, 2006.

22. U.S. Department of Transportation Federal Highways Administration. April 2012. Evaluating Scour at Bridges – Fifth Edition. Hydraulic Engineering Circular No. 18, FHWA-HIF-12-112.
23. U.S. Department of Transportation Federal Highways Administration. September 2009. Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance – Third Edition, Volume 2. Hydraulic Engineering Circular No. 23, FHWA-NHI-09-112.
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25. University of Montana, Department of Geology, *Flood Plain Mapping and Planning Report for the 50- and 100-Year Intervals Flood Zones of the Bitterroot Valley, Montana*, K. Michael Nolan, July 1973.

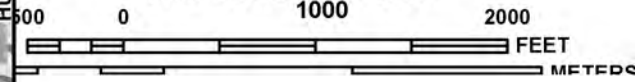
Appendix A – FEMA FIRM Map

Figure A-1. FEMA Flood Hazard Data through the Project Reach





MAP SCALE 1" = 1000'



PANEL 1455E

FIRM
FLOOD INSURANCE RATE MAP
MISSOULA COUNTY,
MONTANA
AND INCORPORATED AREAS

PANEL 1455 OF 1900
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MISSOULA CITY OF	300049	1455	E
MISSOULA COUNTY, Unincorporated Areas	300048	1455	E

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



MAP NUMBER
30063C1455E
MAP REVISED
JULY 6, 2015

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Appendix B – PeakFQ Output Files for USGS Gaging Station 12352500 through Water Year 1998



Program PeakFq
Version 7.1
Time
3/14/2014
13:44

U. S. GEOLOGICAL SURVEY
Annual peak flow frequency analysis

Seq.002.000
Run Date /
06/24/2015

--- PROCESSING OPTIONS ---

Plot option = None
Basin char output = None
Print option = Yes
Debug print = No
Input peaks listing = Long
Input peaks format = WATSTORE peak file

Input files used:

peaks (ascii) - U:\dmarch\Projects\McClay
Bridge\Hydrology\Bitterroot\PEAK.TXT
specifications - U:\dmarch\Projects\McClay
Bridge\Hydrology\Bitterroot\PKFQWPSF.TMP

Output file(s):

main - U:\dmarch\Projects\McClay
Bridge\Hydrology\Bitterroot\PEAK.PRT



```

Program PeakFq          U. S. GEOLOGICAL SURVEY          Seq.001.001
Version 7.1             Annual peak flow frequency analysis  Run Date /
Time                                                            06/24/2015
3/14/2014
13:44
  
```

Station - 12352500 Bitterroot River near Missoula MT

I N P U T D A T A S U M M A R Y

```

Number of peaks in record          =      14
Peaks not used in analysis         =       0
Systematic peaks in analysis       =     14
Historic peaks in analysis         =       0
Beginning Year                     =    1899
Ending Year                         =    1998
Historical Period Length           =     100
Generalized skew                   =   -0.221
      Standard error                =     0.640
      Mean Square error              =     0.410
Skew option                         =    WEIGHTED
Gage base discharge                 =       0.0
User supplied high outlier threshold =   38300.0
User supplied PILF (LO) criterion  =     --
Plotting position parameter        =     0.00
Type of analysis                   =    BULL.17B
PILF (LO) Test Method              =     GBT
Perception Thresholds              =   Not Applicable
Interval Data                       =   Not Applicable
  
```

```

***** NOTICE -- Preliminary machine computations. *****
***** User responsible for assessment and interpretation. *****
  
```

```

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.          0.0
WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION.    5263.9
*WCF161I-USER HIGH OUTLIER CRITERION REPLACES 17B.       38300.0  43084.8
WCF165I-HIGH OUTLIERS AND HISTORIC PEAKS ABOVE HHBASE.   1  0  38300.0
*WCF169I-ACCEPTED HISTORIC PERIOD GTR THAN T.            100.0   70.0
  
```

Kendall's Tau Parameters

	TAU	P-VALUE	MEDIAN SLOPE	No. of PEAKS
SYSTEMATIC RECORD	-0.231	0.274	-742.857	14



Program PeakFq U. S. GEOLOGICAL SURVEY Seq.001.002
 Version 7.1 Annual peak flow frequency analysis Run Date /
 Time
 3/14/2014 06/24/2015
 13:44

Station - 12352500 Bitterroot River near Missoula MT

ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.1778	0.2063	-0.035
BULL.17B ESTIMATE	0.0	1.0000	4.1510	0.1756	-0.387
BULL.17B ESTIMATE OF MSE OF AT-SITE SKEW			0.0745		

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL EXCEEDANCE PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	<-- FOR BULLETIN 17B ESTIMATES --> VARIANCE OF EST.	95% CONFIDENCE LOWER	INTERVALS UPPER
0.9950	4316.	4361.	----	2356.0	5999.0
0.9900	4934.	4927.	----	2858.0	6668.0
0.9500	6984.	6862.	----	4689.0	8827.0
0.9000	8316.	8179.	----	5977.0	10220.0
0.8000	10170.	10110.	----	7838.0	12230.0
0.6667	12160.	12300.	----	9828.0	14530.0
0.5000	14530.	15100.	----	12080.0	17590.0
0.4292	15600.	16440.	----	13030.0	19100.0
0.2000	20000.	22480.	----	16620.0	26090.0
0.1000	23310.	27630.	----	19050.0	32030.0
0.0400	27160.	34390.	----	21690.0	39560.0
0.0200	29800.	39590.	----	23420.0	45080.0
0.0100	32290.	44910.	----	25010.0	50500.0
0.0050	34640.	50390.	----	26470.0	55820.0
0.0020	37580.	57900.	----	28260.0	62720.0



Program PeakFq
 Version 7.1
 Time
 3/14/2014
 13:44

U. S. GEOLOGICAL SURVEY
 Annual peak flow frequency analysis

Seq.001.003
 Run Date /
 06/24/2015

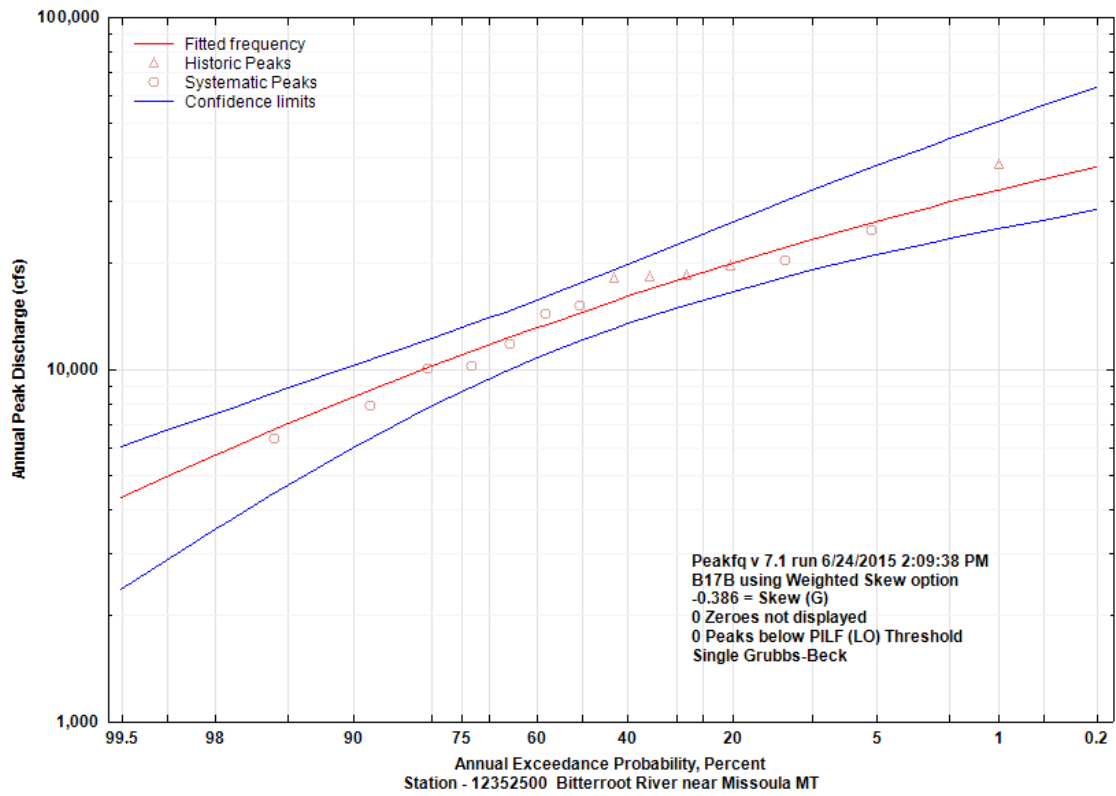
Station - 12352500 Bitterroot River near Missoula MT

I N P U T D A T A L I S T I N G

WATER YEAR	PEAK VALUE	PEAKFQ CODES	REMARKS
1899	38300.0	H	
1900	18200.0	H	
1901	18400.0	H	
1903	19700.0	H	
1904	18300.0	H	
1990	10200.0		
1991	15200.0		
1992	6370.0		
1993	11800.0		
1994	7900.0		
1995	14400.0		
1996	20300.0		
1997	24800.0		
1998	10000.0		

Explanation of peak discharge qualification codes

PeakFQ CODE	NWIS CODE	DEFINITION
D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
X	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
H	7	Historic peak
- Minus-flagged discharge -- Not used in computation		
-8888.0 -- No discharge value given		
- Minus-flagged water year -- Historic peak used in computation		



Appendix C – PeakFQ Output Files for USGS Station 12352500 for All Available Peak Flows



Program PeakFq
Version 7.1
Time
3/14/2014
13:12

U. S. GEOLOGICAL SURVEY
Annual peak flow frequency analysis

Seq.002.000
Run Date /
06/24/2015

--- PROCESSING OPTIONS ---

Plot option = None
Basin char output = None
Print option = Yes
Debug print = No
Input peaks listing = Long
Input peaks format = WATSTORE peak file

Input files used:

peaks (ascii) - U:\dmarch\Projects\McClay
Bridge\Hydrology\Bitterroot\PEAK.TXT
specifications - U:\dmarch\Projects\McClay
Bridge\Hydrology\Bitterroot\PKFQWPSF.TMP

Output file(s):

main - U:\dmarch\Projects\McClay
Bridge\Hydrology\Bitterroot\PEAK.PRT



Program PeakFq
Version 7.1
Time
3/14/2014
13:12

U. S. GEOLOGICAL SURVEY
Annual peak flow frequency analysis

Seq.001.001
Run Date /
06/24/2015

Station - 12352500 Bitterroot River near Missoula MT

I N P U T D A T A S U M M A R Y

Number of peaks in record	=	30
Peaks not used in analysis	=	0
Systematic peaks in analysis	=	30
Historic peaks in analysis	=	0
Beginning Year	=	1899
Ending Year	=	2014
Historical Period Length	=	116
Generalized skew	=	-0.221
Standard error	=	0.640
Mean Square error	=	0.410
Skew option	=	WEIGHTED
Gage base discharge	=	0.0
User supplied high outlier threshold	=	38300.0
User supplied PILF (LO) criterion	=	--
Plotting position parameter	=	0.00
Type of analysis		BULL.17B
PILF (LO) Test Method		GBT
Perception Thresholds	=	Not Applicable
Interval Data	=	Not Applicable

***** NOTICE -- Preliminary machine computations. *****
***** User responsible for assessment and interpretation. *****

WCF134I-NO SYSTEMATIC PEAKS WERE BELOW GAGE BASE.		0.0
WCF195I-NO LOW OUTLIERS WERE DETECTED BELOW CRITERION.		5329.7
*WCF161I-USER HIGH OUTLIER CRITERION REPLACES 17B.	38300.0	39951.4
WCF165I-HIGH OUTLIERS AND HISTORIC PEAKS ABOVE HHBASE.	1 0	38300.0

Kendall's Tau Parameters

	TAU	P-VALUE	MEDIAN SLOPE	No. of PEAKS
SYSTEMATIC RECORD	-0.025	0.858	-16.000	30

Program PeakFq
Version 7.1
Time
3/14/2014
13:12

U. S. GEOLOGICAL SURVEY
Annual peak flow frequency analysis

Seq.001.002
Run Date /
06/24/2015

Station - 12352500 Bitterroot River near Missoula MT



ANNUAL FREQUENCY CURVE PARAMETERS -- LOG-PEARSON TYPE III

	FLOOD BASE		LOGARITHMIC		
	DISCHARGE	EXCEEDANCE PROBABILITY	MEAN	STANDARD DEVIATION	SKEW
SYSTEMATIC RECORD	0.0	1.0000	4.1641	0.1707	-0.104
BULL.17B ESTIMATE	0.0	1.0000	4.1534	0.1565	-0.395
BULL.17B ESTIMATE OF MSE OF AT-SITE SKEW			0.0661		

ANNUAL FREQUENCY CURVE -- DISCHARGES AT SELECTED EXCEEDANCE PROBABILITIES

ANNUAL EXCEEDANCE PROBABILITY	BULL.17B ESTIMATE	SYSTEMATIC RECORD	<-- FOR BULLETIN 17B ESTIMATES -->		
			VARIANCE OF EST.	95% CONFIDENCE LOWER	INTERVALS UPPER
0.9950	4928.	5103.	----	3591.0	6097.0
0.9900	5555.	5676.	----	4172.0	6747.0
0.9500	7581.	7558.	----	6135.0	8807.0
0.9000	8860.	8782.	----	7418.0	10100.0
0.8000	10610.	10510.	----	9187.0	11900.0
0.6667	12440.	12390.	----	11020.0	13870.0
0.5000	14580.	14690.	----	13060.0	16310.0
0.4292	15530.	15760.	----	13930.0	17450.0
0.2000	19370.	20350.	----	17250.0	22420.0
0.1000	22190.	24030.	----	19520.0	26340.0
0.0400	25410.	28620.	----	22010.0	31030.0
0.0200	27590.	31990.	----	23650.0	34340.0
0.0100	29610.	35320.	----	25140.0	37470.0
0.0050	31510.	38640.	----	26520.0	40480.0
0.0020	33860.	43030.	----	28200.0	44270.0



Program PeakFq
 Version 7.1
 Time
 3/14/2014
 13:12

U. S. GEOLOGICAL SURVEY
 Annual peak flow frequency analysis

Seq.001.003
 Run Date /
 06/24/2015

Station - 12352500 Bitterroot River near Missoula MT

I N P U T D A T A L I S T I N G

WATER YEAR	PEAK VALUE	PEAKFQ CODES	REMARKS
1899	38300.0	H	
1900	18200.0	H	
1901	18400.0	H	
1903	19700.0	H	
1904	18300.0	H	
1990	10200.0		
1991	15200.0		
1992	6370.0		
1993	11800.0		
1994	7900.0		
1995	14400.0		
1996	20300.0		
1997	24800.0		
1998	10000.0		
1999	15700.0		
2000	8550.0		
2001	8610.0		
2002	14900.0		
2003	21600.0		
2004	8830.0		
2005	9100.0		
2006	17500.0		
2007	12200.0		
2008	19600.0		
2009	17900.0		
2010	13900.0		
2011	18600.0		
2012	17600.0		
2013	14900.0		
2014	17900.0		

Explanation of peak discharge qualification codes

PeakFQ CODE	NWIS CODE	DEFINITION
D	3	Dam failure, non-recurrent flow anomaly
G	8	Discharge greater than stated value
X	3+8	Both of the above
L	4	Discharge less than stated value
K	6 OR C	Known effect of regulation or urbanization
H	7	Historic peak
-		Minus-flagged discharge -- Not used in computation
-		-8888.0 -- No discharge value given
-		Minus-flagged water year -- Historic peak used in computation



Program PeakFq
 Version 7.1
 Time
 3/14/2014
 13:12

U. S. GEOLOGICAL SURVEY
 Annual peak flow frequency analysis

Seq.001.004
 Run Date /
 06/24/2015

Station - 12352500 Bitterroot River near Missoula MT

EMPIRICAL FREQUENCY CURVES -- WEIBULL PLOTTING POSITIONS

WATER YEAR	RANKED DISCHARGE	SYSTEMATIC RECORD	B17B ESTIMATE
1899	38300.0	0.0323	0.0085
1997	24800.0	0.0645	0.0298
2003	21600.0	0.0968	0.0637
1996	20300.0	0.1290	0.0976
1903	19700.0	0.1613	0.1314
2008	19600.0	0.1935	0.1653
2011	18600.0	0.2258	0.1992
1901	18400.0	0.2581	0.2331
1904	18300.0	0.2903	0.2670
1900	18200.0	0.3226	0.3009
2009	17900.0	0.3548	0.3348
2014	17900.0	0.3871	0.3687
2012	17600.0	0.4194	0.4026
2006	17500.0	0.4516	0.4365
1999	15700.0	0.4839	0.4704
1991	15200.0	0.5161	0.5043
2002	14900.0	0.5484	0.5382
2013	14900.0	0.5806	0.5721
1995	14400.0	0.6129	0.6060
2010	13900.0	0.6452	0.6398
2007	12200.0	0.6774	0.6737
1993	11800.0	0.7097	0.7076
1990	10200.0	0.7419	0.7415
1998	10000.0	0.7742	0.7754
2005	9100.0	0.8065	0.8093
2004	8830.0	0.8387	0.8432
2001	8610.0	0.8710	0.8771
2000	8550.0	0.9032	0.9110
1994	7900.0	0.9355	0.9449
1992	6370.0	0.9677	0.9788



End PeakFQ analysis.
 Stations processed : 1
 Number of errors : 0
 Stations skipped : 0
 Station years : 30

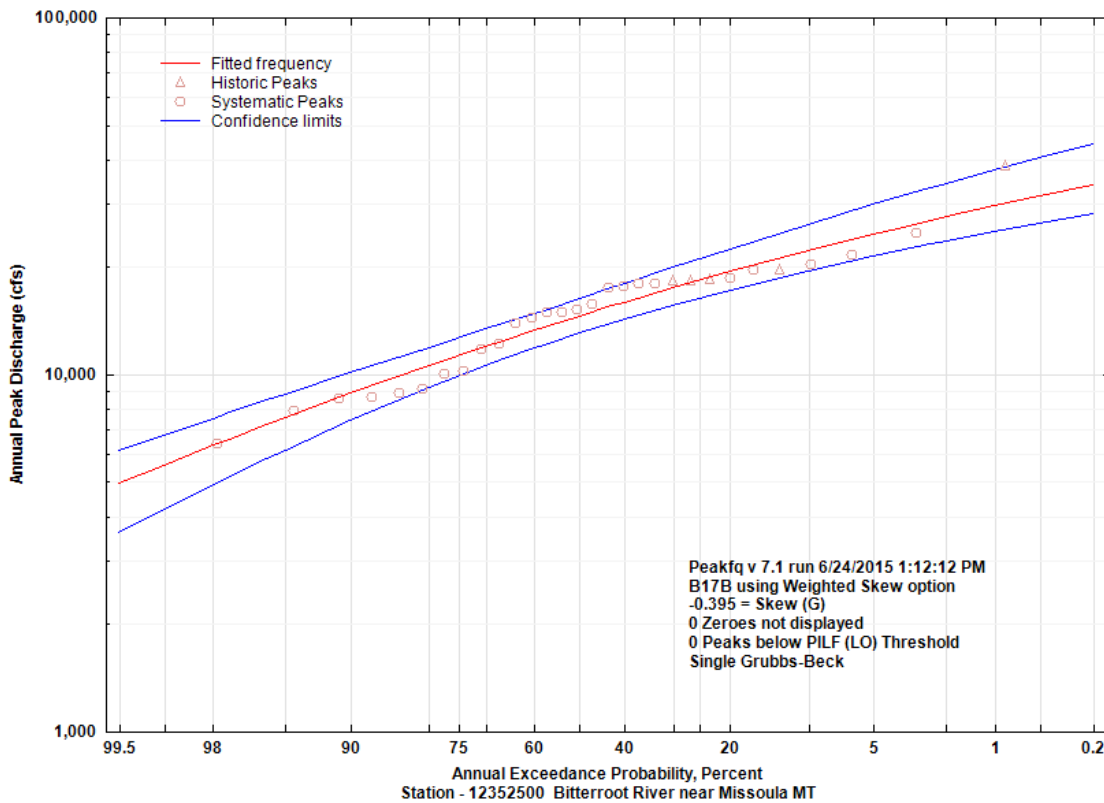
Data records may have been ignored for the stations listed below.
 (Card type must be Y, Z, N, H, I, 2, 3, 4, or *.)
 (2, 4, and * records are ignored.)

For the station below, the following records were ignored:

FINISHED PROCESSING STATION: 12352500 USGS Bitterroot River near
 Missoul

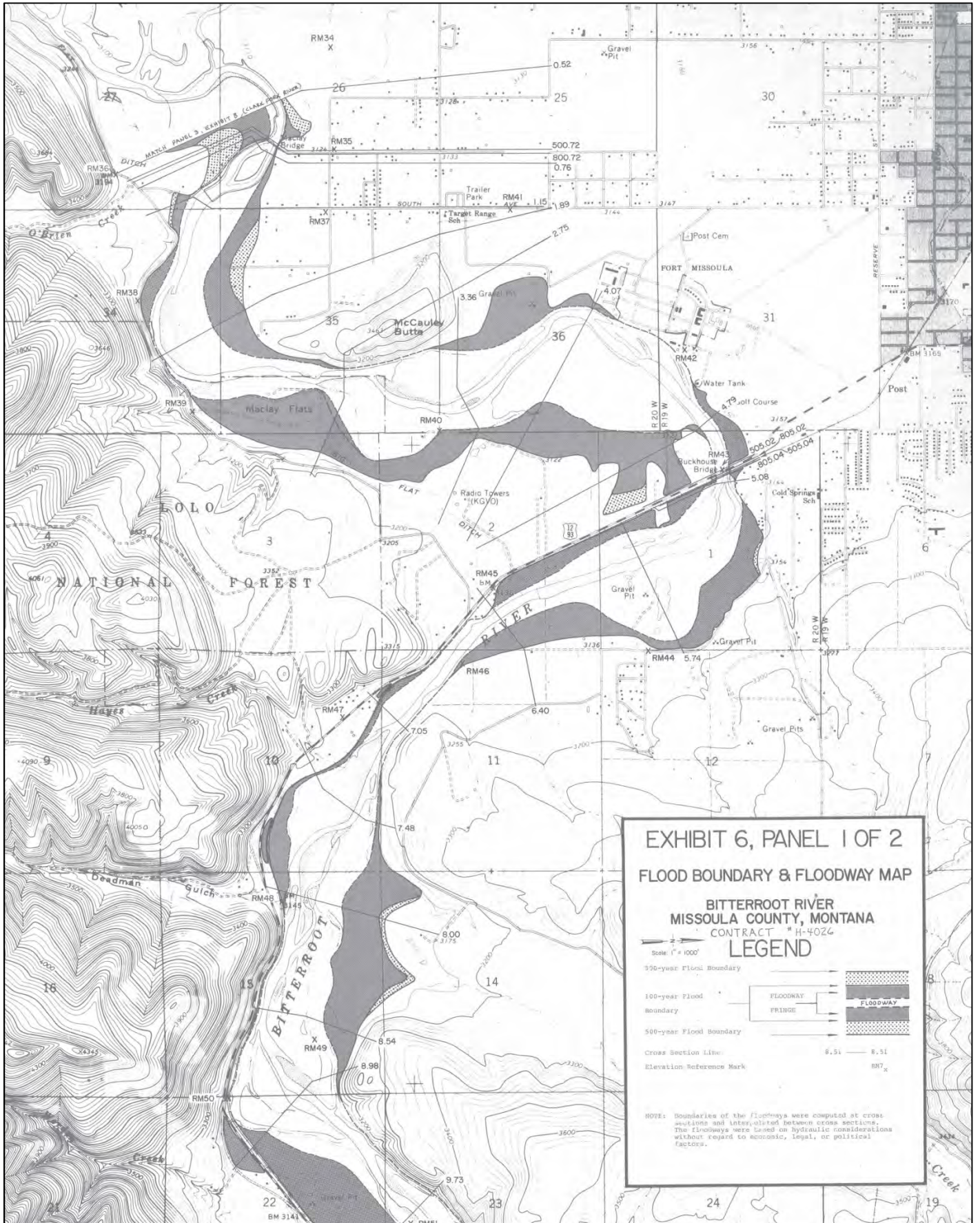
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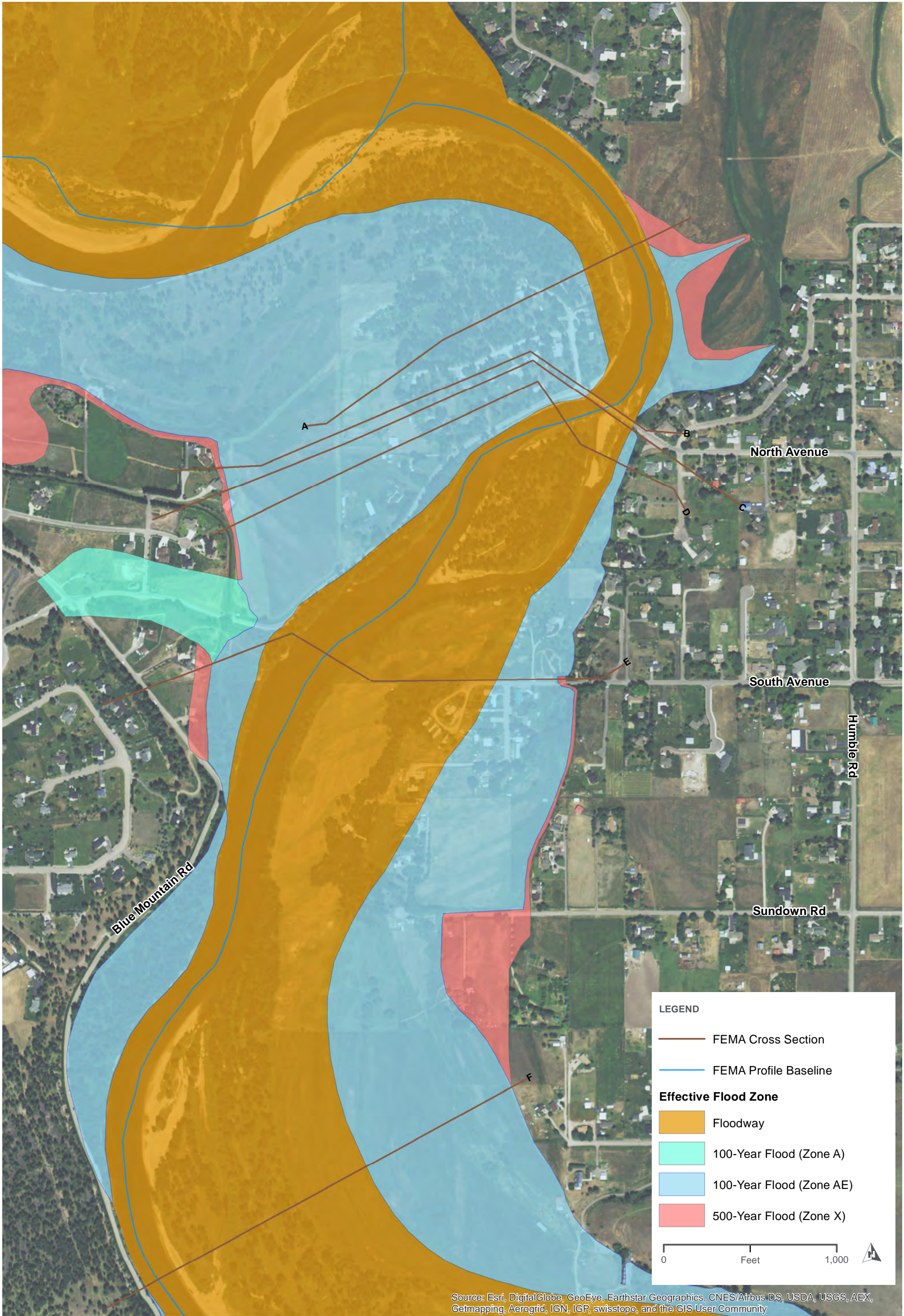
FINISHED PROCESSING STATION:



Appendix D – Hydraulic Analysis Supplemental Figures

Figure D-1. Flood Boundary and Floodway Map from the original Bitterroot Study





LEGEND

- FEMA Cross Section
- FEMA Profile Baseline

Effective Flood Zone

- Floodway
- 100-Year Flood (Zone A)
- 100-Year Flood (Zone AE)
- 500-Year Flood (Zone X)

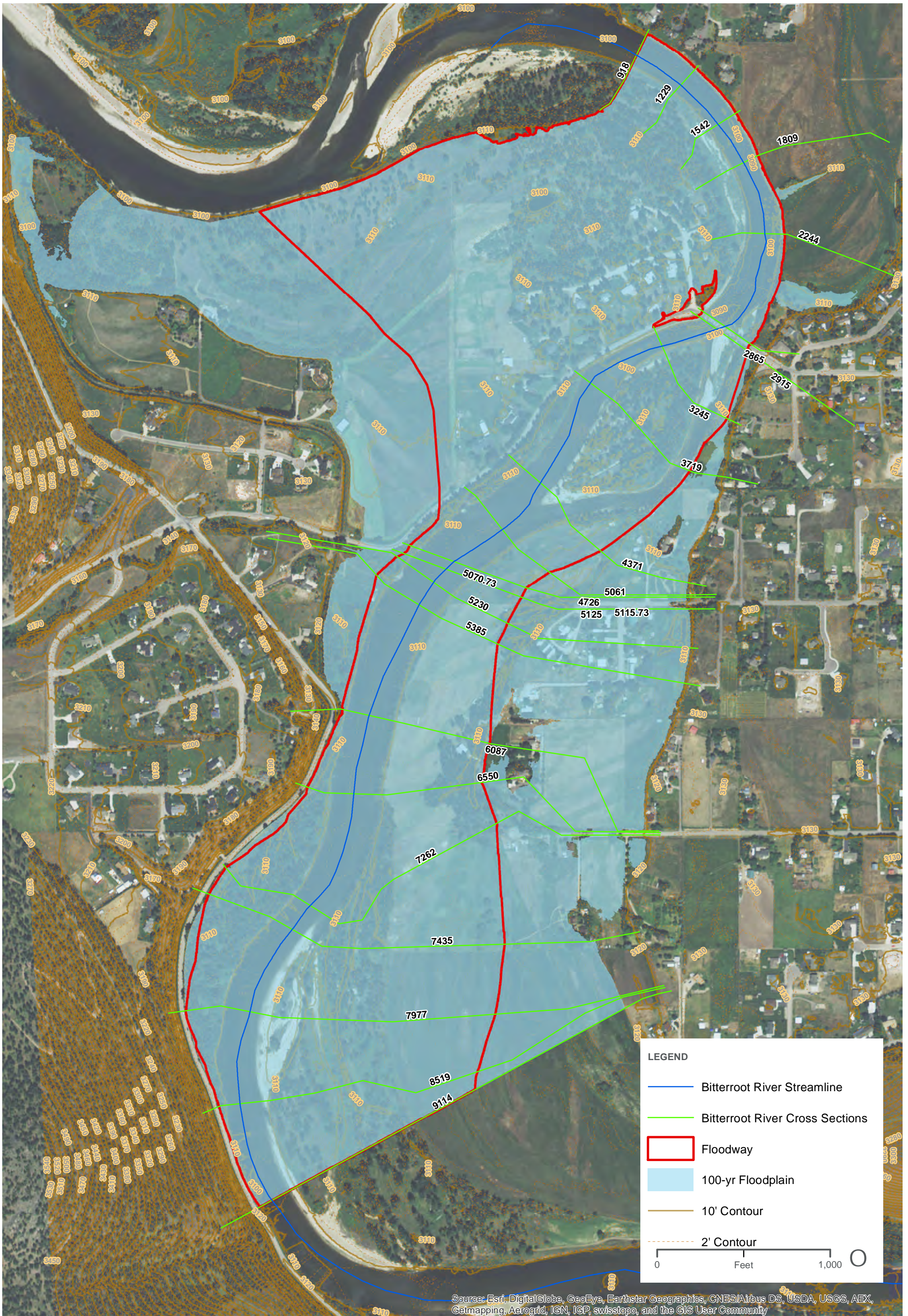
0 Feet 1,000

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community







SOUTH AVENUE BRIDGE
UPN 6296

FIGURE D-2. FLOOD BOUNDARY AND FLOODWAY MAP FROM THE ORIGINAL BITTERROOT STUDY





LEGEND

-  Bitterroot River Streamline
-  Bitterroot River Cross Sections
-  Floodway
-  100-yr Floodplain
-  10' Contour
-  2' Contour

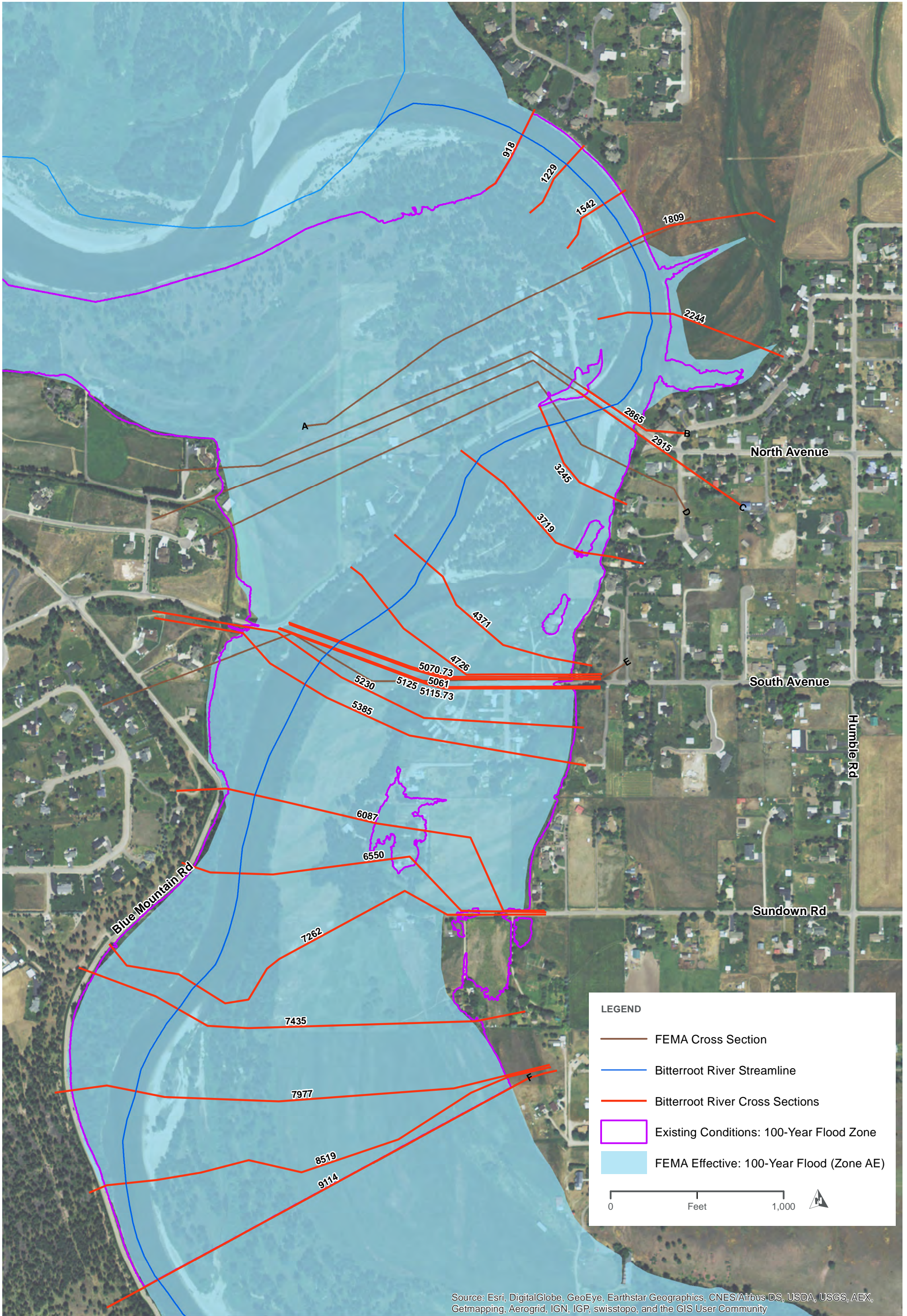
0 Feet 1,000

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

SOUTH AVENUE BRIDGE
UPN 6296

FIGURE D-3. HYDRAULIC WORKMAP - EXISTING CONDITIONS





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

**SOUTH AVENUE BRIDGE
UPN 6296**

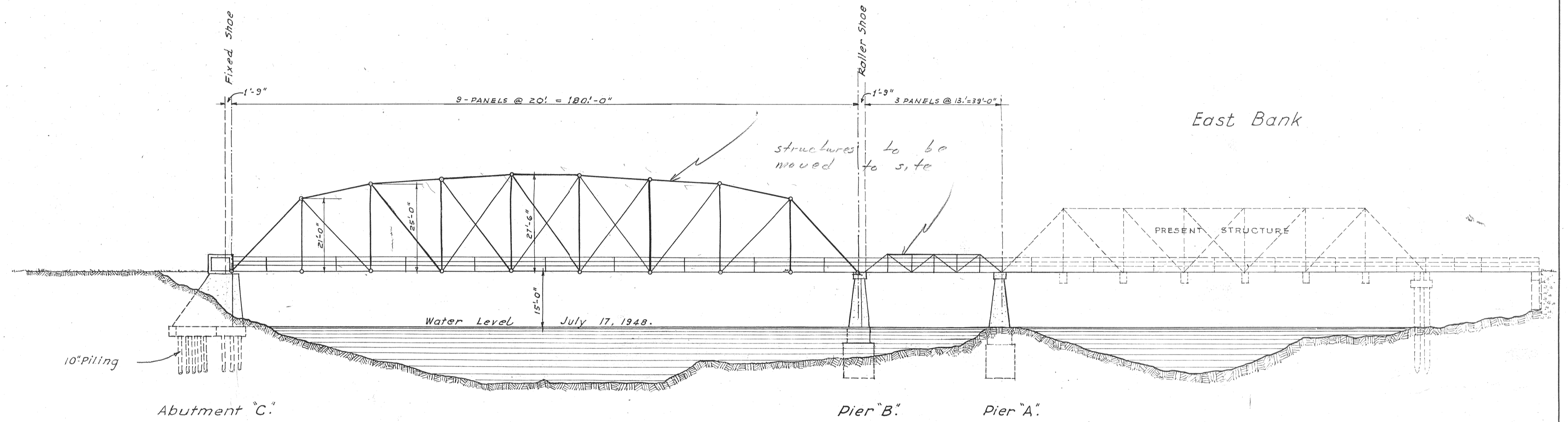
FIGURE D-4. EXISTING CONDITIONS FLOODPLAIN COMPARISON



Appendix E – Maclay Bridge Plans

West Bank

East Bank



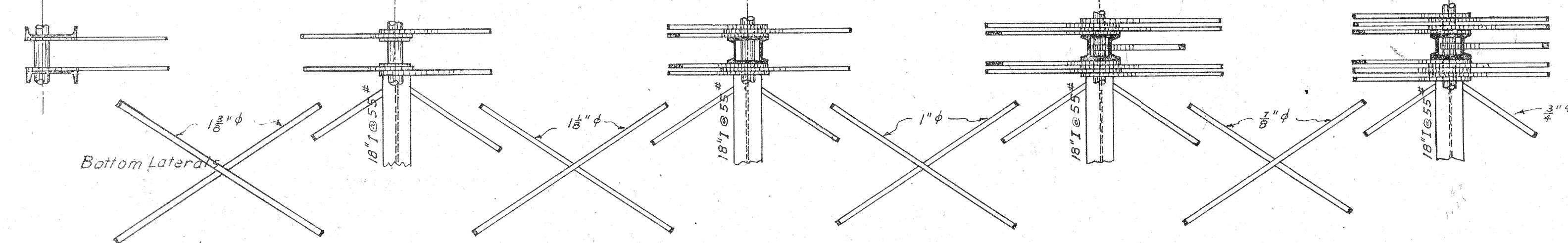
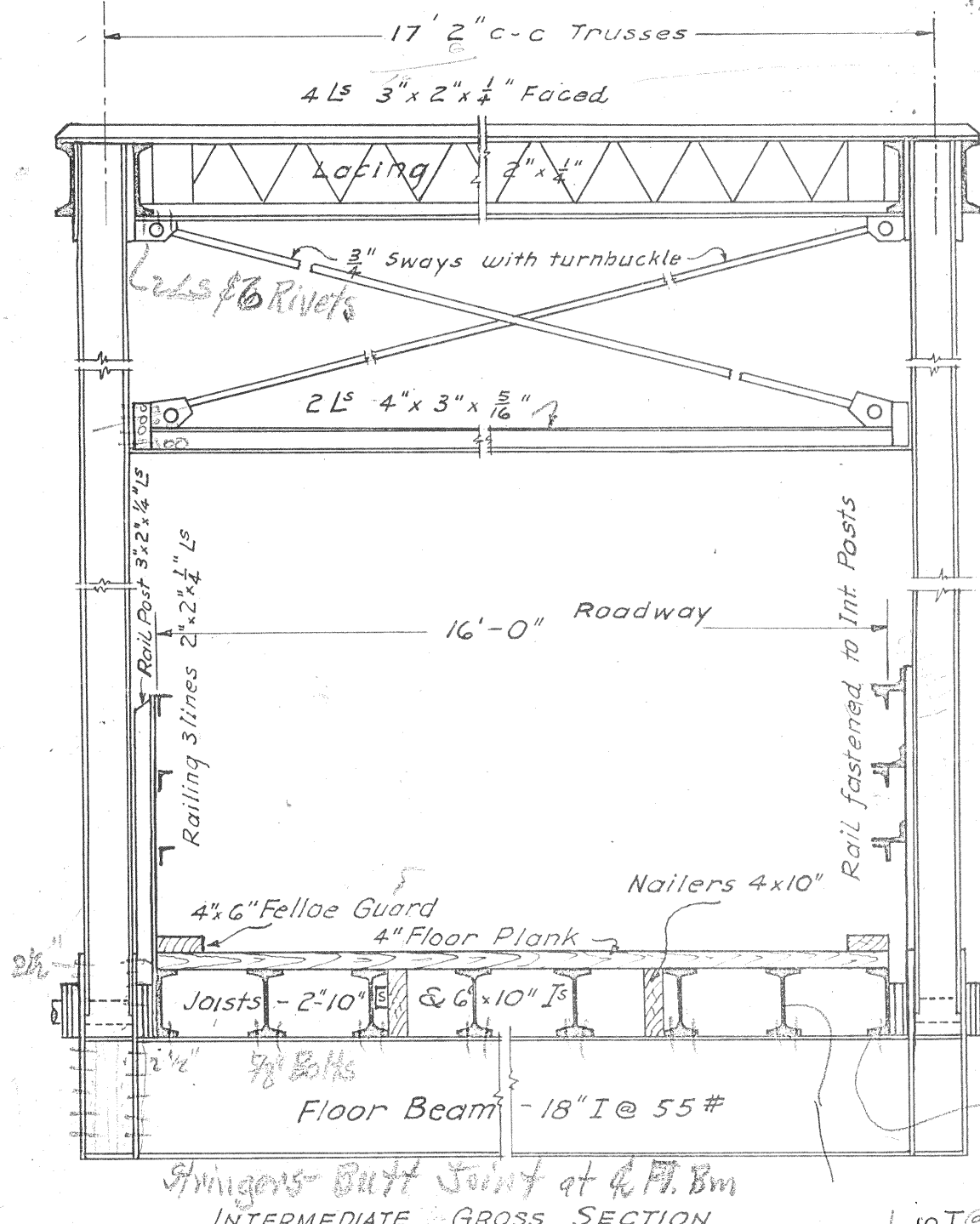
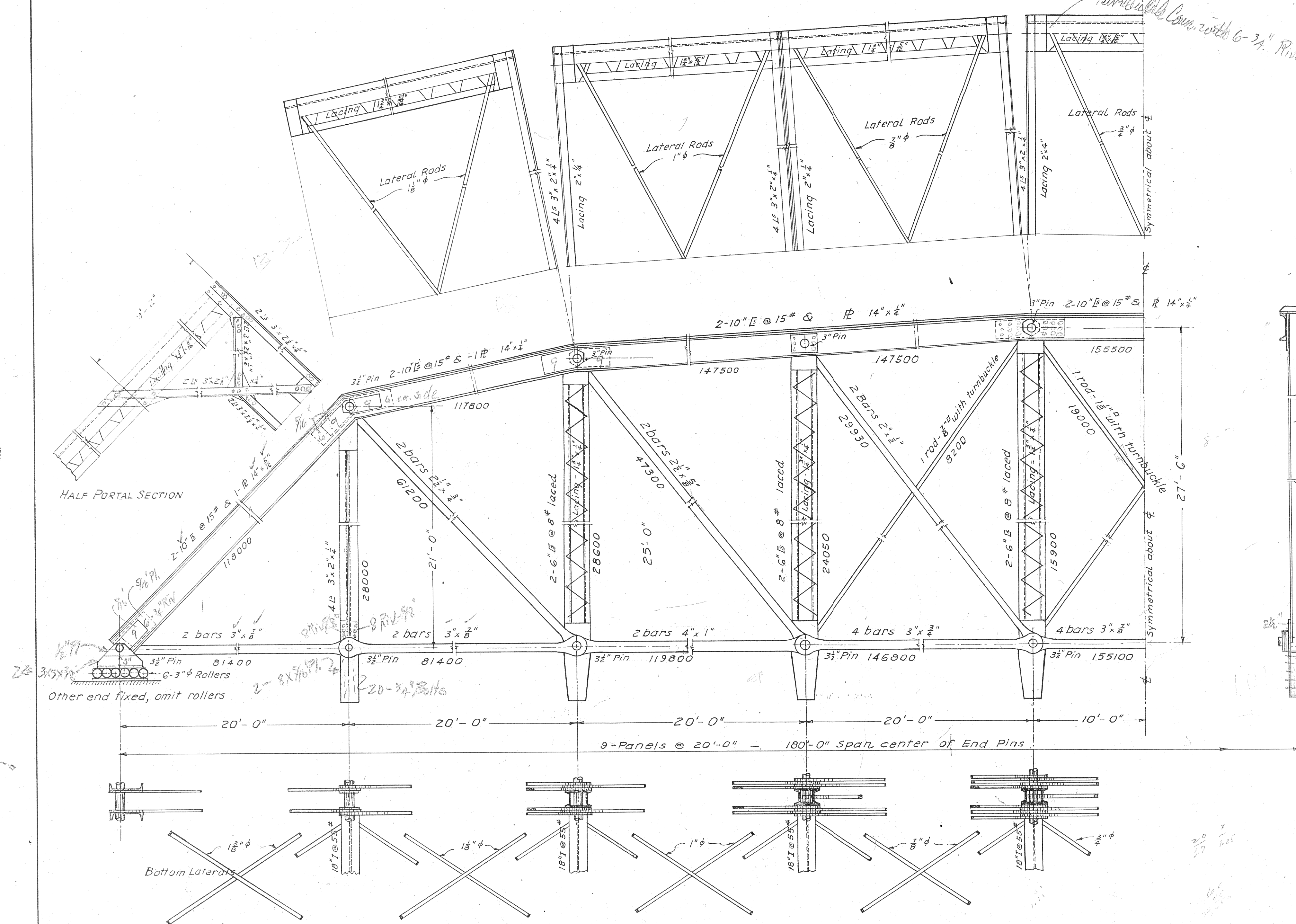
PROFILE OF PROPOSED
MACLAY BRIDGE
MISSOULA COUNTY
MONTANA

SHEET 1. OF 3.

E.C. SCHARN
County Surveyor

Top Lateral Rods to be fastened to Top Chord with Standard Connection Plates

Turnbuckle Conn. with 6-3/4" Ribs



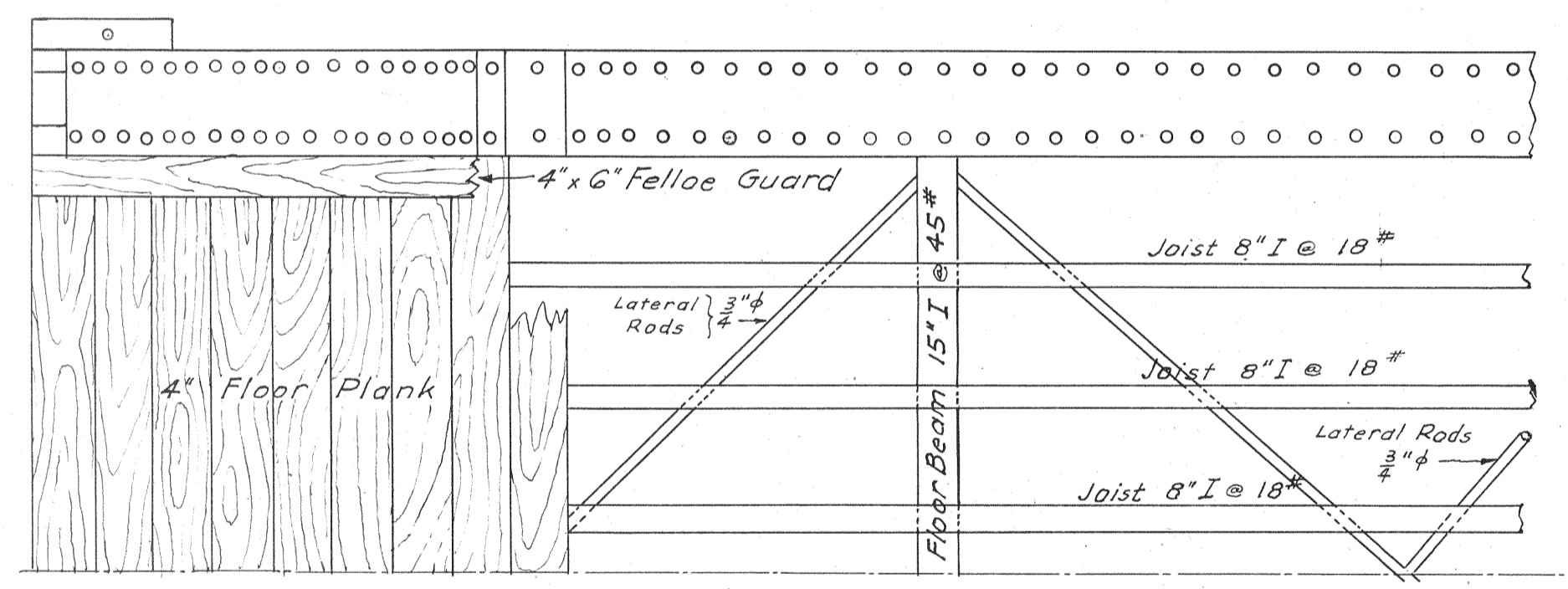
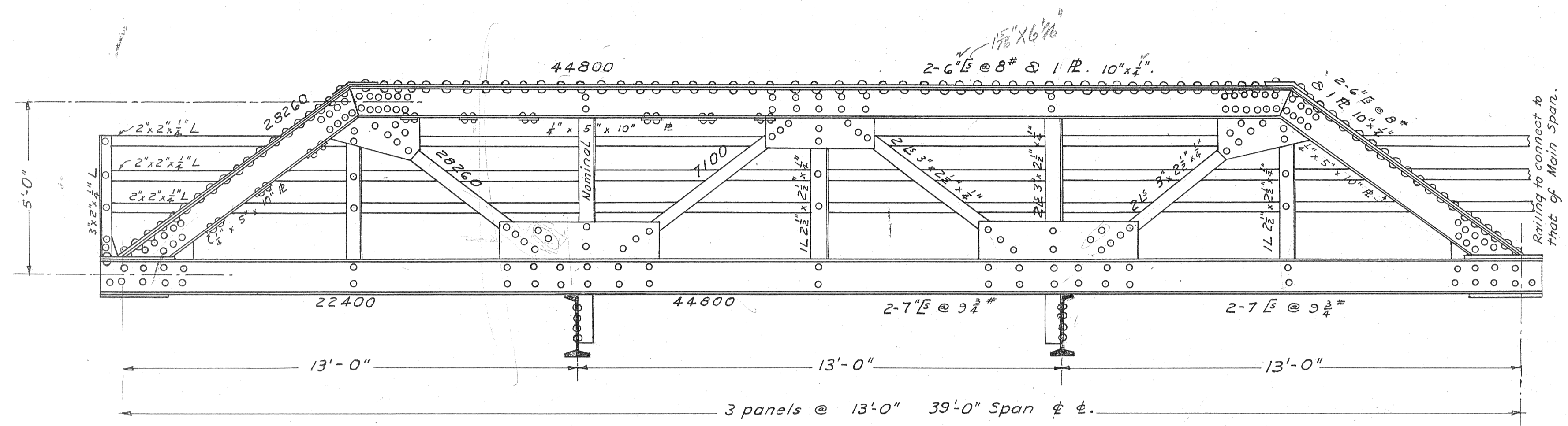
Bottom Lateral Rods to be fastened to Floor Beams with Standard Connection Plates.

PROFILE OF PROPOSED
MACLAY BRIDGE
 MISSOULA COUNTY
 MONTANA
 E.C. SCHARN
 County Surveyor.

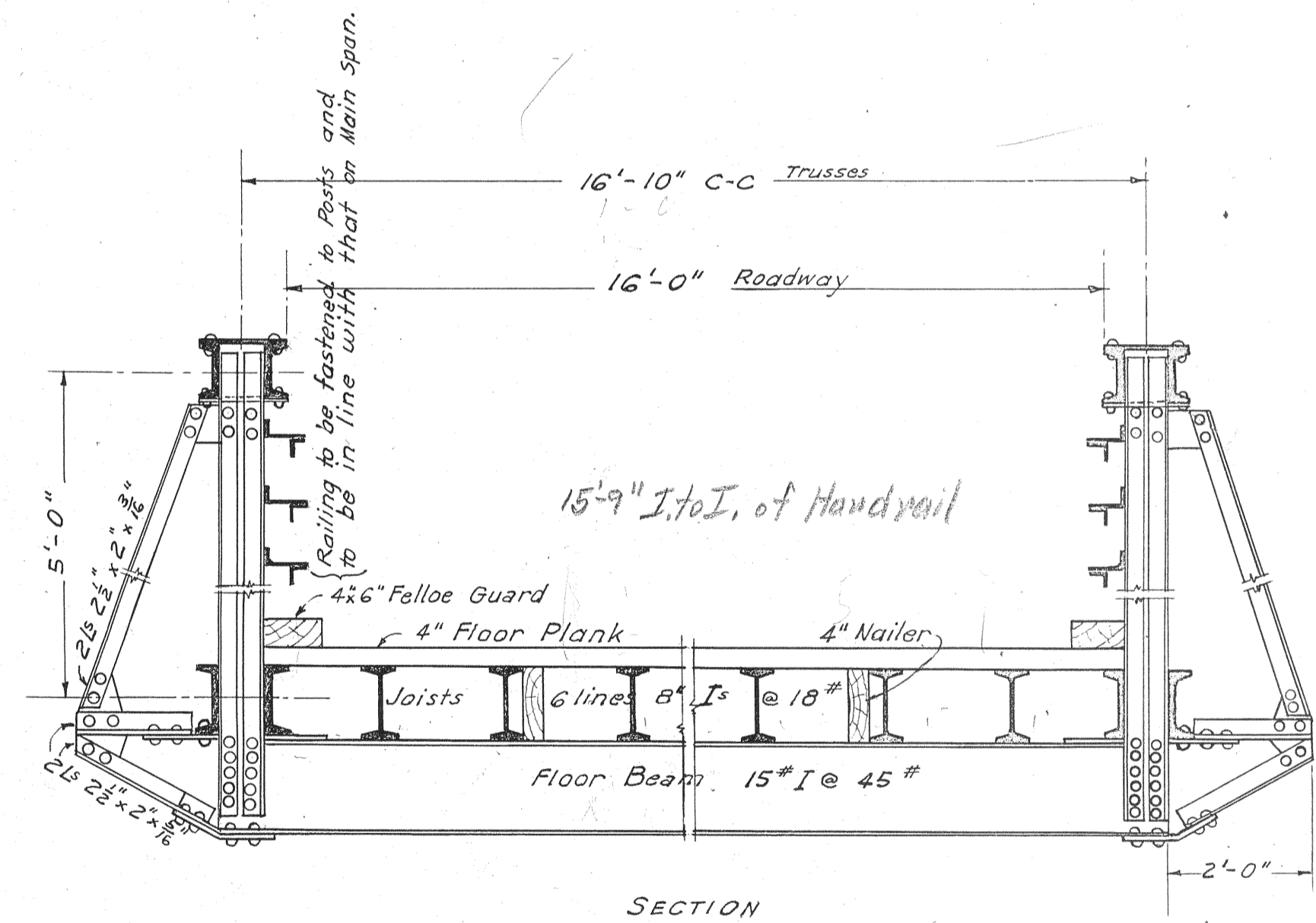
SHEET 2

OF 3.

4-7
 18-11
 4-2
 28-8
 98.7
 28-3
 87.1



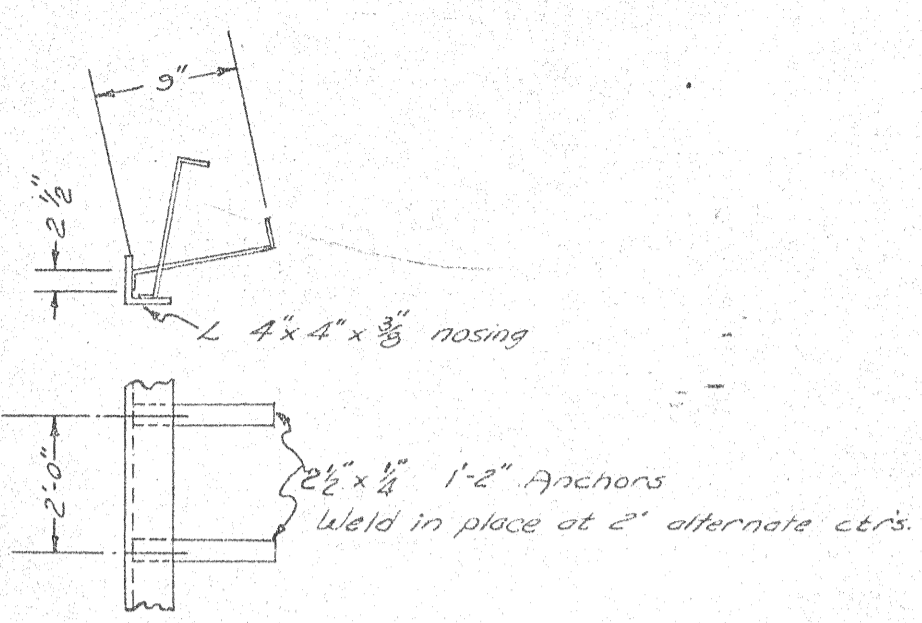
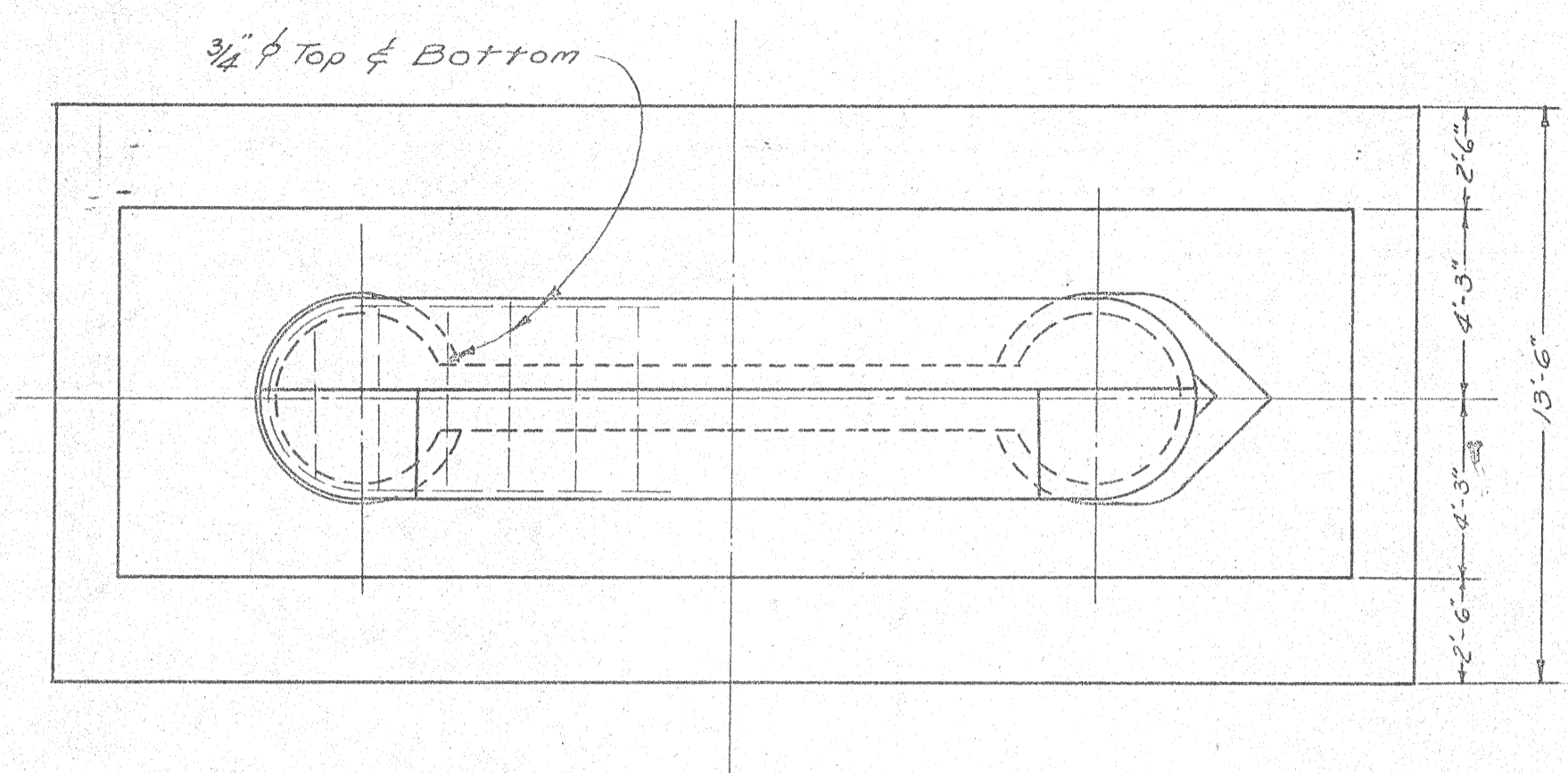
ONE QUARTER OF FLOOR PLAN



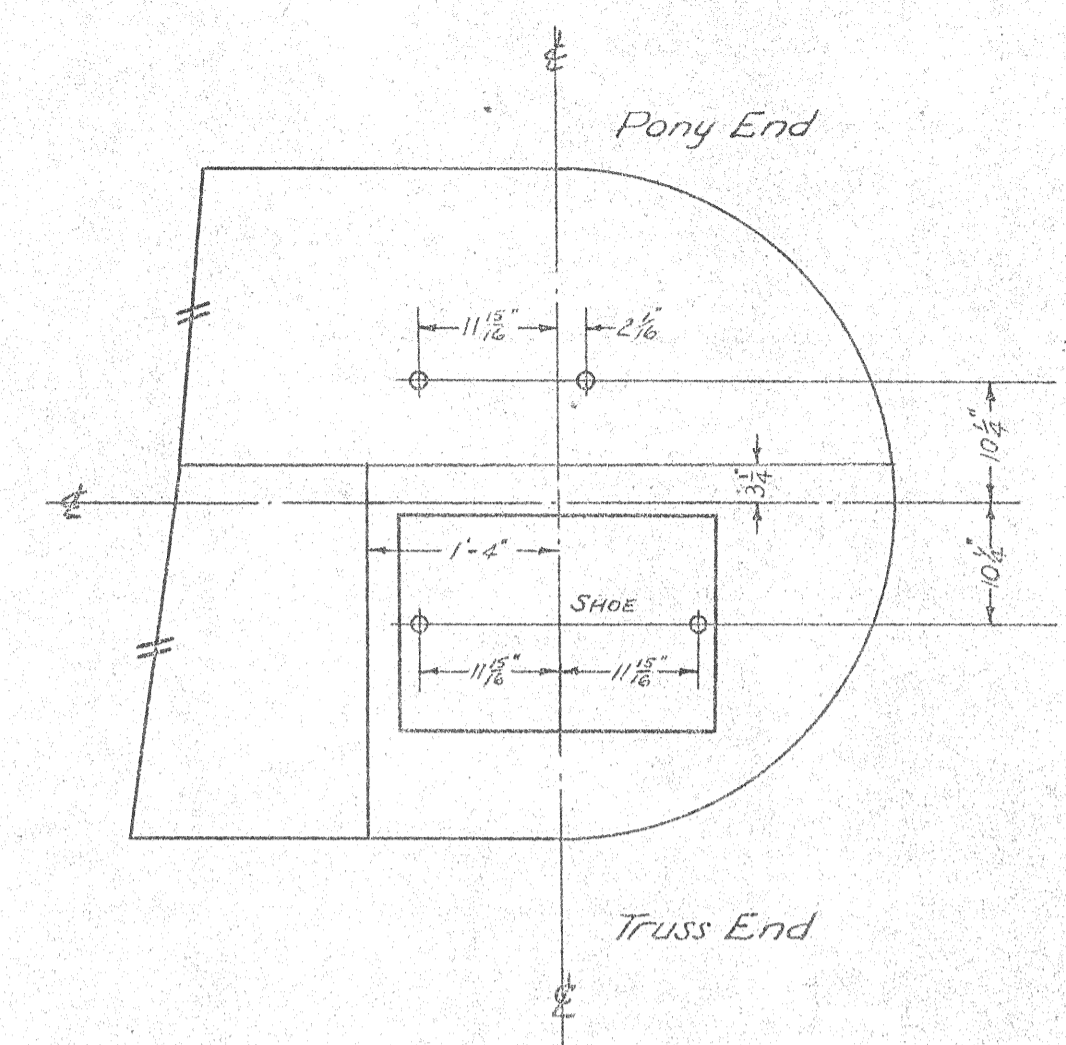
SECTION

PROFILE OF PROPOSED
MACLAY BRIDGE
 MISSOULA COUNTY
 MONTANA
 E.C. SCHARN
 County Surveyor

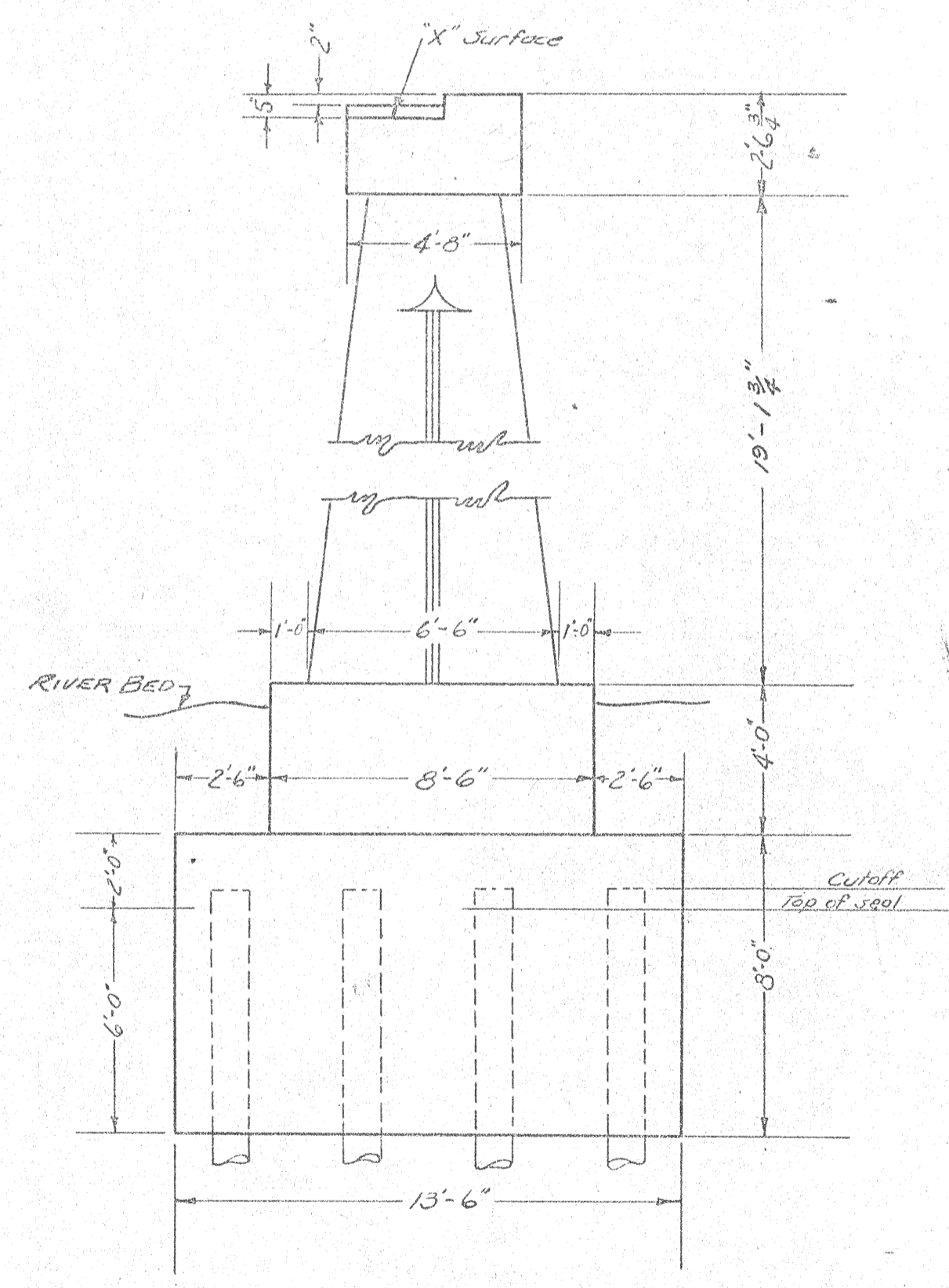
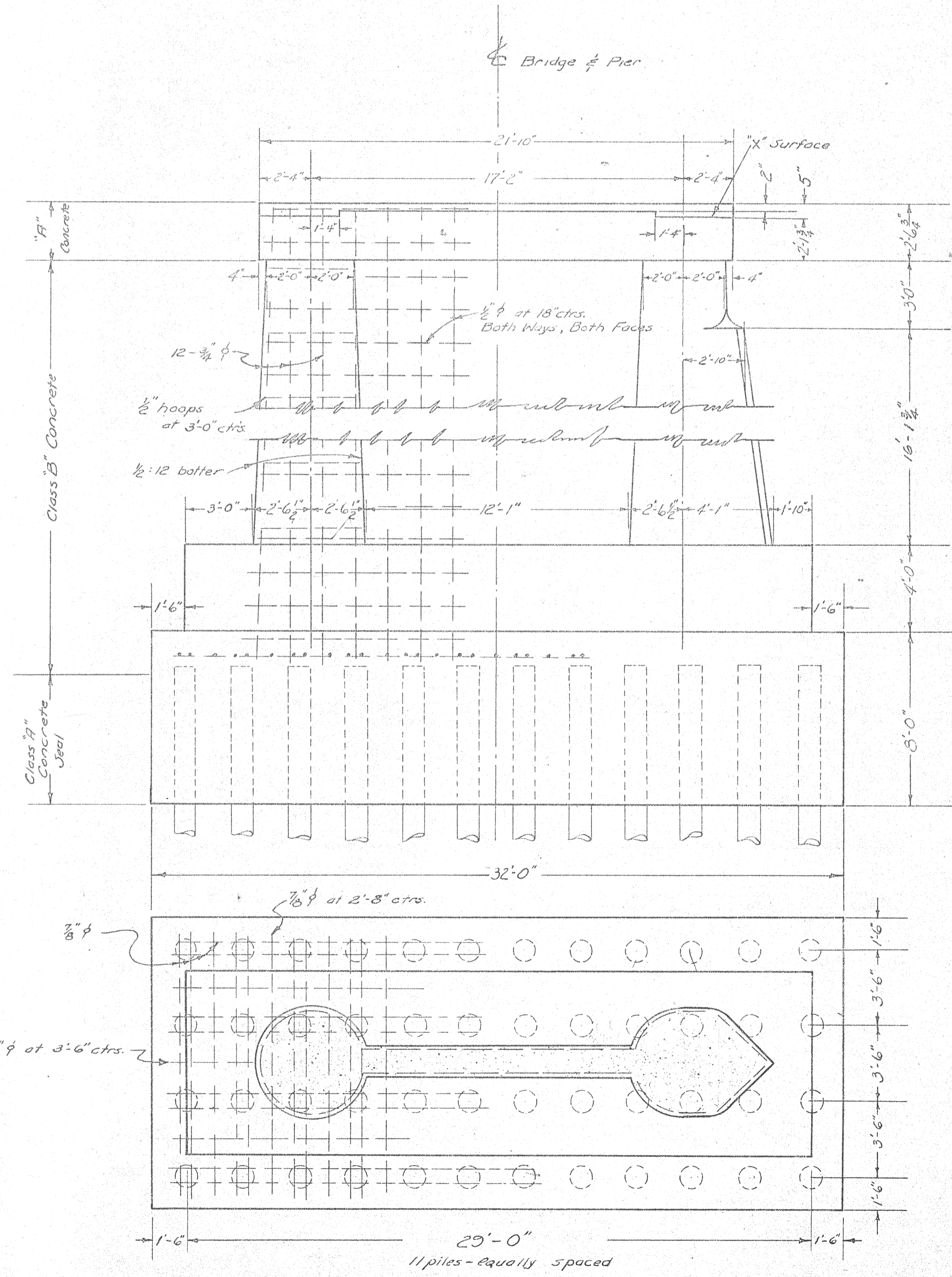
SHEET 3 OF 3



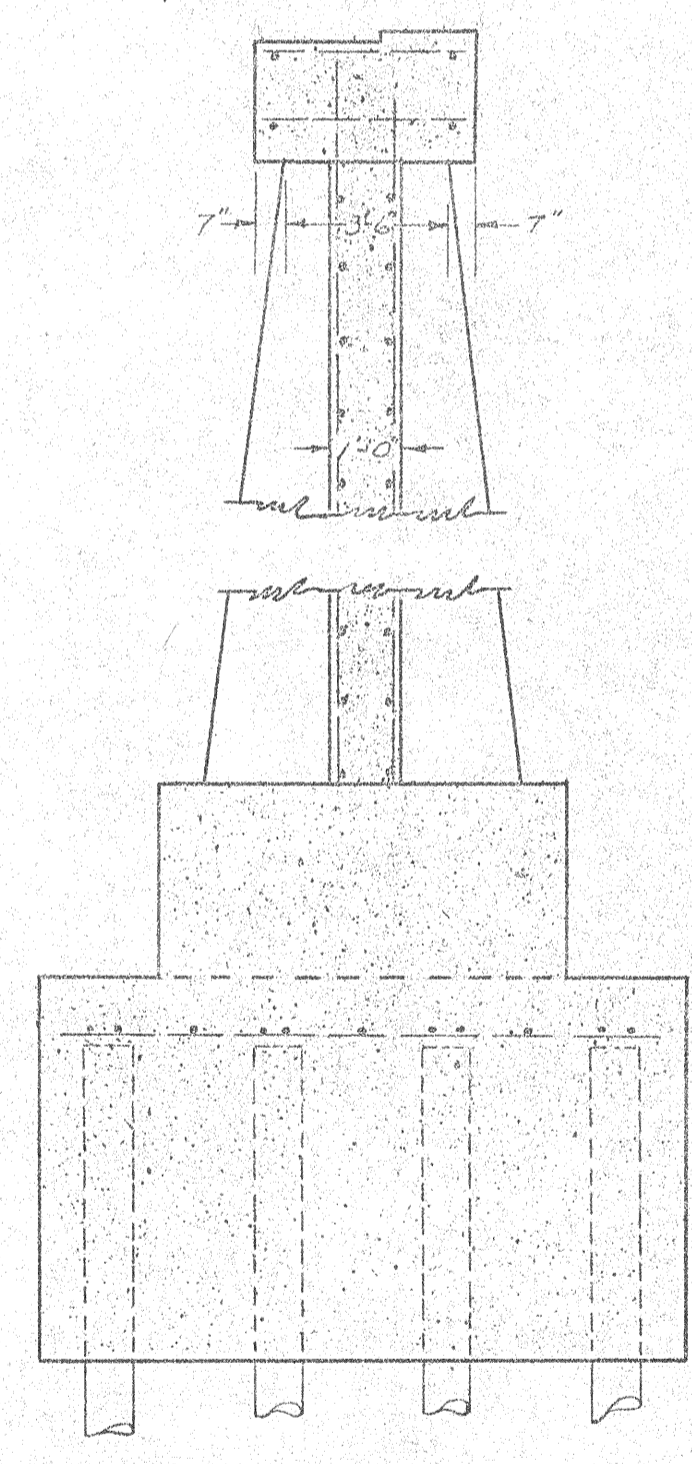
NOSING ANGLE DETAIL
SCALE 1"=1'



ANCHOR BOLT DETAIL
SCALE $\frac{3}{4}$ "=1'



UPSTREAM ELEVATION
SCALE $\frac{1}{4}$ "=1'



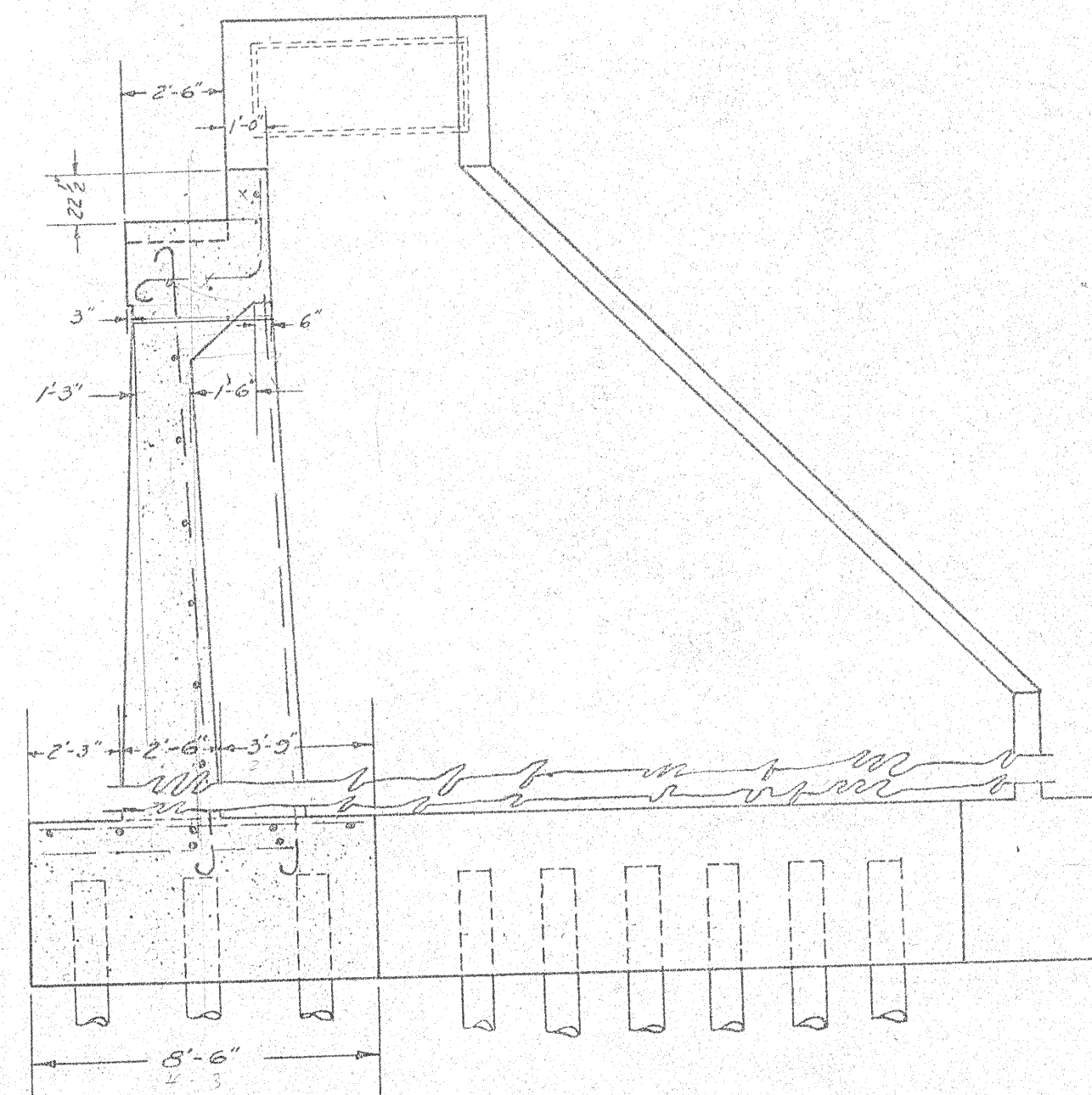
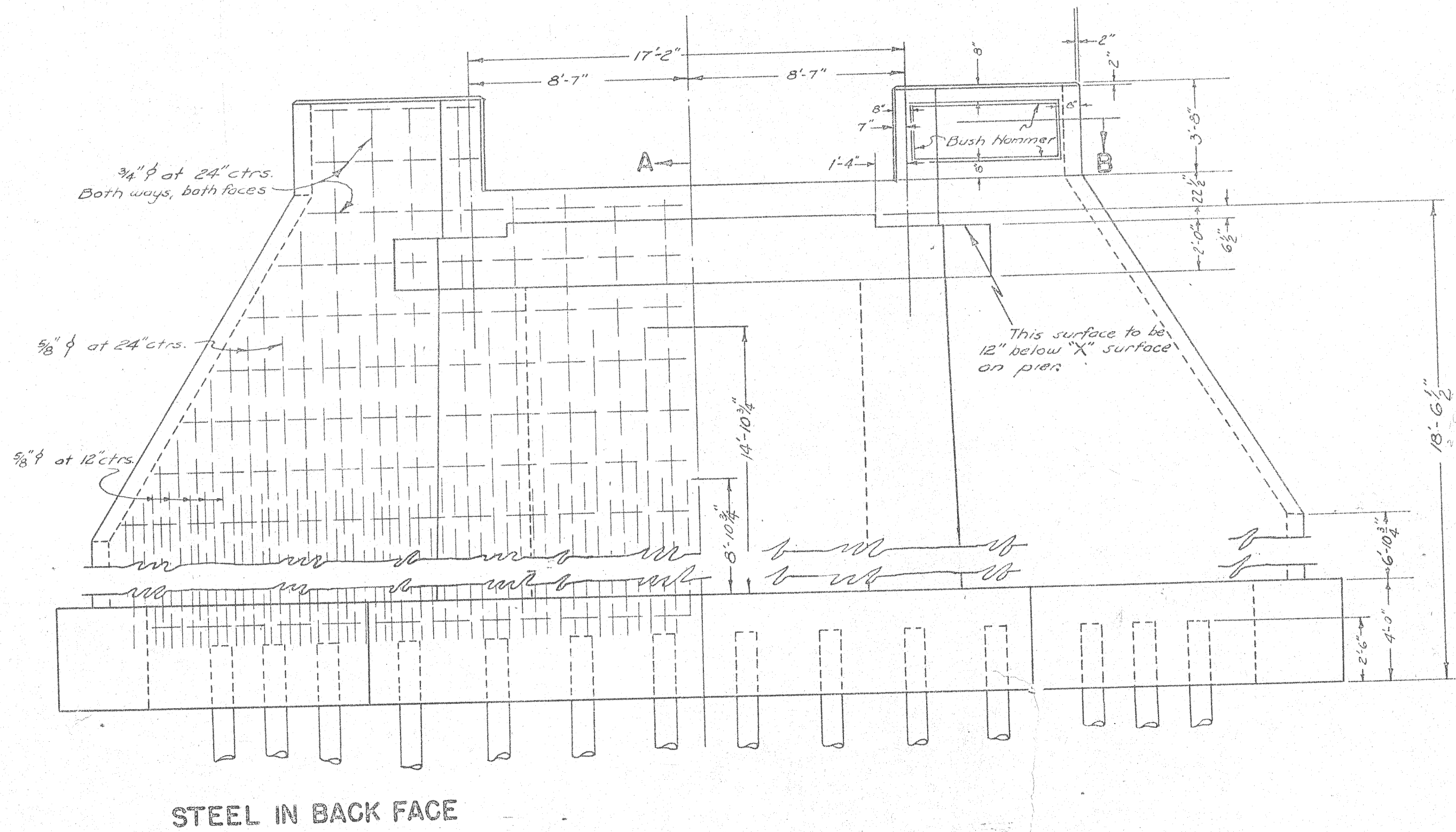
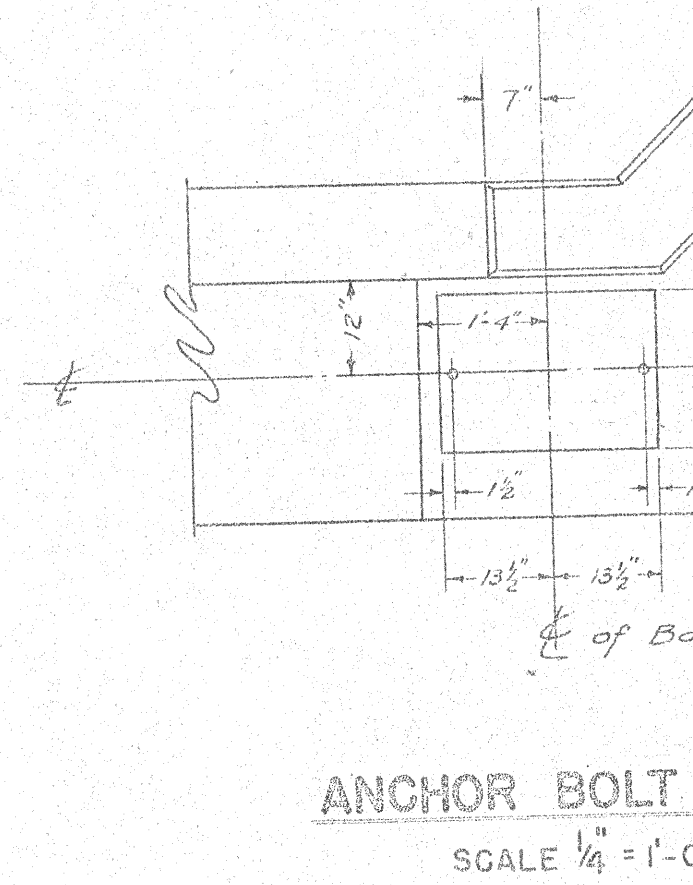
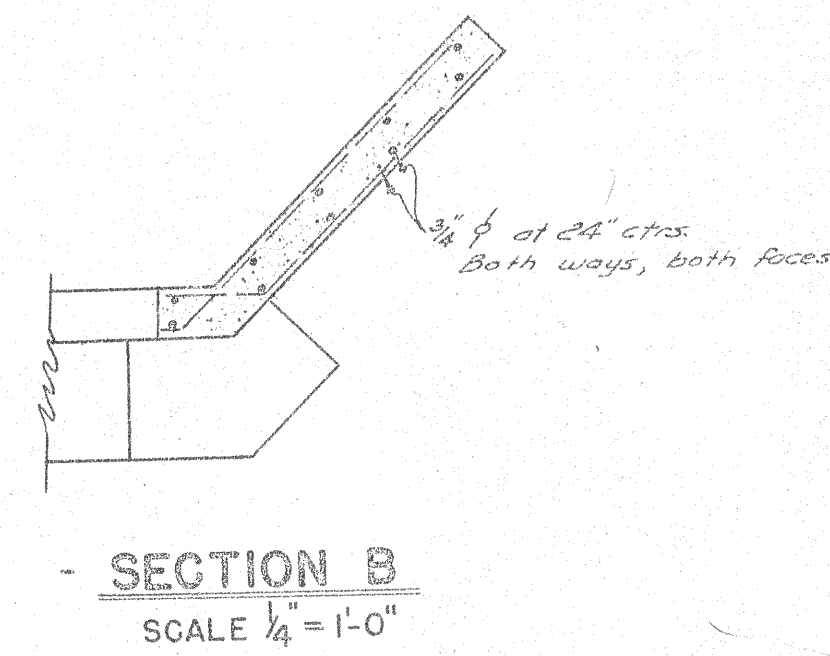
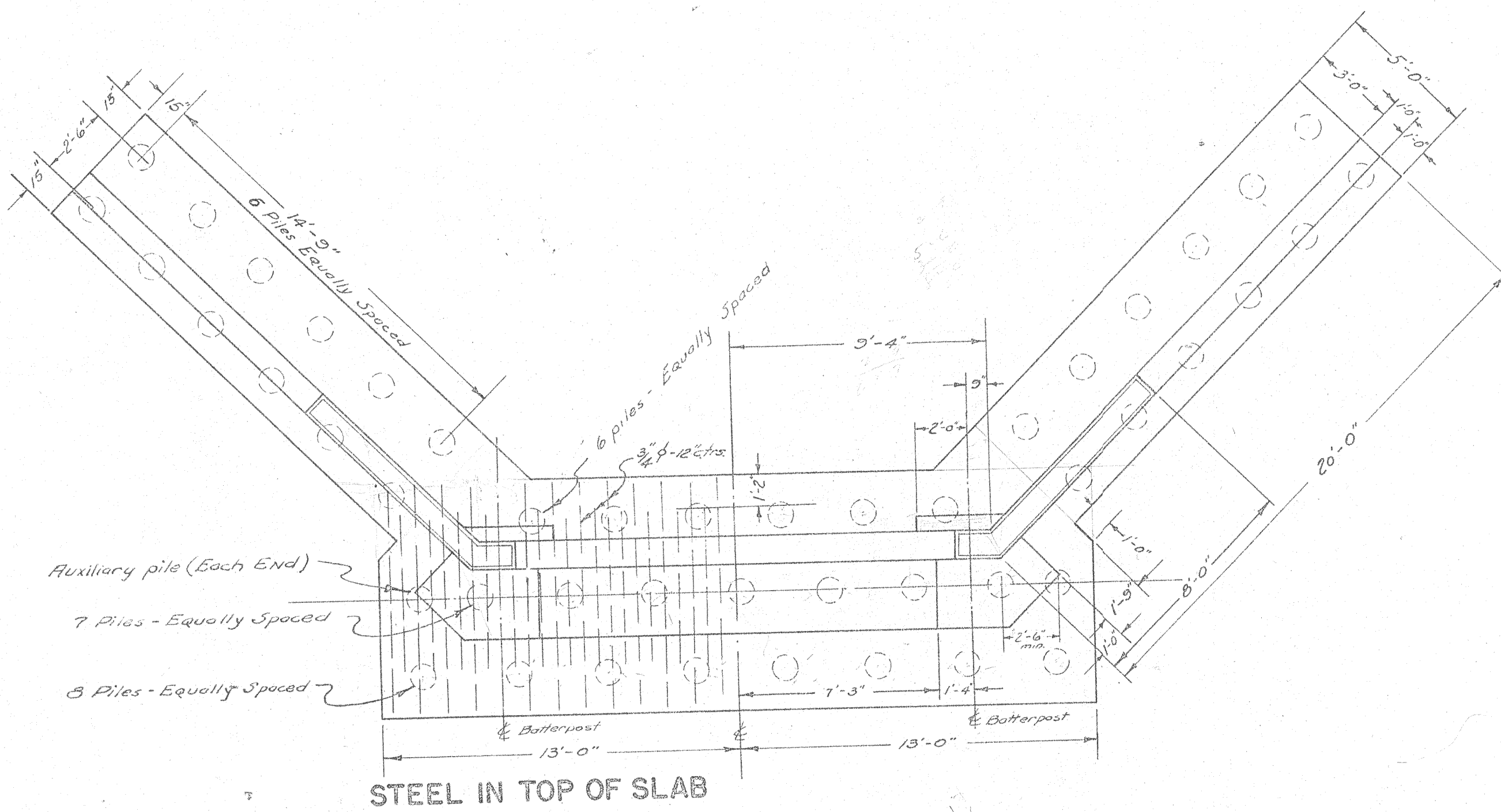
SEC. ON C OF BRIDGE

APPROVED:
BOARD OF COUNTY COM. *C. B. Adams*
John A. Stehl Chairman
Henry M. Rawson
August 9, 1948

PROPOSED BRIDGE CROSSING
AT
MCCLAY BRIDGE SITE

PIER DETAIL "B"

R.J. HALE, E. GR. MISSOULA, MONTANA JULY 20, 1948



SCALE 1/4" = 1'-0"

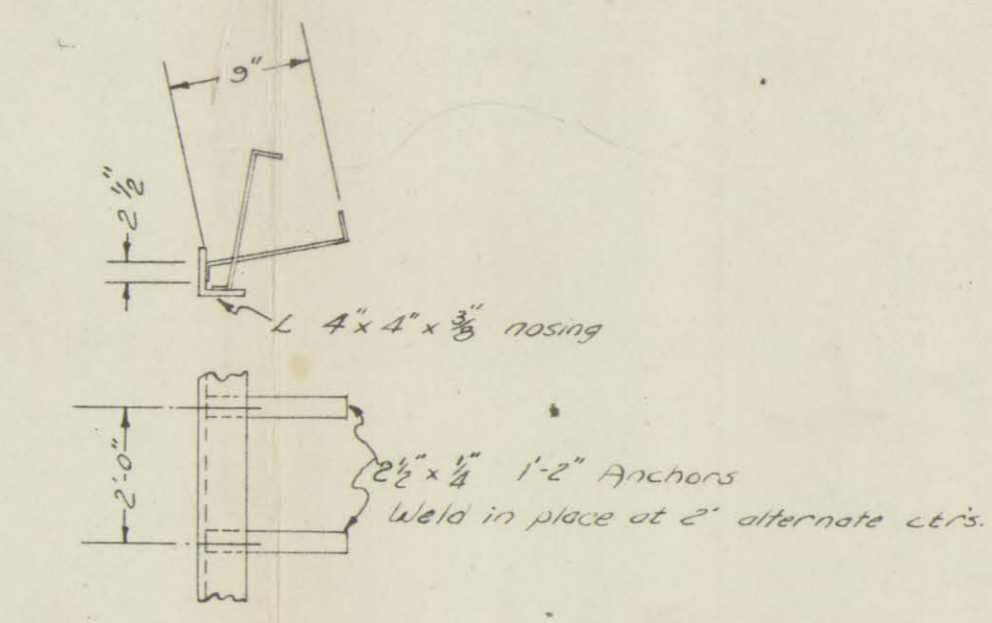
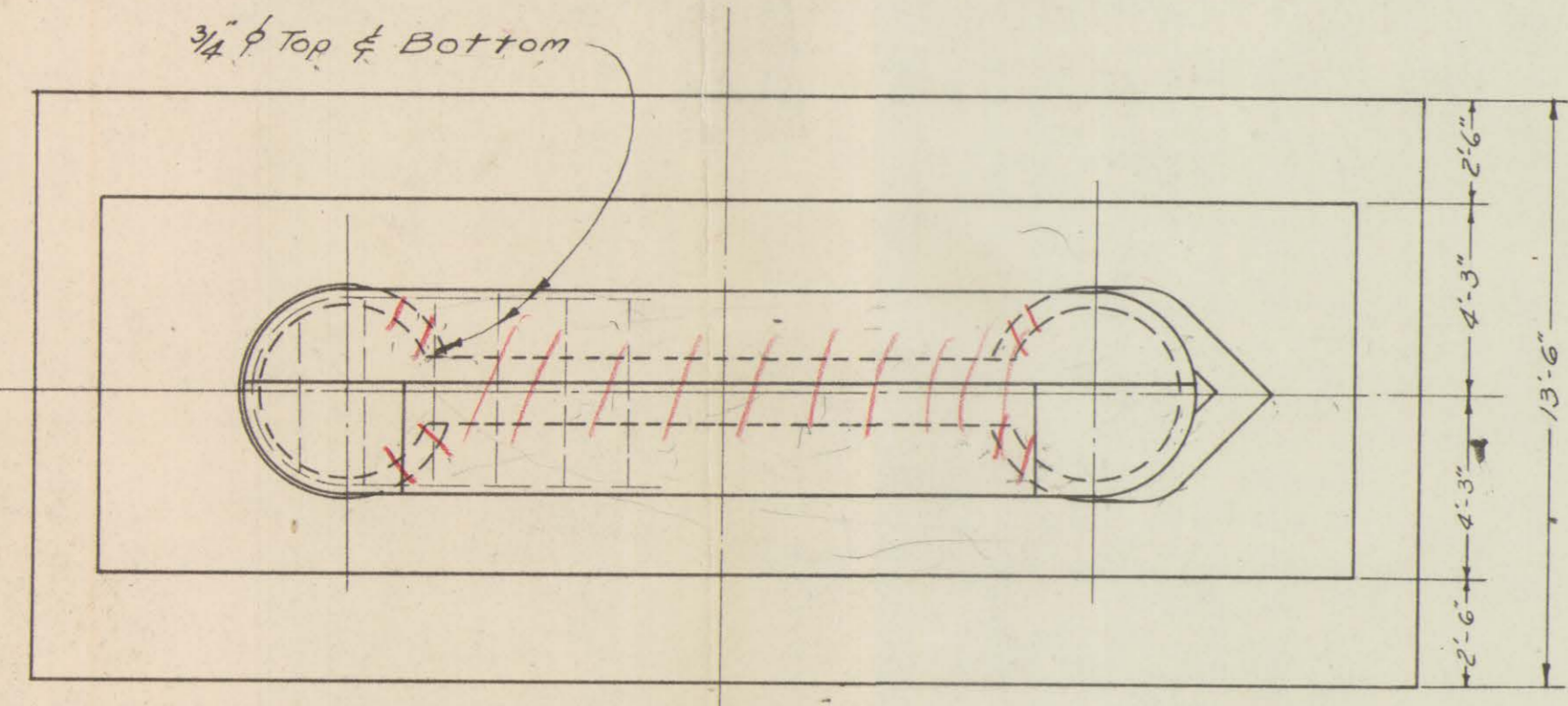
APPROVED:
BOARD OF COUNTY COMM.

Clarence A. Stahl
Superintendent

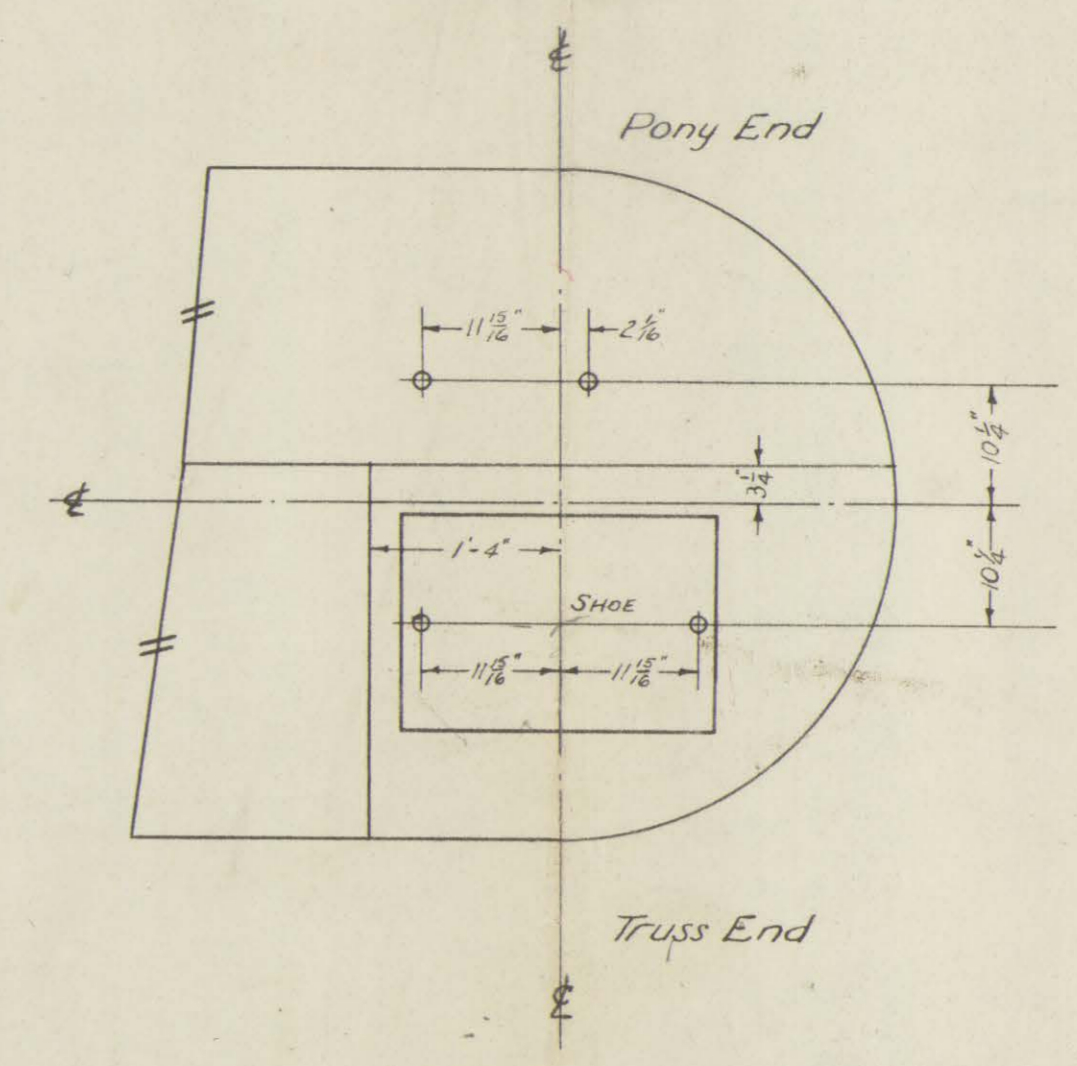
August 9, 1948

PROPOSED BRIDGE CROSSING
AT
M^cCLAY BRIDGE SITE
ABUTMENT DETAIL "C" JULY 20, 1948
R.J. HALE, ENGR.

12
21 8 1/2
33 8 1/2
1 8
35 4 1/4
19 10
15 10

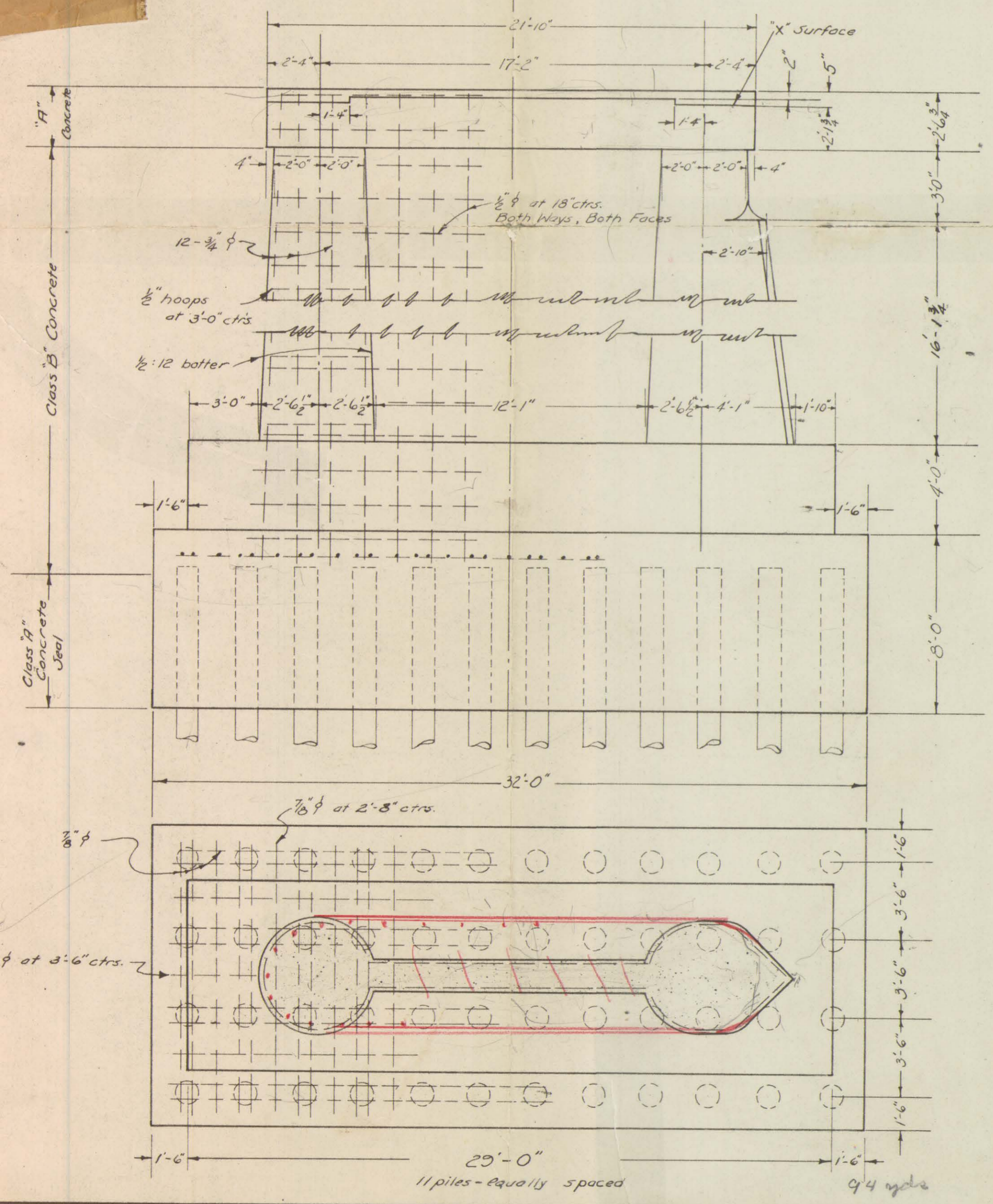


NOSING ANGLE DETAIL
SCALE 1"=1'

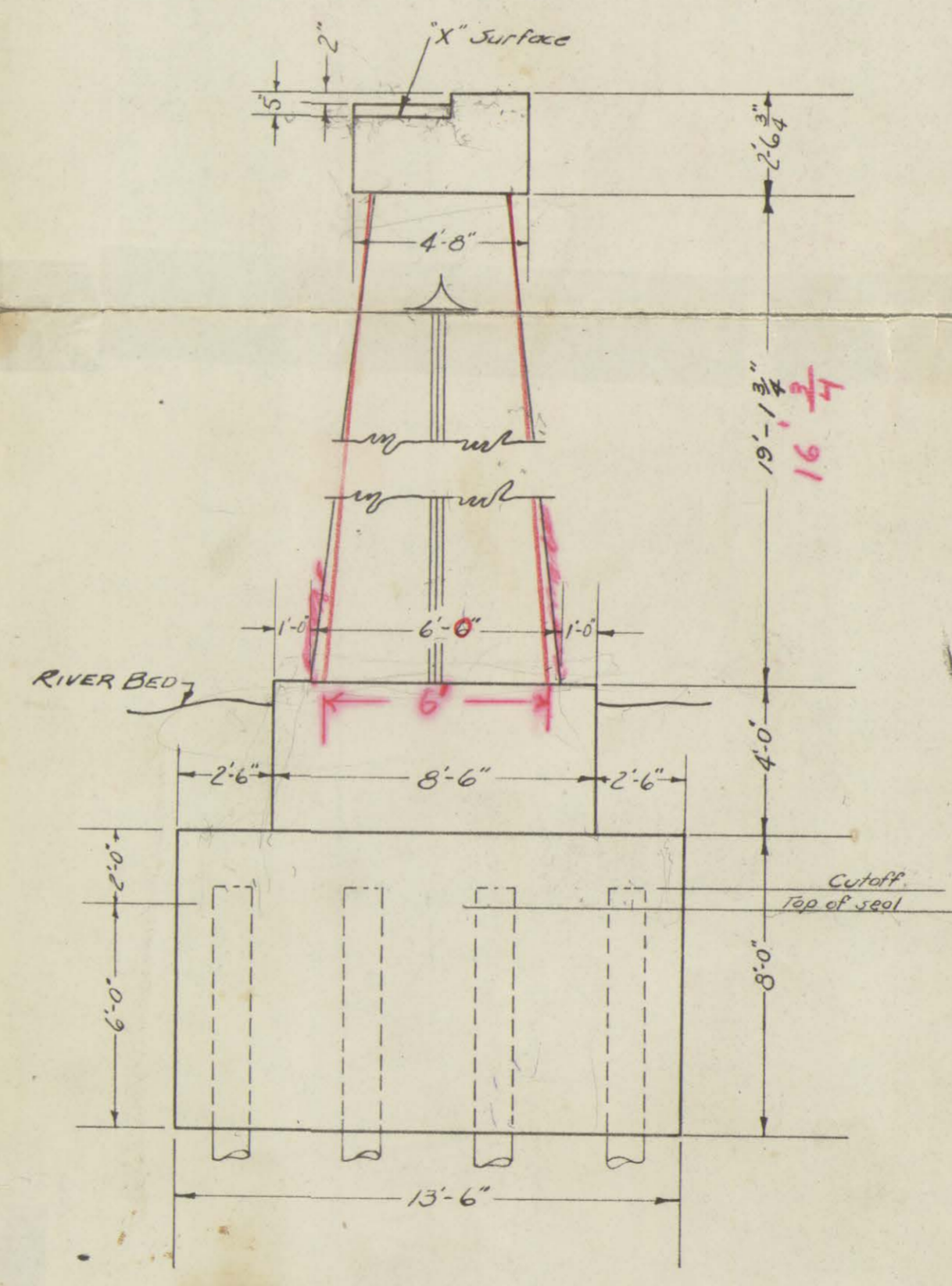


ANCHOR BOLT DETAIL
SCALE 3/4"=1'

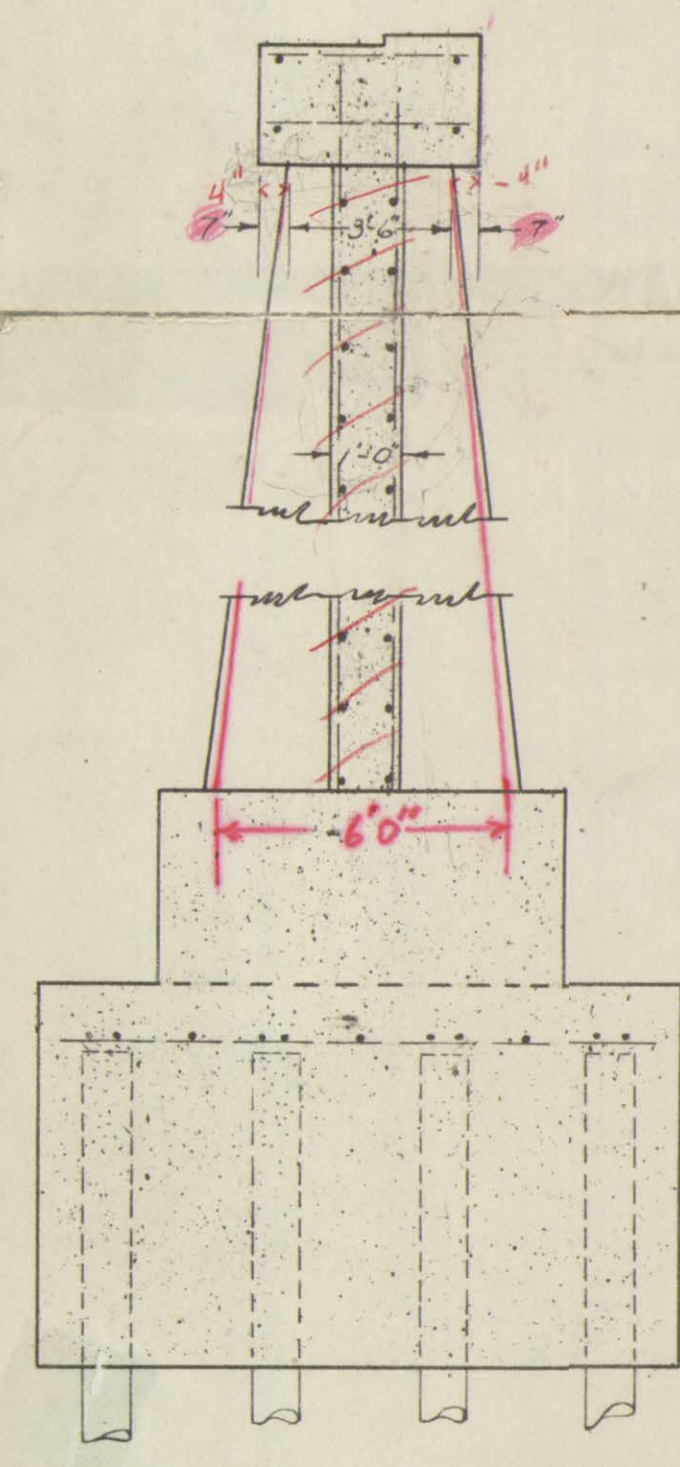
Bridge & Pier



SCALE 1/4"=1'



UPSTREAM ELEVATION



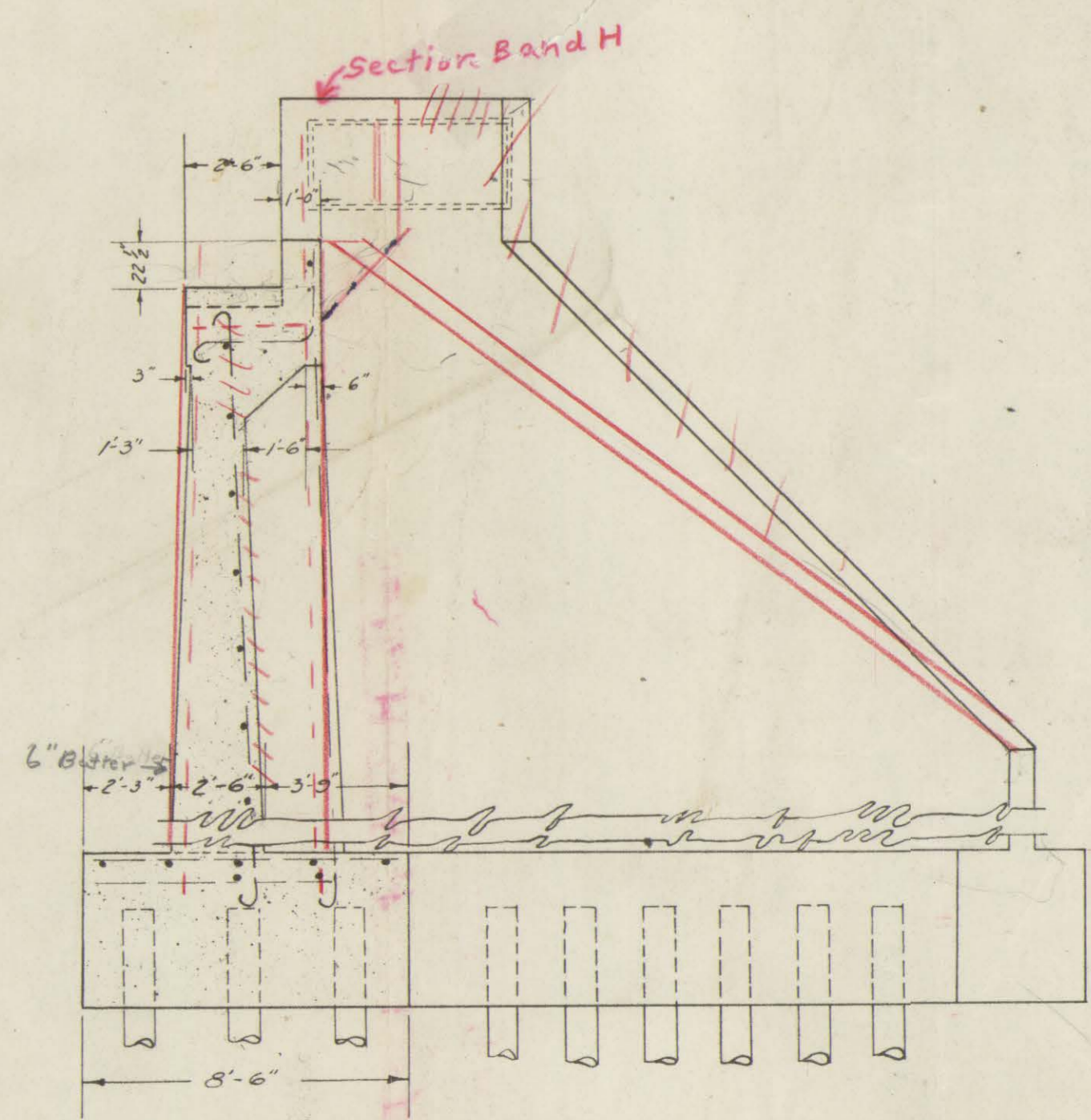
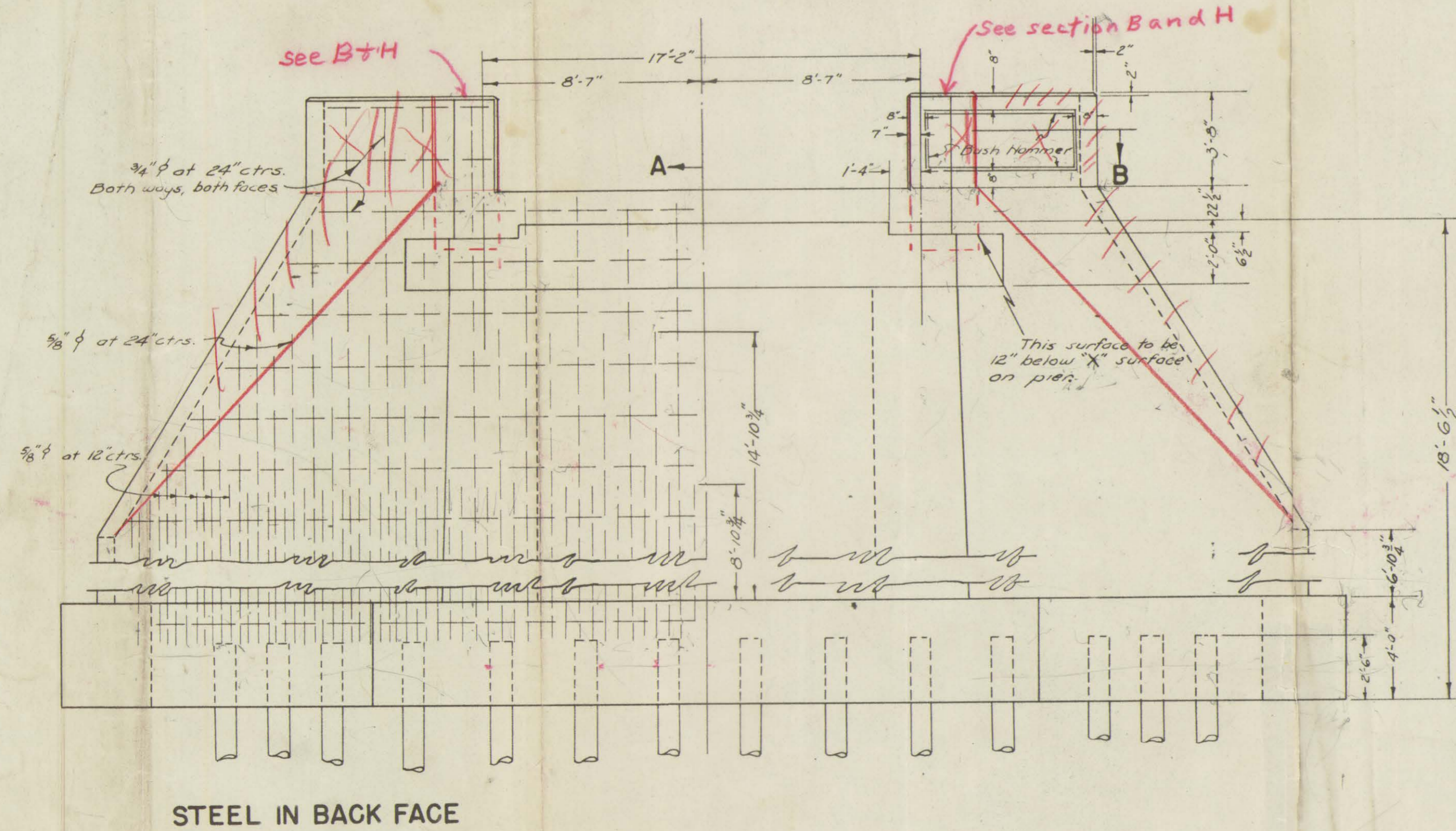
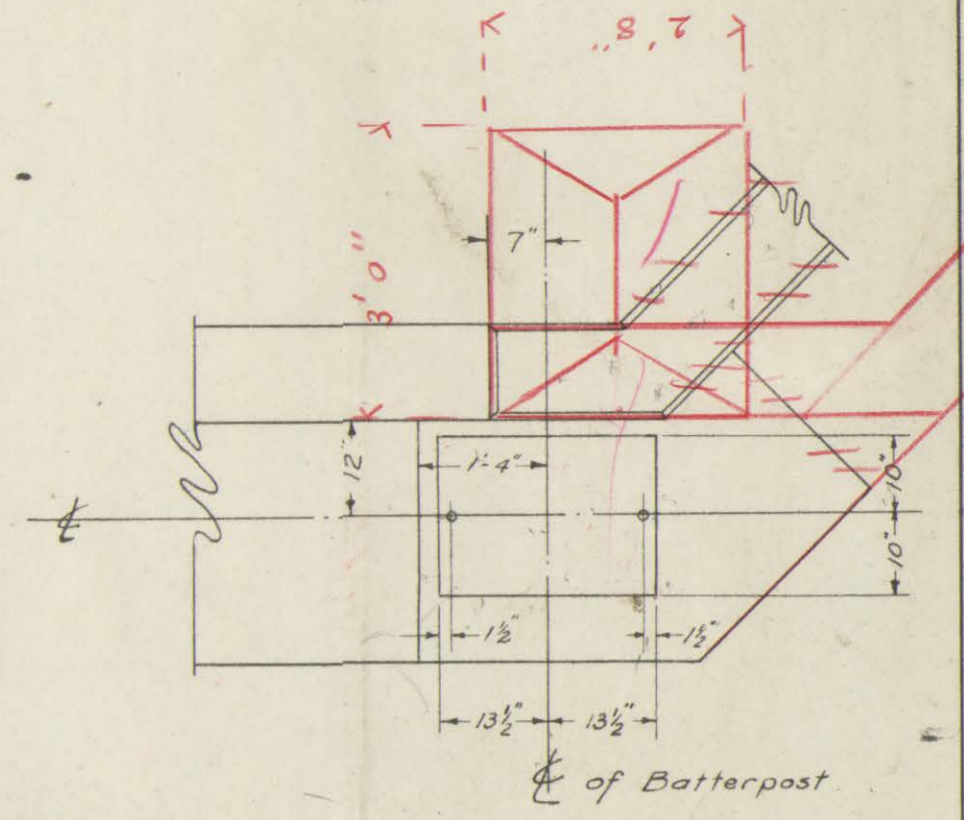
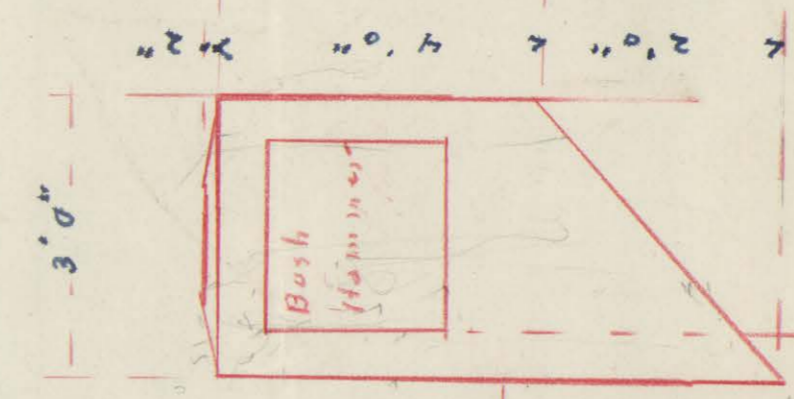
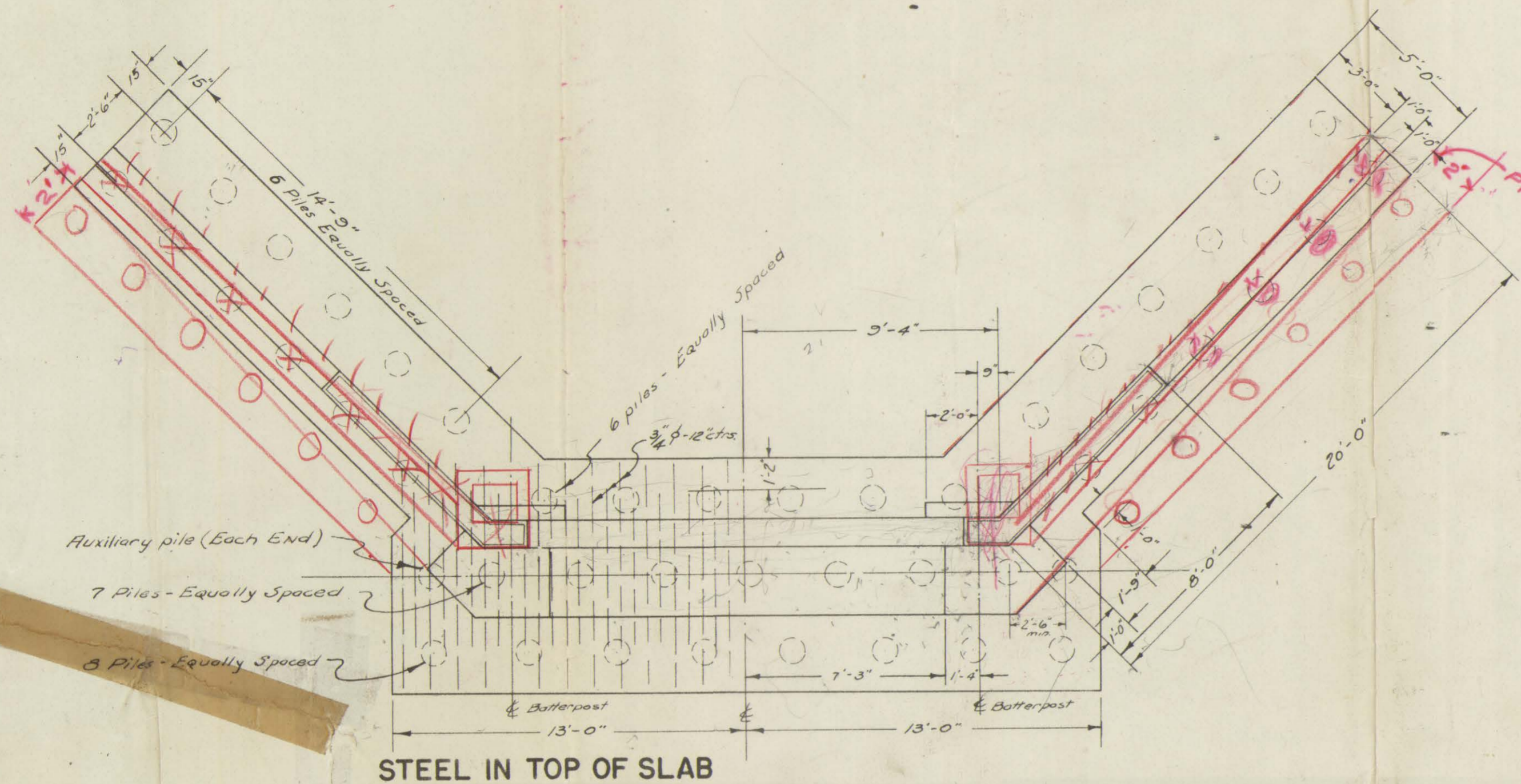
SEC. ON C OF BRIDGE

APPROVED:
BOARD OF COUNTY COM. *C. B. Johnson*
John A. Stebbins Chairman
Harry M. Rawson
August 9, 1948

PROPOSED BRIDGE CROSSING
AT
MCCLAY BRIDGE SITE

PIER DETAIL

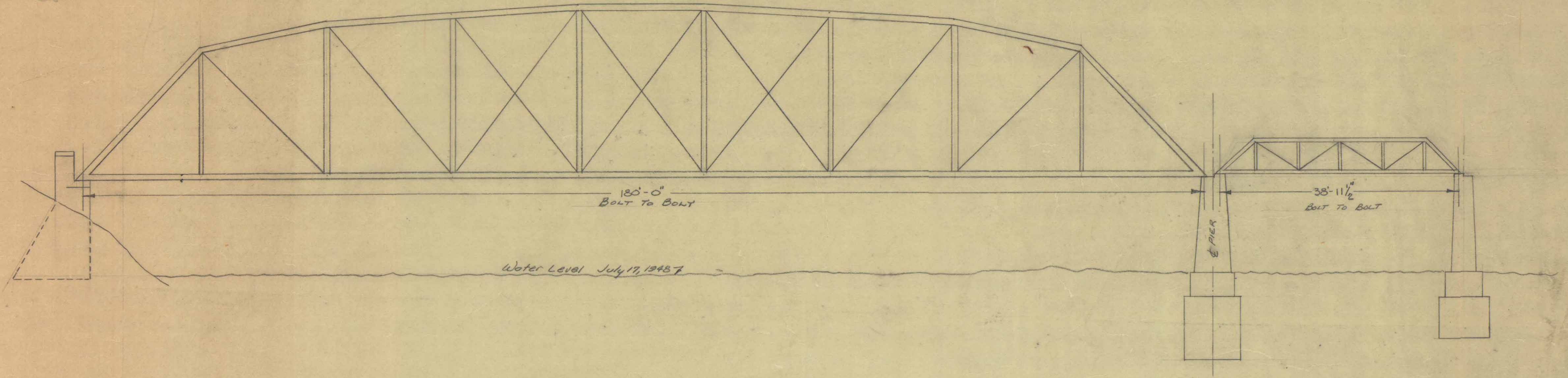
R. J. HALE, ENGR. MISSOULA, MONTANA JULY 20, 1948



SCALE 1/4" = 1'-0"

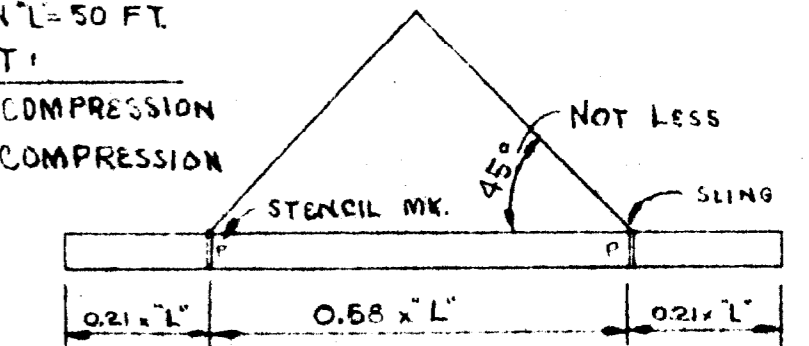
APPROVED:
 BOARD OF COUNTY COMM.
 J. H. ...
 August 9, 1943

PROPOSED BRIDGE CROSSING
 AT
 McCLAY BRIDGE SITE
 ABUTMENT DETAIL
 JULY 20, 1943
 R. J. HALE, ENGR. MISSOULA, MONT.



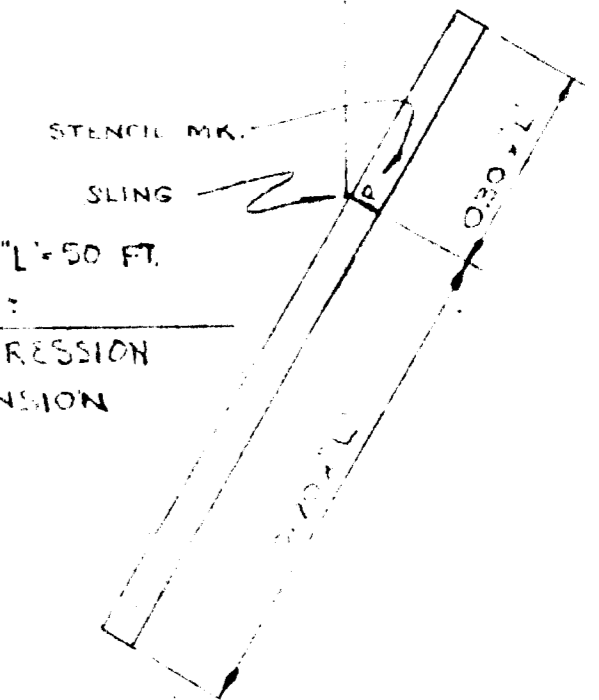
PROPOSED BRIDGE CROSSING
AT
McCLAY BRIDGE SITE
MISSOULA, MONTANA
A. J. HALE, ENGR. JULY 19, 1945

STRESS BASED ON L=50 FT.
AND 50% IMPACT:
MAX=1220 P.S.I. COMPRESSION
MIN=320 P.S.I. COMPRESSION



YARD HANDLING

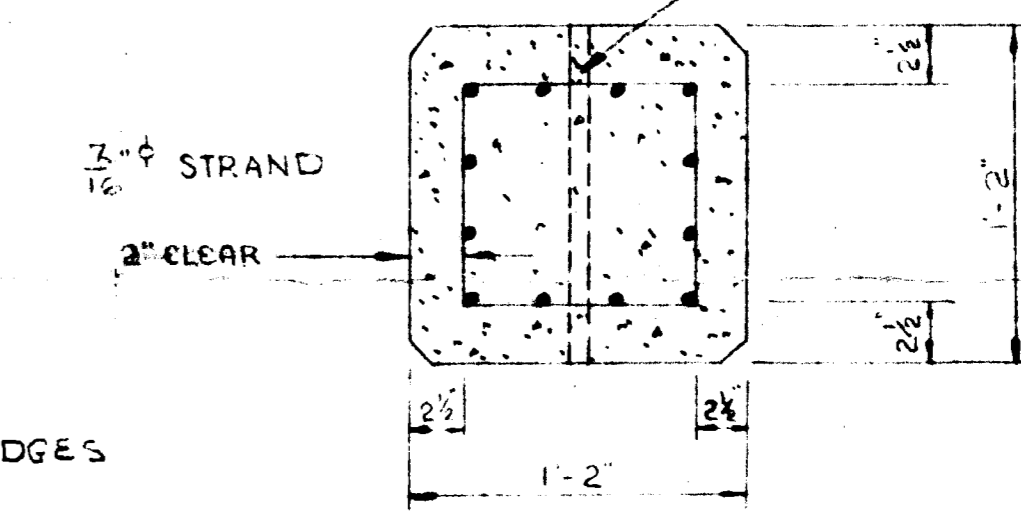
STRESS BASED ON L=50 FT.
AND 50% IMPACT:
MAX=4670 P.S.I. COMPRESSION
MIN=430 P.S.I. TENSION



DRIVER HANDLING
PICK-UP POINTS

NO SCALE

3/4" φ sleeves for passage of steel in trash wall ~ test pile only ~ see elev. for location.



SECTION

NOTE

1. MAX. AGGREGATE SIZE 3/4"
2. 28 DAY CYLINDER STRENGTH = 6,000 P.S.I.; MIN. CYLINDER STRENGTH AT TRANSFER OF PRESTRESS = 4,800 P.S.I.
3. PRESTRESSING STRAND TO BE 3/4" φ SEVEN WIRE STRAND (7 TO K. 22) INITIAL TENSION = 21,700 LBS. / STRAND. INITIAL ELONGATION +0.080 x LENGTH OF STRAND TO R.G.H.P. (INITIAL ELONG. IN IN. H.S. & LEN. STRAND IN FT.)
4. ALL NOTES AND DETAILS NOT SHOWN HEREON SHALL BE AS NOTED ON DRAWING A-269

Approved
Oct. 23, 1964
County Surveyor's Office
Paul White
by [Signature]

UNITED PRESTRESS, INC.
PO BOX 990 GREAT FALLS, MONT.

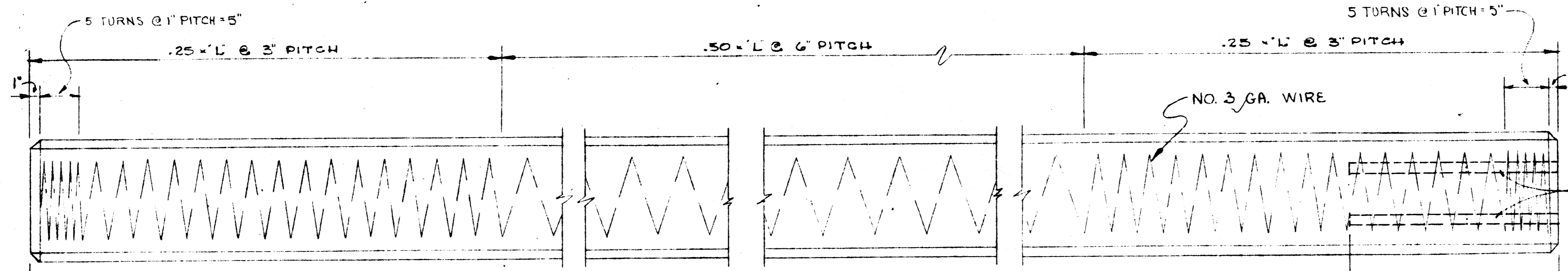
PLANT LOCATED AT
MISSOULA GREAT FALLS BILLINGS

SHOP DRAWING: PRESTRESS PILES
PROJECT: EAST SPAN - MACLAY BRIDGE
CONTRACTOR: PEW CONSTRUCTION

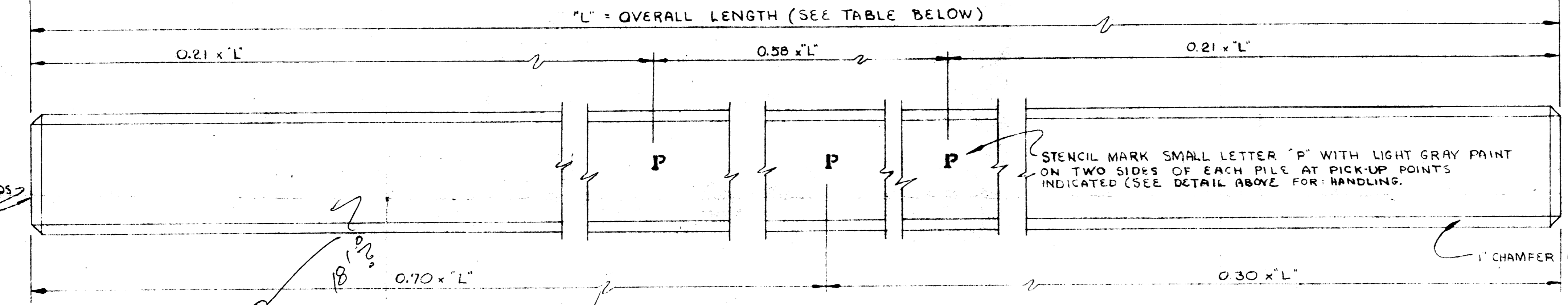
DRAWN BY: RN & AY DATE: 10/15/64
REVISED: 10/16/64 JOB NO: 66440
REVISED: SH NO: 1 OF 3

TABLE OF PILE LENGTHS "L"		
BENT #1	TEST PILE	NONE
	*OTHER	
BENT #2	TEST PILE	50'-0"
	*OTHER	

* LENGTH TO BE DETERMINED BY ENGINEER AFTER TEST PILE IS DRIVEN



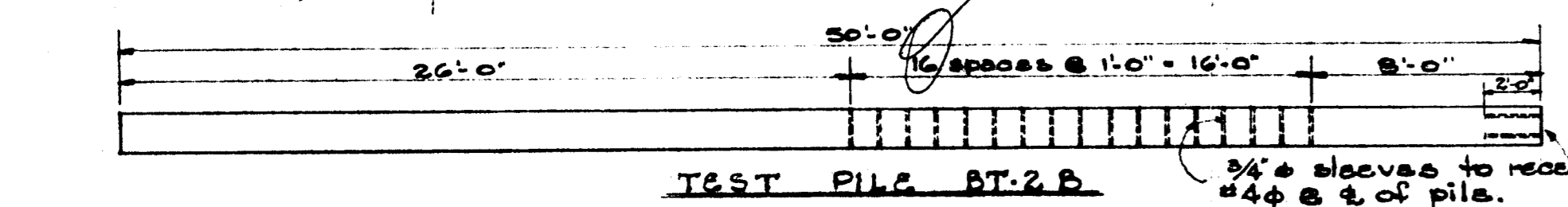
PLAN



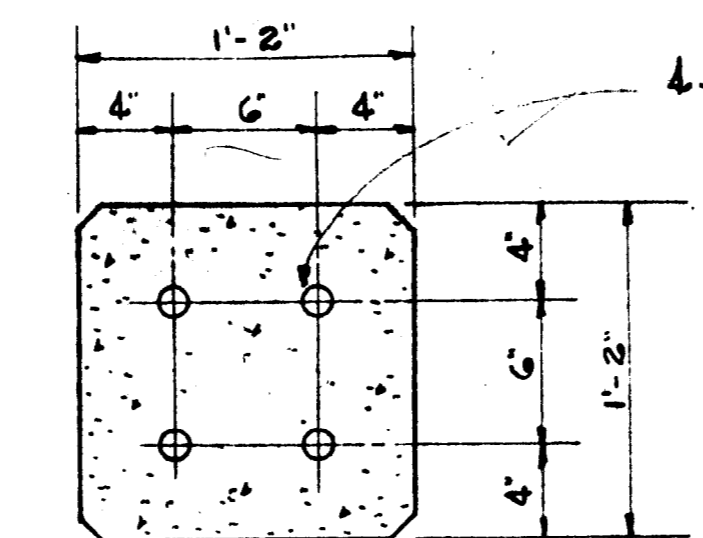
ELEVATION

GRIND STRANDS FLUSH WITH CONCRETE BO. ENDS

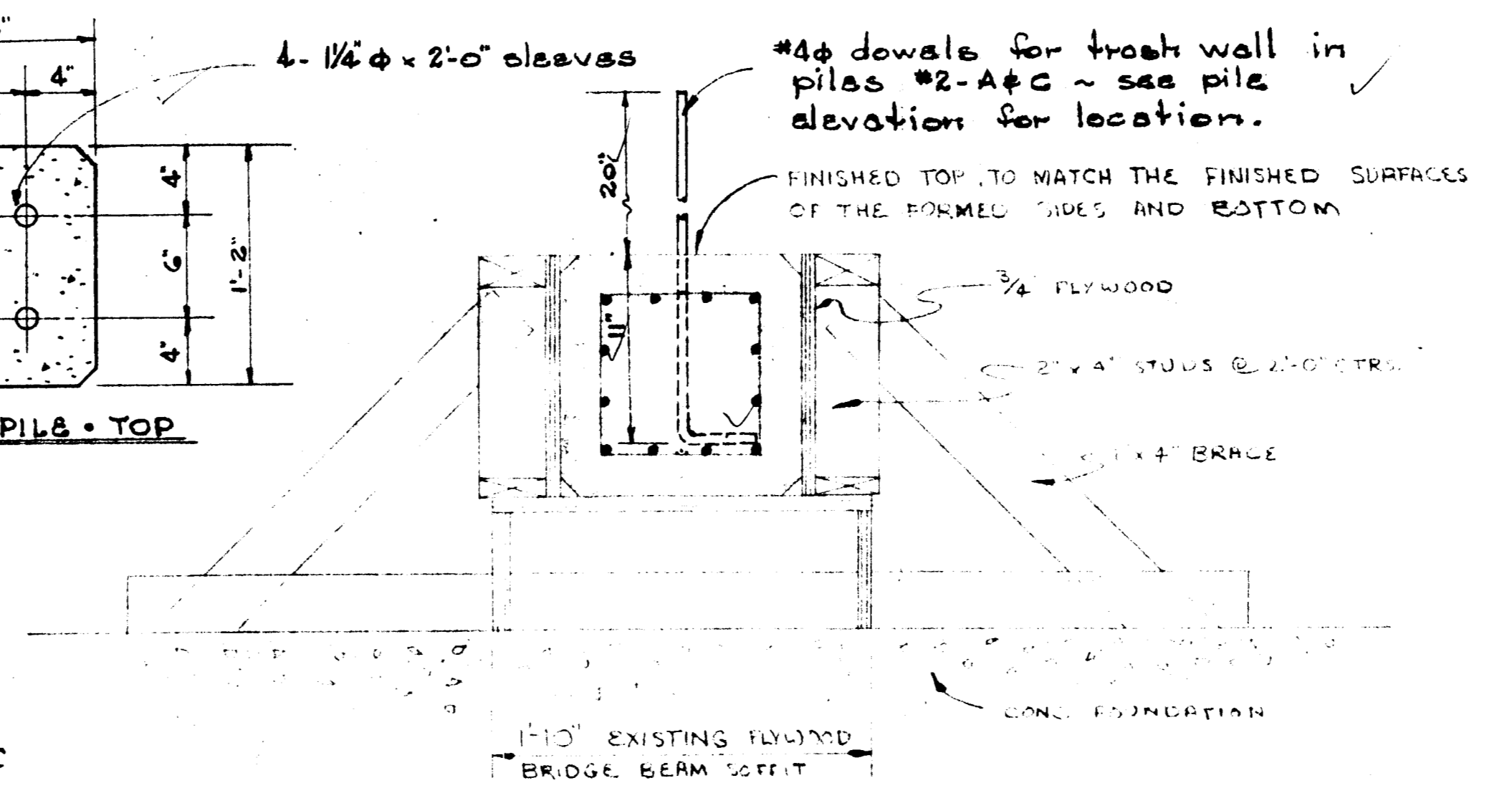
STENCIL MARK SMALL LETTER "P" WITH LIGHT GRAY PAINT ON TWO SIDES OF EACH PILE AT PICK-UP POINTS INDICATED (SEE DETAIL ABOVE FOR HANDLING).



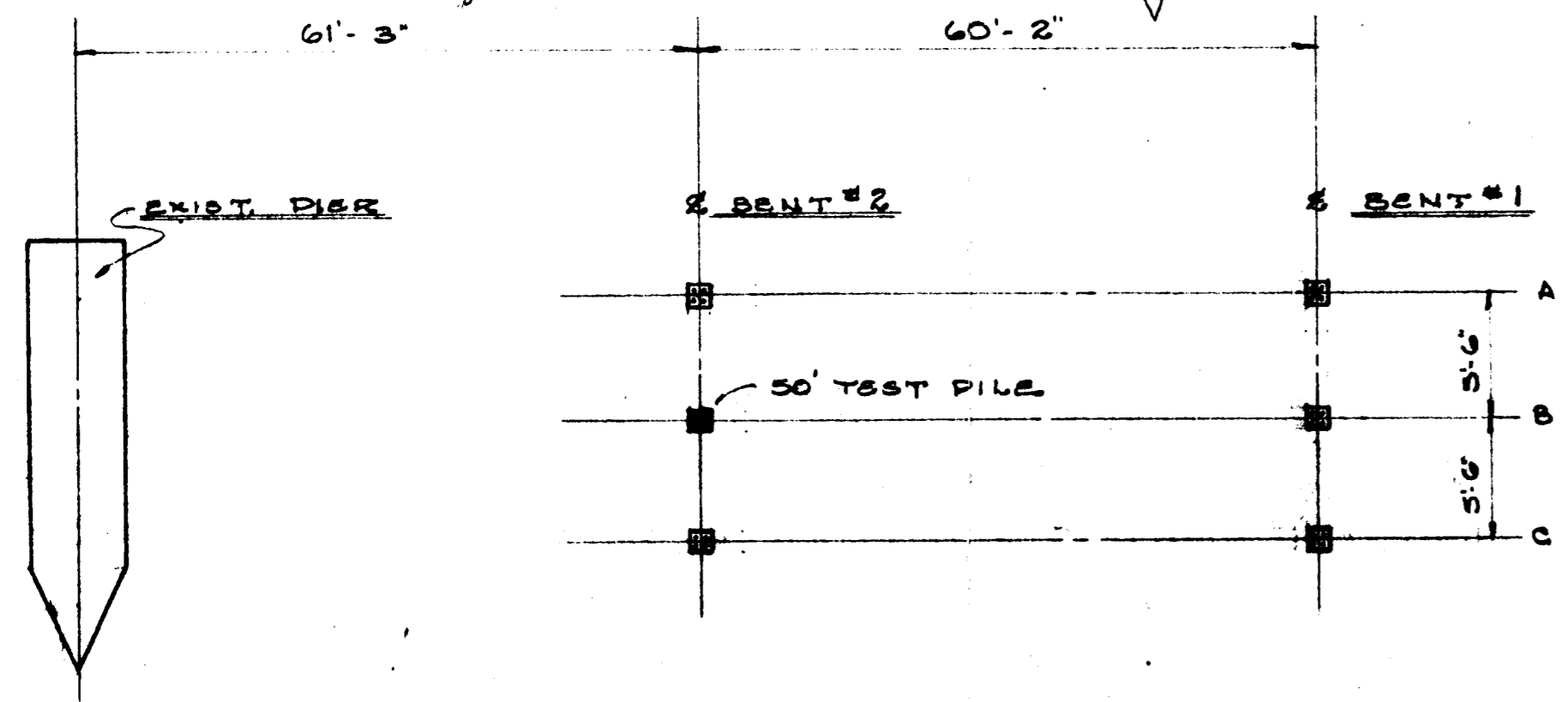
TEST PILE AT-2-B



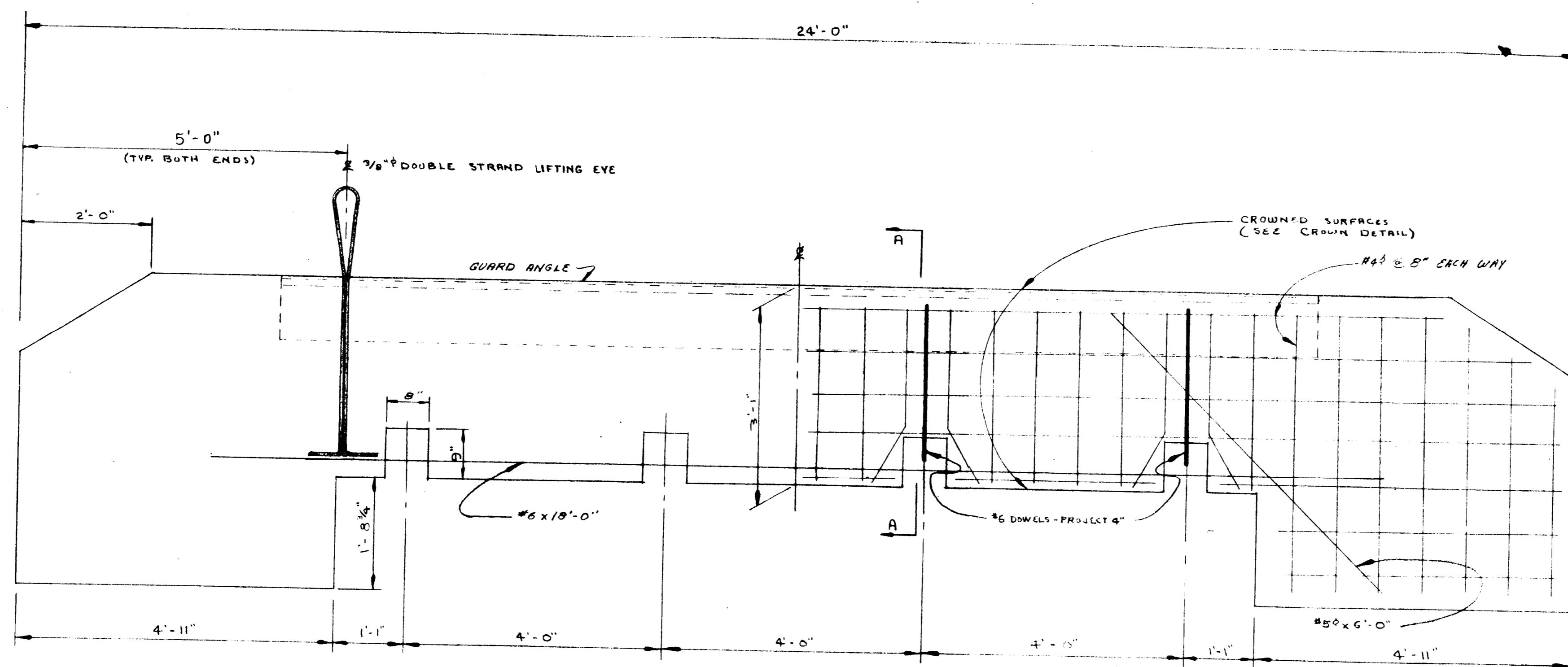
TYPICAL PILE TOP



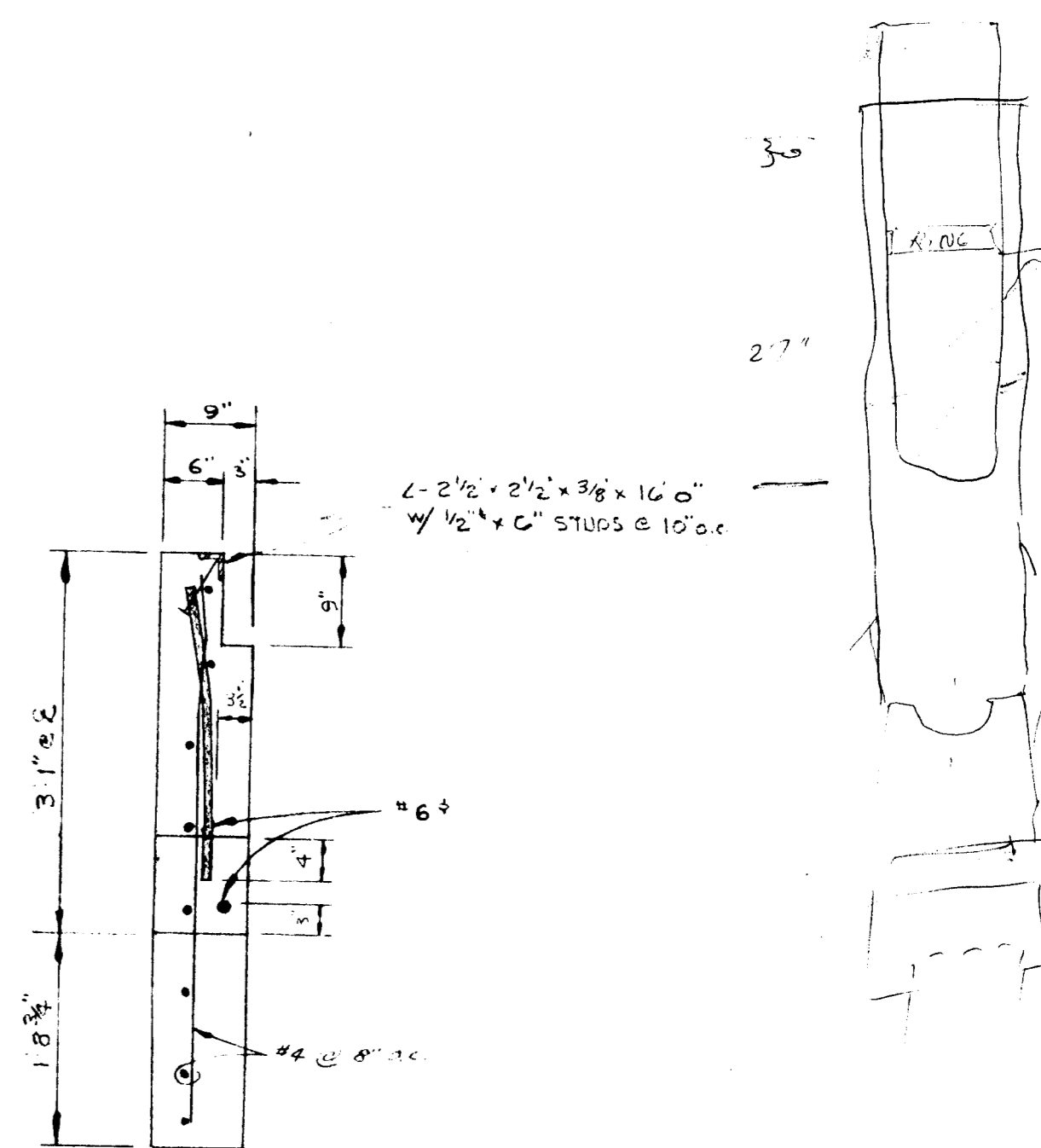
PROPOSED PILE FORM



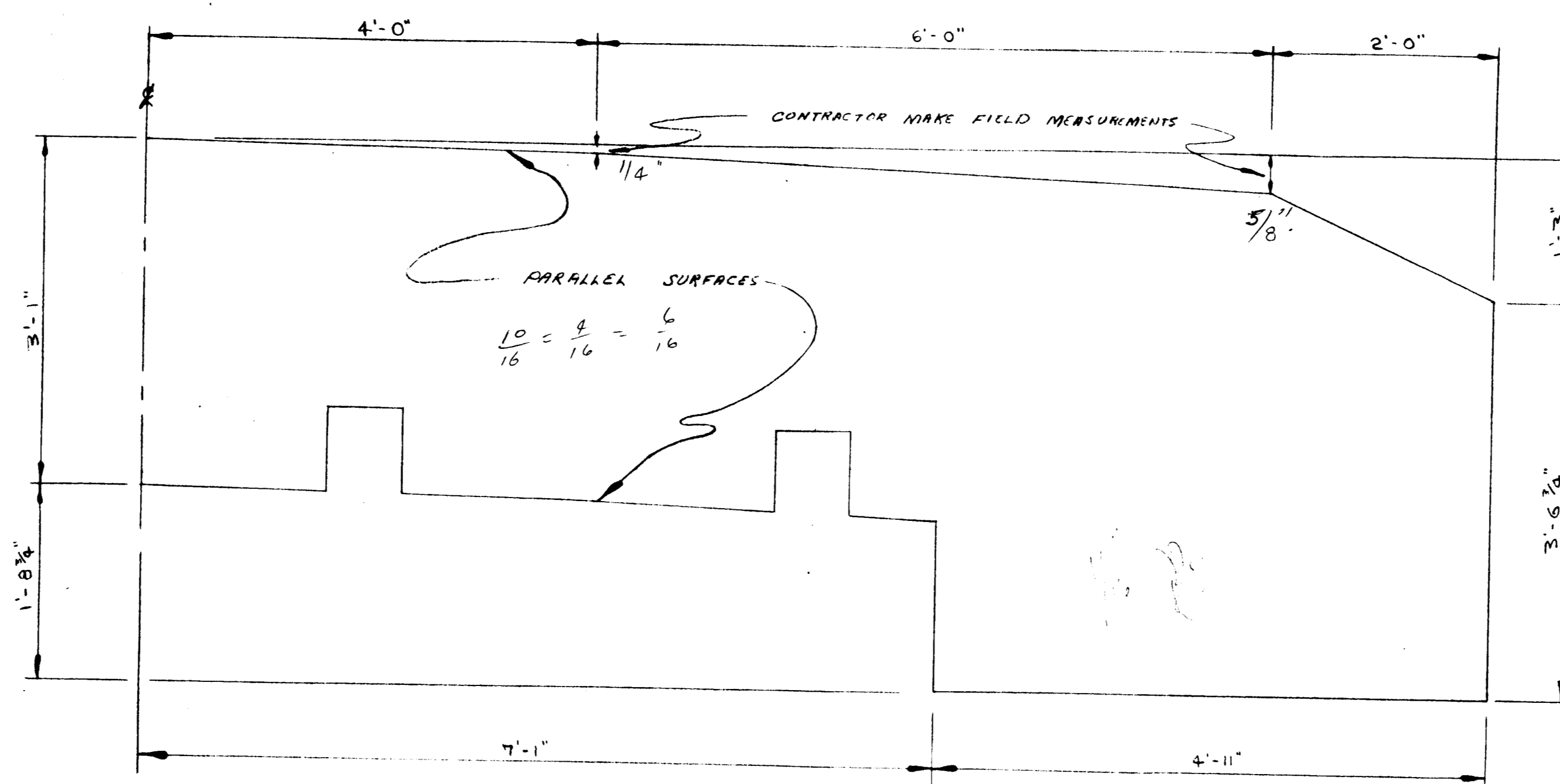
PILE LAYOUT PLAN
NO SCALE



ELEVATION
SCALE 3/8"=1'-0"



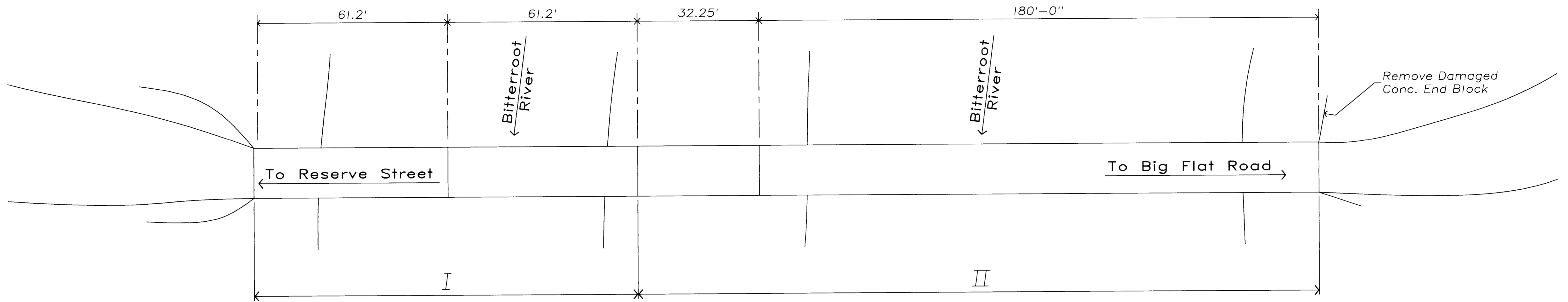
SECTION A-A
SCALE 3/8"=1'-0"



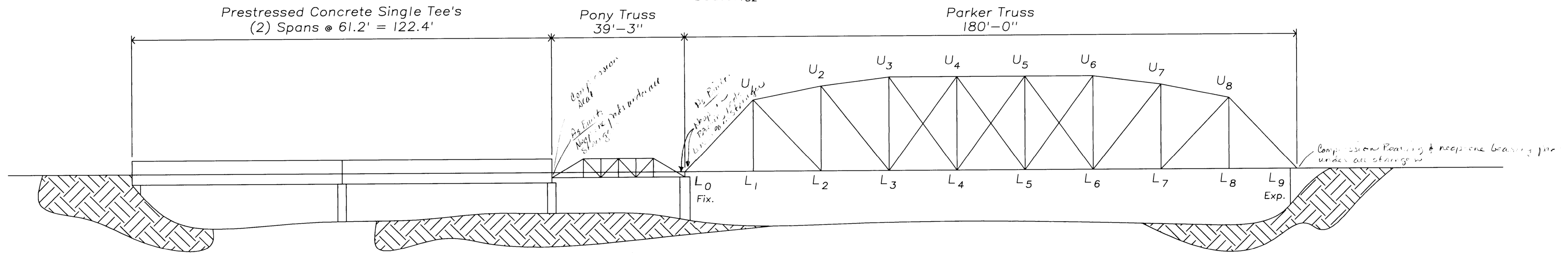
CROWN DETAIL
SCALE 1"=1'-0"

APPROVED
UNITED PRESTRESS INC.
BY: *[Signature]*
FOR PRODUCTION 11/3/64

UNITED PRESTRESS, INC.	
P.O. BOX 990	GREAT FALLS, MONT.
PLANT LOCATED AT	
MISSOULA <input type="checkbox"/>	GREAT FALLS <input checked="" type="checkbox"/> BILLINGS <input type="checkbox"/>
SHOP DRAWING: PRECAST BACK WALL	
PROJECT: EAST SPAN - NACLAY BRIDGE	
CONTRACTOR: PEW CONST. CO.	
DRAWN BY: R. N. H. D.	DATE: 10/19/64
REVISED:	JOB NO. G-6440
REVISED:	SH. NO. 3 OF 3



PLAN
Scale: 1/32" = 1'-0"



ELEVATION
Scale: 1/32" = 1'-0"

DECK REPLACEMENT PROCEDURE:

Each stringer and floor beam top shall be inspected by Engineer after existing decking is removed. Engineer will then warrant the condition with possibility of stringer replacement.

Install 6 1/2" x 2 1/2" Corrugated Steel Decking. All holes in decking shall be pre-punched to align with existing stringers (to be field verified).

Fill decking to top of corrugations with "Self Leveling" fibrous reinforced concrete.

The asphalt overlay shall be MDOT Type "B" and may be placed after the concrete has cured for (7) days. The compacting of the asphalt overlay shall be accomplished by static roller passes. (No equipment using vibratory action for compacting will be allowed on the bridge).

DESIGN NOTES:

Specifications: The repairs for this structure are designed in accordance with AASHTO Standard Specifications for Highway Bridges, 17th Edition, 2002.

Design Load: Post at 14 Tons

Unit Stresses: Concrete: Class "AD": f'c = 4000 psi @ 28 days.

GENERAL NOTES:

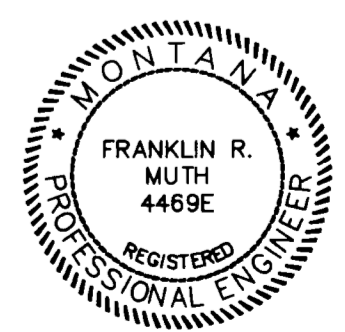
CONSTRUCTION:
All construction shall conform to the Standard Specifications for Road and Bridge Construction, 1995 Edition, Adopted by The Montana Department of Transportation and the Montana Transportation Commission, unless otherwise shown.

I

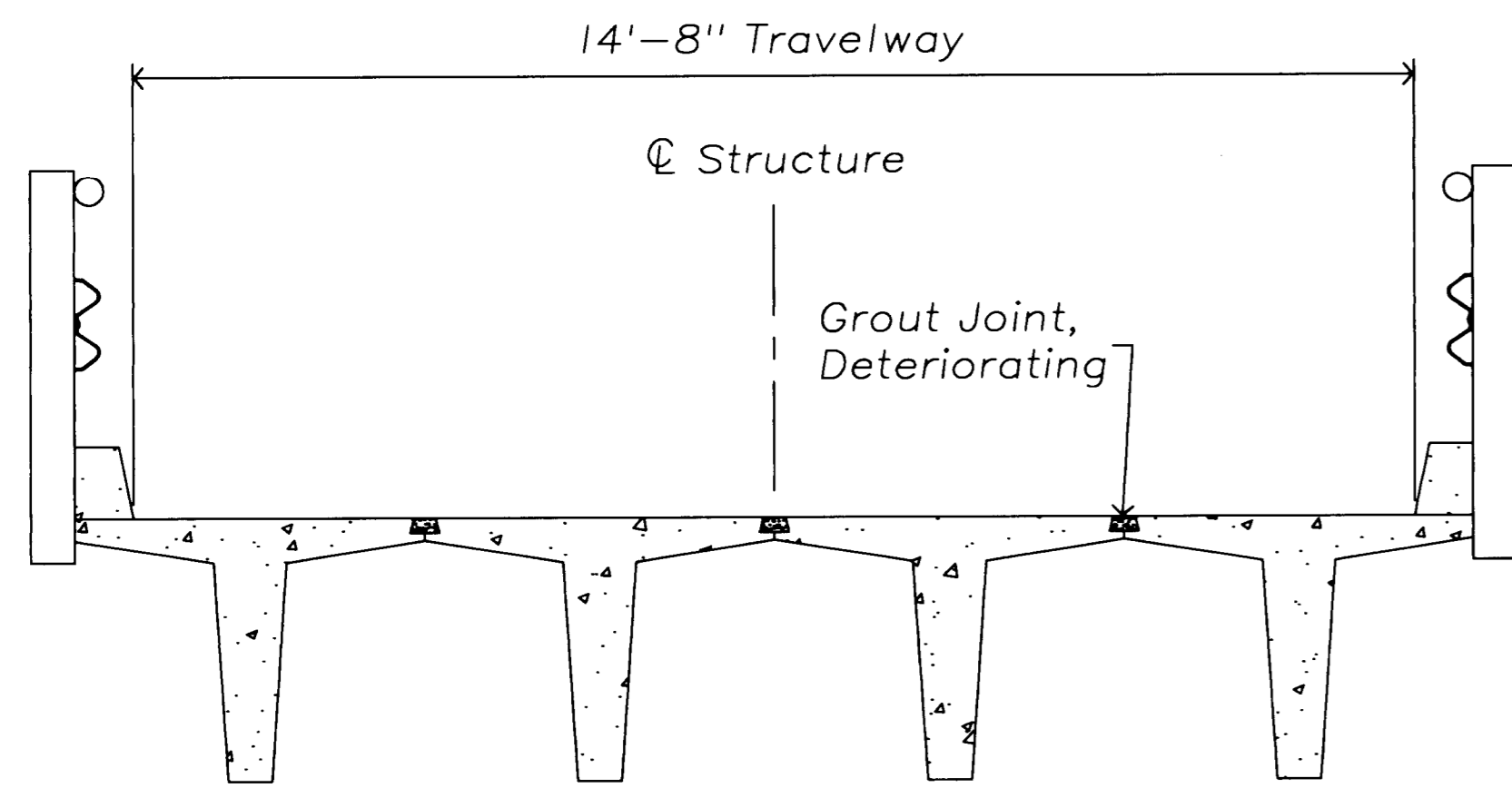
- 1.) Seal Longitudinal Grout Joints
- 2.) 2" ± Asphalt Overlay

II

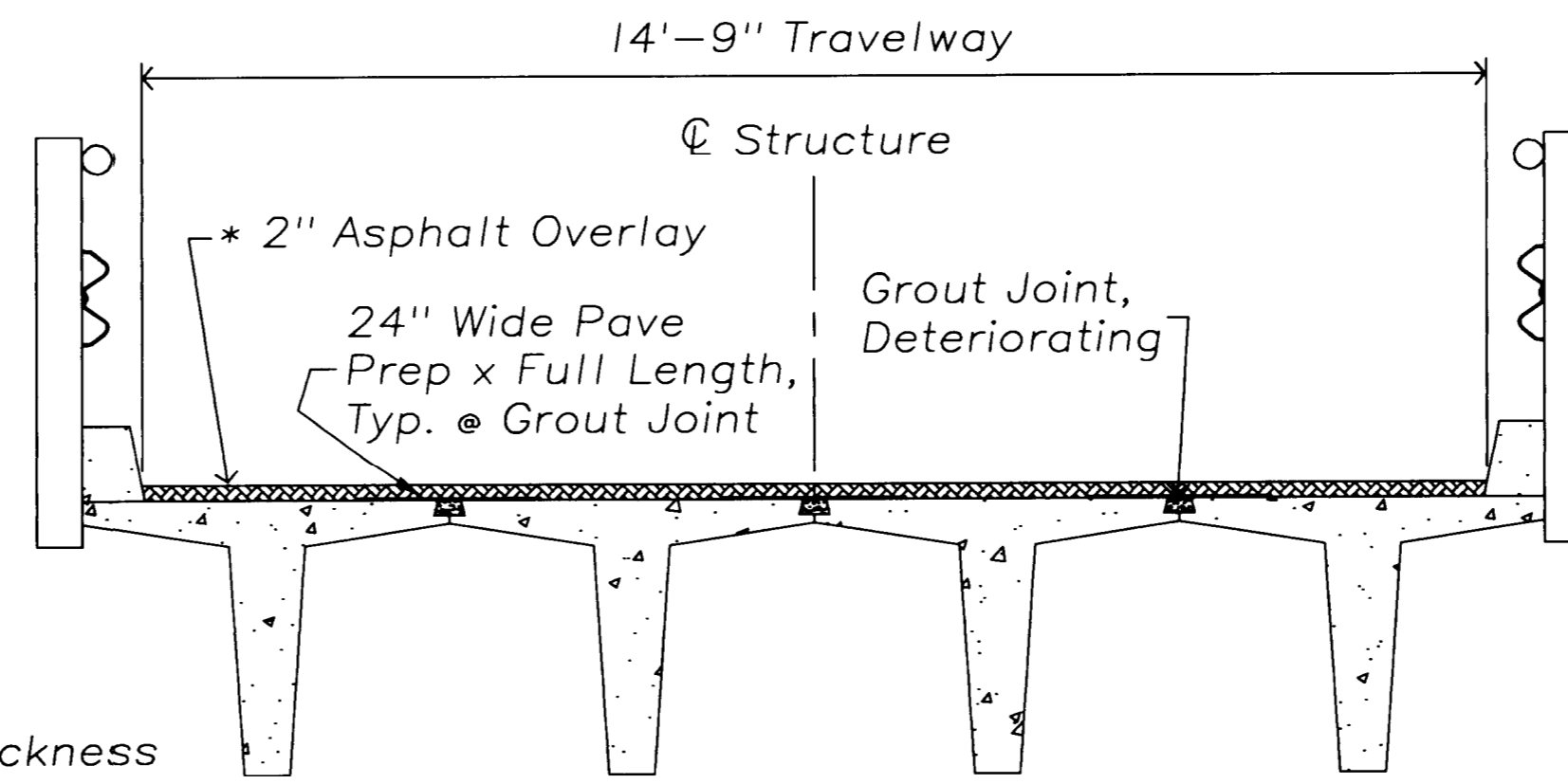
- 1.) Remove & Dispose Existing Timber Deck
- 2.) Replace stringers (S8x18.4 or W10x25.4) as req'd *As Built*
- 3.) Install Steel 6 1/2" x 2 1/2" x 10 ga. Corrugated Decking
- 4.) Install Wheel Guard
- 5.) Pour Wheel Guard Concrete and Concrete in Corrugations
- 6.) 2" Asphalt Overlay
- 7.) Flame Straighten / Shorten Eye Bars as Required
- 8.) Replace missing bolts for bridge rail.



TITLE1	Engineers' Project No. :-----	Sheet -- of --
TITLE2	Designed : --	Sheet Title :
TITLE3	Drawn : --	SHEETTITLE1
TITLE4	Checked : --	SHEETTITLE2
	Approved : --	

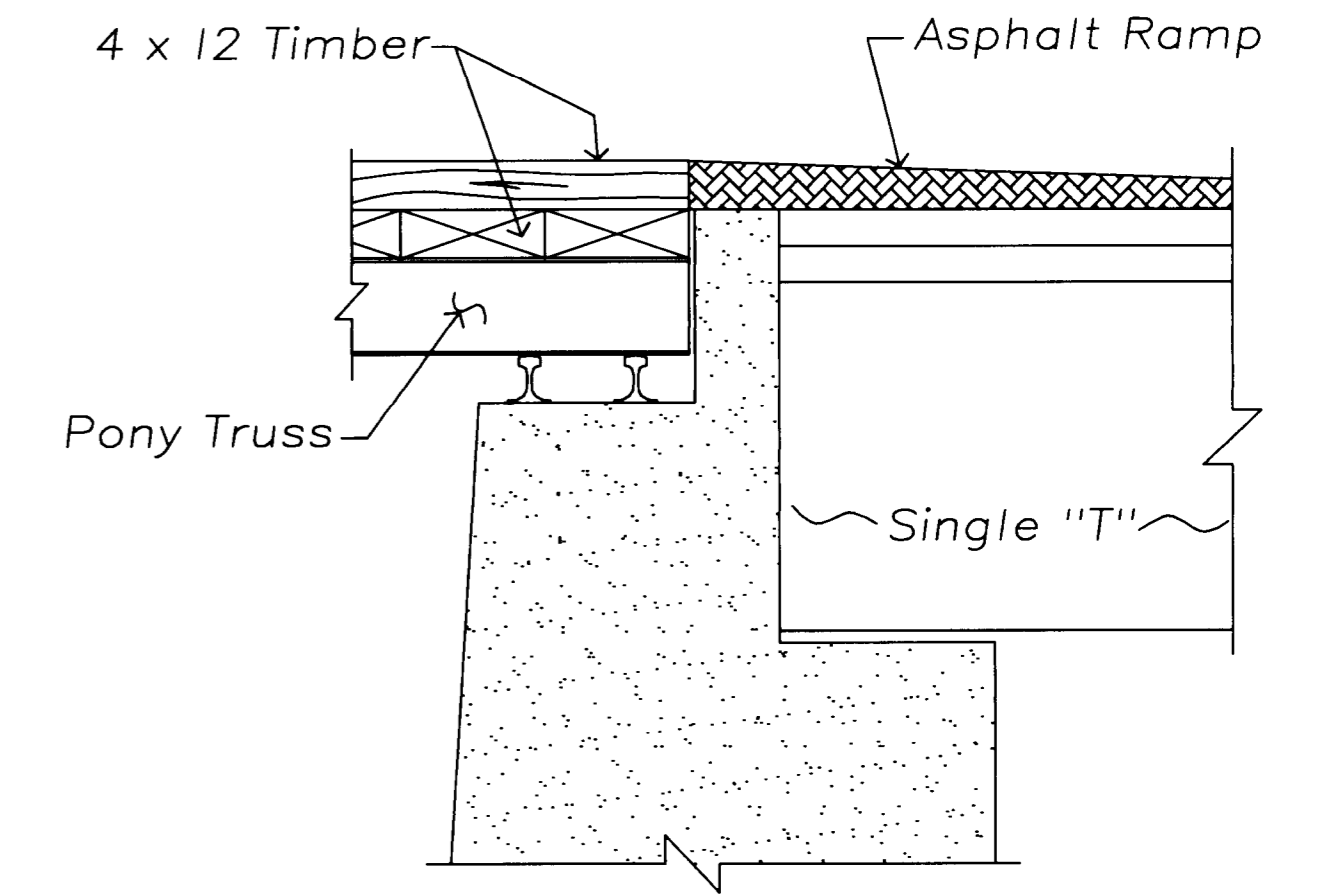


SECTION @ SINGLE "T"
Scale: 1/4" = 1'-0"



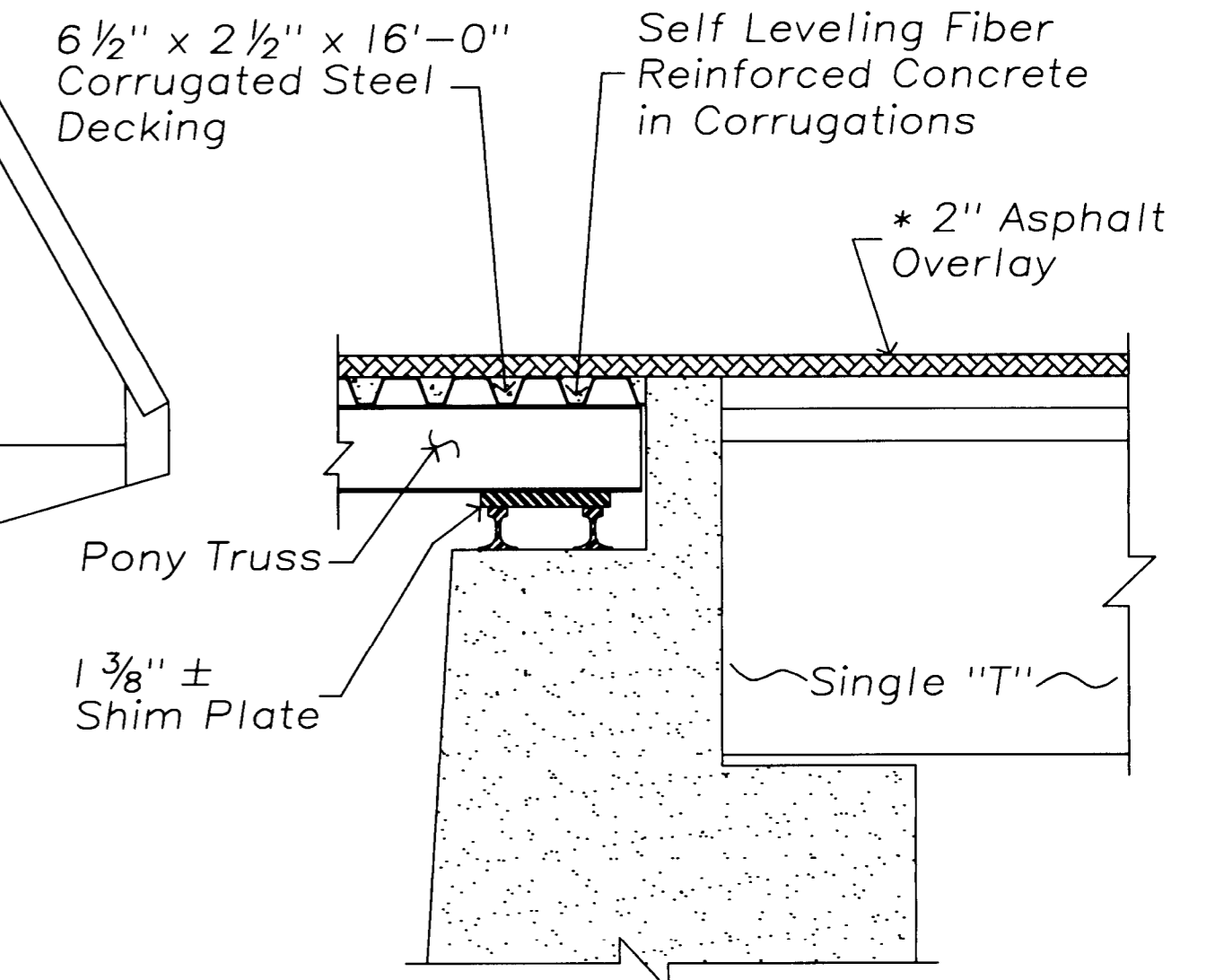
SECTION @ SINGLE "T"
Scale: 1/4" = 1'-0"

* 2" min. thickness. Thickness will vary on Single "T" due to the camber in the beams.



EXISTING

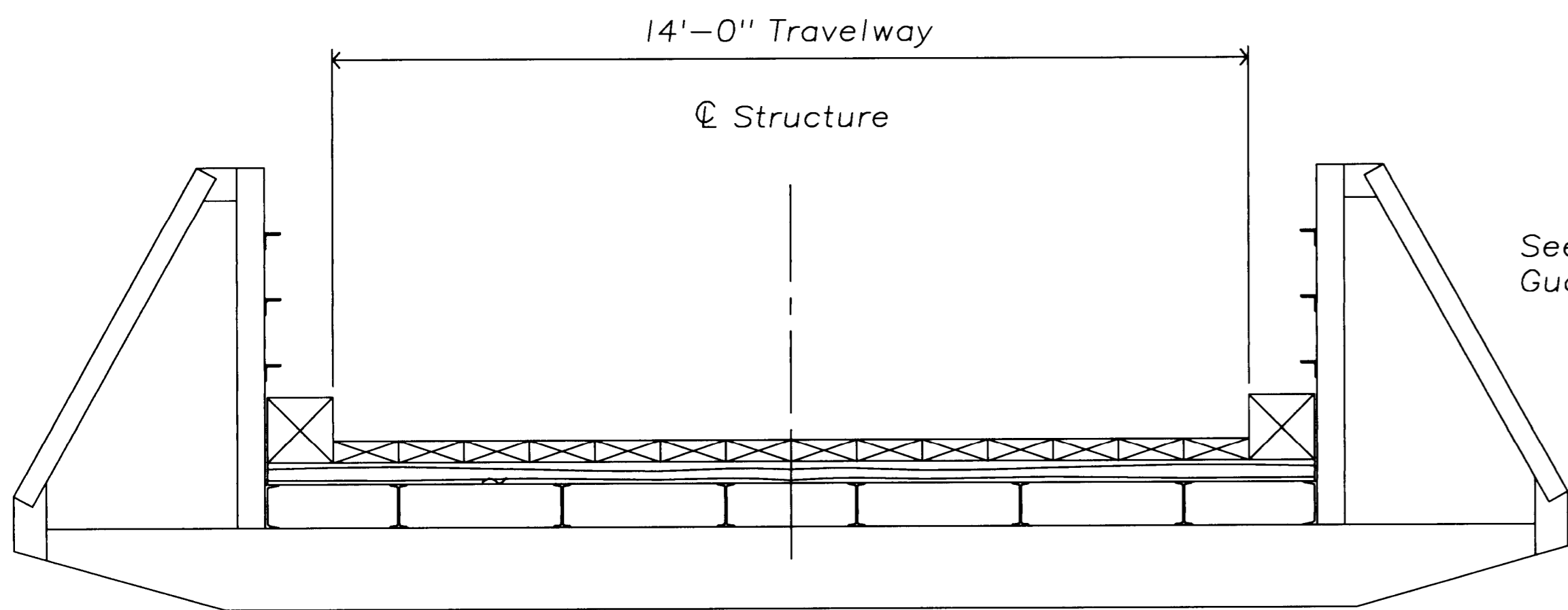
PIER NO. 3
Scale: 3/8" = 1'-0"



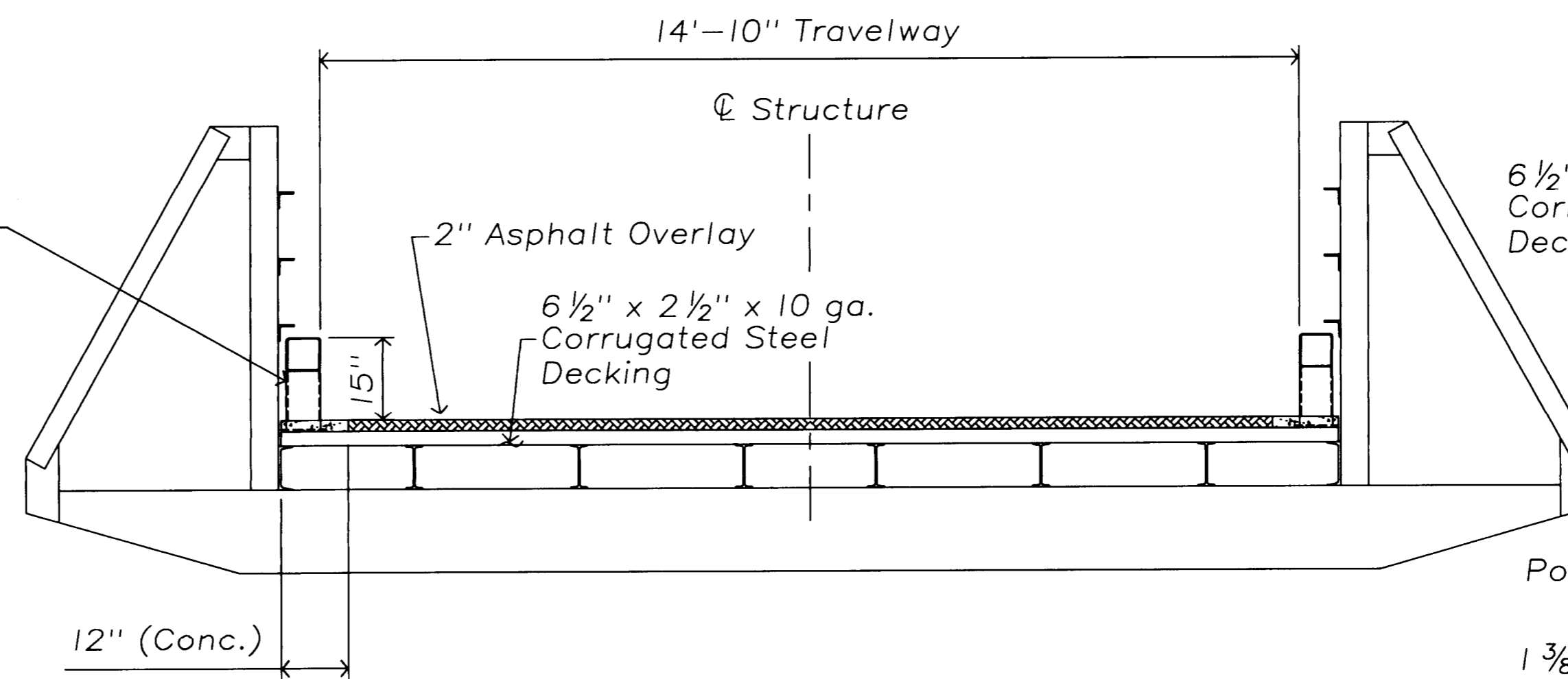
* 2" min. thickness. Thickness will vary on Single "T" due to the camber in the beams.

ENHANCED

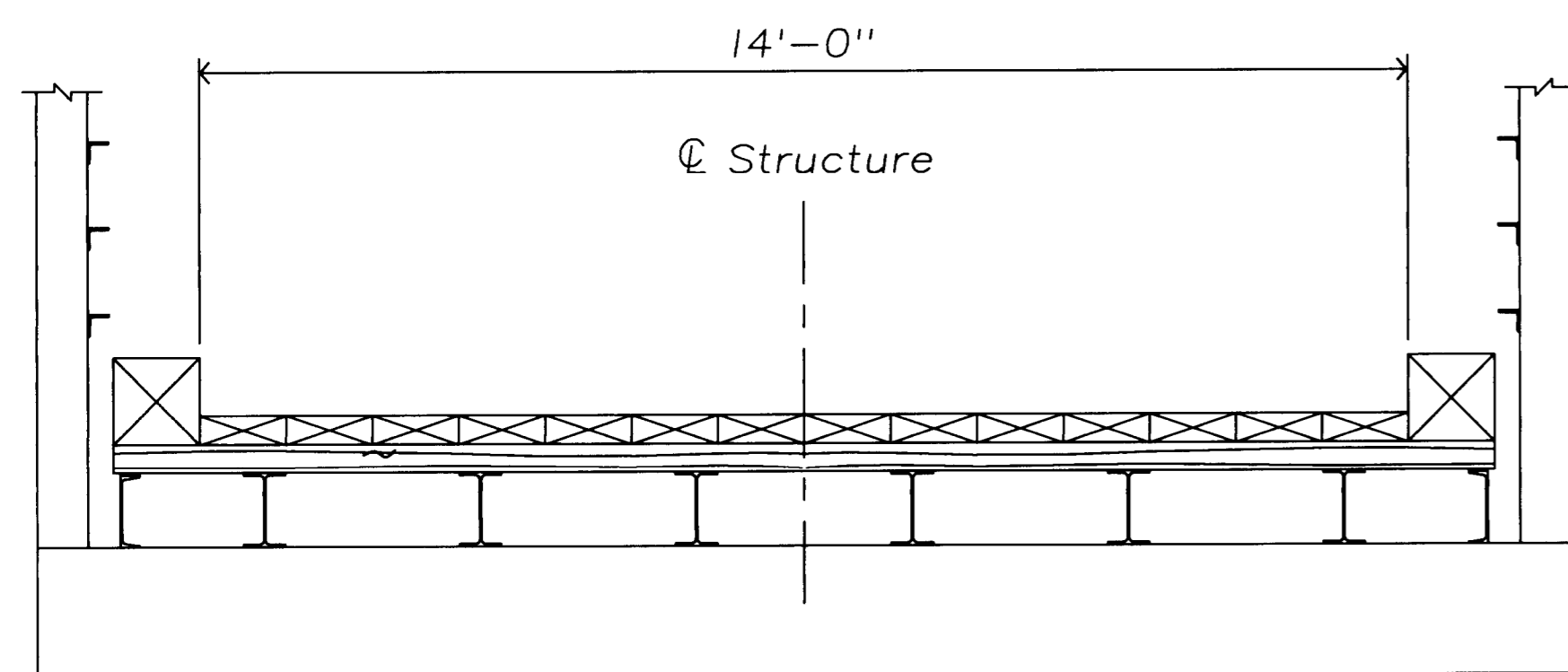
PIER NO. 3
Scale: 3/8" = 1'-0"



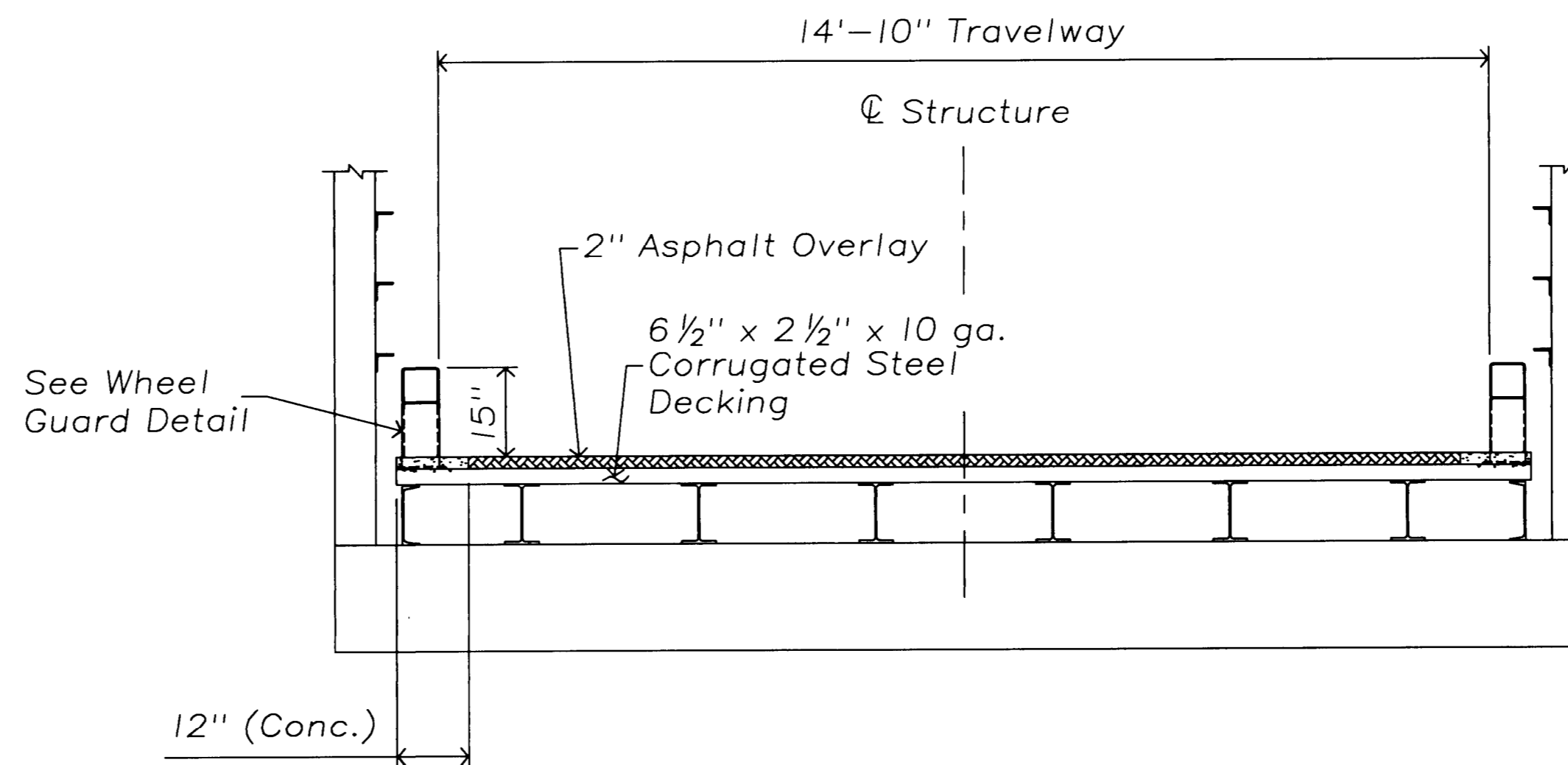
SECTION @ PONY TRUSS
Scale: 1/4" = 1'-0"



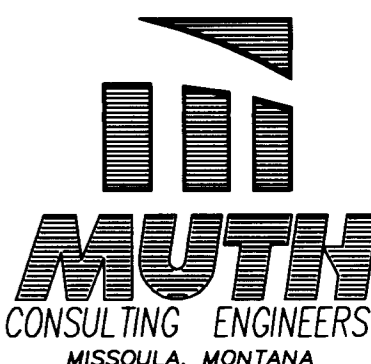
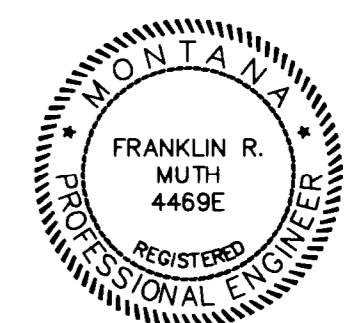
SECTION @ PONY TRUSS
Scale: 1/4" = 1'-0"



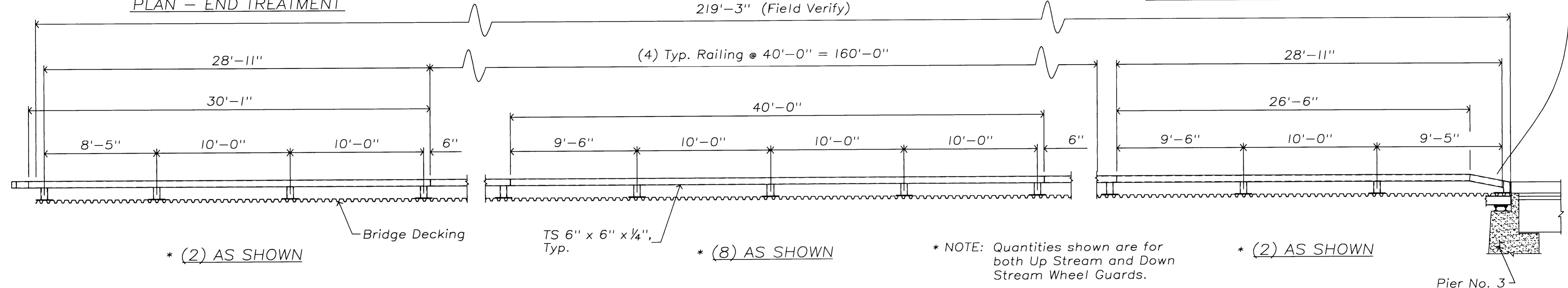
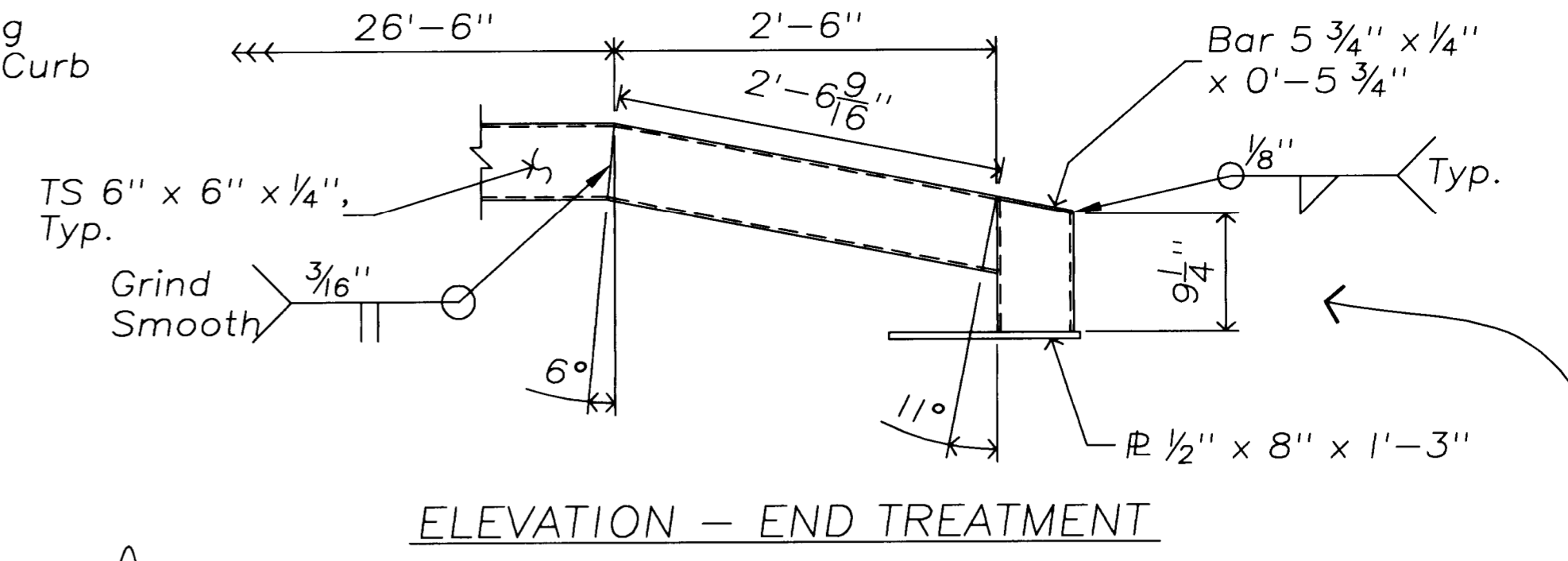
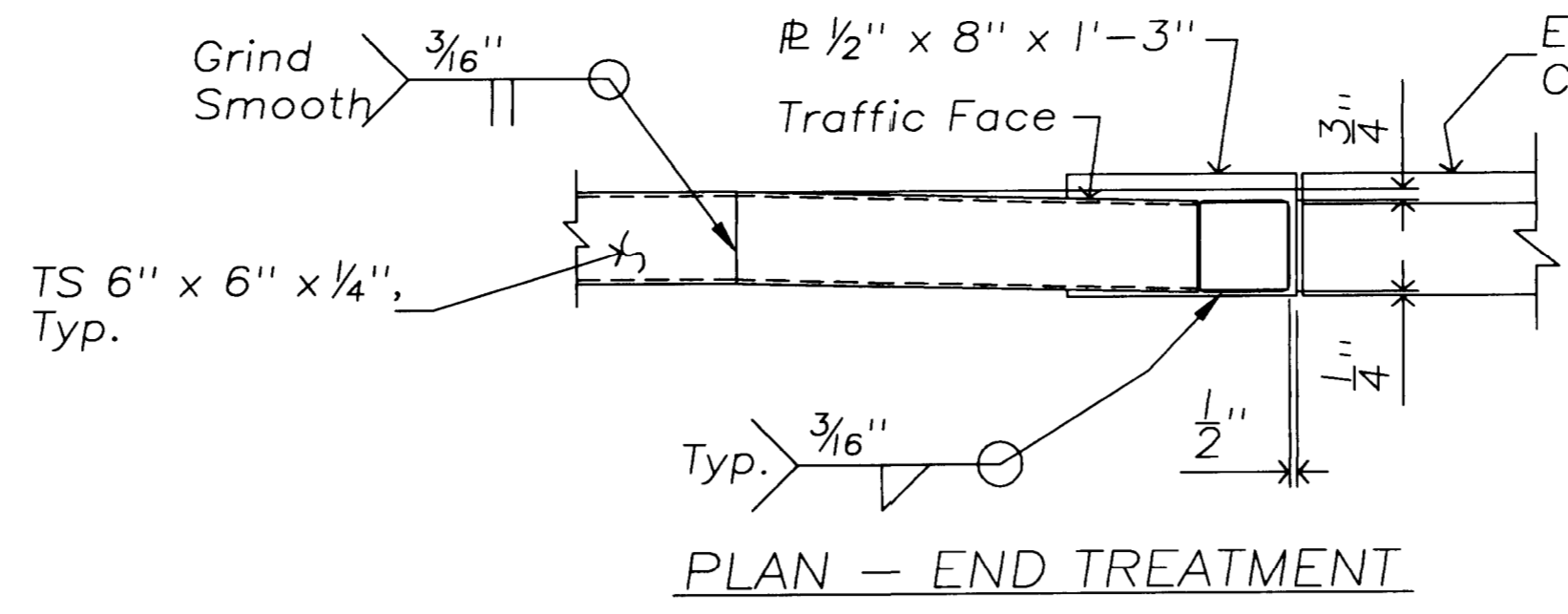
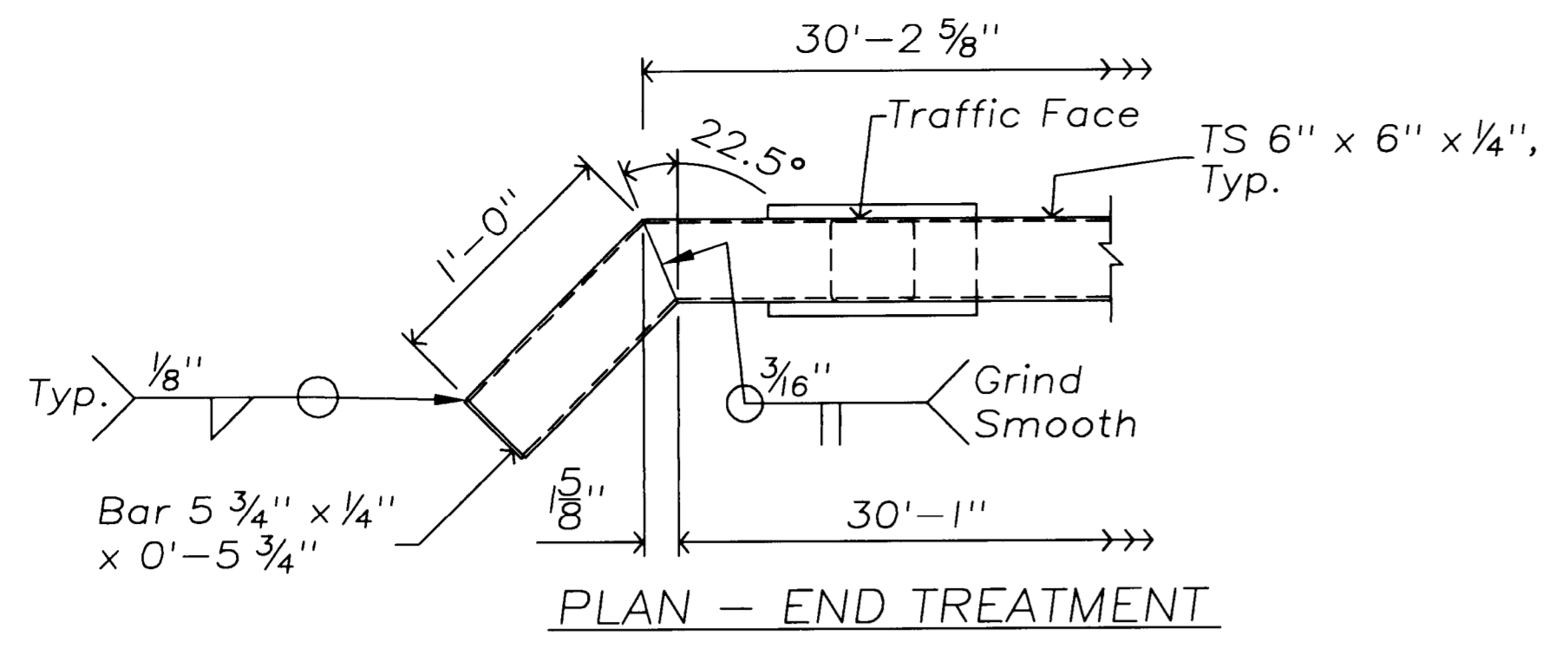
SECTION @ TRUSS
Scale: 1/4" = 1'-0"



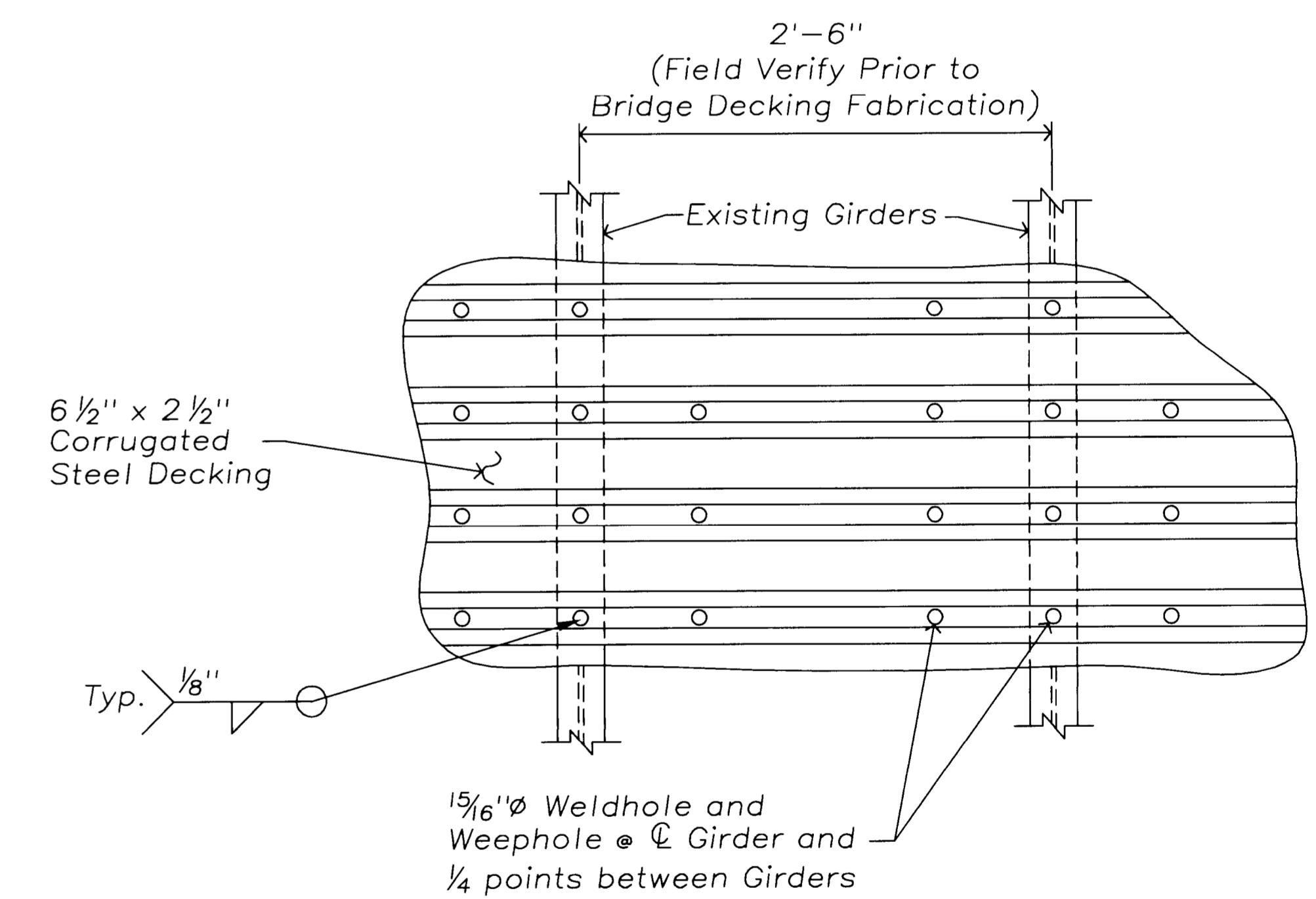
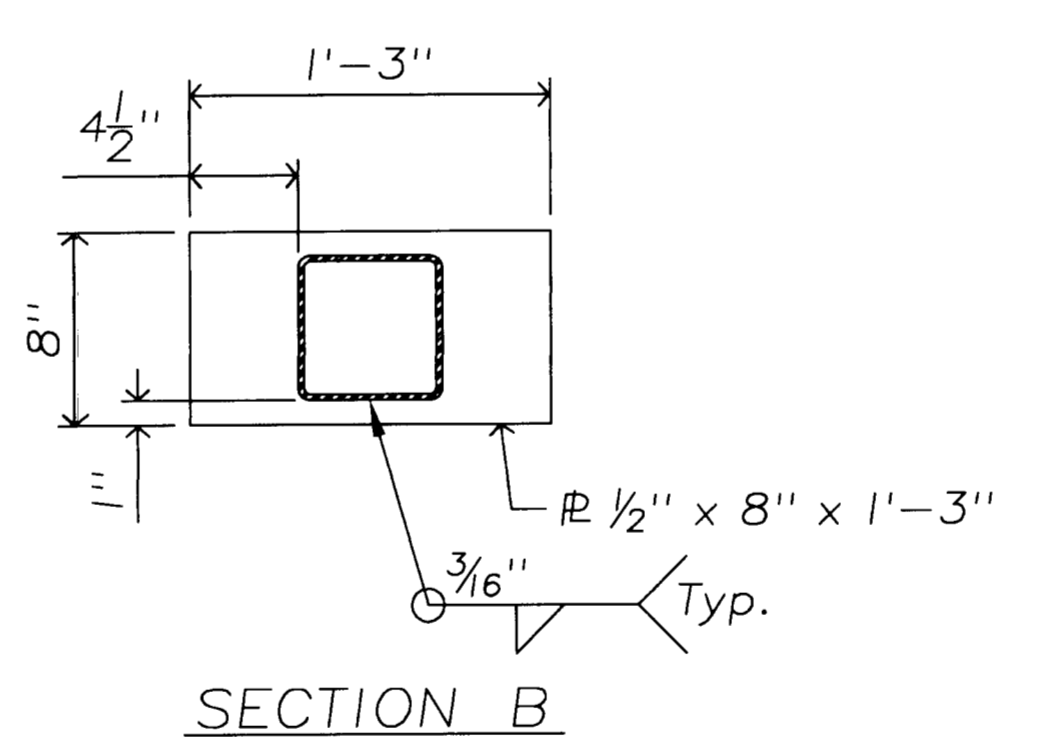
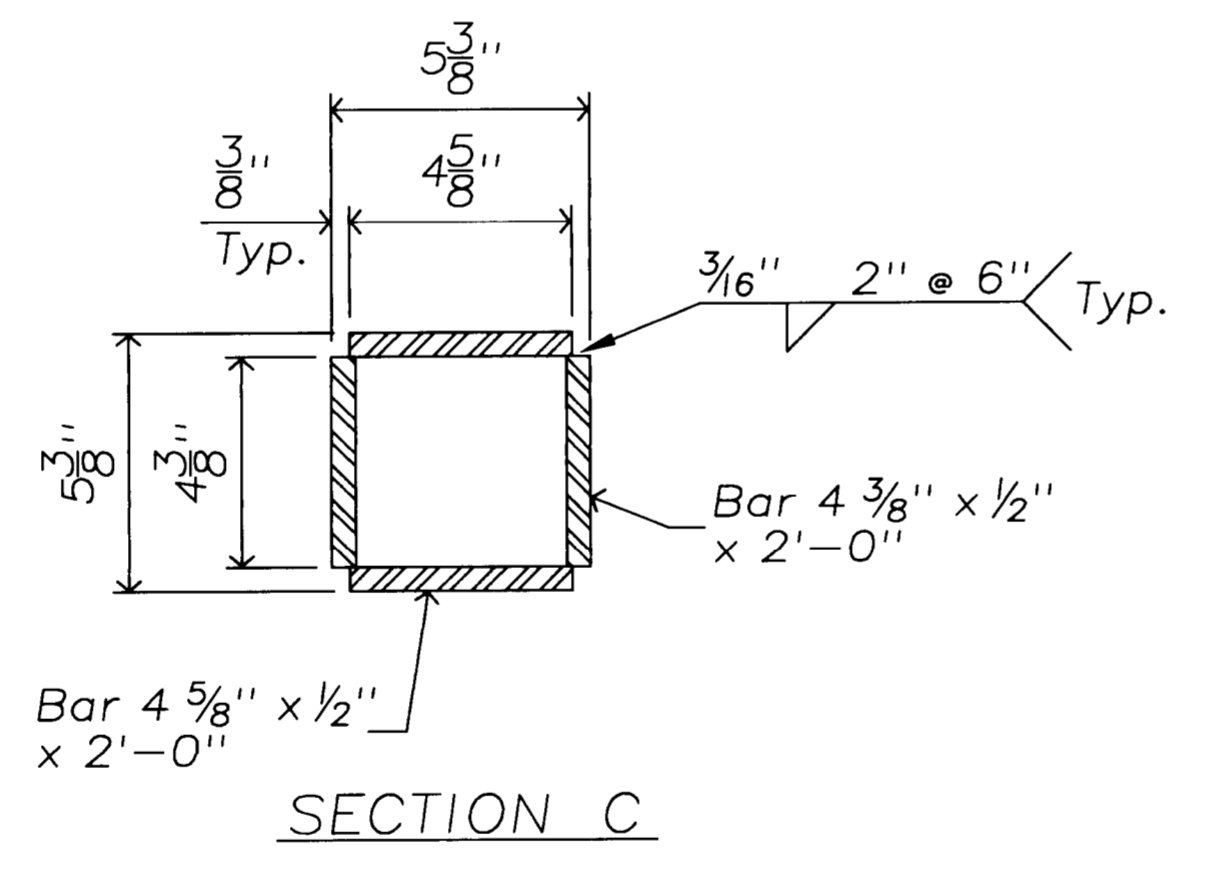
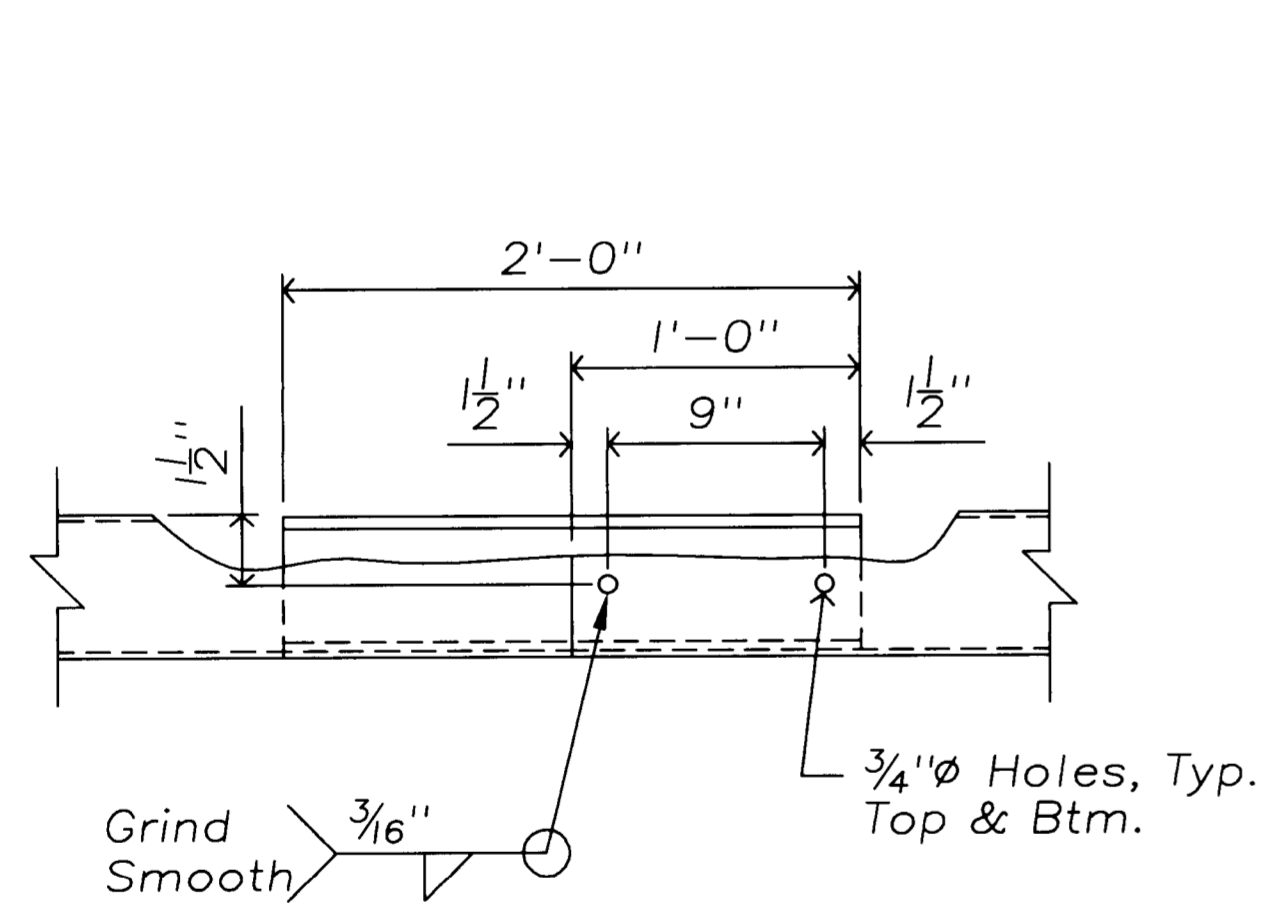
SECTION @ TRUSS
Scale: 1/4" = 1'-0"



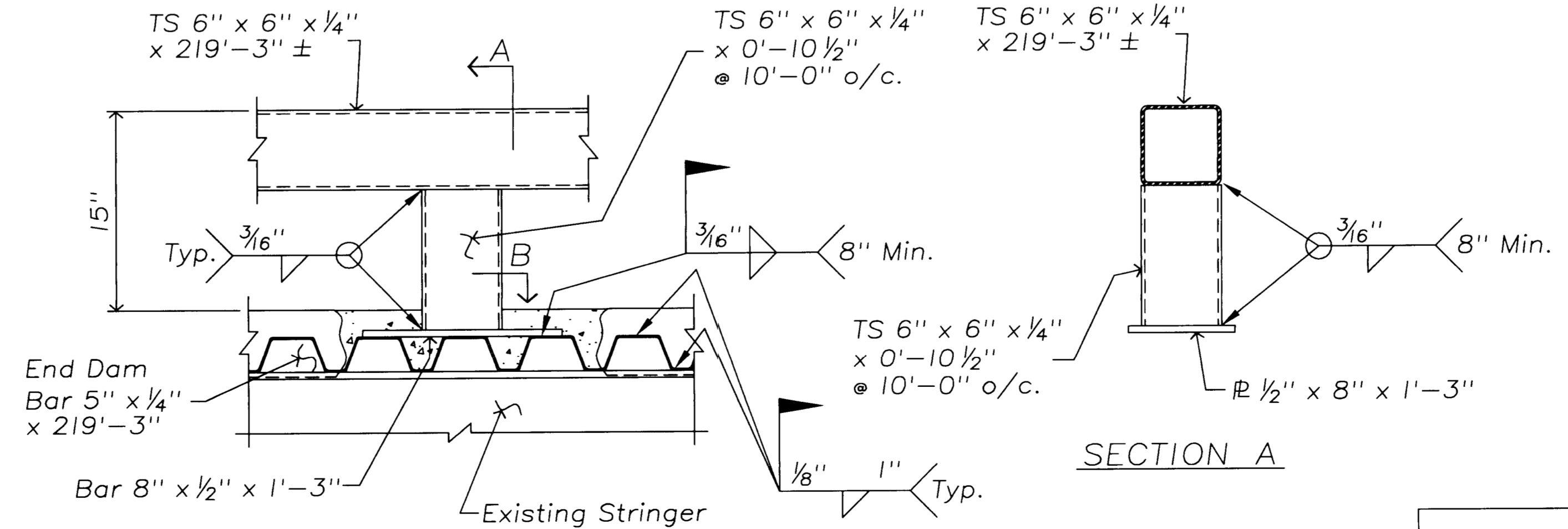
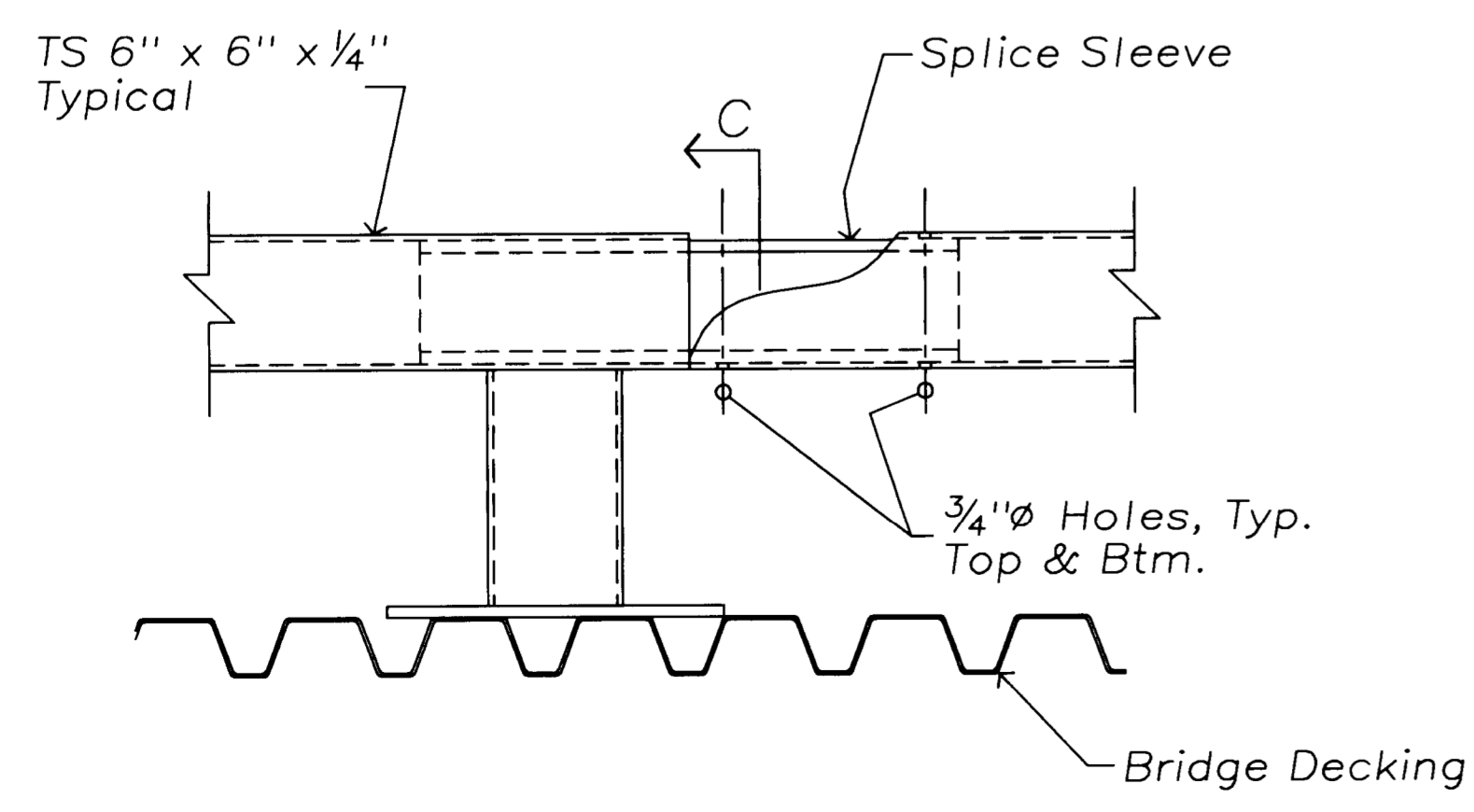
MACLAY BRIDGE OVER THE BITTERROOT RIVER BRIDGE REPAIRS MISSOULA COUNTY		Engineers' Project No. :03-1227	Sheet 2 of 3
Designed : BW	Drawn : FP	Checked : FRM	Approved :
Sheet Title :		TYPICAL SECTIONS	



WHEEL GUARD ELEVATION
Scale: 1/8" = 1'-0"

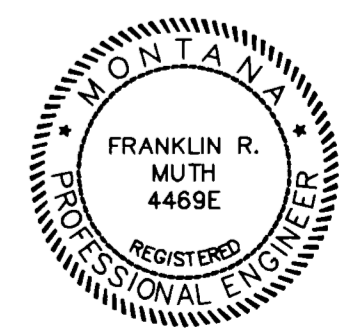


BRIDGE DECK ATTACHMENT
Scale: 3/4" = 1'-0"



WHEEL GUARD DETAIL
Scale: 3/4" = 1'-0"

SPlice DETAIL
Scale: 3/4" = 1'-0"



TITLE1	Engineers' Project No. : -----	Sheet --- of ---
TITLE2	Designed : -----	Sheet Title :
TITLE3	Drawn : -----	SHEETTITLE1
TITLE4	Checked : -----	SHEETTITLE2
	Approved : -----	

Appendix F – FEMA HEC-2 Effective Model Output Files

BITTERROOT

RIVER

BACKWATER COMPUTATIONS, METHOD 11, EM 1110-2-1409

DATE OF RUN 11/21/74

BITTERROOT RIVER NEAR MISSOULA AT MOUTH OF LOLO CREEK FLOOD PLAIN INFORMATION STUDY

SECTION IDENT.	PUR. REACH NO.	NATURAL CONDITIONS		100-YEAR			CONVEYANCE FACTOR K	HEAD LOSS	DISCHARGE Q	VELOCITY	SOULE DEC 1974				TOTAL HEAD	W.S. ELEV.		
		AREA	WP	R	N	VEL. HEAD					VEL. HEAD DIFF.	MEAN HEAD	OTHER LOSSES					
24+00 RIVER MILE		7.45																3140.00
OVERBANK	1	4200.	5061.	1227.	4.12	.1100	2713.		3232.	0.64								
OVERBANK	2	4100.	908.	250.	3.63	.0980	506.		605.	0.67								
CHANNEL	3	4000.	6085.	657.	9.26	.0410	15380.		18321.	3.01								
	4																	
OVERBANK	5	1400.	3634.	766.	5.00	.0600	7424.		8843.	2.31								
TOTALS =							26024.	1.42	31000.	0.11								
26+00 ASSUMED W.S. ELEV. = 3142.44																		
OVERBANK	1	4200.	1695.	1229.	1.38	.1100	436.		836.	0.49								
OVERBANK	2	4100.	2354.	671.	3.51	.0980	1287.		2459.	1.04								
CHANNEL	3	4000.	6352.	799.	7.95	.0410	14502.		27705.	4.36								
	4																	
	5																	
TOTALS =							16226.	3.65	31000.	0.27	-0.16	2.53	0.08	2.46	3142.46			
26+00 RIVER MILE		8.21																3142.46
OVERBANK	1	3500.	1713.	1229.	1.39	.0600	895.		1540.	0.90								
OVERBANK	2	3500.	264.	671.	3.52	.0950	1447.		2491.	1.05								
CHANNEL	3	3450.	6363.	799.	7.97	.0410	15662.		26968.	4.24								
	4																	
	5																	
TOTALS =							18003.	2.97	31000.	0.24								
28+00 ASSUMED W.S. ELEV. = 3144.96																		
OVERBANK	1	3500.	6931.	1721.	4.03	.0600	7345.		9973.	1.44								
OVERBANK	2	3500.	2007.	513.	3.91	.0950	1318.		1790.	0.89								
CHANNEL	3	3450.	4912.	494.	9.95	.0410	14025.		19041.	3.88								
	4																	
OVERBANK	5	2200.	242.	81.	2.99	.1100	145.		197.	0.81								
TOTALS =							22833.	1.84	31000.	0.15	0.09	2.40	0.01	2.50	3144.96			

BACKWATER COMPUTATIONS, METHOD II, EM 1110-2-1409

SECTION IDENT.	POR. NO.	REACH LENGTH	AREA	WP	R	N	CONVEYANCE FACTOR K	HEAD LOSS	DISCHARGE C	VEL. HEAD	VEL. HEAD	VEL. HEAD DIFF.	HEAD LOSS	OTHER HEAD LOSSES	TOTAL HEAD LOSS	ELEV.
28+00		RIVER MILE	8.89													3144.96
OVERBANK	1	3000.	6954.	1721.	4.04	.0880	5439.		7717.	1.11						
OVERBANK	2	3750.	2014.	513.	3.93	.0930	1308.		1856.	0.92						
CHANNEL	3	4100.	4919.	494.	9.96	.0360	14864.		20334.	4.24						
	4															
OVERBANK	5	400.	243.	81.	3.00	.0900	410.		594.	2.44						
TOTALS =							21849.	2.01	31000.		0.19					
30+00		ASSUMED W.S. ELEV. =	3147.53													
OVERBANK	1	3000.	6013.	1141.	4.04	.0880	3609.		6530.	1.42						
OVERBANK	2	3750.	2029.	610.	3.32	.0930	1180.		2134.	1.05						
CHANNEL	3	4100.	4203.	432.	9.72	.0360	12345.		22336.	5.31						
	4															
	5															
TOTALS =							17134.	3.27	31000.		0.32	-0.13	2.64	0.06	2.58	3147.54
30+00		RIVER MILE	9.66													3147.54
OVERBANK	1	2400.	4626.	1141.	4.05	.0900	3964.		7195.	1.56						
OVERBANK	2	3470.	2036.	610.	3.34	.0600	1912.		3470.	1.70						
CHANNEL	3	4150.	4208.	432.	9.73	.0395	11205.		20335.	4.83						
	4															
	5															
TOTALS =							17081.	3.29	31000.		0.25					
32+00		ASSUMED W.S. ELEV. =	3150.82													
OVERBANK	1	3470.	8.	9.	0.98	.0600	3.		7.	0.77						
CHANNEL	3	4150.	3723.	291.	12.77	.0395	11879.		22109.	5.94						
	4															
OVERBANK	5	3100.	5102.	1107.	4.61	.0790	4774.		8985.	1.74						
TOTALS =							18656.	3.46	31000.		0.40	-0.15	3.28	0.08	3.41	3150.84

BACKWATER COMPUTATIONS, METHOD II, EM 1110-2-1409

SECTION IDENT.	PK. NO.	REACH LENGTH	AREA	WP	R	N	CONVEYANCE FACTOR K	HEAD LOSS	DISCHARGE C	VEL.	VEL. HEAD	VEL. HEAD DIFF. LOSS	HEAD LOSS	TOTAL HEAD LOSS	TOTAL ELEV.	
32+00		RIVER MILE	10.45												3150.94	
OVERBANK	1															
OVERBANK	2	1500.	9.	9.	0.99	.0750	4.			0.84						
CHANNEL	3	3250.	3728.	291.	12.79	.0390	13629.		23847.	6.40						
OVERBANK	4															
OVERBANK	5	3100.	5124.	1107.	4.83	.0930	4083.		7145.	1.39						
TOTALS =							17717.	3.06	31000.		0.50					
34+00		ASSUMED W.S. ELEV. =	3153.57													
OVERBANK	1	1100.	602.	296.	2.02	.0850	539.		717.	1.19						
OVERBANK	2	1500.	1880.	465.	4.04	.0750	2445.		1247.	1.73						
CHANNEL	3	3250.	5395.	543.	9.93	.0390	16645.		22177.	4.11						
OVERBANK	4															
OVERBANK	5	3100.	4500.	947.	4.75	.0930	3651.		4859.	1.08						
TOTALS =							23295.	1.77	31000.		0.20	0.30	2.42	0.03	2.75	3153.59
34+00		RIVER MILE	11.07												3153.59	
OVERBANK	1	4400.	608.	295.	2.04	.0910	240.		380.	0.63						
OVERBANK	2	4230.	1887.	465.	4.06	.0970	1130.		1791.	0.95						
CHANNEL	3	4160.	5403.	543.	9.95	.0430	13393.		21223.	3.93						
OVERBANK	4															
OVERBANK	5	1600.	4515.	947.	4.77	.0990	4800.		7606.	1.68						
TOTALS =							14563.	2.51	31000.		0.18					
34+00		ASSUMED W.S. ELEV. =	3156.28													
OVERBANK	1	4400.	1591.	905.	1.76	.0910	571.		987.	0.62						
OVERBANK	2	4230.	6040.	1150.	5.25	.0970	4297.		7435.	1.23						
CHANNEL	3	4160.	4429.	395.	11.22	.0430	11893.		20578.	4.65						
OVERBANK	4															
OVERBANK	5															
TOTALS =							16761.	2.99	29000.		0.24	-0.07	0.75	0.04	2.72	3156.30

BACKWATER COMPUTATIONS, METHOD II, CM 1110-2-1409

SECTION IDENT.	PKG. NO.	REACH LENGTH	AREA	WP	R	N	CONVEYANCE FACTOR K	HEAD LOSS	DISCHARGE Q	VCL. HEAD	VCL. HEAD	VCL. HEAD	HEAD DIFF.	OTHER HEAD LOSSES	TOTAL HEAD	TOTAL HEAD
38+00	RIVER MILE	11.86														2156.30
OVERBANK	1	3650.	1608.	906.	1.77	.0860	674.		1064.	0.66						
OVERBANK	2	3600.	5061.	1150.	5.27	.0940	4436.		7637.	1.26						
CHANNEL	3	3130.	4437.	355.	11.23	.0460	12452.		20298.	4.58						
	4															
	5															
TOTALS =							18361.	2.49	29000.		0.23					
38+00	ASSUMED W.S. ELEV. = 3124.90															
OVERBANK	1	3650.	6498.	2945.	2.21	.0860	3150.		5273.	0.81						
OVERBANK	2	3600.	4376.	1098.	3.98	.0940	2847.		4851.	1.11						
CHANNEL	3	3130.	3176.	242.	13.70	.0460	10499.		17577.	5.53						
	4															
	5															
TOTALS =							16546.	2.80	27700.		0.31	-0.07	2.65	0.04	2.61	1158.92

 HEC2 RELEASE DATED NOV 76 UPDATED AUG1977
 ERROR CORR - 01,02
 MODIFICATION - 50,51,52,53

T1 MISSOULA COUNTY
 T2 10 YEAR EVENT
 T3 BITTERROOT RIVER

Flow rates don't match those found in FIS Vol. 1 Table 2. for Bitterroot but do match flows for the Clark Fork below Missoula.

J1	ICHECK	NO	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FO
	0.	4.	0.	0.	0.000000	0.00	0.0	0.	3105.370	0.000
J2	NPROF	IPLT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
J3	VARIABLE CODES FOR SUMMARY PRINTOUT									
	150.000	202.000	176.000	-215.000	0.000	0.000	0.000	0.000	0.000	0.000
J5	LPRNT	NUMSEC	*****REQUESTED SECTION NUMBERS*****							
	-10.000	-10.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QT	6.000	47000.000	47000.000	47000.000	52250.000	58000.000	64000.000	0.000	0.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.000	0.100	.500	0.000	0.000	0.000	0.000	0.000
NH	5.000	.050	372.000	.043	1672.000	.065	5100.000	.040	5395.000	.050
NH	5538.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	48.930	88.000	1672.000	5100.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	3105.600	360.000	3105.700	372.000	1104.100	472.000	3103.600	512.000	3093.100	534.000
GR	3091.900	566.000	3092.800	590.000	3090.800	600.000	3091.300	629.000	3091.300	659.000
GR	3090.300	709.000	3089.900	749.000	3089.100	789.000	3089.100	829.000	3093.400	834.000
GR	3099.700	850.000	3100.300	856.000	3100.200	872.000	3100.000	879.000	3096.900	889.000
GR	3106.000	912.000	3106.500	930.000	3105.000	942.000	3106.500	972.000	3106.000	1000.000
GR	3105.500	1018.000	3108.000	1026.000	3107.000	1072.000	3108.000	1112.000	3107.000	1140.000
GR	3106.000	1172.000	3107.500	1272.000	3100.600	1373.000	3095.700	1377.000	3091.700	1397.000
GR	3090.000	1422.000	3092.000	1472.000	3090.000	1510.000	3095.000	1544.000	3096.500	1572.000
GK	3095.000	1600.000	3098.500	1612.000	3103.000	1622.000	3104.500	1672.000	3106.000	1772.000
GR	3107.500	1872.000	3106.500	1912.000	3107.000	1972.000	3102.000	1982.000	3105.000	2072.000
GR	3103.200	2148.000	3101.600	2159.000	3103.800	2172.000	3108.000	2220.000	3106.000	2272.000
GR	3109.000	2372.000	3110.000	2472.000	3110.000	2672.000	3105.100	2772.000	3105.200	2790.000
GR	3108.000	2800.000	3107.700	3000.000	3108.000	3100.000	3107.000	3200.000	3106.800	3300.000
GR	3107.000	3400.000	3106.000	3600.000	3103.300	3620.000	3102.000	3683.000	3104.500	3700.000
GR	3105.000	3800.000	3110.000	3880.000	3108.200	5100.000	3104.900	5160.000	3099.900	5180.000
GR	3097.000	5250.000	3100.900	5275.000	3093.400	5300.000	3099.000	5325.000	3103.900	5350.000
GR	3103.900	5375.000	3105.400	5394.000	3107.500	5395.000	3107.500	5396.000	3107.800	5400.000
GR	3108.500	5478.000	3108.100	5528.000	3113.700	5538.000	0.000	0.000	0.000	0.000
QT	6.000	31800.000	31800.000	20900.000	29700.000	31800.000	42000.000	0.000	0.000	0.000
NC	.085	.052	.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	.520	65.000	4902.000	5321.000	500.000	4100.000	2750.000	0.000	0.000	0.000

Flow rates, Match FIS Vol. 1 Table 2

X1	1.150	92.000	2278.000	2618.000	1400.000	1100.000	2025.000	0.000	0.000	0.000
GR	3130.300	1132.000	3127.000	1159.000	3125.800	1241.000	3125.800	1325.000	3124.500	1374.000
GR	3122.500	1429.000	3119.800	1474.000	3118.000	1524.000	3118.300	1578.000	3116.800	1629.000
GR	3113.800	1645.000	3114.000	1672.000	3113.800	1708.000	3112.500	1739.000	3111.000	1772.000
GR	3111.300	1822.000	3112.800	1854.000	3110.300	1883.000	3108.000	1927.000	3106.800	1958.000
GR	3106.800	1980.000	3107.300	2011.000	3107.300	2043.000	3107.300	2066.000	3107.500	2080.000
GR	3107.700	2094.000	3108.200	2120.000	3108.900	2141.000	3110.200	2153.000	3110.900	2167.000
GR	3111.200	2186.000	3110.900	2199.000	3109.200	2216.000	3108.700	2241.000	3107.900	2278.000
GR	3104.700	2281.000	3103.300	2303.000	3101.900	2319.000	3100.600	2328.000	3100.100	2353.000
GR	3099.900	2378.000	3098.900	2403.000	3099.000	2428.000	3099.000	2453.000	3099.100	2477.000
GR	3099.400	2502.000	3099.800	2527.000	3099.900	2552.000	3100.400	2576.000	3100.900	2601.000
GR	3102.000	2610.000	3106.300	2618.000	3107.900	2660.000	3107.600	2679.000	3108.400	2690.000
GR	3108.200	2717.000	3107.200	2766.000	3107.400	2805.000	3107.200	2895.000	3106.900	2948.000
GR	3107.400	3005.000	3107.200	3050.000	3106.900	3100.000	3106.900	3163.000	3103.900	3283.000
GR	3107.400	3300.000	3109.400	3319.000	3109.700	3351.000	3108.400	3456.000	3108.700	3647.000
GR	3109.900	3740.000	3107.400	3872.000	3111.900	3928.000	3116.900	3950.000	3119.900	3974.000
GR	3121.200	3996.000	3124.200	4031.000	3125.400	4198.000	3121.900	4459.000	3121.900	4515.000
GR	3125.200	4855.000	3127.200	5007.000	3128.400	5039.000	3129.200	5271.000	3129.900	5485.000
GR	3128.700	5690.000	3130.200	6032.000	3130.700	6450.000	3132.400	6907.000	3132.900	7130.000
GR	3134.700	7477.000	3135.400	7821.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	5.000	.055	1122.000	.036	1405.000	.046	1538.000	.068	2110.000	.085
NH	4700.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

XS E

X1	1.890	91.000	1122.000	1638.000	4000.000	3700.000	3925.000	0.000	0.000	0.000
GR	3124.200	1048.000	3114.000	1063.000	3114.000	1067.000	3115.800	1069.000	3116.200	1079.000
GR	3114.000	1106.000	3110.800	1122.000	3103.600	1128.000	3101.900	1141.000	3100.900	1147.000
GR	3100.500	1172.000	3099.400	1197.000	3099.800	1222.000	3101.500	1247.000	3102.400	1272.000
GR	3103.700	1297.000	3104.400	1306.000	3106.400	1323.000	3108.600	1358.000	3109.200	1384.000
GR	3111.400	1405.000	3111.000	1429.000	3108.200	1441.000	3109.600	1464.000	3108.800	1482.000
GR	3108.600	1505.000	3106.800	1524.000	3107.600	1544.000	3106.800	1560.000	3106.400	1578.000
GR	3108.600	1600.000	3110.400	1638.000	3110.200	1560.000	3108.800	1662.000	3109.600	1678.000
GR	3107.800	1595.000	3108.400	1712.000	3112.400	1739.000	3112.800	1762.000	3112.000	1818.000
GR	3112.000	1881.000	3111.600	1908.000	3111.600	1939.000	3111.600	1939.000	3109.200	1956.000
GR	3111.200	1992.000	3109.800	2011.000	3106.600	2033.000	3106.800	2045.000	3112.400	2063.000
GR	3114.600	2110.000	3113.400	2158.000	3112.200	2199.000	3112.600	2268.000	3111.600	2316.000
GR	3110.200	2363.000	3110.200	2391.000	3112.600	2425.000	3112.000	2526.000	3111.800	2564.000
GR	3112.600	2623.000	3112.600	2674.000	3112.200	2749.000	3112.000	2855.000	3111.200	2905.000
GR	3110.400	2930.000	3112.000	2968.000	3112.000	3004.000	3111.000	3027.000	3112.400	3060.000
GR	3112.400	3105.000	3111.000	3117.000	3108.600	3152.000	3111.000	3176.000	3108.600	3214.000
GR	3114.400	3252.000	3112.800	3328.000	3113.000	3366.000	3113.800	3430.000	3112.800	3445.000
GR	3113.000	3477.000	3116.400	3492.000	3118.000	3604.000	3117.400	3657.000	3118.400	3685.000
GR	3126.000	3711.000	3125.200	4060.000	3124.400	4088.000	3125.200	4335.000	3125.400	4622.000
GR	3127.600	4700.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	4.000	.055	2983.000	.067	3242.000	.039	3518.000	.058	3767.000	0.000

XS F

X1	2.750	73.000	3242.000	3518.000	4650.000	3500.000	4550.000	0.000	0.000	0.000
GR	3178.800	1123.000	3167.400	1170.000	3146.200	1237.000	3116.300	1305.000	3116.600	1374.000
GR	3116.700	1442.000	3116.500	1483.000	3117.000	1523.000	3116.900	1540.000	3118.800	1560.000
GR	3116.900	1568.000	3116.900	1581.000	3119.100	1591.000	3118.400	1609.000	3118.400	1634.000
GR	3119.100	1679.000	3119.900	1730.000	3114.900	1793.000	3116.400	1869.000	3117.200	1926.000
GR	3118.000	1989.000	3117.600	2045.000	3116.200	2116.000	3118.300	2191.000	3118.000	2250.000
GR	3115.000	2350.000	3117.400	2433.000	3117.800	2489.000	3116.900	2562.000	3115.900	2620.000
GR	3115.900	2675.000	3116.100	2723.000	3116.400	2734.000	3116.200	2765.000	3116.800	2800.000
GR	3116.800	2849.000	3116.800	2892.000	3117.800	2949.000	3117.200	2964.000	3108.400	2983.000
GR	3108.200	2993.000	3108.200	3021.000	3115.200	3032.000	3115.000	3048.000	3115.000	3075.000
GR	3112.800	3102.000	3111.800	3122.000	3114.600	3137.000	3115.600	3163.000	3115.400	3193.000
GR	3114.600	3217.000	3115.600	3242.000	3111.700	3248.000	3112.200	3273.000	3111.100	3285.000
GR	3109.400	3310.000	3108.700	3335.000	3108.400	3357.000	3106.800	3385.000	3105.300	3410.000
GR	3103.300	3435.000	3101.400	3460.000	3102.100	3485.000	3105.400	3510.000	3108.400	3515.000

XS G

GR	3113.400	3518.000	3118.800	3521.000	3120.400	3532.000	3120.600	3542.000	3136.600	3564.000
GR	3169.000	3625.000	3210.200	3697.000	3246.400	3767.000	0.000	0.000	0.000	0.000
NH	4.000	.058	3907.000	.038	4309.000	.070	5483.000	.060	5940.000	0.000
ET	0.000	0.000	4.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	3.360	75.000	3907.000	4309.000	3350.000	2700.000	3225.000	0.000	0.000	0.000
GR	3123.400	2269.000	3121.800	2368.000	3121.900	2523.000	3121.900	2782.000	3122.100	3040.000
GR	3121.500	3361.000	3114.600	3430.000	3114.300	3478.000	3116.000	3636.000	3116.500	3716.000
GR	3114.300	3756.000	3117.700	3797.000	3117.900	3907.000	3114.300	3915.000	3111.800	3989.000
GR	3109.200	3952.000	3105.000	3971.000	3110.600	3996.000	3111.300	4022.000	3111.600	4047.000
GR	3111.400	4072.000	3110.900	4097.000	3110.700	4123.000	3111.000	4148.000	3110.700	4173.000
GR	3110.100	4198.000	3109.500	4224.000	3109.200	4249.000	3110.600	4275.000	3111.200	4295.000
GR	3111.500	4301.000	3118.200	4309.000	3119.000	4346.000	3118.400	4393.000	3117.600	4459.000
GR	3116.600	4472.000	3119.000	4486.000	3118.200	4527.000	3118.200	4585.000	3117.200	4609.000
GR	3118.200	4661.000	3118.400	4744.000	3118.200	4786.000	3114.200	4808.000	3114.800	4838.000
GR	3118.000	4862.000	3117.400	4895.000	3119.400	4931.000	3119.600	4971.000	3118.200	5026.000
GR	3116.200	5058.000	3116.400	5107.000	3115.800	5187.000	3116.600	5272.000	3116.600	5352.000
GR	3115.800	5427.000	3114.800	5463.000	3112.800	5474.000	3117.600	5483.000	3119.000	5532.000
GR	3118.000	5548.000	3116.000	5573.000	3116.000	5587.000	3116.800	5610.000	3116.800	5639.000
GR	3122.600	5647.000	3122.600	5655.000	3122.400	5661.000	3125.800	5665.000	3130.000	5674.000
GR	3130.400	5690.000	3130.000	5701.000	3131.200	5767.000	3134.000	5900.000	3140.000	5940.000
NH	4.000	.085	4388.000	.060	6910.000	.037	7249.000	.065	7401.000	0.000

xs H

X1	4.070	68.000	6910.000	7249.000	1550.000	3800.000	3720.000	0.000	0.000	0.000
GR	3122.500	3452.000	3123.500	3467.000	3120.100	3484.000	3120.200	3548.000	3121.400	3677.000
GR	3122.500	3944.000	3121.000	4075.000	3123.200	4170.000	3123.000	4308.000	3122.300	4360.000
GR	3120.500	4388.000	3118.800	4411.000	3116.900	4455.000	3119.600	4524.000	3118.200	4613.000
GR	3118.700	4645.000	3117.900	4681.000	3118.700	4745.000	3117.500	4768.000	3117.900	4792.000
GR	3116.600	4814.000	3115.600	4923.000	3117.700	4940.000	3118.900	4978.000	3114.800	5008.000
GR	3116.100	5215.000	3117.000	5253.000	3118.200	5356.000	3116.900	5408.000	3119.200	5473.000
GR	3117.900	5500.000	3119.000	5521.000	3118.800	5566.000	3119.200	5594.000	3119.400	5857.000
GR	3120.300	5911.000	3118.600	6001.000	3119.700	6181.000	3121.100	6351.000	3116.200	6464.000
GR	3120.700	6575.000	3121.300	6616.000	3120.200	6693.000	3121.600	6725.000	3121.500	6760.000
GR	3120.600	6802.900	3122.200	6910.000	3117.200	6920.000	3116.900	6923.000	3114.000	6933.000
GR	3111.200	6948.000	3110.000	6973.000	3110.500	6998.000	3110.400	7023.000	3110.600	7048.000
GR	3112.000	7072.000	3111.000	7097.000	3111.100	7121.000	3110.600	7146.000	3110.400	7171.000
GR	3110.700	7196.000	3112.700	7220.000	3114.000	7230.000	3119.300	7243.000	3120.100	7249.000
GR	3121.000	7311.000	3122.900	7381.000	3130.700	7401.000	0.000	0.000	0.000	0.000
NC	.080	.070	.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

xs I

Encroachment table

X1	4.790	32.000	7098.000	7421.000	2750.000	4050.000	3800.000	0.000	0.000	0.000
GR	3127.000	6716.000	3126.300	6764.000	3127.000	6808.000	3125.500	6958.000	3125.000	7023.000
GR	3122.500	7034.000	3125.700	7044.000	3122.800	7058.000	3122.500	7098.000	3121.900	7101.000
GR	3115.500	7109.000	3115.500	7121.000	3116.000	7138.000	3115.500	7170.000	3114.700	7188.000
GR	3114.100	7213.000	3113.200	7236.000	3111.800	7263.000	3111.600	7286.000	3112.300	7313.000
GR	3113.300	7338.000	3111.500	7363.000	3112.400	7386.000	3115.400	7408.000	3122.200	7421.000
GR	3121.800	7441.000	3121.300	7499.000	3121.800	7564.000	3121.800	7603.000	3123.500	7625.000
GR	3127.300	7644.000	3132.100	7665.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	.050	.063	.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000

xs J

X1	505.020	59.000	6954.000	7300.000	1100.000	1250.000	1225.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3135.000	3135.000	0.000
GR	3129.700	5317.000	3129.900	5403.000	3129.800	5505.000	3129.500	5566.000	3129.300	5691.000
GR	3129.200	5808.000	3129.200	5933.000	3129.200	6033.000	3129.300	6131.000	3129.500	6248.000
GR	3129.800	6339.000	3130.400	6423.000	3131.000	6540.000	3131.400	6659.000	3132.700	6791.000
GR	3133.800	6892.000	3134.500	6954.000	3116.200	6980.000	3114.100	7012.000	3116.200	7027.000

xs K

GR	3116.100	7034.000	3114.900	7057.000	3115.400	7092.000	3115.800	7106.000	3114.400	7118.000
GR	3113.000	7131.000	3110.600	7156.000	3103.700	7181.000	3102.900	7206.000	3099.000	7231.000
GR	3112.300	7256.000	3116.100	7263.000	3118.200	7273.000	3128.000	7287.000	3137.900	7300.000
GR	3138.300	7325.000	3138.600	7362.000	3139.400	7428.000	3139.900	7527.000	3141.200	7627.000
GR	3141.800	7703.000	3142.400	7773.000	3143.900	7859.000	3144.700	7923.000	3144.600	8004.000
GR	3145.700	8078.000	3146.100	8146.000	3147.200	8213.000	3147.600	8277.000	3148.200	8347.000
GR	3149.200	8430.000	3149.500	8501.000	3150.700	8583.000	3151.400	8654.000	3152.100	8726.000
GR	3153.100	8801.000	3154.000	8865.000	3154.000	8925.000	3155.200	9000.000	0.000	0.000
SB	1.050	1.500	2.500	346.000	295.000	6.000	6600.000	.500	3111.000	3111.000

X1	805.020	0.000	0.000	0.000	75.000	75.000	75.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	3133.000	3134.500	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3134.500	3137.900	0.000
NC	.050	.070	.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	505.040	45.000	6951.000	7365.000	50.000	50.000	50.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3139.700	3141.400	0.000
GR	3139.700	6624.000	3140.000	6692.000	3140.500	6786.000	3140.900	6888.000	2141.400	6951.000
GR	3130.200	6966.000	3119.300	7001.000	3118.200	7009.000	3116.200	7014.000	3115.100	7051.000
GR	3113.900	7060.000	3115.000	7085.000	3116.200	7114.000	3117.200	7153.000	3117.600	7192.000
GR	3116.100	7196.000	3106.100	7221.000	3105.900	7247.000	3104.500	7273.000	3107.900	7298.000
GR	3116.100	7310.000	3122.200	7320.000	3132.200	7355.000	3141.400	7365.000	3142.000	7421.000
GR	3142.600	7534.000	3142.900	7621.000	3143.300	7702.000	3143.700	7799.000	3144.100	7886.000
GR	3144.300	7966.000	3144.500	8040.000	3145.100	8131.000	3145.400	8214.000	3145.900	8302.000
GR	3146.600	8343.000	3146.700	8422.000	3146.800	8525.000	3147.000	8589.000	3147.000	8680.000
GR	3147.800	8764.000	3148.900	8851.000	3149.100	8928.000	3149.200	8986.000	3149.500	9050.000
SB	1.000	1.500	2.500	414.000	310.000	12.000	8145.000	1.730	3113.000	3113.000

X1	805.040	0.000	0.000	0.000	25.000	25.000	25.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	3137.000	3141.400	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3141.400	3141.400	0.000
NC	.068	.065	.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	5.080	77.000	6975.000	7349.000	20.000	250.000	150.000	0.000	0.000	0.000
GR	3134.500	5325.000	3134.400	5400.000	3134.500	5450.000	3134.400	5550.000	3134.500	5580.000
GR	3132.700	5595.000	3132.700	5645.000	3132.800	5681.000	3133.100	5701.000	3134.400	5711.000
GR	3134.400	5725.000	3133.900	5739.000	3132.000	5757.000	3131.200	5784.000	3130.800	5831.000
GR	3130.300	5859.000	3132.400	5887.000	3133.900	5900.000	3131.400	5911.000	3132.900	5931.000
GR	3131.400	5943.000	3131.200	5965.000	3131.200	5983.000	3131.800	6014.000	3131.500	6026.000
GR	3132.100	6051.000	3132.100	6076.000	3131.800	6092.000	3132.300	6117.000	3132.300	6160.000
GR	3133.900	6195.000	3133.400	6217.000	3135.900	6227.000	3133.900	6239.000	3134.000	6262.000
GR	3134.900	6288.000	3121.800	6307.000	3122.400	6348.000	3121.400	6378.000	3121.200	6401.000
GR	3121.500	6422.000	3122.300	6483.000	3123.100	6527.000	3124.000	6568.000	3124.500	6619.000
GR	3123.700	6657.000	3122.400	6685.000	3122.100	6726.000	3122.200	6766.000	3122.700	6807.000
GR	3123.700	6843.000	3124.300	6880.000	3124.800	6924.000	3123.900	6957.000	3123.500	6975.000
GR	3119.100	6980.000	3119.100	6985.000	3116.900	6994.000	3115.400	7013.000	311.100	7020.000
GR	3116.500	7035.000	3115.900	7041.000	3117.200	7070.000	3116.900	7107.000	3116.700	7132.000
GR	3116.700	7153.000	3116.600	7169.000	3115.400	7201.000	3115.400	7226.000	3111.400	7253.000
GR	3113.100	7280.000	3115.300	7304.000	3115.900	7330.000	3116.800	7332.000	3122.300	7345.000
GR	3126.500	7349.000	3148.100	7376.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	5.000	.050	4787.000	.080	5232.000	.036	5542.000	.076	7024.000	.060
NH	8050.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	5.740	83.000	5232.000	5542.000	2000.000	4050.000	3500.000	0.000	0.000	0.000
GR	3132.200	4380.000	3125.500	4400.000	3125.200	4500.000	3125.000	4650.000	3124.900	4787.000
GR	3124.200	479.000	3125.300	4820.000	3125.200	4845.000	3123.300	4868.000	3123.200	4884.000

Bridge

Phone Business Form, Inc. No. 14127

GR	3124.700	4900.000	3123.900	5014.000	3126.400	5162.000	3130.300	5164.000	3126.300	5203.000
GR	3122.100	5218.000	3121.700	5232.000	3119.500	5240.000	3118.600	5247.000	3116.500	5282.000
GR	3115.200	5307.000	3114.400	5332.000	3114.500	5357.000	3114.800	5382.000	3114.900	5407.000
GR	3114.900	5432.000	3115.200	5457.000	3115.600	5482.000	3118.600	5511.000	3121.300	5539.000
GR	3123.400	5542.000	3124.900	5548.000	3123.900	5557.000	3124.200	5595.000	3124.900	5634.000
GR	3124.700	5646.000	3125.300	5675.000	3125.600	5702.000	3125.300	5742.000	3125.200	5784.000
GR	3124.900	5809.000	3122.500	5878.000	3121.600	6001.000	3121.800	6040.000	3122.000	6090.000
GR	3120.800	6151.000	3122.800	6250.000	3122.000	6266.000	3124.400	6297.000	3121.700	6312.000
GR	3121.600	6334.000	3120.300	6346.000	3120.300	6483.000	3122.100	6545.000	3121.700	6577.000
GR	3121.100	6588.000	3124.400	6757.000	3125.200	6792.000	3125.200	6827.000	3120.200	6854.000
GR	3122.600	6862.000	3120.900	6868.000	3123.200	6877.000	3120.200	6900.000	3120.200	6998.000
GR	3128.200	7024.000	3127.600	7029.000	3127.900	7070.000	3127.200	7108.000	3127.500	7271.000
GR	3123.500	7548.000	3124.000	7587.000	3124.400	7633.000	3123.100	7708.000	3128.000	7730.000
GR	3131.000	7750.000	3130.900	7770.000	3129.200	7780.000	3132.300	7791.000	3134.800	7889.000
GR	3136.100	7940.000	3144.200	8016.000	3162.100	8050.000	0.000	0.000	0.000	0.000
NC	.054	.050	.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Y1	6.400	90.000	1833.000	2120.000	3600.000	3450.000	3503.000	0.000	0.000	0.000
GR	3140.700	1456.000	3135.700	1474.000	3135.200	1483.000	3136.800	1490.000	3136.800	1496.000
GR	3134.900	1508.000	3134.700	1521.000	3134.000	1543.000	3132.900	1594.000	3132.400	1663.000
GR	3131.300	1729.000	3129.900	1770.000	3129.800	1813.000	3130.300	1833.000	3126.500	1835.000
GR	3121.100	1846.000	3116.500	1859.000	3116.200	1883.000	3116.300	1908.000	3116.500	1934.000
GR	3117.100	1959.000	3117.300	1986.000	3118.300	2010.000	3118.500	2035.000	3119.800	2060.000
GR	3121.100	2085.000	3124.600	2115.000	3129.400	2120.000	3129.000	2128.000	3127.500	2147.000
GR	3125.600	2154.000	3126.900	2173.000	3124.600	2186.000	3124.600	2196.000	3131.700	2218.000
GR	3129.700	2251.000	3129.800	2307.000	3129.500	2368.000	3120.500	2429.000	3128.400	2453.000
GR	3129.700	2483.000	3129.000	2523.000	3128.700	2561.000	3127.800	2600.000	3128.100	2626.000
GR	3125.600	2636.000	3123.200	2651.000	3122.600	2660.000	3126.500	2676.000	3130.400	2696.000
GR	3130.200	2732.000	3131.600	2775.000	3131.800	2812.000	3130.900	2844.000	3129.500	2877.000
GR	3128.500	2905.000	3130.500	2939.000	3133.300	2955.000	3134.400	2994.000	3134.400	3024.000
GR	3134.700	3033.000	3134.700	3050.000	3133.200	3056.000	3133.800	3059.000	3133.800	3060.000
GR	3133.100	3066.000	3133.700	3078.000	3132.500	3095.000	3133.000	3126.000	3134.000	3180.000
GR	3134.500	3210.000	3133.800	3249.000	3133.300	3301.000	3133.200	3341.000	3134.100	3364.000
GR	3134.100	3560.000	3135.500	3585.000	3136.500	3605.000	3136.100	3649.000	3136.100	3683.000
GR	3136.200	3717.000	3136.200	3743.000	3135.900	3765.000	3136.600	3810.000	3137.300	3875.000
GR	3137.400	3936.000	3137.900	4004.000	3138.100	4063.000	3138.700	4135.000	3139.000	4220.000
NC	.090	.058	.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	7.050	34.000	1909.000	2178.000	3500.000	3500.000	3400.000	0.000	0.000	0.000
GR	3140.700	1233.000	3127.400	1268.000	3126.700	1322.000	3126.000	1379.000	3126.200	1482.000
GR	3125.900	1536.000	3128.700	1626.000	3131.700	1691.000	3129.900	1738.000	3124.500	1777.000
GR	3127.300	1825.000	3130.600	1883.000	3130.800	1909.000	3130.200	1912.000	3124.900	1915.000
GR	3123.200	1927.000	3121.400	1959.000	3119.600	1984.000	3118.700	2009.000	3118.800	2034.000
GR	3119.200	2058.000	3119.200	2086.000	3119.400	2107.000	3120.800	2132.000	3123.200	2156.000
GR	3126.800	2169.000	3136.400	2178.000	3139.600	2193.000	3150.200	2222.000	3156.700	2252.000
GR	3172.000	2320.000	3193.100	2398.000	3211.600	2458.000	3221.600	2490.000	0.000	0.000
NH	4.000	.090	3367.000	.038	3673.000	.082	4167.000	.055	4261.000	0.000
ET	0.000	0.000	4.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	7.480	65.000	3367.000	3673.000	2300.000	2350.000	2300.000	0.000	0.000	0.000
GR	3142.300	2151.000	3142.500	2161.000	3123.300	2190.000	3123.300	2242.000	3129.300	2265.000
GR	3131.200	2287.000	3127.800	2321.000	3126.300	2379.000	3126.300	2481.000	3125.600	2550.000
GR	3126.000	2557.000	3127.100	2608.000	3127.800	2657.000	3130.400	2692.000	3128.200	2721.000
GR	3129.700	2765.000	3127.600	2773.000	3133.300	2787.000	3132.200	2826.000	3130.700	2882.000
GR	3130.400	2938.000	3129.000	2944.000	3131.900	2959.000	3130.600	3000.000	3129.700	3016.000
GR	3131.400	3055.000	3131.300	3107.000	3131.600	3160.000	3133.100	3193.000	3130.200	3223.000
GR	3131.200	3291.000	3130.300	3367.000	3128.800	3368.000	3126.000	3389.000	3124.000	3409.000
GR	3121.700	3435.000	3121.100	3460.000	3122.200	3485.000	3122.800	3511.000	3122.800	3536.000

GR	3123.100	3562.000	3123.500	3587.000	3123.500	3613.000	3123.000	3639.000	3127.700	3660.000
GR	3123.900	3665.000	3132.100	3673.000	3131.500	3686.000	3131.500	3694.000	3132.000	3734.000
GR	3131.000	3779.000	3132.200	3825.000	3132.000	3849.000	3130.800	3900.000	3129.800	3930.000
GR	3128.300	3961.000	3130.700	3992.000	3129.700	4007.000	3128.800	4031.000	3128.400	4050.000
GR	3130.300	4100.000	3127.200	4118.000	3126.200	4167.000	3137.900	4212.000	3145.200	4261.000
QT	6.000	31000.000	31000.000	20400.000	29000.000	31000.000	41000.000	0.000	0.000	0.000
NC	.050	.058	.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	8.000	88.000	1466.000	2293.000	2700.000	2150.000	2750.000	.000	0.000	0.000
GR	3145.900	1228.000	3145.900	1235.000	3143.900	1241.000	3135.300	1260.000	3115.100	1285.000
GR	3136.300	1315.000	3136.900	1349.000	3136.700	1373.000	3135.100	1395.000	3134.900	1405.000
GR	3135.100	1433.000	3134.900	1451.000	3133.500	1466.000	3132.900	1469.000	3127.100	1472.000
GR	3123.500	1476.000	3123.500	1496.000	3124.600	1516.000	3127.100	1531.000	3129.400	1575.000
GR	3131.500	1614.000	3132.900	1658.000	3132.600	1706.000	3129.500	1754.000	3127.100	1793.000
GR	3126.400	1818.000	3125.700	1841.000	3125.700	1867.000	3124.000	1891.000	3123.600	1915.000
GR	3124.300	1940.000	3127.100	1961.000	3128.300	1982.000	3128.700	2010.000	3129.400	2046.000
GR	3131.300	2095.000	3131.000	2120.000	3130.900	2137.000	3129.900	2153.000	3127.900	2158.000
GR	3126.700	2163.000	3127.900	2174.000	3132.900	2183.000	3130.300	2198.000	3127.500	2217.000
GR	3127.500	2237.000	3130.700	2253.000	3130.100	2271.000	3135.900	2293.000	3135.500	2332.000
GR	3135.100	2391.000	3135.300	2456.000	3133.700	2504.000	3136.100	2541.000	3136.100	2598.000
GR	3136.700	2649.000	3136.900	2708.000	3136.100	2769.000	3135.700	2814.000	3136.100	2856.000
GR	3135.500	2911.000	3134.900	2946.000	3134.100	2953.000	3133.100	2982.000	3133.300	2997.000
GR	3135.100	3015.000	3135.500	3053.000	3135.500	3091.000	3135.300	3142.000	3134.300	3177.000
GR	3133.300	3221.000	3134.100	3254.000	3134.900	3296.000	3134.900	3322.000	3134.300	3335.000
GR	3134.700	3343.000	3133.500	3375.000	3133.500	3423.000	3135.900	3586.000	3134.500	3590.000
GR	3136.300	3607.000	3137.100	3686.000	3140.100	3897.000	3140.500	3990.000	3142.100	4212.000
GR	3142.900	4247.000	3142.700	4299.000	3145.500	4555.000	0.000	0.000	0.000	0.000
NC	.050	.075	.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	8.540	90.000	1258.000	1583.000	2900.000	2700.000	2850.000	0.000	0.000	0.000
GR	3144.300	1240.000	3136.100	1258.000	3128.100	1274.000	3120.300	1292.000	3119.500	1327.000
GR	3122.000	1365.000	3123.000	1390.000	3125.000	1415.000	3128.100	1446.000	3129.700	1460.000
GR	3132.100	1507.000	3131.900	1527.000	3131.900	1558.000	3130.500	1575.000	3134.300	1583.000
GR	3134.500	1596.000	3135.100	1626.000	3135.100	1647.000	3141.500	1660.000	3149.500	1673.000
GR	3150.900	1632.000	3151.100	1702.000	3150.700	1724.000	3143.300	1740.000	3131.700	1764.000
GR	3132.100	1779.000	3134.300	1795.000	3134.300	1807.000	3132.900	1823.000	3133.100	1872.000
GR	3133.100	1921.000	3134.100	1945.000	3132.300	1959.000	3133.100	1970.000	3133.700	1998.000
GR	3133.500	2017.000	3135.900	2033.000	3134.700	2058.000	3134.500	2084.000	3134.700	2105.000
GR	3134.700	2128.000	3133.700	2170.000	3134.100	2209.000	3134.300	2238.000	3134.500	2261.000
GR	3129.500	2274.000	3129.500	2292.000	3134.300	2309.000	3134.100	2330.000	3132.900	2346.000
GR	3128.900	2357.000	3128.900	2420.000	3132.900	2426.000	3136.100	2442.000	3136.500	2450.000
GR	3136.500	2474.000	3134.900	2499.000	3136.500	2537.000	3135.500	2555.000	3133.500	2573.000
GR	3133.900	2580.000	3131.300	2596.000	3133.700	2611.000	3135.500	2642.000	3135.100	2678.000
GR	3134.700	2706.000	3134.700	2732.000	3134.700	2767.000	3135.500	2799.000	3133.300	2824.000
GR	3133.300	2859.000	3132.300	2878.000	3132.100	2897.000	3133.500	2908.000	3131.700	2911.000
GR	3133.100	2936.000	3132.100	2947.000	3133.300	2969.000	3134.700	2994.000	3134.100	3016.000
GR	3134.100	3036.000	3135.100	3060.000	3135.500	3089.000	3135.300	3147.000	3135.100	3191.000
GR	3137.300	3103.000	3137.700	3614.000	3136.700	3652.000	3138.900	3664.000	3144.900	3678.000
N4	4.000	.110	1814.000	.098	2059.000	.041	2703.000	.060	3607.000	0.000

X1	8.980	74.000	2059.000	2703.000	2550.000	1800.000	2300.000	0.000	0.000	0.000
GR	3145.000	575.000	3140.000	584.000	3135.000	595.000	3136.000	687.000	3135.000	703.000
GR	3134.000	723.000	3134.000	743.000	3135.000	759.000	3136.000	772.000	3136.000	1001.000
GR	3135.000	1162.000	3137.000	1436.000	3135.000	1675.000	3138.000	1814.000	3135.000	1967.000
GR	3136.400	2025.000	3136.700	2040.000	3137.000	2059.000	3132.400	2065.000	3131.000	2066.000
GR	3129.100	2082.000	3131.400	2091.000	3132.400	2094.000	3134.600	2099.000	3131.800	2103.000
GR	3129.800	2108.000	3127.700	2116.000	3127.800	2141.000	3128.400	2165.000	3128.700	2175.000

GR	3129.900	2209.000	3130.400	2230.000	3130.700	2250.000	3130.900	2275.000	3130.600	2296.000
GR	3130.000	2312.000	3129.500	2330.000	3129.200	2344.000	3128.000	2381.000	3127.500	2407.000
GR	3127.200	2430.000	3127.800	2475.000	3129.200	2497.000	3132.400	2515.000	3134.700	2527.000
GR	3135.700	2535.000	3135.000	2545.000	3135.700	2609.000	3132.100	2637.000	3131.600	2659.000
GR	3129.800	2684.000	3132.100	2698.000	3136.000	2703.000	3135.400	2740.000	3135.000	2834.000
GR	3135.000	3093.000	3133.000	3133.000	3135.000	3168.000	3136.000	3233.000	3135.000	3268.000
GR	3130.000	3295.000	3130.000	3329.000	3135.000	3361.000	3137.000	3370.000	3138.000	3459.000
GR	3140.000	3475.000	3143.000	3506.000	3145.000	3520.000	3150.000	3528.000	3155.000	3544.000
GR	3160.000	3558.000	3165.000	3572.000	3170.000	3590.000	3175.000	3607.000	0.000	0.000
NH	4.000	.060	2584.000	.095	3257.000	.040	4053.000	.060	4092.000	0.000

X1	9.730	74.000	3257.000	4053.000	4150.000	4000.000	4000.000	0.000	0.000	0.000
GR	3147.000	1321.000	3147.000	1329.000	3145.000	1337.000	3140.000	1365.000	3141.000	1679.000
GR	3141.000	2117.000	3142.000	2584.000	3140.000	2631.000	3136.000	2700.000	3138.000	2766.000
GR	3159.000	2898.000	3136.000	2946.000	3139.000	2980.000	3140.000	2994.000	3140.000	3088.000
GR	3140.400	3165.000	3138.200	3180.000	3139.300	3186.000	3138.700	3198.000	3140.400	3212.000
GR	3139.200	3217.000	3139.200	3224.000	3139.600	3227.000	3140.100	3237.000	3140.400	3249.000
GR	3140.000	3257.000	3135.600	3263.000	3132.400	3273.000	3132.000	3303.000	3132.300	3327.000
GR	3134.200	3368.000	3133.100	3395.000	3131.800	3408.000	3127.900	3470.000	3127.600	3495.000
GR	3127.200	3512.000	3128.200	3530.000	3130.400	3549.000	3133.000	3570.000	3134.300	3592.000
GR	3134.800	3602.000	3135.300	3620.000	3135.100	3632.000	3133.500	3642.000	3134.700	3662.000
GR	3139.400	3680.000	3139.800	3694.000	3137.100	3711.000	3139.000	3726.000	3138.400	3736.000
GR	3139.400	3747.000	3138.000	3778.000	3138.300	3808.000	3136.200	3829.000	3137.900	3840.000
GR	3137.500	3864.000	3134.800	3871.000	3134.600	3877.000	3138.400	3911.000	3138.600	3920.000
GR	3136.200	3930.000	3137.400	3937.000	3136.800	3953.000	3133.700	3957.000	3130.500	3966.000
GR	3130.400	3984.000	3133.700	3991.000	3137.300	3996.000	3137.300	4030.000	3139.000	4041.000
GR	3140.000	4047.000	3145.000	4053.000	3150.000	4061.000	3175.000	4092.000	0.000	0.000
NH	4.000	.088	1991.000	.093	2506.000	.038	3001.000	.090	3135.000	0.000

X1	10.390	67.000	2506.000	3001.000	3500.000	3400.000	3450.000	0.000	0.000	0.000
GR	3200.000	0.000	3155.000	73.000	3154.000	81.000	3155.000	92.000	3156.000	103.000
GR	3156.000	180.000	3150.000	236.000	3150.000	254.000	3145.000	280.000	3141.000	289.000
GR	3144.000	308.000	3139.000	417.000	3139.000	451.000	3141.000	508.000	3140.000	599.000
GR	3140.000	649.000	3141.000	699.000	3141.000	1991.000	3140.000	2065.000	3139.000	2120.000
GR	3140.000	2173.000	3142.000	2223.000	3142.000	2307.000	3140.000	2336.000	3139.000	2353.000
GR	3140.000	2372.000	3142.000	2383.000	3144.800	2409.000	3141.800	2410.000	3140.800	2422.000
GR	3142.200	2443.000	3142.500	2468.000	3142.600	2486.000	3142.200	2506.000	3142.500	2521.000
GR	3137.700	2525.000	3136.200	2527.000	3132.000	2551.000	3132.000	2554.000	3132.500	2583.000
GR	3132.400	2606.000	3133.000	2625.000	3132.800	2648.000	3133.100	2673.000	3133.500	2694.000
GR	3134.400	2724.000	3134.600	2753.000	3134.900	2783.000	3135.000	2800.000	3135.300	2821.000
GR	3135.100	2841.000	3135.900	2861.000	3136.700	2881.000	3136.600	2902.000	3137.200	2921.000
GR	3137.700	2924.000	3138.400	2942.000	3137.400	2957.000	3135.200	2983.000	3135.300	3001.000
GR	3137.300	3005.000	3142.500	3007.000	3142.000	3039.000	3142.000	3071.000	3150.000	3085.000
GR	3175.000	3125.000	3180.000	3135.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	4.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	4.000	.090	4140.000	.100	4724.000	.041	5172.000	.090	5182.000	0.000

X1	11.160	74.000	4724.000	5175.000	3400.000	4150.000	4100.000	0.000	0.000	0.000
GR	3149.000	2790.000	3146.000	2944.000	3145.000	2957.000	3140.000	2974.000	3140.000	2993.000
GR	3146.000	3020.000	3144.000	3057.000	3145.000	3278.000	3143.300	3425.000	3143.000	3655.000
GR	3145.000	3760.000	3143.000	3800.000	3143.800	3808.000	3143.100	3822.000	3143.100	3865.000
GR	3144.100	3902.000	3143.000	3929.000	3143.000	3977.000	3143.000	4022.000	3143.600	4062.000
GR	3143.800	4140.000	3143.600	4175.000	3144.100	4234.000	3143.600	4266.000	3144.600	4305.000
GR	3142.500	4311.000	3143.000	4319.000	3140.800	4326.000	3141.700	4341.000	3145.200	4354.000
GR	3143.300	4368.000	3143.400	4407.000	3143.000	4444.000	3144.900	4453.000	3144.800	4502.000
GR	3143.100	4552.000	3144.400	4569.000	3142.800	4579.000	3141.800	4603.000	3141.500	4627.000
GR	3142.400	4640.000	3141.400	4648.000	3143.800	4659.000	3144.400	4671.000	3141.200	4685.000
GR	3141.600	4702.000	3142.900	4713.000	3150.200	4724.000	3149.700	4736.000	3146.400	4742.000

GR	3139.900	4769.000	3138.200	4792.000	3137.200	4812.000	3136.800	4820.000	3136.200	4837.000
GR	3135.800	4859.000	3133.300	4875.000	3132.300	4892.000	3134.900	4919.000	3136.200	4937.000
GR	3136.200	4954.000	3137.000	4981.000	3138.200	5010.000	3138.600	5030.000	3138.800	5052.000
GR	3138.900	5072.000	3138.200	5092.000	3138.400	5112.000	3137.800	5127.000	3139.900	5150.000
GR	3143.100	5162.000	3151.000	5174.000	3154.600	5175.000	3154.000	5182.000	0.000	0.000
NC	.075	.093	.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	11.950	78.000	4879.000	5158.000	2900.000	3100.000	4150.000	0.000	0.000	0.000
GR	3204.000	0.000	3200.000	8.000	3196.000	20.000	3198.000	27.000	3195.000	30.000
GR	3190.000	51.000	3185.000	76.000	3182.000	139.000	3182.000	559.000	3185.000	571.000
GR	3187.000	590.000	3187.000	651.000	3185.000	664.000	3181.000	700.000	3180.000	926.000
GR	3178.000	1249.000	3177.000	1574.000	3176.000	1631.000	3179.000	1648.000	3179.000	1663.000
GR	3179.000	1673.000	3176.000	1712.000	3175.000	1855.000	3175.000	1974.000	3174.000	2074.000
GR	3171.000	2343.000	3170.000	2514.000	3169.000	2583.000	3167.000	2850.000	3166.000	3214.000
GR	3165.000	3434.000	3165.000	3762.000	3163.000	4159.000	3165.000	4350.000	3164.000	4542.000
GR	3163.000	4619.000	3167.200	4835.000	3161.000	4836.000	3159.200	4845.000	3155.600	4855.000
GR	3149.800	4869.000	3149.200	4879.000	3145.900	4886.000	3143.000	4889.000	3141.200	4891.000
GR	3138.200	4901.000	3137.400	4905.000	3133.900	4927.000	3133.700	4936.000	3133.900	4956.000
GR	3134.900	4981.000	3135.600	5006.000	3136.600	5032.000	3137.700	5059.000	3138.900	5083.000
GR	3140.000	5119.000	3140.000	5142.000	3140.700	5151.000	3142.800	5154.000	3147.600	5158.000
GR	3147.200	5175.000	3146.000	5347.000	3148.000	5549.000	3146.000	5633.000	3147.000	5890.000
GR	3145.000	6018.000	3145.000	6042.000	3143.000	6051.000	3143.000	6166.000	3145.000	6183.000
GR	3146.000	6238.000	3150.000	6263.000	3155.000	6284.000	3160.000	6321.000	3165.000	6355.000
GR	3170.000	6369.000	3175.000	6376.000	3188.000	6403.000	0.000	0.000	0.000	0.000
NH	4.000	.091	4426.000	.097	4895.000	.042	5419.000	.099	6416.000	0.000

X1	12.570	93.000	4895.000	5419.000	1500.000	3100.000	3250.000	0.000	0.000	0.000
GR	3187.000	0.000	3187.000	48.000	3185.000	60.000	3181.000	135.000	3180.000	341.000
GR	3177.000	624.000	3175.000	910.000	3170.000	1045.000	3170.000	1216.000	3168.000	1365.000
GR	3168.000	1384.000	3166.000	1399.000	3168.000	1468.000	3168.000	1940.000	3165.000	2117.000
GR	3163.000	2298.000	3162.000	2497.000	3162.000	2700.000	3161.000	2877.000	3160.000	2997.000
GR	3161.000	3012.000	3161.000	3021.000	3160.000	3043.000	3158.000	3220.000	3158.000	3408.000
GR	3157.000	3571.000	3158.000	3788.000	3159.000	4024.000	3158.000	4071.000	3155.000	4117.000
GR	3152.000	4139.000	3151.000	4283.000	3152.000	4426.000	3150.000	4524.000	3148.000	4570.000
GR	3150.000	4650.000	3149.000	4776.000	3148.700	4895.000	3148.600	4902.000	3144.400	4906.000
GR	3141.800	4910.000	3140.200	4932.000	3140.900	4945.000	3140.700	4960.000	3140.900	4975.000
GR	3144.500	4977.000	3146.900	4978.000	3147.900	4982.000	3148.400	4997.000	3148.400	5011.000
SR	3147.100	5028.000	3144.900	5029.000	3141.900	5031.000	3141.700	5032.000	3142.600	5051.000
GR	3143.900	5061.000	3145.500	5077.000	3145.000	5097.000	3145.400	5114.000	3145.300	5128.000
GR	3144.100	5134.000	3144.400	5145.000	3144.000	5155.000	3143.100	5170.000	3142.100	5188.000
GR	3141.500	5210.000	3141.300	5237.000	3141.500	5265.000	3141.500	5290.000	3142.300	5322.000
GR	3143.000	5340.000	3143.900	5355.000	3144.200	5376.000	3143.100	5382.000	3141.200	5400.000
GR	3142.700	5411.000	3145.400	5414.000	3146.600	5416.000	3149.700	5419.000	3149.200	5436.000
GR	3149.300	5442.000	3150.000	5531.000	3149.000	5588.000	3149.000	5734.000	3148.000	6092.000
GR	3149.000	6340.000	3150.000	6358.000	3155.000	6369.000	3160.000	6380.000	3165.000	6388.000
GR	3170.000	6398.000	3175.000	6404.000	3181.000	6416.000	0.000	0.000	0.000	0.000
NH	4.000	.091	3950.000	.097	5109.000	.043	5494.000	.090	5534.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	13.350	65.000	5109.000	5494.000	4300.000	4200.000	4160.000	0.000	0.000	0.000
GR	3158.700	2198.000	3157.000	2720.000	3158.000	2898.000	3156.000	3070.000	3155.000	3126.000
GR	3155.000	3397.000	3154.000	3742.000	3153.000	3950.000	3149.500	4277.000	3151.600	4316.000
GR	3151.900	4346.000	3151.600	4377.000	3151.200	4400.000	3151.500	4422.000	3151.900	4438.000
GR	3150.500	4444.000	3150.500	4456.000	3150.400	4477.000	3150.000	4492.000	3150.500	4563.000
GR	3150.500	4656.000	3150.500	4717.000	3151.600	4729.000	3150.500	4755.000	3151.700	4762.000
GR	3151.300	4780.000	3150.500	4802.000	3150.700	4819.000	3150.500	4833.000	3150.800	4847.000
GR	3150.500	4877.000	3150.500	4896.000	3150.400	4924.000	3150.900	4950.000	3151.100	4996.000
GR	3151.800	5037.000	3152.300	5077.000	3152.200	5109.000	3148.900	5112.000	3147.700	5115.000

GR	3145.400	5122.000	3142.600	5144.000	3141.800	5170.000	3142.100	5182.000	3142.200	5191.000
GR	3143.900	5217.000	3144.500	5248.000	3144.300	5276.000	3144.000	5306.000	3143.300	5329.000
GR	3144.000	5362.000	3144.300	5400.000	3145.300	5422.000	3147.600	5428.000	3148.600	5442.000
GR	3147.700	5461.000	3148.600	5471.000	3149.800	5477.000	3151.300	5486.000	3165.000	5494.000
GR	3170.000	5502.000	3175.000	5507.000	3180.000	5517.000	3185.000	5526.000	3193.000	5534.000
QT	6.000	29100.000	29100.000	19200.000	27200.000	29100.000	38500.000	0.000	0.000	5534.000
NH	4.000	.086	6545.000	.094	7638.000	.046	7853.000	.090	7864.000	0.000

X1	13.950	69.000	7638.000	7853.000	3600.000	3000.000	3130.000	0.000	0.000	0.000
GR	3159.000	2370.000	3158.000	2563.000	3158.000	2913.000	3155.000	3052.000	3157.000	3173.000
GR	3157.000	3455.000	3158.000	3569.000	3158.000	3887.000	3156.500	3918.000	3156.500	3966.000
GR	3157.000	4031.000	3157.000	4388.000	3156.000	4656.000	3157.000	4872.000	3157.000	5084.000
GR	3156.000	5102.000	3156.000	5226.000	3157.000	5277.000	3155.000	5358.000	3157.000	5426.000
GR	3155.000	5501.000	3157.000	5706.000	3156.000	5880.000	3158.000	5995.000	3157.000	6149.000
GR	3158.000	6235.000	3155.000	6269.000	3154.000	6294.000	3155.000	6322.000	3157.000	6405.000
GR	3155.000	6473.000	3157.000	6545.000	3155.000	6554.000	3152.000	6569.000	3152.000	6584.000
GR	3154.000	6708.000	3153.000	6796.000	3155.000	6857.000	3157.000	6900.000	3157.000	7109.000
GR	3155.000	7197.000	3154.000	7252.000	3155.000	7356.000	3155.000	7444.000	3154.000	7478.000
GR	3155.000	7555.000	3155.000	7566.000	3155.300	7629.000	3149.900	7636.000	3146.900	7638.000
GR	3145.600	7640.000	3142.500	7653.000	3142.800	7660.000	3140.000	7662.000	3141.900	7681.000
GR	3143.000	7716.000	3144.000	7737.000	3143.700	7765.000	3143.300	7771.000	3143.400	7805.000
GR	3145.900	7825.000	3147.700	7829.000	3149.700	7835.000	3150.700	7839.000	3151.800	7841.000
GR	3155.000	7846.000	3160.000	7853.000	3165.000	7860.000	3170.000	7864.000	0.000	0.000
NC	.090	.065	.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	14.730	71.000	10046.000	10429.000	3550.000	4200.000	4150.000	0.000	0.000	0.000
GR	3158.700	6750.000	3154.800	6781.000	3157.000	6791.000	3155.700	6802.000	3153.800	6826.000
GR	3153.800	6872.000	3159.200	6892.000	3158.200	693.000	3155.400	6938.000	3158.700	6966.000
GR	3158.800	7004.000	3158.100	7051.000	3158.100	7093.000	3156.400	7121.000	3156.400	7133.000
GR	3157.900	7160.000	3157.900	7201.000	3158.900	7264.000	3156.500	7291.000	3156.800	7313.000
GR	3158.500	7354.000	3158.300	7479.000	3156.200	7526.000	3154.000	7564.000	3154.000	7616.000
GR	3159.200	7697.000	3158.400	7870.000	3159.400	7987.000	3158.800	8010.000	3159.100	8140.000
GR	3159.200	8196.000	3158.700	8580.000	3152.600	8597.000	3156.800	8631.000	3154.200	8666.000
GR	3157.300	8786.000	3157.100	8877.000	3155.100	8927.000	3152.100	8964.000	3152.100	8976.000
GR	3156.900	8997.000	3159.100	9053.000	3157.500	9180.000	3158.100	9212.000	3156.600	9370.000
GR	3157.800	9460.000	3159.300	9663.000	3158.900	9846.000	3159.000	9971.000	3159.100	10004.000
GR	3160.0	10046.000	3151.600	10064.000	3149.800	10089.000	3149.600	10114.000	3149.200	10139.000
GR	3148.	10164.000	3148.300	10189.000	3149.100	10214.000	3150.000	10239.000	3150.400	10264.000
GR	3151	10289.000	3151.600	10308.000	3153.900	10333.000	3153.100	10379.000	3155.800	10396.000
GR	3160.	10429.000	3160.400	10698.000	3161.700	10780.000	3160.700	11126.000	3165.600	11142.000
GR	3172.600	11186.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	.090	.060	.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	514.930	90.000	11471.000	11700.000	1100.000	1000.000	1025.000	0.000	0.000	0.000
GR	3162.200	6972.000	3160.600	7054.000	3159.400	7099.000	3160.200	7152.000	3160.000	7286.000
GR	3153.300	7367.000	3158.300	7378.000	3160.200	7406.000	3159.600	7423.000	3159.000	7434.000
GR	3157.000	7447.000	3157.000	7471.000	3162.900	7488.000	3163.100	7537.000	3162.700	7648.000
GR	3159.400	7877.000	3160.500	7927.000	3159.900	8091.000	3160.000	8163.000	3158.900	8187.000
GR	3157.200	8212.000	3155.300	8243.000	3155.300	8259.000	3158.000	8278.000	3160.700	8290.000
GR	3160.100	8352.000	3160.700	8373.000	3159.800	8407.000	3160.000	8470.000	3160.500	8540.000
GR	3160.900	8604.000	3159.900	8658.000	3159.300	8680.000	3159.900	8725.000	3159.000	8752.000
GR	3156.900	8800.000	3153.800	8864.000	3153.800	8870.000	3155.800	8887.000	3155.800	8932.000
GR	3160.800	8947.000	3161.500	8968.000	3160.800	9047.000	3159.700	9137.000	3159.200	9207.000
GR	3159.800	9272.000	3159.800	9282.000	3159.800	9293.000	3159.800	9304.000	3159.800	9317.000
GR	3159.300	9368.000	3159.400	9464.000	3155.600	9531.000	3157.700	9586.000	3157.600	9680.000
GR	3158.700	9771.000	3159.400	9869.000	3159.400	9959.000	3159.300	10022.000	3159.600	10111.000
GR	3159.100	10179.000	3160.300	10211.000	3160.600	10284.000	3160.700	10382.000	3160.900	10440.000
GR	3161.100	10660.000	3159.700	10755.000	3160.900	11000.000	3159.500	11043.000	3157.000	11105.000

GR	3157.900	11120.000	3158.000	11273.000	3161.400	11363.000	3164.100	11418.000	3168.700	11471.000
GR	3151.800	11472.000	3149.300	11496.000	3149.000	11511.000	3149.400	11541.000	3149.500	11561.000
GR	3149.600	11581.000	3148.900	11601.000	3148.000	11621.000	3146.800	11646.000	3148.900	11671.000
GR	3151.800	11686.000	3169.000	11700.000	3167.800	11731.000	3168.300	11768.000	3170.600	11821.000

X1	814.930	0.000	0.000	0.000	25.000	25.000	25.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3160.900	3161.100	0.000
NC	.090	.065	.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	15.020	92.000	11658.000	11968.000	450.000	450.000	450.000	0.000	0.000	0.000
GR	3162.800	7356.000	3162.800	7479.000	3162.800	7582.000	3162.800	7708.000	3162.300	7748.000
GR	3162.500	7821.000	3162.000	7983.000	3161.600	8026.000	3158.400	8094.000	3157.400	8130.000
GR	3157.400	8165.000	3159.200	8203.000	3160.200	8229.000	3160.800	8271.000	3160.200	8325.000
GR	3160.600	8366.000	3159.400	8413.000	3159.800	8467.000	3158.600	8501.000	3160.200	8551.000
GR	3160.500	8583.000	3159.500	8622.000	3156.300	8665.000	3155.000	8694.000	3155.000	8714.000
GR	3157.200	8731.000	3161.500	8748.000	3161.400	8784.000	3160.300	8853.000	3160.200	8889.000
GR	3159.000	8906.000	3157.300	8919.000	3159.600	8940.000	3160.000	8965.000	3158.100	8992.000
GR	3157.700	9033.000	3160.900	9062.000	3161.200	9103.000	3160.200	9151.000	3160.900	9214.000
GR	3160.800	9257.000	3160.800	9282.000	3160.400	9295.000	3160.400	9306.000	3160.400	9325.000
GR	3159.500	9406.000	3157.900	9502.000	3159.500	9604.000	3160.600	9689.000	3160.400	9738.000
GR	3162.400	10252.000	3162.000	10310.000	3161.600	10402.000	3161.900	10500.000	3160.500	10577.000
GR	3163.100	10576.000	3162.500	10656.000	3163.500	10737.000	3162.600	10828.000	3161.100	10937.000
GR	3155.900	10972.000	3155.800	11036.000	3154.800	11100.000	3153.600	11139.000	3162.600	11089.000
GR	3161.200	11264.000	3160.700	11321.000	3161.500	11444.000	3161.600	11531.000	3158.400	11198.000
GR	3161.300	11646.000	3160.400	11658.000	3159.200	11683.000	3153.600	11704.000	3161.500	11570.000
GR	3153.000	11734.000	3152.100	11754.000	3151.000	11779.000	3151.300	11804.000	3151.200	11729.000
GR	3152.600	11844.000	3152.700	11869.000	3151.800	11875.000	3146.400	11915.000	3151.900	11824.000
GR	3159.000	11968.000	3162.500	12003.000	3171.200	12042.000	3180.000	12065.000	3153.600	11935.000
GR	3192.000	12111.000	3196.200	12135.000	0.000	0.000	0.000	0.000	3186.200	12087.000
NH	5.000	.090	9484.000	.065	10264.000	.039	10713.000	0.000	0.000	0.000
14	12582.000	0.000	0.000	0.000	0.000	0.000	0.000	.055	11550.000	.088
								0.000	0.000	0.000

X1	15.590	89.000	10264.000	11550.000	2250.000	3000.000	3000.000	0.000	0.000	0.000
GR	3165.000	6474.000	3163.400	6630.000	3161.100	7181.000	3162.600	7279.000	3161.600	7559.000
GR	3160.800	7639.000	3161.300	7920.000	3161.900	7980.000	3160.800	8028.000	3160.900	8136.000
GR	3159.300	8225.000	3161.100	8254.000	3159.600	8288.000	3160.900	8362.000	3160.600	8440.000
GR	3157.700	8770.000	3157.700	8795.000	3160.800	8826.000	3161.900	8880.000	3161.500	8940.000
GR	3162.300	9028.000	3162.600	9196.000	3161.100	9250.000	3164.200	9384.000	3162.100	9484.000
GR	3156.600	9508.000	3156.600	9518.000	3161.700	9531.000	3158.100	9598.000	3158.500	9641.000
GR	3162.500	9664.000	3163.600	9796.000	3163.100	10059.000	3163.700	10179.000	3161.500	10230.000
GR	3161.900	10264.000	3156.800	10275.000	3148.900	10300.000	3150.700	10330.000	3154.000	10346.000
GR	3155.300	10360.000	3155.600	10385.000	3155.600	10410.000	3155.600	10435.000	3155.900	10460.000
GR	3156.800	10483.000	3161.700	10519.000	3162.500	10563.000	3160.900	10592.000	3160.000	10621.000
GR	3158.800	10641.000	3158.800	10660.000	3160.400	10672.000	3161.600	10695.000	3161.600	10702.000
GR	3163.400	10713.000	3162.000	10809.000	3160.100	10854.000	3163.300	10924.000	3160.700	10949.000
GR	3157.600	11026.000	3157.200	11049.000	3158.700	11059.000	3159.700	11131.000	3160.300	11141.000
GR	3160.600	11206.000	3159.500	11220.000	3159.500	11240.000	3163.200	11250.000	3162.400	11343.000
GR	3161.400	11411.000	3159.500	11429.000	3157.600	11470.000	3161.000	11550.000	3162.500	11584.000
GR	3160.700	11657.000	3160.100	11688.000	3162.300	11712.000	3163.300	11770.000	3161.200	11893.000
GR	3160.200	12016.000	3160.800	12081.000	3160.800	12183.000	3159.500	12230.000	3159.700	12278.000
GR	3157.400	12353.000	3156.200	12407.000	3157.000	12479.000	3223.000	12582.000	0.000	0.000
NH	4.000	.080	8847.000	.070	9487.000	.042	10375.000	.078	11852.000	0.000

X1	15.970	92.000	9487.000	10375.000	2100.000	1950.000	2050.000	0.000	3.000	0.000
GR	3167.200	5892.000	3162.600	6021.000	3165.900	6163.000	3162.300	6705.000	3162.500	6748.000
GR	3166.400	6781.000	3166.300	7078.000	3163.400	7307.000	3165.700	7357.000	3164.600	7605.000
GR	3162.900	7663.000	3164.900	7692.000	3164.000	7760.000	3162.500	7784.000	3164.300	7831.000

GR	3164.100	7971.000	3162.700	8016.000	3162.700	8057.000	3164.500	8114.000	3163.900	8623.000
GR	3161.500	8680.000	3165.900	8726.000	3164.900	8770.000	3165.700	8847.000	3159.400	8869.000
GR	3159.500	8891.000	3164.200	8938.000	3164.200	8994.000	3160.800	9009.000	3160.800	9042.000
GR	3164.400	9109.000	3165.700	9161.000	3165.900	9376.000	3166.900	9407.000	3164.500	9487.000
GR	3160.900	9498.000	3162.500	9520.000	3161.600	9534.000	3165.000	9579.000	3165.100	9614.000
GR	3163.000	9639.000	3164.700	9656.000	3161.500	9686.000	3161.600	9694.000	3163.900	9728.000
GR	3165.200	9751.000	3165.700	9776.000	3165.300	9833.000	3162.900	9854.000	3162.400	9864.000
GR	3159.400	9873.000	3156.700	9896.000	3156.600	9919.000	3155.700	9943.000	3155.100	9968.000
GR	3156.200	9993.000	3157.600	10018.000	3159.400	10041.000	3162.900	10053.000	3163.200	10119.000
GR	3161.900	10150.000	3164.000	10154.000	3163.600	10274.000	3159.400	10294.000	3158.000	10326.000
GR	3159.400	10365.000	3164.200	10375.000	3164.700	10407.000	3162.700	10455.000	3162.700	10493.000
GR	3164.000	10522.000	3165.400	10606.000	3167.000	10746.000	3164.700	10776.000	3159.800	10883.000
GR	3159.000	10912.000	3166.400	10939.000	3165.700	11118.000	3164.600	11262.000	3166.600	11341.000
GR	3165.300	11443.000	3162.200	11497.000	3164.700	11537.000	3162.600	11585.000	3164.800	11613.000
GR	3163.300	11626.000	3165.600	11643.000	3163.900	11691.000	3164.600	11743.000	3164.600	11814.000
GR	3171.400	11833.000	3181.100	11852.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	4.000	.095	7283.000	.048	7876.000	.039	8371.000	.063	8997.000	0.000

X1	16.840	90.000	7283.000	8371.000	3950.000	4050.000	4600.000	0.000	0.000	0.000
GR	3170.300	5816.000	3170.300	5943.000	3169.800	6037.000	3170.200	6096.000	3170.700	6137.000
GR	3170.600	6179.000	3166.500	6231.000	3166.500	6248.000	3168.200	6292.000	3169.500	6310.000
GR	3169.500	6320.000	3170.600	6333.000	3170.600	6351.000	3169.600	6373.000	3171.100	6399.000
GR	3170.400	6413.000	3169.200	6427.000	3168.100	6445.000	3168.500	6463.000	3168.500	6474.000
GR	3166.400	6485.000	3166.400	6497.000	3168.400	6522.000	3169.000	6537.000	3169.500	6564.000
GR	3166.800	6574.000	3166.800	6579.000	3169.100	6592.000	3169.100	6615.000	3168.800	6671.000
GR	3167.700	6691.000	3167.000	6726.000	3168.000	6753.000	3169.100	6773.000	3168.500	6814.000
GR	3169.100	6933.000	3169.800	6990.000	3169.800	7065.000	3171.000	7146.000	3171.400	7283.000
GR	3168.800	7292.000	3166.600	7301.000	3167.400	7324.000	3168.700	7339.000	3168.700	7370.000
GR	3167.100	7379.000	3166.500	7413.000	3165.300	7436.000	3165.300	7590.000	3166.100	7603.000
GR	3166.100	7616.000	3165.300	7621.000	3165.300	7715.000	3166.800	7748.000	3166.800	7839.000
GR	3166.800	7855.000	3166.800	7876.000	3166.200	7887.000	3165.300	7902.000	3165.300	7942.000
GR	3170.100	7971.000	3170.700	7980.000	3169.400	7996.000	3170.700	8017.000	3170.100	8046.000
GR	3169.200	8064.000	3168.300	8099.000	3166.600	8114.000	3166.200	8139.000	3165.300	8147.000
GR	3164.600	8170.000	3163.700	8195.000	3162.800	8245.000	3161.400	8270.000	3162.500	8295.000
GR	3163.400	8320.000	3163.000	8345.000	3165.300	8360.000	3172.000	8371.000	3172.000	8449.000
GR	3172.000	8526.000	3171.100	8535.000	3171.600	8583.000	3171.600	8701.000	3171.300	8772.000
GR	3170.100	8816.000	3169.900	8867.000	3171.800	8909.000	3174.200	8946.000	3189.700	8997.000
NH	4.000	.095	9670.000	.055	10051.000	.039	10398.000	.063	11577.000	0.000
ET	0.000	0.000	4.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	17.630	91.000	9670.000	10388.000	3150.000	2000.000	4150.000	0.000	0.000	0.000
GR	3175.100	5290.000	3172.800	5675.000	3172.300	6193.000	3172.500	6555.000	3173.800	7462.000
GR	3173.160	7596.000	3171.400	7697.000	3174.700	8267.000	3175.000	8298.000	3175.000	8345.000
GR	3173.200	8409.000	3173.700	8467.000	3173.400	8491.000	3170.300	8500.000	3168.600	8512.000
GR	3171.700	8533.000	3171.700	8569.000	3173.000	8589.000	3172.800	8607.000	3170.600	8612.000
GR	3171.600	8626.000	3174.800	8641.000	3174.800	8674.000	3174.800	8734.000	3175.800	8781.000
GR	3175.800	8836.000	3176.000	8878.000	3176.200	8901.000	3175.300	8909.000	3175.300	8943.000
GR	3175.600	8963.000	3175.600	9016.000	3174.900	9029.000	3174.800	9052.000	3175.300	9074.000
GR	3175.100	9106.000	3175.700	9141.000	3174.900	9202.000	3175.300	9282.000	3175.300	9347.000
GR	3172.300	9400.000	3172.100	9428.000	3171.400	9458.000	3171.400	9488.000	3173.700	9514.000
GR	3174.900	9539.000	3174.300	9567.000	3174.200	9659.000	3173.000	9670.000	3168.700	9682.000
GR	3168.700	9705.000	3172.700	9727.000	3171.400	9763.000	3173.000	9780.000	3173.000	9831.000
GR	3173.900	9918.000	3174.500	9994.000	3174.500	10042.000	3167.300	10051.000	3164.500	10076.000
GR	3163.600	10101.000	3163.200	10126.000	3165.400	10151.000	3165.200	10176.000	3165.200	10201.000
GR	3165.100	10220.000	3165.600	10241.000	3166.900	10250.000	3167.300	10271.000	3169.000	10325.000
GR	3169.200	10375.000	3174.000	10388.000	3173.300	10418.000	3169.400	10426.000	3169.400	10436.000
GR	3173.000	10452.000	3175.500	10498.000	3172.700	10831.000	3169.900	10982.000	3167.800	11016.000
GR	3166.800	11058.000	3166.800	11152.000	3169.700	11173.000	3171.900	11272.000	3171.400	11356.000
GR	3172.800	11409.000	3172.800	11427.000	3172.000	11473.000	3170.500	11532.000	3176.100	11556.000

GR	3177.600	11577.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	.080	.065	.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	18.110	92.000	11154.000	11418.000	2500.000	2850.000	2550.000	0.000	0.000	0.000	0.000
GR	3175.900	6422.000	3173.500	6586.000	3173.400	6718.000	3174.300	7044.000	3175.200	7197.000	0.000
GR	3174.300	7328.000	3173.900	7485.000	3174.100	7651.000	3174.000	7947.000	3175.000	8006.000	0.000
GR	3175.300	8085.000	3175.100	8132.000	3173.600	8193.000	3174.600	8254.000	3176.100	8306.000	0.000
GR	3175.600	8334.000	3175.800	8403.000	3175.900	8420.000	3174.400	8432.000	3175.700	8463.000	0.000
GR	3174.600	8500.000	3174.300	8577.000	3175.200	8657.000	3175.600	8708.000	3175.400	8791.000	0.000
GR	3175.800	8883.000	3175.200	8936.000	3176.500	8982.000	3176.400	9023.000	3175.100	9033.000	0.000
GR	3177.600	9043.000	3172.000	9074.000	3173.000	9087.000	3173.800	9100.000	3176.700	9116.000	0.000
GR	3177.000	9149.000	3177.600	9181.000	3176.300	9251.000	3176.800	9344.000	3178.400	9376.000	0.000
GR	3178.700	9423.000	3178.500	9461.000	3178.900	9495.000	3177.900	9563.000	3178.700	9629.000	0.000
GR	3178.500	9670.000	3176.200	9703.000	3178.800	9738.000	3178.800	9790.000	3178.200	9827.000	0.000
GR	3176.900	9853.000	3178.100	9885.000	3177.900	9945.000	3177.700	9985.000	3175.000	10012.000	0.000
GR	3175.000	10020.000	3177.900	10032.000	3179.200	10084.000	3178.600	10124.000	3174.400	10160.000	0.000
GR	3177.400	10192.000	3177.400	10246.000	3178.700	10327.000	3175.400	10381.000	3177.800	10429.000	0.000
GR	3179.400	10508.000	3177.900	10561.000	3177.800	10599.000	3174.700	10631.000	3176.900	10684.000	0.000
GR	3176.800	10725.000	3177.800	10783.000	3178.500	10859.000	3177.900	10898.000	3175.600	10927.000	0.000
GR	3176.300	10976.000	3176.100	11042.000	3173.300	11076.000	3175.300	11111.000	3175.300	11154.000	0.000
GR	3171.000	11174.000	3169.900	11212.000	3169.600	11237.000	3168.800	11262.000	3168.800	11282.000	0.000
GR	3165.600	11302.000	3168.400	11322.000	3167.200	11347.000	3162.300	11372.000	3161.200	11390.000	0.000
GR	3169.900	11418.000	3200.000	11448.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	4.000	.075	2542.000	.040	2872.000	.075	4188.000	.085	4285.000	0.000	0.000
ET	0.000	0.000	9.100	0.000	0.000	0.000	0.000	0.000	1375.000	3970.000	0.000

X1	18.970	85.000	2542.000	2872.000	3200.000	3000.000	4525.000	0.000	0.000	0.000	0.000
GR	3184.200	709.000	3183.100	750.000	3182.200	848.000	3182.300	992.000	3181.600	1025.000	0.000
GR	3181.600	1056.000	3180.600	1065.000	3181.500	1078.000	3182.900	1131.000	3182.100	1182.000	0.000
GR	3182.600	1258.000	3182.800	1316.000	3182.800	1352.000	3179.300	1390.000	3180.300	1419.000	0.000
GR	3181.200	1448.000	3180.600	1479.000	3180.600	1511.000	3181.200	1581.000	3181.100	1640.000	0.000
GR	3180.600	1721.000	3180.500	1819.000	3181.400	1964.000	3181.900	1944.000	3182.600	1989.000	0.000
GR	3182.000	2059.000	3182.600	2120.000	3182.700	2160.000	3183.100	2185.000	3181.800	2210.000	0.000
GR	3182.000	2250.000	3181.700	2290.000	3182.200	2330.000	3182.400	2380.000	3182.600	2412.000	0.000
GR	3183.100	2460.000	3181.800	2503.000	3181.900	2526.000	3182.600	2542.000	3173.800	2564.000	0.000
GR	3169.600	2594.000	3168.000	2622.000	3169.200	2649.000	3171.600	2683.000	3173.100	2707.000	0.000
GR	3173.800	2733.000	3176.100	2790.000	3179.300	2838.000	3181.800	2872.000	3180.900	2933.000	0.000
GR	3179.300	2951.000	3177.100	2988.000	3178.300	3010.000	3180.400	3024.000	3180.100	3083.000	0.000
GR	3180.000	3143.000	3180.700	3201.000	3181.200	3231.000	3178.800	3254.000	3178.800	3285.000	0.000
GR	3176.300	3615.000	3176.900	3634.000	3176.800	3433.000	3176.500	3477.000	3176.900	3558.000	0.000
GR	3174.300	3817.000	3173.500	3850.000	3175.800	3686.000	3174.000	3709.000	3174.000	3763.000	0.000
GR	3176.900	3946.000	3175.500	3957.000	3175.700	3901.000	3176.900	3915.000	3176.700	3933.000	0.000
GR	3179.700	4115.000	3176.300	4153.000	3177.800	3983.000	3178.400	4041.000	3180.400	4073.000	0.000
NH	5.000	.085	3081.000	.055	4023.000	.041	4339.000	.060	4668.000	.070	4285.000
NH	5148.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	19.550	92.000	4023.000	4339.000	1900.000	2200.000	3050.000	0.000	0.000	0.000	0.000
GR	3186.000	0.000	3184.600	353.000	3184.500	538.000	3185.000	721.000	3185.800	786.000	0.000
GR	3184.600	976.000	3183.000	1052.000	3178.500	1065.000	3178.500	1090.000	3183.100	1098.000	0.000
GR	3180.800	1131.000	3181.500	1271.000	3182.400	1305.000	3182.400	1328.000	3182.700	1420.000	0.000
GR	3182.800	1508.000	3183.700	1562.000	3184.300	1664.000	3183.100	1784.000	3181.400	1824.000	0.000
GR	3184.400	1901.000	3183.500	1954.000	3182.900	2041.000	3184.400	2072.000	3183.700	2140.000	0.000
GR	3183.600	2176.000	3182.700	2186.000	3184.500	2194.000	3182.900	2224.000	3182.900	2337.000	0.000
GR	3184.000	2484.000	3181.200	2553.000	3183.400	2588.000	3182.300	2617.000	3182.900	2654.000	0.000
GR	3183.000	2764.000	3181.800	2840.000	3184.600	2956.000	3183.300	3081.000	3180.100	3205.000	0.000

xs AM

GR	3179.600	3280.000	3182.500	3321.000	3182.200	3375.000	3180.100	3411.000	3180.300	3461.000
GR	3181.700	3496.000	3182.500	3547.000	3182.800	3608.000	3183.200	3683.000	3182.600	3769.000
GR	3184.000	3839.000	3183.400	3873.000	3181.900	3902.000	3184.200	3924.000	3184.000	3961.000
GR	3182.600	3979.000	3182.300	4016.000	3183.500	4023.000	3176.000	4065.000	3173.900	4090.000
GR	3172.400	4312.000	3174.400	4135.000	3174.700	4151.000	3175.100	4170.000	3176.100	4230.000
GR	3180.800	4254.000	3179.700	4297.000	3177.600	4326.000	3183.300	4339.000	3182.400	4433.000
GR	3179.700	4456.000	3179.700	4480.000	3181.300	4507.000	3182.200	4652.000	3183.200	4709.000
GR	3182.000	4724.000	3180.300	4759.000	3176.600	4770.000	3176.600	4819.000	3179.800	4839.000
GR	3181.000	4853.000	3185.900	4868.000	3183.600	4892.000	3183.600	4908.000	3184.900	4922.000
GR	3184.000	4945.000	3183.400	4974.000	3182.500	5001.000	3184.100	5015.000	3184.400	5056.000
GR	3190.500	5119.000	3203.500	5148.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	4.000	.085	1038.000	.041	1682.000	.052	2626.000	.060	6059.000	0.000
ET	0.000	0.000	4.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	20.310	88.000	1038.000	2626.000	2000.000	2950.000	4000.000	0.000	0.000	0.000
GR	3188.700	252.000	3188.100	468.000	3187.600	754.000	3185.200	779.000	3185.100	794.000
GR	3187.900	850.000	3187.000	883.000	3184.400	90.000	3185.100	933.000	3185.900	986.000
GR	3188.100	1038.000	3176.900	1070.000	3176.400	109.000	3177.400	1116.000	3180.400	1160.000
GR	3182.700	1226.000	3185.800	1298.000	3183.700	1357.000	3182.700	1361.000	3184.500	1370.000
GR	3186.500	1435.000	3185.200	1462.000	3185.000	1476.000	3186.200	1488.000	3185.700	1512.000
GR	3183.400	1528.000	3185.500	1551.000	3184.300	1587.000	3185.600	1619.000	3185.600	1630.000
GR	3182.900	1660.000	3181.900	1663.000	3184.800	1682.000	3184.400	1692.000	3186.200	1700.000
GR	3184.100	1735.000	3185.500	1748.000	3185.700	1800.000	3184.400	1837.000	3184.700	1854.000
GR	3183.200	1878.000	3184.400	1930.000	3184.400	1952.000	3186.800	1953.000	3186.400	1991.000
GR	3183.900	2047.000	3184.500	2066.000	3186.000	2106.000	3186.500	2255.000	3185.800	2345.000
GR	3184.700	2444.000	3182.800	2503.000	3182.400	2514.000	3183.200	2543.000	3180.800	2548.000
GR	3176.000	2562.000	3176.000	2595.000	3180.300	2611.000	3184.400	2626.000	3184.700	2643.000
GR	3183.800	2723.000	3183.800	2781.000	3185.400	2855.000	3185.200	2951.000	3183.400	2972.000
GR	3180.400	2987.000	3180.400	2992.000	3178.400	3051.000	3182.000	3090.000	3184.300	3203.000
GR	3184.700	3236.000	3183.700	3285.000	3180.900	3304.000	3180.900	3316.000	3182.900	3330.000
GR	3183.600	3364.000	3183.700	3385.000	3183.600	3395.000	3188.000	3743.000	3189.500	4157.000
GR	3189.000	4984.000	3188.000	5250.000	3186.700	5546.000	3183.500	5728.000	3184.300	5761.000
GR	3187.100	5803.000	3188.500	5877.000	3210.000	6059.000	0.000	0.000	0.000	0.000
NH	4.000	.080	7172.000	.039	7677.000	.060	9046.000	.080	12336.000	0.000

xs AN



X1	20.750	90.000	7172.000	9046.000	2500.000	1250.000	2350.000	0.000	0.000	0.000
GR	3193.000	5990.000	3190.800	6407.000	3189.100	6424.000	3184.300	6469.000	3187.500	6502.000
GR	3188.000	6521.000	3188.100	6596.000	3187.600	6669.000	3184.900	6675.000	3184.900	6684.000
GR	3189.900	6996.000	3188.700	6771.000	3186.800	6881.000	3188.400	6910.000	3189.000	6953.000
GR	3188.600	6978.000	3187.800	6950.000	3187.800	7006.000	3187.000	7024.000	3188.300	7043.000
GR	3188.300	7068.000	3187.400	7080.000	3188.000	7102.000	3187.600	7172.000	3182.800	7186.000
GR	3180.700	7211.000	3181.300	7230.000	3182.800	7239.000	3189.300	7274.000	3187.200	7353.000
GR	3188.300	7423.000	3182.800	7450.000	3181.100	7475.000	3179.800	7500.000	3179.300	7525.000
GR	3179.400	7550.000	3179.700	7575.000	3179.600	7600.000	3179.400	7625.000	3179.100	7650.000
GR	3182.800	7666.000	3186.500	7677.000	3187.200	7723.000	3186.000	7824.000	3186.900	7859.000
GR	3186.900	7859.000	3186.900	7908.000	3187.100	8128.000	3187.200	8214.000	3186.600	8363.000
GR	3186.000	8392.000	3185.800	8442.000	3185.700	8471.000	3186.800	8486.000	3186.100	8526.000
GR	3186.100	8588.000	3181.800	8613.000	3180.600	8636.000	3180.900	8653.000	3184.100	8673.000
GR	3184.100	8728.000	3183.600	8784.000	3182.400	8813.000	3181.900	8849.000	3180.800	8864.000
GR	3181.000	8936.000	3180.800	8991.000	3179.700	9011.000	3179.700	9022.000	3184.500	9046.000
GR	3186.600	9058.000	3187.000	9093.000	3186.100	9125.000	3189.300	9171.000	3185.600	9175.000
GR	3185.600	9238.000	3184.900	9282.000	3182.900	9351.000	3183.200	9383.000	3185.900	9434.000
GR	3190.500	9847.000	3191.000	10344.000	3190.600	10947.000	3188.600	11592.000	3184.200	11609.000
GR	3184.600	11683.000	3189.000	11741.000	3189.500	11948.000	3200.000	12171.000	3220.000	12336.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

xs - County Line



 HEC2 RELEASE DATED NOV 76 UPDATED AUG1977
 ERROR CORR - 01,02
 MODIFICATION - 50,51,52,53

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

BITTERROOT RIVER

SUMMARY PRINTOUT TABLE 150

Flow rates match
 FIS Vol. 1 Table 2
 for Bitterroot River
 (10-, 50-, 100-, and
 500-year)

Flow rates match
 FIS Vol. 1 Table 2
 for Clark Fork River

Computed water
 surface elevations
 are in NGVD29,
 add 3.5' to get to
 NAVD88. DON'T
 MATCH FWDT!!!

SECNO	XLCH	ELTRD	Q	CWSEL	CRWS	EG	AREA			.01K	
48.930	0.00	0.00	0.00	3089.10	47000.00	3105.37	0.00	3105.73			
48.930	0.00	0.00	0.00	3089.10	52250.00	3106.07	0.00	3106.43	7.09	1.50	10223.40 17652.62
48.930	0.00	0.00	0.00	3089.10	58000.00	3106.84	0.00	3107.18	6.89	2.13	11390.77 19909.10
48.930	0.00	0.00	0.00	3089.10	64000.00	3107.53	0.00	3107.86	6.43	2.57	12973.45 22864.17
*.520	2750.00	0.00	0.00	3090.90	20900.00	3106.88	0.00	3107.48	6.26	2.17	14848.47 25579.04
.520	2750.00	0.00	0.00	3090.90	29700.00	3107.61	0.00	3108.54	12.44	6.27	4052.13 5924.51
.520	2750.00	0.00	0.00	3090.90	31800.00	3108.25	0.00	3109.11	17.97	7.97	4934.03 7006.28
.520	2750.00	0.00	0.00	3090.90	42000.00	3108.92	0.00	3110.13	15.53	7.75	5780.61 8068.59
500.720	1050.00	0.00	0.00	3086.70	20900.00	3108.04	0.00	3108.58	20.42	9.28	6738.72 9293.79
500.720	1050.00	0.00	0.00	3086.70	29700.00	3109.25	0.00	3110.13	9.03	5.91	3536.35 6956.76
500.720	1050.00	0.00	0.00	3086.70	31800.00	3109.69	0.00	3110.63	13.28	7.54	3936.60 8149.11
500.720	1050.00	0.00	0.00	3086.70	42000.00	3110.78	0.00	3112.16	13.64	7.78	4086.96 8610.45
800.720	30.00	114.20	3111.50	3086.70	20900.00	3108.06	0.00	3108.60	18.12	9.42	4456.31 9667.56
800.720	30.00	114.20	3111.50	3086.70	29700.00	3109.29	0.00	3110.17	8.98	5.90	3542.84 6975.69
800.720	30.00	114.20	3111.50	3086.70	31800.00	3109.74	0.00	3110.67	13.15	7.52	3950.40 8191.15
800.720	30.00	114.20	3111.50	3086.70	42000.00	3111.65	0.00	3112.86	13.49	7.75	4102.12 8657.38
*.760	200.00	0.00	0.00	3091.90	20900.00	3108.50	0.00	3108.77	14.70	8.83	4754.11 10955.37
.760	200.00	0.00	0.00	3091.90	29700.00	3110.01	0.00	3110.41	6.36	4.10	5013.88 8290.56
.760	200.00	0.00	0.00	3091.90	31800.00	3110.51	0.00	3110.92	7.76	5.09	5967.14 10658.60
.760	200.00	0.00	0.00	3091.90	42000.00	3112.65	0.00	3113.13	7.63	5.19	6358.39 11512.72
1.150	2025.00	0.00	0.00	3098.90	20900.00	3109.90	0.00	3110.23	7.18	5.64	8151.19 15672.50
1.150	2025.00	0.00	0.00	3098.90	29700.00	3111.54	0.00	3111.85	8.61	5.14	6575.15 7120.75
1.150	2025.00	0.00	0.00	3098.90	31800.00	3112.00	0.00	3112.29	7.43	5.31	7899.29 10898.02
1.150	2025.00	0.00	0.00	3098.90	42000.00	3114.02	0.00	3114.26	6.87	5.24	10868.97 17130.59
1.890	3925.00	0.00	0.00	3099.40	20900.00	3113.35	0.00	3113.64	5.10	5.03	15320.96 18590.64
1.890	3925.00	0.00	0.00	3099.40	29700.00	3114.67	0.00	3114.99	8.87	4.68	6738.38 7018.27
1.890	3925.00	0.00	0.00	3099.40	31800.00	3114.97	0.00	3115.29	8.84	5.09	9818.48 9991.17
1.890	3925.00	0.00	0.00	3099.40	42000.00	3116.41	0.00	3116.72	8.73	5.16	10514.85 10761.35
2.750	4550.00	0.00	0.00	3101.40	20900.00	3117.58	0.00	3118.03	7.94	5.34	13987.76 14902.52
2.750	4550.00	0.00	0.00	3101.40	29700.00	3118.91	0.00	3119.38	10.49	5.88	5306.03 6453.25
2.750	4550.00	0.00	0.00	3101.40	31800.00	3119.18	0.00	3119.65	10.72	6.43	7982.01 9073.13
2.750	4550.00	0.00	0.00	3101.40	42000.00	3120.35	0.00	3120.83	10.73	6.53	8556.92 9709.25
									10.61	6.90	11139.97 12893.99

XS A

XS B

XS C

XS D

XS E

XS F

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10K*S	VCH	AREA	.01K
3.360	3225.00	0.00	0.00	3105.00	20900.00	3120.06	0.00	3120.21	4.69	3.75	9528.99	9649.89
3.360	3225.00	0.00	0.00	3105.00	29700.00	3121.43	0.00	3121.60	4.75	4.13	12642.57	13624.95
3.360	3225.00	0.00	0.00	3105.00	31800.00	3121.70	0.00	3121.88	4.80	4.22	13287.43	14522.08
3.360	3225.00	0.00	0.00	3105.00	42000.00	3122.89	0.00	3123.08	4.93	4.57	17015.79	18923.82
4.070	3720.00	0.00	0.00	3110.00	20900.00	3121.48	0.00	3121.61	7.8	3.76	10620.80	10105.40
4.070	3720.00	0.00	0.00	3110.00	29700.00	3122.79	0.00	3122.92	4.06	3.97	15207.61	14745.18
4.070	3720.00	0.00	0.00	3110.00	31800.00	3123.06	0.00	3123.19	4.02	4.01	16232.19	15669.34
4.070	3720.00	0.00	0.00	3110.00	42000.00	3124.22	0.00	3124.36	3.91	4.23	20779.87	21242.20
4.790	3800.00	0.00	0.00	3111.50	20900.00	3123.65	0.00	3124.29	12.26	6.52	3565.81	5969.51
4.790	3800.00	0.00	0.00	3111.50	29700.00	3124.91	0.00	3125.86	15.76	8.02	4309.42	7480.69
4.790	3800.00	0.00	0.00	3111.50	31800.00	3125.16	0.00	3126.19	16.59	8.35	4462.53	7807.20
4.790	3800.00	0.00	0.00	3111.50	42000.00	3126.24	0.00	3127.65	20.48	9.86	5198.35	9280.42
505.020	1225.00	0.00	0.00	3099.00	20900.00	3124.91	0.00	3125.31	5.79	5.09	4103.61	8682.23
505.020	1225.00	0.00	0.00	3099.00	29700.00	3126.59	0.00	3127.23	7.97	6.41	4636.75	10517.19
505.020	1225.00	0.00	0.00	3099.00	31800.00	3126.94	0.00	3127.64	8.48	6.70	4749.52	10920.10
505.020	1225.00	0.00	0.00	3099.00	42000.00	3128.48	0.00	3129.47	10.86	8.01	5244.48	12747.37
805.020	75.00	3134.50	3133.00	3099.00	20900.00	3124.92	0.00	3125.33	5.78	5.09	4107.57	8695.43
805.020	75.00	3134.50	3133.00	3099.00	29700.00	3126.61	0.00	3127.25	7.94	6.40	4644.12	10543.37
805.020	75.00	3134.50	3133.00	3099.00	31800.00	3126.97	0.00	3127.66	8.43	6.68	4757.31	10950.05
805.020	75.00	3134.50	3133.00	3099.00	42000.00	3128.52	0.00	3129.51	10.77	7.99	5258.16	12799.24
505.040	50.00	0.00	0.00	3104.50	20900.00	3124.93	0.00	3125.40	8.84	5.50	3799.51	7029.18
505.040	50.00	0.00	0.00	3104.50	29700.00	3126.63	0.00	3127.33	11.45	6.75	4398.36	8776.06
505.040	50.00	0.00	0.00	3104.50	31800.00	3126.98	0.00	3127.75	12.04	7.02	4526.94	9166.12
505.040	50.00	0.00	0.00	3104.50	42000.00	3128.55	0.00	3129.60	14.68	8.34	5099.71	10963.60
805.040	25.00	3141.40	3137.00	3104.50	20900.00	3124.95	0.00	3125.42	8.77	5.49	3808.91	7055.65
805.040	25.00	3141.40	3137.00	3104.50	29700.00	3126.67	0.00	3127.38	11.32	6.73	4415.15	8826.70
805.040	25.00	3141.40	3137.00	3104.50	31800.00	3127.04	0.00	3127.80	11.89	7.00	4545.76	9223.65
805.040	25.00	3141.40	3137.00	3104.50	42000.00	3128.63	0.00	3129.67	14.42	8.19	5129.73	11060.42
5.080	150.00	0.00	0.00	3111.40	20900.00	3125.14	0.00	3125.57	11.67	5.52	4868.16	6117.05
5.080	150.00	0.00	0.00	3111.40	29700.00	3127.09	0.00	3127.55	10.43	5.71	6916.25	9198.44
5.080	150.00	0.00	0.00	3111.40	31800.00	3127.51	0.00	3127.98	10.20	5.99	7357.77	9954.80
5.080	150.00	0.00	0.00	3111.40	42000.00	3129.38	0.00	3129.88	9.43	6.37	9330.47	13076.90
5.740	3500.00	0.00	0.00	3114.40	20900.00	3127.26	0.00	3127.37	2.84	3.43	13433.48	12410.69
5.740	3500.00	0.00	0.00	3114.40	29700.00	3129.00	0.00	3129.10	2.45	3.52	19143.94	18979.92
5.740	3500.00	0.00	0.00	3114.40	31800.00	3129.38	0.00	3129.48	2.37	3.53	20416.69	20643.50
5.740	3500.00	0.00	0.00	3114.40	42000.00	3131.12	0.00	3131.21	2.08	3.59	26262.11	29123.95
6.400	3500.00	0.00	0.00	3116.20	20900.00	3128.86	0.00	3129.54	13.94	6.78	3402.53	5598.26
6.400	3500.00	0.00	0.00	3116.20	29700.00	3130.38	0.00	3131.27	16.09	7.95	4620.86	7403.85
6.400	3500.00	0.00	0.00	3116.20	31800.00	3130.71	0.00	3131.62	16.24	8.14	4971.09	7892.23
6.400	3500.00	0.00	0.00	3116.20	42000.00	3132.24	0.00	3133.21	15.72	8.68	6789.23	10592.41
7.050	3400.00	0.00	0.00	3118.70	20900.00	3132.39	0.00	3132.78	6.78	5.54	6140.02	8025.61
7.050	3400.00	0.00	0.00	3118.70	29700.00	3134.37	0.00	3134.85	7.22	6.31	7960.94	11053.26
7.050	3400.00	0.00	0.00	3118.70	31800.00	3134.76	0.00	3135.26	7.37	6.49	8326.02	11712.18
7.050	3400.00	0.00	0.00	3118.70	42000.00	3136.41	0.00	3137.03	8.22	7.35	9857.74	14650.02

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10K+S	VCH	AREA	.G1K
7.480	2300.00	0.00	0.00	3121.10	20900.00	3133.89	0.00	3134.04	4.36	3.69	10879.96	1001.57
7.480	2300.00	0.00	0.00	3121.10	29700.00	3135.92	0.00	3136.07	3.90	4.13	14983.36	15043.32
7.480	2300.00	0.00	0.00	3121.10	31800.00	3136.34	0.00	3136.49	3.85	4.20	15836.65	16211.48
7.480	2300.00	0.00	0.00	3121.10	42000.00	3138.14	0.00	3138.31	3.75	4.52	19516.22	21096.73
8.000	2750.00	0.00	0.00	3123.50	20400.00	3135.33	0.00	3135.52	6.93	3.67	6087.18	7751.66
8.000	2750.00	0.00	0.00	3123.50	29000.00	3137.11	0.00	3137.31	5.33	3.78	9807.20	12559.15
8.000	2750.00	0.00	0.00	3123.50	31000.00	3137.48	0.00	3137.68	5.02	3.78	10731.24	13833.21
8.000	2750.00	0.00	0.00	3123.50	41000.00	3139.16	0.00	3139.34	4.04	3.81	14930.70	20390.45
8.540	2850.00	0.00	0.00	3119.50	20400.00	3137.04	0.00	3137.28	5.46	4.52	8039.13	8731.26
8.540	2850.00	0.00	0.00	3119.50	29000.00	3138.59	0.00	3138.86	5.46	4.96	11419.49	12414.63
8.540	2850.00	0.00	0.00	3119.50	31000.00	3138.92	0.00	3139.18	5.43	5.04	12171.16	13205.65
8.540	2850.00	0.00	0.00	3119.50	41000.00	3140.40	0.00	3140.68	5.28	5.36	15622.53	17648.11
8.980	2300.00	0.00	0.00	3127.20	20400.00	3138.30	0.00	3138.41	4.59	3.04	10981.31	9420.34
8.980	2300.00	0.00	0.00	3127.20	29000.00	3139.80	0.00	3139.92	4.26	3.26	15282.14	14055.61
8.980	2300.00	0.00	0.00	3127.20	31000.00	3140.11	0.00	3140.23	4.18	3.30	16205.51	15166.11
8.980	2300.00	0.00	0.00	3127.20	41000.00	3141.54	0.00	3141.67	3.95	3.53	20367.89	20637.65
9.730	4000.00	0.00	0.00	3127.20	20400.00	3140.79	0.00	3141.00	9.03	3.81	6419.78	6790.39
9.730	4000.00	0.00	0.00	3127.20	29000.00	3142.10	0.00	3142.34	8.64	4.22	9498.54	9864.68
9.730	4000.00	0.00	0.00	3127.20	31000.00	3142.37	0.00	3142.62	8.50	4.28	10224.86	10630.58
9.730	4000.00	0.00	0.00	3127.20	41000.00	3143.64	0.00	3143.90	7.70	4.49	13668.00	14776.37
10.390	3450.00	0.00	0.00	3132.00	20400.00	3143.33	0.00	3143.52	6.00	3.92	9594.22	8326.43
10.390	3450.00	0.00	0.00	3132.00	29000.00	3144.62	0.00	3144.83	6.04	4.33	13168.47	11796.92
10.390	3450.00	0.00	0.00	3132.00	31000.00	3144.87	0.00	3145.09	6.08	4.42	13888.91	12572.07
10.390	3450.00	0.00	0.00	3132.00	41000.00	3146.05	0.00	3146.29	6.25	4.83	17171.34	16405.97
11.160	4100.00	0.00	0.00	3132.30	20400.00	3146.14	0.00	3146.38	8.71	4.45	8237.02	6912.47
11.160	4100.00	0.00	0.00	3132.30	29000.00	3147.44	0.00	3147.71	9.03	4.93	1148.08	9651.01
11.160	4100.00	0.00	0.00	3132.30	31000.00	3147.70	0.00	3147.99	9.09	5.03	11762.77	10281.99
11.160	4100.00	0.00	0.00	3132.30	41000.00	3148.93	0.00	3149.24	9.34	5.47	14613.10	13417.03
11.950	4150.00	0.00	0.00	3133.70	20400.00	3149.26	0.00	3149.62	7.54	5.19	6661.92	7429.10
11.950	4150.00	0.00	0.00	3133.70	29000.00	3150.76	0.00	3151.19	8.47	6.03	8735.89	9649.99
11.950	4150.00	0.00	0.00	3133.70	31000.00	3151.06	0.00	3151.52	8.89	6.20	9152.96	10394.18
11.950	4150.00	0.00	0.00	3133.70	41000.00	3152.44	0.00	3152.98	9.89	6.97	11096.00	13036.56
12.570	3250.00	0.00	0.00	3140.20	20400.00	3151.79	0.00	3151.98	7.21	3.88	8400.20	7599.41
12.570	3250.00	0.00	0.00	3140.20	29000.00	3153.40	0.00	3153.61	6.69	4.20	11984.56	11211.67
12.570	3250.00	0.00	0.00	3140.20	31000.00	3153.73	0.00	3153.94	6.62	4.27	12726.28	12050.52
12.570	3250.00	0.00	0.00	3140.20	41000.00	3155.23	0.00	3155.46	6.39	4.59	16097.65	16222.59
13.350	4160.00	0.00	0.00	3141.80	20400.00	3154.74	0.00	3154.96	6.98	4.21	8463.06	7725.39
13.350	4160.00	0.00	0.00	3141.80	29000.00	3156.27	0.00	3156.51	7.10	4.65	12034.49	10886.92
13.350	4160.00	0.00	0.00	3141.80	31000.00	3156.58	0.00	3156.83	7.10	4.74	12808.70	11637.88
13.350	4160.00	0.00	0.00	3141.80	41000.00	3158.02	0.00	3158.28	7.00	5.06	16820.25	15497.49
13.950	3130.00	0.00	0.00	3140.00	19200.00	3157.27	0.00	3157.64	9.53	5.47	7724.00	6218.52
13.950	3130.00	0.00	0.00	3140.00	27200.00	3158.71	0.00	3158.98	7.89	5.30	14767.79	9685.21
13.950	3130.00	0.00	0.00	3140.00	29100.00	3159.00	0.00	3159.25	7.55	5.24	16345.12	10592.68
13.950	3130.00	0.00	0.00	3140.00	38500.00	3160.30	0.00	3160.48	6.13	4.97	23498.91	15553.44

SECNO	XLCH	ELTRD	ELLC	ELMIN	CWSEL	CRISW	EG	10K*5	VCH	AREA	.01K	
14.730	4150.00	0.00	0.00	3148.30	19200.00	3160.24	0.00	3160.39	5.16	3.84	11358.23	6453.41
14.730	4150.00	0.00	0.00	3148.30	27200.00	3161.34	0.00	3161.50	5.35	4.22	15756.25	11756.20
14.730	4150.00	0.00	0.00	3148.30	29100.00	3161.56	0.00	3161.73	5.41	4.31	16686.94	15506.23
14.730	4150.00	0.00	0.00	3148.30	38500.00	3162.55	0.00	3162.73	5.57	4.65	21016.08	16319.69
514.930	1025.00	0.00	0.00	3146.80	19200.00	3160.82	0.00	3161.18	8.56	5.61	6085.75	6563.00
514.930	1025.00	0.00	0.00	3146.80	27200.00	3161.96	0.00	3162.31	8.77	6.00	12792.96	9183.96
514.930	1025.00	0.00	0.00	3146.80	29100.00	3162.18	0.00	3162.53	8.80	6.08	13760.31	9808.99
514.930	1025.00	0.00	0.00	3146.80	38500.00	3163.20	0.00	3163.53	8.79	6.35	18222.59	12985.12
814.930	25.00	0.00	0.00	3146.80	19200.00	3160.57	0.00	3161.49	16.48	7.68	2498.58	4729.38
814.930	25.00	0.00	0.00	3146.80	27200.00	3161.98	0.00	3162.33	8.68	5.98	12867.63	9231.19
814.930	25.00	0.00	0.00	3146.80	29100.00	3162.21	0.00	3162.56	8.71	6.05	13835.95	9859.05
814.930	25.00	0.00	0.00	3146.80	38500.00	3163.23	0.00	3163.56	8.71	6.33	18305.97	13046.79
15.020	450.00	0.00	0.00	3146.40	19200.00	3161.82	0.00	3162.05	7.75	4.65	8952.07	6897.79
15.020	450.00	0.00	0.00	3146.40	27200.00	3162.44	0.00	3162.77	10.70	5.72	11203.06	8316.13
15.020	450.00	0.00	0.00	3146.40	29100.00	3162.66	0.00	3162.99	10.71	5.81	12087.01	8890.40
15.020	450.00	0.00	0.00	3146.40	38500.00	3163.66	0.00	3163.98	10.44	6.12	16594.74	11915.53
15.590	3000.00	0.00	0.00	3148.90	19200.00	3163.71	0.00	3163.75	4.88	2.05	15743.45	8091.34
15.590	3000.00	0.00	0.00	3148.90	27200.00	3164.60	0.00	3164.65	4.68	2.20	21013.59	12576.94
15.590	3000.00	0.00	0.00	3148.90	29100.00	3164.81	0.00	3164.85	4.61	2.23	22213.66	13557.77
15.590	3000.00	0.00	0.00	3148.90	38500.00	3165.70	0.00	3165.75	4.38	2.37	27611.03	18391.56
15.970	2050.00	0.00	0.00	3155.10	19200.00	3165.35	0.00	3165.52	17.35	3.97	8414.21	4609.06
15.970	2050.00	0.00	0.00	3155.10	27200.00	3166.20	0.00	3166.33	16.58	3.83	12548.78	6680.16
15.970	2050.00	0.00	0.00	3155.10	29100.00	3166.36	0.00	3166.50	15.98	3.86	13465.12	7279.22
15.970	2050.00	0.00	0.00	3155.10	38500.00	3167.12	0.00	3167.26	13.70	3.96	17913.47	10399.78
16.840	4600.00	0.00	0.00	3161.40	19200.00	3171.09	0.00	3171.23	9.85	3.14	7942.62	6118.86
16.840	4600.00	0.00	0.00	3161.40	27200.00	3171.96	0.00	3172.14	10.64	3.63	10364.31	8339.36
16.840	4600.00	0.00	0.00	3161.40	29100.00	3172.12	0.00	3172.30	10.98	3.75	10837.07	8782.83
16.840	4600.00	0.00	0.00	3161.40	38500.00	3172.60	0.00	3173.03	12.49	4.29	17936.49	10894.05
17.630	4150.00	0.00	0.00	3163.20	19200.00	3174.22	0.00	3174.36	7.21	3.68	10630.06	7152.29
17.630	4150.00	0.00	0.00	3163.20	27200.00	3175.21	0.00	3175.33	7.22	3.54	15858.35	10120.34
17.630	4150.00	0.00	0.00	3163.20	29100.00	3175.40	0.00	3175.52	7.17	3.66	16999.02	10565.59
17.630	4150.00	0.00	0.00	3163.20	38500.00	3176.24	0.00	3176.36	7.01	3.77	22147.61	14536.84
18.110	2550.00	0.00	0.00	3161.20	19200.00	3176.60	0.00	3176.92	13.36	5.60	8142.43	5253.02
18.110	2550.00	0.00	0.00	3161.20	27200.00	3177.55	0.00	3177.86	12.94	5.92	11667.42	7560.25
18.110	2550.00	0.00	0.00	3161.20	29100.00	3177.74	0.00	3178.05	12.99	6.00	12394.94	8073.27
18.110	2550.00	0.00	0.00	3161.20	38500.00	3178.55	0.00	3178.86	13.11	6.37	15895.06	10632.56
18.970	4525.00	0.00	0.00	3168.00	19200.00	3181.27	0.00	3181.46	9.90	4.46	7400.54	6100.88
18.970	4525.00	0.00	0.00	3168.00	27200.00	3182.26	0.00	3182.51	11.29	5.08	9760.88	8096.77
18.970	4525.00	0.00	0.00	3168.00	29100.00	3182.48	0.00	3182.73	11.50	5.20	10367.50	8582.71
18.970	4525.00	0.00	0.00	3168.00	38500.00	3183.36	0.00	3183.64	12.33	5.75	13277.90	10963.43
19.550	3050.00	0.00	0.00	3172.40	19200.00	3184.15	0.00	3184.35	12.40	4.60	8240.44	5452.37
19.550	3050.00	0.00	0.00	3172.40	27200.00	3185.14	0.00	3185.32	10.79	4.69	12559.43	8282.34
19.550	3050.00	0.00	0.00	3172.40	29100.00	3185.34	0.00	3185.51	10.55	4.72	13398.95	8559.81
19.550	3050.00	0.00	0.00	3172.40	38500.00	3186.20	0.00	3186.36	9.84	4.87	17642.48	12272.17

SECNO	XLCH	ELTRD	ELLC	ELMIN	O	CWSEL	CRWS	EG	10K*5	VCH	AREA	.CLK
20.310	4000.00	0.00	0.00	3176.00	19200.00	3187.69	0.00	3187.75	8.12	2.21	10623.61	6738.74
20.310	4000.00	0.00	0.00	3176.00	27200.00	3188.45	0.00	3188.53	8.66	2.57	13752.92	9240.52
20.310	4000.00	0.00	0.00	3176.00	29100.00	3188.62	0.00	3188.70	8.80	2.64	14422.61	9812.07
20.310	4000.00	0.00	0.00	3176.00	38500.00	3189.33	0.00	3189.43	9.12	2.95	17818.41	10748.09
20.750	2350.00	0.00	0.00	3179.10	19200.00	3189.02	0.00	3189.08	5.06	2.02	11353.94	8539.12
20.750	2350.00	0.00	0.00	3179.10	27200.00	3189.97	0.00	3190.03	6.06	2.24	15006.30	11048.22
20.750	2350.00	0.00	0.00	3179.10	29100.00	3190.15	0.00	3190.22	6.12	2.29	15785.89	11763.62
20.750	2350.00	0.00	0.00	3179.10	38500.00	3190.93	0.00	3191.02	6.46	2.56	19429.43	15142.15

BITTERROOT RIVER

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
48.930	47000.00	3105.37	0.00	0.00	0.00	1556.09	0.00
48.930	52250.00	3106.07	.70	0.00	0.00	1795.21	0.00
48.930	58000.00	3106.84	.77	0.00	0.00	2361.17	0.00
48.930	64000.00	3107.53	.69	0.00	0.00	2929.44	0.00
.520	20900.00	3106.88	0.00	1.51	0.00	1163.85	2750.00
.520	29700.00	3107.61	.72	1.54	0.00	1275.89	2750.00
.520	31800.00	3108.25	.64	1.41	0.00	1374.88	2750.00
.520	42000.00	3108.92	.67	1.39	0.00	1478.94	2750.00
500.720	20900.00	3108.04	0.00	1.15	0.00	325.87	1050.00
500.720	29700.00	3109.25	1.21	1.64	0.00	335.20	1050.00
500.720	31800.00	3109.69	.45	1.45	0.00	338.64	1050.00
500.720	42000.00	3110.78	1.08	1.86	0.00	341.00	1050.00
800.720	20900.00	3108.06	0.00	.02	0.00	326.02	30.00
800.720	29700.00	3109.29	1.23	.04	0.00	335.52	30.00
800.720	31800.00	3109.74	.45	.04	0.00	338.99	30.00
800.720	42000.00	3111.65	1.91	.87	0.00	341.00	30.00
.760	20900.00	3108.50	0.00	.44	0.00	573.59	200.00
.760	29700.00	3110.01	1.51	.72	0.00	777.25	200.00
.760	31800.00	3110.51	.49	.77	0.00	804.58	200.00
.760	42000.00	3112.65	2.15	1.00	0.00	844.46	200.00
1.150	20900.00	3109.90	0.00	1.40	0.00	1953.09	2025.00
1.150	29700.00	3111.54	1.65	1.53	0.00	2122.18	2025.00
1.150	31800.00	3112.00	.45	1.49	0.00	2151.96	2025.00
1.150	42000.00	3114.02	2.02	1.36	0.00	2293.48	2025.00
1.890	20900.00	3113.35	0.00	3.45	0.00	2191.71	3925.00
1.890	29700.00	3114.67	1.33	3.13	0.00	2392.40	3925.00
1.890	31800.00	3114.97	.30	2.98	0.00	2398.16	3925.00
1.890	42000.00	3116.41	1.43	2.39	0.00	2432.77	3925.00
2.750	20900.00	3117.58	0.00	4.24	0.00	1770.34	4550.00
2.750	29700.00	3118.91	1.33	4.24	0.00	2141.38	4550.00
2.750	31800.00	3119.18	.27	4.21	0.00	2169.99	4550.00
2.750	42000.00	3120.35	1.17	3.94	0.00	2235.82	4550.00
3.360	20900.00	3120.06	0.00	2.48	0.00	2268.03	3225.00
3.360	29700.00	3121.43	1.37	2.52	0.00	2283.61	3225.00
3.360	31800.00	3121.70	.28	2.53	0.00	2392.02	3225.00
3.360	42000.00	3122.89	1.18	2.54	0.00	3360.68	3225.00
4.070	20900.00	3121.48	0.00	1.42	0.00	3147.54	3720.00
4.070	29700.00	3122.79	1.31	1.36	0.00	3739.14	3720.00
4.070	31800.00	3123.06	.27	1.36	0.00	3818.23	3720.00
4.070	42000.00	3124.22	1.16	1.33	0.00	3932.36	3720.00
4.790	20900.00	3123.65	0.00	2.17	0.00	579.78	3800.00
4.790	29700.00	3124.91	1.26	2.12	0.00	600.88	3800.00
4.790	31800.00	3125.16	.25	2.10	0.00	605.13	3800.00

10-YR
50-YR
100-YR
500-YR

Hess & Barry Farms, Inc. 1/1/77

4.790 42000.00 3125.24 1.07 2.02 0.00 754.35 3800.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
505.020	20900.00	3124.91	0.00	1.26	0.00	314.97	1225.00
505.020	29700.00	3126.59	1.68	1.69	0.00	319.75	1225.00
505.020	31800.00	3126.94	.35	1.78	0.00	320.76	1225.00
505.020	42000.00	3128.48	1.53	2.24	0.00	325.97	1225.00
805.020	20900.00	3124.92	0.00	.01	0.00	315.00	75.00
805.020	29700.00	3126.61	1.69	.02	0.00	319.82	75.00
805.020	31800.00	3126.97	.36	.03	0.00	320.83	75.00
805.020	42000.00	3128.52	1.55	.04	0.00	325.18	75.00
505.040	20900.00	3124.93	0.00	.00	0.00	346.61	50.00
505.040	29700.00	3126.63	1.70	.01	0.00	358.01	50.00
505.040	31800.00	3126.98	.36	.01	0.00	360.42	50.00
505.040	42000.00	3128.55	1.57	.03	0.00	370.93	50.00
805.040	20900.00	3124.95	0.00	.03	0.00	346.79	25.00
805.040	29700.00	3126.67	1.72	.05	0.00	358.33	25.00
805.040	31800.00	3127.04	.36	.05	0.00	360.77	25.00
805.040	42000.00	3128.63	1.60	.08	0.00	371.47	25.00
5.080	20900.00	3125.14	0.00	.19	0.00	1045.55	150.00
5.080	29700.00	3127.09	1.95	.42	0.00	1050.42	150.00
5.080	31800.00	3127.51	.42	.48	0.00	1051.55	150.00
5.080	42000.00	3129.38	1.87	.75	0.00	1056.61	150.00
5.740	20900.00	3127.26	0.00	2.12	0.00	3072.43	3500.00
5.740	29700.00	3129.00	1.74	1.91	0.00	3333.64	3500.00
5.740	31800.00	3129.38	.38	1.87	0.00	3343.01	3500.00
5.740	42000.00	3131.12	1.74	1.74	0.00	3403.58	3500.00
6.400	20900.00	3128.86	0.00	1.60	0.00	587.22	3500.00
6.400	29700.00	3130.38	1.52	1.37	0.00	1033.78	3500.00
6.400	31800.00	3130.71	.33	1.32	0.00	1075.16	3500.00
6.400	42000.00	3132.24	1.54	1.13	0.00	1283.36	3500.00
7.050	20900.00	3132.39	0.00	3.53	0.00	919.36	3400.00
7.050	29700.00	3134.37	1.97	3.99	0.00	926.41	3400.00
7.050	31800.00	3134.76	.39	4.05	0.00	927.81	3400.00
7.050	42000.00	3136.41	1.65	4.17	0.00	933.69	3400.00
7.480	20900.00	3133.89	0.00	1.50	0.00	2022.54	2300.00
7.480	29700.00	3135.92	2.03	1.55	0.00	2033.38	2300.00
7.480	31800.00	3136.34	.42	1.58	0.00	2035.63	2300.00
7.480	42000.00	3138.14	1.80	1.73	0.00	2045.95	2300.00
8.000	20400.00	3135.33	0.00	1.43	0.00	1639.06	2750.00
8.000	29000.00	3137.11	1.78	1.19	0.00	2430.32	2750.00
8.000	31000.00	3137.48	.38	1.15	0.00	2457.74	2750.00
8.000	41000.00	3139.16	1.68	1.02	0.00	2578.72	2750.00
8.540	20400.00	3137.04	0.00	1.72	0.00	1858.56	2850.00
8.540	29000.00	3138.59	1.55	1.49	0.00	2314.17	2850.00
8.540	31000.00	3138.92	.32	1.44	0.00	2317.93	2850.00
8.540	41000.00	3140.40	1.48	1.25	0.00	2330.74	2850.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
8.980	20400.00	3138.30	0.00	1.25	0.00	2873.64	2300.00
8.980	29000.00	3139.80	1.50	1.20	0.00	2888.86	2300.00
8.980	31000.00	3140.11	.31	1.19	0.00	2892.33	2300.00
8.980	41000.00	3141.54	1.43	1.14	0.00	2909.74	2300.00
9.730	20400.00	3140.79	0.00	2.49	0.00	1686.56	4000.00
9.730	29000.00	3142.10	1.31	2.30	0.00	2696.26	4000.00
9.730	31000.00	3142.37	.27	2.26	0.00	2698.09	4000.00
9.730	41000.00	3143.64	1.27	2.10	0.00	2706.75	4000.00
10.390	20400.00	3143.33	0.00	2.54	0.00	2756.52	3450.00
10.390	29000.00	3144.62	1.29	2.52	0.00	2792.93	3450.00
10.390	31000.00	3144.87	.26	2.51	0.00	2795.74	3450.00
10.390	41000.00	3146.05	1.18	2.41	0.00	2802.51	3450.00
11.160	20400.00	3146.14	0.00	2.81	0.00	2204.46	4100.00
11.160	29000.00	3147.44	1.30	2.82	0.00	2278.03	4100.00
11.160	31000.00	3147.70	.27	2.83	0.00	2293.14	4100.00
11.160	41000.00	3148.93	1.23	2.88	0.00	2361.94	4100.00
11.950	20400.00	3149.26	0.00	3.13	0.00	1380.41	4150.00
11.950	29000.00	3150.76	1.49	3.32	0.00	1399.45	4150.00
11.950	31000.00	3151.06	.31	3.36	0.00	1401.46	4150.00
11.950	41000.00	3152.44	1.38	3.51	0.00	1410.56	4150.00
12.570	20400.00	3151.79	0.00	2.52	0.00	2150.27	3250.00
12.570	29000.00	3153.40	1.61	2.64	0.00	2236.70	3250.00
12.570	31000.00	3153.73	.33	2.67	0.00	2239.86	3250.00
12.570	41000.00	3155.23	1.50	2.79	0.00	2255.98	3250.00
13.350	20400.00	3154.74	0.00	2.95	0.00	2000.78	4160.00
13.350	29000.00	3156.27	1.53	2.87	0.00	2441.76	4160.00
13.350	31000.00	3156.58	.32	2.86	0.00	2469.06	4160.00
13.350	41000.00	3158.02	1.44	2.79	0.00	3291.93	4160.00
13.950	19200.00	3157.27	0.00	2.53	0.00	4259.90	3130.00
13.950	27200.00	3158.71	1.45	2.45	0.00	5425.72	3130.00
13.950	29100.00	3159.00	.29	2.41	0.00	5481.23	3130.00
13.950	38500.00	3160.30	1.30	2.28	0.00	5483.42	3130.00
14.730	19200.00	3160.24	0.00	2.97	0.00	3677.83	4150.00
14.730	27200.00	3161.34	1.10	2.63	0.00	4229.44	4150.00
14.730	29100.00	3161.56	.22	2.56	0.00	4319.22	4150.00
14.730	38500.00	3162.55	.99	2.24	0.00	4382.02	4150.00
514.930	19200.00	3160.82	0.00	.58	0.00	3744.66	1025.00
514.930	27200.00	3161.96	1.14	.62	0.00	4243.51	1025.00
514.930	29100.00	3162.18	.23	.63	0.00	4262.65	1025.00
514.930	38500.00	3163.20	1.02	.66	0.00	4651.68	1025.00
514.930	19200.00	3160.57	0.00	-.25	0.00	221.66	25.00
514.930	27200.00	3161.98	1.41	.03	0.00	4244.99	25.00
514.930	29100.00	3162.21	.23	.03	0.00	4264.04	25.00
514.930	38500.00	3163.23	1.02	.03	0.00	4652.06	25.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
15.020	19200.00	3161.82	0.00	1.25	0.00	3365.27	450.00
15.020	27200.00	3162.44	.63	.46	0.00	3890.67	450.00
15.020	29100.00	3162.66	.22	.45	0.00	4066.43	450.00
15.020	38500.00	3163.66	1.00	.43	0.00	4652.21	450.00
15.590	19200.00	3163.71	0.00	1.89	0.00	5844.78	3000.00
15.590	27200.00	3164.60	.90	2.16	0.00	5977.66	3000.00
15.590	29100.00	3164.81	.20	2.14	0.00	5997.51	3000.00
15.590	38500.00	3165.70	.89	2.03	0.00	6018.57	3000.00
15.970	19200.00	3165.35	0.00	1.65	0.00	4310.70	2050.00
15.970	27200.00	3166.20	.84	1.59	0.00	5364.48	2050.00
15.970	29100.00	3166.36	.17	1.56	0.00	5659.59	2050.00
15.970	38500.00	3167.12	.76	1.43	0.00	5926.85	2050.00
16.840	19200.00	3171.09	0.00	5.74	0.00	2563.89	4600.00
16.840	27200.00	3171.96	.87	5.77	0.00	2940.16	4600.00
16.840	29100.00	3172.12	.16	5.76	0.00	3097.94	4600.00
16.840	38500.00	3172.80	.68	5.67	0.00	3108.38	4600.00
17.630	19200.00	3174.22	0.00	3.13	0.00	4836.78	4150.00
17.630	27200.00	3175.21	.99	3.25	0.00	5786.19	4150.00
17.630	29100.00	3175.40	.19	3.28	0.00	5995.74	4150.00
17.630	38500.00	3176.24	.84	3.44	0.00	6267.98	4150.00
18.110	19200.00	3176.60	0.00	2.38	0.00	3459.66	2550.00
18.110	27200.00	3177.55	.95	2.34	0.00	3935.93	2550.00
18.110	29100.00	3177.74	.19	2.34	0.00	4003.07	2550.00
18.110	38500.00	3178.55	.81	2.31	0.00	4633.71	2550.00
18.970	19200.00	3181.27	0.00	4.67	0.00	2111.04	4525.00
18.970	27200.00	3182.28	1.01	4.72	0.00	2792.13	4525.00
18.970	29100.00	3182.48	.21	4.75	0.00	3023.94	4525.00
18.970	38500.00	3183.36	.87	4.81	0.00	3459.45	4525.00
19.550	19200.00	3184.15	0.00	2.89	0.00	3808.19	3050.00
19.550	27200.00	3185.14	.99	2.87	0.00	4680.22	3050.00
19.550	29100.00	3185.34	.20	2.86	0.00	4782.59	3050.00
19.550	38500.00	3186.20	.85	2.84	0.00	5074.54	3050.00
20.310	19200.00	3187.69	0.00	3.54	0.00	3463.97	4000.00
20.310	27200.00	3188.45	.76	3.31	0.00	4275.32	4000.00
20.310	29100.00	3188.62	.16	3.27	0.00	4417.31	4000.00
20.310	38500.00	3189.33	.71	3.13	0.00	5295.18	4000.00
20.750	19200.00	3189.02	0.00	1.33	0.00	3518.46	2350.00
20.750	27200.00	3189.97	.94	1.52	0.00	4187.98	2350.00
20.750	29100.00	3190.15	.18	1.53	0.00	4269.74	2350.00
20.750	38500.00	3190.93	.78	1.60	0.00	5424.73	2350.00

SUMMARY OF ERRORS

HEC2 RELEASE DATED NOV 76 UPDATED AUG1977
ERROR CORR - 01,02
MODIFICATION - 50,51,52,53

T1 MISSOULA COUNTY
T2 100 YEAR EVENT, NATURAL PROFILE
T3 BITTERROOT RIVER

J1 ICHECK INQ NINV TDIP STRT METRIC HVINS Q WSEL FQ
0. 2. 0. 0. 0.00000 0.00 0.0 0. 3195.379 0.000

J2 NPROF IPILOT PREVS XSECV XSECH FN ALLDC IBW CHM IM ITRACE
1.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

J3 VARIABLE CODES FOR SUMMARY PRINTOUT
150.000 200.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

QT 6.000 47000.000 47000.000 47000.000 52250.000 56000.000 64000.000 0.000 0.000 0.000
ET 0.000 0.000 5.400 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
NC 0.000 0.000 0.000 .100 .500 0.000 0.000 0.000 0.000 0.000 0.000
NH 5.000 .050 372.000 .043 1672.000 .065 5100.000 .040 5395.000 .050
NH 5538.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

0.5' encroachment using Method 4

X1 48.930 88.000 1672.000 5100.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000
GR 3105.600 360.000 3105.700 372.000 3104.100 472.000 3103.600 512.000 3093.100 534.000
GR 3091.900 566.000 3092.800 590.000 3090.800 600.000 3091.300 629.000 3091.300 659.000
GR 3090.300 709.000 3089.900 749.000 3089.100 789.000 3089.100 629.000 3093.400 839.000
GR 3099.700 850.000 3100.300 856.000 3100.200 872.000 3100.000 879.000 3096.900 889.000
GR 3106.000 912.000 3106.500 930.000 3105.000 942.000 3106.500 972.000 3106.000 1000.000
GR 3105.500 1018.000 3108.000 1026.000 3107.000 1072.000 3108.000 1112.000 3107.000 1140.000
GR 3106.000 1172.000 3107.500 1272.000 3100.600 1373.000 3095.700 1377.000 3091.700 1397.000
GR 3090.000 1422.000 3092.000 1472.000 3090.000 1510.000 3095.000 1544.000 3096.500 1572.000
GR 3095.000 1600.000 3098.500 1612.000 3103.000 1622.000 3104.500 1672.000 3106.000 1772.000
GR 3107.500 1872.000 3106.500 1912.000 3107.000 1972.000 3102.000 1982.000 3108.000 2072.000
GR 3103.200 2148.000 3101.600 2150.000 3103.800 2172.000 3108.000 2220.000 3106.000 2272.000
GR 3109.000 2372.000 3111.000 2472.000 3110.000 2672.000 3105.100 2772.000 3105.200 2790.000
GR 3108.000 2600.000 3107.700 3000.000 3108.000 3100.000 3107.000 3200.000 3106.800 3300.000
GR 3107.000 3400.000 3106.000 3600.000 3103.300 3620.000 3102.000 3683.000 3104.500 3700.000
GR 3105.000 3800.000 3110.000 3880.000 3108.200 5100.000 3104.900 5160.000 3099.900 5180.000
GR 3097.000 5250.000 3100.900 5275.000 3093.400 5300.000 3099.000 5325.000 3103.900 5350.000
GR 3103.900 5375.000 3105.400 5394.000 3107.500 5395.000 3107.500 5396.000 3107.800 5400.000
GR 3108.500 5478.000 3108.100 5528.000 3113.700 5538.000 0.000 0.000 0.000 0.000
QT 6.000 31800.000 31800.000 20900.000 29700.000 31800.000 42000.000 0.000 0.000 0.000
NC .085 .052 .033 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000

Flow rates match FIS Vol. 1, Table 2

XS A

X1 .520 65.000 4902.000 5321.000 900.000 4100.000 2750.000 0.000 0.000 0.000
GR 3109.200 3794.000 3105.900 4297.000 3104.700 4388.000 3105.200 4562.000 3104.700 4614.000
GR 3106.700 4701.000 3105.700 4792.000 3106.700 4931.000 3104.900 4868.000 3106.700 4902.000
GR 3104.900 4988.000 3102.800 5005.000 3101.100 5033.000 3100.000 5066.000 3099.700 5104.000

Moore Business Forms, Inc. 14177

GR	3098.200	5125.000	3097.600	5130.000	3095.500	5150.000	3094.000	5175.000	3092.300	5200.000
GR	3092.200	5225.000	3091.700	5250.000	3090.900	5275.000	3097.700	5292.000	3101.500	5297.000
GR	3110.900	5321.000	3109.700	5392.000	3111.400	5478.000	3112.700	5584.000	3112.200	5659.000
GR	3112.900	5795.000	3111.400	5837.000	3111.300	5887.000	3111.200	5916.000	3112.700	6004.000
GR	3110.700	6047.000	3111.700	6087.000	3113.200	6120.000	3113.700	6203.000	3112.400	6265.000
GR	3114.400	6308.000	3112.200	6375.000	3114.200	6481.000	3116.200	6593.000	3114.200	6630.000
GR	3116.900	6643.000	3113.400	6663.000	3114.900	6720.000	3116.400	6760.000	3114.700	6847.000
GR	3115.700	6887.000	3114.700	6989.000	3116.200	7016.000	3116.200	7041.000	3115.400	7087.000
GR	3116.400	7132.000	3117.200	7236.000	3117.900	7328.000	3115.200	7393.000	3117.200	7444.000
GR	3119.400	7462.000	3119.200	7558.000	3119.900	7595.000	3118.700	7625.000	3120.900	7748.000
NH	4.000	.060	3460.000	.090	4670.000	.036	5011.000	.065	6025.000	0.000

X1	500.720	75.000	4670.000	5011.000	300.000	1500.000	1050.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3112.000	3112.000	0.000
GR	3130.300	1365.000	3124.800	1431.000	3125.000	1472.000	3122.500	1510.000	3123.000	1597.000
GR	3120.300	1681.000	3120.500	1749.000	3116.800	1788.000	3116.300	1867.000	3116.500	1903.000
GR	3114.500	1964.000	3115.500	1997.000	3111.800	2164.000	3103.000	2323.000	3102.300	2401.000
GR	3103.800	2422.000	3102.900	2447.000	3102.300	2465.000	3102.300	2576.000	3101.000	2632.000
GR	3101.000	2668.000	3 2.500	2802.000	3104.000	2908.000	3105.200	3128.000	3104.700	3308.000
GR	3104.900	3427.000	3105.900	3468.000	3105.200	3601.000	3105.700	3765.000	3105.2	3815.000
GR	3103.700	3852.000	3104.900	3933.900	3106.400	3964.000	3106.700	4054.000	3106.2	4076.000
GR	3106.700	4185.000	3106.700	4522.000	3104.700	4569.000	3114.200	4638.000	3114.200	4670.000
GR	3100.000	4670.000	3098.200	4682.000	3096.400	4691.000	3086.700	4722.000	3087.200	4739.000
GR	3089.900	4763.000	3091.100	4782.000	3094.700	4806.000	3098.200	4819.000	3103.300	4841.000
GR	3101.700	4847.000	3105.100	4860.000	3101.200	4870.000	3099.800	4909.000	3099.300	4933.000
GR	3098.800	4945.000	3099.300	4954.000	3105.200	4974.000	3110.000	5011.000	3114.200	5011.000
GR	3114.900	5088.000	3117.200	5137.000	3125.400	5233.000	3121.400	5256.000	3124.900	5521.000
GR	3126.200	5692.000	3126.400	5893.000	3126.900	5977.000	3127.200	6068.000	3126.700	6134.000
GR	3125.400	6278.000	3126.200	6324.000	3130.200	6487.000	3130.900	6548.000	3130.900	6626.000
SB	.950	1.500	2.500	340.000	275.000	7.000	4440.000	1.160	3096.000	3096.000

X1	800.720	0.000	0.000	0.000	30.000	30.000	30.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	3111.400	3114.200	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3114.200	3114.200	0.000
NH	4.000	.080	4254.000	.037	4466.000	.042	4799.000	.052	7317.000	0.000

X1	.760	73.000	4254.000	4799.000	125.000	200.000	200.000	0.000	0.000	0.000
GR	3111.000	4022.000	3110.000	4067.000	3109.400	4151.000	3109.900	4212.000	3108.900	4254.000
GR	3102.700	4263.000	3098.000	4273.000	3095.300	4276.000	3091.900	4288.000	3093.300	4313.000
GR	3095.900	4338.000	3096.600	4363.000	3096.000	4392.000	3098.900	4411.000	3101.200	4443.000
GR	3099.900	4455.000	3099.400	4466.000	3103.400	4487.000	3104.700	4513.000	3103.700	4547.000
GR	3104.200	4579.000	3102.200	4603.000	3097.900	4614.000	3097.700	4628.000	3096.500	4647.000
GR	3098.700	4678.000	3099.200	4693.000	3099.400	4731.000	3098.200	4749.000	3097.700	4765.000
GR	3096.700	4776.000	3097.700	4787.000	3106.400	4799.000	3107.900	4822.000	3111.900	4863.000
GR	3115.400	4879.000	3122.200	4895.000	3124.700	4905.000	3126.700	4948.000	3121.200	5075.000
GR	3120.400	5175.000	3123.200	5208.000	3126.700	5282.000	3126.700	5377.000	3125.400	5437.000
GR	3125.700	5509.000	3127.700	5585.000	3129.700	5653.000	3129.200	5684.000	3126.700	5713.000
GR	3128.700	5805.000	3127.700	5835.000	3127.900	5963.000	3126.700	6036.000	3130.200	6155.000
GR	3127.200	6164.000	3126.700	6201.000	3126.400	6228.000	3124.700	6243.000	3127.200	6397.000
GR	3126.900	6507.000	3128.200	6596.000	3126.400	6737.000	3126.900	6834.000	3130.200	6985.000
GR	3129.700	6990.000	3130.700	6995.000	3119.400	7004.000	3128.700	7114.000	3127.400	7187.000
GR	3123.700	7250.000	3124.200	7265.000	3131.400	7317.000	0.000	0.000	0.000	0.000
NC	.053	.068	.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	1.150	92.000	2278.000	2618.000	1400.000	1100.000	2025.000	0.000	0.000	0.000
GR	3130.300	1132.000	3127.000	1159.000	3129.800	1241.000	3125.800	1325.000	3124.800	1374.000
GR	3122.500	1429.000	3119.800	1474.000	3118.500	1524.000	3118.300	1578.000	3116.800	1629.000

XSB



Magna Business Forms, Inc. 1417

Moore Business Forms, Inc. 33

GR	3113.800	1645.000	3114.000	1672.000	3113.800	1708.000	3112.500	1739.000	2111.000	1772.000
GR	3111.300	1822.000	3112.800	1854.000	3110.300	1883.000	3108.000	1927.000	3106.800	1958.000
GR	3106.800	1983.000	3107.300	2011.000	3107.300	2043.000	3107.300	2066.000	3107.500	2080.000
GR	3107.700	2094.000	3108.200	2120.000	3108.900	2141.000	3110.200	2153.000	3110.900	2167.000
GR	3111.200	2186.000	3116.900	2199.000	3109.200	2216.000	3108.700	2241.000	3107.900	2273.000
GR	3104.700	2281.000	3103.300	2303.000	3101.900	2319.000	3100.600	2328.000	3100.100	2353.000
GR	3099.900	2378.000	3099.900	2403.000	3099.000	2428.000	3099.000	2453.000	3099.100	2477.000
GR	3099.400	2502.000	3099.800	2527.000	3099.900	2552.000	3100.400	2576.000	3100.900	2601.000
GR	3102.300	2610.000	3106.300	2618.000	3107.900	2660.000	3107.600	2679.000	3108.400	2693.000
GR	3108.200	2717.000	3107.200	2765.000	3107.400	2805.000	3107.200	2895.000	3106.900	2943.000
GR	3107.400	3005.000	3107.200	3050.000	3106.900	3100.000	3106.900	3163.000	3103.900	3283.000
GR	3107.400	3300.000	3109.400	3319.000	3109.700	3351.000	3108.400	3456.000	3108.700	3647.000
GR	3109.900	3740.000	3107.400	3872.000	3111.900	3928.000	3116.900	3950.000	3119.900	3974.000
GR	3121.200	3946.000	3124.200	4031.000	3125.400	4198.000	3121.900	4459.000	3121.900	4515.000
GR	3125.200	4855.000	3127.200	5007.000	3128.400	5039.000	3129.200	5271.000	3129.900	5485.000
GR	3128.700	5690.000	3120.200	6032.000	3130.700	6450.000	3132.400	6907.000	3132.900	7134.000
GR	3134.700	7477.000	3135.400	7821.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	5.000	.055	1122.000	.036	1405.000	.046	1638.000	.059	2110.000	.085
NH	4700.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

XI	1.890	91.000	1122.000	1838.000	4000.000	3700.000	3925.000	0.000	0.000	0.000
GR	3124.200	1048.000	3114.000	1063.000	3114.000	1067.000	3115.800	1069.000	3116.200	1079.000
GR	3114.700	1106.000	3110.800	1122.000	3103.600	1126.000	3101.900	1141.000	3100.900	1147.000
GR	3100.500	1172.000	3099.400	1197.000	3099.800	1222.000	3101.500	1247.000	3102.400	1272.000
GR	3103.700	1297.000	3104.400	1306.000	3108.400	1323.000	3108.600	1358.000	3109.200	1384.000
GR	3111.400	1405.000	3111.000	1429.000	3117.000	1441.000	3109.600	1464.000	3108.800	1482.000
GR	3108.600	1505.000	3106.800	1524.000	3117.000	1544.000	3106.800	1550.000	3106.400	1573.000
GR	3108.600	1600.000	3110.400	1638.000	3110.200	1650.000	3108.800	1662.000	3109.600	1678.000
GR	3107.800	1695.000	3108.400	1712.000	3112.400	1739.000	3112.800	1752.000	3112.000	1818.000
GR	3112.000	1881.000	3111.600	1908.000	3111.600	1939.000	3111.600	1939.000	3109.200	1956.000
GR	3111.200	1992.000	3109.800	2011.000	3106.600	2033.000	3106.800	2045.000	3112.400	2063.000
GR	3114.600	2110.000	3113.400	2159.000	3112.200	2199.000	3112.600	2268.000	3111.600	2316.000
GR	3110.200	2363.000	3110.200	2391.000	3112.600	2425.000	3112.000	2526.000	3111.800	2564.000
GR	3112.600	2623.000	3112.600	2674.000	3112.200	2749.000	3112.000	2855.000	3111.200	2909.000
GR	3110.400	2930.000	3112.000	2968.000	3112.000	3004.000	3111.000	3027.000	3112.400	3060.000
GR	3112.400	3105.000	3111.000	3117.000	3108.600	3152.000	3111.000	3176.000	3108.600	3214.000
GR	3114.400	3252.000	3112.800	3328.000	3113.000	3366.000	3113.800	3430.000	3112.800	3445.000
GR	3113.000	3477.000	3116.400	3492.000	3118.000	3604.000	3117.400	3657.000	3118.400	3665.000
GR	3126.000	3711.000	3125.200	4063.000	3124.400	4088.000	3125.200	4335.000	3125.400	4622.000
GR	3127.600	4700.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	4.000	.055	2983.000	.067	3242.000	.039	3518.000	.058	3767.000	0.000

XI	2.750	73.000	3242.000	3518.000	4650.000	3500.000	4550.000	0.000	0.000	0.000
GR	3178.800	1123.000	3167.400	1170.000	3145.200	1237.000	3116.300	1305.000	3116.600	1374.000
GR	3116.700	1442.000	3116.500	1483.000	3117.600	1523.000	3116.900	1540.000	3118.800	1560.000
GR	3116.900	1565.000	3116.900	1581.000	3119.100	1591.000	3118.400	1609.000	3118.400	1634.000
GR	3119.100	1679.000	3119.900	1730.000	3114.900	1793.000	3116.400	1869.000	3117.200	1926.000
GR	3118.000	1989.000	3117.600	2045.000	3116.200	2116.000	3118.300	2191.000	3118.000	2250.000
GR	3115.000	2350.000	3117.400	2433.000	3117.800	2489.000	3118.900	2562.000	3119.900	2620.000
GR	3115.900	2675.000	3118.100	2723.000	3116.400	2734.000	3116.200	2765.000	3115.800	2800.000
GR	3116.800	2849.000	3116.800	2892.000	3117.800	2949.000	3117.200	2964.000	3108.400	2983.000
GR	3108.200	2993.000	3108.200	3021.000	3115.200	3032.000	3115.000	3048.000	3115.700	3075.000
GR	3112.800	3102.000	3111.800	3122.000	3114.600	3137.000	3115.600	3163.000	3119.400	3193.000
GR	3114.600	3217.000	3115.600	3242.000	3111.700	3248.000	3112.200	3273.000	3111.100	3285.000
GR	3109.400	3310.000	3108.700	3335.000	3108.400	3357.000	3108.800	3385.000	3105.300	3410.000
GR	3103.300	3435.000	3101.400	3460.000	3102.100	3485.000	3105.400	3510.000	3108.400	3515.000
GR	3113.400	3518.000	3118.800	3521.000	3120.400	3532.000	3120.600	3542.000	3130.600	3564.000
GR	3169.000	3625.000	3210.200	3697.000	3246.400	3767.000	0.000	0.000	0.000	0.000
NH	4.000	.058	3907.000	.038	4309.000	.070	5483.000	.060	5940.000	0.000

Hoover Paints Firm, Inc. 1177

ET	0.000	0.000	4.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	3.360	75.000	3407.000	4309.000	3350.000	2700.000	3225.000	0.000	0.000	0.000	0.000	0.000
GR	3123.400	2269.000	3121.800	2368.000	3121.900	2523.000	3121.900	2782.000	3122.100	3122.100	3040.000	3.000
GR	3121.500	3361.000	3114.600	3430.000	3114.300	3479.000	3116.000	3636.000	3116.500	3116.500	3716.000	0.000
GR	3114.300	3756.000	3117.700	3797.000	3117.900	3907.000	3114.300	3915.000	3111.800	3111.800	3939.000	0.000
GR	3109.200	3952.000	3105.000	3971.000	3110.600	3996.000	3111.300	4022.000	3111.600	3111.600	4047.000	0.000
GR	3111.400	4072.000	3110.900	4097.000	3110.700	4123.000	3111.000	4148.000	3110.700	3110.700	4173.000	0.000
GR	3110.100	4198.000	3109.500	4224.000	3109.200	4249.000	3110.600	4275.000	3111.200	3111.200	4295.000	0.000
GR	3111.500	4301.000	3118.200	4309.000	3119.000	4346.000	3118.400	4393.000	3117.600	3117.600	4459.000	0.000
GR	3115.600	4472.000	3119.000	4486.000	3118.200	4527.000	3118.200	4585.000	3117.200	3117.200	4609.000	0.000
GR	3118.200	4661.000	3118.400	4744.000	3118.200	4786.000	3114.200	4808.000	3114.800	3114.800	4838.000	0.000
GR	3118.000	4862.000	3117.400	4895.000	3119.400	4931.000	3119.600	4971.000	3118.200	3118.200	5026.000	0.000
GR	3116.200	5058.000	3116.400	5107.000	3115.800	5187.000	3116.600	5272.000	3116.600	3116.600	5352.000	0.000
GR	3115.800	5427.000	3114.800	5463.000	3112.800	5474.000	3117.600	5483.000	3119.000	3119.000	5532.000	0.000
GR	3118.000	5548.000	3116.000	5573.000	3116.000	5587.000	3116.800	5610.000	3116.800	3116.800	5639.000	0.000
GR	3122.600	5647.000	3122.600	5655.000	3122.400	5661.000	3125.800	5665.000	3130.000	3130.000	5674.000	0.000
GR	3130.400	5690.000	3130.000	5701.000	3131.200	5767.000	3134.000	5900.000	3140.000	3140.000	5940.000	0.000
EH	4.000	.085	4388.000	.060	6910.000	.037	7249.000	.065	7401.000	7401.000	0.000	0.000
X1	4.070	68.000	6910.000	7249.000	1550.000	3800.000	3720.000	0.000	0.000	0.000	0.000	0.000
GR	3122.500	3452.000	3123.500	3467.000	3120.100	3494.000	3120.200	3548.000	3121.400	3121.400	3677.000	0.000
GR	3122.500	3944.000	3121.000	4075.000	3123.200	4170.000	3123.000	4308.000	3122.300	3122.300	4360.000	0.000
GR	3120.500	4388.000	3118.800	4411.000	3116.900	4455.000	3119.600	4524.000	3118.200	3118.200	4613.000	0.000
GR	3118.700	4645.000	3117.900	4681.000	3118.700	4745.000	3117.500	4768.000	3117.900	3117.900	4792.000	0.000
GR	3116.600	4814.000	3115.000	4923.000	3117.700	4940.000	3118.900	4978.000	3114.800	3114.800	5008.000	0.000
GR	3116.100	5215.000	3117.000	5253.000	3118.200	5356.000	3116.900	5408.000	3119.200	3119.200	5473.000	0.000
GR	3117.900	5500.000	3119.000	5521.000	3118.800	5566.000	3119.200	5594.000	3119.400	3119.400	5657.000	0.000
GR	3120.300	5911.000	3118.600	6001.000	3119.700	6181.000	3121.100	6351.000	3116.200	3116.200	6464.000	0.000
GR	3120.700	6575.000	3121.300	6616.000	3120.200	6693.000	3121.600	6725.000	3121.500	3121.500	6760.000	0.000
GR	3120.600	6802.000	3122.200	6910.000	3117.200	6920.000	3116.900	6923.000	3114.000	3114.000	6933.000	0.000
GR	3111.200	6948.000	3110.000	6973.000	3110.500	6998.000	3110.400	7023.000	3110.600	3110.600	7048.000	0.000
GR	3112.000	7072.000	3111.000	7097.000	3111.100	7121.000	3110.600	7146.000	3110.400	3110.400	7171.000	0.000
GR	3110.700	7196.000	3112.700	7220.000	3114.000	7230.000	3119.300	7243.000	3120.100	3120.100	7249.000	0.000
GR	3121.000	7311.000	3122.900	7381.000	3130.700	7401.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	.080	.070	.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	4.790	32.000	7098.000	7421.000	2750.000	4050.000	3800.000	0.000	0.000	0.000	0.000	0.000
GR	3127.000	6716.000	3126.300	6764.000	3127.000	6808.000	3125.500	6958.000	3125.400	3125.400	7023.000	0.000
GR	3122.500	7038.000	3125.700	7044.000	3122.800	7058.000	3122.500	7098.000	3121.900	3121.900	7101.000	0.000
GR	3115.500	7109.000	3115.500	7121.000	3116.000	7138.000	3115.500	7170.000	3114.700	3114.700	7188.000	0.000
GR	3114.100	7213.000	3113.200	7236.000	3111.800	7263.000	3111.600	7286.000	3112.300	3112.300	7313.000	0.000
GR	3113.300	7338.000	3111.500	7363.000	3112.400	7386.000	3115.400	7408.000	3122.200	3122.200	7421.000	0.000
GR	3121.800	7441.000	3121.300	7499.000	3121.800	7564.000	3121.800	7603.000	3123.500	3123.500	7625.000	0.000
GR	3127.300	7644.000	3132.100	7665.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	.050	.063	.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	505.070	59.000	6954.000	7300.000	1100.000	1250.000	1225.000	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	3129.700	5317.000	3129.900	5403.000	3129.800	5505.000	3129.500	5586.000	3129.300	3129.300	5691.000	0.000
GR	3129.200	5808.000	3129.200	5933.000	3129.200	6033.000	3129.300	6131.000	3129.500	3129.500	6243.000	0.000
GR	3127.800	6339.000	3130.400	6423.000	3131.000	6540.000	3131.400	6639.000	3132.700	3132.700	6791.000	0.000
GR	3133.800	6892.000	3134.500	6954.000	3116.200	6980.000	3114.100	7012.000	3116.200	3116.200	7027.000	0.000
GR	3116.100	7034.000	3114.900	7057.000	3115.400	7092.000	3115.800	7106.000	3114.400	3114.400	7118.000	0.000
GR	3113.000	7131.000	3110.600	7156.000	3103.700	7181.000	3102.900	7206.000	3099.000	3099.000	7231.000	0.000
GR	3112.300	7256.000	3116.100	7263.000	3118.200	7273.000	3128.000	7287.000	3137.900	3137.900	7300.000	0.000

GR	3138.300	7325.000	3138.600	7362.000	3139.400	7428.000	3139.900	7527.000	3141.200	7627.000
GR	3141.800	7703.000	3142.400	7773.000	3143.900	7859.000	3144.700	7933.000	3144.800	8004.000
GR	3145.700	8078.000	3146.100	8146.000	3147.200	8213.000	3147.600	8277.000	3148.200	8347.000
GR	3149.200	8430.000	3149.500	8501.000	3150.700	8583.000	3151.400	8654.000	3152.100	8725.000
GR	3153.100	8801.000	3154.000	8865.000	3154.000	8925.000	3155.200	9000.000	0.000	0.000
SB	1.050	1.500	2.500	346.000	295.000	6.000	6600.000	.500	3111.000	3111.000

X1	805.020	0.000	0.000	0.000	75.000	75.000	75.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	3133.000	3134.500	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3134.500	3137.900	0.000
NC	.050	.070	.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	505.040	45.000	6951.000	7365.000	50.000	50.000	50.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3139.700	3141.400	0.000
GR	3139.700	6624.000	3140.000	6692.000	3140.500	6766.000	3140.900	6888.000	3141.400	6951.000
GR	3130.200	6966.000	3119.300	7001.000	3118.200	7009.000	3116.200	7014.000	3115.100	7051.000
GR	3113.900	7060.000	3115.000	7085.000	3115.200	7114.000	3117.200	7153.000	3117.600	7192.000
GR	3116.100	7196.000	3106.100	7221.000	3105.900	7247.000	3104.500	7273.000	3107.900	7298.000
GR	3116.100	7310.000	3122.200	7320.000	3132.200	7355.000	3141.400	7365.000	3142.000	7421.000
GR	3142.600	7534.000	3142.900	7621.000	3143.300	7702.000	3143.700	7799.000	3144.100	7886.000
GR	3144.300	7966.000	3144.500	8040.000	3145.100	8131.000	3145.400	8214.000	3145.900	8302.000
GR	3146.600	8343.000	3146.700	8422.000	3146.100	8525.000	3147.000	8589.000	3147.000	8680.000
GR	3147.800	8764.000	3148.900	8851.000	3149.100	8928.000	3149.200	8986.000	3149.500	9050.000
SB	1.000	1.500	2.500	414.000	310.000	12.000	8145.000	1.730	3113.000	3113.000

X1	805.040	0.000	0.000	0.000	25.000	25.000	25.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	3137.000	3141.400	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3141.400	3141.400	0.000
NC	.068	.065	.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	.080	77.000	6975.000	7349.000	20.000	250.000	150.000	0.000	0.000	0.000
GR	3134.500	5325.000	3134.400	5400.000	3134.500	5450.000	3134.400	5500.000	3134.500	5580.000
GR	3132.700	5595.000	3132.700	5645.000	3132.800	5681.000	3133.100	5701.000	3134.400	5711.000
GR	3134.400	5725.000	3133.900	5739.000	3132.000	5757.000	3131.200	5784.000	3130.800	5831.000
GR	3130.300	5859.000	3132.400	5887.000	3133.900	5900.000	3131.400	5911.000	3132.900	5931.000
GR	3131.400	5943.000	3131.200	5965.000	3131.200	5983.000	3131.800	6014.000	3131.500	6028.000
GR	3132.100	6051.000	3132.100	6076.000	3131.800	6092.000	3132.300	6117.000	3132.300	6130.000
GR	3133.900	6195.000	3133.400	6217.000	3135.900	6227.000	3133.900	6239.000	3134.000	6262.000
GR	3134.900	6288.000	3121.800	6307.000	3122.400	6348.000	3121.400	6378.000	3121.200	6401.000
GR	3121.600	6422.000	3122.300	6483.000	3123.100	6527.000	3124.000	6568.000	3124.500	6619.000
GR	3123.700	6657.000	3122.400	6685.000	3122.100	6726.000	3122.200	6766.000	3122.700	6807.000
GR	3123.700	6843.000	3124.300	6880.000	3124.800	6924.000	3123.900	6957.000	3123.500	6975.000
GR	3119.100	6980.000	3119.100	6985.000	3116.900	6994.000	3115.400	7013.000	3115.100	7020.000
GR	3116.500	7035.000	3115.900	7041.000	3117.200	7070.000	3116.900	7107.000	3116.700	7132.000
GR	3116.700	7153.000	3116.600	7169.000	3115.400	7211.000	3115.400	7226.000	3111.400	7253.000
GR	3113.100	7280.000	3115.300	7304.000	3115.900	7330.000	3116.600	7332.000	3122.300	7345.000
GR	3126.500	7349.000	3148.100	7376.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	5.000	.050	4787.000	.050	5232.000	.036	5542.000	.075	7024.000	.060
MH	8050.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	5.740	83.000	5232.000	5542.000	2000.000	4050.000	3500.000	0.000	0.000	0.000
GR	3132.200	4380.000	3125.500	4400.000	3125.200	4500.000	3125.000	4650.000	3124.900	4787.000
GR	3124.200	4798.000	3125.300	4820.000	3125.200	4845.000	3123.300	4866.000	3123.200	4884.000
GR	3124.700	4900.000	3123.900	5014.000	3126.400	5162.000	3130.300	5184.000	3126.300	5203.000
GR	3122.100	5218.000	3121.700	5232.000	3119.500	5240.000	3115.600	5247.000	3116.500	5282.000
GR	3115.200	5307.000	3114.400	5332.000	3114.500	5357.000	3114.800	5382.000	3114.900	5407.000

GR	3114.900	5432.000	3115.200	5457.000	3115.600	5482.000	3118.600	5511.000	3121.300	5539.000
GR	3123.400	5542.000	3124.900	5548.000	3123.900	5557.000	3124.200	5595.000	3124.900	5634.000
GR	3124.700	5646.000	3125.300	5675.000	3125.600	5702.000	3125.300	5742.000	3125.200	5724.000
GR	3124.500	5809.000	3122.500	5878.000	3121.600	6001.000	3121.800	6040.000	3122.000	6090.000
GR	3120.800	6151.000	3122.800	6250.000	3122.000	6266.000	3124.400	6297.000	3121.700	6312.000
GP	3121.600	6334.000	3120.300	6346.000	3120.300	6483.000	3122.100	6545.000	3121.700	6577.000
GR	3121.100	6588.000	3124.400	6757.000	3125.200	6792.000	3125.200	6827.000	3120.200	6854.000
GR	3122.600	6862.000	3120.900	6868.000	3123.200	6877.000	3120.200	6900.000	3120.200	6993.000
GR	3129.200	7024.000	3127.600	7029.000	3127.900	7070.000	3127.200	7108.000	3127.500	7271.000
GR	3123.500	7548.000	3124.000	7587.000	3124.400	7633.000	3123.100	7708.000	3128.000	7730.000
GP	3131.000	7750.000	3130.900	7770.000	3129.200	7780.000	3132.300	7791.000	3134.800	7889.000
GP	3136.100	7940.000	3144.200	8016.000	3162.100	8050.000	0.000	0.000	0.000	0.000
NC	.054	.050	.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	6.400	90.000	1933.000	2120.000	3600.000	3450.000	3500.000	0.000	0.000	0.000
GR	3140.700	1456.000	3135.700	1474.000	3135.200	1483.000	3136.800	1490.000	3136.800	1496.000
GR	3134.900	1508.000	3134.700	1521.000	3134.000	1543.000	3132.900	1594.000	3132.400	1663.000
GR	3131.300	1729.000	3129.900	1770.000	3129.800	1813.000	3130.300	1833.000	3126.500	1835.000
GR	3121.100	1846.000	3116.500	1859.000	3116.200	1883.000	3116.300	1908.000	3116.500	1934.000
GR	3117.100	1959.000	3117.300	1986.000	3118.300	2010.000	3118.500	2035.000	3119.800	2060.000
GR	3121.100	2085.000	3124.600	2115.000	3129.400	2120.000	3129.000	2128.000	3127.500	2147.000
GR	3125.600	2154.000	3126.900	2173.000	3124.600	2186.000	3124.600	2198.000	3131.700	2218.000
GR	3129.700	2251.000	3129.800	2307.000	3129.500	2368.000	3128.500	2429.000	3128.400	2453.000
GR	3129.700	2483.000	3129.000	2523.000	3128.700	2561.000	3127.800	2600.000	3128.100	2626.000
GR	3125.600	2636.000	3123.200	2651.000	3122.600	2660.000	3126.500	2676.000	3130.400	2696.000
GR	3130.200	2732.000	3131.600	2775.000	3131.800	2812.000	3130.900	2844.000	3129.500	2877.000
GR	3128.500	2905.000	3130.500	2939.000	3133.300	2965.000	3134.400	2994.000	3134.400	3024.000
GR	3134.700	3033.000	3134.700	3050.000	3133.200	3056.000	3133.800	3059.000	3133.800	3060.000
GR	3133.100	3066.000	3133.700	3078.000	3132.500	3095.000	3133.000	3126.000	3134.000	3180.000
GR	3134.500	3210.000	3133.800	3249.000	3133.300	3301.000	3133.200	3341.000	3134.100	3364.000
GR	3134.100	3560.000	3135.500	3585.000	3136.500	3605.000	3136.100	3649.000	3136.100	3683.000
GP	3136.200	3717.000	3136.200	3743.000	3135.900	3765.000	3136.600	3810.000	3137.300	3875.000
GR	3137.400	3936.000	3137.900	4004.000	3138.100	4063.000	3138.700	4135.000	3139.000	4220.000
NC	.090	.058	.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	7.050	34.000	1909.000	2178.000	3500.000	3500.000	3400.000	0.000	0.000	0.000
GR	3140.700	1233.000	3127.400	1268.000	3126.700	1322.000	3126.000	1379.000	3126.200	1482.000
GR	3125.900	1536.000	3128.700	1626.000	3131.700	1691.000	3129.900	1738.000	3124.300	1777.000
GR	3127.300	1875.000	3130.600	1883.000	3130.800	1909.000	3130.200	1912.000	3124.900	1915.000
GR	3123.200	1927.000	3121.400	1959.000	3119.800	1984.000	3118.700	2009.000	3118.800	2034.000
GR	3119.200	2058.000	3119.200	2086.000	3119.400	2107.000	3120.800	2132.000	3123.200	2156.000
GR	3126.800	2169.000	3136.400	2178.000	3139.600	2193.000	3150.200	2222.000	3155.700	2252.000
GR	3172.000	2320.000	3193.100	2394.000	3211.600	2458.000	3221.600	2490.000	0.000	0.000
NH	4.000	.090	3367.000	.038	3673.000	.082	4167.000	.055	4251.000	0.000
ET	0.000	0.000	4.460	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	7.480	65.000	3367.000	3673.000	2300.000	2350.000	2300.000	0.000	0.000	0.000
GR	3142.300	2151.000	3142.500	2161.000	3123.300	2150.000	3123.300	2242.000	3129.300	2255.000
GR	3131.200	2247.000	3127.600	2321.000	3126.300	2379.000	3126.300	2431.000	3129.000	2453.000
GR	3126.000	2557.000	3127.100	2608.000	3127.800	2677.000	3130.400	2692.000	3128.200	2721.000
GR	3129.700	2765.000	3127.600	2773.000	3133.300	2787.000	3132.200	2826.000	3130.700	2882.000
GR	3130.400	2938.000	3129.000	2944.000	3131.900	2959.000	3130.600	3000.000	3129.700	3016.000
GR	3131.400	3055.000	3131.300	3107.000	3131.600	3160.000	3133.100	3193.000	3130.200	3223.000
GR	3131.200	3291.000	3130.300	3367.000	3128.800	3368.000	3126.000	3389.000	3124.000	3409.000
GR	3121.700	3435.000	3121.100	3460.000	3122.200	3485.000	3122.800	3511.000	3122.800	3535.000
GR	3123.100	3562.000	3123.500	3587.000	3123.500	3613.000	3123.000	3639.000	3121.700	3660.000
GR	3123.900	3665.000	3132.100	3673.000	3131.500	3686.000	3131.500	3694.000	3132.000	3734.000
GR	3131.000	3779.000	3132.200	3825.000	3132.000	3849.000	3130.800	3900.000	3129.800	3930.000

GR	3128.300	3961.000	3130.700	3992.000	3129.700	4007.000	3128.800	4031.000	3128.400	4050.000
GR	3130.300	4100.000	3127.200	4118.000	3126.200	4167.000	3137.900	4212.000	3145.200	4261.000
QT	6.000	31000.000	31000.000	20400.000	29000.000	31000.000	41000.000	0.000	0.000	0.000
NC	.050	.058	.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	8.000	88.000	1466.000	2293.000	2700.000	2150.000	2750.000	0.000	0.000	0.000
GR	3145.900	1228.000	3145.900	1235.000	3143.900	1241.000	3135.300	1260.000	3135.100	1285.000
GR	3136.300	1315.000	3136.900	1349.000	3136.700	1373.000	3135.100	1395.000	3134.900	1405.000
GR	3135.100	1433.000	3134.900	1451.000	3133.500	1466.000	3132.900	1469.000	3127.100	1472.000
GR	3123.500	1476.000	3123.500	1496.000	3124.600	1516.000	3127.100	1531.000	3129.400	1575.000
GR	3131.500	1614.000	3132.900	1658.000	3132.600	1706.000	3129.500	1759.000	3127.100	1793.000
GR	3126.400	1818.000	3125.700	1841.000	3125.700	1867.000	3124.000	1891.000	3123.800	1915.000
GK	3124.300	1940.000	3127.100	1961.000	3128.300	1962.000	3128.700	2010.000	3129.400	2046.000
GR	3131.300	2095.000	3131.000	2120.000	3130.900	2137.000	3129.900	2153.000	3127.900	2158.000
GR	3126.700	2163.000	3127.900	2174.000	3133.400	2183.000	3130.300	2198.000	3127.500	2217.000
GR	3127.500	2237.000	3130.700	2253.000	3130.100	2271.000	3135.900	2295.000	3135.500	2332.000
GR	3135.100	2391.000	3135.300	2456.000	3133.700	2504.000	3136.100	2541.000	3136.100	2598.000
GR	3136.700	2649.000	3136.900	2708.000	3136.100	2769.000	3135.700	2814.000	3136.100	2856.000
GR	3135.500	2911.000	3134.900	2946.000	3134.100	2953.000	3133.100	2982.000	3133.300	2997.000
GR	3135.100	3015.000	3135.500	3053.000	3135.500	3091.000	3135.300	3142.000	3134.300	3177.000
GR	3133.300	3221.000	3134.100	3254.000	3134.900	3296.000	3134.900	3322.000	3134.300	3335.000
GR	3134.700	3343.000	3133.500	3375.000	3133.500	3423.000	3135.900	3586.000	3134.500	3590.000
GR	3136.300	3607.000	3137.100	3686.000	3140.100	3897.000	3140.500	3990.000	3142.100	4212.000
GR	3142.900	4247.000	3142.300	4299.000	3145.500	4555.000	0.000	0.000	0.000	0.000
NC	.050	.075	.036	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	8.540	90.000	1258.000	1583.000	2900.000	2700.000	2850.000	0.000	0.000	0.000
GR	3144.300	1240.000	3136.100	1258.000	3128.100	1274.000	3120.300	1292.000	3119.500	1327.000
GR	3122.000	1365.000	3123.000	1390.000	3125.000	1415.000	3128.100	1446.000	3129.700	1460.000
GR	3132.100	1507.000	3131.900	1527.000	3131.900	1558.000	3130.500	1575.000	3134.300	1583.000
GR	3134.500	1596.000	3135.100	1626.000	3135.100	1647.000	3141.500	1660.000	3149.500	1673.000
GR	3150.900	1682.000	3151.100	1702.000	3150.700	1724.000	3143.300	1740.000	3131.700	1764.000
GR	3132.100	1779.000	3134.300	1795.000	3134.300	1807.000	3132.900	1823.000	3133.100	1872.000
GR	3133.100	1921.000	3134.100	1945.000	3132.300	1959.000	3133.100	1970.000	3133.700	1998.000
GR	3133.500	2017.000	3135.900	2033.000	3134.700	2058.000	3134.500	2084.000	3134.700	2105.000
GR	3134.700	2128.000	3133.700	2170.000	3134.100	2209.000	3134.300	2238.000	3134.500	2261.000
GR	3129.500	2274.000	3129.500	2292.000	3134.300	2309.000	3134.100	2330.000	3132.900	2346.000
GR	3128.900	2357.000	3128.900	2420.000	3132.900	2426.000	3136.100	2442.000	3136.500	2450.000
GR	3136.500	2474.000	3136.900	2499.000	3136.500	2537.000	3135.500	2551.000	3133.500	2573.000
GR	3133.900	2580.000	3131.300	2596.000	3133.700	2611.000	3135.500	2642.000	3135.100	2678.000
GR	3134.700	2706.000	3134.700	2732.000	3134.700	2767.000	3135.500	2799.000	3133.300	2824.000
GR	3133.300	2859.000	3132.300	2878.000	3132.100	2897.000	3133.500	2908.000	3131.700	2921.000
GR	3133.100	2936.000	3132.100	2947.000	3133.300	2969.000	3134.700	2994.000	3134.100	3016.000
GR	3134.100	3036.000	3135.100	3060.000	3135.500	3079.000	3135.300	3147.000	3135.100	3191.000
GR	3137.300	3203.000	3137.700	3214.000	3136.700	3252.000	3138.900	3264.000	3144.900	3278.000
NH	4.000	.110	1814.000	.098	2059.000	.041	2703.000	.060	3607.000	0.000

X1	8.980	74.000	2059.000	2703.000	2550.000	1800.000	2300.000	0.000	0.000	0.000
GR	3145.000	575.000	3140.000	584.000	3135.000	595.000	3136.000	667.000	3135.000	703.000
GR	3134.000	723.000	3134.000	743.000	3135.000	759.000	3135.000	772.000	3136.000	1031.000
GR	3135.000	1162.000	3137.000	1436.000	3135.000	1675.000	3138.000	1814.000	3135.000	1967.000
GR	3136.400	2025.000	3136.700	2040.000	3137.000	2059.000	3132.400	2065.000	3131.000	2066.000
GR	3129.100	2082.000	3131.400	2091.000	3132.400	2094.000	3134.600	2099.000	3131.800	2103.000
GR	3129.800	2108.000	3127.700	2116.000	3127.800	2141.000	3128.400	2165.000	3128.700	2175.000
GR	3129.900	2209.000	3130.400	2230.000	3130.700	2250.000	3130.900	2275.000	3130.600	2296.000
GR	3130.000	2312.000	3129.500	2330.000	3129.200	2344.000	3128.000	2381.000	3127.500	2407.000
GF	3127.200	2430.000	3127.800	2475.000	3129.200	2497.000	3132.400	2515.000	3134.700	2527.000

GR	3135.700	2535.000	3136.000	2545.000	3135.700	2609.000	3132.100	2637.000	3131.600	2659.000
GR	3129.800	2684.000	3132.100	2698.000	3136.000	2703.000	3135.400	2740.000	3135.000	2634.000
GR	3135.900	3093.000	3133.000	3133.000	3135.000	3168.000	3136.000	3233.000	3135.000	3268.000
GR	3130.000	3295.000	3130.000	3324.000	3135.000	3361.000	3137.000	3370.000	3138.000	3459.000
GR	3140.000	3475.000	3143.000	3506.000	3145.000	3520.000	3150.000	3528.000	3155.000	3544.000
GR	3160.000	3558.000	3165.000	3572.000	3170.000	3590.000	3175.000	3607.000	0.000	0.000
NH	4.000	.060	2584.000	.095	3257.000	.040	4053.000	.060	4092.000	0.000

X1	9.730	74.000	3257.000	4053.000	4150.000	4000.000	4000.000	0.000	0.000	0.000
GR	3147.000	1321.000	3147.000	1329.000	3145.000	1337.000	3140.000	1365.000	3141.000	1674.000
GR	3141.000	2117.000	3142.000	2584.000	3140.000	2631.000	3136.000	2700.000	3138.000	2766.000
GR	3139.000	2898.000	3136.000	2946.000	3139.000	2980.000	3140.000	2994.000	3140.000	3088.000
GR	3140.400	3165.000	3138.200	3180.000	3139.300	3186.000	3138.700	3198.000	3140.400	3212.000
GR	3139.200	3217.000	3139.200	3224.000	3139.600	3227.000	3140.100	3237.000	3140.400	3249.000
GR	3140.000	3257.000	3135.600	3263.000	3132.400	3273.000	3132.000	3303.000	3132.300	3327.000
GR	3134.200	3368.000	3133.100	3395.000	3131.800	3408.000	3127.900	3470.000	3127.600	3495.000
GR	3127.200	3512.000	3128.200	3530.000	3130.400	3549.000	3133.000	3570.000	3134.300	3592.000
GR	3134.800	3602.000	3135.300	3620.000	3135.100	3632.000	3133.500	3642.000	3134.700	3662.000
GR	3139.400	3680.000	3139.800	3694.000	3137.100	3711.000	3139.000	3726.000	3138.400	3736.000
GR	3139.400	3747.000	3138.000	3778.000	3138.300	3808.000	3136.200	3829.000	3137.900	3843.000
GR	3137.500	3864.000	3134.800	3871.000	3134.600	3877.000	3136.400	3911.000	3136.600	3920.000
GR	3136.200	3930.000	3137.400	3937.000	3136.800	3953.000	3133.700	3957.000	3130.500	3966.000
GR	3130.400	3984.000	3133.700	3991.000	3137.300	3996.000	3137.300	4030.000	3139.000	4041.000
GR	3140.000	4047.000	3145.000	4053.000	3150.000	4061.000	3175.000	4092.000	0.000	0.000
NH	4.000	.088	1991.000	.093	2506.000	.038	3001.000	.090	3135.000	0.000

X1	10.390	67.000	2506.000	3001.000	3500.000	3400.000	3450.000	0.000	0.000	0.000
GR	3200.000	0.000	3155.000	73.000	3154.000	81.000	3155.000	92.000	3156.000	103.000
GR	3156.000	180.000	3150.000	236.000	3150.000	254.000	3145.000	280.000	3141.000	289.000
GR	3144.000	308.000	3139.000	417.000	3139.000	451.000	3141.000	506.000	3140.000	599.000
GR	3140.000	649.000	3141.000	699.000	3141.000	1991.000	3140.000	2065.000	3139.000	2123.000
GR	3140.000	2173.000	3142.000	2223.000	3142.000	2307.000	3140.000	2336.000	3139.000	2353.000
GR	3140.000	2372.000	3142.000	2383.000	3144.800	2409.000	3141.800	2410.000	3140.800	2422.000
GR	3142.200	2443.000	3142.500	2458.000	3142.600	2486.000	3142.200	2506.000	3142.800	2521.000
GR	3137.700	2525.000	3136.200	2527.000	3132.000	2551.000	3132.000	2564.000	3132.500	2583.000
GR	3132.400	2606.000	3133.000	2625.000	3132.800	2648.000	3133.100	2673.000	3133.500	2694.000
GR	3134.400	2724.000	3134.600	2753.000	3134.900	2783.000	3135.000	2806.000	3135.300	2821.000
GR	3135.100	2841.000	3135.900	2861.000	3136.700	2881.000	3136.600	2902.000	3137.200	2921.000
GR	3137.700	2924.000	3138.400	2942.000	3137.400	2957.000	3135.200	2983.000	3135.300	3001.000
GR	3137.300	3005.000	3142.500	3007.000	3142.000	3039.000	3142.000	3071.000	3150.000	3085.000
GR	3175.000	3125.000	3180.000	3135.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	4.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	4.000	.090	4100.000	.100	4724.000	.041	5175.000	.090	5182.000	0.000

X1	11.160	74.000	4724.000	5175.000	5400.000	4150.000	4100.000	0.000	0.000	0.000
GR	3149.000	2790.000	3146.000	2944.000	3145.000	2957.000	3140.000	2974.000	3140.000	2993.000
GR	3146.000	3020.000	3144.000	3057.000	3145.000	3278.000	3143.300	3425.000	3142.000	3655.000
GR	3143.000	3760.000	3143.000	3800.000	3143.800	3808.000	3143.100	3822.000	3143.100	3865.000
GR	3144.100	3902.000	3143.000	3924.000	3143.400	3977.000	3143.000	4022.000	3143.600	4062.000
GR	3143.800	4140.000	3143.600	4175.000	3144.100	4234.000	3143.600	4266.000	3144.600	4305.000
GR	3142.500	4311.000	3143.000	4319.000	3140.800	4326.000	3141.700	4341.000	3140.200	4354.000
GR	3143.300	4368.000	3143.400	4407.000	3143.000	4444.000	3144.900	4453.000	3144.800	4502.000
GR	3143.100	4552.000	3144.400	4569.000	3142.800	4579.000	3141.800	4603.000	3141.500	4627.000
GR	3142.400	4640.000	3141.400	4648.000	3143.800	4659.000	3144.400	4671.000	3141.200	4685.000
GR	3141.600	4702.000	3142.900	4713.000	3150.200	4724.000	3149.700	4736.000	3146.400	4742.000
GR	3139.900	4769.000	3138.200	4792.000	3137.200	4812.000	3136.800	4820.000	3136.200	4837.000
GR	3135.800	4859.000	3133.300	4875.000	3132.300	4892.000	3134.900	4919.000	3136.200	4937.000
GR	3136.200	4954.000	3137.000	4981.000	3138.200	5010.000	3138.600	5030.000	3138.800	5052.000

GR	3138.900	5072.000	3138.200	5092.000	3138.400	5112.000	3137.800	5127.000	3139.900	5150.000
GR	3143.100	5162.000	3151.000	5174.000	3154.600	5175.000	3154.000	5182.000	0.000	0.000
NC	.075	.093	.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	11.950	78.000	4879.000	5158.000	2900.000	3100.000	4150.000	0.000	0.000	0.000
GR	3204.000	0.000	3200.000	8.000	3196.000	20.000	3198.000	27.000	3195.000	33.000
GR	3190.000	51.000	3185.000	76.000	3182.000	139.000	3182.000	559.000	3185.000	571.000
GR	3187.000	590.000	3187.000	651.000	3185.000	664.000	3181.000	700.000	3180.000	926.000
GR	3178.000	1249.000	3177.000	1574.000	3176.000	1631.000	3179.000	1648.000	3179.000	1663.000
GR	3179.000	1673.000	3176.000	1712.000	3175.000	1855.000	3175.000	1974.000	3174.000	2074.000
GP	3171.000	2343.000	3170.000	2514.000	3169.000	2583.000	3167.000	2850.000	3166.000	3214.000
GR	3165.000	3434.000	3165.000	3762.000	3163.000	4159.000	3165.000	4350.000	3164.000	4542.000
GR	3163.000	4619.000	3167.200	4835.000	3161.000	4836.000	3159.200	4845.000	3155.600	4855.000
GR	3149.800	4859.000	3149.200	4879.000	3145.900	4886.000	3143.000	4889.000	3141.200	4891.000
GR	3138.200	4901.000	3137.400	4905.000	3133.900	4927.000	3133.700	4936.000	3133.900	4956.000
GR	3134.900	4981.000	3135.600	5006.000	3136.600	5032.000	3137.700	5059.000	3138.900	5088.000
GR	3140.000	5119.000	3140.000	5142.000	3140.700	5151.000	3142.800	5154.000	3147.600	5158.000
GR	3147.200	5175.000	3146.000	5347.000	3148.000	5549.000	3146.000	5633.000	3147.000	5890.000
GR	3146.000	6018.000	3145.000	6042.000	3143.000	6051.000	3143.000	6166.000	3145.000	6183.000
GR	3146.000	6238.000	3130.000	6263.000	3155.000	6284.000	3160.000	6321.000	3165.000	6355.000
GP	3170.000	6369.000	3175.000	6376.000	3188.000	6403.000	0.000	0.000	0.000	0.000
NH	4.000	.091	4426.000	.097	4895.000	.042	5419.000	.099	6416.000	0.000

X1	12.570	93.000	4895.000	5419.000	1500.000	3100.000	3250.000	0.000	0.000	0.000
GR	3187.000	0.000	3187.000	48.000	3185.000	60.000	3181.000	135.000	3180.000	341.000
GR	3177.000	624.000	3175.000	910.000	3170.000	1045.000	3170.000	1216.000	3168.000	1365.000
GR	3168.000	1384.000	3166.000	1399.000	3168.000	1468.000	3168.000	1940.000	3165.000	2117.000
GR	3163.000	2298.000	3162.000	2497.000	3162.000	700.000	3161.000	2877.000	3160.000	2997.000
GR	3161.000	3012.000	3161.000	3021.000	3160.000	3043.000	3158.000	3220.000	3158.000	3408.000
GR	3157.000	3571.000	3158.000	3788.000	3159.000	4024.000	3158.000	4071.000	3155.000	4117.000
GR	3152.000	4139.000	3151.000	4283.000	3152.000	4426.000	3150.000	4524.000	3148.000	4570.000
GR	3150.000	4650.000	3149.000	4776.000	3148.700	4895.000	3148.600	4902.000	3144.400	4906.000
GR	3141.800	4910.000	3140.200	4932.000	3140.900	4945.000	3140.700	4960.000	3140.900	4975.000
GR	3144.500	4977.000	3146.900	4978.000	3147.900	4982.000	3148.400	4997.000	3148.400	5013.000
GR	3147.100	5028.000	3144.900	5029.000	3141.900	5031.000	3141.700	5032.000	3142.600	5051.000
GR	3143.900	5061.000	3145.500	5077.000	3145.000	5097.000	3145.400	5114.000	3145.300	5128.000
GR	3144.100	5134.000	3144.400	5147.000	3144.000	5155.000	3143.100	5170.000	3142.100	5188.000
GR	3141.500	5210.000	3141.300	5237.000	3141.500	5265.000	3141.500	5290.000	3142.300	5322.000
GR	3143.700	5340.000	3143.900	5355.000	3144.200	5376.000	3143.100	5382.000	3141.200	5400.000
GR	3142.700	5411.000	3145.400	5414.000	3146.600	5416.000	3149.700	5419.000	3149.200	5436.000
GR	3149.300	5442.000	3150.000	5531.000	3149.000	5588.000	3149.000	5734.000	3148.000	6092.000
GR	3149.000	6340.000	3150.000	6358.000	3155.000	6369.000	3150.000	6380.000	3165.000	6388.000
GR	3170.000	6398.000	3175.000	6404.000	3181.000	6416.000	0.000	0.000	0.000	0.000
NH	4.000	.091	3950.000	.097	5109.000	.043	5494.000	.099	5534.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	13.350	65.000	5109.000	5494.000	4200.000	4200.000	4160.000	0.000	0.000	0.000
GR	3158.000	2198.000	3157.000	2720.000	3158.000	2898.000	3158.000	3070.000	3155.000	3128.000
GR	3155.000	3397.000	3154.000	3742.000	3153.000	3950.000	3149.500	4277.000	3151.500	4316.000
GR	3151.900	4346.000	3151.600	4377.000	3151.200	4400.000	3151.500	4422.000	3151.900	4438.000
GR	3150.500	4444.000	3150.500	4456.000	3150.400	4477.000	3150.000	4492.000	3150.500	4503.000
GR	3150.500	4656.000	3150.500	4717.000	3151.600	4729.000	3150.500	4755.000	3151.700	4762.000
GR	3151.300	4780.000	3150.500	4877.000	3150.700	4819.000	3150.500	4833.000	3150.800	4847.000
GR	3150.500	4877.000	3150.500	4896.000	3150.400	4924.000	3150.900	4950.000	3151.100	4996.000
GR	3151.800	5037.000	3152.300	5077.000	3152.200	5109.000	3148.900	5112.000	3147.700	5115.000
GR	3145.400	5122.000	3142.600	5144.000	3141.800	5170.000	3142.100	5182.000	3142.200	5191.000
GR	3143.900	5217.000	3144.500	5240.000	3144.300	5276.000	3144.000	5306.000	3143.300	5329.000
GR	3144.000	5362.000	3144.300	5400.000	3145.300	5422.000	3147.600	5428.000	3148.600	5442.000

GR	3147.700	5461.000	3148.600	5471.000	3149.800	5477.000	3151.300	5486.000	3165.000	5494.000
CR	3170.000	5502.000	3175.000	5507.000	3180.000	5517.000	3185.000	5526.000	3193.000	5534.000
QT	6.000	29100.000	29100.000	19220.000	27200.000	29100.000	38500.000	0.000	0.000	0.000
NH	4.000	.086	6545.000	.094	7638.000	.046	7853.000	.090	7864.000	0.000

X1	13.950	69.000	7038.000	7853.000	3600.000	3000.000	3130.000	0.000	0.000	0.000
GR	3159.000	2370.000	3158.000	2563.000	3158.000	2913.000	3155.000	3052.000	3157.000	3173.000
GR	3157.000	3455.000	3158.000	3569.000	3158.000	3687.000	3156.500	3918.000	3156.500	3965.000
GR	3157.000	4031.000	3157.000	4388.000	3156.000	4656.000	3157.000	4872.000	3157.000	5084.000
GR	3156.000	5102.000	3156.000	5226.000	3157.000	5277.000	3155.000	5358.000	3157.000	5426.000
GR	3155.000	5501.000	3157.000	5706.000	3156.000	5880.000	3158.000	5995.000	3157.000	6149.000
GR	3158.000	6235.000	3155.000	6269.000	3154.000	6294.000	3155.000	6322.000	3157.000	6405.000
GR	3155.000	6473.000	3157.000	6545.000	3155.000	6554.000	3152.000	6569.000	3152.000	6584.000
GR	3154.000	6706.000	3153.000	6795.000	3155.000	6857.000	3157.000	6900.000	3157.000	7109.000
GR	3155.000	7197.000	3154.000	7252.000	3155.000	7356.000	3155.000	7444.000	3154.000	7478.000
GR	3155.000	7553.000	3155.000	7566.000	3155.300	7629.000	3149.900	7636.000	3146.900	7638.000
GR	3145.800	7640.000	3142.500	7651.000	3142.800	7660.000	3140.000	7662.000	3141.900	7681.000
GR	3143.000	7716.000	3144.000	7737.000	3143.700	7765.000	3143.300	7791.000	3143.400	7805.000
GR	3145.900	7825.000	3147.700	7829.000	3149.700	7835.000	3150.700	7839.000	3151.800	7841.000
GR	3155.000	7846.000	3160.000	7853.000	3165.000	7860.000	3170.000	7864.000	0.000	0.000
NC	.090	.065	.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	14.730	71.000	10046.000	10429.000	3550.000	4200.000	4150.000	0.000	0.000	0.000
GR	3158.700	6750.000	3153.800	6781.000	3157.000	6791.000	3155.700	6802.000	3153.800	6826.000
CR	3153.800	6872.000	3159.200	6892.000	3158.200	6913.000	3155.400	6936.000	3158.700	6966.000
GR	3158.800	7004.000	3158.100	7051.000	3158.100	7093.000	3156.400	7121.000	3156.400	7133.000
GR	3157.900	7160.000	3157.900	7201.000	3158.900	7264.000	3156.500	7291.000	3156.800	7313.000
GR	3158.500	7354.000	3158.300	7479.000	3156.200	7526.000	3154.000	7564.000	3154.000	7616.000
GR	3159.200	7597.000	3158.400	7870.000	3159.400	7987.000	3158.800	8010.000	3159.100	8140.000
GR	3159.700	8196.000	3158.700	8580.000	3152.800	8597.000	3156.800	8631.000	3154.200	8666.000
GR	3147.300	8786.000	3157.100	8877.000	3155.100	8927.000	3152.100	8964.000	3152.100	8976.000
GR	3156.900	8997.000	3157.100	9053.000	3157.500	9180.000	3158.100	9212.000	3156.600	9370.000
GR	3157.800	9460.000	3159.300	9663.000	3158.900	9846.000	3159.000	9971.000	3159.100	10004.000
GR	3160.000	10046.000	3151.600	10064.000	3149.800	10089.000	3149.600	10114.000	3149.200	10139.000
GR	3148.500	10164.000	3148.300	10189.000	3149.100	10214.000	3150.000	10239.000	3150.000	10264.000
GR	3151.000	10289.000	3151.600	10308.000	3153.900	10333.000	3153.100	10379.000	3155.800	10396.000
GR	3160.400	10429.000	3160.400	10698.000	3161.700	10780.000	3160.700	11126.000	3165.600	11142.000
GR	3172.600	11186.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	.090	.060	.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	514.930	90.000	11471.000	11700.000	1100.000	1000.000	1025.000	0.000	0.000	0.000
GR	3162.200	6972.000	3160.600	7054.000	3159.400	7099.000	3160.200	7152.000	3160.000	7285.000
GR	3158.300	7367.000	3164.300	7378.000	3160.200	7406.000	3159.600	7423.000	3159.000	7434.000
GR	3157.000	7447.000	3157.000	7471.000	3162.900	7488.000	3163.100	7537.000	3162.700	7648.000
GR	3159.400	7877.000	3160.500	7927.000	3159.900	8091.000	3160.000	8163.000	3158.900	8187.000
GR	3157.700	8212.000	3155.300	8243.000	3155.300	8259.000	3158.000	8278.000	3160.700	8293.000
GR	3160.100	8352.000	3165.700	8373.000	3159.800	8407.000	3160.000	8470.000	3160.500	8540.000
GR	3160.900	8604.000	3159.900	8658.000	3159.300	8680.000	3159.700	8725.000	3159.000	8752.000
GR	3156.900	8800.000	3153.800	8864.000	3153.800	8870.000	3155.800	8897.000	3155.600	8932.000
GR	3160.800	8947.000	3161.500	8964.000	3160.800	9047.000	3159.700	9137.000	3159.200	9207.000
GR	3154.800	9272.000	3154.800	9282.000	3154.800	9293.000	3159.800	9300.000	3159.800	9317.000
GR	3159.100	9368.000	3159.400	9464.000	3155.600	9531.000	3157.700	9500.000	3157.600	9680.000
GR	3158.700	9771.000	3159.400	9869.000	3159.400	9959.000	3159.300	10022.000	3159.600	10111.000
GR	3159.100	10179.000	3160.300	10211.000	3160.600	10284.000	3160.700	10382.000	3160.900	10400.000
GR	3161.100	10660.000	3159.700	10755.000	3160.900	11000.000	3159.500	11043.000	3157.000	11105.000
CR	3157.900	11120.000	3158.000	11273.000	3151.400	11363.000	3164.100	11416.000	3168.700	11471.000
GR	3161.800	11472.000	3149.200	11496.000	3149.000	11511.000	3149.400	11541.000	3149.500	11561.000
GR	3149.600	11581.000	3148.900	11601.000	3146.000	11621.000	3146.800	11646.000	3148.900	11571.000

GR	3151.600	11586.000	3169.000	11709.000	3167.800	11731.000	3168.300	11768.000	3170.000	11821.000
X1	814.930	0.000	0.000	0.000	25.000	25.000	25.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	3160.900	3161.100	0.000
NC	.090	.065	.038	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	15.020	92.000	11658.000	11968.000	450.000	450.000	450.000	0.000	0.000	0.000
GR	3162.800	7356.000	3162.800	7479.000	3162.800	7582.000	3162.800	7706.000	3162.300	7748.000
GR	3162.500	7821.000	3162.000	7983.000	3161.600	8026.000	3158.400	8094.000	3157.400	8130.000
GR	3157.400	8165.000	3159.200	8203.000	3160.200	8229.000	3160.800	8271.000	3160.200	8325.000
GR	3160.600	8366.000	3159.400	8413.000	3159.800	8467.000	3158.600	8501.000	3160.600	8551.000
GR	3160.500	8583.000	3159.500	8622.000	3156.300	8665.000	3155.000	8694.000	3155.000	8714.000
GR	3157.200	8731.000	3161.500	8748.000	3161.400	8784.000	3160.300	8853.000	3160.200	8889.000
GR	3159.000	8906.000	3157.300	8919.000	3159.600	8940.000	3160.000	8965.000	3158.100	8992.000
GR	3157.700	9033.000	3160.900	9062.000	3161.200	9103.000	3160.200	9151.000	3160.900	9214.000
GR	3160.800	9257.000	3160.800	9282.000	3160.400	9295.000	3160.400	9306.000	3160.400	9325.000
GR	3159.500	9406.000	3157.900	9502.000	3159.500	9604.000	3160.600	9689.000	3160.500	9778.000
GR	3162.400	10252.000	3162.000	10310.000	3161.600	10402.000	3161.900	10500.000	3161.100	10537.000
GR	3163.100	10576.000	3162.500	10656.000	3163.500	10737.000	3162.600	10828.000	3162.600	10897.000
GR	3155.900	10972.000	3155.800	11036.000	3154.800	11100.000	3153.600	11139.000	3158.400	11198.000
GR	3161.200	11264.000	3160.700	11321.000	3161.300	11444.000	3161.500	11531.000	3161.500	11570.000
GR	3161.300	11646.000	3160.400	11658.000	3159.200	11683.000	3153.600	11704.000	3151.200	11729.000
GR	3153.000	11734.000	3152.100	11754.000	3151.000	11779.000	3151.300	11804.000	3151.900	11824.000
GR	3152.600	11844.000	3152.700	11869.000	3151.800	11875.000	3146.400	11915.000	3153.600	11935.000
GR	3159.000	11968.000	3162.500	12003.000	3171.200	12042.000	3180.000	12065.000	3186.200	12087.000
GR	3192.000	12111.000	3196.200	12135.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	5.000	.099	9484.000	.365	10264.000	.039	10713.000	.055	11550.000	.088
NH	12582.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	15.590	89.000	10264.000	11550.000	2250.000	3000.000	3000.000	0.000	0.000	0.000
GR	3165.000	6474.000	3163.400	6630.000	3161.100	7181.000	3162.600	7279.000	3161.600	7559.000
GR	3160.800	7639.000	3161.300	7920.000	3161.900	7980.000	3160.800	8028.000	3160.900	8136.000
GR	3159.300	8225.000	3161.100	8254.000	3159.600	8288.000	3160.900	8362.000	3160.600	8400.000
GR	3157.700	8770.000	3157.700	8795.000	3160.800	8826.000	3161.900	8880.000	3161.500	8940.000
GR	3162.300	9028.000	3162.600	9196.000	3161.100	9250.000	3164.200	9384.000	3162.100	9484.000
GR	3156.600	9508.000	3156.600	9518.000	3161.700	9531.000	3158.100	9598.000	3158.500	9641.000
GR	3162.500	9664.000	3163.600	9796.000	3163.100	10059.000	3163.700	10179.000	3161.500	10230.000
GR	3161.900	10284.000	3158.800	10275.000	3148.900	10308.000	3150.700	10330.000	3154.000	10346.000
GR	3156.300	10360.000	3156.600	10385.000	3156.600	10410.000	3156.600	10435.000	3156.900	10460.000
GR	3156.800	10483.000	3161.700	10619.000	3162.500	10563.000	3160.900	10592.000	3150.000	10621.000
GR	3158.800	10641.000	3158.800	10660.000	3160.400	10672.000	3161.600	10695.000	3161.600	10702.000
GR	3163.400	10713.000	3162.000	10809.000	3160.100	10854.000	3163.300	10924.000	3160.700	10949.000
GR	3157.600	11026.000	3157.200	11049.000	3158.700	11059.000	3159.700	11131.000	3160.300	11141.000
GR	3160.600	11208.000	3159.500	11229.000	3159.500	11240.000	3163.200	11250.000	3162.400	11343.000
GR	3161.400	11411.000	3159.500	11429.000	3157.600	11470.000	3161.000	11550.000	3162.500	11584.000
GR	3160.700	11657.000	3160.100	11688.000	3162.300	11712.000	3163.300	11770.000	3161.200	11893.000
GR	3160.200	12016.000	3160.800	12041.000	3160.800	12183.000	3159.500	12230.000	3159.700	12278.000
GR	3157.400	12353.000	3156.200	12407.000	3157.000	12479.000	3223.000	12582.000	0.000	0.000
NH	4.000	.060	8847.000	.070	9487.000	.042	10375.000	.073	11852.000	0.000

X1	15.970	92.000	9487.000	10375.000	2100.000	1950.000	2050.000	0.000	0.000	0.000
GR	3167.200	5892.000	3162.600	6021.000	3165.900	6163.000	3162.300	6735.000	3162.500	6743.000
GR	3166.400	6781.000	3166.300	7078.000	3163.400	7307.000	3165.700	7357.000	3164.600	7605.000
GR	3162.900	7663.000	3164.900	7692.000	3164.300	7760.000	3162.500	7784.000	3164.300	7831.000
GR	3164.100	7971.000	3162.700	8015.000	3162.700	8057.000	3164.500	8114.000	3163.900	8223.000
GR	3161.500	8640.000	3165.900	8726.000	3164.900	8770.000	3165.700	8847.000	3159.400	8869.000
GR	3159.500	8891.000	3164.200	8938.000	3164.200	8994.000	3160.800	9009.000	3160.800	9042.000

XI	18.110	92.000	11154.000	11418.000	2509.000	2650.000	2550.000	0.000	0.000	0.000
GR	3175.900	6422.000	3173.500	6586.000	3173.400	6718.000	3174.300	7044.000	3175.200	7157.000
GR	3174.300	7328.000	3173.900	7485.000	3174.100	7651.000	3174.000	7947.000	3175.000	8006.000
GR	3175.300	8085.000	3175.100	8132.000	3173.600	8193.000	3174.600	8254.000	3176.100	8300.000
GR	3175.600	8334.000	3175.800	8403.000	3175.900	8420.000	3174.400	8432.000	3175.700	8463.000
GR	3174.600	8500.000	3174.300	8577.000	3175.200	8657.000	3175.600	8708.000	3175.400	8791.000
GP	3175.800	8883.000	3175.200	8936.000	3176.500	8962.000	3176.400	9023.000	3175.100	9013.000
GR	3177.600	9343.000	3172.000	9374.000	3173.000	9087.000	3173.800	9100.000	3176.700	9116.000
GP	3177.000	9149.000	3177.500	9181.000	3176.300	9251.000	3176.800	9344.000	3178.400	9376.000
GR	3178.700	9423.000	3178.500	9461.000	3178.900	9495.000	3177.900	9563.000	3178.700	9629.000
GR	3178.500	9670.000	3176.200	9703.000	3178.800	9738.000	3178.800	9790.000	3178.200	9827.000
GR	3176.900	9853.000	3178.100	9885.000	3177.900	9945.000	3177.700	9985.000	3175.000	10012.000
GR	3175.000	10020.000	3177.900	10032.000	3179.200	10084.000	3178.600	10124.000	3174.400	10160.000
GR	3177.400	10192.000	3177.400	10246.000	3178.700	10327.000	3175.400	10381.000	3177.800	10429.000
GR	3179.400	10508.000	3177.900	10561.000	3177.800	10599.000	3174.700	10631.000	3176.900	10684.000
GR	3176.800	10725.000	3177.800	10783.000	3178.500	10859.000	3177.900	10898.000	3175.600	10927.000
GR	3176.300	10976.000	3176.100	11042.000	3173.300	11076.000	3175.300	11111.000	3175.300	11154.000
GR	3171.000	11174.000	3169.900	11212.000	3169.600	11237.000	3168.800	11262.000	3168.800	11282.000
GR	3168.600	11302.000	3168.400	11322.000	3167.200	11347.000	3162.300	11372.000	3161.200	11390.000
GR	3169.900	11418.000	3200.000	11448.000	0.000	0.000	0.000	0.000	0.000	0.000
NH	4.000	.075	2542.000	.040	2872.000	.075	4188.000	.085	4285.000	0.000
ET	0.000	0.000	9.100	0.000	0.000	0.000	0.000	0.000	1375.000	3970.000

XI	18.970	85.000	2542.000	2872.000	3200.000	3000.000	4525.000	0.000	0.000	0.000
GR	3184.200	700.000	3183.100	750.000	3182.200	848.000	3182.300	992.000	3181.600	1025.000
GR	3181.600	1050.000	3180.600	1065.000	3181.500	1078.000	3182.900	1131.000	3182.100	1182.000
GR	3182.600	1258.000	3182.800	1316.000	3182.800	1352.000	3179.300	1390.000	3180.300	1419.000
GR	3181.200	1448.000	3180.600	1479.000	3180.600	1511.000	3181.200	1581.000	3181.100	1640.000
GR	3180.600	1721.000	3180.500	1819.000	3181.400	1864.000	3181.900	1944.000	3182.600	1989.000
GR	3182.000	2059.000	3182.500	2120.000	3182.700	2160.000	3183.100	2185.000	3181.800	2210.000
GR	3182.000	2250.000	3181.700	2290.000	3182.200	2330.000	3182.400	2386.000	3182.600	2412.000
GR	3183.100	2460.000	3181.800	2503.000	3181.900	2526.000	3182.600	2542.000	3173.800	2564.000
GR	3169.600	2594.000	3188.000	2622.000	3169.200	2649.000	3171.600	2683.000	3173.100	2707.000
GR	3173.800	2733.000	3176.100	2790.000	3179.300	2838.000	3181.800	2872.000	3180.900	2933.000
GR	3179.300	2951.000	3179.100	2988.000	3178.300	3010.000	3180.400	3024.000	3180.100	3083.000
GR	3180.000	3143.000	3180.700	3201.000	3181.200	3231.000	3178.800	3254.000	3178.800	3285.000
GR	3179.500	3300.000	3177.800	3375.000	3176.800	3433.000	3176.500	3497.000	3176.900	3558.000
GR	3176.300	3615.000	3176.900	3634.000	3175.800	3686.000	3174.000	3709.000	3174.000	3763.000
GR	3174.300	3817.000	3173.500	3859.000	3174.000	3901.000	3176.900	3915.000	3176.700	3933.000
GR	3176.900	3946.000	3175.500	3957.000	3175.700	3983.000	3178.400	4041.000	3180.400	4073.000
GR	3179.700	4115.000	3176.300	4153.000	3177.800	4188.000	3197.000	4229.000	3230.200	4285.000
NH	5.000	.055	3081.000	.055	4023.000	.041	4339.000	.060	4868.000	.070
NH	5148.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	5.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000

XI	19.550	92.000	4023.000	4339.000	1900.000	2200.000	3150.000	0.000	0.000	0.000
GR	3186.000	0.000	3184.600	353.000	3184.500	536.000	3185.000	721.000	3185.800	786.000
GR	3184.600	976.000	3183.000	1052.000	3178.500	1045.000	3178.500	1090.000	3173.100	1098.000
GR	3180.800	1131.000	3181.500	1271.000	3182.400	1305.000	3182.400	1328.000	3182.700	1420.000
GR	3182.800	1508.000	3183.700	1562.000	3184.300	1664.000	3183.100	1784.000	3181.400	1824.000
GR	3184.400	1901.000	3183.500	1954.000	3182.900	2041.000	3184.400	2072.000	3183.700	2140.000
GR	3183.600	2176.000	3182.700	2186.000	3184.500	2194.000	3182.900	2224.000	3182.900	2337.000
GR	3184.000	2484.000	3181.200	2553.000	3183.400	2589.000	3182.300	2617.000	3182.900	2654.000
GR	3183.000	2764.000	3181.800	2840.000	3184.600	2956.000	3183.300	3081.000	3180.100	3205.000
GR	3179.600	3280.000	3182.500	3321.000	3182.200	3375.000	3180.100	3411.000	3180.300	3461.000
GR	3181.700	3496.000	3182.500	3547.000	3182.800	3608.000	3183.200	3683.000	3182.000	3769.000
GR	3184.000	3839.000	3183.400	3873.000	3181.900	3902.000	3184.200	3924.000	3184.000	3961.000

 HEC2 RELEASE DATED NOV 76 UPDATED AUG1977
 ERROR CORR - 01,02
 MODIFICATION - 50,51,52,53

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

BITTERROOT RIVER

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10K*S	VCH	AREA	DLK
48.930	0.00	0.00	0.00	3089.10	47000.00	3105.37	0.00	3105.73	7.09	1.50	10223.40	17552.62
48.930	0.00	0.00	0.00	3089.10	47000.00	3105.87	0.00				10019.00	17658.86
.5	2750.00	0.00	0.00	3090.90	31800.00	3107.05	0.00				4245.61	6150.29
.520	2750.00	0.00	0.00	3090.90	31800.00	3107.50	0.00	3108.78	23.95	9.11	3491.03	6497.97
500.720	1050.00	0.00	0.00	3086.70	31800.00	3109.40	0.00	3110.39	14.66	7.97	3987.75	8335.25
500.720	1050.00	0.00	0.00	3086.70	31800.00	3109.74	0.00	3110.67	13.50	7.75	4101.28	8654.77
800.720	30.00	3114.20	3111.50	3086.70	31800.00	3109.45	0.00	3110.43	14.48	7.94	4304.28	8355.88
800.720	30.00	3114.20	3111.50	3086.70	31800.00	3109.95	0.00	3110.85	12.83	7.62	4175.62	8879.55
.760	200.00	0.00	0.00	3091.90	31800.00	3110.00	0.00	3110.70	8.23	5.32	6161.55	11081.71
.760	200.00	0.00	0.00	3091.90	31800.00	3110.68	0.00	3111.09	7.42	5.16	6167.45	11675.72
1.150	2025.00	0.00	0.00	3098.90	31800.00	3111.86	0.00	3112.17	7.34	5.38	10567.01	11739.48
1.150	2025.00	0.00	0.00	3098.90	31800.00	3112.18	0.00	3112.55	7.89	5.38	9004.59	11317.61
1.890	3925.00	0.00	0.00	3099.40	31800.00	3114.96	0.00	3115.28	8.80	5.17	10496.95	10719.78
1.890	3925.00	0.00	0.00	3099.40	31800.00	3115.44	0.00	3115.61	8.99	5.34	8390.58	10606.19
2.750	4550.00	0.00	0.00	3101.40	31800.00	3119.12	0.00	3119.65	10.72	6.51	8560.47	9713.27
2.750	4550.00	0.00	0.00	3101.40	31600.00	3119.72	0.00	3120.20	10.56	6.67	7237.74	9713.27
3.360	3225.00	0.00	0.00	3105.00	31800.00	3121.70	0.00	3121.68	4.79	4.22	13287.78	14522.55
3.360	3225.00	0.00	0.00	3105.00	31800.00	3122.22	0.00	3122.40	4.58	4.25	12763.46	14864.58
4.070	3720.00	0.00	0.00	3110.00	31800.00	3123.06	0.00	3123.20	4.02	3.01	16232.79	15869.99
4.070	3720.00	0.00	0.00	3110.00	31000.00	3123.54	0.00	3123.69	3.84	4.04	14544.09	16117.09
4.790	3800.00	0.00	0.00	3111.50	31800.00	3125.16	0.00	3126.19	16.59	8.35	4462.53	7807.20
4.790	3800.00	0.00	0.00	3111.50	31800.00	3125.57	0.00	3126.68	16.72	8.47	3754.21	7776.25
505.020	1225.00	0.00	0.00	3099.00	31800.00	3126.94	0.00	3127.64	6.48	6.70	4749.53	10920.10
505.020	1225.00	0.00	0.00	3099.00	31800.00	3127.41	0.00	3128.07	7.60	6.49	4899.64	11464.14
805.020	75.00	3134.50	3133.00	3099.00	31800.00	3126.97	0.00	3127.66	6.43	6.64	4757.85	10950.05
805.020	75.00	3134.50	3133.00	3099.00	31800.00	3127.47	0.00	3128.12	7.60	6.47	4911.42	11023.54

NOT A MATCH WITH FW
PRINTOUT AND FWDT!

NOT A MATCH WITH FW
PRINTOUT AND FWDT!

SECND	XLCH	FLTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10K*S	VCH	AREA	.01K
505.040	50.00	0.00	0.00	3104.50	31800.00	3126.98	0.00	3127.75	12.04	7.02	4526.94	9166.13
505.040	50.00	0.00	0.00	3104.50	31800.00	3127.49	0.00	3128.19	10.69	6.75	4708.01	9725.53
805.040	25.00	3141.40	3137.00	3104.50	31800.00	3127.04	0.00	3127.80	11.89	7.00	4545.76	9223.65
805.040	25.00	3141.40	3137.00	3104.50	31800.00	3127.54	0.00	3128.24	10.57	6.73	4726.98	9782.99
5.080	150.00	0.00	0.00	3111.40	31800.00	3127.51	0.00	3127.98	10.20	5.99	7357.78	9954.81
5.080	150.00	0.00	0.00	3111.40	31800.00	3127.86	0.00	3128.41	10.77	6.27	6470.57	9688.86
5.740	3500.00	0.00	0.00	3114.40	31800.00	3129.38	0.00	3129.48	2.37	3.53	20416.69	20643.51
5.740	3500.00	0.00	0.00	3114.40	31800.00	3129.87	0.00	3129.98	2.38	3.62	19260.09	20612.86
6.400	3500.00	0.00	0.00	3116.20	31800.00	3130.71	0.00	3131.62	16.24	8.14	4971.09	7892.23
6.400	3500.00	0.00	0.00	3116.20	31800.00	3131.15	0.00	3132.19	16.59	8.41	4253.85	7807.67
7.050	3400.00	0.00	0.00	3118.70	31800.00	3134.76	0.00	3135.26	7.37	6.49	8326.02	1172.18
7.050	3400.00	0.00	0.00	3118.70	31800.00	3135.29	0.00	3135.84	7.30	6.62	7593.21	11766.53
7.480	2300.00	0.00	0.00	3121.10	31800.00	3136.34	0.00	3136.49	3.85	4.20	15836.65	16211.48
7.480	2300.00	0.00	0.00	3121.10	31800.00	3136.68	0.00	3137.04	3.67	4.22	15622.59	16597.09
8.000	2750.00	0.00	0.00	3123.50	31000.00	3137.48	0.00	3137.68	5.02	3.78	10731.24	13833.21
8.000	2750.00	0.00	0.00	3123.50	31000.00	3137.99	0.00	3138.22	5.03	3.91	8770.13	13815.68
8.540	2850.00	0.00	0.00	3119.50	31000.00	3138.92	0.00	3139.18	5.43	5.04	12171.16	13305.65
8.540	2850.00	0.00	0.00	3119.50	31000.00	3139.44	0.00	3139.73	5.44	5.15	10584.96	13292.04
8.980	2300.00	0.00	0.00	3127.20	31000.00	3140.11	0.00	3140.23	4.18	3.30	16205.51	15166.13
8.980	2300.00	0.00	0.00	3127.20	31000.00	3140.64	0.00	3140.78	4.10	3.39	14475.89	15311.80
9.730	4000.00	0.00	0.00	3127.20	31000.00	3142.37	0.00	3142.62	8.50	4.28	10224.86	10630.58
9.730	4000.00	0.00	0.00	3127.20	31000.00	3142.86	0.00	3143.16	8.54	4.46	7782.91	10605.30
10.390	3450.00	0.00	0.00	3132.00	31000.00	3144.87	0.00	3145.09	6.08	4.42	13888.91	12572.07
10.390	3450.00	0.00	0.00	3132.00	31000.00	3145.40	0.00	3145.65	6.14	4.54	11972.92	12514.68
11.160	4100.00	0.00	0.00	3132.30	31000.00	3147.70	0.00	3147.99	9.09	5.03	11762.77	10281.99
11.160	4100.00	0.00	0.00	3132.30	31000.00	3148.22	0.00	3148.52	8.69	5.07	10563.43	10515.43
11.950	4150.00	0.00	0.00	3133.70	31000.00	3151.06	0.00	3151.52	6.89	6.20	9162.55	1094.18
11.950	4150.00	0.00	0.00	3133.70	31000.00	3151.52	0.00	3152.01	6.83	6.28	8565.99	10432.13
12.570	3250.00	0.00	0.00	3140.20	31000.00	3153.73	0.00	3153.94	6.62	4.27	12726.28	12050.52
12.570	3250.00	0.00	0.00	3140.20	31000.00	3154.18	0.00	3154.42	6.50	4.35	11101.18	12160.22
13.350	4150.00	0.00	0.00	3141.80	31000.00	3156.58	0.00	3156.83	7.10	4.74	12808.70	11637.68
13.350	4150.00	0.00	0.00	3141.80	31000.00	3157.03	0.00	3157.31	7.23	4.90	10513.58	11528.31
13.950	3130.00	0.00	0.00	3140.00	29100.00	3159.00	0.00	3159.25	7.50	5.24	16345.12	10592.65
13.950	3130.00	0.00	0.00	3140.00	29100.00	3159.47	0.00	3159.75	7.64	5.38	13459.26	10525.36
14.730	4150.00	0.00	0.00	3148.30	29100.00	3161.56	0.00	3161.73	5.41	4.31	16686.94	12006.23
14.730	4150.00	0.00	0.00	3148.30	29100.00	3162.07	0.00	3162.26	5.41	4.44	14666.07	12509.07
514.930	1025.00	0.00	0.00	3146.80	29100.00	3162.18	0.00	3162.53	6.80	6.08	13760.31	9808.99
514.930	1025.00	0.00	0.00	3146.80	29100.00	3162.68	0.00	3163.07	6.76	6.20	11816.57	9829.24

SECND	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10K**	VCH	AREA	.01K
814.930	25.00	0.00	0.00	3146.80	29100.00	3162.21	0.00	3162.55	6.71	6.05	13835.95	9859.05
814.930	25.00	0.00	0.00	3146.80	29100.00	3162.71	0.00	3163.09	6.74	6.20	11820.74	9942.43
15.020	450.00	0.00	0.00	3146.40	29100.00	3162.66	0.00	3162.99	10.71	5.81	12087.01	8890.40
15.020	450.00	0.00	0.00	3146.40	29100.00	3163.16	0.00	3163.53	10.91	6.00	10715.21	8611.34
15.590	3000.00	0.00	0.00	3148.90	29100.00	3164.61	0.00	3164.85	4.61	2.23	22210.66	13557.77
15.590	3000.00	0.00	0.00	3148.90	29100.00	3165.34	0.00	3165.40	4.50	2.32	19688.53	13714.11
15.970	2050.00	0.00	0.00	3155.10	29100.00	3166.36	0.00	3166.50	15.98	3.86	13465.12	7279.22
15.970	2050.00	0.00	0.00	3155.10	29100.00	3166.86	0.00	3167.04	15.98	4.14	11062.62	7280.17
16.840	4600.00	0.00	0.00	3161.40	29100.00	3172.12	0.00	3172.30	10.96	3.75	10837.07	8782.63
16.840	4600.00	0.00	0.00	3161.40	29100.00	3172.65	0.00	3172.88	10.80	3.93	8273.96	8855.06
17.630	4150.00	0.00	0.00	3163.20	29100.00	3175.40	0.00	3175.52	7.17	3.66	16999.02	10865.69
17.630	4150.00	0.00	0.00	3163.20	29100.00	3175.91	0.00	3176.04	6.64	3.61	15008.84	11290.79
18.110	2550.00	0.00	0.00	3161.20	29100.00	3177.74	0.00	3178.05	12.99	6.00	12394.94	8073.27
18.110	2550.00	0.00	0.00	3161.20	29100.00	3178.18	0.00	3178.54	13.84	6.25	11103.00	7821.70
18.970	4525.00	0.00	0.00	3168.00	29100.00	3182.48	0.00	3182.73	11.50	5.20	10367.50	8582.71
18.970	4525.00	0.00	0.00	3168.00	29100.00	3182.94	0.00	3183.18	10.41	5.12	10338.84	9019.01
19.550	3050.00	0.00	0.00	3172.40	29100.00	3185.34	0.00	3185.51	10.55	4.72	13398.95	8959.81
19.550	3050.00	0.00	0.00	3172.40	29100.00	3185.74	0.00	3185.95	11.34	5.05	11808.76	8642.36
20.310	4000.00	0.00	0.00	3176.00	29100.00	3188.62	0.00	3188.70	6.80	2.64	14422.61	9812.07
20.310	4000.00	0.00	0.00	3176.00	29100.00	3189.11	0.00	3189.21	6.24	2.73	12078.04	10139.99
20.750	2350.00	0.00	0.00	3179.10	29100.00	3190.15	0.00	3190.22	6.12	2.29	15785.89	11763.62
20.750	2350.00	0.00	0.00	3179.10	29100.00	3190.62	0.00	3190.70	5.90	2.36	13122.92	11980.44

BITTERRODT RIVER

SUMMARY PRINTOUT TABLE 150

SECD	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
48.930	47000.00	3105.37	0.00	0.00	0.00	1556.09	0.00
48.930	47000.00	3105.87	.50	0.00	.50	1425.98	0.00
.520	31800.00	3107.05	0.00	1.68	0.00	1189.33	2750.00
.520	31800.00	3107.50	.45	1.63	.45	410.31	2750.00
500.720	31800.00	3109.40	0.00	2.35	0.00	336.38	1050.00
500.720	31800.00	3109.74	.34	2.24	.34	338.97	1050.00
800.720	31800.00	3109.45	0.00	.05	0.00	336.75	30.00
800.720	31800.00	3109.95	.50	.21	.50	340.61	30.00
.760	31800.00	3110.26	0.00	.81	0.00	790.94	200.00
.760	31800.00	3110.68	.42	.73	.42	545.00	200.00
1.150	31800.00	3111.86	0.00	1.60	0.00	2143.27	2025.00
1.150	31800.00	3112.18	.32	1.50	.32	1453.82	2025.00
1.890	31800.00	3114.96	0.00	3.19	0.00	2397.86	3925.00
1.890	31800.00	3115.44	.49	3.27	.49	1415.61	3925.00
2.750	31800.00	3119.18	0.00	4.22	0.00	2170.13	4550.00
2.750	31800.00	3119.72	.54	4.27	.54	1198.64	4550.00
3.360	31800.00	3121.70	0.00	2.52	0.00	2392.10	3225.00
3.360	31800.00	3122.22	.51	2.50	.51	1972.80	3225.00
4.070	31800.00	3123.06	0.00	1.36	0.00	3816.35	3720.00
4.070	31800.00	3123.54	.48	1.37	.48	2524.23	3720.00
4.790	31800.00	3125.16	0.00	2.10	0.00	605.13	3800.00
4.790	31800.00	3125.57	.41	2.02	.41	323.00	3800.00
505.020	31800.00	3126.94	0.00	1.78	0.00	320.76	1225.00
505.020	31800.00	3127.41	.47	1.84	.47	322.09	1225.00
805.020	31800.00	3126.97	0.00	.03	0.00	320.83	75.00
805.020	31800.00	3127.47	.50	.06	.50	322.25	75.00
505.040	31800.00	3127.08	0.00	.01	0.00	360.42	50.00
505.040	31800.00	3127.49	.50	.02	.50	363.78	50.00
805.040	31800.00	3127.04	0.00	.05	0.00	360.77	25.00
805.040	31800.00	3127.54	.50	.05	.50	364.12	25.00
5.080	31800.00	3127.51	0.00	.48	0.00	1051.55	150.00
5.080	31800.00	3127.86	.35	.33	.35	834.52	150.00
5.740	31800.00	3129.38	0.00	1.87	0.00	3343.01	3500.00
5.740	31800.00	3129.87	.49	2.00	.49	2796.74	3500.00
6.400	31800.00	3130.71	0.00	1.32	0.00	1075.16	3500.00
6.400	31800.00	3131.15	.44	1.28	.44	569.55	3500.00

SECND	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
7.050	31800.00	3134.76	0.00	4.05	0.00	927.81	3400.00
7.050	31800.00	3135.29	.53	4.14	.53	776.80	3400.00
7.480	31800.00	3136.34	0.00	1.58	0.00	2035.63	2300.00
7.480	31800.00	3136.88	.54	1.58	.54	1893.81	2300.00
8.600	31000.00	3137.48	0.00	1.15	0.00	2457.74	2750.00
8.000	31000.00	3137.99	.51	1.12	.51	1345.29	2750.00
8.540	31000.00	3138.92	0.00	1.44	0.00	2317.93	2850.00
8.540	31000.00	3139.44	.52	1.45	.52	1496.58	2850.00
8.980	31000.00	3140.11	0.00	1.19	0.00	2892.33	2300.00
8.980	31000.00	3140.64	.53	1.20	.53	2246.16	2300.00
9.730	31000.00	3142.37	0.00	2.26	0.00	2698.09	4000.00
9.730	31000.00	3142.86	.49	2.21	.49	1117.71	4000.00
10.390	31000.00	3144.87	0.00	2.51	0.00	2795.74	3450.00
10.390	31000.00	3145.40	.53	2.54	.53	2042.80	3450.00
11.160	31000.00	3147.70	0.00	2.83	0.00	2293.14	4100.00
11.160	31000.00	3148.22	.51	2.81	.51	1669.90	4100.00
11.950	31000.00	3151.06	0.00	3.36	0.00	1401.46	4150.00
11.950	31000.00	3151.52	.46	3.30	.46	1208.90	4150.00
12.570	31000.00	3153.73	0.00	2.67	0.00	2239.86	3250.00
12.570	31000.00	3154.16	.46	2.67	.46	1555.72	3250.00
13.350	31000.00	3156.58	0.00	2.86	0.00	2469.06	4160.00
13.350	31000.00	3157.03	.45	2.84	.45	1322.99	4160.00
13.950	29100.00	3159.00	0.00	2.41	0.00	5481.23	3130.00
13.950	29100.00	3159.47	.48	2.45	.48	3042.94	3130.00
14.730	29100.00	3161.56	0.00	2.56	0.00	4319.22	4150.00
14.730	29100.00	3162.07	.51	2.59	.51	2944.28	4150.00
514.930	29100.00	3162.18	0.00	.63	0.00	4262.65	1025.00
514.930	29100.00	3162.68	.50	.62	.50	2860.01	1025.00
814.930	29100.00	3162.21	0.00	.03	0.00	4264.04	25.00
814.930	29100.00	3162.71	.50	.02	.50	2853.86	25.00
15.070	29100.00	3162.66	0.00	.45	0.00	4066.43	450.00
15.070	29100.00	3163.16	.49	.45	.49	3083.62	450.00
15.590	29100.00	3164.81	0.00	2.14	0.00	5997.51	3000.00
15.590	29100.00	3165.34	.54	2.19	.54	4508.03	3000.00
15.970	29100.00	3166.36	0.00	1.56	0.00	5659.59	2050.00
15.970	29100.00	3166.86	.50	1.52	.50	3494.71	2050.00
16.840	29100.00	3172.12	0.00	5.76	0.00	3097.94	4600.00
16.840	29100.00	3172.65	.53	5.79	.53	1542.50	4600.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
17.630	29100.00	3175.40	0.00	3.28	0.00	5995.74	4150.00
17.630	29100.00	3175.71	.51	3.26	.51	4914.08	4150.00
18.110	29100.00	3177.74	0.00	2.34	0.00	4003.07	2550.00
18.110	29100.00	3178.18	.44	2.26	.44	3584.10	2550.00
18.970	29100.00	3182.48	0.00	4.75	0.00	3023.94	4525.00
18.970	29100.00	3182.94	.45	4.76	.45	2560.24	4525.00
19.550	29100.00	3185.34	0.00	2.86	0.00	4782.59	3050.00
19.550	29100.00	3185.74	.40	2.80	.40	3338.22	3050.00
20.310	29100.00	3188.62	0.00	3.27	0.00	4417.31	4000.00
20.310	29100.00	3189.11	.50	3.37	.50	2306.60	4000.00
20.750	29100.00	3190.15	0.00	1.53	0.00	4269.74	2350.00
20.750	29100.00	3190.62	.47	1.51	.47	2246.63	2350.00

SUMMARY OF ERRORS

FLOODWAY DATA, RITTENROOT RIVER
PROFILE NO. 2

STATION	FLOODWAY		MEAN VELOCITY	WATER SURFACE ELEVATION		
	WIDTH (FT)	SECTION AREA		WITH FLOODWAY	WITHOUT FLOODWAY	
48.930	4746.4790	10019.	4.7	3105.9	3105.4	.5
520	410.	3491.	9.1	3107.4	3107.0	.4
500.720	339.	4101.	7.8	3109.7	3109.4	.3
800.720	341.	4174.	7.6	3109.9	3109.4	.5
.760	545.	6167.	5.2	3110.7	3110.3	.4
1.150	1454.	9005.	3.5	3112.2	3111.9	.3
1.890	1416.	8399.	3.8	3115.5	3115.0	.5
2.750	1199.	7238.	4.4	3119.7	3119.2	.5
3.360	1073.	12763.	2.5	3122.2	3121.7	.5
4.070	2574.	14544.	2.2	3123.6	3123.1	.5
4.790	323.	3754.	8.5	3125.6	3125.2	.4
505.020	322.	4900.	6.5	3127.4	3126.9	.5
805.020	322.	4919.	6.5	3127.5	27.0	.5
505.040	364.	4709.	6.8	3127.5	27.0	.5
805.040	364.	4727.	6.7	3127.5	3127.0	.5
5.080	835.	6471.	4.9	3127.9	3127.5	.4
5.740	2801.	19260.	1.7	3129.9	3129.4	.5
6.400	580.	4254.	7.5	3131.1	3130.7	.4
7.050	777.	7593.	4.2	3135.3	3134.8	.5
7.480	1894.	15623.	2.0	3136.8	3136.3	.5
8.000	1345.	8770.	3.5	3138.0	3137.5	.5
8.540	1589.	10585.	2.9	3139.4	3138.9	.5
8.980	2246.	14476.	2.1	3140.6	3140.1	.5
9.730	1118.	7783.	4.0	3142.9	3142.4	.5
10.390	2044.	11973.	2.6	3145.4	3144.9	.5
11.160	1688.	10563.	2.9	3148.2	3147.7	.5
11.950	1209.	8566.	3.6	3151.6	3151.1	.5
12.570	1556.	11101.	2.8	3154.2	3153.7	.5
13.350	1323.	10514.	2.9	3157.0	3156.6	.4
13.950	3043.	13469.	2.2	3159.5	3159.0	.5
14.730	2944.	14666.	2.0	3162.1	3161.6	.5
514.930	2942.	11817.	2.5	3162.7	3162.2	.5
614.930	2936.	11821.	2.5	3162.7	3162.2	.5
15.020	3147.	10715.	2.7	3163.2	3162.7	.5
15.590	4508.	19688.	1.5	3165.3	3164.8	.5
15.970	3511.	11063.	2.6	3166.9	3166.4	.5
16.640	1542.	8274.	3.5	3172.6	3172.1	.5
17.630	4956.	16009.	1.8	3175.9	3175.4	.5
18.110	4229.	11103.	2.6	3178.1	3177.7	.4
18.970	2595.	10339.	2.8	3183.0	3182.5	.5
19.550	3338.	11809.	2.5	3185.7	3185.3	.4
20.310	2307.2625	12078.	2.4	3189.1	3188.6	.5
20.750	2247.2857	13123.	2.2	3190.0	3190.1	.5

These values match the FIS FWDT after adding 3.5' for datum conversion

XS A doesn't match the FIS FWDT + 3.5?
3107+3.5=3110.5
FIS FWDT = 3111.8 (matches Natural profile WSEL)

ALL 310 FT. FOR ...
ALL 310 FT. FOR ...

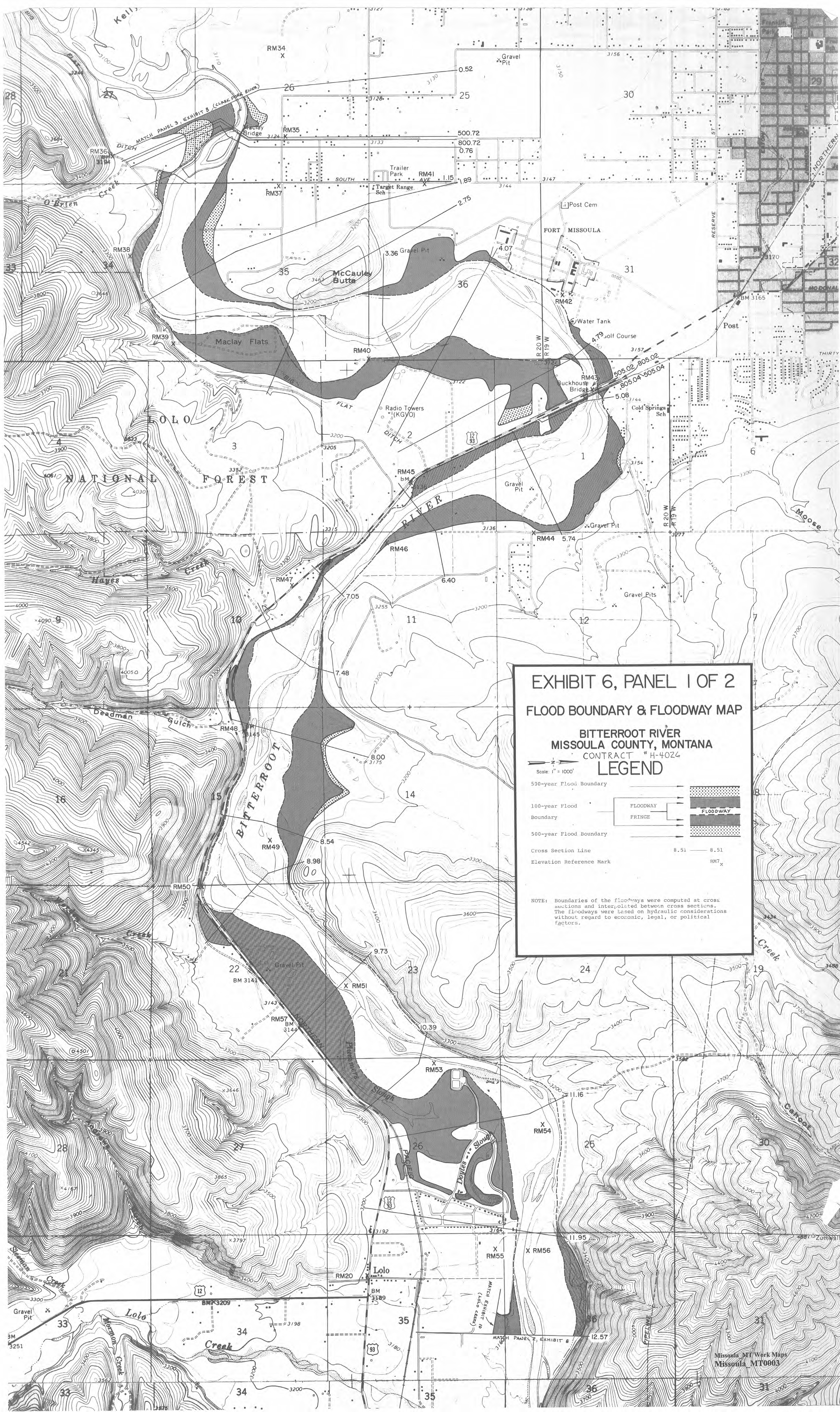


EXHIBIT 6, PANEL 1 OF 2
FLOOD BOUNDARY & FLOODWAY MAP

BITTERROOT RIVER
MISSOULA COUNTY, MONTANA
 CONTRACT # H-4024

LEGEND

<p>500-year Flood Boundary</p> <p>100-year Flood Boundary</p> <p>500-year Flood Boundary</p> <p>Cross Section Line</p> <p>Elevation Reference Mark</p>	 <p>8.51 — 8.51</p> <p>RM7 x</p>
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NOTE: Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations without regard to economic, legal, or political factors.

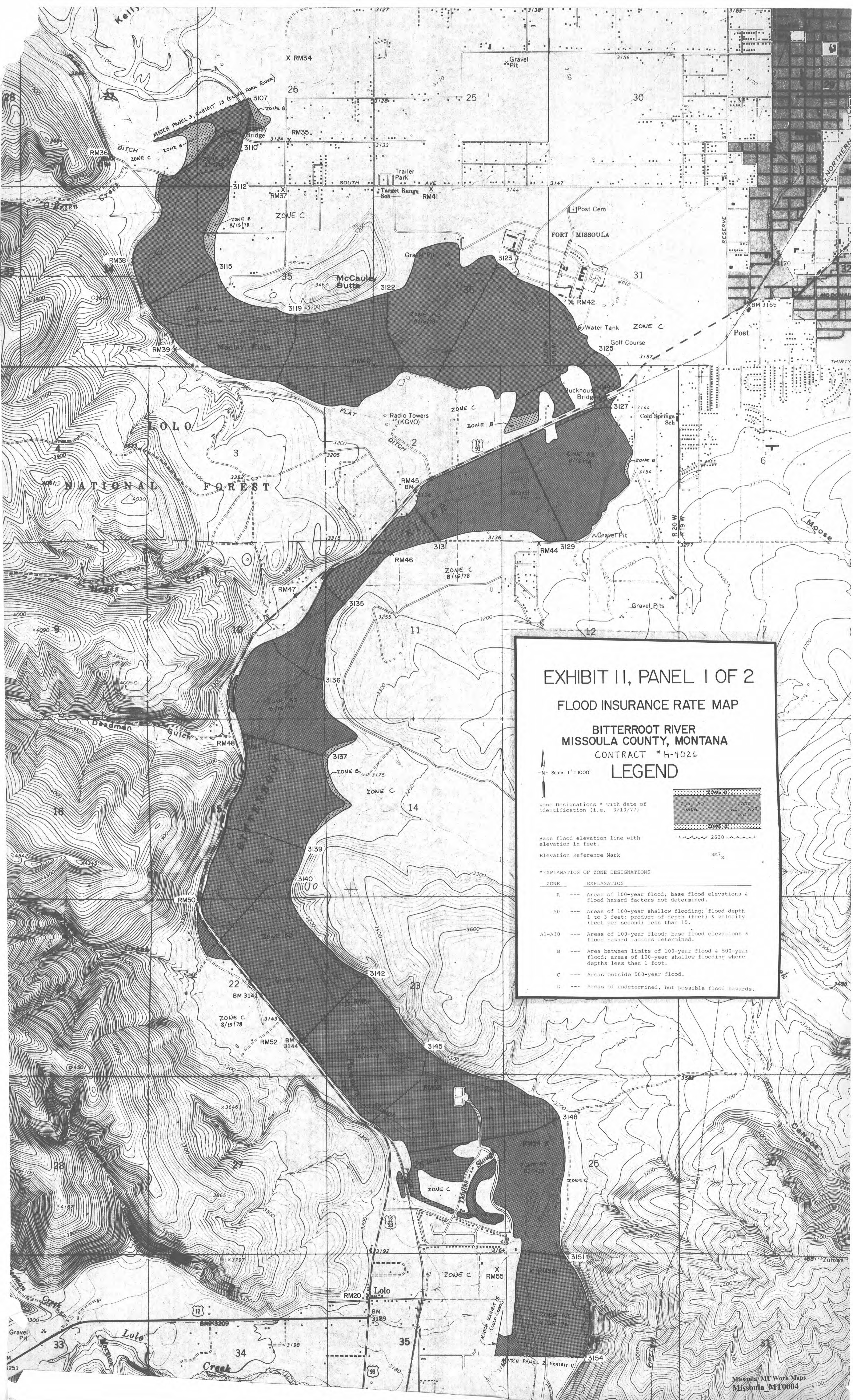


EXHIBIT II, PANEL I OF 2
 FLOOD INSURANCE RATE MAP
 BITTERROOT RIVER
 MISSOULA COUNTY, MONTANA
 CONTRACT # H-4026
LEGEND

Scale: 1" = 1000'

Zone A0 Date	Zone A1 - A30 Date
Zone C 2630	

Zone Designations * with date of identification (i.e. 3/10/77)

Base flood elevation line with elevation in feet.

Elevation Reference Mark

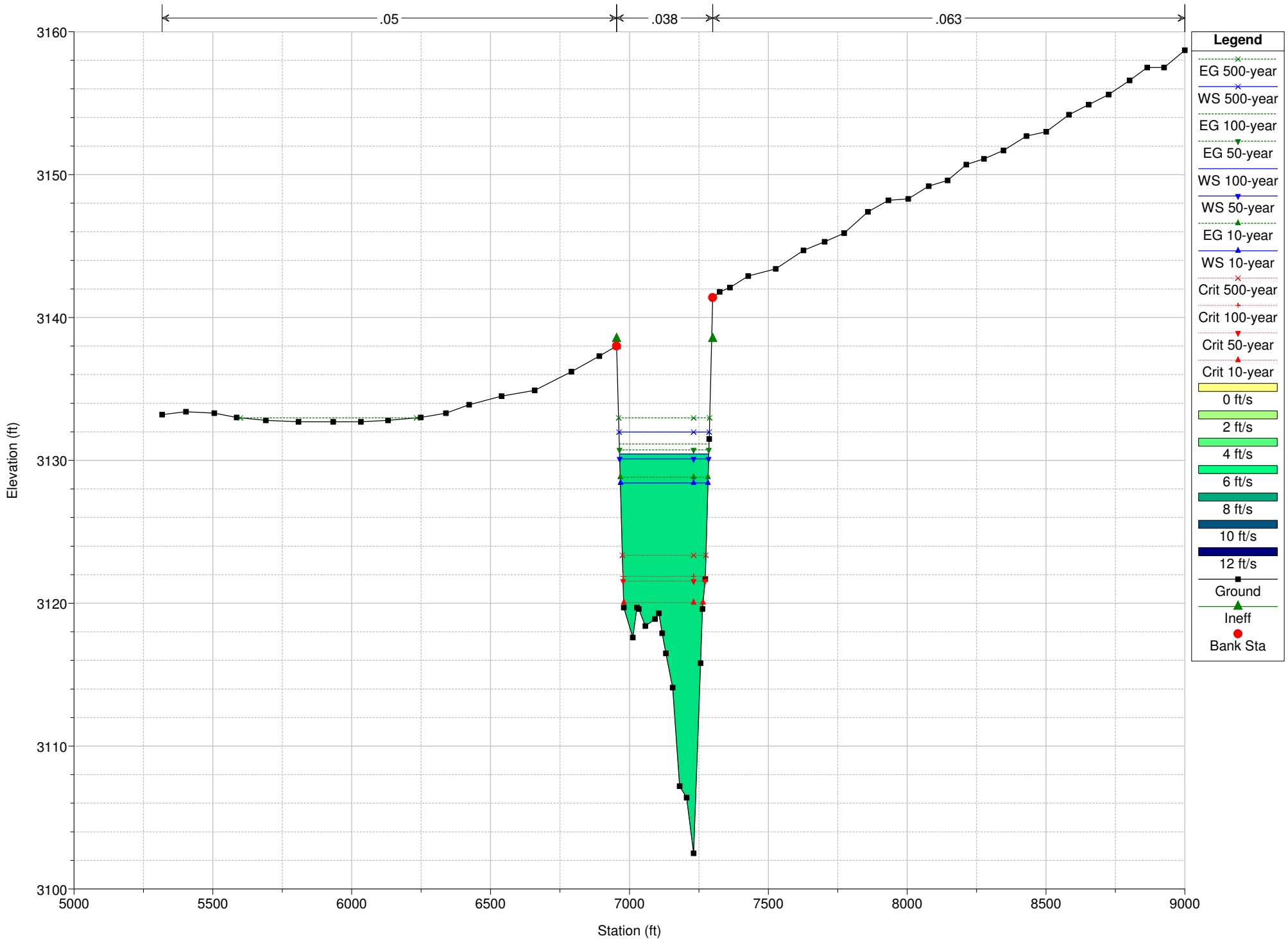
*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations & flood hazard factors not determined.
A0	Areas of 100-year shallow flooding; flood depth 1 to 3 feet; product of depth (feet) & velocity (feet per second) less than 15.
A1-A30	Areas of 100-year flood; base flood elevations & flood hazard factors determined.
B	Area between limits of 100-year flood & 500-year flood; areas of 100-year shallow flooding where depths less than 1 foot.
C	Areas outside 500-year flood.
D	Areas of undetermined, but possible flood hazards.

Appendix G – Duplicate Effective HEC-RAS Model Output Files

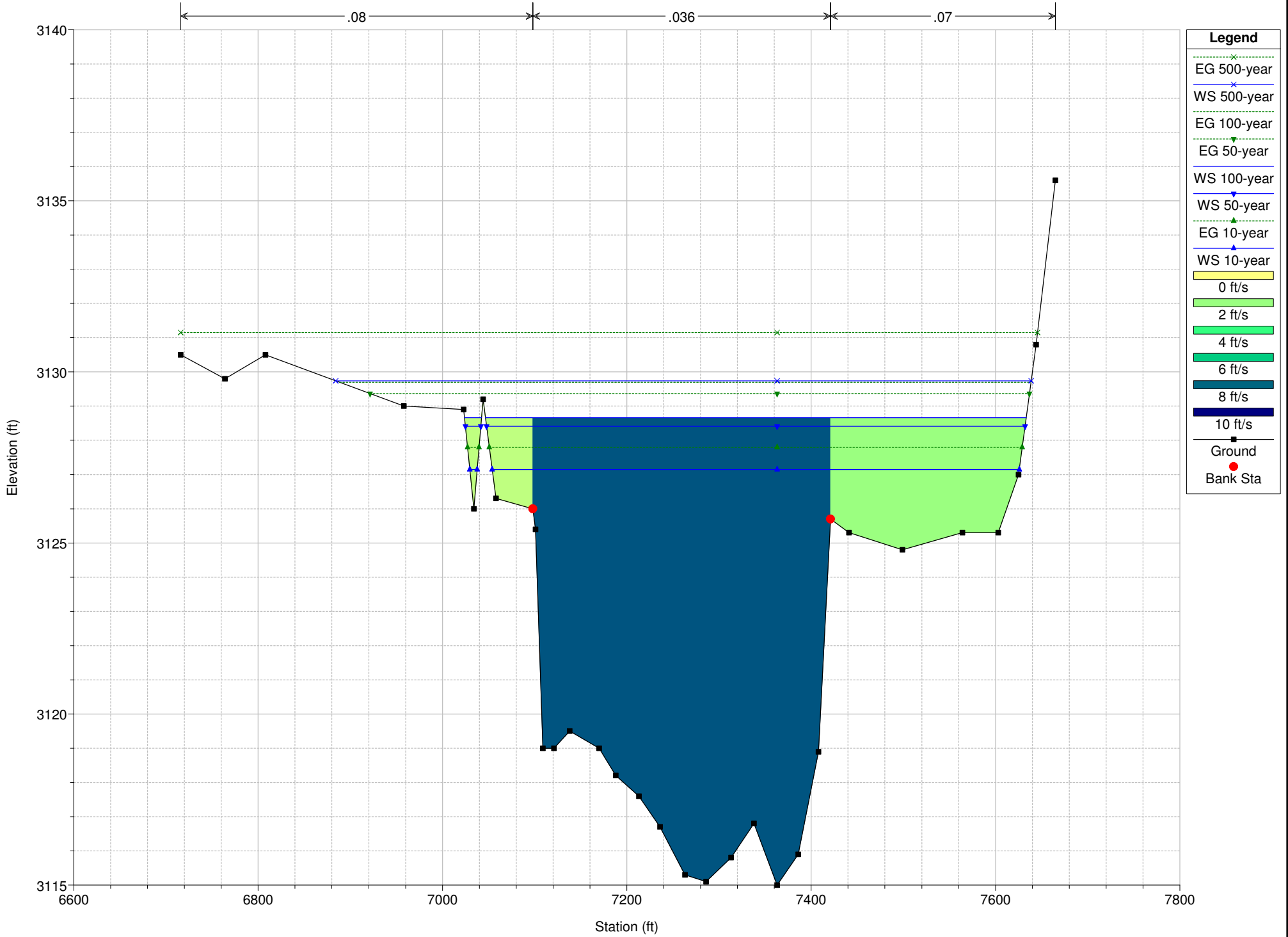
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	1836.717	100-year	31800.00	3094.40	3111.75	3107.12	3112.61	0.001551	7.74	5785.57	1375.44	0.45
1	1836.717	10-year	20900.00	3094.40	3106.88	3105.16	3108.51	0.004098	10.24	2041.20	301.49	0.69
1	1836.717	50-year	29700.00	3094.40	3107.05	3106.78	3110.18	0.007677	14.19	2092.66	303.31	0.95
1	1836.717	500-year	42000.00	3094.40	3111.75	3109.19	3113.26	0.002706	10.23	5785.57	1375.44	0.59
1	2864.989	100-year	31800.00	3090.20	3113.20	3106.77	3114.17	0.001391	7.89	4032.05	2760.51	0.40
1	2864.989	10-year	20900.00	3090.20	3110.17	3104.49	3110.90	0.001358	6.84	3055.05	2292.09	0.38
1	2864.989	50-year	29700.00	3090.20	3112.42	3106.37	3113.39	0.001471	7.87	3774.68	2732.57	0.41
1	2864.989	500-year	42000.00	3090.20	3114.12	3108.46	3115.58	0.001922	9.67	4344.34	2789.04	0.48
1	2900	Bridge										
1	2914.929	100-year	31800.00	3090.20	3113.25	3106.77	3114.21	0.001374	7.85	4049.17	2762.35	0.40
1	2914.929	10-year	20900.00	3090.20	3110.21	3104.45	3110.93	0.001343	6.82	3066.39	2652.63	0.38
1	2914.929	50-year	29700.00	3090.20	3112.48	3106.36	3113.43	0.001451	7.83	3791.95	2734.46	0.41
1	2914.929	500-year	42000.00	3090.20	3116.54	3108.46	3117.57	0.001103	8.13	5163.58	2894.35	0.37
1	3143.176	100-year	31800.00	3095.40	3114.05		3114.46	0.000754	5.17	6391.74	806.86	0.27
1	3143.176	10-year	20900.00	3095.40	3110.83		3111.19	0.000983	4.81	4352.34	557.04	0.30
1	3143.176	50-year	29700.00	3095.40	3113.28		3113.70	0.000837	5.21	5790.16	723.44	0.28
1	3143.176	500-year	42000.00	3095.40	3117.39		3117.78	0.000523	5.09	9195.25	850.09	0.24
1	5167.802	100-year	31800.00	3102.40	3115.52		3115.81	0.000681	5.22	10919.43	2153.48	0.27
1	5167.802	10-year	20900.00	3102.40	3112.88		3113.31	0.001154	5.73	5587.58	1800.41	0.34
1	5167.802	50-year	29700.00	3102.40	3114.92		3115.25	0.000793	5.44	9623.76	2113.57	0.29
1	5167.802	500-year	42000.00	3102.40	3118.41		3118.59	0.000368	4.45	17356.18	2302.12	0.21
1	9113.882	100-year	31800.00	3102.90	3118.48		3118.80	0.000871	5.15	10549.95	2398.28	0.30
1	9113.882	10-year	20900.00	3102.90	3116.90		3117.18	0.000860	4.62	6860.83	2203.64	0.30
1	9113.882	50-year	29700.00	3102.90	3118.17		3118.49	0.000885	5.10	9814.28	2392.37	0.30
1	9113.882	500-year	42000.00	3102.90	3120.25		3120.53	0.000688	5.07	14832.49	2457.46	0.27
1	13681.61	100-year	31800.00	3104.90	3122.69		3123.18	0.001087	6.58	8493.59	2171.31	0.33
1	13681.61	10-year	20900.00	3104.90	3121.09		3121.55	0.001068	5.93	5223.88	1765.44	0.32
1	13681.61	50-year	29700.00	3104.90	3122.43		3122.91	0.001085	6.48	7924.50	2143.51	0.33
1	13681.61	500-year	42000.00	3104.90	3123.87		3124.36	0.001069	6.94	11098.38	2236.05	0.33
1	16905.70	100-year	31800.00	3108.50	3125.23		3125.40	0.000474	4.20	13352.36	2406.12	0.22
1	16905.70	10-year	20900.00	3108.50	3123.58		3123.73	0.000463	3.73	9579.26	2268.28	0.21
1	16905.70	50-year	29700.00	3108.50	3124.95		3125.12	0.000469	4.11	12708.34	2283.92	0.22
1	16905.70	500-year	42000.00	3108.50	3126.41		3126.60	0.000487	4.55	17099.48	3362.22	0.23
1	20829.82	100-year	31800.00	3113.50	3126.57		3126.70	0.000400	4.01	16257.16	3825.40	0.21
1	20829.82	10-year	20900.00	3113.50	3124.98		3125.12	0.000427	3.75	10626.24	3150.58	0.21
1	20829.82	50-year	29700.00	3113.50	3126.30		3126.43	0.000404	3.96	15230.48	3740.73	0.21
1	20829.82	500-year	42000.00	3113.50	3127.73		3127.87	0.000389	4.22	20812.46	3932.41	0.21
1	24473.40	100-year	31800.00	3115.00	3128.66		3129.70	0.001659	8.35	4463.24	605.15	0.44
1	24473.40	10-year	20900.00	3115.00	3127.15		3127.80	0.001225	6.52	3566.57	579.80	0.37
1	24473.40	50-year	29700.00	3115.00	3128.41		3129.37	0.001576	8.02	4310.12	600.90	0.43
1	24473.40	500-year	42000.00	3115.00	3129.74		3131.15	0.002048	9.86	5199.39	754.49	0.50
1	25701.15	100-year	31800.00	3102.50	3130.45	3121.89	3131.14	0.000848	6.69	4750.33	320.76	0.31
1	25701.15	10-year	20900.00	3102.50	3128.41	3120.05	3128.82	0.000579	5.09	4103.96	314.97	0.25
1	25701.15	50-year	29700.00	3102.50	3130.09	3121.55	3130.73	0.000797	6.40	4637.50	319.76	0.30
1	25701.15	500-year	42000.00	3102.50	3131.98	3123.36	3132.98	0.001085	8.01	5245.38	325.08	0.35

SouthAveBridge Plan: DupEffect 7/8/2016
 RS = 25701.15 HEC2 Sta 4.79, FEMA XS 'K'

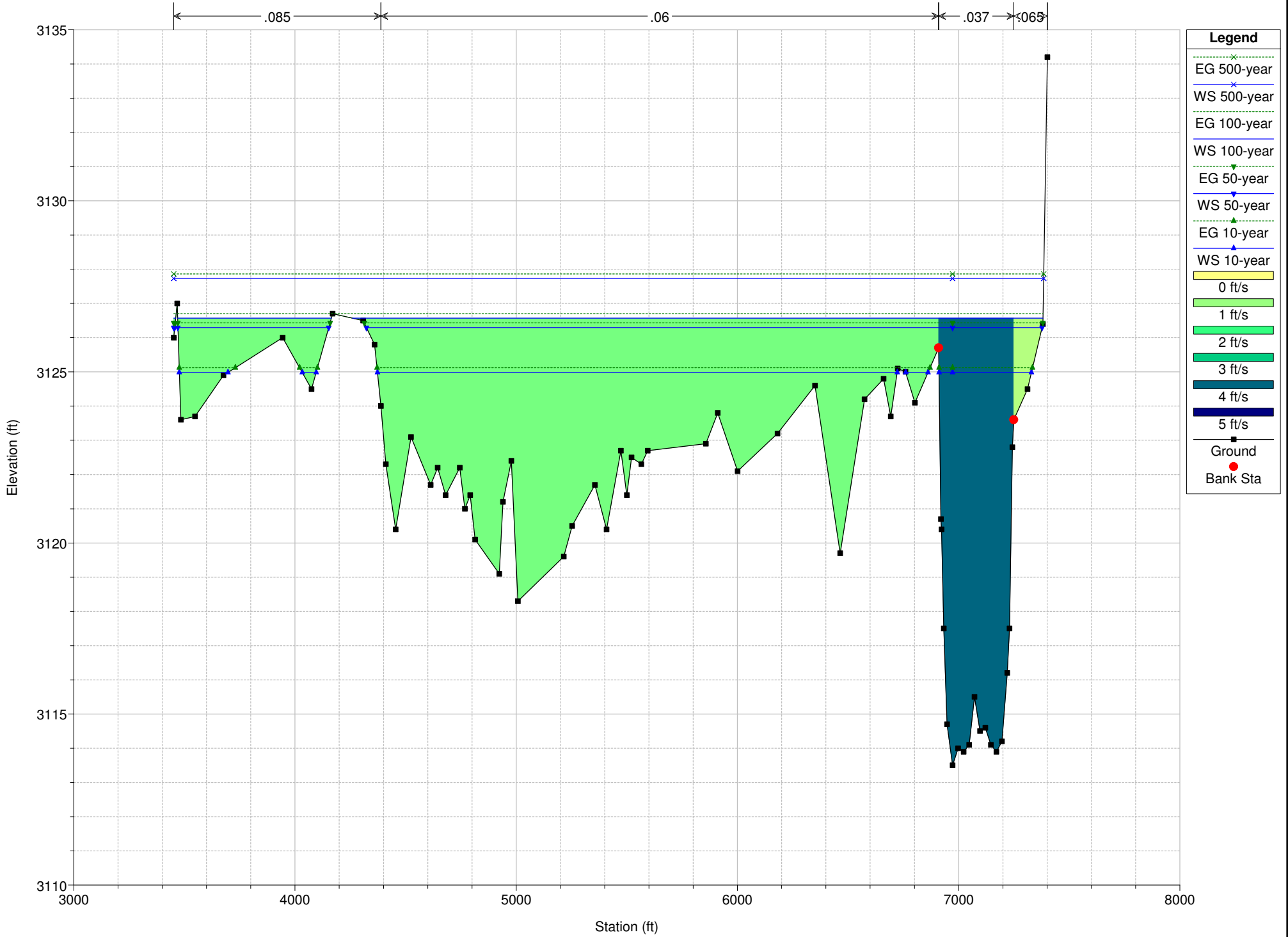


SouthAveBridge Plan: DupEffect 7/8/2016

RS = 24473.40 HEC2 Sta 4.79, FEMA XS 'J'



SouthAveBridge Plan: DupEffect 7/8/2016
 RS = 20829.82 HEC2 Sta 4.07, FEMA XS 'I'

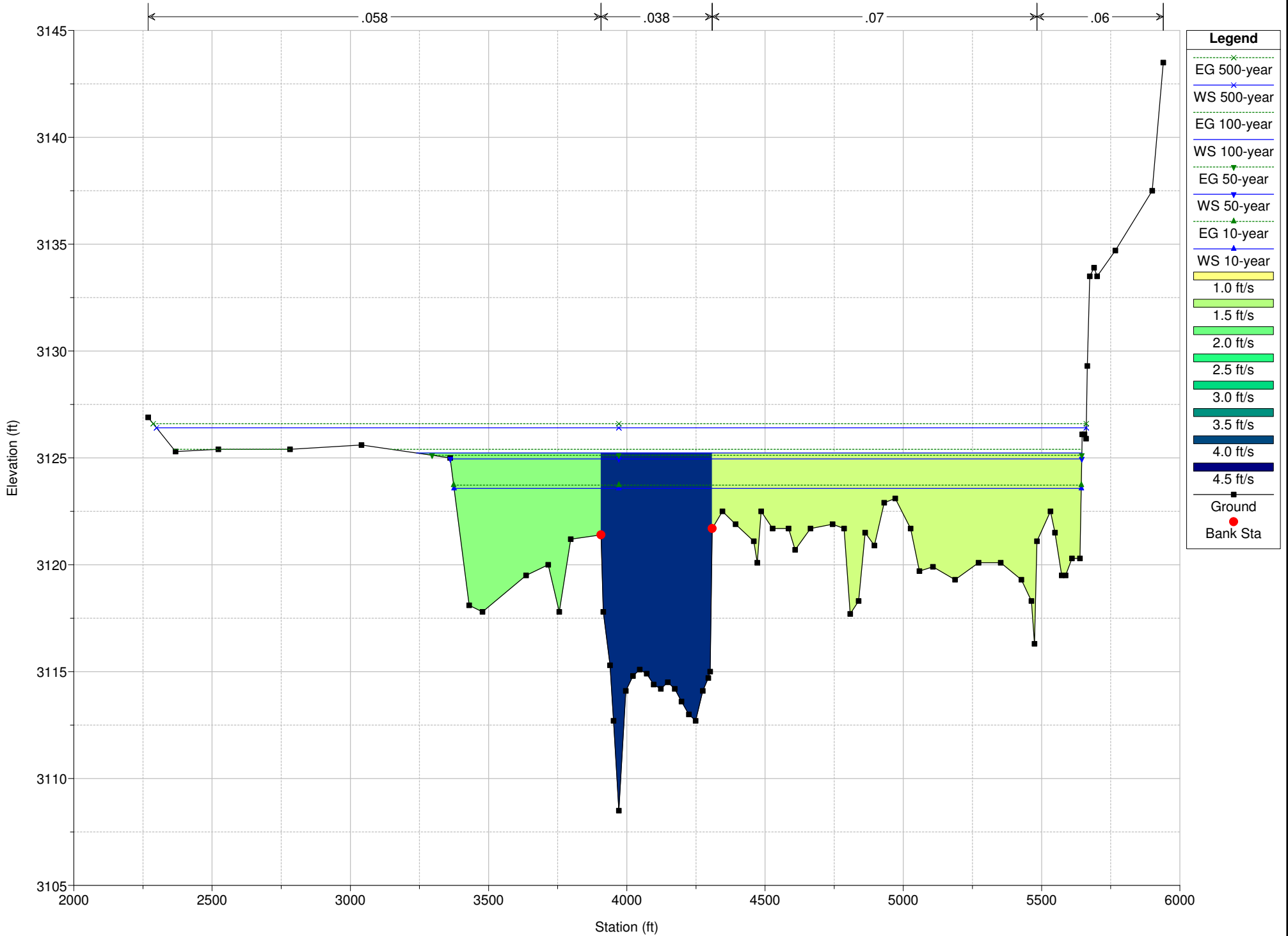


Legend

- EG 500-year
- WS 500-year
- EG 100-year
- WS 100-year
- EG 50-year
- WS 50-year
- EG 10-year
- WS 10-year
- 0 ft/s
- 1 ft/s
- 2 ft/s
- 3 ft/s
- 4 ft/s
- 5 ft/s
- Ground
- Bank Sta

SouthAveBridge Plan: DupEffect 7/8/2016

RS = 16905.70 HEC2 Sta 3.36, FEMA XS 'H'

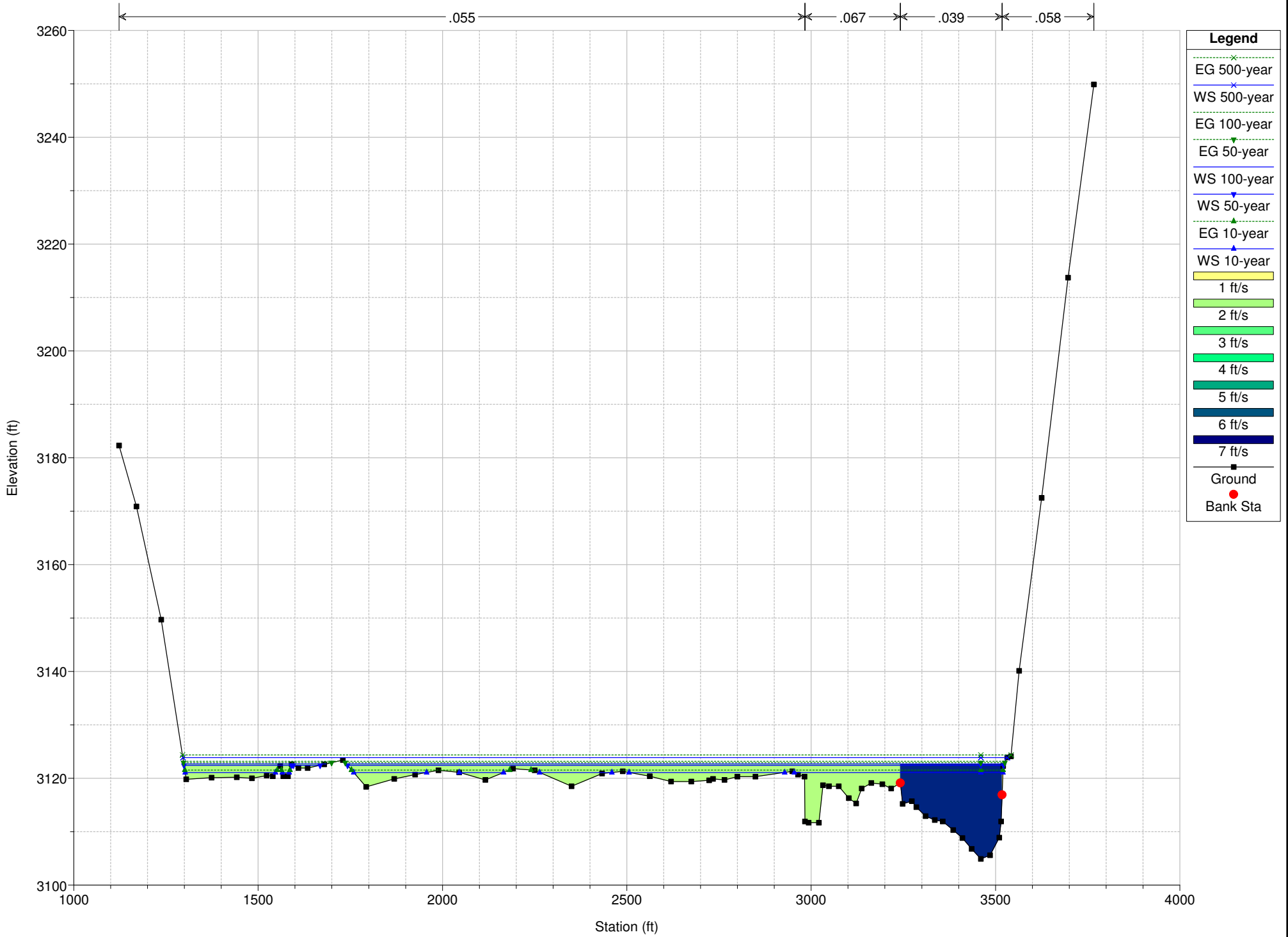


Legend

- EG 500-year
- WS 500-year
- EG 100-year
- WS 100-year
- EG 50-year
- WS 50-year
- EG 10-year
- WS 10-year
- 1.0 ft/s
- 1.5 ft/s
- 2.0 ft/s
- 2.5 ft/s
- 3.0 ft/s
- 3.5 ft/s
- 4.0 ft/s
- 4.5 ft/s
- Ground
- Bank Sta

SouthAveBridge Plan: DupEffect 7/8/2016

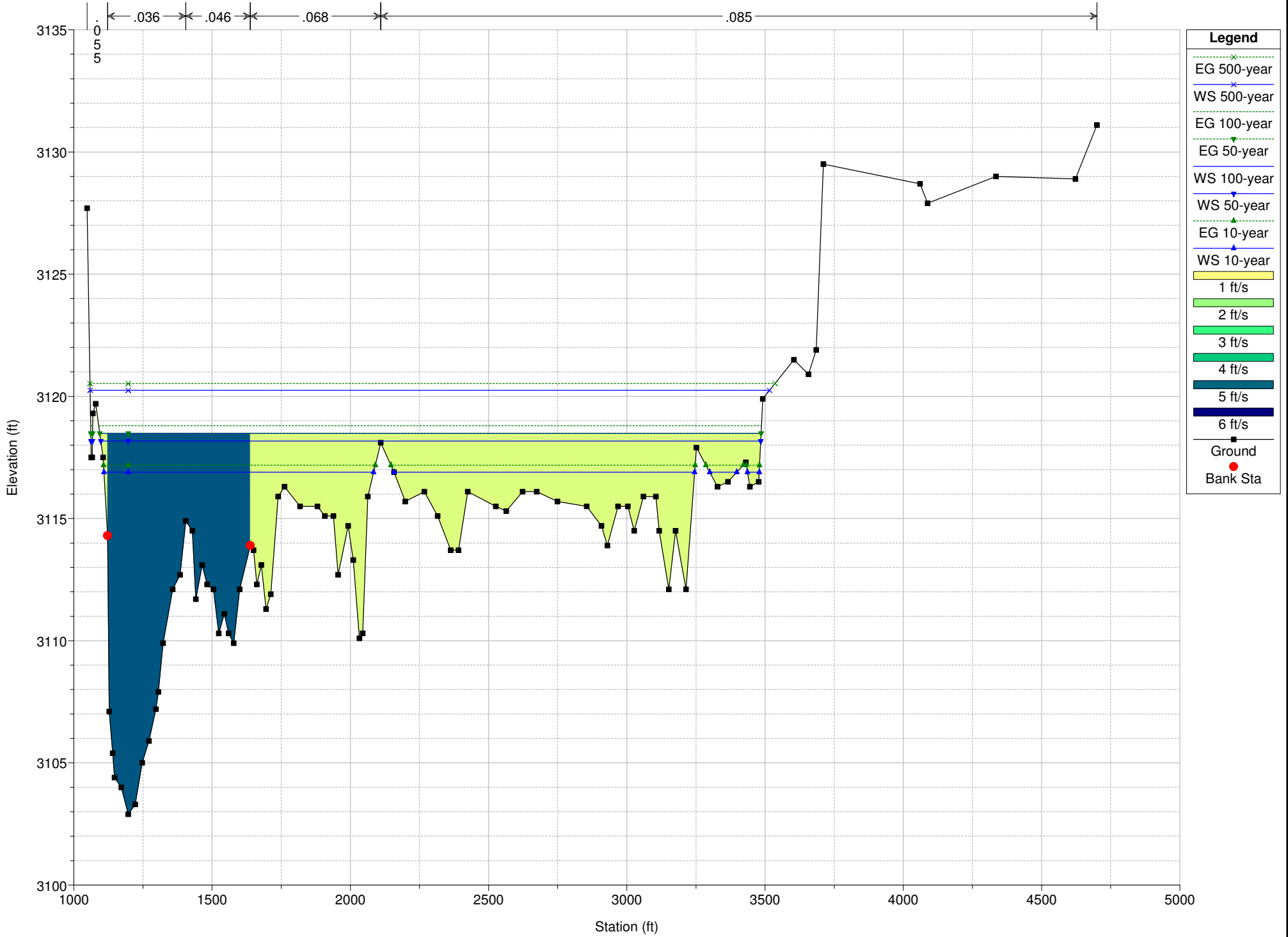
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Legend

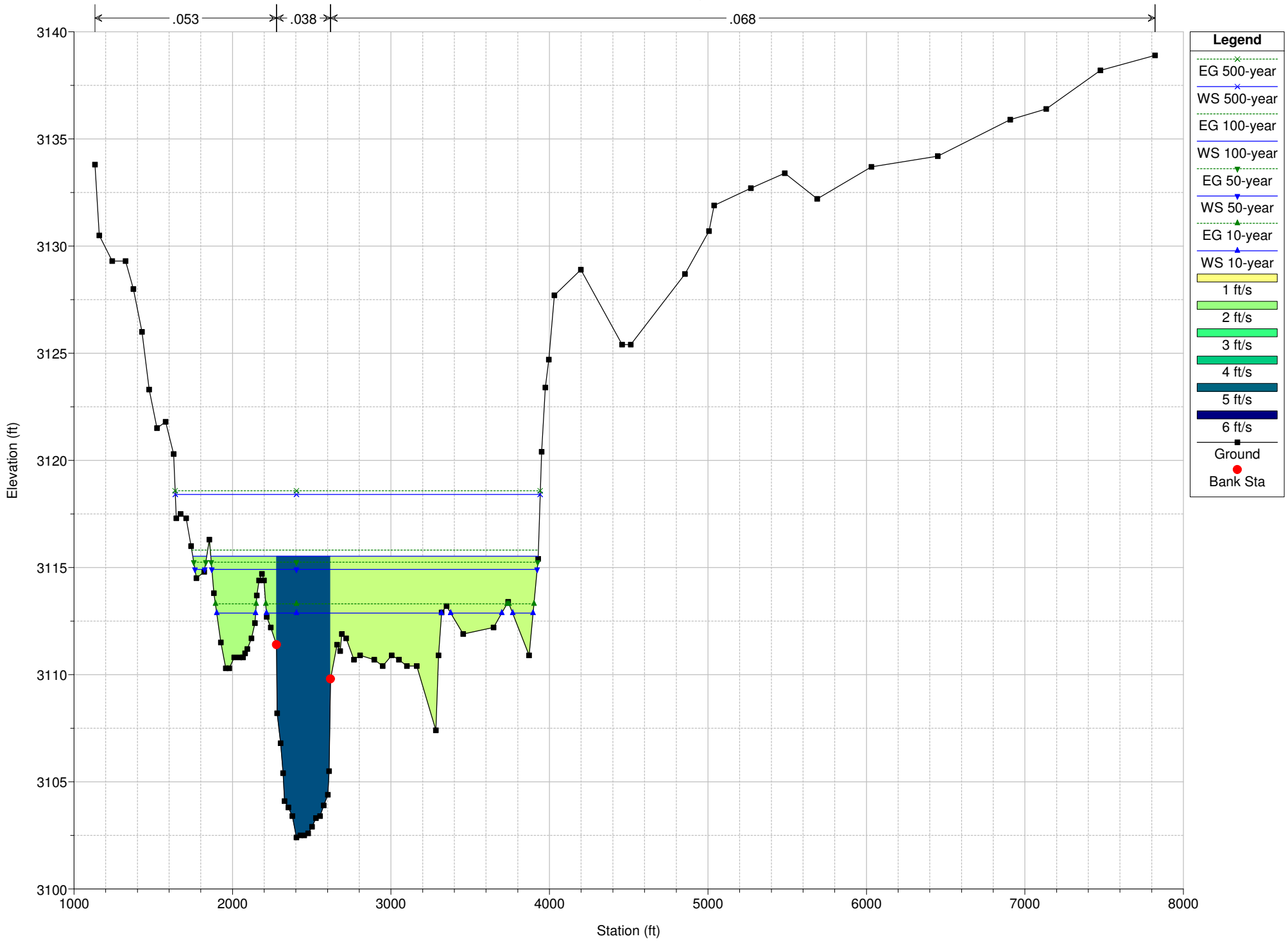
- EG 500-year (dotted green line with 'x' marker)
- WS 500-year (solid blue line with 'x' marker)
- EG 100-year (dotted green line with 'x' marker)
- EG 50-year (dotted green line with 'x' marker)
- WS 100-year (solid blue line with triangle marker)
- WS 50-year (solid blue line with triangle marker)
- EG 10-year (dotted green line with triangle marker)
- WS 10-year (solid blue line with triangle marker)
- 1 ft/s (yellow bar)
- 2 ft/s (light green bar)
- 3 ft/s (green bar)
- 4 ft/s (medium green bar)
- 5 ft/s (dark green bar)
- 6 ft/s (dark blue bar)
- 7 ft/s (darkest blue bar)
- Ground (black line with square marker)
- Bank Sta (red dot)

SouthAveBridge Plan: DupEffect 7/8/2016
 RS = 9113.882 HEC2 Sta 1.89, FEMA XS 'F'



- Legend**
- EG 500-year
 - WS 500-year
 - EG 100-year
 - EG 50-year
 - WS 100-year
 - WS 50-year
 - EG 10-year
 - WS 10-year
 - 1 ft/s
 - 2 ft/s
 - 3 ft/s
 - 4 ft/s
 - 5 ft/s
 - 6 ft/s
 - Ground
 - Bank Sta

SouthAveBridge Plan: DupEffect 7/8/2016
 RS = 5167.802 HEC Sta 1.15, FEMA XS 'E'

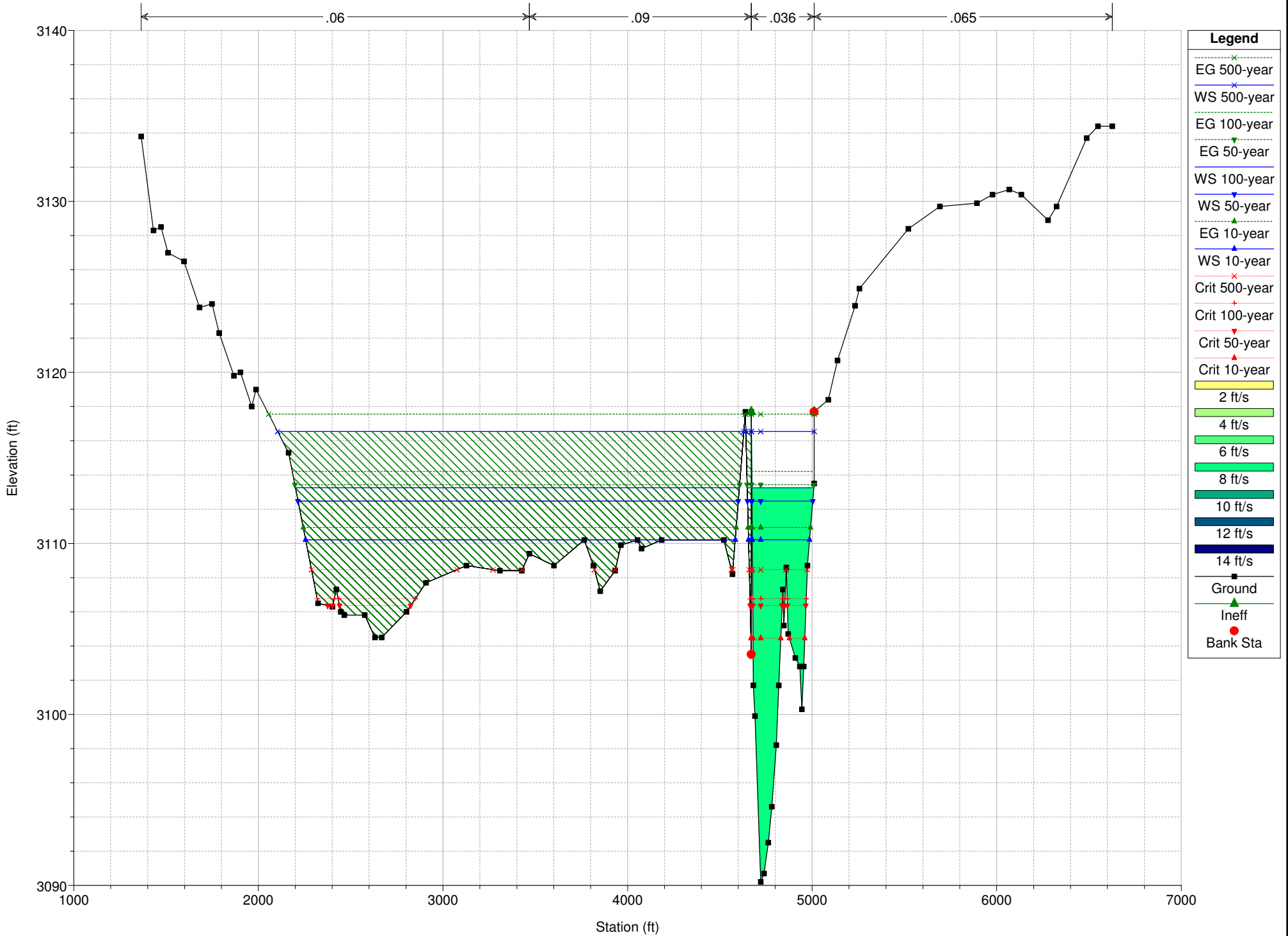


Legend

- EG 500-year (dashed green line with 'x' marker)
- WS 500-year (solid blue line with 'x' marker)
- EG 100-year (dashed green line with 'v' marker)
- WS 100-year (solid blue line with 'v' marker)
- EG 50-year (dashed green line with '^' marker)
- WS 50-year (solid blue line with '^' marker)
- EG 10-year (dashed green line with '^' marker)
- WS 10-year (solid blue line with '^' marker)
- 1 ft/s (yellow bar)
- 2 ft/s (light green bar)
- 3 ft/s (green bar)
- 4 ft/s (dark green bar)
- 5 ft/s (teal bar)
- 6 ft/s (dark blue bar)
- Ground (black line with square marker)
- Bank Sta (red dot)

SouthAveBridge Plan: DupEffect 7/8/2016

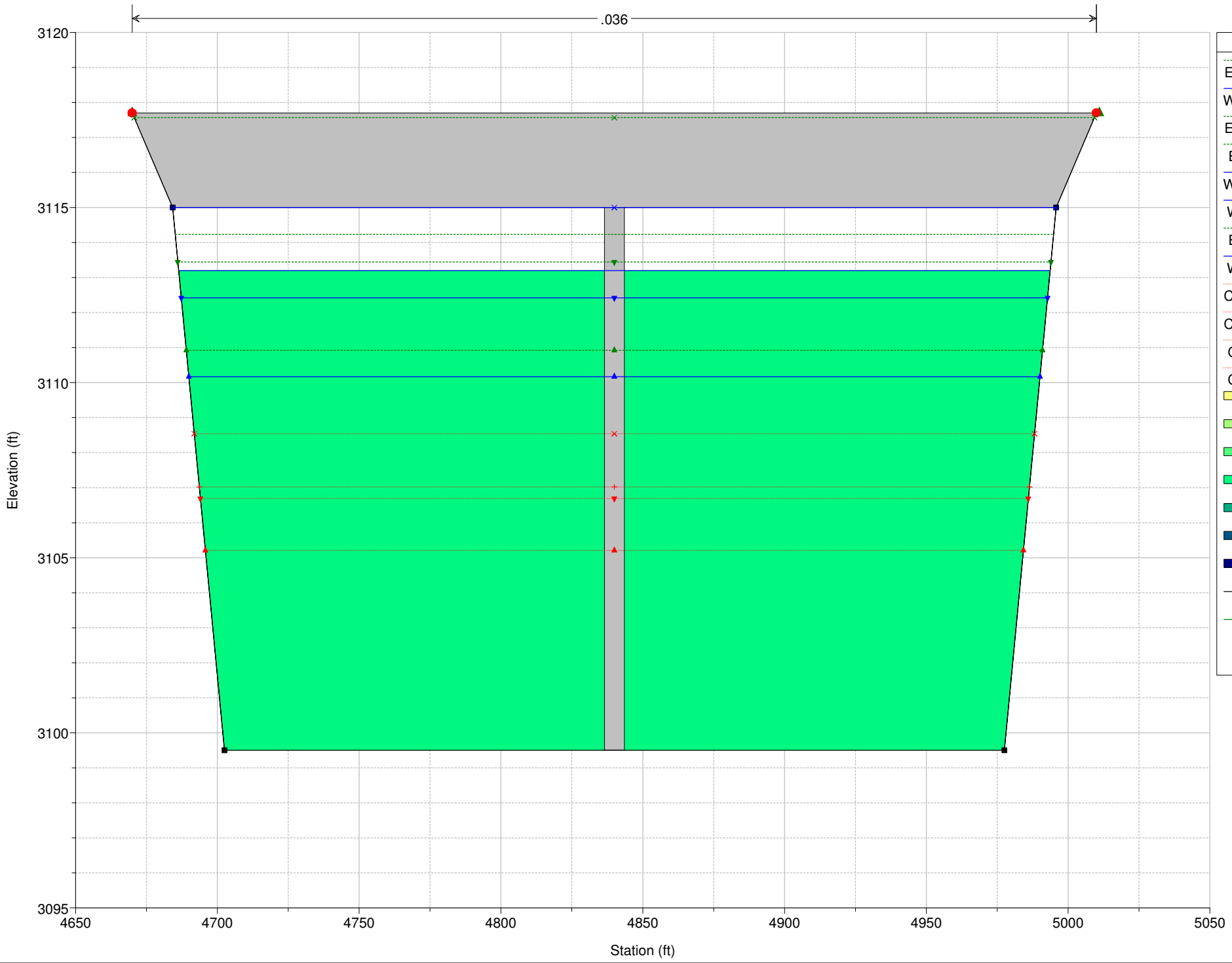
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SouthAveBridge Plan: DupEffect 7/8/2016

RS = 2900 BR

.036



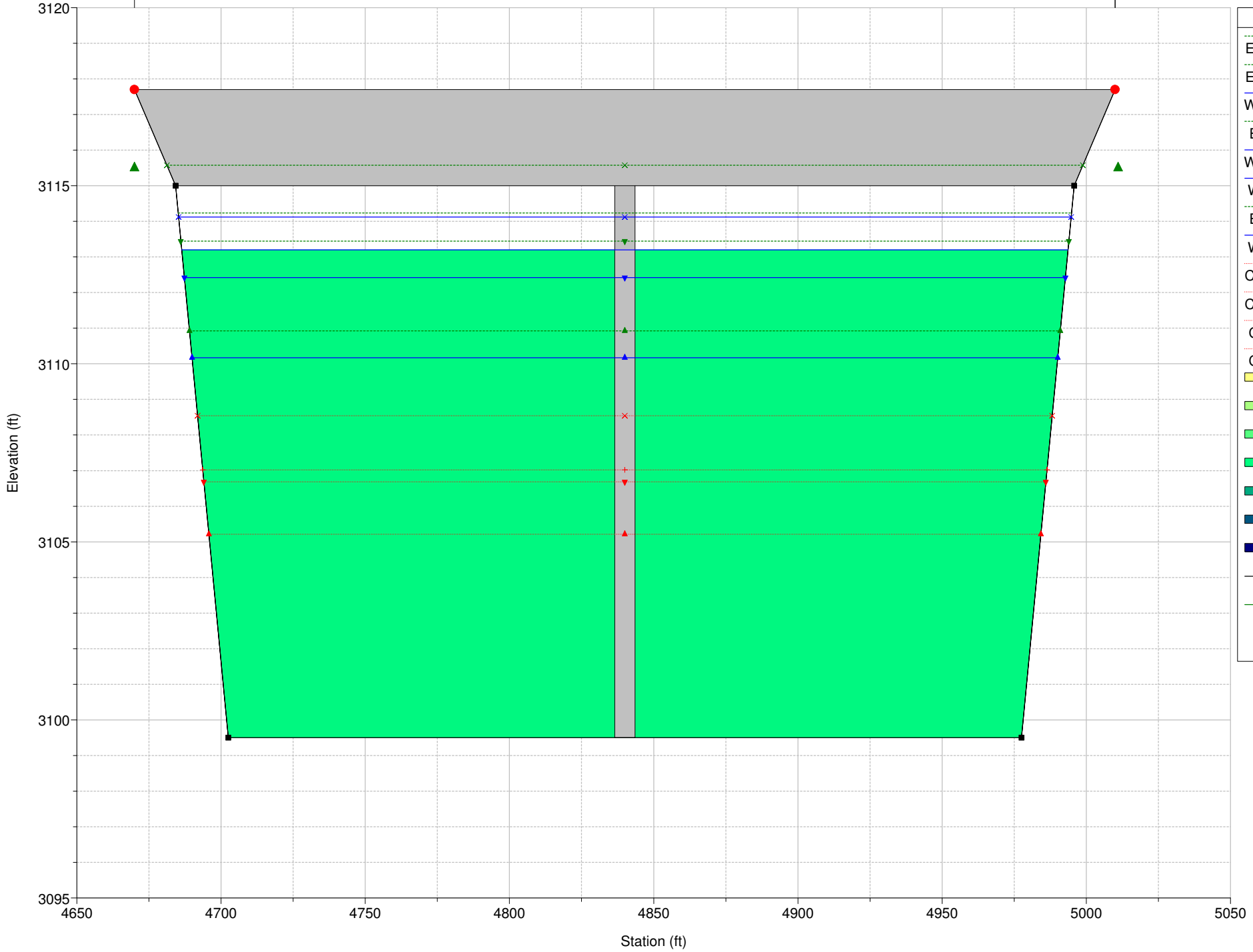
Legend

- EG 500-year (dotted green line with 'x' marker)
- WS 500-year (solid blue line with 'x' marker)
- EG 100-year (dotted green line with 'x' marker)
- EG 50-year (dotted green line with 'x' marker)
- WS 100-year (solid blue line with 'x' marker)
- WS 50-year (solid blue line with 'x' marker)
- EG 10-year (dotted green line with 'x' marker)
- WS 10-year (solid blue line with 'x' marker)
- Crit 500-year (dotted red line with 'x' marker)
- Crit 100-year (dotted red line with 'x' marker)
- Crit 50-year (dotted red line with 'x' marker)
- Crit 10-year (dotted red line with 'x' marker)
- 2 ft/s (yellow bar)
- 4 ft/s (light green bar)
- 6 ft/s (medium green bar)
- 8 ft/s (dark green bar)
- 10 ft/s (teal bar)
- 12 ft/s (dark teal bar)
- 14 ft/s (dark blue bar)
- Ground (black square marker)
- Ineff (green triangle marker)
- Bank Sta (red circle marker)

SouthAveBridge Plan: DupEffect 7/8/2016

RS = 2900 BR

.036

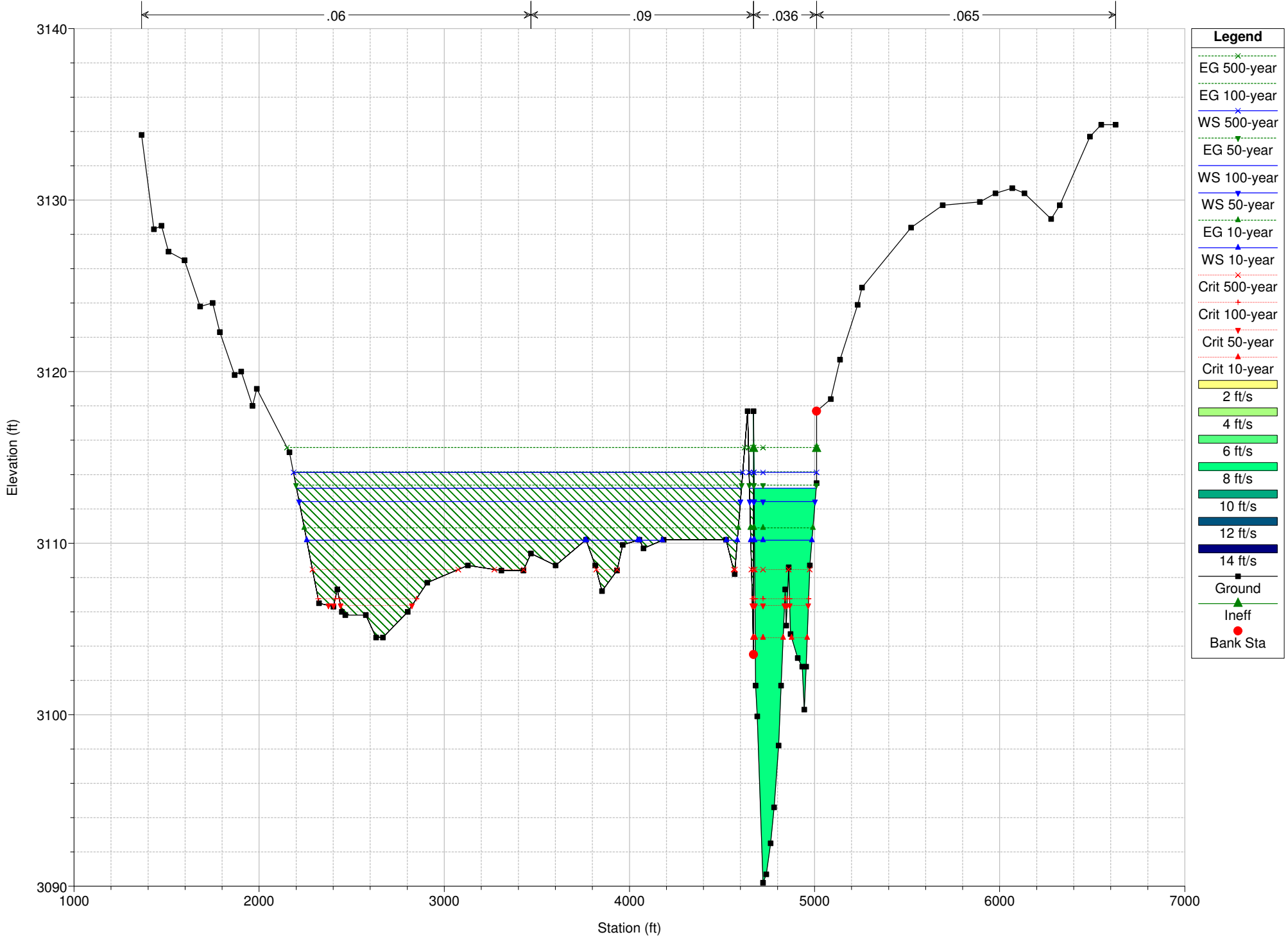


Legend

- EG 500-year
- EG 100-year
- WS 500-year
- EG 50-year
- WS 100-year
- WS 50-year
- EG 10-year
- WS 10-year
- Crit 500-year
- Crit 100-year
- Crit 50-year
- Crit 10-year
- 2 ft/s
- 4 ft/s
- 6 ft/s
- 8 ft/s
- 10 ft/s
- 12 ft/s
- 14 ft/s
- Ground
- Ineff
- Bank Sta

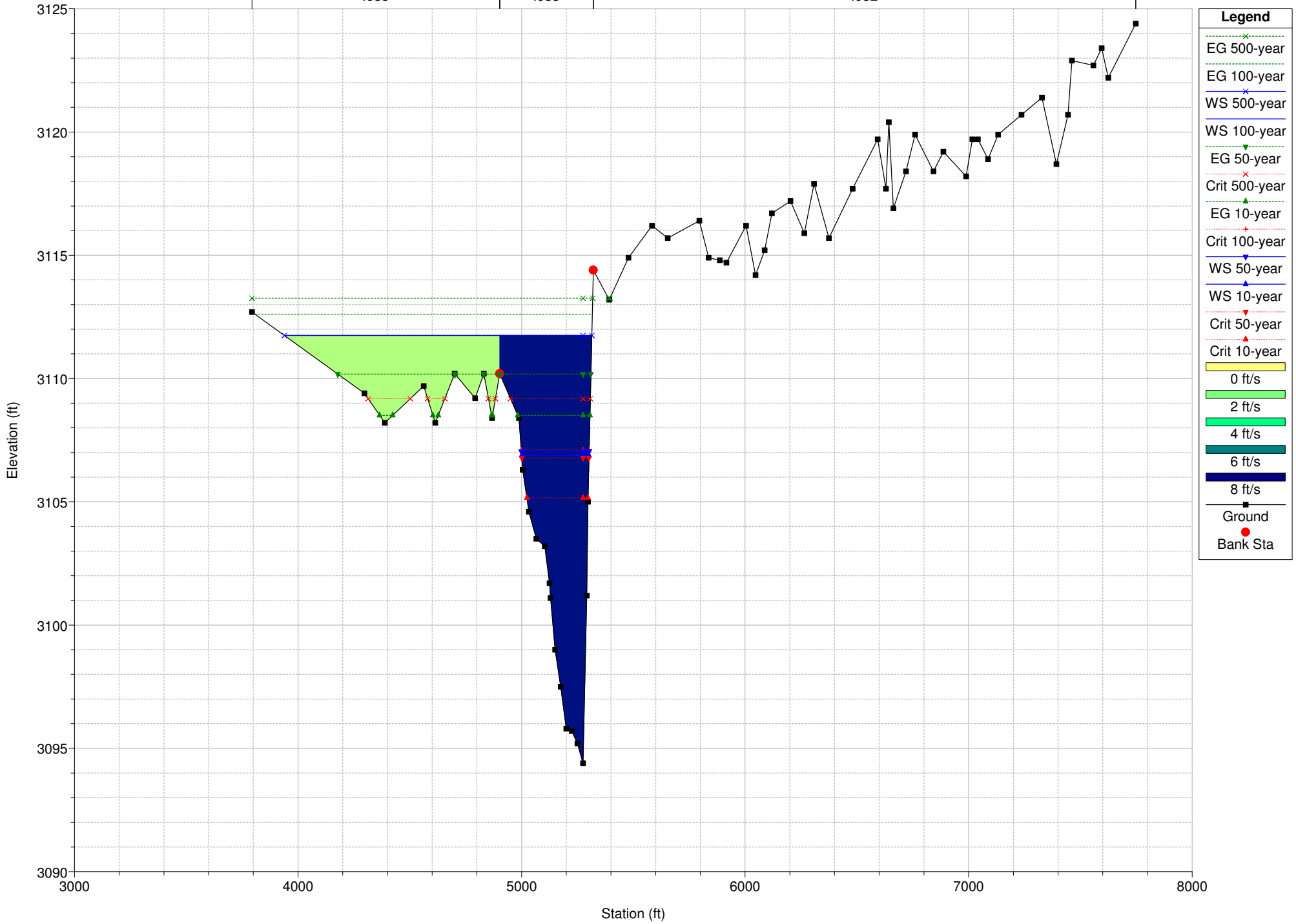
SouthAveBridge Plan: DupEffect 7/8/2016

RS = 2864.989 HEC2 Sta 500.72, FEMA XS 'B'



SouthAveBridge Plan: DupEffect 7/8/2016

RS = 1836.717 HEC2 Sta 0.52, FEMA XS 'A'



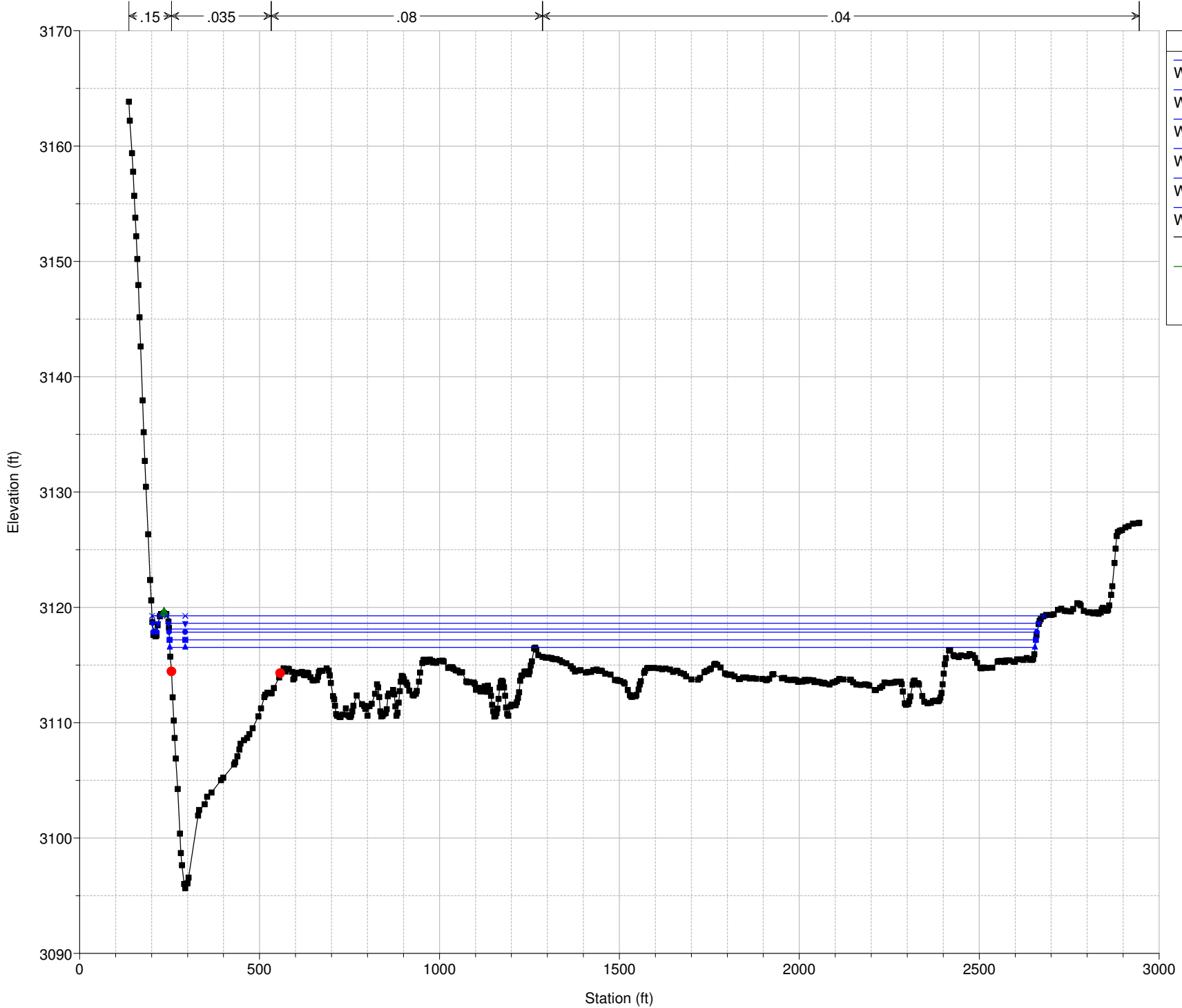
Legend	
EG 500-year	Green dashed line with 'x' marker
EG 100-year	Blue dashed line with 'x' marker
WS 500-year	Blue solid line with square marker
WS 100-year	Blue solid line with square marker
EG 50-year	Green dashed line with 'v' marker
Crit 500-year	Red dashed line with 'x' marker
EG 10-year	Green dashed line with 'v' marker
Crit 100-year	Red dashed line with 'x' marker
WS 50-year	Blue solid line with square marker
WS 10-year	Blue solid line with square marker
Crit 50-year	Red dashed line with 'v' marker
Crit 10-year	Red dashed line with 'v' marker
0 ft/s	Yellow bar
2 ft/s	Light green bar
4 ft/s	Medium green bar
6 ft/s	Dark green bar
8 ft/s	Dark blue bar
Ground	Black line with square marker
Bank Sta	Red circle marker

Appendix H – Existing Conditions HEC-RAS Model Output Files

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)	
1	4371	Max WS	ExistAlt1_100yr	28083.96	3100.96	3115.37		3115.53	0.000544	3.60	9196.20	1327.77	0.18
1	4371	Max WS	ExistAlt1_010yr	20388.31	3100.96	3114.16		3114.29	0.000491	3.19	7602.88	1325.53	0.17
1	4371	Max WS	ExistAlt1_200yr	30879.20	3100.96	3115.71		3115.89	0.000570	3.75	9659.86	1328.35	0.19
1	4371	Max WS	ExistAlt1_500yr	34792.60	3100.96	3116.17		3116.36	0.000603	3.95	10264.21	1329.10	0.19
1	4371	Max WS	ExistAlt1_025yr	23377.93	3100.96	3114.68		3114.82	0.000509	3.34	8284.40	1326.64	0.17
1	4371	Max WS	ExistAlt1_050yr	26678.50	3100.96	3115.17		3115.33	0.000533	3.52	8941.44	1327.46	0.18
1	4549			Lat Struct									
1	4726	Max WS	ExistAlt1_100yr	29718.91	3101.29	3115.44		3115.70	0.000446	4.74	9162.65	1534.91	0.24
1	4726	Max WS	ExistAlt1_010yr	20751.72	3101.29	3114.25		3114.45	0.000370	4.04	7339.54	1531.83	0.21
1	4726	Max WS	ExistAlt1_200yr	32984.59	3101.29	3115.79		3116.07	0.000475	4.99	9695.70	1535.94	0.25
1	4726	Max WS	ExistAlt1_500yr	37569.83	3101.29	3116.24		3116.55	0.000514	5.31	10388.62	1537.37	0.26
1	4726	Max WS	ExistAlt1_025yr	24210.67	3101.29	3114.76		3114.98	0.000398	4.32	8119.62	1533.13	0.22
1	4726	Max WS	ExistAlt1_050yr	28071.04	3101.29	3115.25		3115.50	0.000431	4.62	8871.16	1534.42	0.23
1	4872			Lat Struct									
1	5061	Max WS	ExistAlt1_100yr	31248.51	3101.66	3115.58		3115.88	0.000782	5.05	8903.30	1536.06	0.26
1	5061	Max WS	ExistAlt1_010yr	20891.42	3101.66	3114.39		3114.61	0.000625	4.20	7075.87	1521.26	0.23
1	5061	Max WS	ExistAlt1_200yr	35130.45	3101.66	3115.93		3116.25	0.000845	5.35	9434.85	1536.91	0.27
1	5061	Max WS	ExistAlt1_500yr	40611.96	3101.66	3116.38		3116.75	0.000930	5.75	10122.13	1538.03	0.29
1	5061	Max WS	ExistAlt1_025yr	24769.03	3101.66	3114.90		3115.15	0.000679	4.52	7859.46	1534.30	0.24
1	5061	Max WS	ExistAlt1_050yr	29294.39	3101.66	3115.39		3115.67	0.000751	4.89	8611.59	1535.60	0.25
1	5070.73	Max WS	ExistAlt1_100yr	31257.03	3101.65	3115.52		3115.90	0.000954	5.56	7785.15	1428.99	0.29
1	5070.73	Max WS	ExistAlt1_010yr	20890.31	3101.65	3114.36		3114.62	0.000715	4.49	6174.08	1262.10	0.24
1	5070.73	Max WS	ExistAlt1_200yr	35142.55	3101.65	3115.86		3116.28	0.001044	5.92	8267.87	1443.76	0.30
1	5070.73	Max WS	ExistAlt1_500yr	40632.88	3101.65	3116.29		3116.78	0.001163	6.40	8896.81	1454.03	0.32
1	5070.73	Max WS	ExistAlt1_025yr	24769.41	3101.65	3114.86		3115.17	0.000804	4.91	6847.74	1397.47	0.26
1	5070.73	Max WS	ExistAlt1_050yr	29299.69	3101.65	3115.34		3115.70	0.000910	5.37	7521.25	1423.02	0.28
1	5115.73	Max WS	ExistAlt1_100yr	31371.08	3101.62	3115.52		3115.97	0.001150	5.95	7472.42	1483.38	0.30
1	5115.73	Max WS	ExistAlt1_010yr	20891.03	3101.62	3114.37		3114.67	0.000823	4.71	5945.29	1089.44	0.25
1	5115.73	Max WS	ExistAlt1_200yr	35324.92	3101.62	3115.85		3116.36	0.001268	6.36	7970.01	1505.46	0.32
1	5115.73	Max WS	ExistAlt1_500yr	40906.39	3101.62	3116.28		3116.86	0.001422	6.89	8619.53	1515.86	0.34
1	5115.73	Max WS	ExistAlt1_025yr	24792.91	3101.62	3114.86		3115.22	0.000945	5.19	6552.48	1343.10	0.27
1	5115.73	Max WS	ExistAlt1_050yr	29387.09	3101.62	3115.34		3115.76	0.001089	5.73	7203.23	1448.64	0.29
1	5120			Lat Struct									
1	5125	Max WS	ExistAlt1_100yr	31390.27	3101.61	3115.56		3115.97	0.001072	5.76	7951.41	1601.23	0.29
1	5125	Max WS	ExistAlt1_010yr	20892.06	3101.61	3114.38		3114.67	0.000798	4.64	6201.77	1351.81	0.25
1	5125	Max WS	ExistAlt1_200yr	35349.21	3101.61	3115.90		3116.35	0.001167	6.12	8502.13	1609.34	0.31
1	5125	Max WS	ExistAlt1_500yr	40946.92	3101.61	3116.35		3116.86	0.001287	6.58	9218.90	1611.61	0.32
1	5125	Max WS	ExistAlt1_025yr	24795.93	3101.61	3114.89		3115.22	0.000897	5.07	6922.88	1489.86	0.27
1	5125	Max WS	ExistAlt1_050yr	29399.24	3101.61	3115.37		3115.76	0.001018	5.56	7656.58	1583.41	0.28
1	5150			Lat Struct									
1	5230	Max WS	ExistAlt1_100yr	31800.63	3101.79	3115.64		3116.06	0.000710	5.87	8393.72	1979.93	0.30
1	5230	Max WS	ExistAlt1_010yr	20899.79	3101.79	3114.42		3114.75	0.000577	4.94	5698.27	1454.07	0.26
1	5230	Max WS	ExistAlt1_200yr	35997.15	3101.79	3115.98		3116.46	0.000798	6.34	9000.05	2004.43	0.32
1	5230	Max WS	ExistAlt1_500yr	41998.73	3101.79	3116.41		3116.98	0.000925	6.98	9786.78	2058.51	0.34
1	5230	Max WS	ExistAlt1_025yr	24899.55	3101.79	3114.95		3115.36	0.000668	5.48	6215.34	1636.47	0.28
1	5230	Max WS	ExistAlt1_050yr	29699.57	3101.79	3115.46		3115.85	0.000667	5.63	8068.07	1913.01	0.29
1	5385	Max WS	ExistAlt1_100yr	31798.11	3101.66	3115.75		3116.16	0.000680	5.78	8514.36	2127.20	0.29
1	5385	Max WS	ExistAlt1_010yr	20899.49	3101.66	3114.52		3114.83	0.000517	4.69	5833.62	1471.81	0.25
1	5385	Max WS	ExistAlt1_200yr	36000.11	3101.66	3116.10		3116.57	0.000752	6.19	9235.79	2158.59	0.31
1	5385	Max WS	ExistAlt1_500yr	41997.39	3101.66	3116.56		3117.10	0.000850	6.75	10166.42	2175.66	0.33
1	5385	Max WS	ExistAlt1_025yr	24898.73	3101.66	3115.03		3115.39	0.000602	5.22	6387.89	1918.61	0.27
1	5385	Max WS	ExistAlt1_050yr	29698.60	3101.66	3115.55		3115.94	0.000644	5.56	8119.12	2114.88	0.29
1	6087	Max WS	ExistAlt1_100yr	31798.32	3102.08	3116.29		3116.83	0.001150	6.57	7033.85	1657.30	0.34
1	6087	Max WS	ExistAlt1_010yr	20899.85	3102.08	3114.92		3115.32	0.000827	5.38	5156.66	976.90	0.29
1	6087	Max WS	ExistAlt1_200yr	35999.73	3102.08	3116.71		3117.29	0.001246	6.90	7806.74	1927.63	0.35
1	6087	Max WS	ExistAlt1_500yr	41999.64	3102.08	3117.27		3117.89	0.001351	7.26	8906.58	2014.69	0.36
1	6087	Max WS	ExistAlt1_025yr	24899.87	3102.08	3115.50		3115.96	0.000964	5.89	5659.00	1318.62	0.31
1	6087	Max WS	ExistAlt1_050yr	29698.97	3102.08	3116.06		3116.58	0.001099	6.38	6658.77	1619.17	0.33
1	6550	Max WS	ExistAlt1_100yr	31799.85	3102.37	3116.74		3117.27	0.000872	6.50	8189.65	1780.90	0.33
1	6550	Max WS	ExistAlt1_010yr	20899.09	3102.37	3115.28		3115.64	0.000655	5.17	6215.54	1045.53	0.28
1	6550	Max WS	ExistAlt1_200yr	35998.77	3102.37	3117.19		3117.77	0.000933	6.90	9005.85	1891.27	0.35
1	6550	Max WS	ExistAlt1_500yr	42000.19	3102.37	3117.76		3118.41	0.001007	7.38	10117.80	2022.59	0.36
1	6550	Max WS	ExistAlt1_025yr	24899.99	3102.37	3115.91		3116.33	0.000730	5.67	6839.60	1314.32	0.30
1	6550	Max WS	ExistAlt1_050yr	29700.33	3102.37	3116.50		3116.99	0.000819	6.22	7781.67	1583.05	0.32
1	7262	Max WS	ExistAlt1_100yr	31800.79	3101.11	3117.33		3117.61	0.000519	5.27	12902.01	2510.60	0.26

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)	
1	7262	Max WS	ExistAlt1_010yr	20900.79	3101.11	3115.72		3115.95	0.000460	4.54	9295.19	2015.98	0.24
1	7262	Max WS	ExistAlt1_200yr	36000.27	3101.11	3117.82		3118.12	0.000541	5.52	14195.75	2715.68	0.27
1	7262	Max WS	ExistAlt1_500yr	42000.67	3101.11	3118.45		3118.77	0.000566	5.82	15904.51	2748.24	0.27
1	7262	Max WS	ExistAlt1_025yr	24900.42	3101.11	3116.40		3116.65	0.000476	4.80	10666.53	2153.00	0.25
1	7262	Max WS	ExistAlt1_050yr	29701.15	3101.11	3117.06		3117.33	0.000506	5.13	12209.76	2418.43	0.26
1	7435	Max WS	ExistAlt1_100yr	31800.30	3100.79	3117.51		3117.68	0.000358	4.25	13771.16	2293.32	0.21
1	7435	Max WS	ExistAlt1_010yr	20899.15	3100.79	3115.87		3116.03	0.000347	3.82	10084.93	2230.84	0.20
1	7435	Max WS	ExistAlt1_200yr	36000.24	3100.79	3118.01		3118.19	0.000374	4.45	14918.13	2342.64	0.22
1	7435	Max WS	ExistAlt1_500yr	41999.28	3100.79	3118.65		3118.84	0.000392	4.71	16405.50	2494.95	0.22
1	7435	Max WS	ExistAlt1_025yr	24899.97	3100.79	3116.57		3116.72	0.000342	3.94	11633.71	2240.99	0.20
1	7435	Max WS	ExistAlt1_050yr	29697.50	3100.79	3117.24		3117.40	0.000352	4.16	13145.18	2264.64	0.21
1	7977	Max WS	ExistAlt1_100yr	31798.00	3099.02	3117.71		3117.85	0.000336	3.99	14643.46	2547.47	0.19
1	7977	Max WS	ExistAlt1_010yr	20898.61	3099.02	3116.07		3116.21	0.000356	3.75	10468.42	2522.90	0.20
1	7977	Max WS	ExistAlt1_200yr	35997.63	3099.02	3118.22		3118.37	0.000339	4.11	15919.72	2557.98	0.20
1	7977	Max WS	ExistAlt1_500yr	41999.07	3099.02	3118.87		3119.02	0.000348	4.29	17562.67	2577.65	0.20
1	7977	Max WS	ExistAlt1_025yr	24900.00	3099.02	3116.76		3116.89	0.000339	3.80	12213.33	2529.69	0.19
1	7977	Max WS	ExistAlt1_050yr	29698.81	3099.02	3117.44		3117.57	0.000337	3.93	13929.86	2542.90	0.19
1	8519	Max WS	ExistAlt1_100yr	31799.02	3097.10	3117.90		3118.06	0.000516	4.27	12914.61	2495.69	0.21
1	8519	Max WS	ExistAlt1_010yr	20900.27	3097.10	3116.27		3116.45	0.000588	4.17	8877.65	2461.56	0.22
1	8519	Max WS	ExistAlt1_200yr	35998.57	3097.10	3118.41		3118.57	0.000510	4.35	14166.50	2509.15	0.21
1	8519	Max WS	ExistAlt1_500yr	41999.38	3097.10	3119.06		3119.23	0.000509	4.48	15820.78	2532.83	0.21
1	8519	Max WS	ExistAlt1_025yr	24899.84	3097.10	3116.95		3117.12	0.000543	4.16	10553.49	2467.86	0.21
1	8519	Max WS	ExistAlt1_050yr	29699.10	3097.10	3117.62		3117.79	0.000523	4.23	12221.74	2488.62	0.21
1	9114	Max WS	ExistAlt1_100yr	31800.00	3095.66	3118.12		3118.33	0.000452	4.70	12633.58	2426.46	0.24
1	9114	Max WS	ExistAlt1_010yr	20900.00	3095.66	3116.53		3116.74	0.000484	4.47	8777.73	2404.56	0.24
1	9114	Max WS	ExistAlt1_200yr	36000.00	3095.66	3118.63		3118.83	0.000451	4.81	13845.28	2434.81	0.24
1	9114	Max WS	ExistAlt1_500yr	42000.00	3095.66	3119.28		3119.49	0.000456	5.00	15415.12	2461.89	0.24
1	9114	Max WS	ExistAlt1_025yr	24900.00	3095.66	3117.19		3117.39	0.000462	4.53	10363.91	2408.03	0.24
1	9114	Max WS	ExistAlt1_050yr	29700.00	3095.66	3117.85		3118.05	0.000454	4.65	11968.94	2422.73	0.24

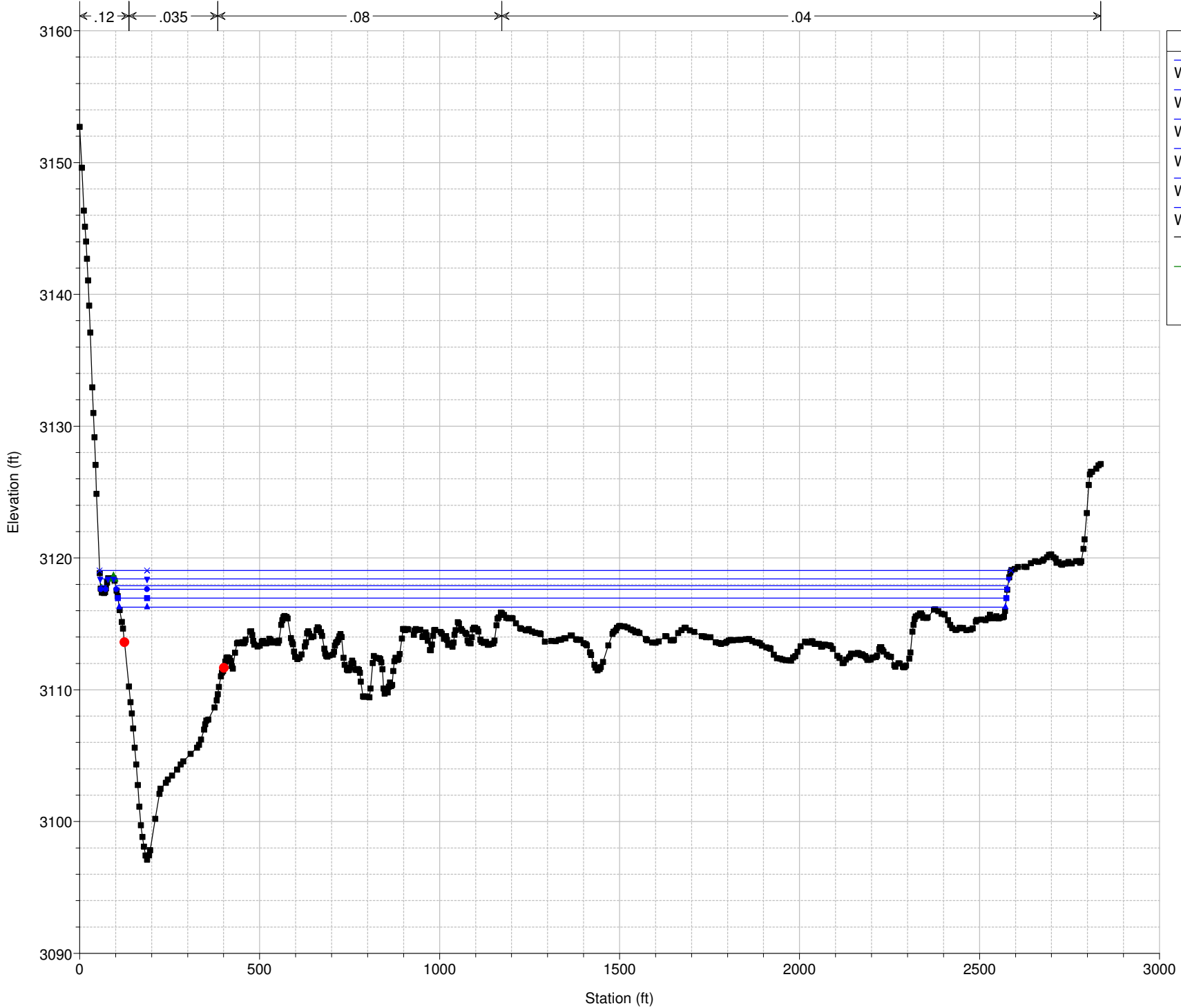
RS = 9114



Legend

- WS Max WS - ExistAlt1_500yr (Blue 'x' symbol)
- WS Max WS - ExistAlt1_200yr (Blue inverted triangle symbol)
- WS Max WS - ExistAlt1_100yr (Blue circle symbol)
- WS Max WS - ExistAlt1_050yr (Blue square symbol)
- WS Max WS - ExistAlt1_025yr (Blue triangle symbol)
- WS Max WS - ExistAlt1_010yr (Blue inverted triangle symbol)
- Ground (Black square symbol)
- Ineff (Green triangle symbol)
- Bank Sta (Red circle symbol)

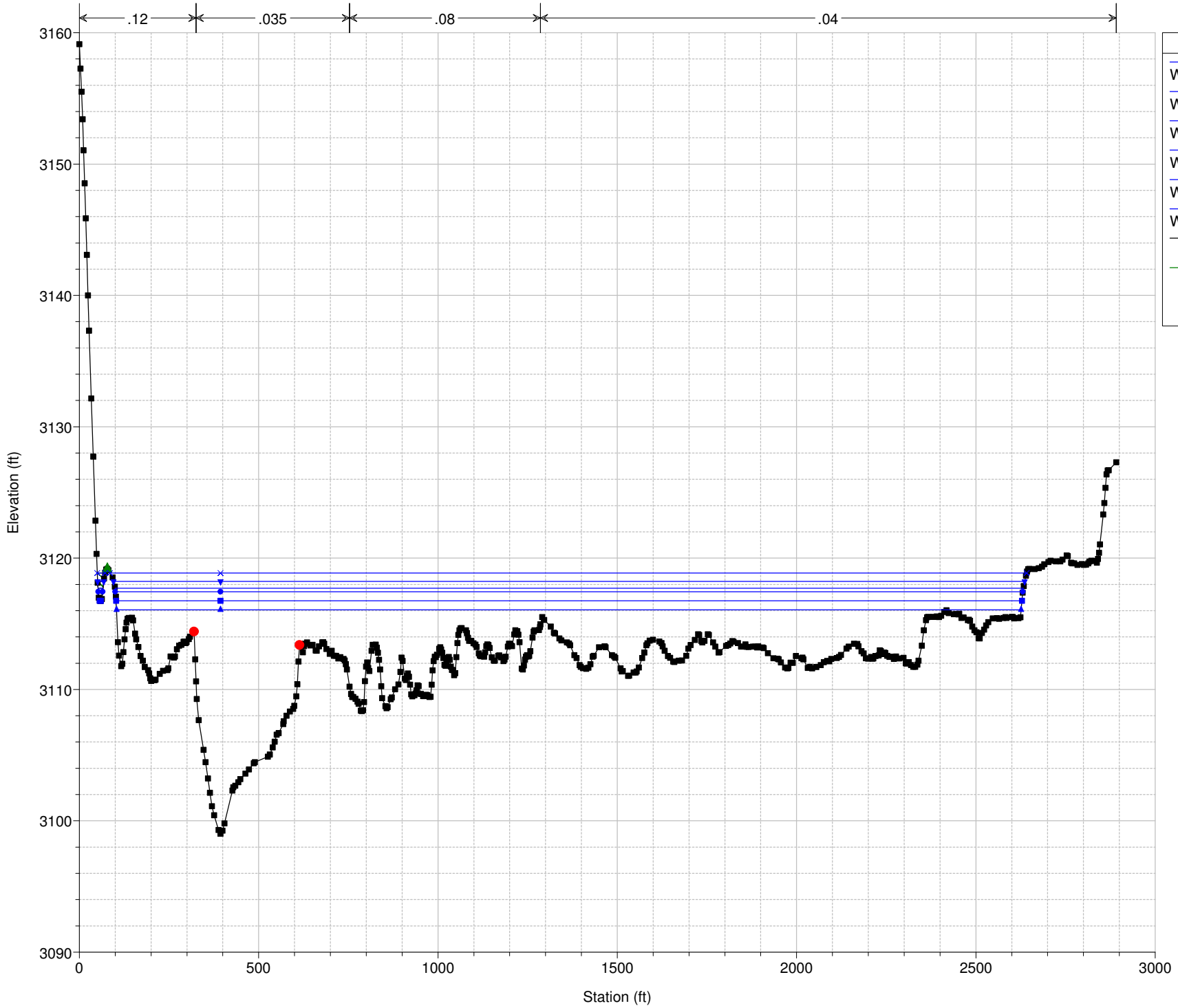
RS = 8519



Legend

- WS Max WS - ExistAlt1_500yr (Blue line with 'x' marker)
- WS Max WS - ExistAlt1_200yr (Blue line with downward triangle marker)
- WS Max WS - ExistAlt1_100yr (Blue line with upward triangle marker)
- WS Max WS - ExistAlt1_050yr (Blue line with circle marker)
- WS Max WS - ExistAlt1_025yr (Blue line with square marker)
- WS Max WS - ExistAlt1_010yr (Blue line with upward triangle marker)
- Ground (Black line with square marker)
- Ineff (Green line with upward triangle marker)
- Bank Sta (Red line with circle marker)

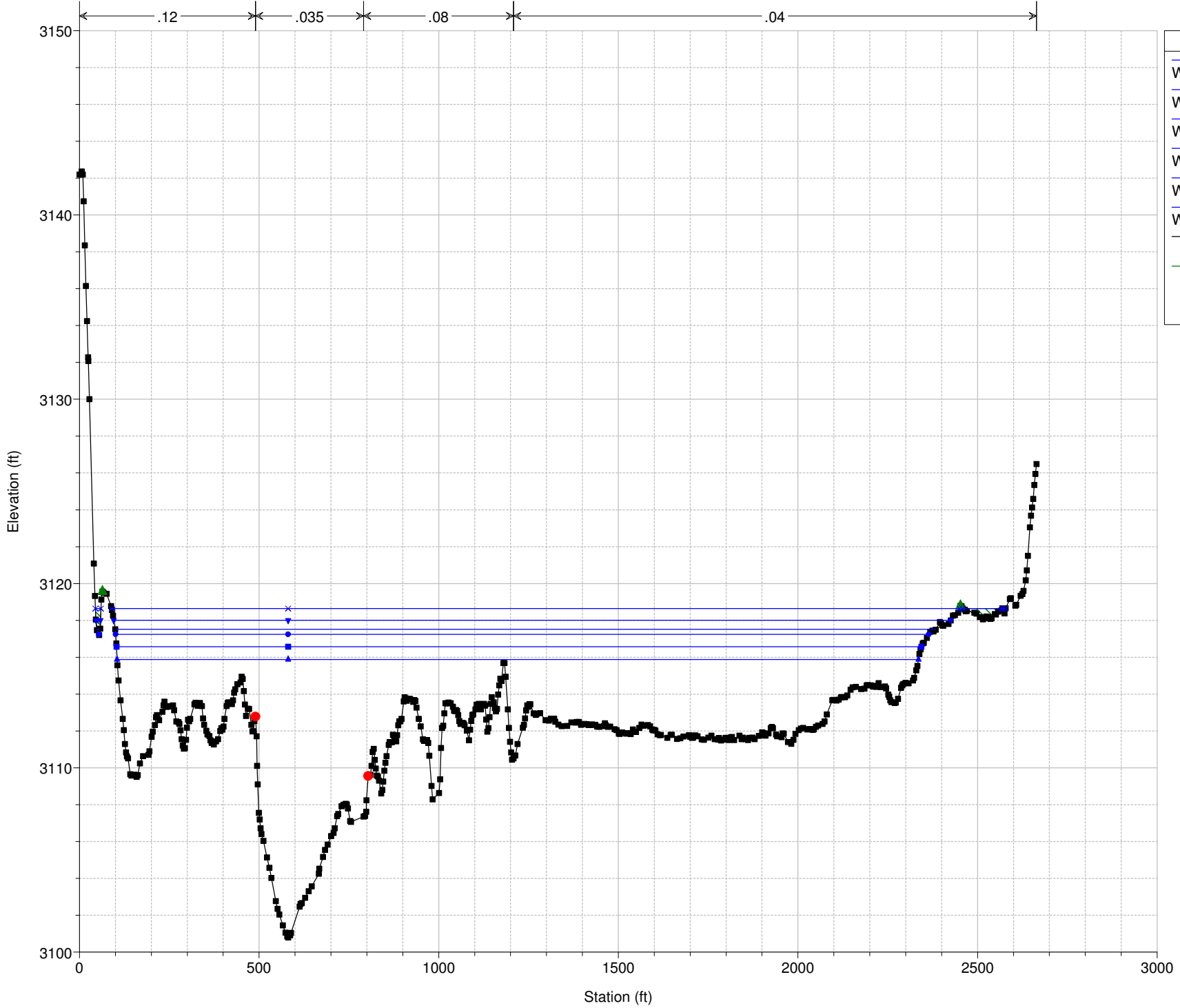
RS = 7977



Legend

- WS Max WS - ExistAlt1_500yr (blue line with x marker)
- WS Max WS - ExistAlt1_200yr (blue line with triangle marker)
- WS Max WS - ExistAlt1_100yr (blue line with circle marker)
- WS Max WS - ExistAlt1_050yr (blue line with square marker)
- WS Max WS - ExistAlt1_025yr (blue line with triangle marker)
- WS Max WS - ExistAlt1_010yr (blue line with triangle marker)
- Ground (black line with square marker)
- Ineff (green line with triangle marker)
- Bank Sta (red line with circle marker)

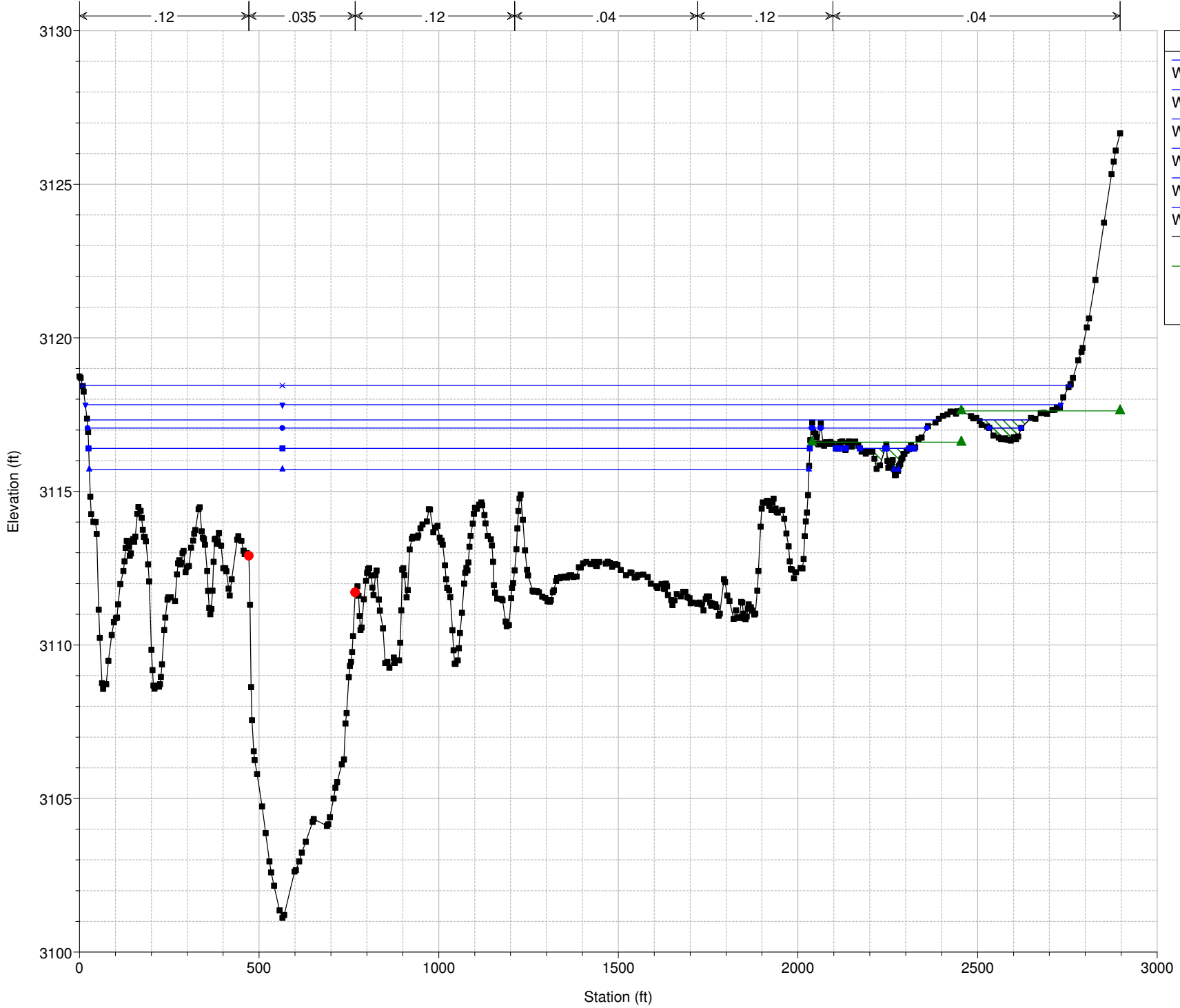
RS = 7435



Legend	
WS Max WS - ExistAlt1_500yr	x
WS Max WS - ExistAlt1_200yr	▼
WS Max WS - ExistAlt1_100yr	●
WS Max WS - ExistAlt1_050yr	■
WS Max WS - ExistAlt1_025yr	▲
WS Max WS - ExistAlt1_010yr	▲
Ground	■
Ineff	▲
Bank Sta	●



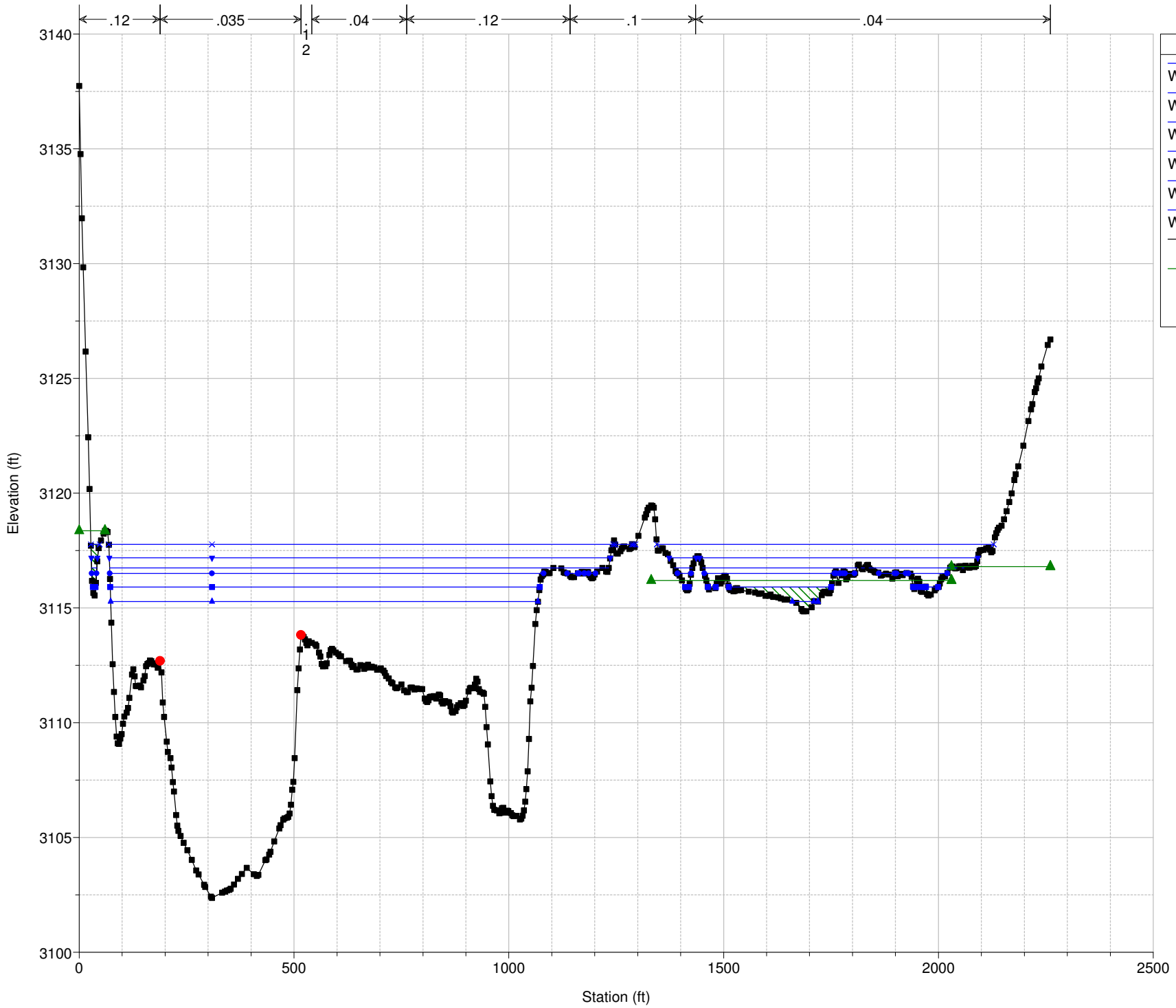
RS = 7262



Legend

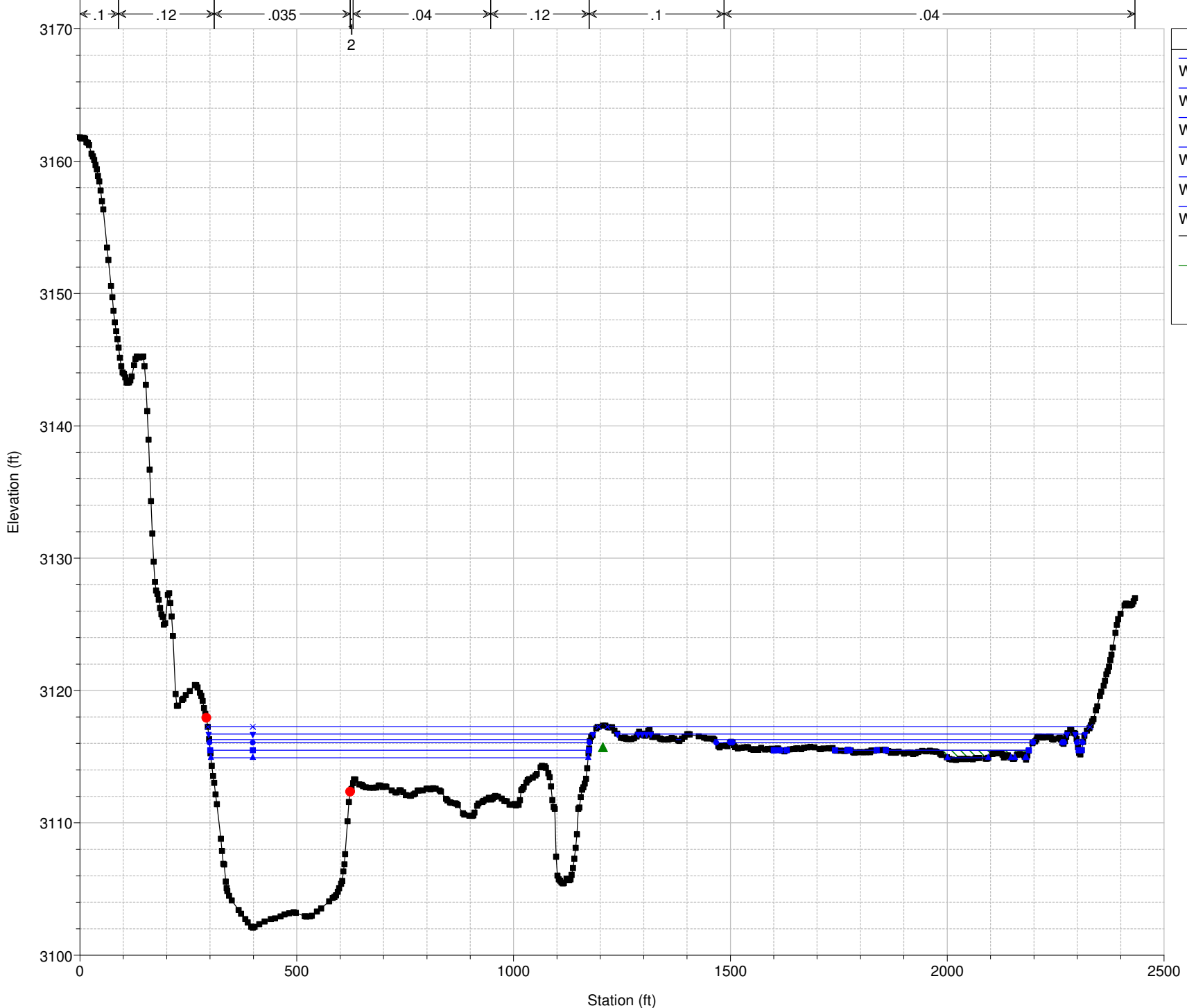
- WS Max WS - ExistAlt1_500yr (Blue line with 'x' marker)
- WS Max WS - ExistAlt1_200yr (Blue line with inverted triangle marker)
- WS Max WS - ExistAlt1_100yr (Blue line with circle marker)
- WS Max WS - ExistAlt1_050yr (Blue line with square marker)
- WS Max WS - ExistAlt1_025yr (Blue line with triangle marker)
- WS Max WS - ExistAlt1_010yr (Blue line with inverted triangle marker)
- Ground (Black line with square marker)
- Ineff (Green line with triangle marker)
- Bank Sta (Red circle marker)

RS = 6550



Legend	
WS Max WS - ExistAlt1_500yr	x
WS Max WS - ExistAlt1_200yr	▼
WS Max WS - ExistAlt1_100yr	●
WS Max WS - ExistAlt1_050yr	■
WS Max WS - ExistAlt1_025yr	▲
WS Max WS - ExistAlt1_010yr	▲
Ground	■
Ineff	▲
Bank Sta	●

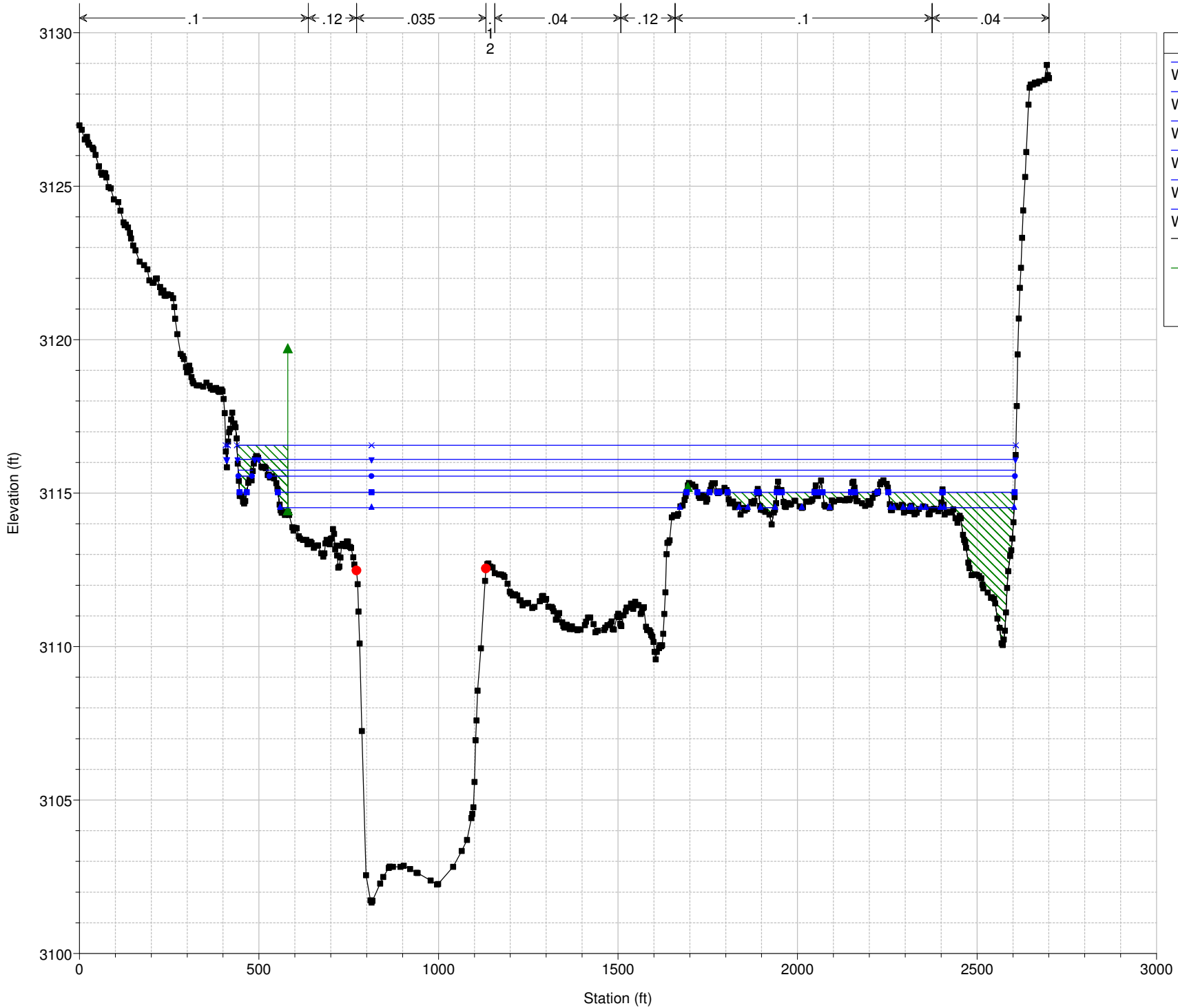
RS = 6087



Legend

- WS Max WS - ExistAlt1_500yr (Blue cross)
- WS Max WS - ExistAlt1_200yr (Blue inverted triangle)
- WS Max WS - ExistAlt1_100yr (Blue circle)
- WS Max WS - ExistAlt1_050yr (Blue square)
- WS Max WS - ExistAlt1_025yr (Blue triangle)
- WS Max WS - ExistAlt1_010yr (Blue inverted triangle)
- Ground (Thick black line)
- Ineff (Green triangle)
- Bank Sta (Red circle)

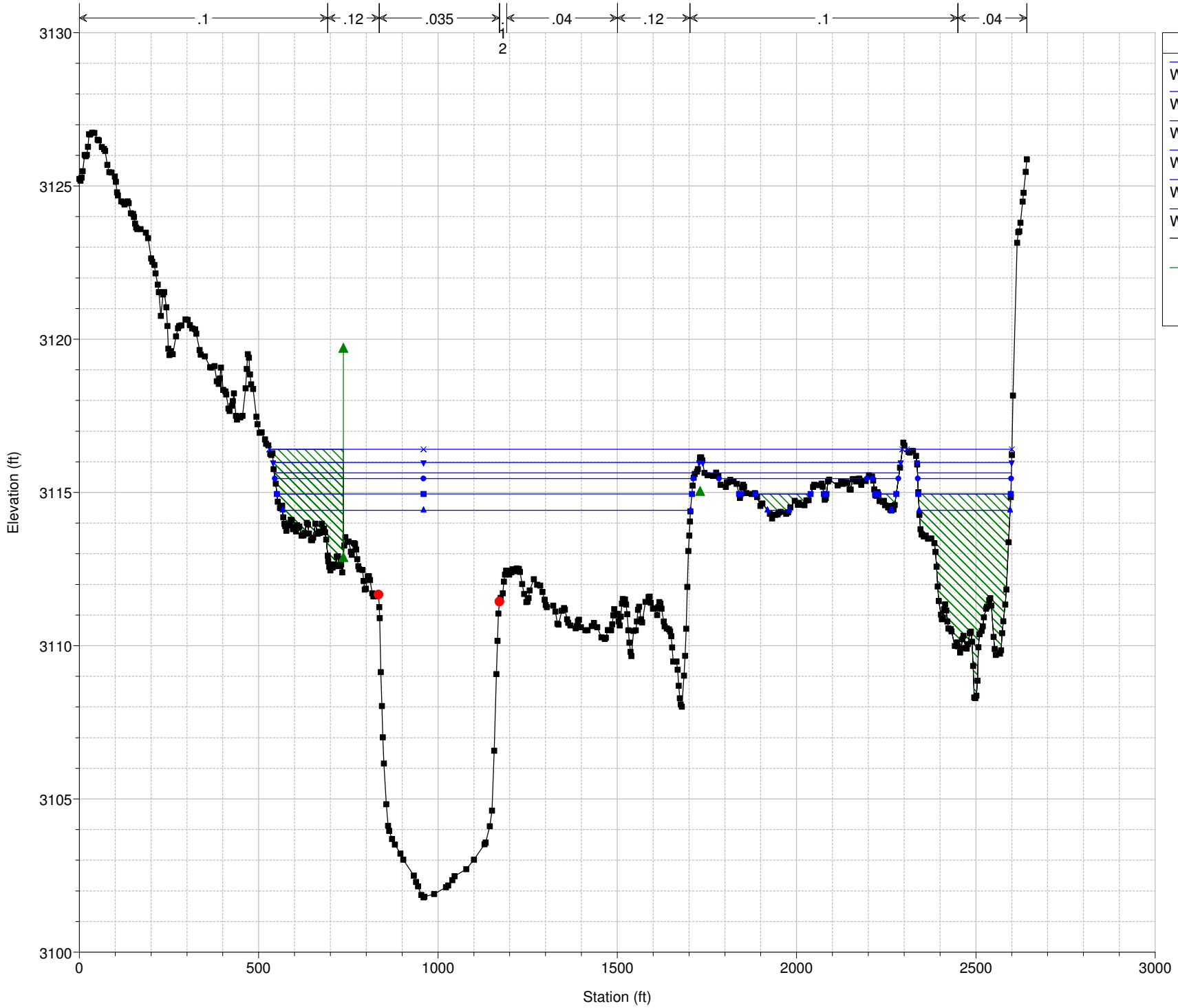
RS = 5385



Legend

- WS Max WS - ExistAlt1_500yr
- WS Max WS - ExistAlt1_200yr
- WS Max WS - ExistAlt1_100yr
- WS Max WS - ExistAlt1_050yr
- WS Max WS - ExistAlt1_025yr
- WS Max WS - ExistAlt1_010yr
- Ground
- Ineff
- Bank Sta

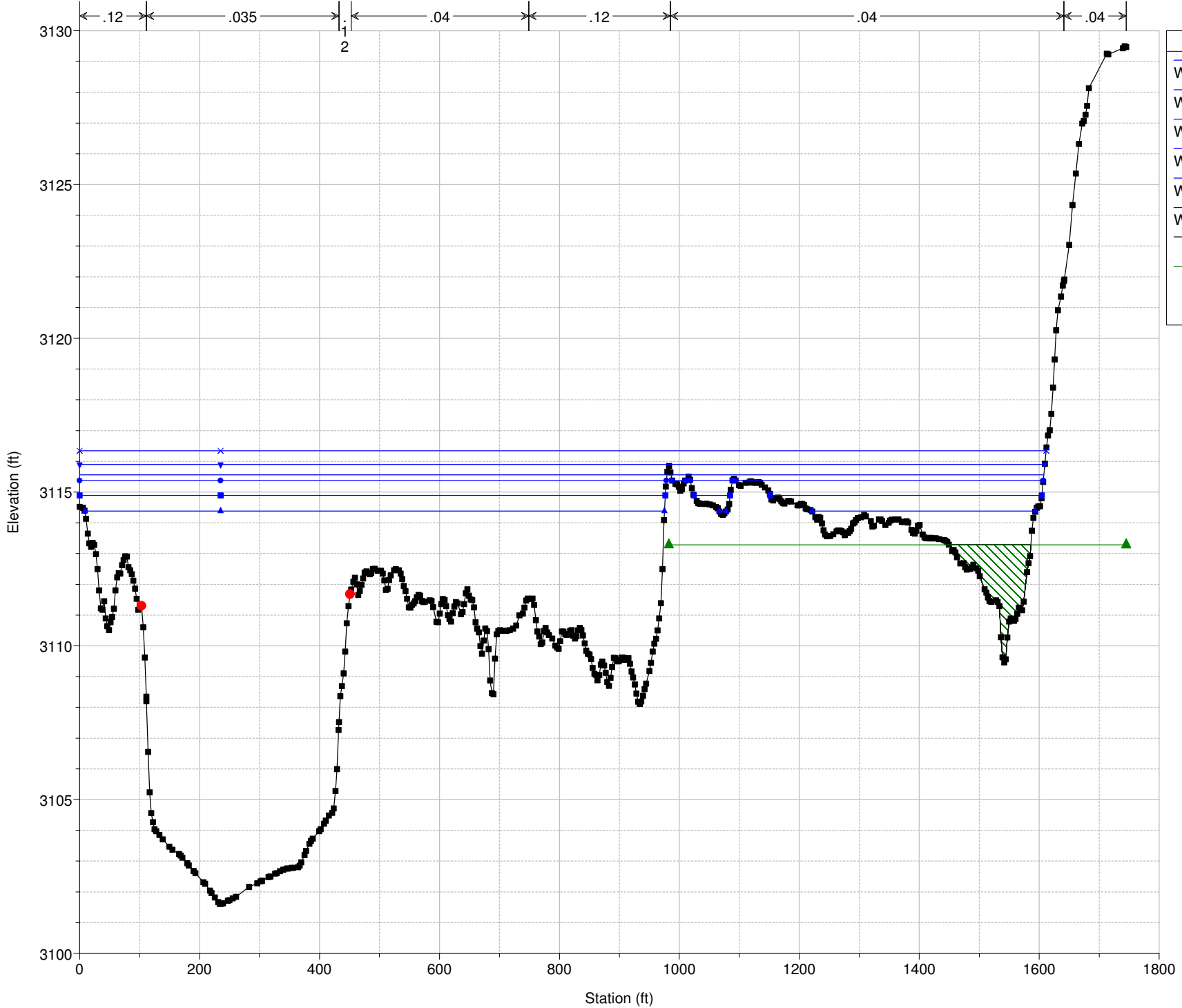
RS = 5230



Legend

- WS Max WS - ExistAlt1_500yr (x)
- WS Max WS - ExistAlt1_200yr (v)
- WS Max WS - ExistAlt1_100yr (o)
- WS Max WS - ExistAlt1_050yr (■)
- WS Max WS - ExistAlt1_025yr (▲)
- WS Max WS - ExistAlt1_010yr (△)
- Ground (black line with squares)
- Ineff (green triangle with arrow)
- Bank Sta (red circle)

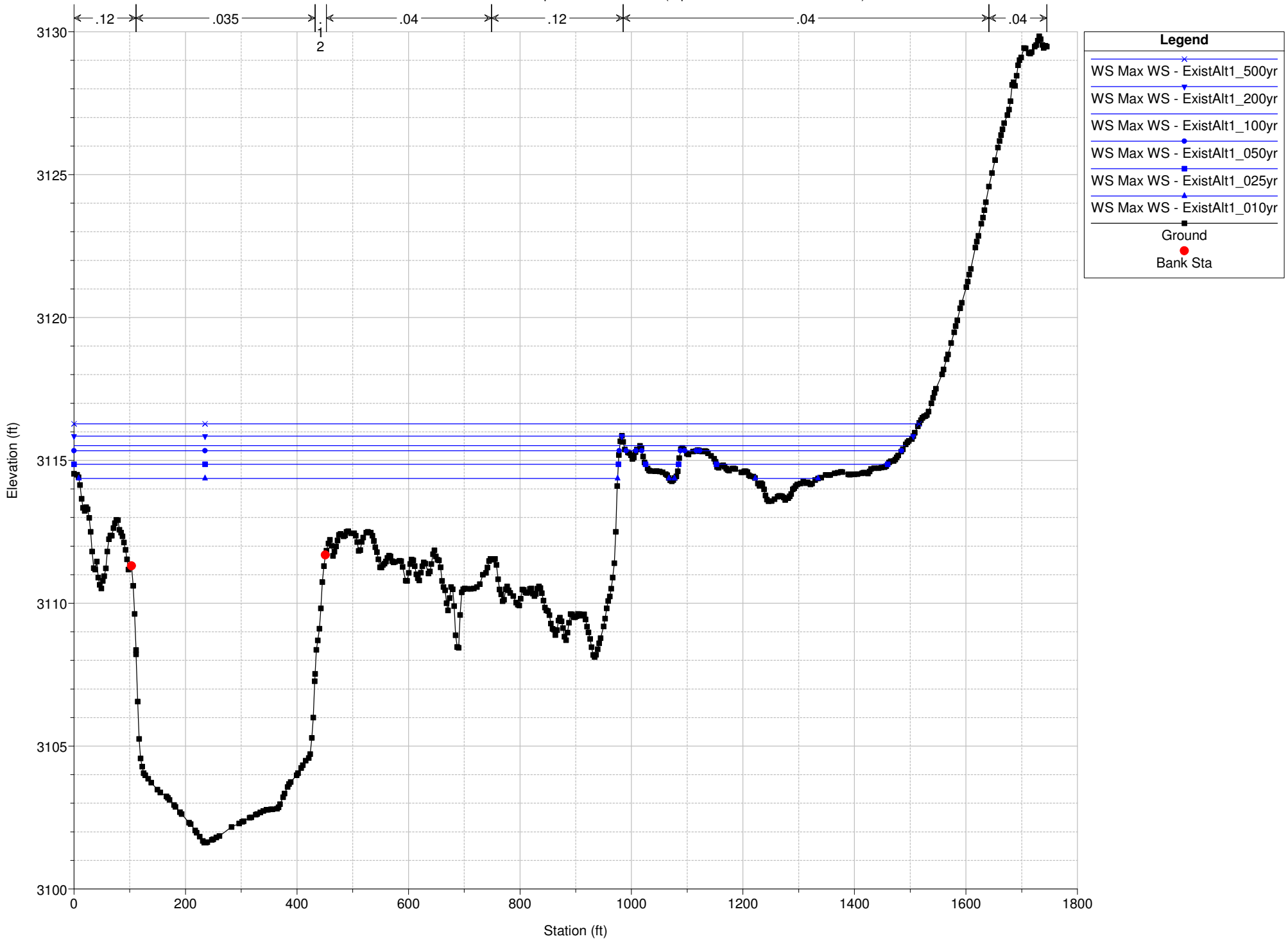
RS = 5125



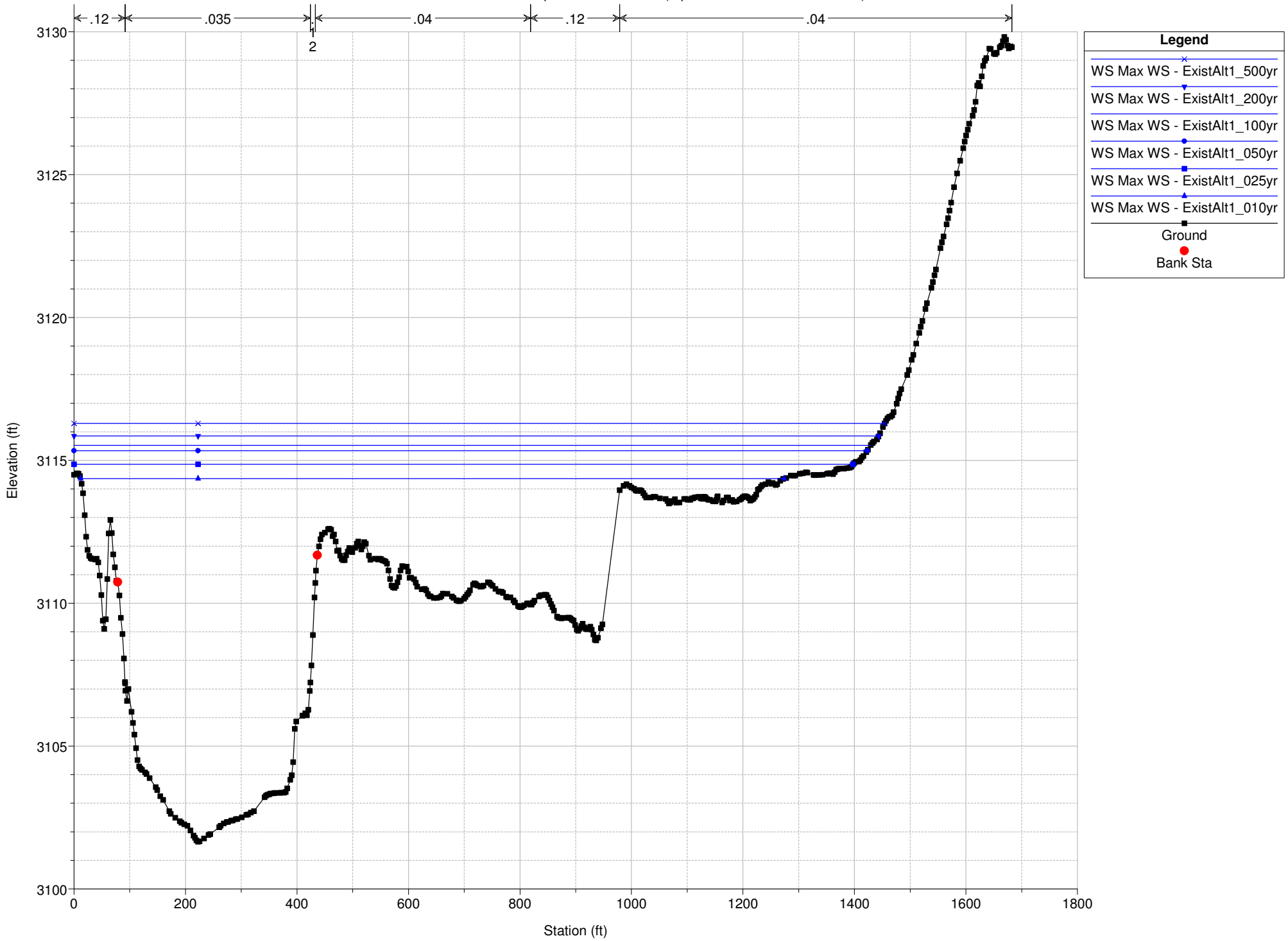
Legend

- WS Max WS - ExistAlt1_500yr (Blue line with 'x' marker)
- WS Max WS - ExistAlt1_200yr (Blue line with inverted triangle marker)
- WS Max WS - ExistAlt1_100yr (Blue line with circle marker)
- WS Max WS - ExistAlt1_050yr (Blue line with square marker)
- WS Max WS - ExistAlt1_025yr (Blue line with triangle marker)
- WS Max WS - ExistAlt1_010yr (Blue line with inverted triangle marker)
- Ground (Black line with square marker)
- Ineff (Green line with triangle marker)
- Bank Sta (Red circle marker)

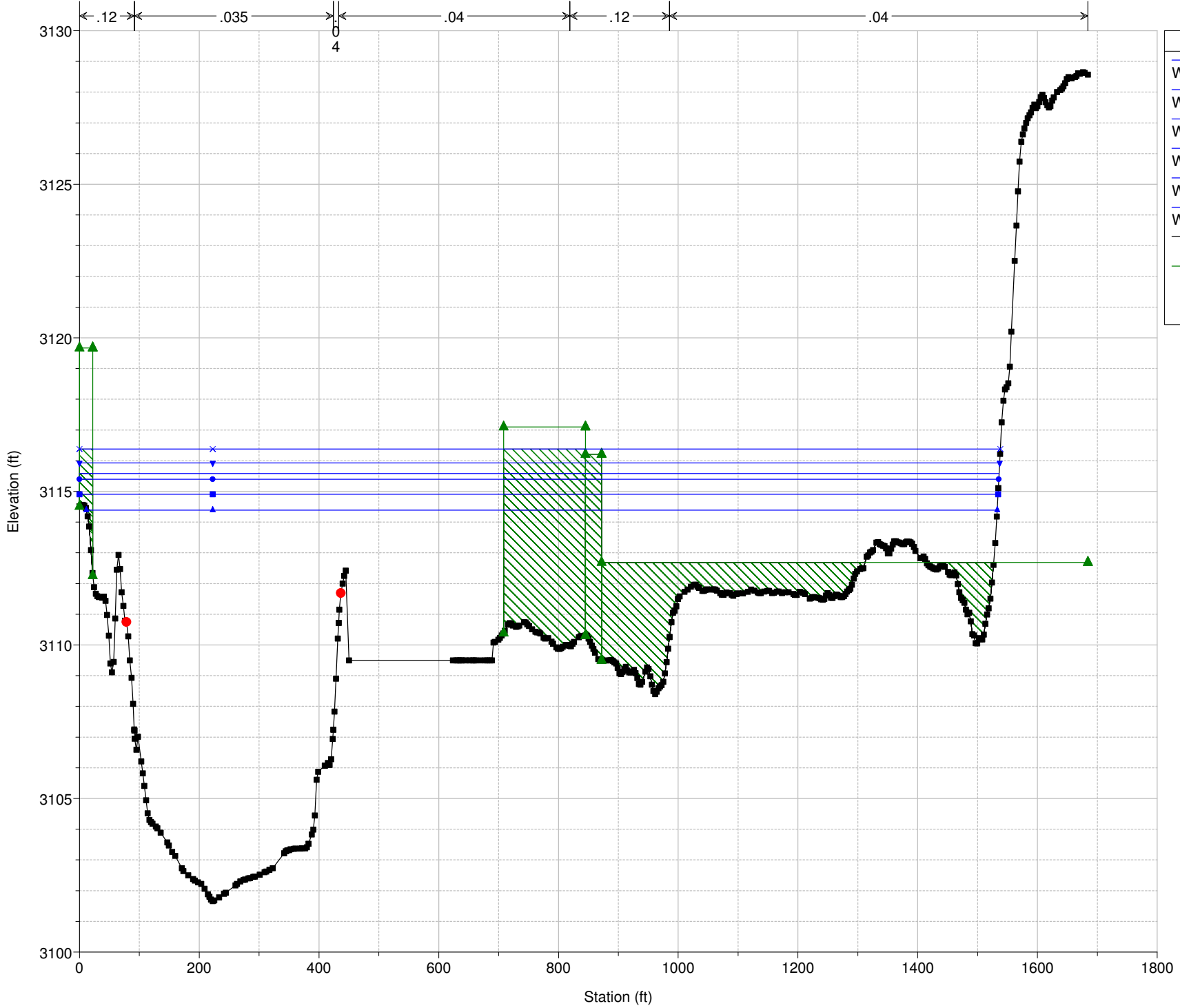
RS = 5115.73 Copied from Sta 5125 (represents internal road section)



RS = 5070.73 Copied from Sta 5061 (represents internal road section)



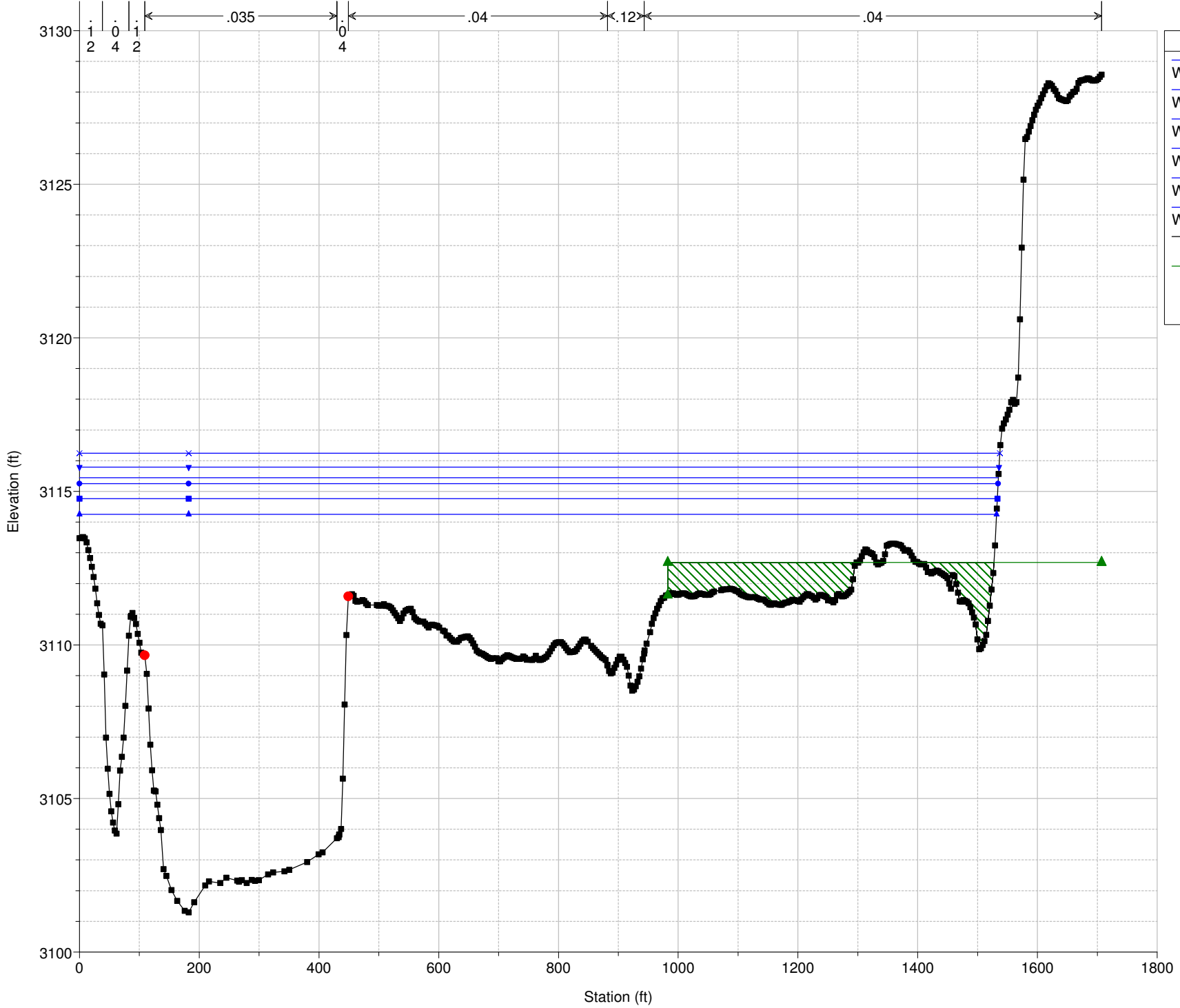
RS = 5061



Legend

- WS Max WS - ExistAlt1_500yr (blue 'x')
- WS Max WS - ExistAlt1_200yr (blue inverted triangle)
- WS Max WS - ExistAlt1_100yr (blue circle)
- WS Max WS - ExistAlt1_050yr (blue square)
- WS Max WS - ExistAlt1_025yr (blue triangle)
- WS Max WS - ExistAlt1_010yr (blue inverted triangle)
- Ground (black line with square)
- Ineff (green hatched area)
- Bank Sta (red circle)

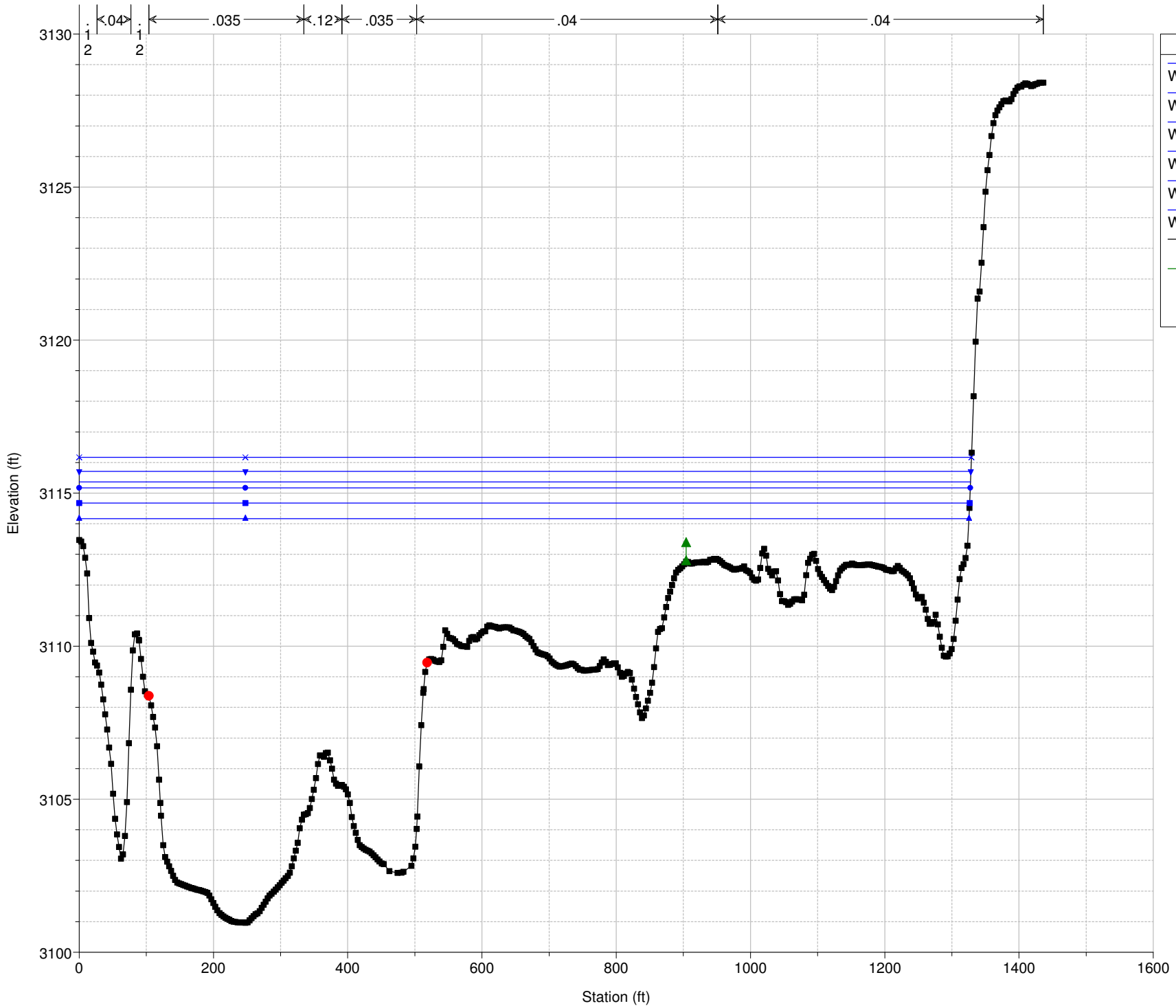
RS = 4726



Legend

- WS Max WS - ExistAlt1_500yr (x)
- WS Max WS - ExistAlt1_200yr (▽)
- WS Max WS - ExistAlt1_100yr (●)
- WS Max WS - ExistAlt1_050yr (■)
- WS Max WS - ExistAlt1_025yr (▲)
- WS Max WS - ExistAlt1_010yr (▽)
- Ground (■)
- Ineff (▲)
- Bank Sta (●)

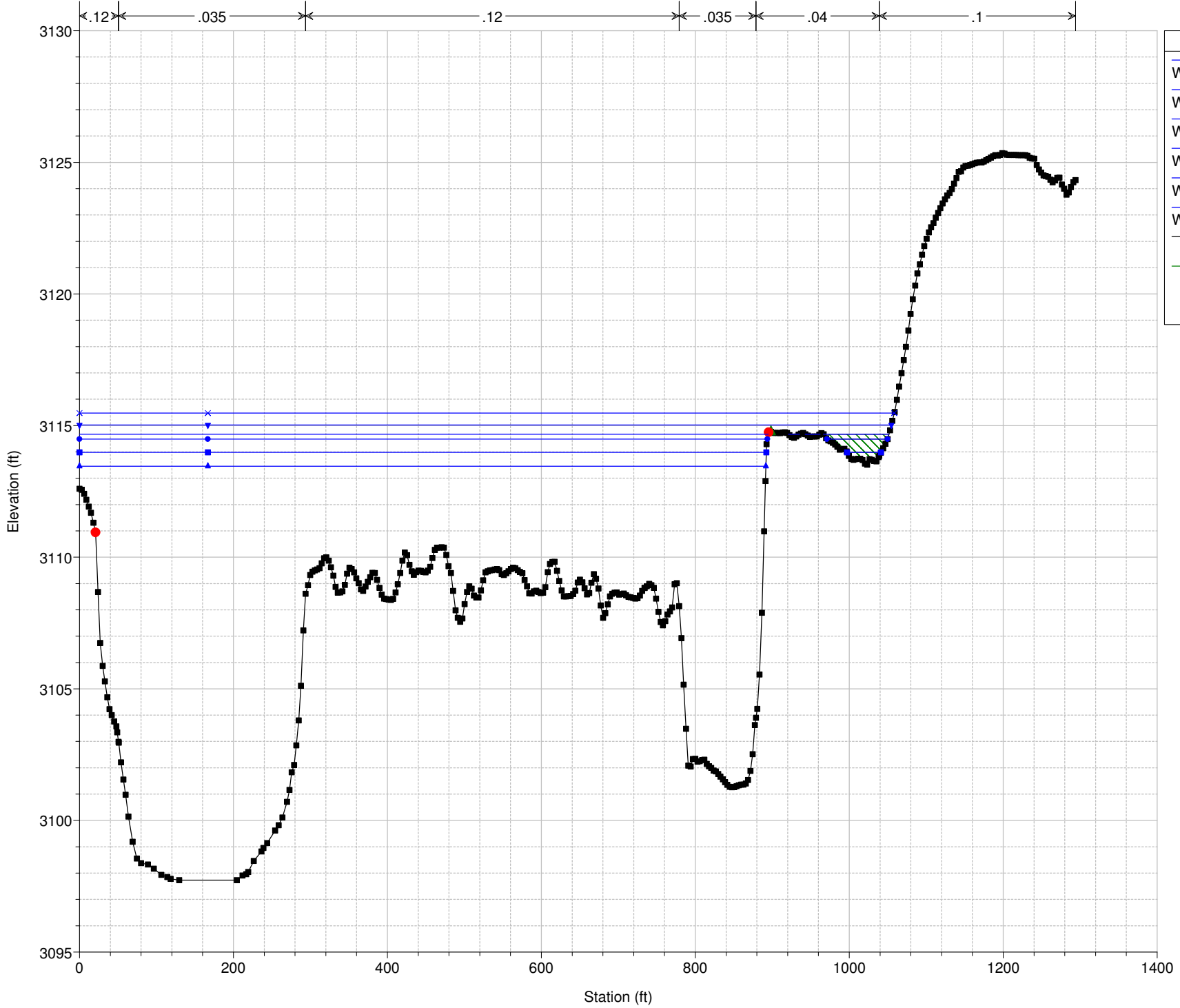
RS = 4371



Legend

- WS Max WS - ExistAlt1_500yr (Blue 'x' marker)
- WS Max WS - ExistAlt1_200yr (Blue inverted triangle marker)
- WS Max WS - ExistAlt1_100yr (Blue circle marker)
- WS Max WS - ExistAlt1_050yr (Blue square marker)
- WS Max WS - ExistAlt1_025yr (Blue triangle marker)
- WS Max WS - ExistAlt1_010yr (Blue inverted triangle marker)
- Ground (Black line with square markers)
- Ineff (Green line with triangle marker)
- Bank Sta (Red circle marker)

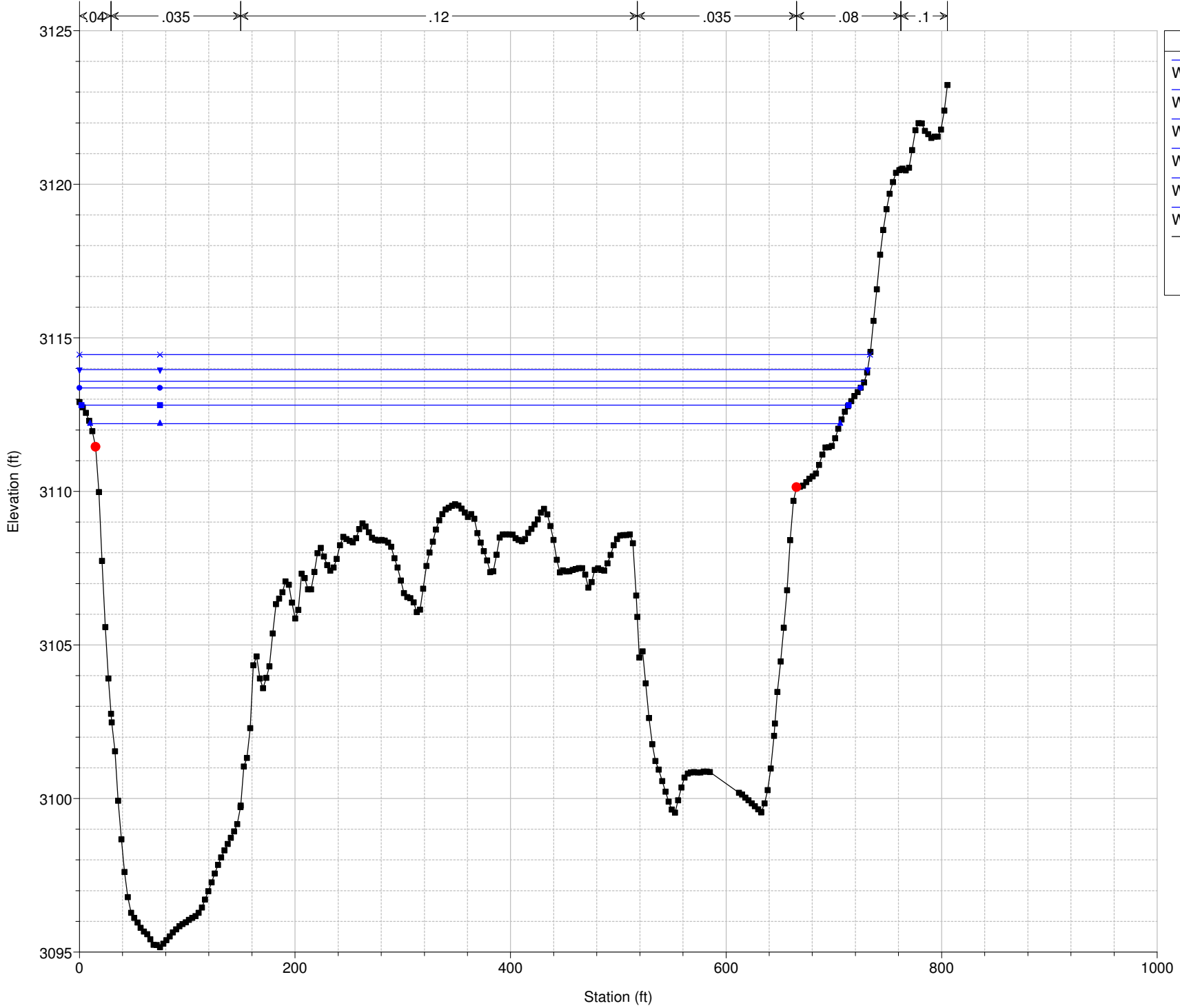
RS = 3719



Legend

- WS Max WS - ExistAlt1_500yr (x)
- WS Max WS - ExistAlt1_200yr (inverted triangle)
- WS Max WS - ExistAlt1_100yr (triangle)
- WS Max WS - ExistAlt1_050yr (circle)
- WS Max WS - ExistAlt1_025yr (square)
- WS Max WS - ExistAlt1_010yr (triangle)
- Ground (thick black line)
- Ineff (hatched area)
- Bank Sta (red circle)

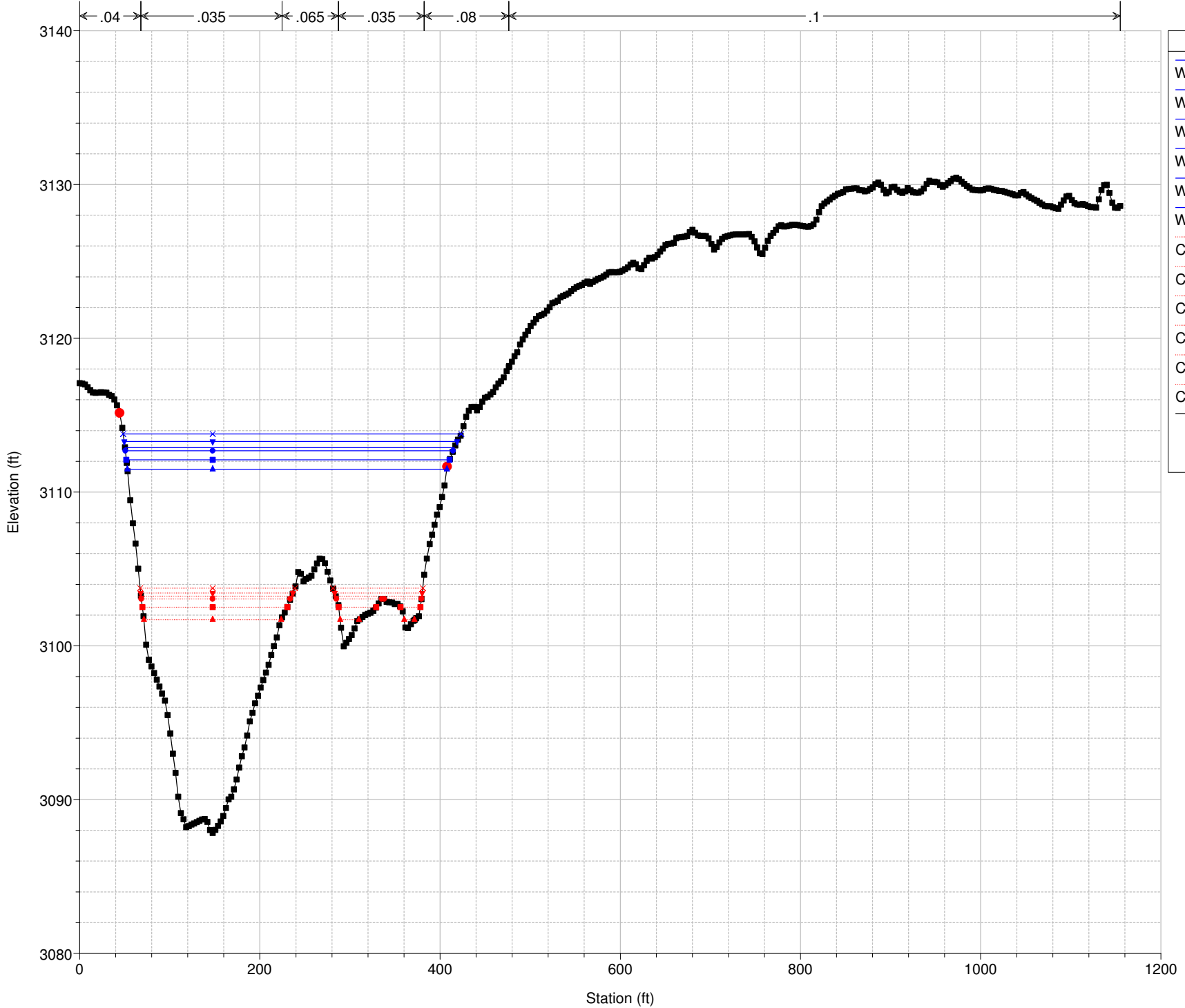
RS = 3245



Legend

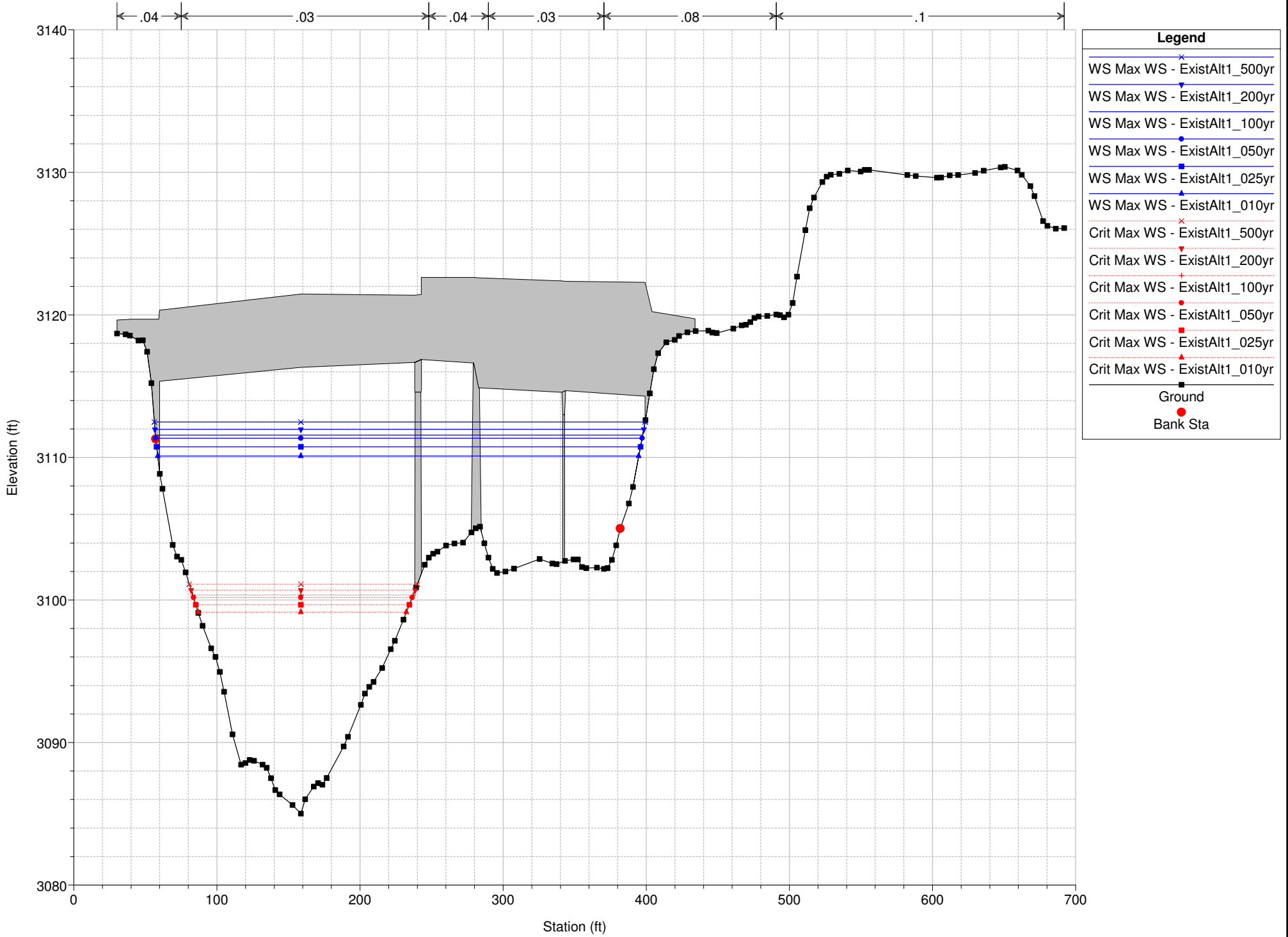
- WS Max WS - ExistAlt1_500yr (x)
- WS Max WS - ExistAlt1_200yr (v)
- WS Max WS - ExistAlt1_100yr (o)
- WS Max WS - ExistAlt1_050yr (square)
- WS Max WS - ExistAlt1_025yr (triangle)
- WS Max WS - ExistAlt1_010yr (inverted triangle)
- Ground (square)
- Bank Sta (circle)

RS = 2915

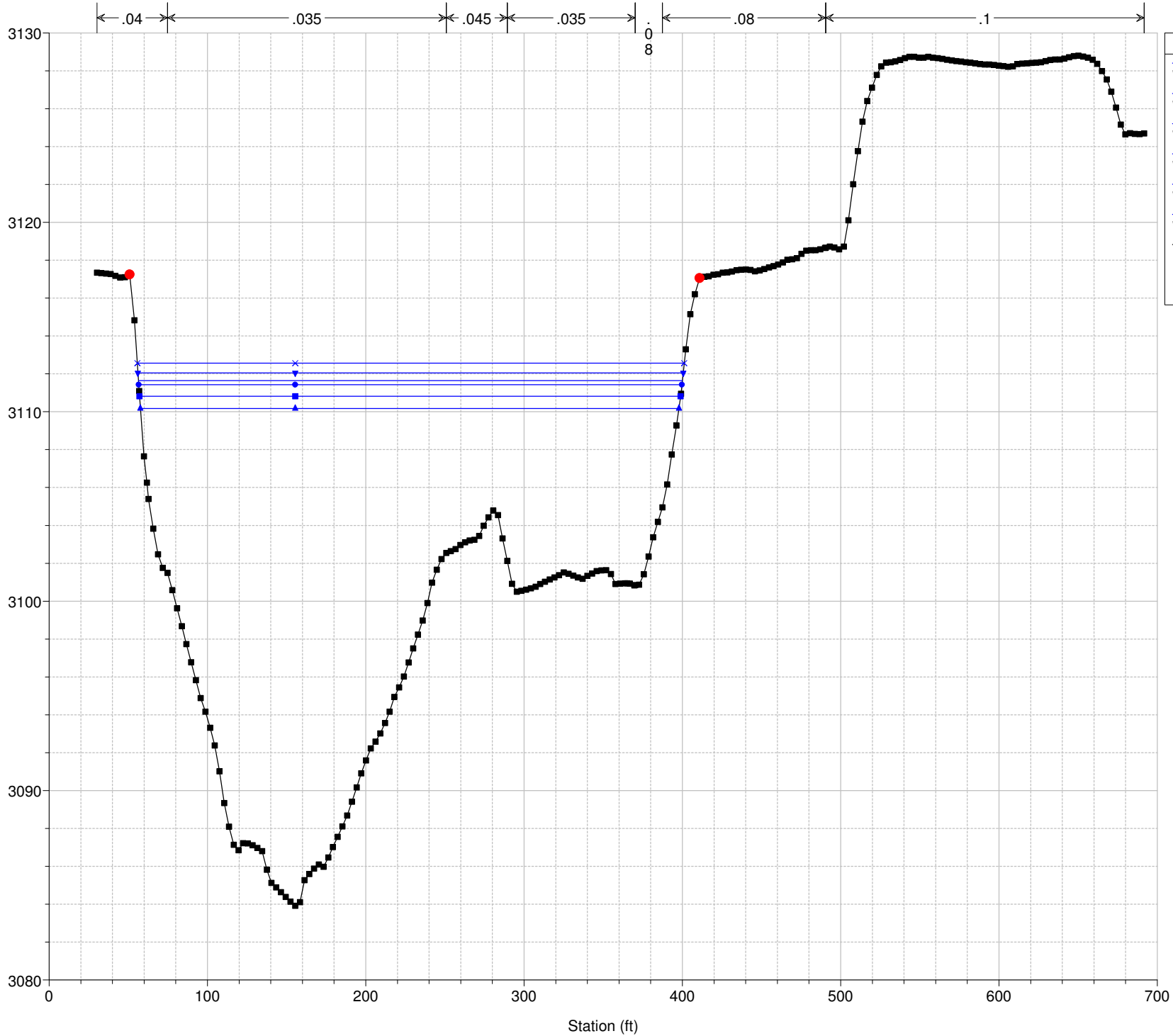


Legend	
WS Max WS - ExistAlt1_500yr	x
WS Max WS - ExistAlt1_200yr	▼
WS Max WS - ExistAlt1_100yr	●
WS Max WS - ExistAlt1_050yr	■
WS Max WS - ExistAlt1_025yr	▲
WS Max WS - ExistAlt1_010yr	◆
Crit Max WS - ExistAlt1_500yr	x
Crit Max WS - ExistAlt1_200yr	▼
Crit Max WS - ExistAlt1_100yr	+
Crit Max WS - ExistAlt1_050yr	●
Crit Max WS - ExistAlt1_025yr	■
Crit Max WS - ExistAlt1_010yr	▲
Ground	■
Bank Sta	●

RS = 2890 BR Existing Bridge



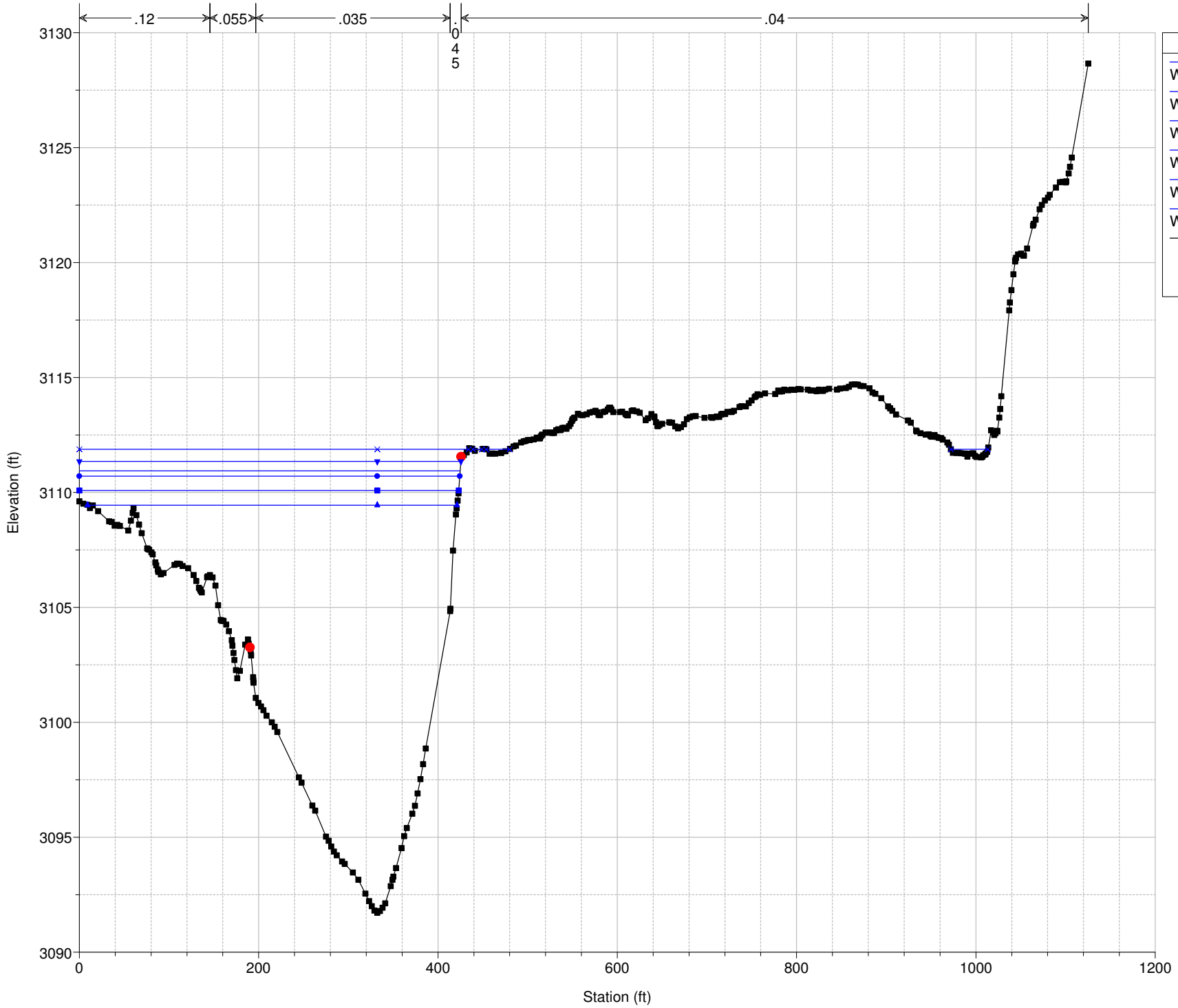
RS = 2865



Legend

- WS Max WS - ExistAlt1_500yr (cross)
- WS Max WS - ExistAlt1_200yr (inverted triangle)
- WS Max WS - ExistAlt1_100yr (x)
- WS Max WS - ExistAlt1_050yr (circle)
- WS Max WS - ExistAlt1_025yr (square)
- WS Max WS - ExistAlt1_010yr (triangle)
- Ground (square)
- Bank Sta (circle)

RS = 2244



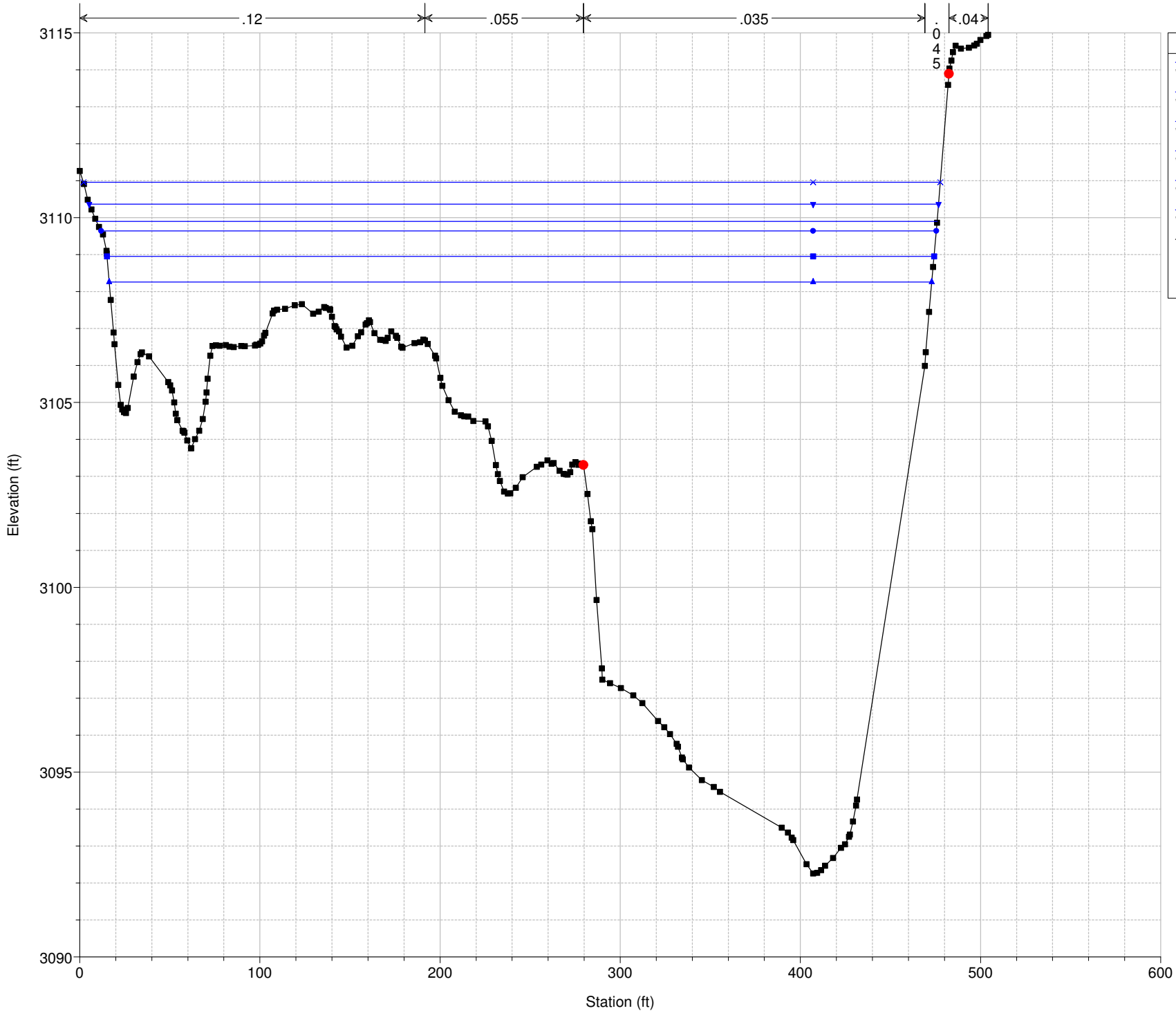
Legend

- WS Max WS - ExistAlt1_500yr (blue 'x')
- WS Max WS - ExistAlt1_200yr (blue inverted triangle)
- WS Max WS - ExistAlt1_100yr (blue circle)
- WS Max WS - ExistAlt1_050yr (blue square)
- WS Max WS - ExistAlt1_025yr (blue triangle)
- WS Max WS - ExistAlt1_010yr (blue inverted triangle)
- Ground (black square)
- Bank Sta (red circle)

RS = 1809



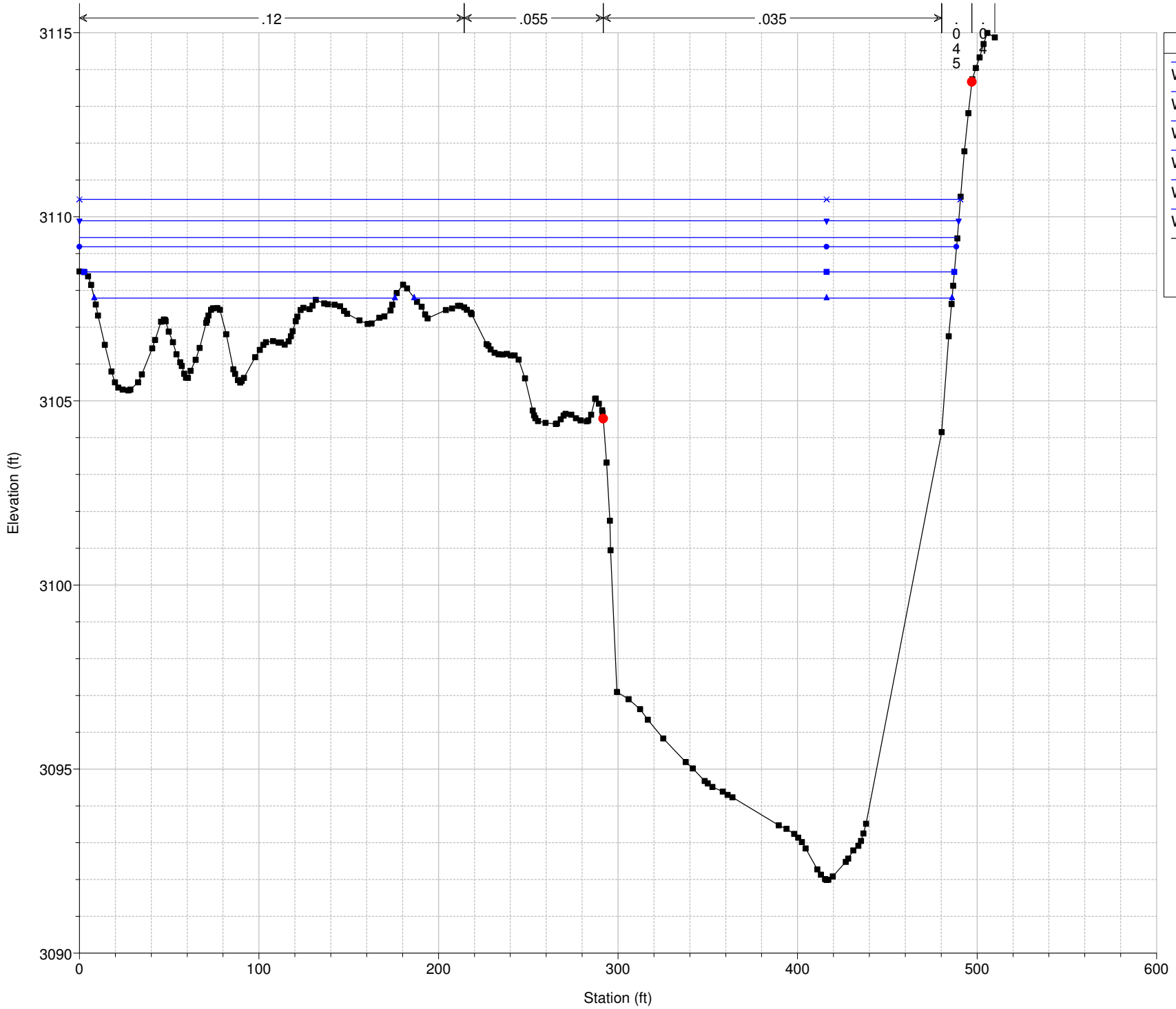
RS = 1542



Legend

- WS Max WS - ExistAlt1_500yr (x)
- WS Max WS - ExistAlt1_200yr (v)
- WS Max WS - ExistAlt1_100yr (o)
- WS Max WS - ExistAlt1_050yr (■)
- WS Max WS - ExistAlt1_025yr (▲)
- WS Max WS - ExistAlt1_010yr (▲)
- Ground (■)
- Bank Sta (●)

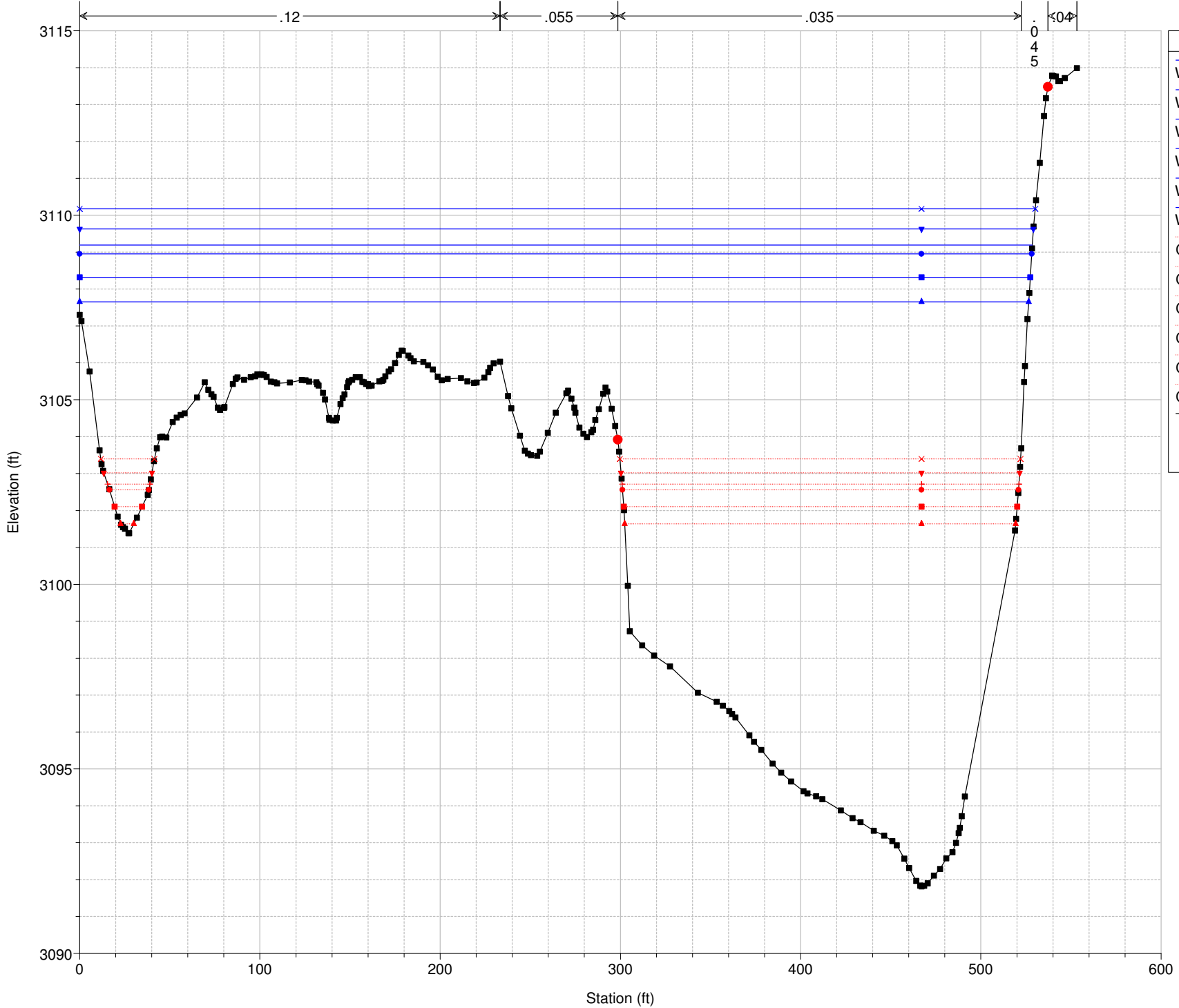
RS = 1229



Legend

- WS Max WS - ExistAlt1_500yr (blue line with cross)
- WS Max WS - ExistAlt1_200yr (blue line with triangle)
- WS Max WS - ExistAlt1_100yr (blue line with circle)
- WS Max WS - ExistAlt1_050yr (blue line with square)
- WS Max WS - ExistAlt1_025yr (blue line with triangle)
- Ground (black line with square)
- Bank Sta (red circle)

RS = 918



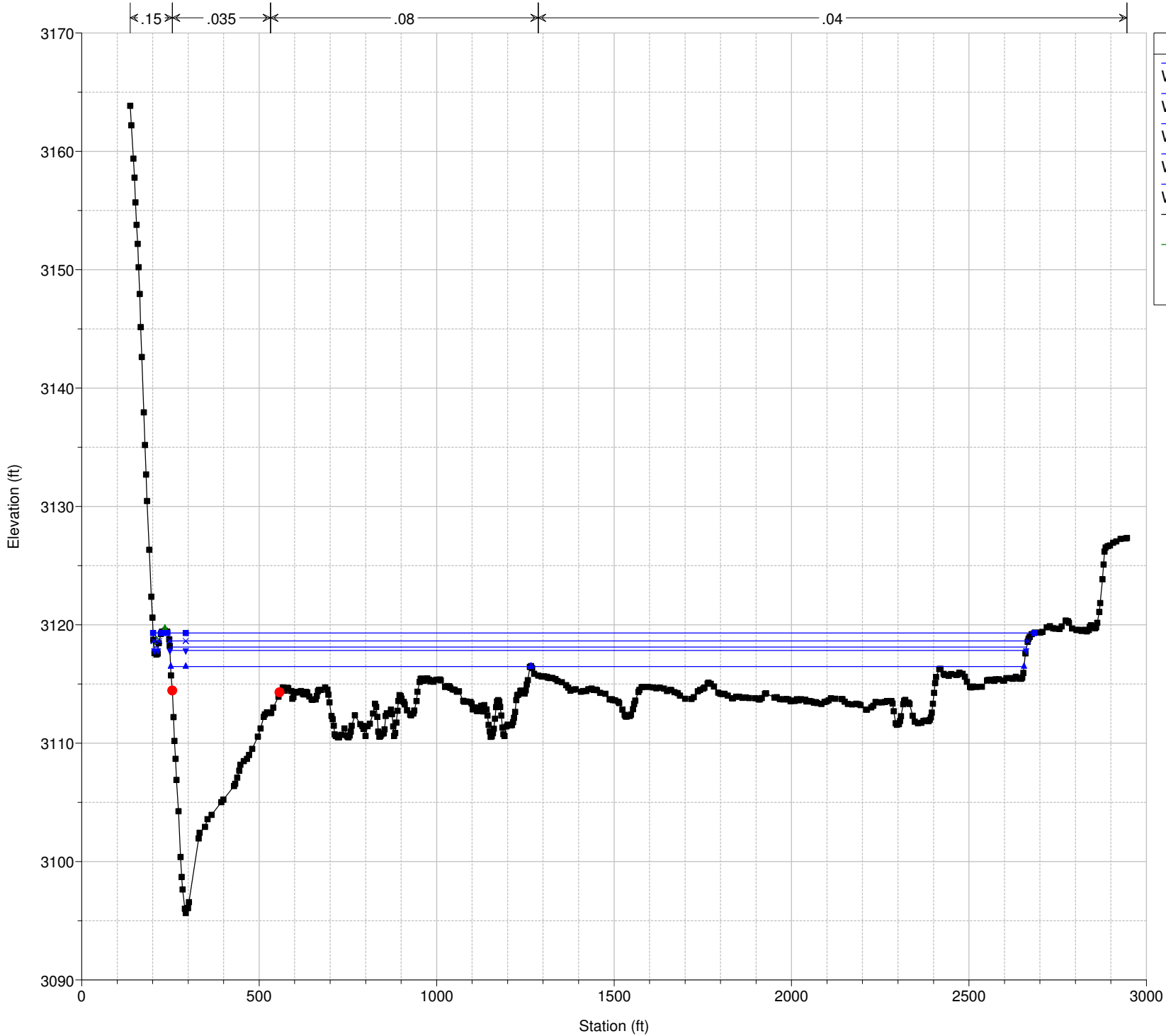
Legend	
WS Max WS - ExistAlt1_500yr	✕
WS Max WS - ExistAlt1_200yr	▼
WS Max WS - ExistAlt1_100yr	●
WS Max WS - ExistAlt1_050yr	■
WS Max WS - ExistAlt1_025yr	▲
WS Max WS - ExistAlt1_010yr	✕
Crit Max WS - ExistAlt1_500yr	✕
Crit Max WS - ExistAlt1_200yr	▼
Crit Max WS - ExistAlt1_100yr	+
Crit Max WS - ExistAlt1_050yr	●
Crit Max WS - ExistAlt1_025yr	■
Crit Max WS - ExistAlt1_010yr	▲
Ground	■
Bank Sta	●

Appendix I – Proposed Conditions HEC-RAS Model Output Files

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	918	Max WS	PropAlt1A_Exc_100yr	25165.57	3091.81	3109.52	3102.95	3110.32	0.001004	7.43	4514.92	529.01	0.36
1	918	Max WS	PropAlt1A_Exc_010yr	19925.96	3091.81	3107.89	3101.80	3108.59	0.001004	6.90	3650.77	526.85	0.35
1	918	Max WS	PropAlt1A_Exc_050yr	24316.70	3091.81	3109.27	3102.77	3110.05	0.001004	7.35	4380.65	528.64	0.36
1	918	Max WS	PropAlt1A_Exc_200yr	26705.72	3091.81	3109.98	3103.26	3110.79	0.001004	7.57	4754.80	529.79	0.36
1	918	Max WS	PropAlt1A_Exc_500yr	28652.63	3091.81	3110.53	3103.65	3111.38	0.001004	7.73	5050.64	530.86	0.36
1	933		Lat Struct										
1	1229	Max WS	PropAlt1A_Exc_100yr	24277.85	3091.99	3109.72		3110.78	0.001324	8.50	3623.68	489.47	0.41
1	1229	Max WS	PropAlt1A_Exc_010yr	19626.98	3091.99	3108.03		3109.02	0.001387	8.10	2799.13	474.66	0.41
1	1229	Max WS	PropAlt1A_Exc_050yr	23539.88	3091.99	3109.46		3110.51	0.001336	8.45	3494.56	489.03	0.41
1	1229	Max WS	PropAlt1A_Exc_200yr	25636.39	3091.99	3110.19		3111.27	0.001304	8.59	3854.50	490.26	0.40
1	1229	Max WS	PropAlt1A_Exc_500yr	27351.16	3091.99	3110.77		3111.86	0.001281	8.70	4138.57	491.24	0.40
1	1320		Lat Struct										
1	1542	Max WS	PropAlt1A_Exc_100yr	24832.33	3092.26	3110.16		3111.14	0.001258	8.35	3890.69	469.42	0.40
1	1542	Max WS	PropAlt1A_Exc_010yr	20067.59	3092.26	3108.49		3109.41	0.001313	7.95	3118.35	457.41	0.40
1	1542	Max WS	PropAlt1A_Exc_050yr	24098.48	3092.26	3109.90		3110.88	0.001271	8.30	3768.53	466.68	0.40
1	1542	Max WS	PropAlt1A_Exc_200yr	26205.82	3092.26	3110.62		3111.62	0.001241	8.44	4108.17	473.39	0.40
1	1542	Max WS	PropAlt1A_Exc_500yr	27806.02	3092.26	3111.19		3112.20	0.001209	8.51	4379.62	477.59	0.39
1	1665		Lat Struct										
1	1809	Max WS	PropAlt1A_Exc_100yr	24831.32	3090.62	3110.47		3111.61	0.001480	9.00	3506.97	409.09	0.43
1	1809	Max WS	PropAlt1A_Exc_010yr	20069.43	3090.62	3108.80		3109.88	0.001546	8.58	2834.00	396.23	0.43
1	1809	Max WS	PropAlt1A_Exc_050yr	24094.29	3090.62	3110.21		3111.34	0.001494	8.95	3400.66	408.63	0.43
1	1809	Max WS	PropAlt1A_Exc_200yr	26170.67	3090.62	3110.92		3112.08	0.001458	9.08	3694.12	409.92	0.43
1	1809	Max WS	PropAlt1A_Exc_500yr	27885.17	3090.62	3111.49		3112.66	0.001436	9.19	3926.22	414.68	0.42
1	2024		Lat Struct										
1	2244	Max WS	PropAlt1A_Exc_100yr	25033.27	3091.72	3111.27		3112.03	0.000925	7.17	4125.68	425.36	0.34
1	2244	Max WS	PropAlt1A_Exc_010yr	20071.53	3091.72	3109.67		3110.32	0.000896	6.61	3447.22	422.04	0.33
1	2244	Max WS	PropAlt1A_Exc_050yr	24244.18	3091.72	3111.03		3111.77	0.000922	7.09	4021.16	424.90	0.34
1	2244	Max WS	PropAlt1A_Exc_200yr	26545.46	3091.72	3111.70		3112.49	0.000937	7.35	4310.09	464.93	0.34
1	2244	Max WS	PropAlt1A_Exc_500yr	28402.22	3091.72	3112.23		3113.06	0.000938	7.53	4584.61	546.28	0.34
1	2450		Lat Struct										
1	2865	Max WS	PropAlt1A_Exc_100yr	25356.84	3083.92	3112.04		3112.41	0.000527	4.90	5178.64	344.41	0.22
1	2865	Max WS	PropAlt1A_Exc_010yr	20075.86	3083.92	3110.41		3110.70	0.000465	4.34	4621.10	340.76	0.21
1	2865	Max WS	PropAlt1A_Exc_050yr	24466.16	3083.92	3111.79		3112.15	0.000515	4.80	5094.70	343.91	0.22
1	2865	Max WS	PropAlt1A_Exc_200yr	27016.10	3083.92	3112.47		3112.87	0.000549	5.07	5328.34	345.30	0.23
1	2865	Max WS	PropAlt1A_Exc_500yr	29201.00	3083.92	3113.00		3113.43	0.000579	5.30	5510.63	346.38	0.23
1	2915	Max WS	PropAlt1A_Exc_100yr	25366.33	3087.83	3111.95		3112.45	0.001035	5.66	4482.13	357.59	0.28
1	2915	Max WS	PropAlt1A_Exc_010yr	20078.30	3087.83	3110.33		3110.74	0.000981	5.14	3909.26	349.71	0.27
1	2915	Max WS	PropAlt1A_Exc_050yr	24476.63	3087.83	3111.71		3112.19	0.001027	5.57	4395.15	355.70	0.28
1	2915	Max WS	PropAlt1A_Exc_200yr	27056.68	3087.83	3112.38		3112.91	0.001056	5.84	4636.26	361.09	0.29
1	2915	Max WS	PropAlt1A_Exc_500yr	29225.15	3087.83	3112.90		3113.48	0.001084	6.06	4826.72	365.70	0.29
1	3002		Lat Struct										
1	3245	Max WS	PropAlt1A_Exc_100yr	25374.47	3095.16	3112.96		3113.27	0.003990	4.45	5764.24	716.46	0.27
1	3245	Max WS	PropAlt1A_Exc_010yr	20078.85	3095.16	3111.41		3111.69	0.004859	4.31	4680.06	676.89	0.28
1	3245	Max WS	PropAlt1A_Exc_050yr	24485.81	3095.16	3112.72		3113.02	0.004088	4.42	5592.42	708.96	0.27
1	3245	Max WS	PropAlt1A_Exc_200yr	27065.07	3095.16	3113.39		3113.71	0.003847	4.51	6075.72	725.24	0.26
1	3245	Max WS	PropAlt1A_Exc_500yr	29272.59	3095.16	3113.93		3114.25	0.003701	4.59	6464.14	731.19	0.26
1	3398		Lat Struct										
1	3719	Max WS	PropAlt1A_Exc_100yr	26311.18	3097.73	3114.51		3114.67	0.002078	3.27	8087.95	973.75	0.19
1	3719	Max WS	PropAlt1A_Exc_010yr	20145.49	3097.73	3113.18		3113.31	0.002048	2.93	6902.23	891.42	0.18
1	3719	Max WS	PropAlt1A_Exc_050yr	25190.94	3097.73	3114.29		3114.45	0.002060	3.20	7895.85	958.12	0.19
1	3719	Max WS	PropAlt1A_Exc_200yr	28563.81	3097.73	3114.90		3115.08	0.002114	3.39	8534.27	1053.63	0.19
1	3719	Max WS	PropAlt1A_Exc_500yr	31698.38	3097.73	3115.40		3115.59	0.002175	3.55	9055.92	1057.81	0.20
1	4045		Lat Struct										
1	4371	Max WS	PropAlt1A_Exc_100yr	29434.68	3100.96	3115.34		3115.52	0.000605	3.78	9161.85	1327.73	0.19
1	4371	Max WS	PropAlt1A_Exc_010yr	20617.86	3100.96	3114.02		3114.16	0.000539	3.31	7408.09	1325.18	0.18
1	4371	Max WS	PropAlt1A_Exc_050yr	27788.46	3100.96	3115.12		3115.29	0.000591	3.70	8872.41	1327.37	0.19
1	4371	Max WS	PropAlt1A_Exc_200yr	32743.15	3100.96	3115.74		3115.93	0.000634	3.96	9690.34	1328.39	0.20
1	4371	Max WS	PropAlt1A_Exc_500yr	37344.73	3100.96	3116.24		3116.46	0.000676	4.20	10358.64	1329.22	0.21
1	4549		Lat Struct										
1	4726	Max WS	PropAlt1A_Exc_100yr	31041.18	3101.29	3115.40		3115.73	0.000558	5.30	8460.85	1534.80	0.26
1	4726	Max WS	PropAlt1A_Exc_010yr	20868.50	3101.29	3114.09		3114.35	0.000458	4.45	6457.27	1531.43	0.24
1	4726	Max WS	PropAlt1A_Exc_050yr	29115.46	3101.29	3115.18		3115.50	0.000540	5.15	8131.17	1534.24	0.26
1	4726	Max WS	PropAlt1A_Exc_200yr	34882.55	3101.29	3115.79		3116.15	0.000597	5.59	9064.35	1535.95	0.28
1	4726	Max WS	PropAlt1A_Exc_500yr	40233.96	3101.29	3116.29		3116.69	0.000648	5.97	9826.71	1537.52	0.29
1	4872		Lat Struct										
1	5061	Max WS	PropAlt1A_Exc_100yr	31736.17	3101.66	3115.57		3115.92	0.000776	5.39	7883.63	1536.03	0.28

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	5061	Max WS	PropAlt1A_Exc_010yr	20897.20	3101.66	3114.26		3114.51	0.000610	4.42	6139.42	1519.55	0.24
1	5061	Max WS	PropAlt1A_Exc_050yr	29624.97	3101.66	3115.36		3115.69	0.000742	5.20	7599.55	1535.51	0.27
1	5061	Max WS	PropAlt1A_Exc_200yr	35938.02	3101.66	3115.96		3116.36	0.000845	5.74	8414.37	1536.99	0.29
1	5061	Max WS	PropAlt1A_Exc_500yr	41928.60	3101.66	3116.45		3116.91	0.000942	6.23	9080.80	1538.24	0.31
1	5100			Mult Open									
1	5125	Max WS	PropAlt1A_Exc_100yr	31736.96	3101.61	3115.53		3115.98	0.000725	5.90	7037.58	1600.54	0.30
1	5125	Max WS	PropAlt1A_Exc_010yr	20896.90	3101.61	3114.26		3114.58	0.000529	4.68	5457.17	1333.05	0.25
1	5125	Max WS	PropAlt1A_Exc_050yr	29624.97	3101.61	3115.33		3115.75	0.000683	5.66	6766.03	1571.25	0.29
1	5125	Max WS	PropAlt1A_Exc_200yr	35935.91	3101.61	3115.92		3116.41	0.000793	6.30	7578.64	1609.42	0.32
1	5125	Max WS	PropAlt1A_Exc_500yr	41929.27	3101.61	3116.41		3116.98	0.000884	6.83	8271.19	1611.94	0.34
1	5150			Lat Struct									
1	5230	Max WS	PropAlt1A_Exc_100yr	31783.89	3101.79	3115.64		3116.05	0.000675	5.82	8384.56	1978.26	0.29
1	5230	Max WS	PropAlt1A_Exc_010yr	20897.95	3101.79	3114.28		3114.63	0.000583	5.00	5568.53	1408.94	0.27
1	5230	Max WS	PropAlt1A_Exc_050yr	29659.82	3101.79	3115.43		3115.81	0.000639	5.60	8023.17	1903.23	0.28
1	5230	Max WS	PropAlt1A_Exc_200yr	35984.30	3101.79	3116.04		3116.50	0.000737	6.21	9115.85	2008.27	0.31
1	5230	Max WS	PropAlt1A_Exc_500yr	41984.07	3101.79	3116.55		3117.08	0.000828	6.76	10047.00	2072.06	0.33
1	5385	Max WS	PropAlt1A_Exc_100yr	31791.52	3101.66	3115.73		3116.15	0.000684	5.79	8483.69	2126.49	0.29
1	5385	Max WS	PropAlt1A_Exc_010yr	20898.13	3101.66	3114.39		3114.71	0.000546	4.78	5687.40	1345.99	0.26
1	5385	Max WS	PropAlt1A_Exc_050yr	29667.45	3101.66	3115.52		3115.91	0.000652	5.58	8048.40	2105.19	0.29
1	5385	Max WS	PropAlt1A_Exc_200yr	35992.93	3101.66	3116.15		3116.61	0.000737	6.15	9330.81	2162.16	0.31
1	5385	Max WS	PropAlt1A_Exc_500yr	41993.14	3101.66	3116.68		3117.20	0.000812	6.63	10401.62	2176.99	0.33
1	6087	Max WS	PropAlt1A_Exc_100yr	31793.83	3102.08	3116.28		3116.82	0.001156	6.58	7013.63	1655.04	0.34
1	6087	Max WS	PropAlt1A_Exc_010yr	20899.30	3102.08	3114.80		3115.22	0.000861	5.47	5056.64	889.31	0.30
1	6087	Max WS	PropAlt1A_Exc_050yr	29669.51	3102.08	3116.03		3116.56	0.001109	6.41	6613.38	1614.12	0.33
1	6087	Max WS	PropAlt1A_Exc_200yr	35994.77	3102.08	3116.75		3117.32	0.001226	6.85	7880.27	1934.05	0.35
1	6087	Max WS	PropAlt1A_Exc_500yr	41995.48	3102.08	3117.36		3117.95	0.001305	7.14	9086.42	2036.27	0.35
1	6550	Max WS	PropAlt1A_Exc_100yr	31795.92	3102.37	3116.73		3117.26	0.000865	6.48	8163.92	1768.24	0.33
1	6550	Max WS	PropAlt1A_Exc_010yr	20900.37	3102.37	3115.18		3115.55	0.000681	5.24	6118.21	1031.25	0.29
1	6550	Max WS	PropAlt1A_Exc_050yr	29676.19	3102.37	3116.48		3116.97	0.000825	6.23	7747.44	1556.66	0.32
1	6550	Max WS	PropAlt1A_Exc_200yr	35996.21	3102.37	3117.22		3117.79	0.000923	6.87	9058.58	1894.71	0.34
1	6550	Max WS	PropAlt1A_Exc_500yr	41995.59	3102.37	3117.83		3118.46	0.000979	7.31	10252.54	2031.76	0.36
1	7262	Max WS	PropAlt1A_Exc_100yr	31794.95	3101.11	3117.32		3117.61	0.000521	5.28	12827.58	2508.79	0.26
1	7262	Max WS	PropAlt1A_Exc_010yr	20900.53	3101.11	3115.64		3115.88	0.000478	4.60	9132.84	2011.90	0.24
1	7262	Max WS	PropAlt1A_Exc_050yr	29697.47	3101.11	3117.04		3117.32	0.000510	5.14	12167.68	2415.32	0.26
1	7262	Max WS	PropAlt1A_Exc_200yr	35997.54	3101.11	3117.84		3118.14	0.000536	5.50	14252.78	2716.46	0.27
1	7262	Max WS	PropAlt1A_Exc_500yr	41996.39	3101.11	3118.50		3118.81	0.000554	5.77	16039.48	2752.11	0.27
1	7435	Max WS	PropAlt1A_Exc_100yr	31796.97	3100.79	3117.51		3117.68	0.000359	4.26	13756.34	2293.05	0.21
1	7435	Max WS	PropAlt1A_Exc_010yr	20900.25	3100.79	3115.80		3115.96	0.000361	3.88	9917.76	2229.96	0.21
1	7435	Max WS	PropAlt1A_Exc_050yr	29698.49	3100.79	3117.22		3117.39	0.000355	4.17	13106.50	2263.58	0.21
1	7435	Max WS	PropAlt1A_Exc_200yr	35997.87	3100.79	3118.03		3118.21	0.000371	4.44	14962.51	2343.37	0.22
1	7435	Max WS	PropAlt1A_Exc_500yr	41997.52	3100.79	3118.69		3118.88	0.000385	4.68	16509.26	2499.31	0.22
1	7977	Max WS	PropAlt1A_Exc_100yr	31799.84	3099.02	3117.71		3117.85	0.000337	3.99	14620.97	2547.38	0.19
1	7977	Max WS	PropAlt1A_Exc_010yr	20899.51	3099.02	3116.00		3116.14	0.000360	3.76	10299.71	2520.19	0.20
1	7977	Max WS	PropAlt1A_Exc_050yr	29698.96	3099.02	3117.42		3117.56	0.000340	3.95	13889.09	2542.64	0.19
1	7977	Max WS	PropAlt1A_Exc_200yr	35997.67	3099.02	3118.24		3118.38	0.000337	4.10	15963.14	2558.34	0.20
1	7977	Max WS	PropAlt1A_Exc_500yr	42000.28	3099.02	3118.91		3119.06	0.000342	4.26	17667.52	2579.31	0.20
1	8519	Max WS	PropAlt1A_Exc_100yr	31798.79	3097.10	3117.90		3118.06	0.000518	4.27	12895.43	2495.58	0.21
1	8519	Max WS	PropAlt1A_Exc_010yr	20899.80	3097.10	3116.21		3116.40	0.000612	4.24	8729.83	2461.01	0.22
1	8519	Max WS	PropAlt1A_Exc_050yr	29698.84	3097.10	3117.61		3117.77	0.000527	4.25	12186.70	2488.13	0.21
1	8519	Max WS	PropAlt1A_Exc_200yr	35998.16	3097.10	3118.42		3118.59	0.000506	4.33	14206.58	2509.68	0.21
1	8519	Max WS	PropAlt1A_Exc_500yr	41998.47	3097.10	3119.09		3119.26	0.000501	4.45	15917.27	2534.60	0.21
1	9114	Max WS	PropAlt1A_Exc_100yr	31800.00	3095.66	3118.12		3118.32	0.000453	4.71	12618.21	2426.40	0.24
1	9114	Max WS	PropAlt1A_Exc_010yr	20900.00	3095.66	3116.48		3116.70	0.000498	4.52	8660.35	2402.29	0.25
1	9114	Max WS	PropAlt1A_Exc_050yr	29700.00	3095.66	3117.84		3118.04	0.000458	4.66	11937.15	2422.55	0.24
1	9114	Max WS	PropAlt1A_Exc_200yr	36000.00	3095.66	3118.64		3118.85	0.000448	4.80	13879.54	2435.15	0.24
1	9114	Max WS	PropAlt1A_Exc_500yr	42000.00	3095.66	3119.31		3119.52	0.000450	4.97	15498.55	2465.12	0.24

RS = 9114

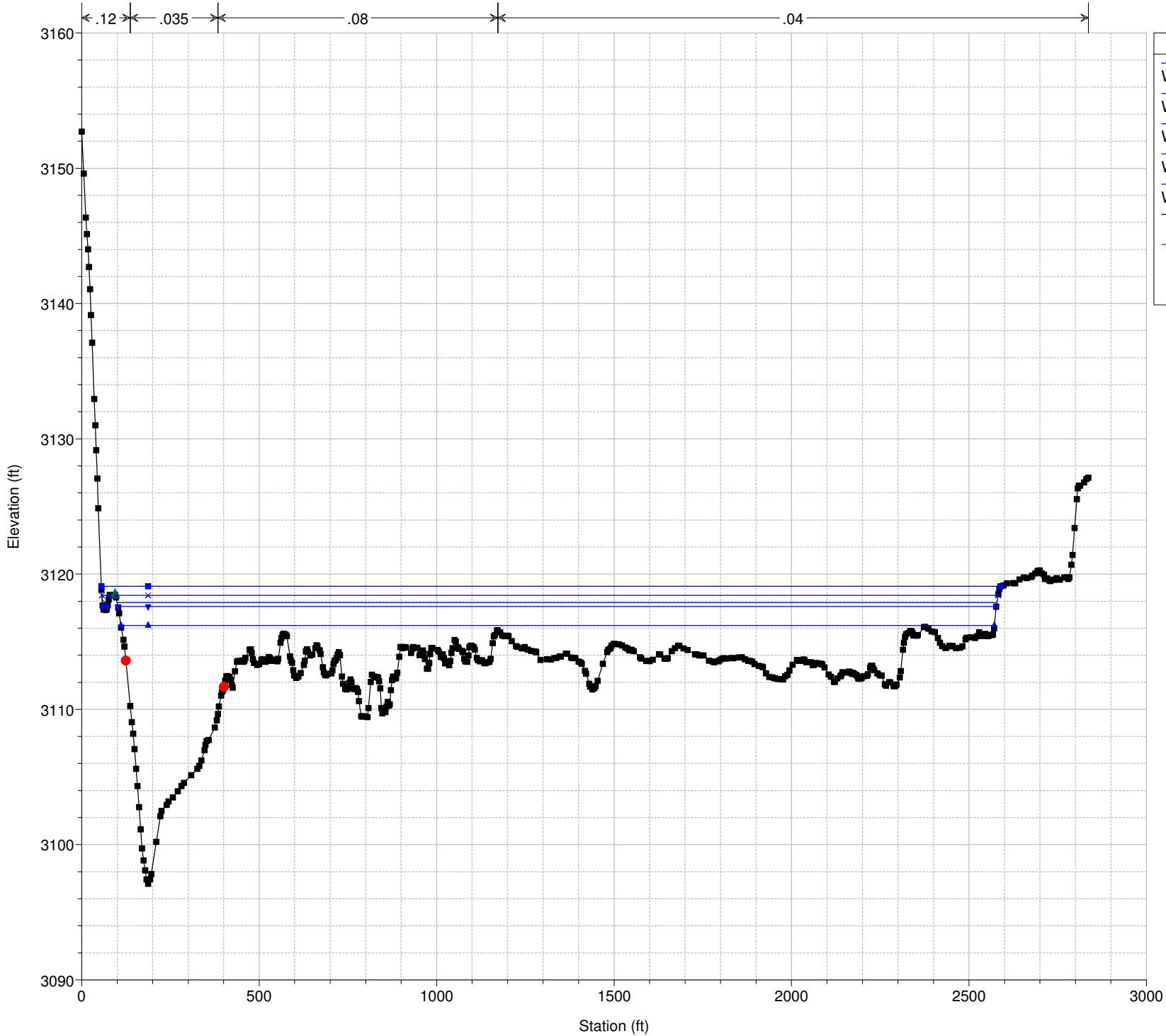


Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta



RS = 8519



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

RS = 7977



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

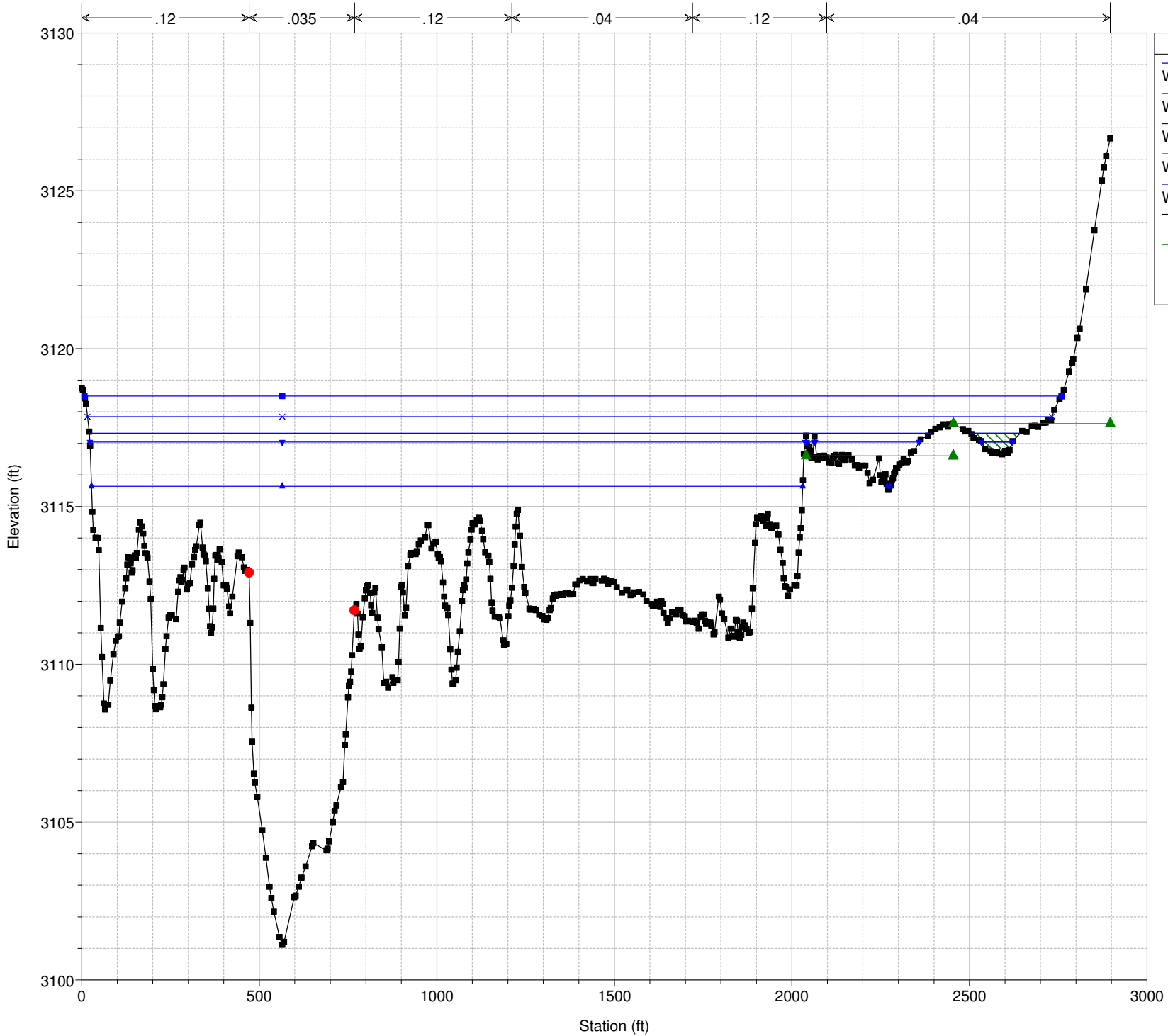
RS = 7435



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

RS = 7262

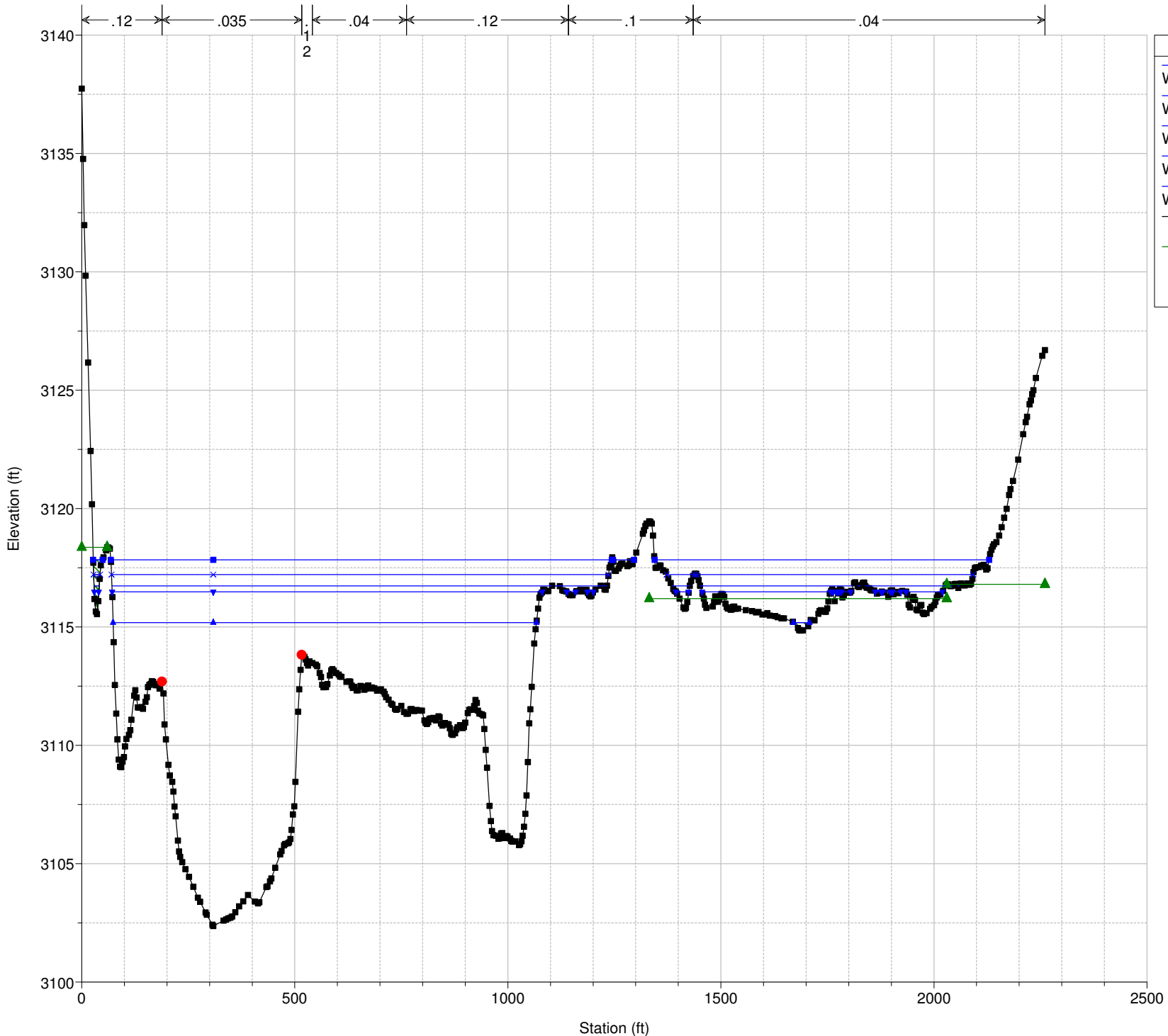


Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta



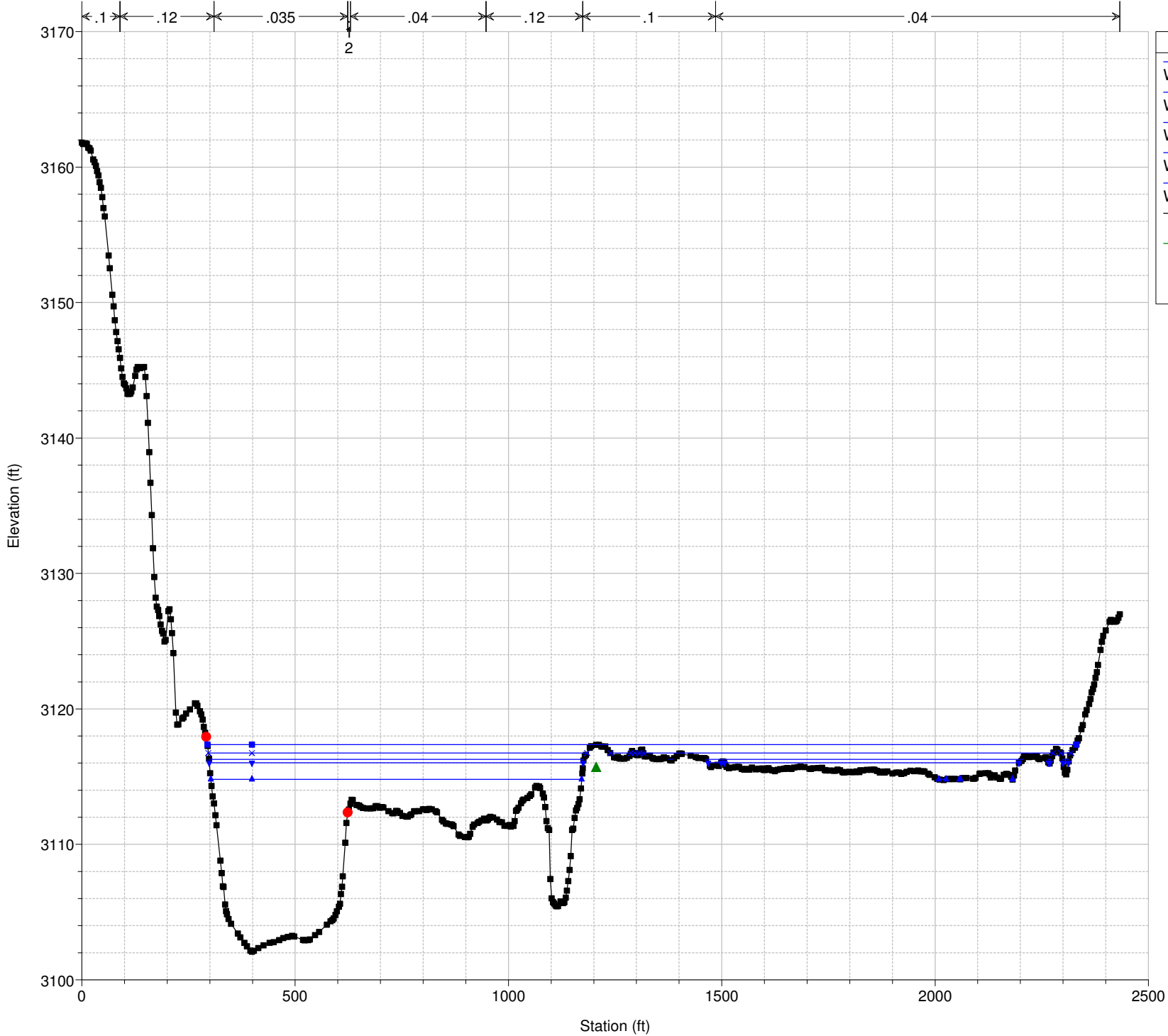
RS = 6550



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

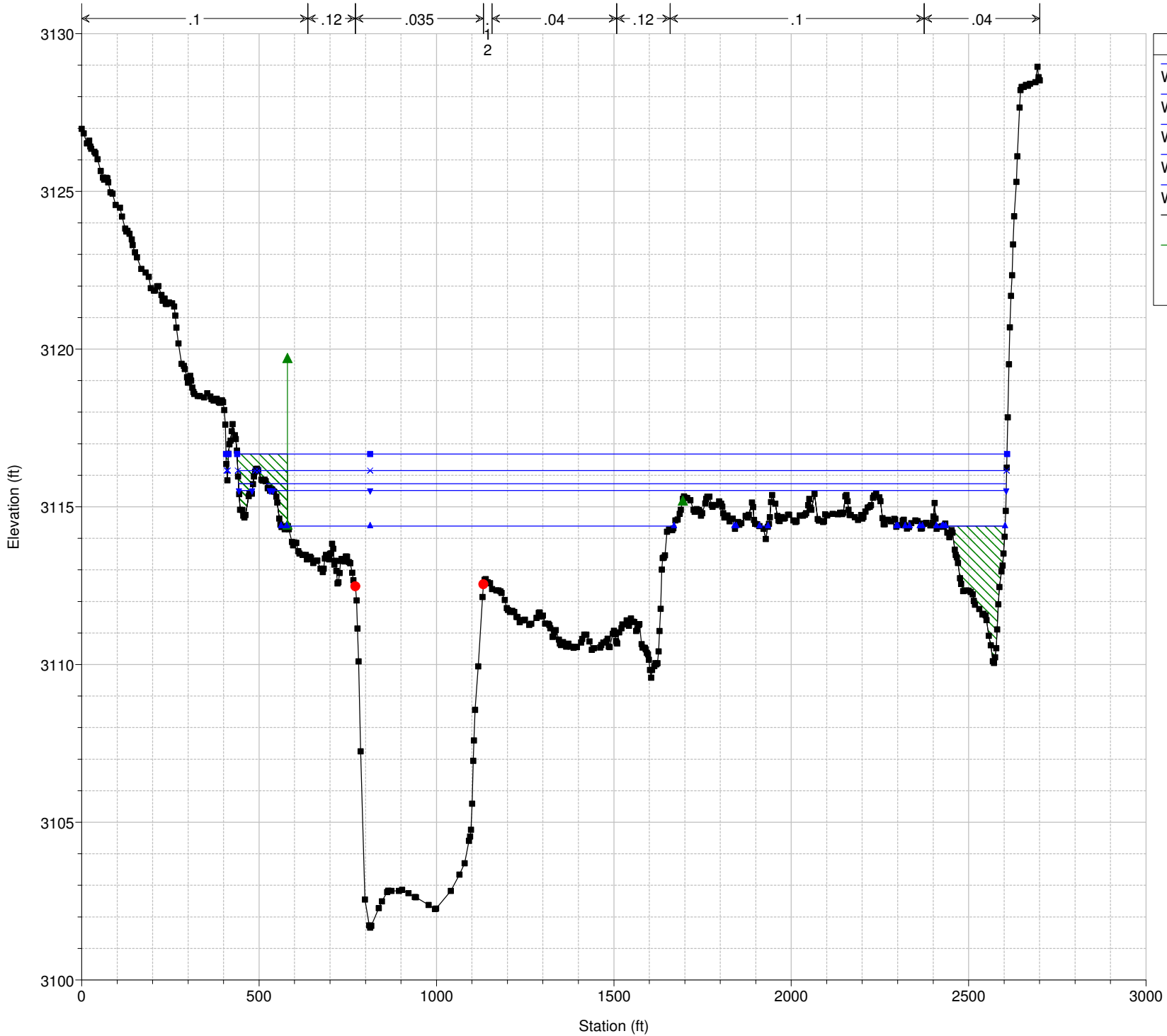
RS = 6087



Legend

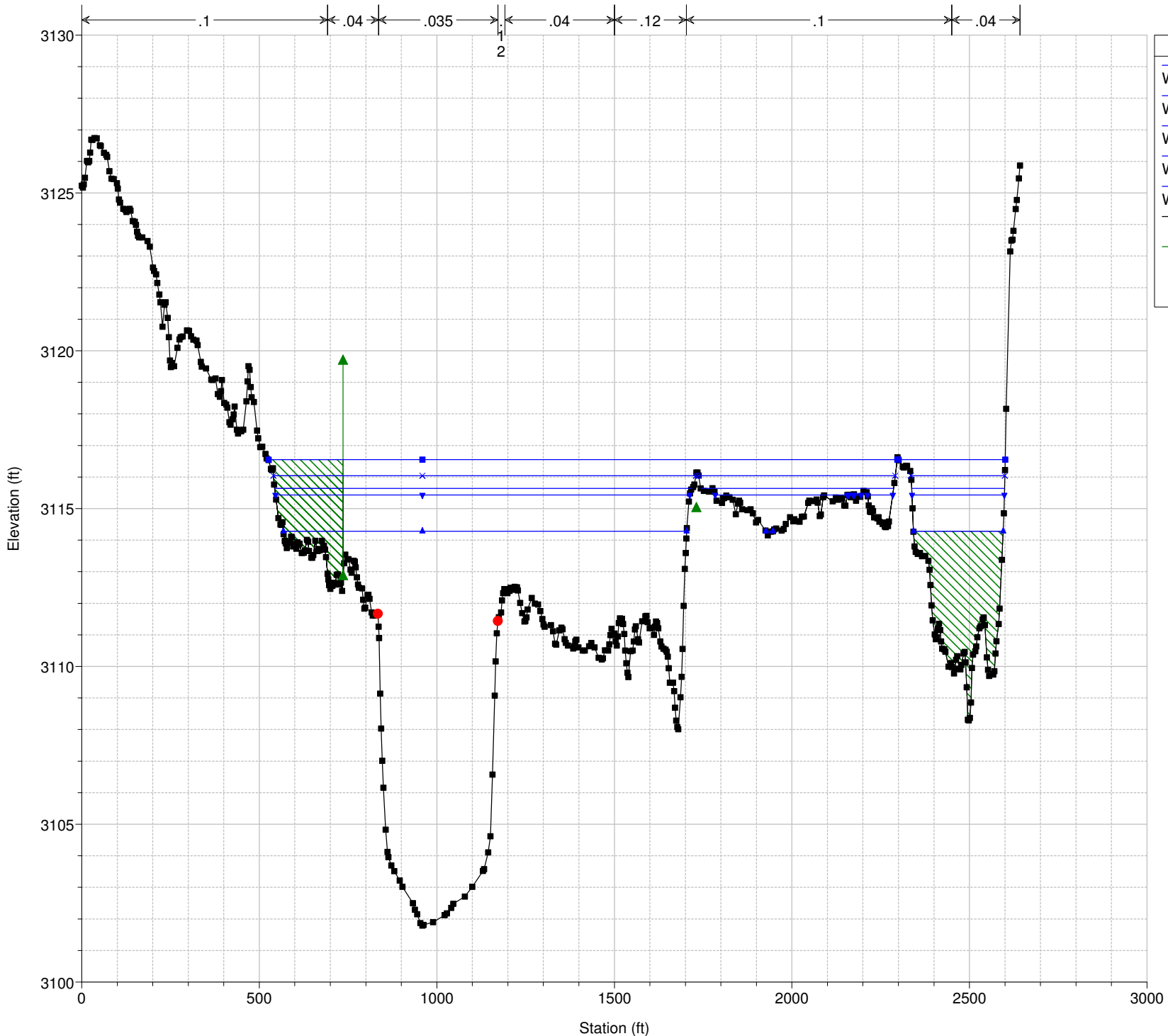
- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

RS = 5385



Legend	
■	WS Max WS - PropAlt1A_Exc_500yr
×	WS Max WS - PropAlt1A_Exc_200yr
▼	WS Max WS - PropAlt1A_Exc_100yr
▲	WS Max WS - PropAlt1A_Exc_050yr
▲	WS Max WS - PropAlt1A_Exc_010yr
■	Ground
▲	Ineff
●	Bank Sta

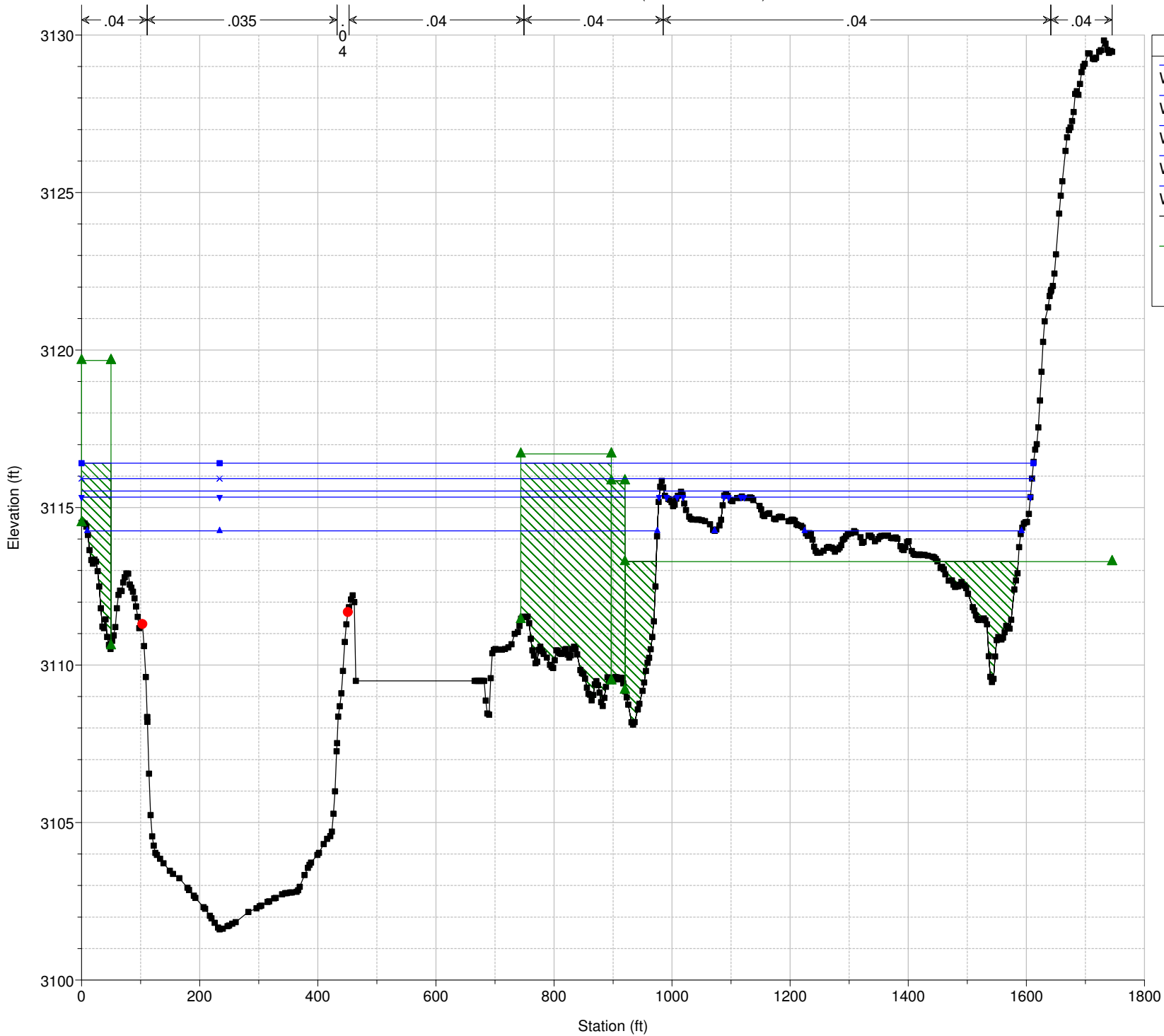
RS = 5230



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

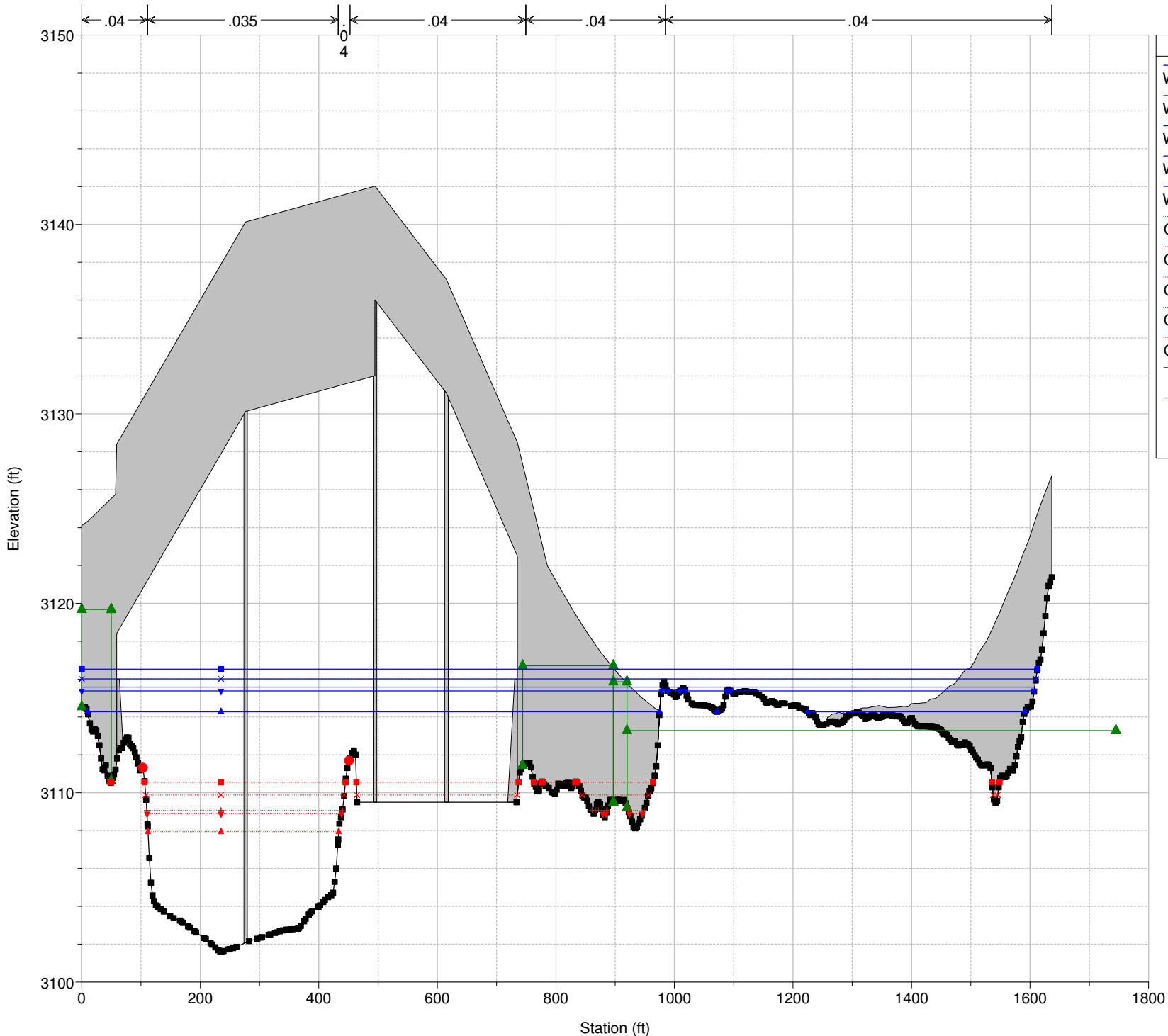
RS = 5125 ROB (Sta 464.5 - 733.5) excavated to 3110.5'



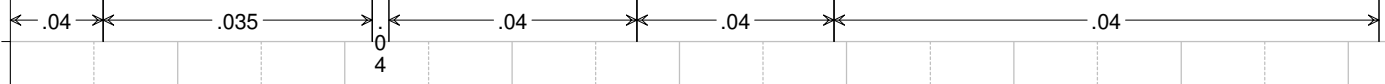
Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

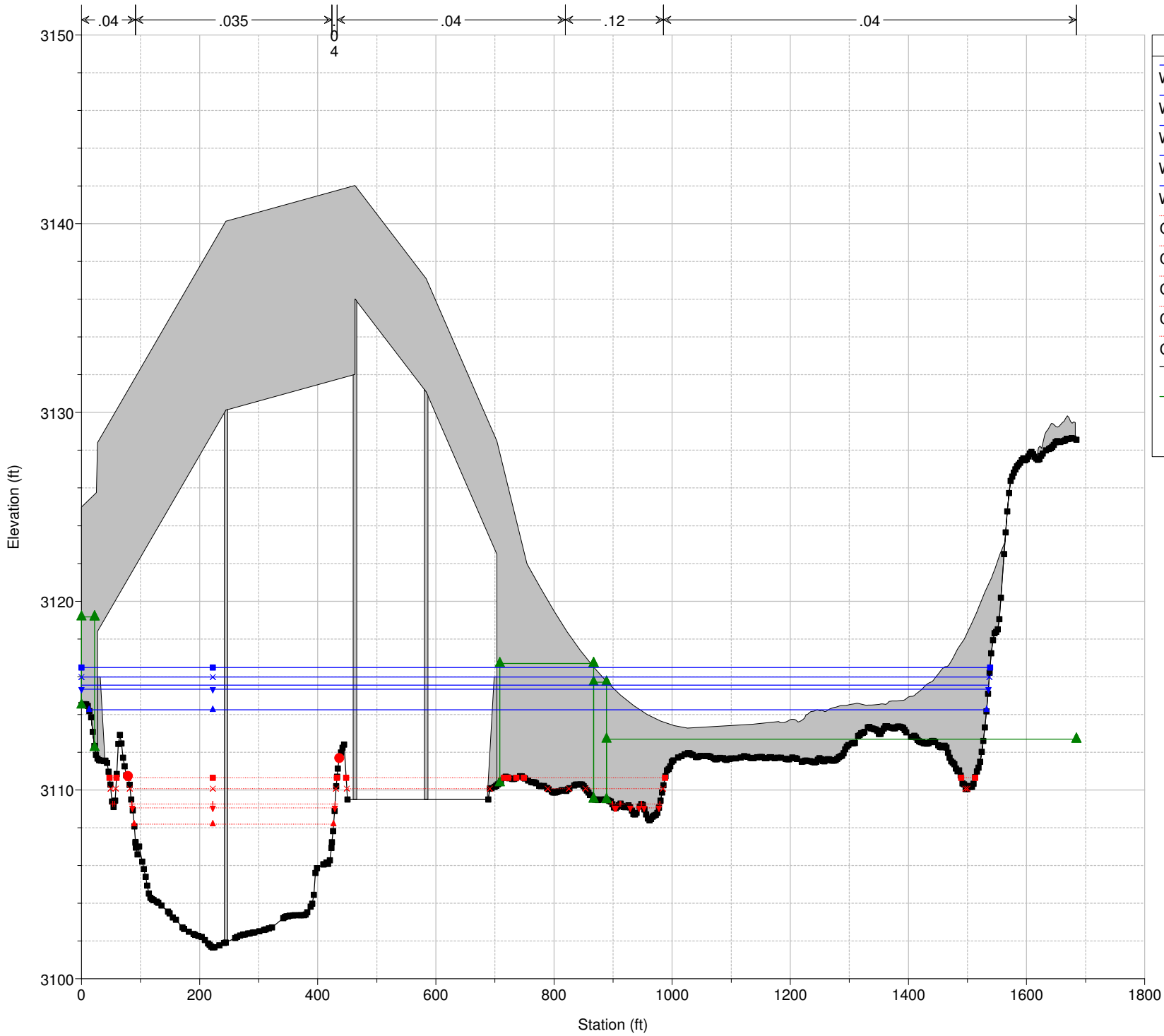
RS = 5100 MO



Legend	
WS Max WS - PropAlt1A_Exc_500yr	Blue line with square markers
WS Max WS - PropAlt1A_Exc_200yr	Blue line with 'x' markers
WS Max WS - PropAlt1A_Exc_100yr	Blue line with triangle markers
WS Max WS - PropAlt1A_Exc_050yr	Blue line with inverted triangle markers
WS Max WS - PropAlt1A_Exc_010yr	Blue line with upward triangle markers
Crit Max WS - PropAlt1A_Exc_500yr	Red line with square markers
Crit Max WS - PropAlt1A_Exc_200yr	Red line with 'x' markers
Crit Max WS - PropAlt1A_Exc_100yr	Red line with triangle markers
Crit Max WS - PropAlt1A_Exc_050yr	Red line with inverted triangle markers
Crit Max WS - PropAlt1A_Exc_010yr	Red line with upward triangle markers
Ground	Black line with green triangle markers
Ineff	Green line with upward triangle markers
Bank Sta	Red line with circle markers



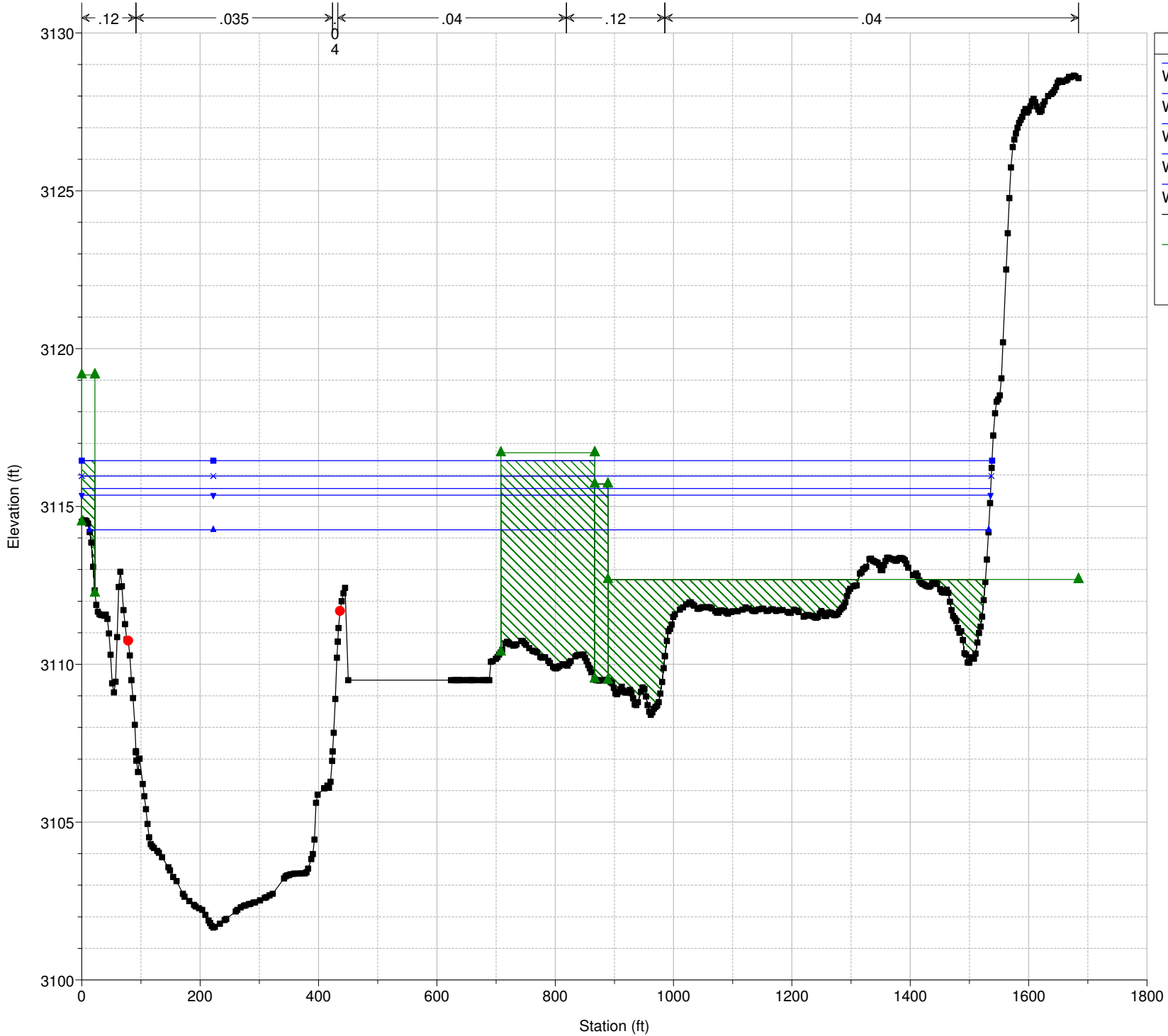
RS = 5100 MO



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Crit Max WS - PropAlt1A_Exc_500yr
- Crit Max WS - PropAlt1A_Exc_200yr
- Crit Max WS - PropAlt1A_Exc_100yr
- Crit Max WS - PropAlt1A_Exc_050yr
- Crit Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

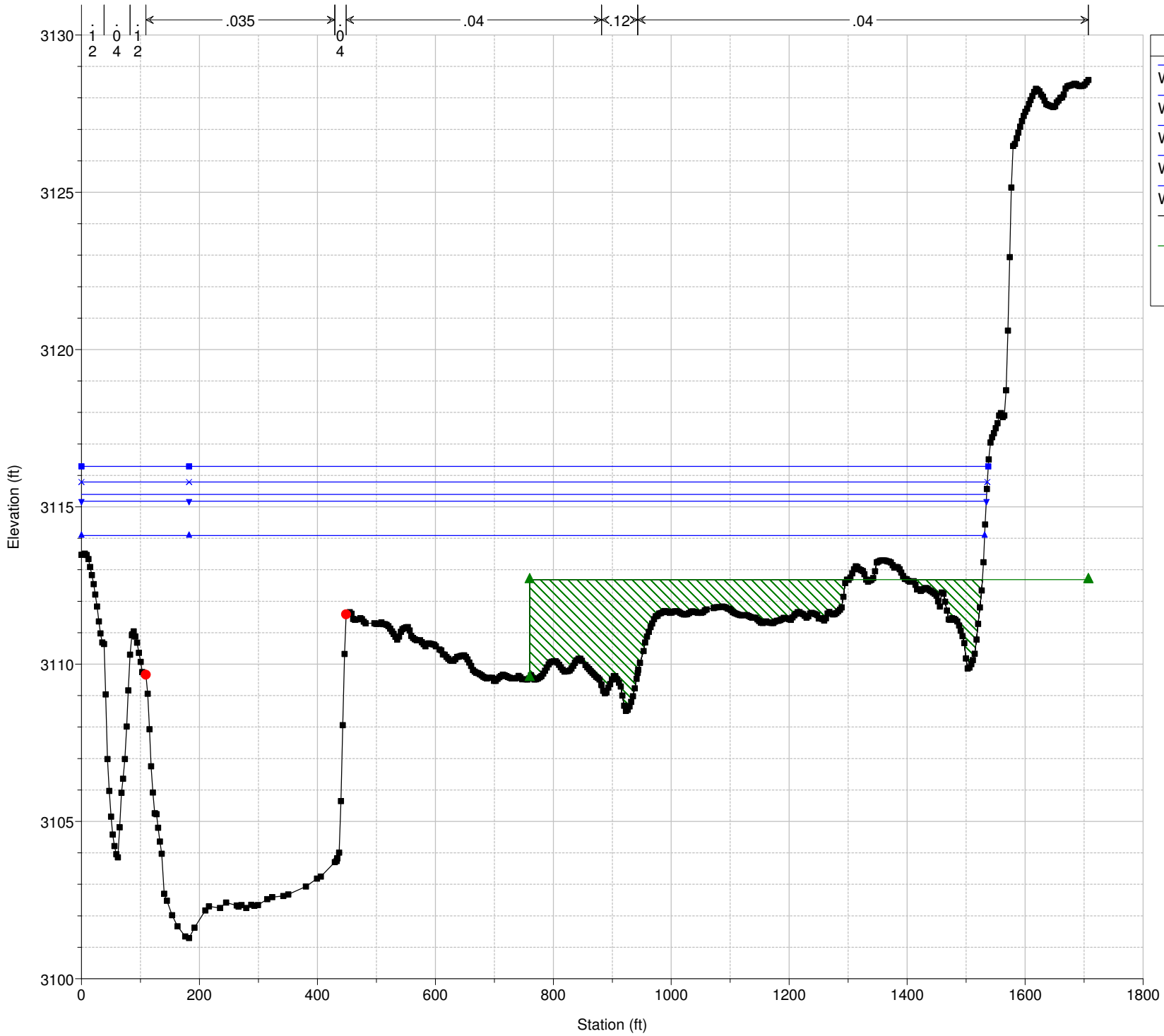
RS = 5061 ROB (Sta 450.209 - 688.83) excavated to 3109.25'



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

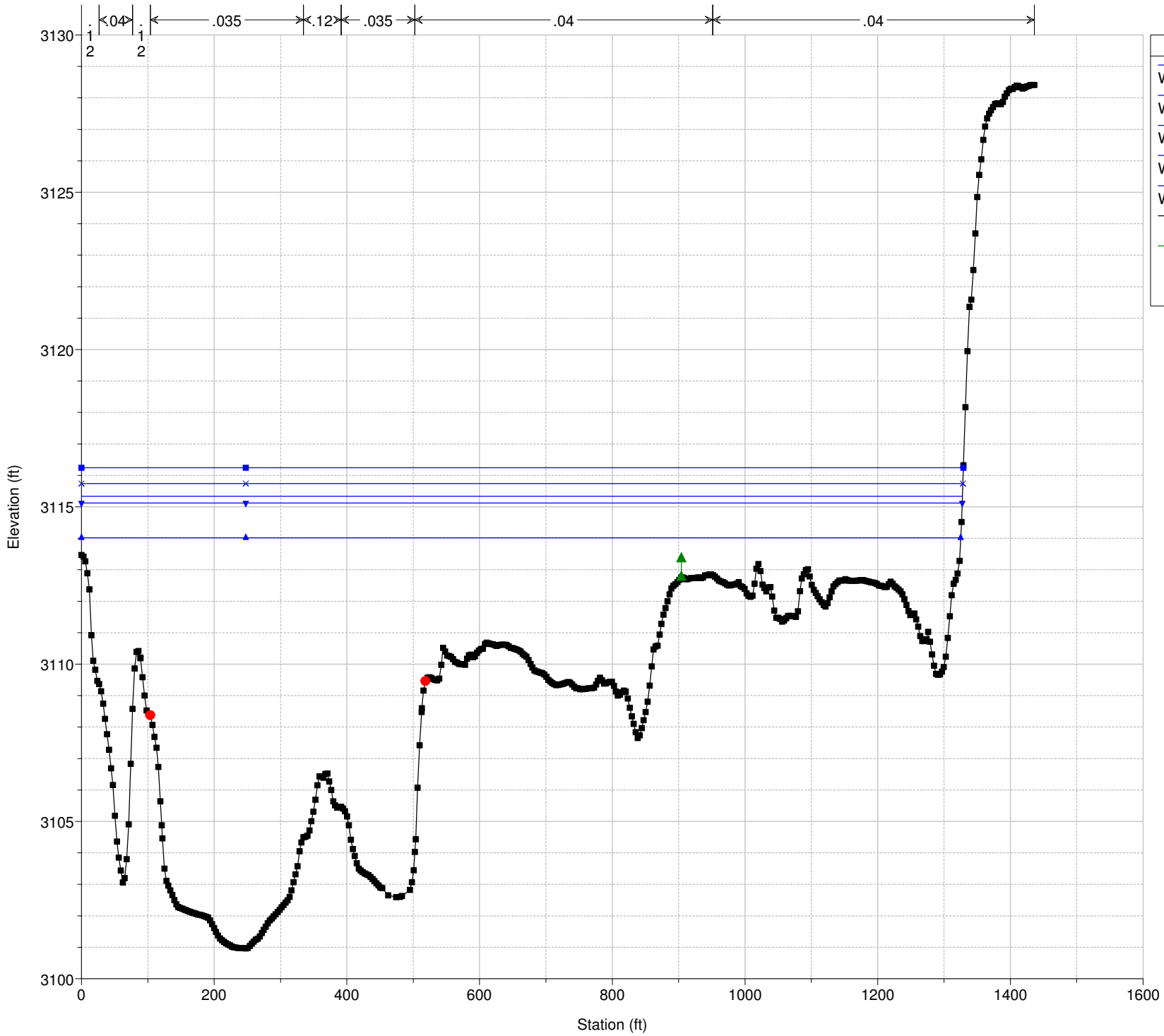
RS = 4726



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

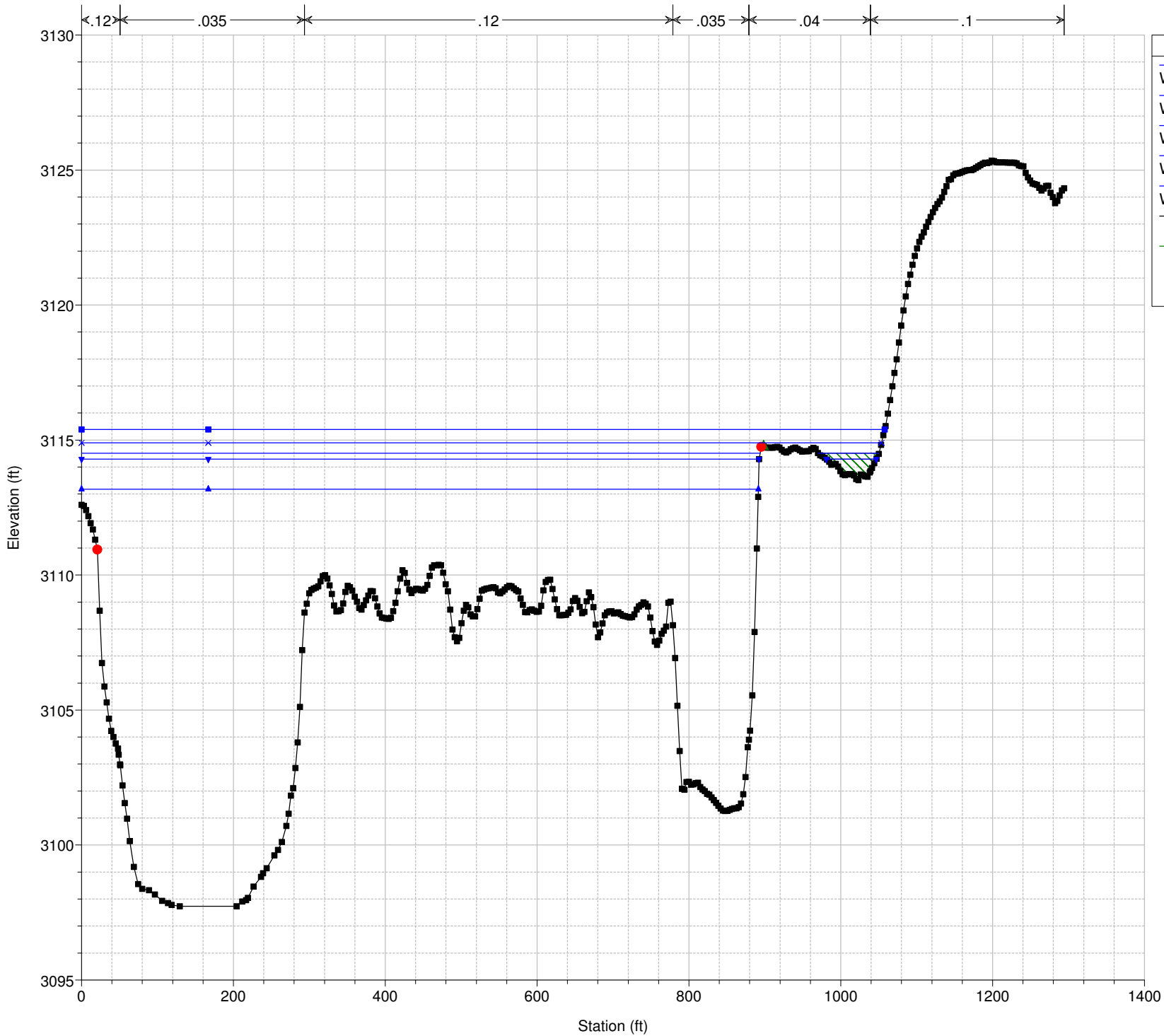
RS = 4371



Legend

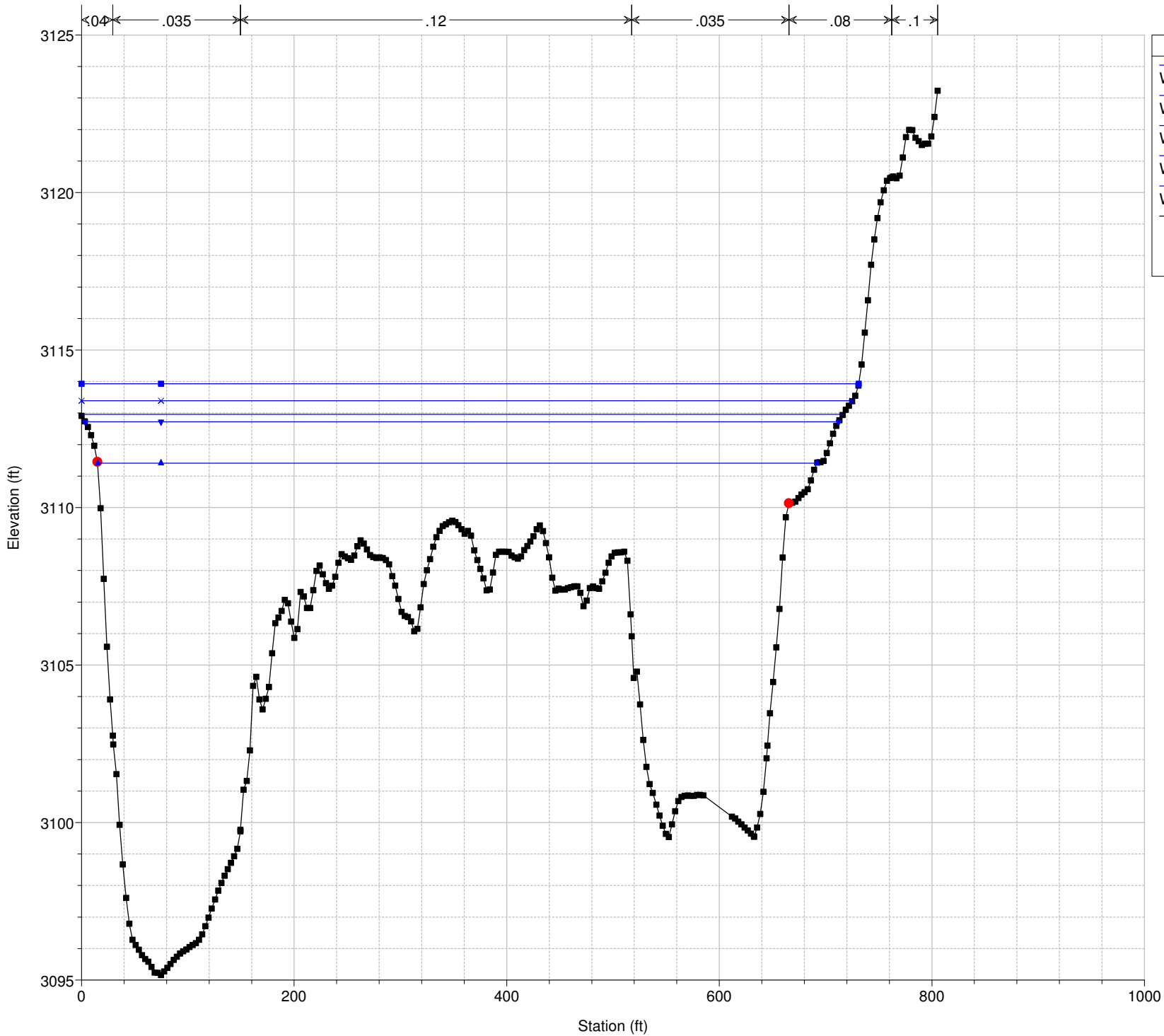
- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Ineff
- Bank Sta

RS = 3719



Legend	
■	WS Max WS - PropAlt1A_Exc_500yr
×	WS Max WS - PropAlt1A_Exc_200yr
▼	WS Max WS - PropAlt1A_Exc_100yr
▲	WS Max WS - PropAlt1A_Exc_050yr
▲	WS Max WS - PropAlt1A_Exc_010yr
■	Ground
▲	Ineff
●	Bank Sta

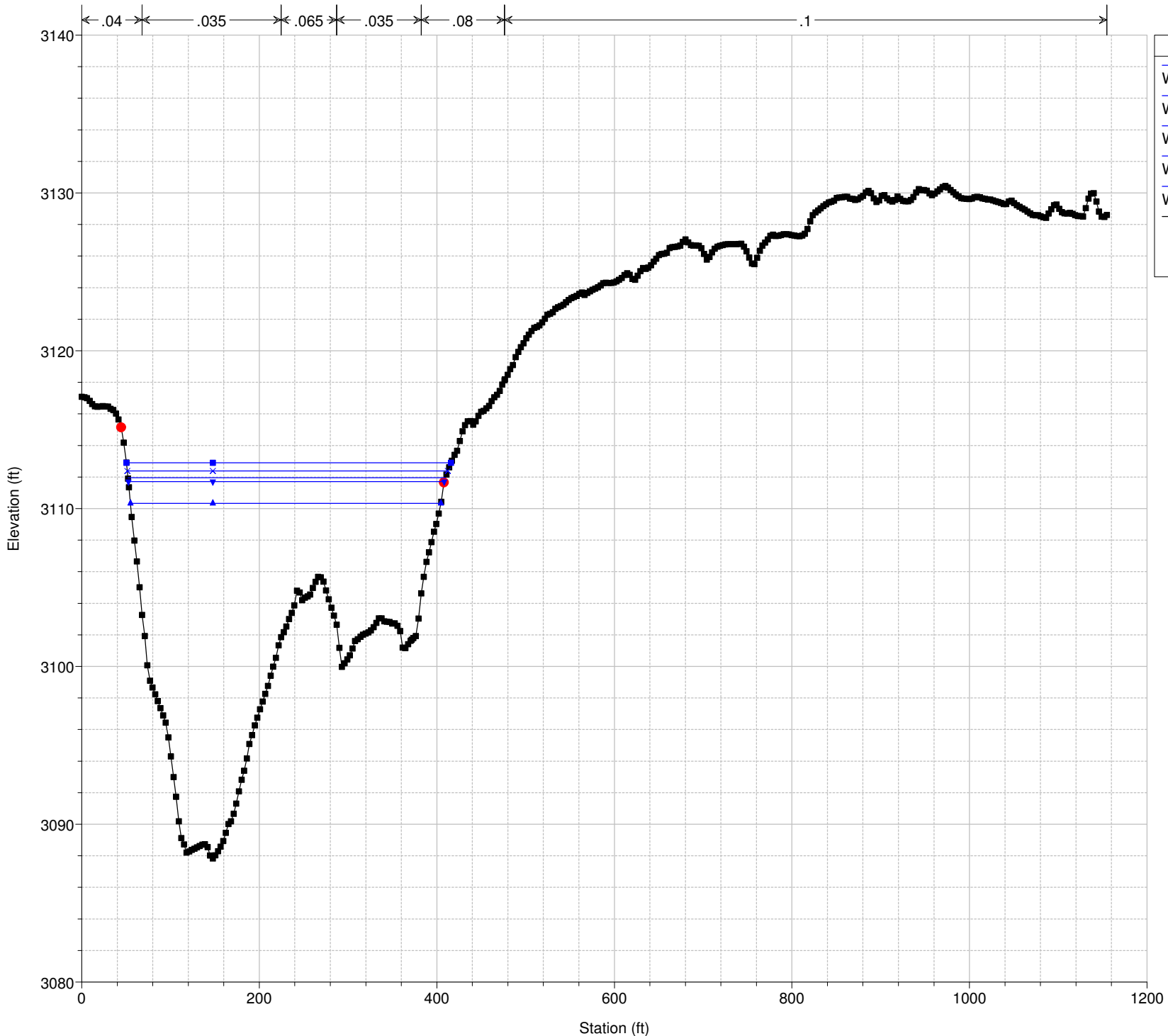
RS = 3245



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- Ground
- Bank Sta

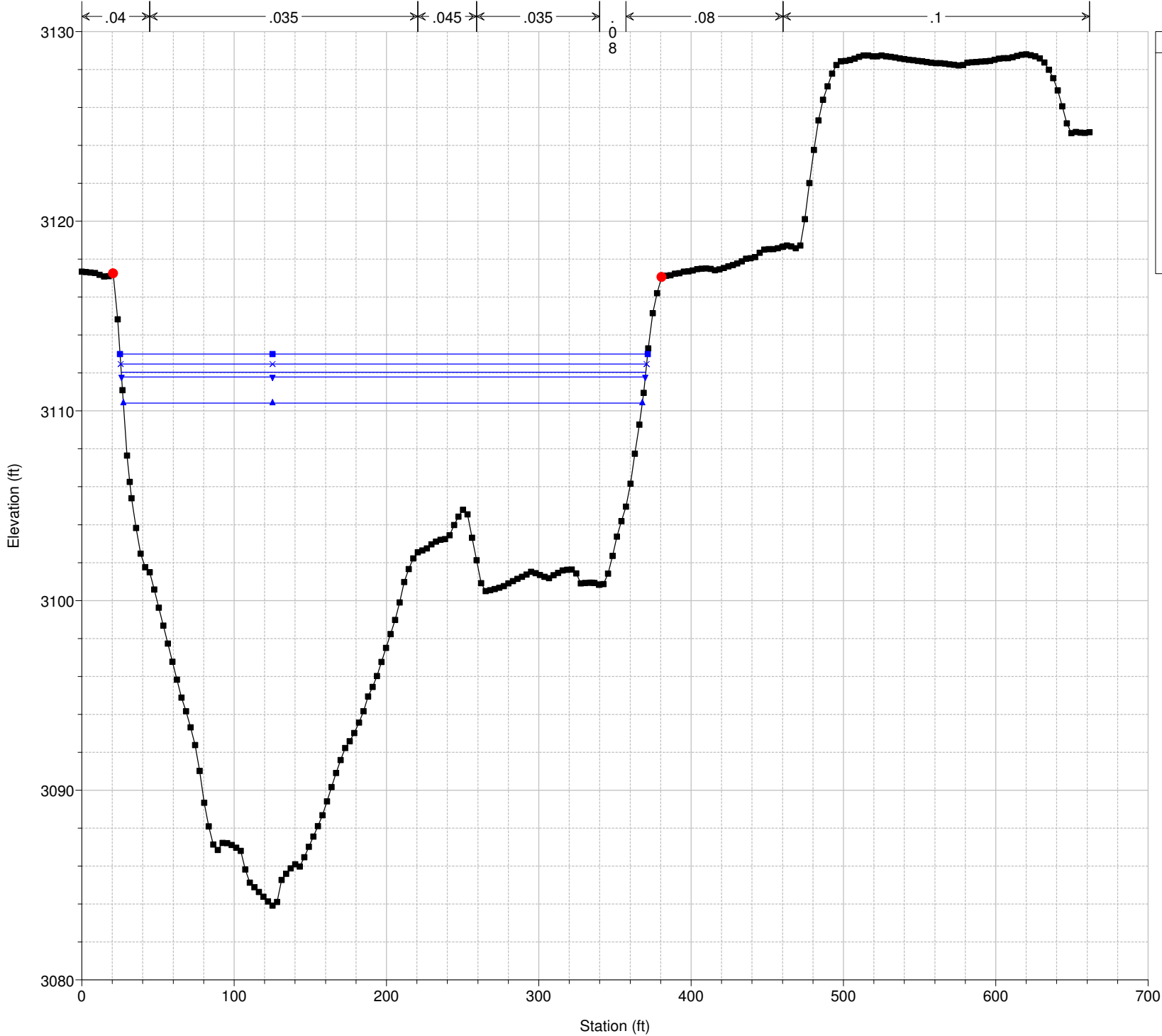
RS = 2915



Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Bank Sta

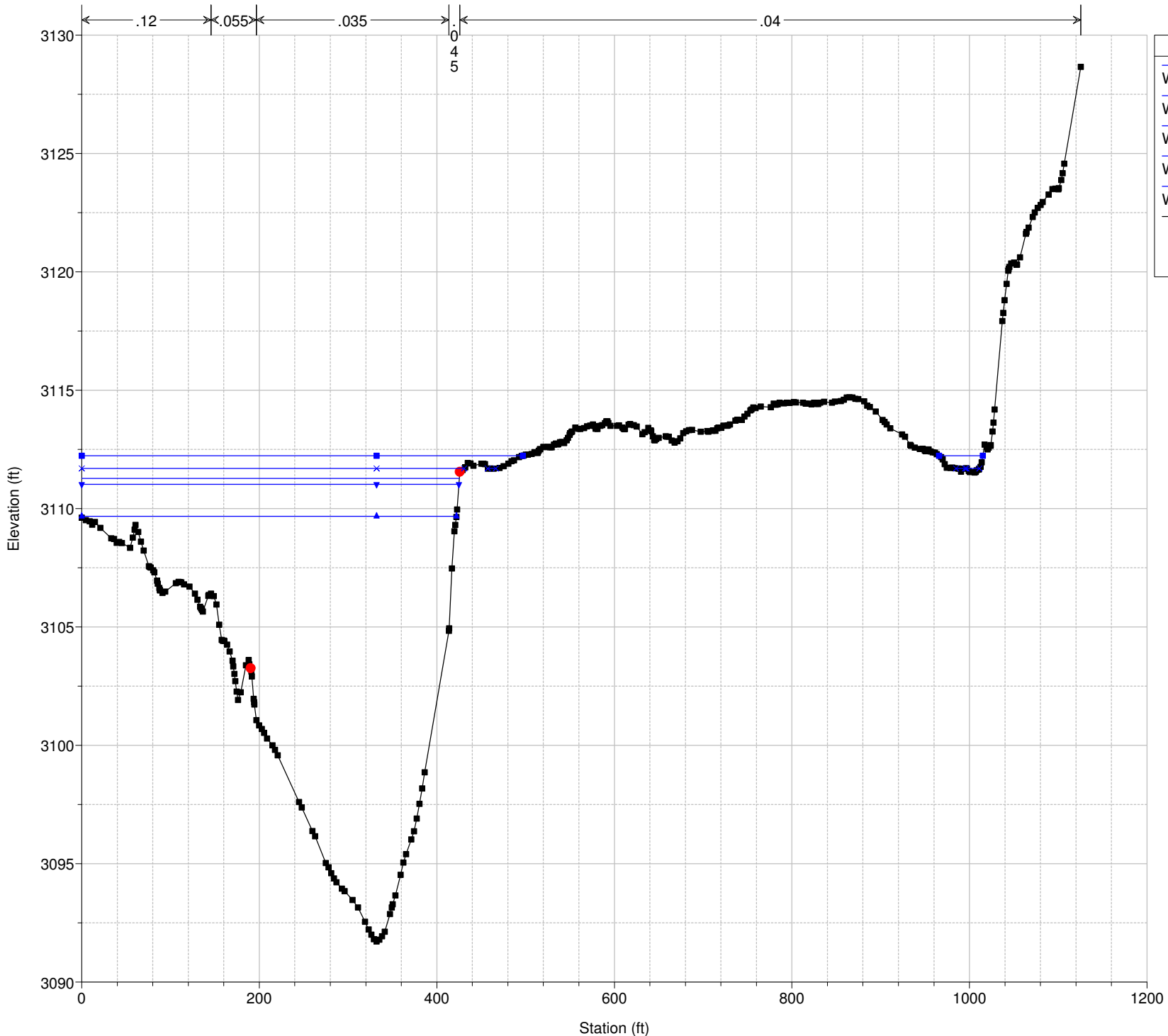
RS = 2865



Legend

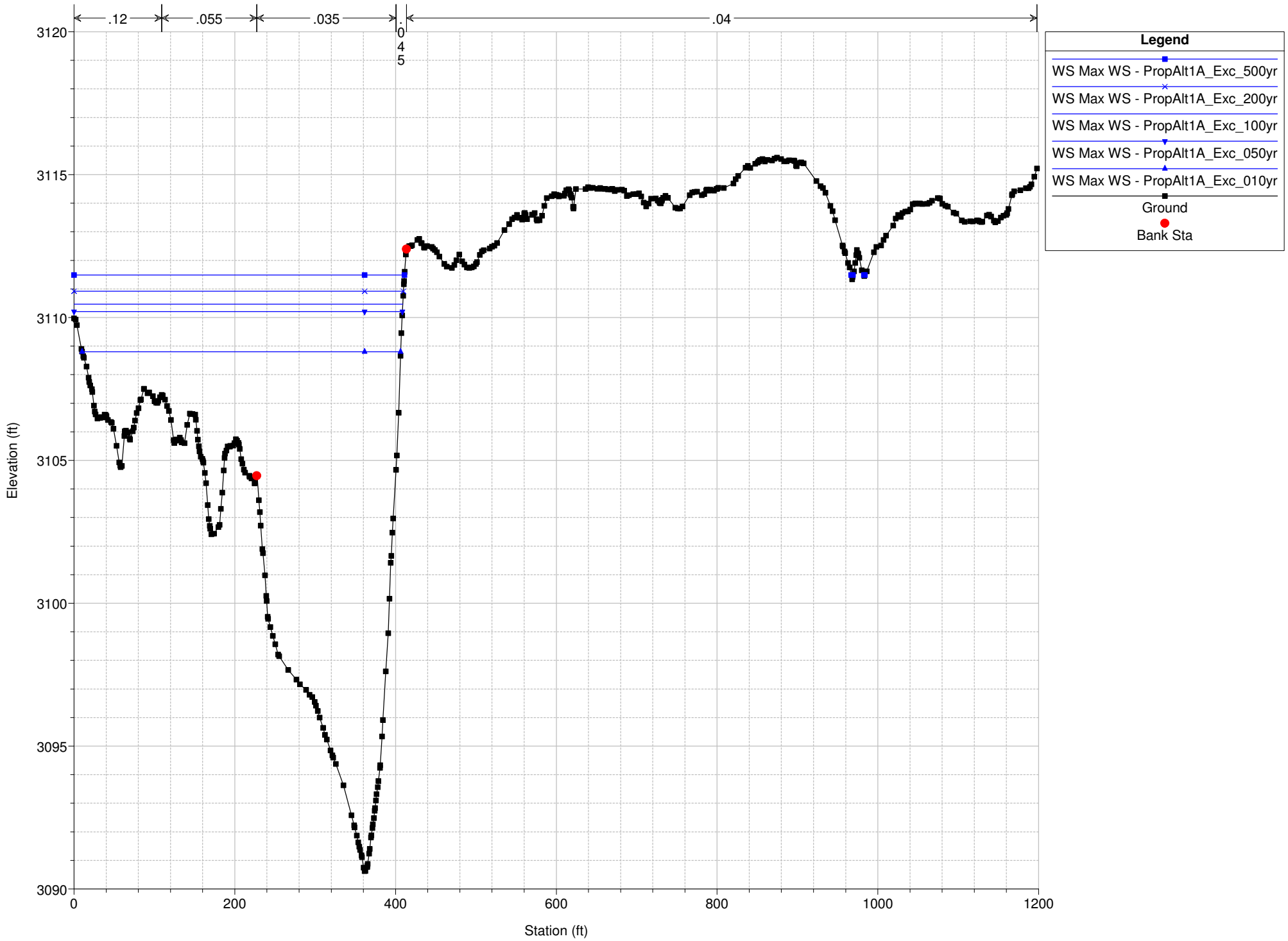
- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Bank Sta

RS = 2244

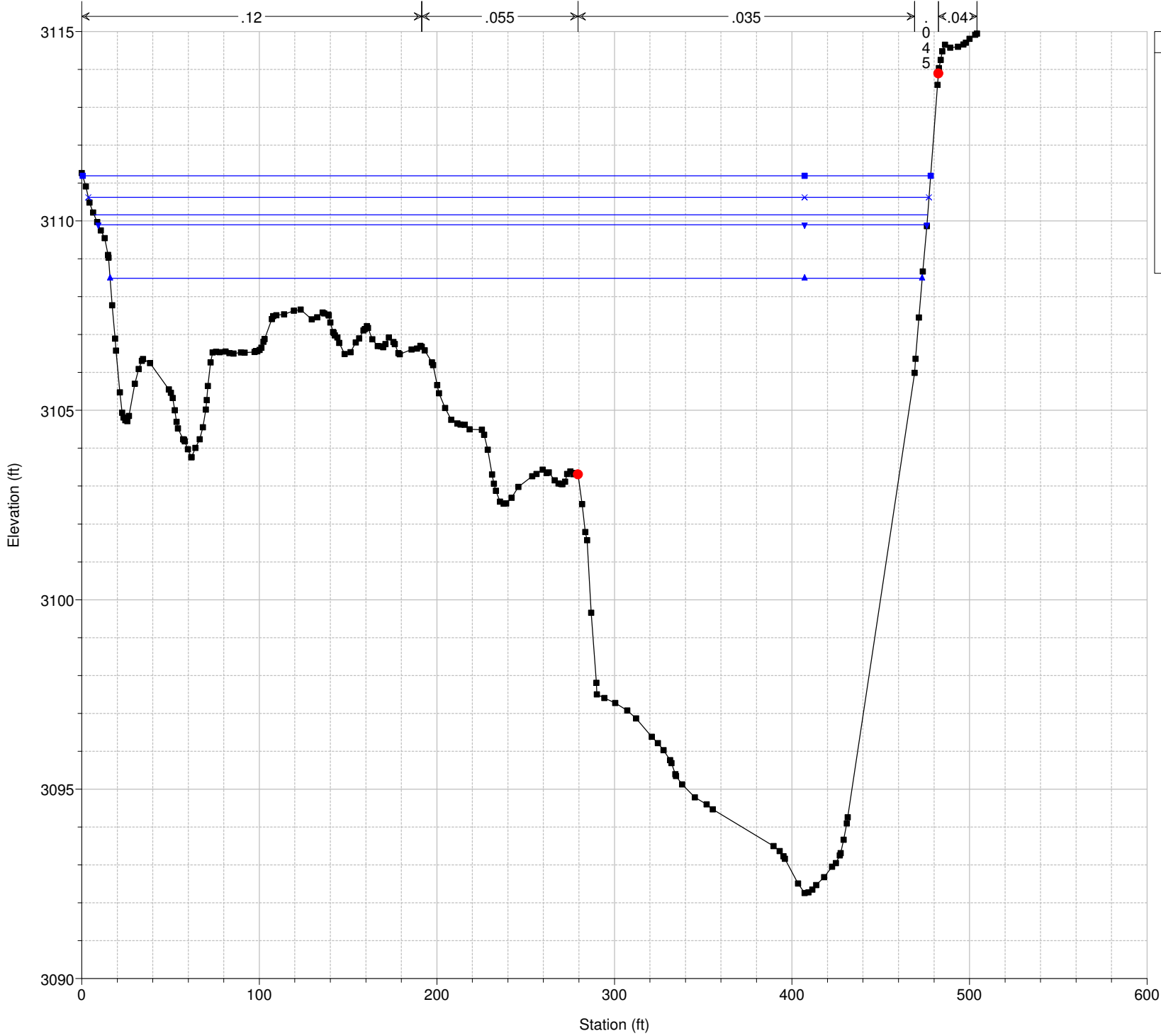


Legend	
■	WS Max WS - PropAlt1A_Exc_500yr
×	WS Max WS - PropAlt1A_Exc_200yr
▼	WS Max WS - PropAlt1A_Exc_100yr
▲	WS Max WS - PropAlt1A_Exc_050yr
◆	WS Max WS - PropAlt1A_Exc_010yr
■	Ground
●	Bank Sta

RS = 1809

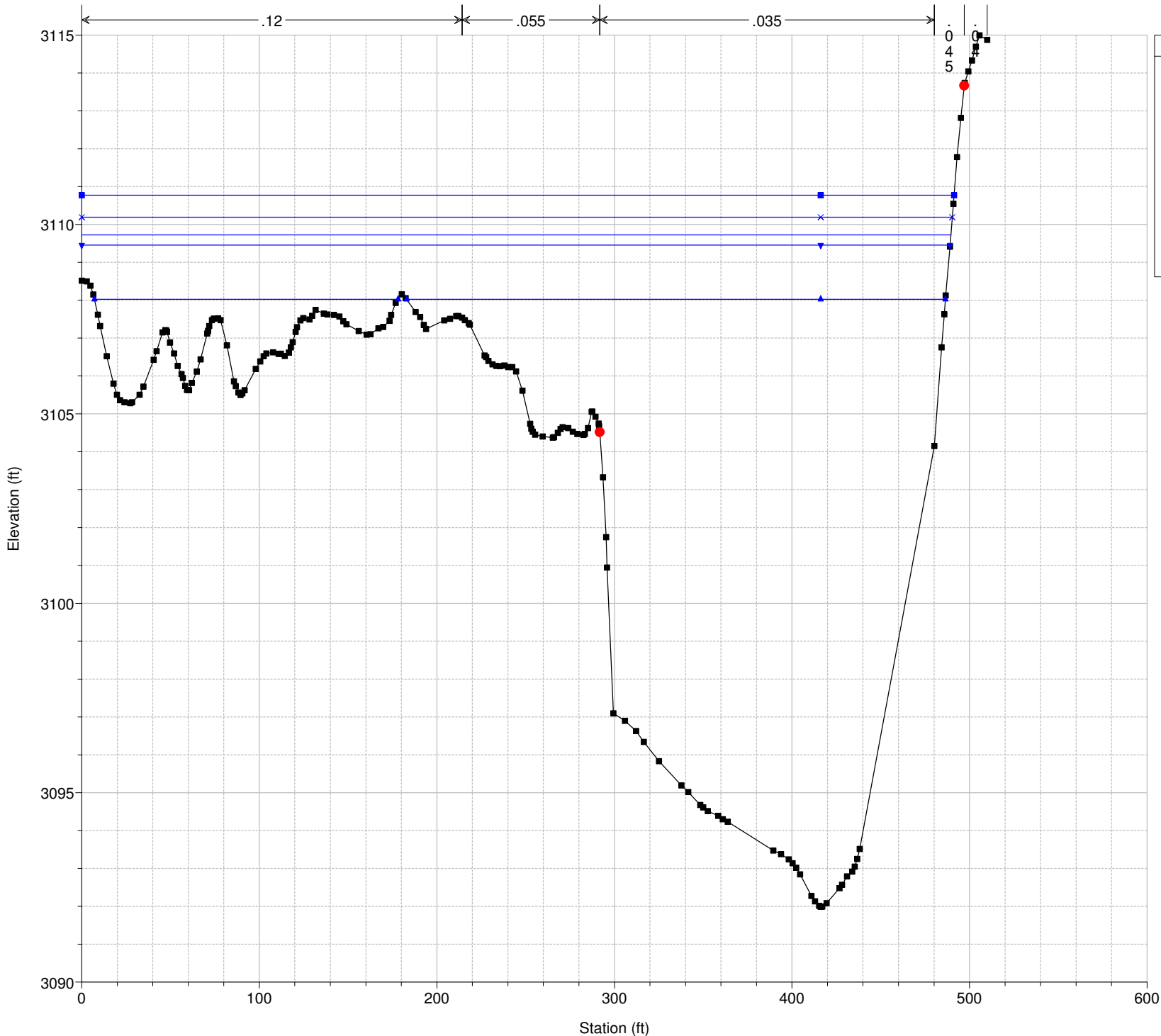


RS = 1542



Legend	
■	WS Max WS - PropAlt1A_Exc_500yr
×	WS Max WS - PropAlt1A_Exc_200yr
▼	WS Max WS - PropAlt1A_Exc_100yr
▲	WS Max WS - PropAlt1A_Exc_050yr
■	WS Max WS - PropAlt1A_Exc_010yr
■	Ground
●	Bank Sta

RS = 1229



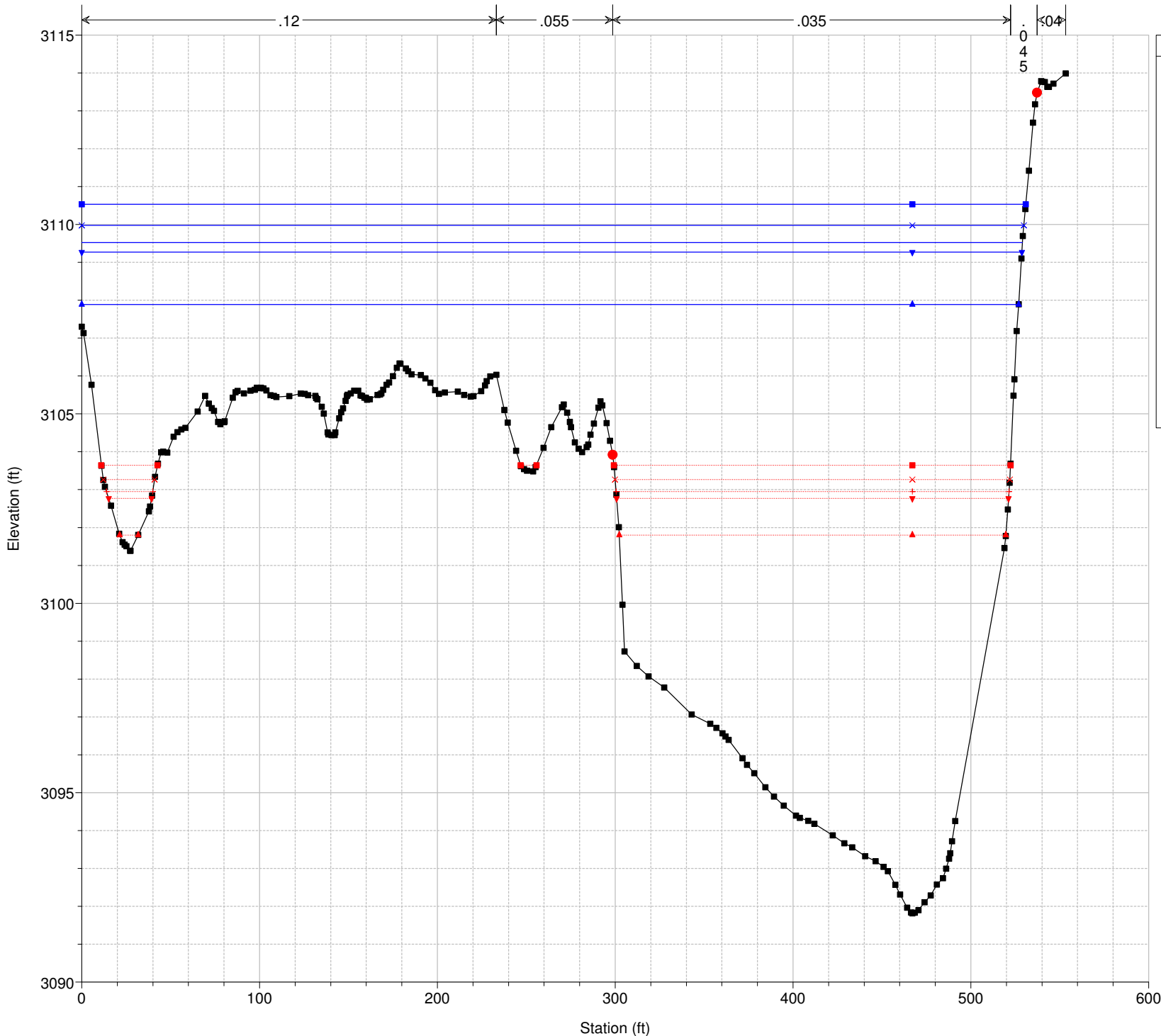
Legend

- WS Max WS - PropAlt1A_Exc_500yr
- × WS Max WS - PropAlt1A_Exc_200yr
- ▼ WS Max WS - PropAlt1A_Exc_100yr
- ▲ WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Ground
- Bank Sta



0
4
5

RS = 918



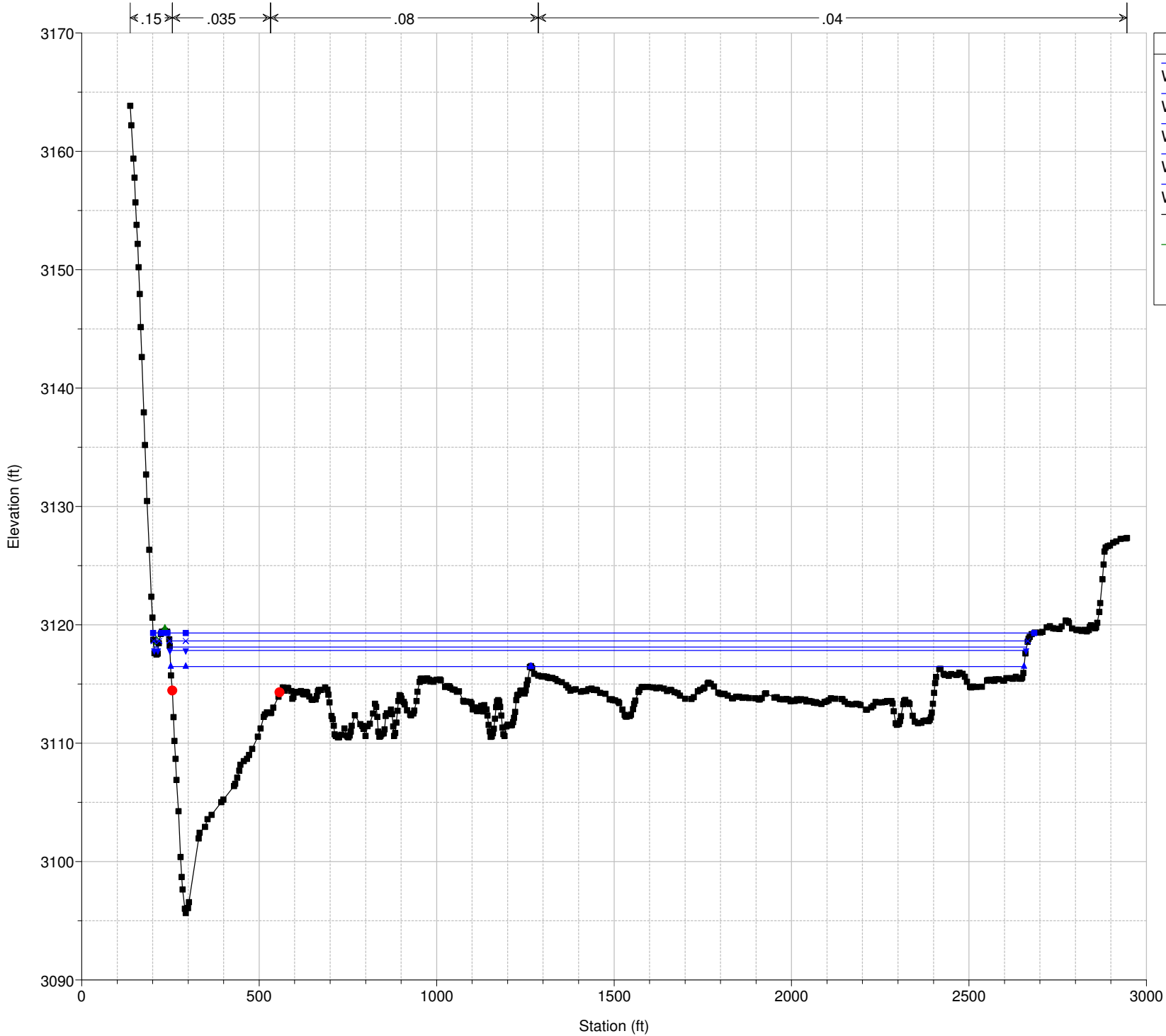
Legend

- WS Max WS - PropAlt1A_Exc_500yr
- WS Max WS - PropAlt1A_Exc_200yr
- WS Max WS - PropAlt1A_Exc_100yr
- WS Max WS - PropAlt1A_Exc_050yr
- WS Max WS - PropAlt1A_Exc_010yr
- Crit Max WS - PropAlt1A_Exc_500yr
- Crit Max WS - PropAlt1A_Exc_200yr
- Crit Max WS - PropAlt1A_Exc_100yr
- Crit Max WS - PropAlt1A_Exc_050yr
- Crit Max WS - PropAlt1A_Exc_010yr
- Ground
- Bank Sta

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	918	Max WS	PropAlt1B_Exc_100yr	25171.45	3091.81	3109.52	3102.95	3110.32	0.001004	7.43	4515.44	529.01	0.36
1	918	Max WS	PropAlt1B_Exc_010yr	19940.46	3091.81	3107.89	3101.80	3108.59	0.001004	6.90	3652.82	526.86	0.35
1	918	Max WS	PropAlt1B_Exc_050yr	24328.85	3091.81	3109.27	3102.77	3110.05	0.001004	7.35	4382.20	528.64	0.36
1	918	Max WS	PropAlt1B_Exc_200yr	26710.00	3091.81	3109.98	3103.27	3110.79	0.001004	7.57	4755.31	529.79	0.36
1	918	Max WS	PropAlt1B_Exc_500yr	28663.67	3091.81	3110.54	3103.68	3111.38	0.001004	7.73	5052.19	530.87	0.36
1	933		Lat Struct										
1	1229	Max WS	PropAlt1B_Exc_100yr	24283.94	3091.99	3109.73		3110.79	0.001324	8.50	3624.76	489.47	0.41
1	1229	Max WS	PropAlt1B_Exc_010yr	19641.37	3091.99	3108.03		3109.03	0.001387	8.10	2801.45	474.85	0.41
1	1229	Max WS	PropAlt1B_Exc_050yr	23556.91	3091.99	3109.46		3110.52	0.001337	8.45	3495.99	489.03	0.41
1	1229	Max WS	PropAlt1B_Exc_200yr	25639.94	3091.99	3110.20		3111.27	0.001304	8.59	3854.98	490.26	0.40
1	1229	Max WS	PropAlt1B_Exc_500yr	27362.62	3091.99	3110.78		3111.87	0.001281	8.70	4140.01	491.25	0.40
1	1320		Lat Struct										
1	1542	Max WS	PropAlt1B_Exc_100yr	24840.45	3092.26	3110.16		3111.15	0.001258	8.35	3891.72	469.45	0.40
1	1542	Max WS	PropAlt1B_Exc_010yr	20083.25	3092.26	3108.49		3109.42	0.001313	7.95	3120.59	457.43	0.40
1	1542	Max WS	PropAlt1B_Exc_050yr	24118.96	3092.26	3109.90		3110.88	0.001272	8.31	3770.01	466.71	0.40
1	1542	Max WS	PropAlt1B_Exc_200yr	26147.73	3092.26	3110.62		3111.62	0.001235	8.42	4108.63	473.40	0.40
1	1542	Max WS	PropAlt1B_Exc_500yr	27827.37	3092.26	3111.20		3112.20	0.001210	8.52	4381.01	477.61	0.39
1	1665		Lat Struct										
1	1809	Max WS	PropAlt1B_Exc_100yr	24825.04	3090.62	3110.47		3111.61	0.001479	8.99	3506.97	409.09	0.43
1	1809	Max WS	PropAlt1B_Exc_010yr	20085.20	3090.62	3108.80		3109.88	0.001547	8.59	2835.55	396.27	0.43
1	1809	Max WS	PropAlt1B_Exc_050yr	24115.92	3090.62	3110.21		3111.35	0.001495	8.95	3401.86	408.63	0.43
1	1809	Max WS	PropAlt1B_Exc_200yr	26184.72	3090.62	3110.93		3112.08	0.001458	9.09	3695.32	409.93	0.43
1	1809	Max WS	PropAlt1B_Exc_500yr	27912.02	3090.62	3111.49		3112.67	0.001437	9.20	3927.84	414.88	0.42
1	2024		Lat Struct										
1	2244	Max WS	PropAlt1B_Exc_100yr	25051.80	3091.72	3111.27		3112.03	0.000927	7.18	4125.27	425.36	0.34
1	2244	Max WS	PropAlt1B_Exc_010yr	20087.27	3091.72	3109.68		3110.33	0.000896	6.61	3449.28	422.05	0.33
1	2244	Max WS	PropAlt1B_Exc_050yr	24265.97	3091.72	3111.03		3111.77	0.000923	7.09	4022.82	424.90	0.34
1	2244	Max WS	PropAlt1B_Exc_200yr	26507.80	3091.72	3111.71		3112.49	0.000933	7.33	4312.49	469.00	0.34
1	2244	Max WS	PropAlt1B_Exc_500yr	28411.82	3091.72	3112.24		3113.06	0.000937	7.53	4589.02	547.59	0.34
1	2450		Lat Struct										
1	2865	Max WS	PropAlt1B_Exc_100yr	25345.92	3083.92	3112.04		3112.41	0.000526	4.89	5178.98	344.41	0.22
1	2865	Max WS	PropAlt1B_Exc_010yr	20092.24	3083.92	3110.41		3110.71	0.000466	4.35	4622.85	340.78	0.21
1	2865	Max WS	PropAlt1B_Exc_050yr	24489.89	3083.92	3111.80		3112.15	0.000516	4.81	5096.05	343.92	0.22
1	2865	Max WS	PropAlt1B_Exc_200yr	27042.22	3083.92	3112.47		3112.87	0.000550	5.08	5328.34	345.30	0.23
1	2865	Max WS	PropAlt1B_Exc_500yr	29209.24	3083.92	3113.00		3113.44	0.000579	5.30	5511.31	346.38	0.23
1	2915	Max WS	PropAlt1B_Exc_100yr	25372.71	3087.83	3111.95		3112.45	0.001036	5.66	4482.13	357.59	0.28
1	2915	Max WS	PropAlt1B_Exc_010yr	20093.19	3087.83	3110.33		3110.74	0.000981	5.14	3910.97	349.74	0.27
1	2915	Max WS	PropAlt1B_Exc_050yr	24501.94	3087.83	3111.71		3112.20	0.001028	5.57	4396.89	355.73	0.28
1	2915	Max WS	PropAlt1B_Exc_200yr	27049.30	3087.83	3112.38		3112.91	0.001055	5.83	4637.40	361.12	0.29
1	2915	Max WS	PropAlt1B_Exc_500yr	29223.39	3087.83	3112.91		3113.48	0.001082	6.06	4828.15	365.74	0.29
1	3002		Lat Struct										
1	3245	Max WS	PropAlt1B_Exc_100yr	25376.02	3095.16	3112.96		3113.27	0.003989	4.45	5764.94	716.48	0.27
1	3245	Max WS	PropAlt1B_Exc_010yr	20093.48	3095.16	3111.41		3111.70	0.004855	4.31	4683.36	676.96	0.28
1	3245	Max WS	PropAlt1B_Exc_050yr	24511.82	3095.16	3112.73		3113.03	0.004086	4.42	5596.75	709.16	0.27
1	3245	Max WS	PropAlt1B_Exc_200yr	27059.87	3095.16	3113.40		3113.71	0.003843	4.51	6077.14	725.27	0.26
1	3245	Max WS	PropAlt1B_Exc_500yr	29266.18	3095.16	3113.93		3114.25	0.003697	4.59	6465.56	731.20	0.26
1	3398		Lat Struct										
1	3719	Max WS	PropAlt1B_Exc_100yr	26311.20	3097.73	3114.51		3114.68	0.002077	3.27	8088.82	973.80	0.19
1	3719	Max WS	PropAlt1B_Exc_010yr	20161.97	3097.73	3113.18		3113.32	0.002048	2.93	6905.93	891.42	0.18
1	3719	Max WS	PropAlt1B_Exc_050yr	25222.78	3097.73	3114.30		3114.46	0.002061	3.21	7900.42	958.50	0.19
1	3719	Max WS	PropAlt1B_Exc_200yr	28559.95	3097.73	3114.90		3115.08	0.002112	3.39	8535.55	1053.64	0.19
1	3719	Max WS	PropAlt1B_Exc_500yr	31696.77	3097.73	3115.40		3115.59	0.002175	3.55	9055.92	1057.81	0.20
1	4045		Lat Struct										
1	4371	Max WS	PropAlt1B_Exc_100yr	29435.85	3100.96	3115.34		3115.52	0.000604	3.78	9163.14	1327.73	0.19
1	4371	Max WS	PropAlt1B_Exc_010yr	20610.13	3100.96	3114.02		3114.16	0.000537	3.30	7413.27	1325.19	0.18
1	4371	Max WS	PropAlt1B_Exc_050yr	27826.81	3100.96	3115.13		3115.30	0.000592	3.70	8878.90	1327.38	0.19
1	4371	Max WS	PropAlt1B_Exc_200yr	32739.38	3100.96	3115.74		3115.93	0.000634	3.96	9690.34	1328.39	0.20
1	4371	Max WS	PropAlt1B_Exc_500yr	37345.94	3100.96	3116.24		3116.46	0.000676	4.20	10359.94	1329.22	0.21
1	4549		Lat Struct										
1	4726	Max WS	PropAlt1B_Exc_100yr	31035.95	3101.29	3115.40		3115.73	0.000558	5.30	8460.85	1534.80	0.26
1	4726	Max WS	PropAlt1B_Exc_010yr	20863.93	3101.29	3114.09		3114.35	0.000457	4.45	6461.76	1531.44	0.24
1	4726	Max WS	PropAlt1B_Exc_050yr	29169.07	3101.29	3115.19		3115.51	0.000541	5.15	8138.66	1534.25	0.26
1	4726	Max WS	PropAlt1B_Exc_200yr	34880.31	3101.29	3115.79		3116.15	0.000596	5.59	9064.35	1535.95	0.28
1	4726	Max WS	PropAlt1B_Exc_500yr	40235.00	3101.29	3116.29		3116.69	0.000648	5.97	9828.21	1537.52	0.29
1	4872		Lat Struct										
1	5061	Max WS	PropAlt1B_Exc_100yr	31757.57	3101.66	3115.57		3115.92	0.000775	5.38	7936.52	1536.04	0.28

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	5061	Max WS	PropAlt1B_Exc_010yr	20897.83	3101.66	3114.26		3114.51	0.000608	4.41	6171.35	1519.60	0.24
1	5061	Max WS	PropAlt1B_Exc_050yr	29639.64	3101.66	3115.36		3115.69	0.000739	5.19	7654.42	1535.53	0.27
1	5061	Max WS	PropAlt1B_Exc_200yr	35937.15	3101.66	3115.97		3116.36	0.000840	5.73	8467.40	1537.00	0.29
1	5061	Max WS	PropAlt1B_Exc_500yr	41925.88	3101.66	3116.46		3116.91	0.000939	6.22	9139.04	1538.25	0.31
1	5100			Mult Open									
1	5125	Max WS	PropAlt1B_Exc_100yr	31756.28	3101.61	3115.51		3115.97	0.000738	5.95	6935.19	1600.28	0.30
1	5125	Max WS	PropAlt1B_Exc_010yr	20897.32	3101.61	3114.26		3114.56	0.000535	4.70	5344.40	1332.47	0.25
1	5125	Max WS	PropAlt1B_Exc_050yr	29639.11	3101.61	3115.31		3115.73	0.000697	5.71	6654.02	1560.73	0.29
1	5125	Max WS	PropAlt1B_Exc_200yr	35936.95	3101.61	3115.90		3116.40	0.000808	6.35	7471.33	1609.33	0.32
1	5125	Max WS	PropAlt1B_Exc_500yr	41925.63	3101.61	3116.38		3116.98	0.000907	6.91	8151.24	1611.80	0.34
1	5150			Lat Struct									
1	5230	Max WS	PropAlt1B_Exc_100yr	31788.73	3101.79	3115.63		3116.05	0.000676	5.82	8381.07	1977.58	0.29
1	5230	Max WS	PropAlt1B_Exc_010yr	20898.71	3101.79	3114.29		3114.63	0.000582	5.00	5570.42	1409.15	0.27
1	5230	Max WS	PropAlt1B_Exc_050yr	29682.50	3101.79	3115.42		3115.81	0.000642	5.61	8009.38	1900.46	0.29
1	5230	Max WS	PropAlt1B_Exc_200yr	35987.36	3101.79	3116.03		3116.49	0.000740	6.22	9095.95	2007.62	0.31
1	5230	Max WS	PropAlt1B_Exc_500yr	41985.05	3101.79	3116.53		3117.06	0.000833	6.78	10017.01	2070.09	0.33
1	5385	Max WS	PropAlt1B_Exc_100yr	31795.06	3101.66	3115.73		3116.15	0.000685	5.79	8477.75	2126.35	0.29
1	5385	Max WS	PropAlt1B_Exc_010yr	20899.47	3101.66	3114.39		3114.71	0.000546	4.78	5688.72	1349.90	0.26
1	5385	Max WS	PropAlt1B_Exc_050yr	29692.26	3101.66	3115.51		3115.91	0.000655	5.60	8032.07	2103.26	0.29
1	5385	Max WS	PropAlt1B_Exc_200yr	35994.78	3101.66	3116.14		3116.60	0.000740	6.16	9310.52	2161.37	0.31
1	5385	Max WS	PropAlt1B_Exc_500yr	41994.26	3101.66	3116.66		3117.19	0.000817	6.65	10371.42	2176.82	0.33
1	6087	Max WS	PropAlt1B_Exc_100yr	31794.88	3102.08	3116.27		3116.82	0.001157	6.58	7010.40	1654.67	0.34
1	6087	Max WS	PropAlt1B_Exc_010yr	20900.65	3102.08	3114.81		3115.22	0.000860	5.47	5058.34	890.69	0.30
1	6087	Max WS	PropAlt1B_Exc_050yr	29694.24	3102.08	3116.02		3116.55	0.001114	6.42	6601.96	1613.12	0.33
1	6087	Max WS	PropAlt1B_Exc_200yr	35994.87	3102.08	3116.74		3117.32	0.001230	6.86	7864.70	1932.39	0.35
1	6087	Max WS	PropAlt1B_Exc_500yr	41994.14	3102.08	3117.35		3117.94	0.001311	7.15	9062.09	2029.36	0.35
1	6550	Max WS	PropAlt1B_Exc_100yr	31797.21	3102.37	3116.73		3117.26	0.000866	6.48	8160.50	1765.27	0.33
1	6550	Max WS	PropAlt1B_Exc_010yr	20901.56	3102.37	3115.18		3115.55	0.000681	5.24	6119.18	1031.32	0.29
1	6550	Max WS	PropAlt1B_Exc_050yr	29694.46	3102.37	3116.48		3116.97	0.000827	6.24	7741.41	1551.03	0.32
1	6550	Max WS	PropAlt1B_Exc_200yr	35996.06	3102.37	3117.21		3117.79	0.000925	6.87	9047.11	1893.97	0.34
1	6550	Max WS	PropAlt1B_Exc_500yr	41995.78	3102.37	3117.82		3118.45	0.000983	7.32	10234.39	2030.99	0.36
1	7262	Max WS	PropAlt1B_Exc_100yr	31798.04	3101.11	3117.32		3117.61	0.000522	5.28	12822.95	2508.29	0.26
1	7262	Max WS	PropAlt1B_Exc_010yr	20901.77	3101.11	3115.64		3115.88	0.000478	4.60	9134.79	2011.96	0.24
1	7262	Max WS	PropAlt1B_Exc_050yr	29696.62	3101.11	3117.04		3117.31	0.000511	5.15	12158.59	2414.65	0.26
1	7262	Max WS	PropAlt1B_Exc_200yr	35996.14	3101.11	3117.84		3118.13	0.000537	5.50	14238.85	2716.27	0.27
1	7262	Max WS	PropAlt1B_Exc_500yr	41994.97	3101.11	3118.49		3118.80	0.000556	5.78	16019.99	2751.71	0.27
1	7435	Max WS	PropAlt1B_Exc_100yr	31799.43	3100.79	3117.51		3117.68	0.000360	4.26	13754.10	2293.00	0.21
1	7435	Max WS	PropAlt1B_Exc_010yr	20899.20	3100.79	3115.80		3115.96	0.000361	3.88	9917.76	2229.96	0.21
1	7435	Max WS	PropAlt1B_Exc_050yr	29697.23	3100.79	3117.22		3117.38	0.000356	4.17	13099.87	2263.40	0.21
1	7435	Max WS	PropAlt1B_Exc_200yr	35997.59	3100.79	3118.03		3118.21	0.000371	4.44	14952.84	2343.21	0.22
1	7435	Max WS	PropAlt1B_Exc_500yr	41998.80	3100.79	3118.68		3118.88	0.000386	4.68	16495.43	2498.82	0.22
1	7977	Max WS	PropAlt1B_Exc_100yr	31798.60	3099.02	3117.71		3117.85	0.000337	3.99	14618.50	2547.37	0.19
1	7977	Max WS	PropAlt1B_Exc_010yr	20899.28	3099.02	3116.00		3116.14	0.000360	3.76	10302.17	2520.26	0.20
1	7977	Max WS	PropAlt1B_Exc_050yr	29698.04	3099.02	3117.42		3117.56	0.000340	3.95	13881.67	2542.59	0.19
1	7977	Max WS	PropAlt1B_Exc_200yr	35998.39	3099.02	3118.23		3118.38	0.000337	4.10	15955.08	2558.27	0.20
1	7977	Max WS	PropAlt1B_Exc_500yr	41998.29	3099.02	3118.90		3119.05	0.000343	4.27	17651.91	2579.03	0.20
1	8519	Max WS	PropAlt1B_Exc_100yr	31799.99	3097.10	3117.89		3118.06	0.000518	4.27	12893.01	2495.55	0.21
1	8519	Max WS	PropAlt1B_Exc_010yr	20899.91	3097.10	3116.21		3116.40	0.000612	4.24	8729.83	2461.01	0.22
1	8519	Max WS	PropAlt1B_Exc_050yr	29700.06	3097.10	3117.61		3117.77	0.000528	4.25	12179.45	2488.03	0.21
1	8519	Max WS	PropAlt1B_Exc_200yr	35999.54	3097.10	3118.42		3118.58	0.000506	4.34	14198.68	2509.58	0.21
1	8519	Max WS	PropAlt1B_Exc_500yr	41999.30	3097.10	3119.09		3119.26	0.000502	4.46	15904.28	2534.08	0.21
1	9114	Max WS	PropAlt1B_Exc_100yr	31800.00	3095.66	3118.12		3118.32	0.000453	4.71	12615.26	2426.39	0.24
1	9114	Max WS	PropAlt1B_Exc_010yr	20900.00	3095.66	3116.48		3116.70	0.000498	4.52	8660.35	2402.29	0.25
1	9114	Max WS	PropAlt1B_Exc_050yr	29700.00	3095.66	3117.84		3118.04	0.000458	4.67	11932.44	2422.52	0.24
1	9114	Max WS	PropAlt1B_Exc_200yr	36000.00	3095.66	3118.64		3118.84	0.000448	4.80	13871.86	2435.07	0.24
1	9114	Max WS	PropAlt1B_Exc_500yr	42000.00	3095.66	3119.30		3119.52	0.000451	4.97	15486.03	2464.64	0.24

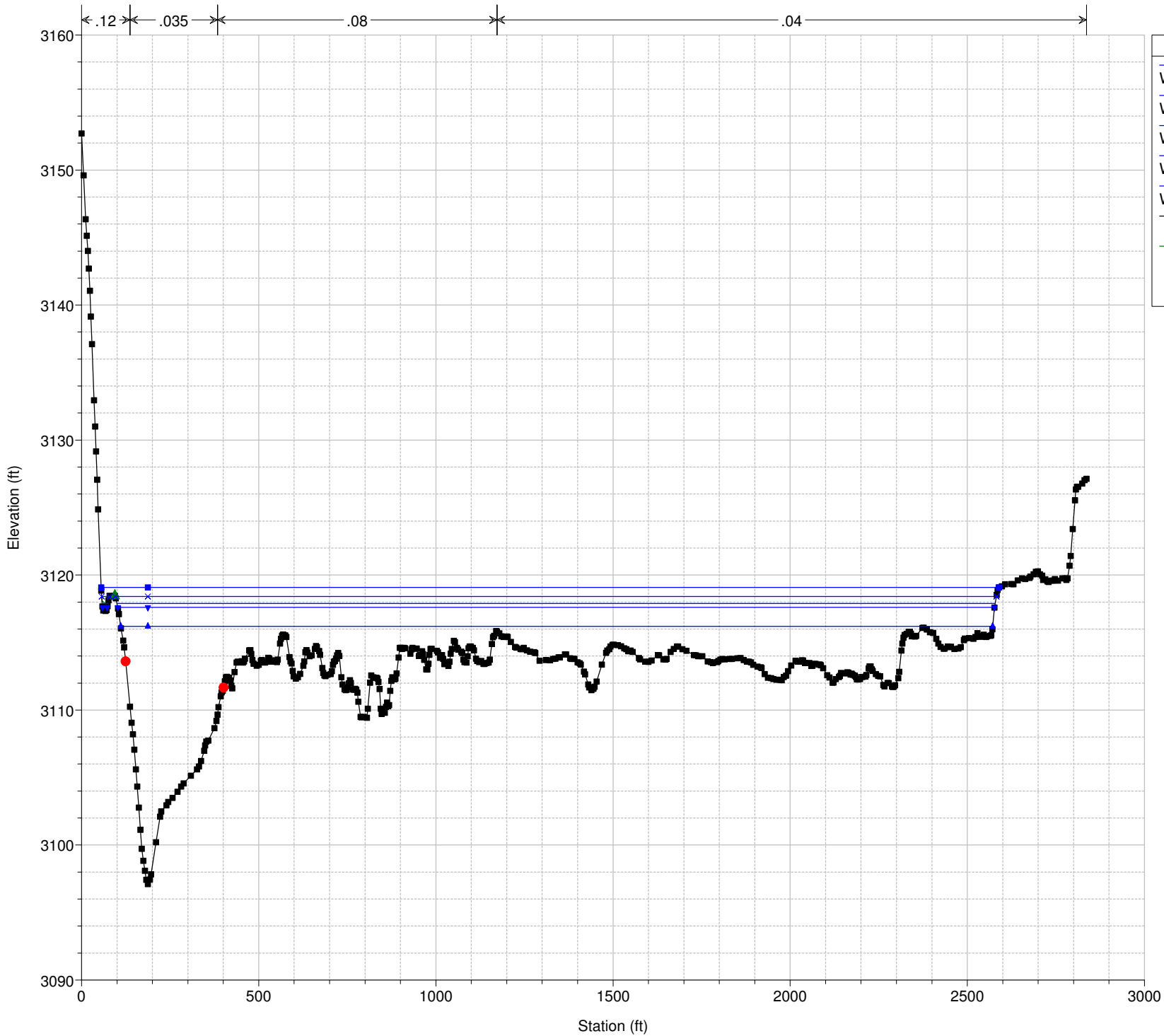
RS = 9114



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

RS = 8519



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

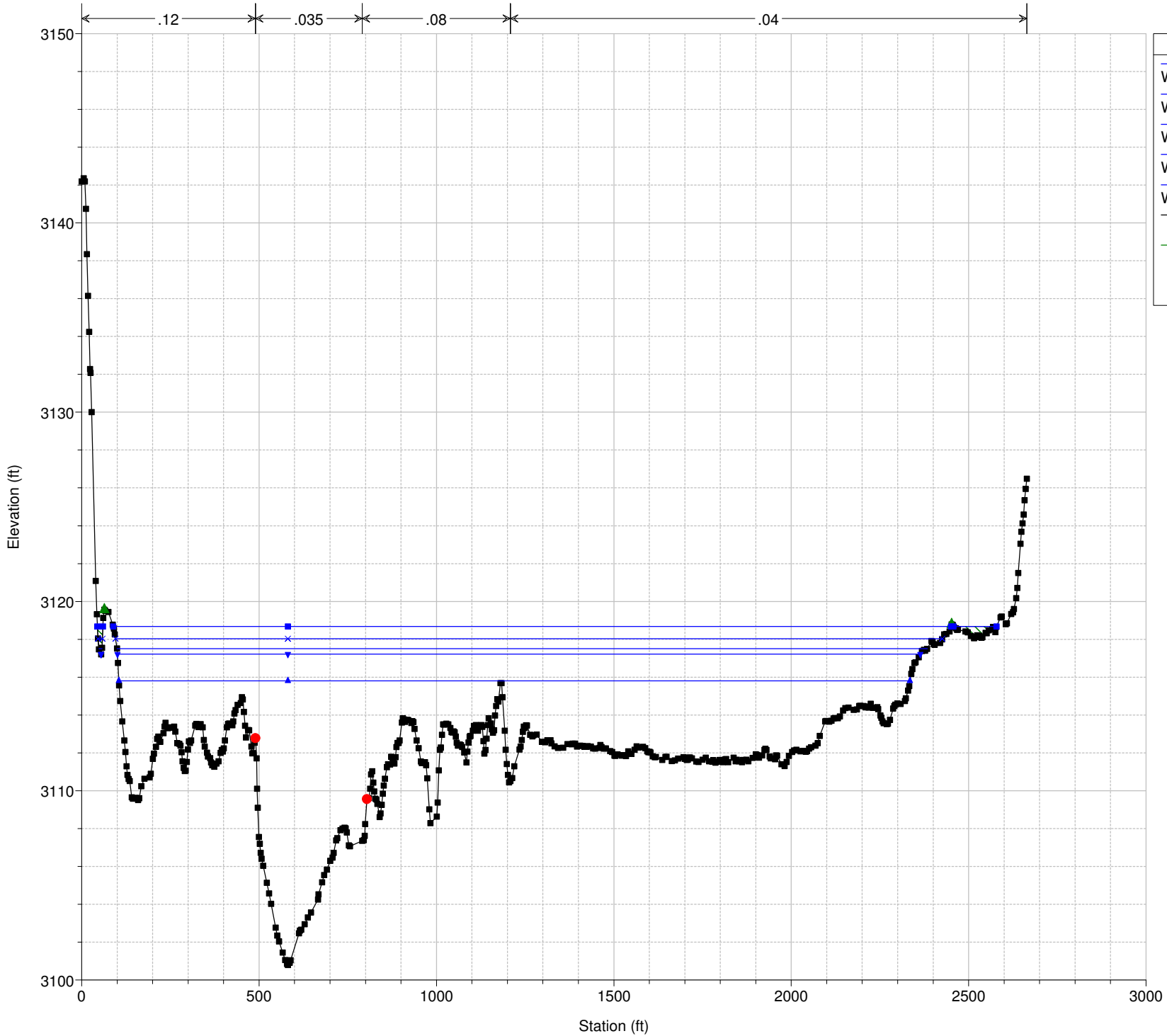
RS = 7977



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

RS = 7435

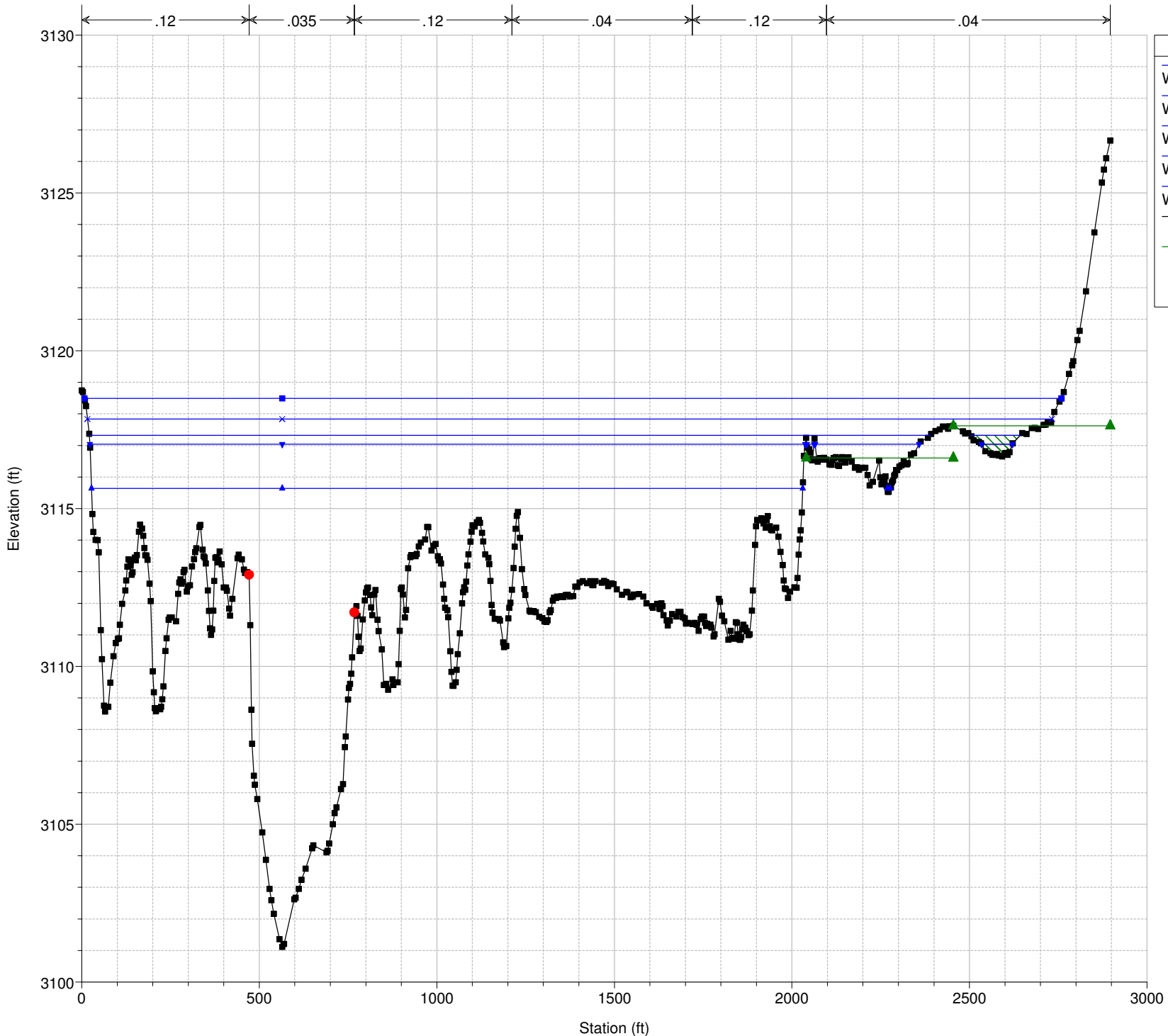


Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta



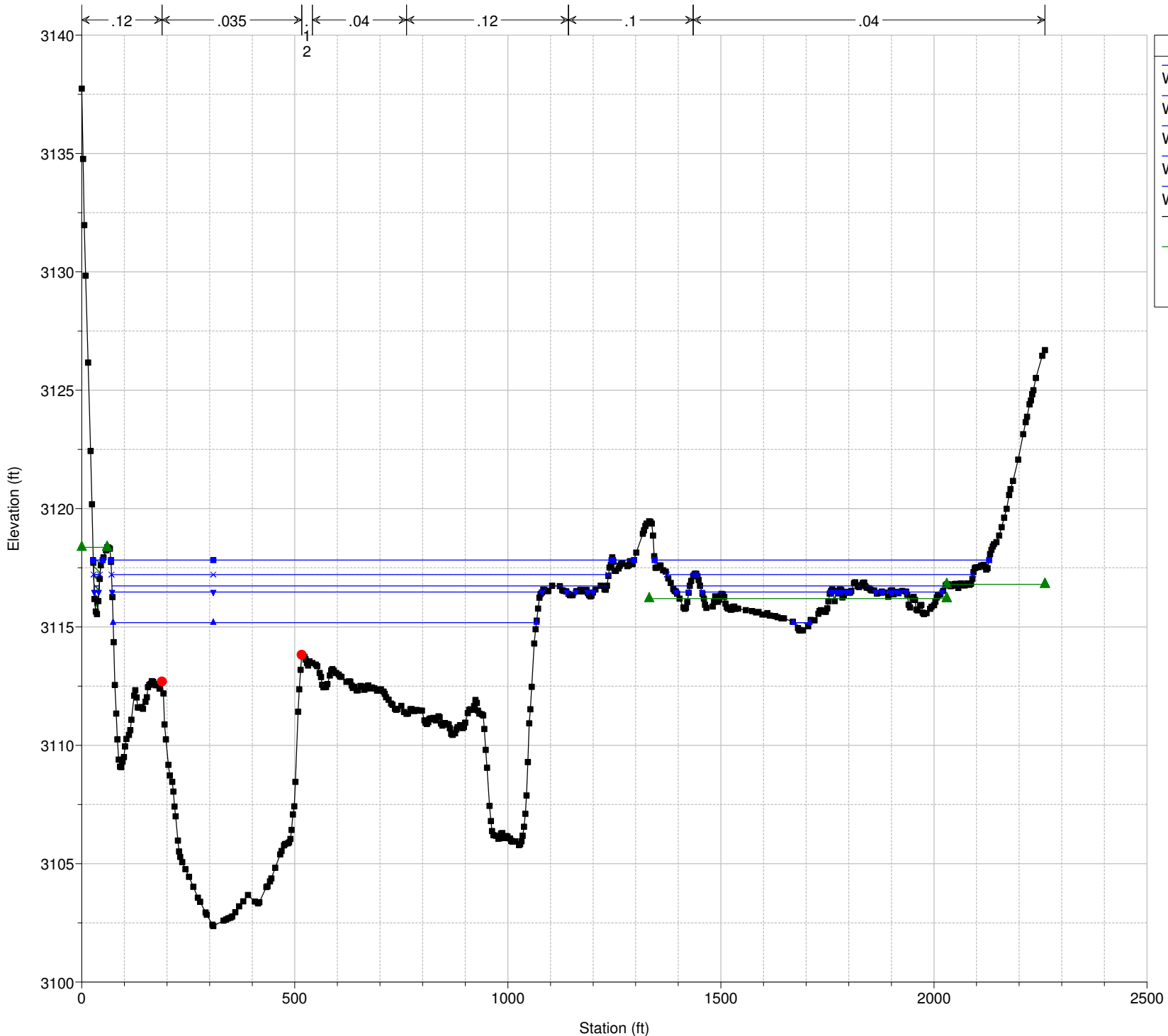
RS = 7262



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

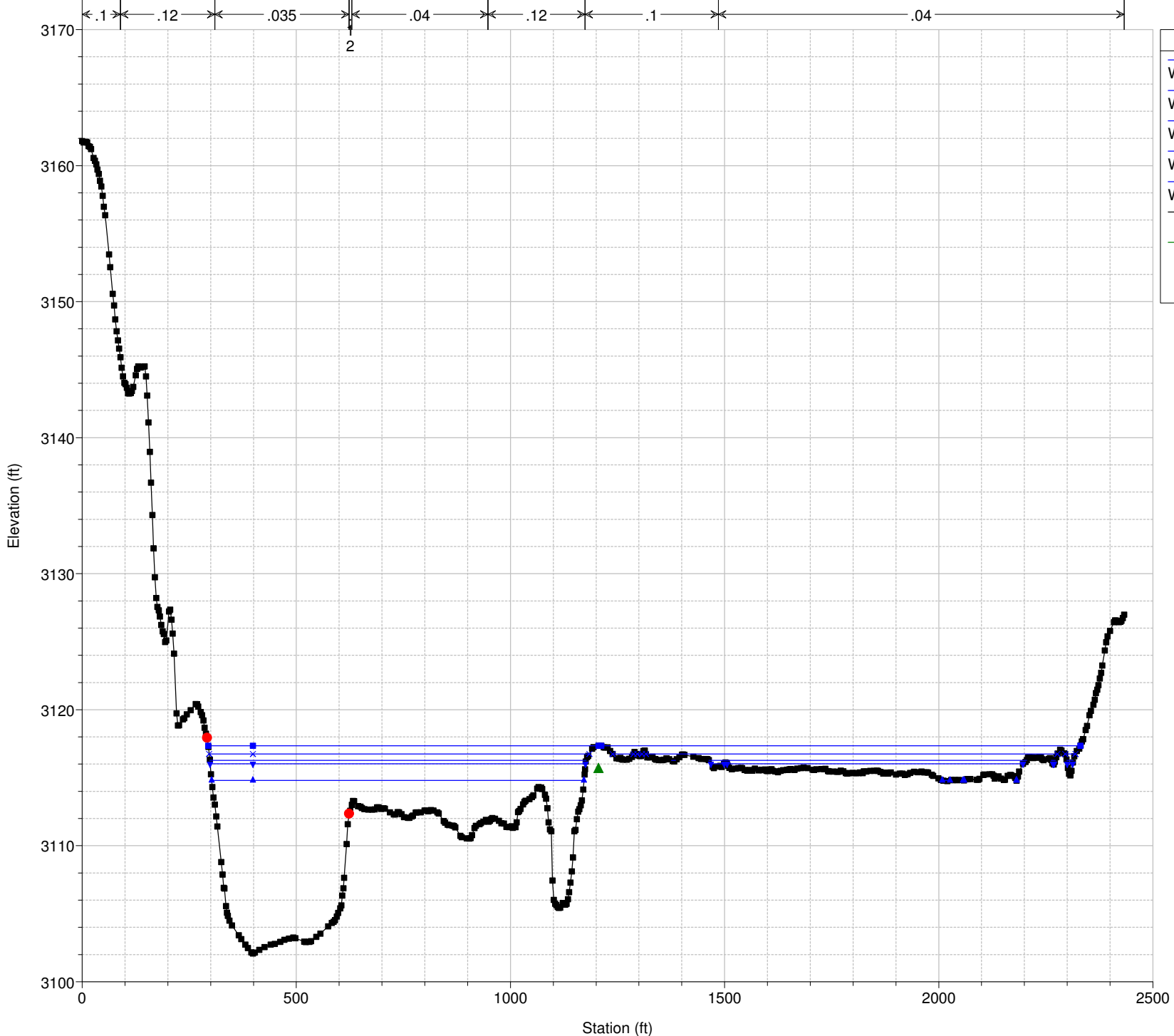
RS = 6550



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

RS = 6087

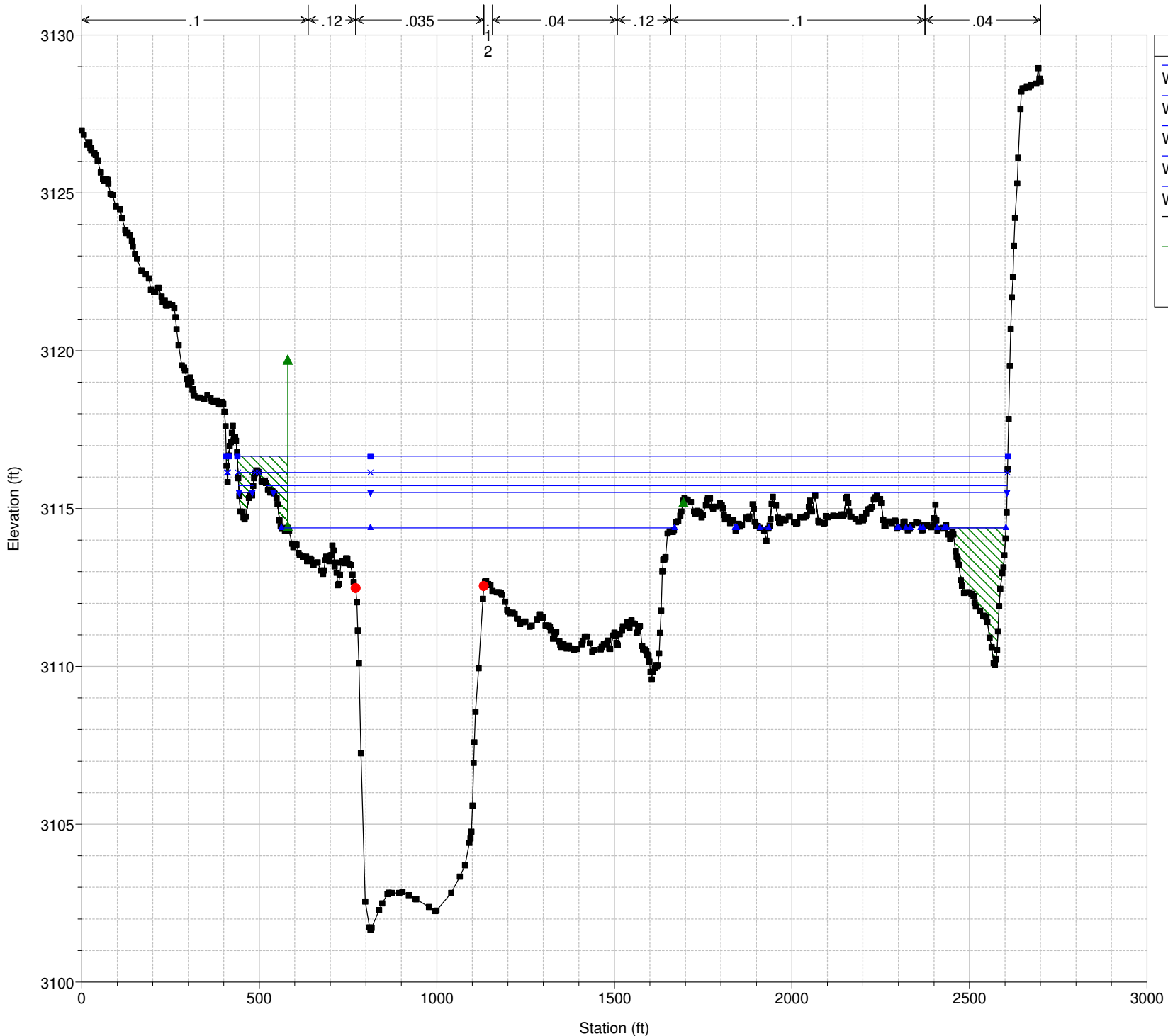


Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

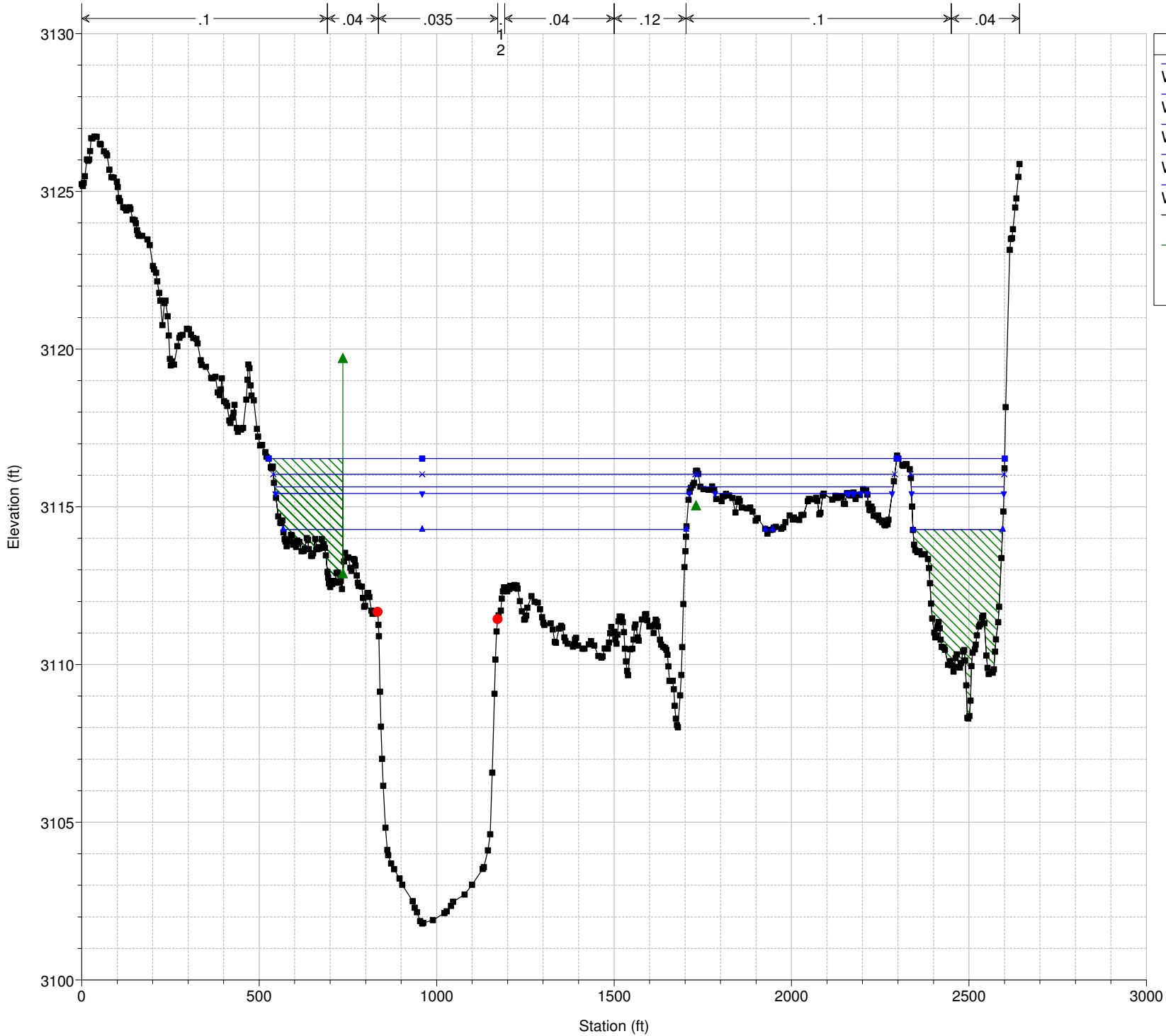


RS = 5385



Legend	
■	WS Max WS - PropAlt1B_Exc_500yr
×	WS Max WS - PropAlt1B_Exc_200yr
▼	WS Max WS - PropAlt1B_Exc_100yr
▲	WS Max WS - PropAlt1B_Exc_050yr
▲	WS Max WS - PropAlt1B_Exc_010yr
■	Ground
▲	Ineff
●	Bank Sta

RS = 5230

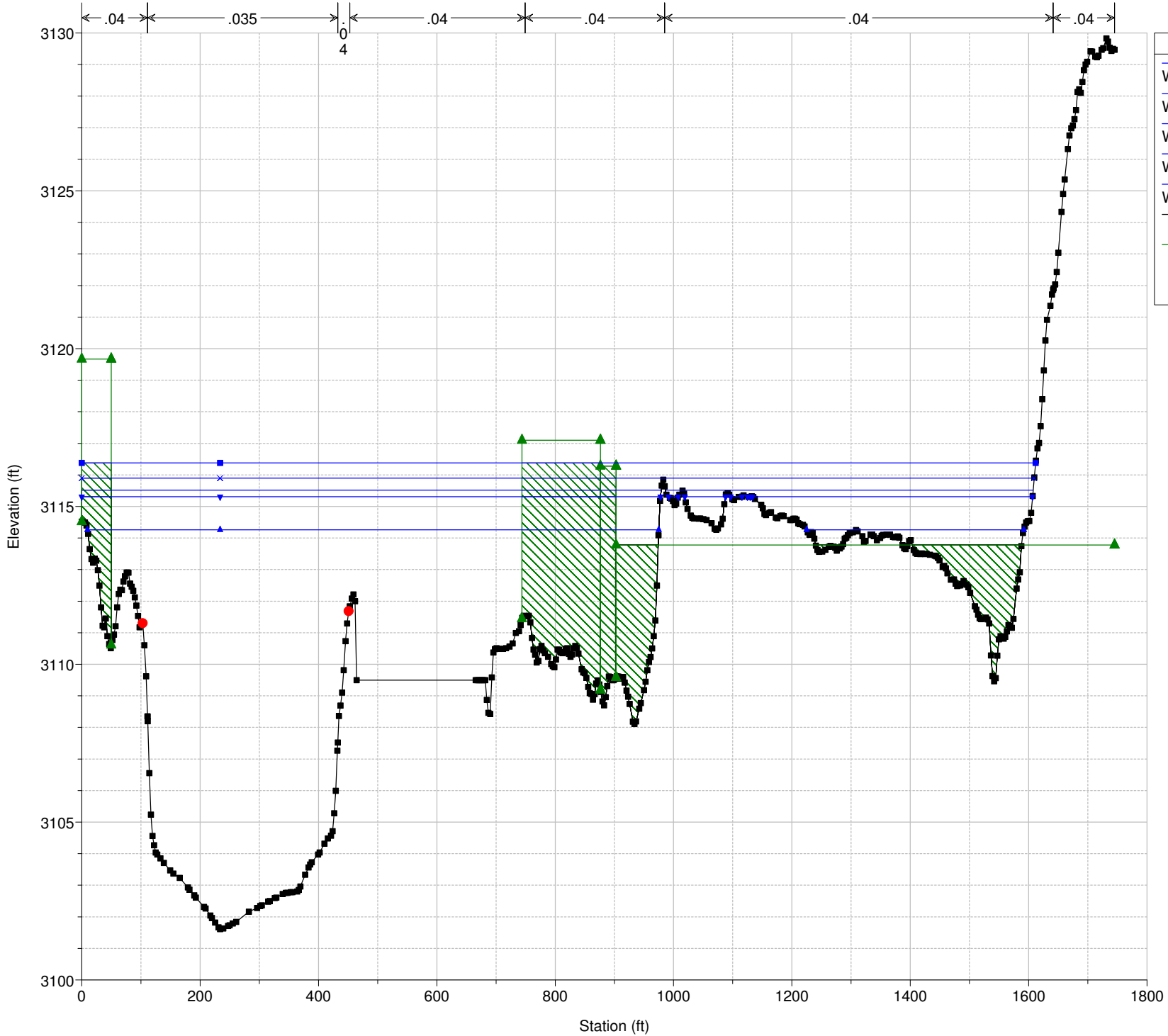


Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta



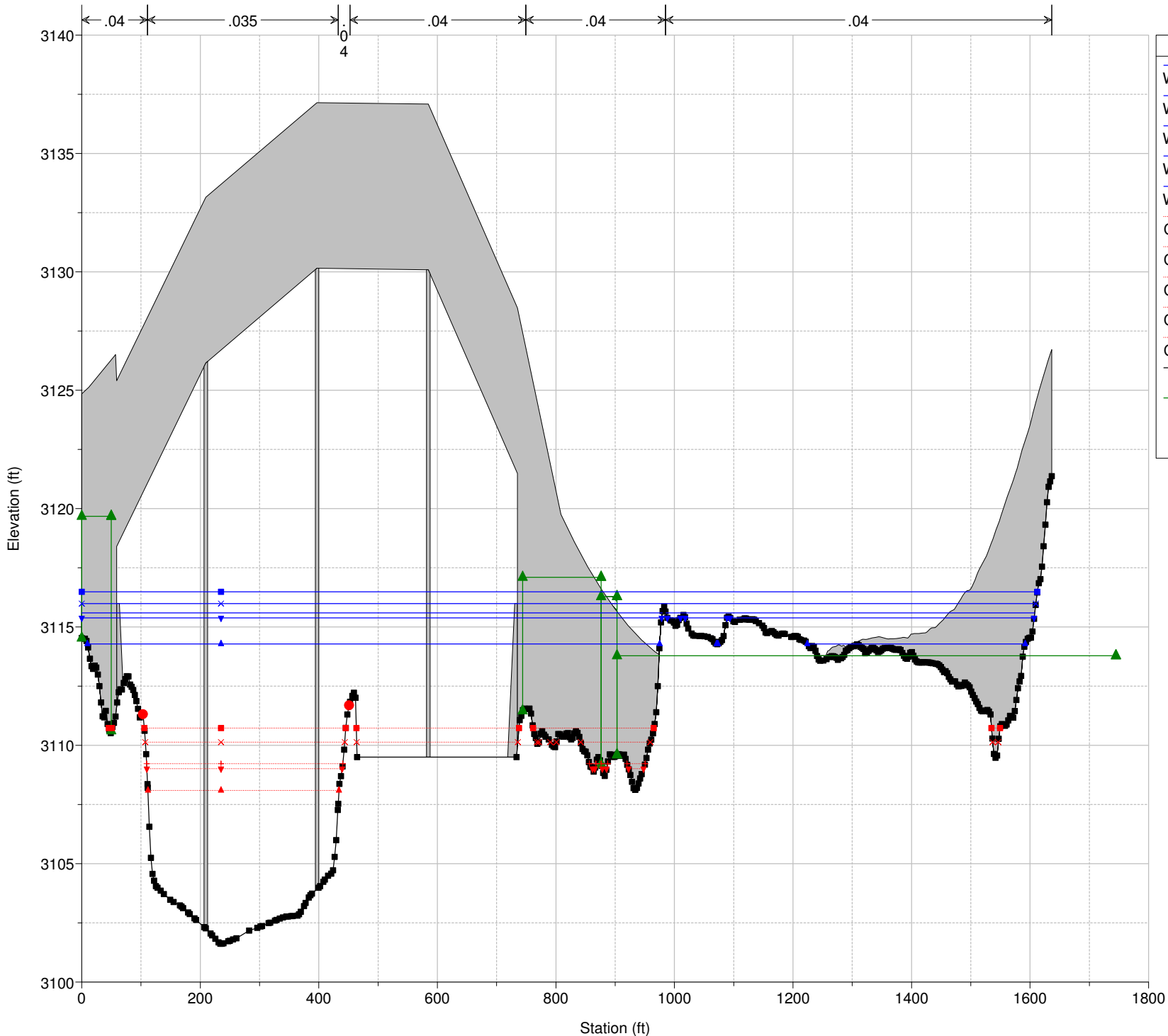
RS = 5125 ROB (Sta 464.5 - 733.5) excavated to 3110.5'



Legend

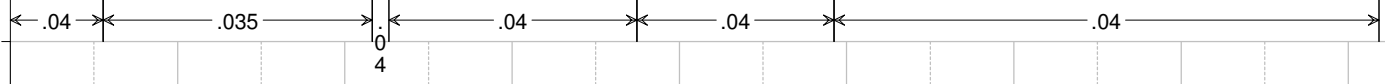
- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

RS = 5100 MO

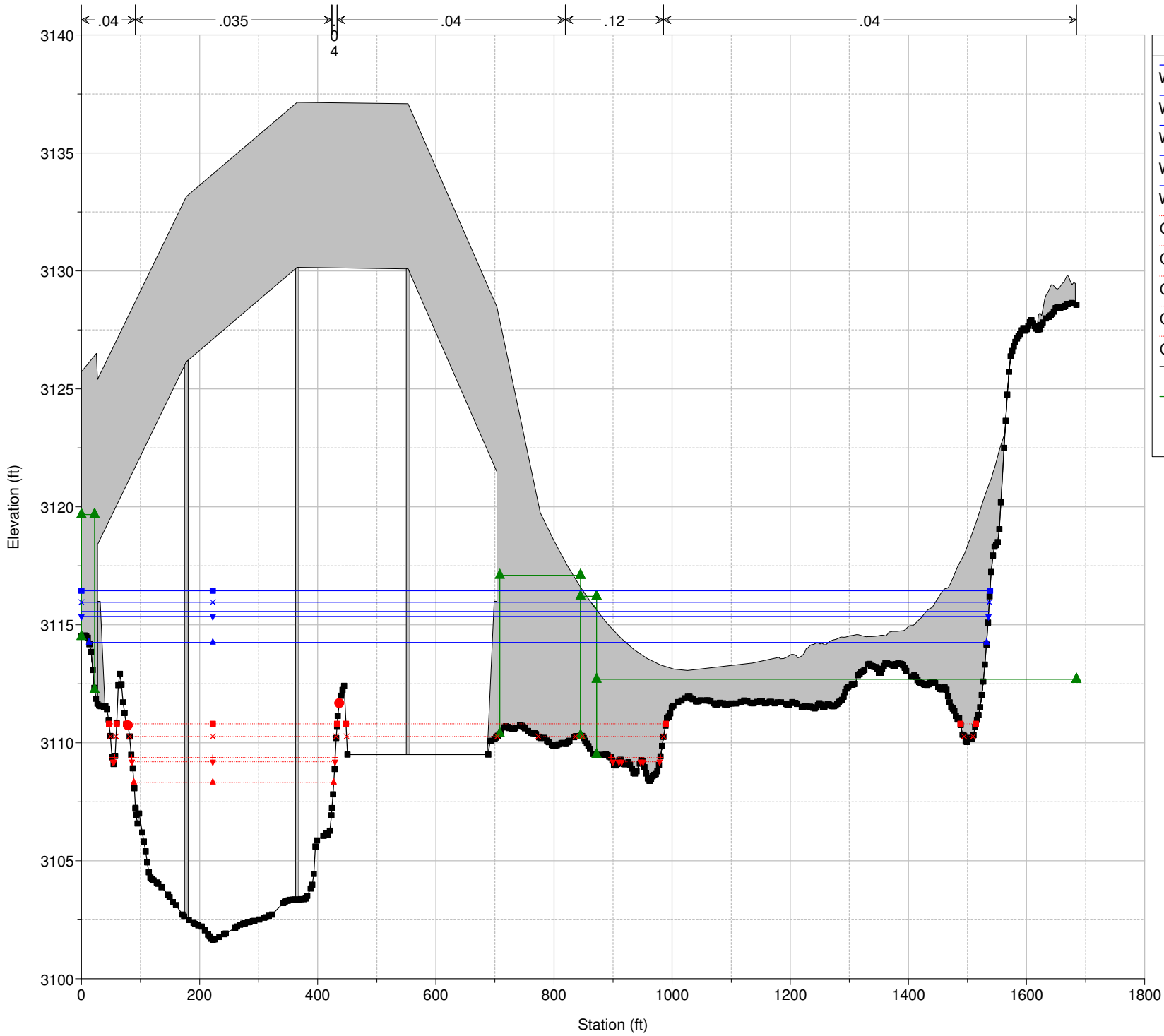


Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Crit Max WS - PropAlt1B_Exc_500yr
- Crit Max WS - PropAlt1B_Exc_200yr
- Crit Max WS - PropAlt1B_Exc_100yr
- Crit Max WS - PropAlt1B_Exc_050yr
- Crit Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta



RS = 5100 MO

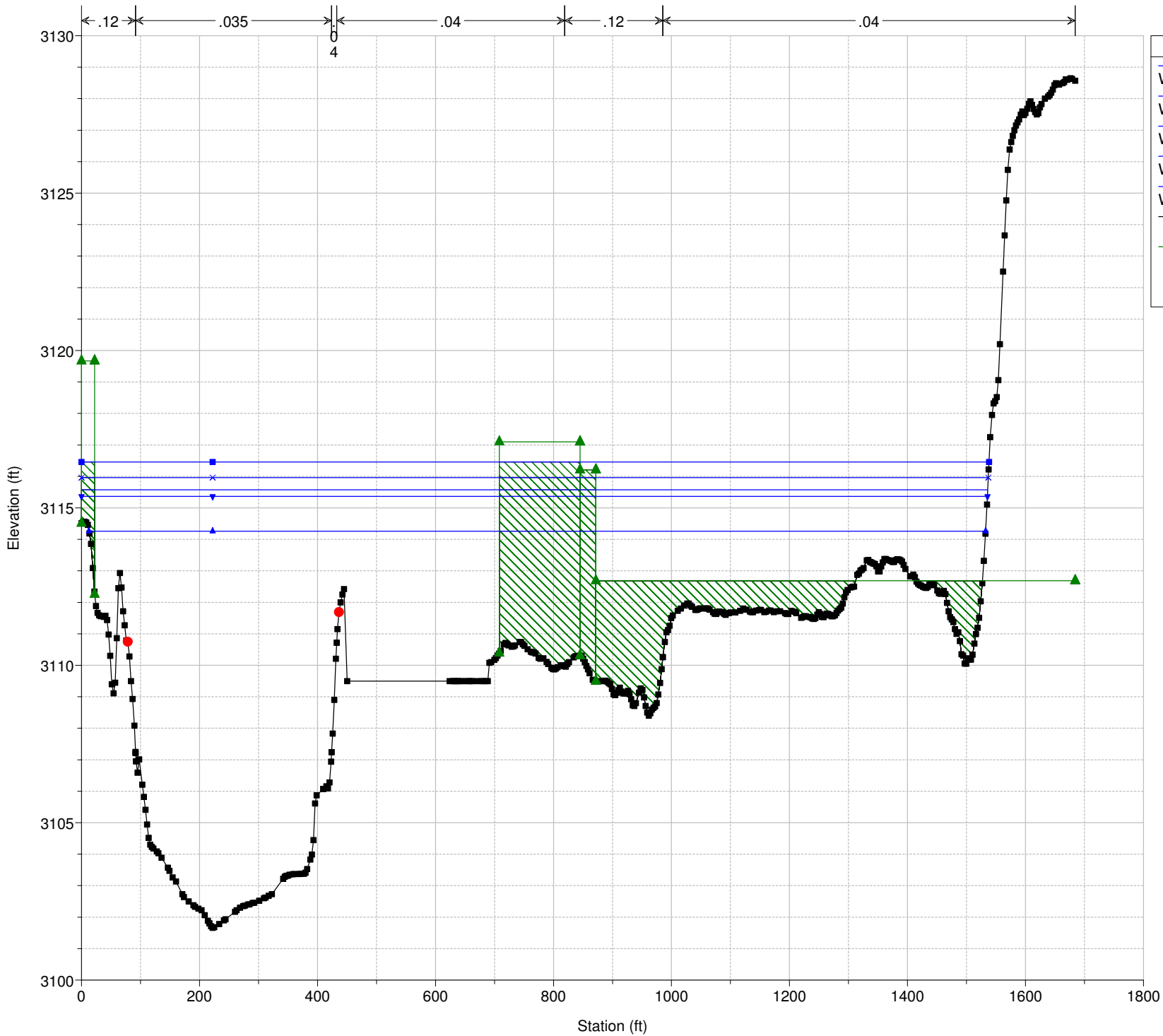


Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Crit Max WS - PropAlt1B_Exc_500yr
- Crit Max WS - PropAlt1B_Exc_200yr
- Crit Max WS - PropAlt1B_Exc_100yr
- Crit Max WS - PropAlt1B_Exc_050yr
- Crit Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta



RS = 5061

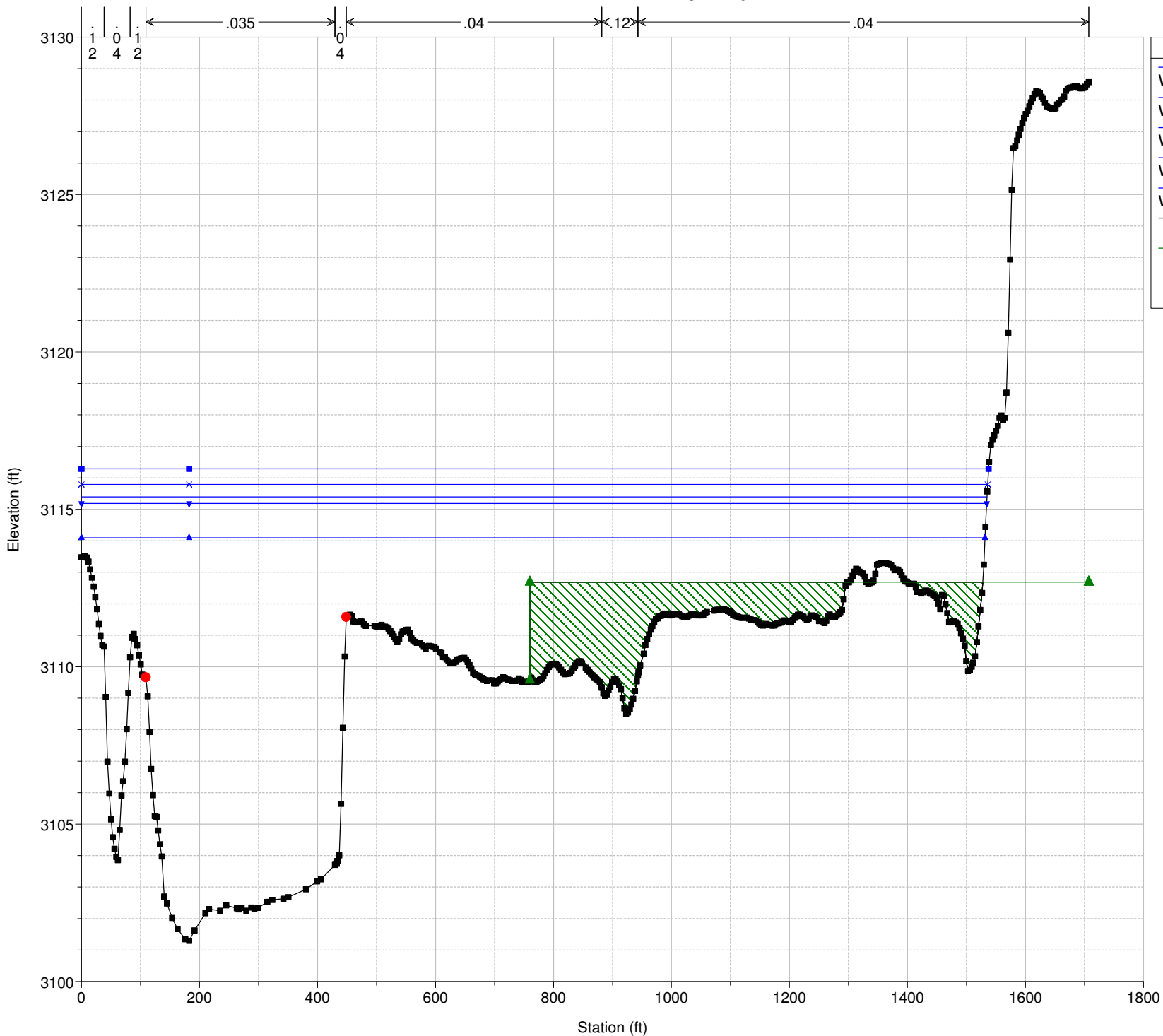


Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta



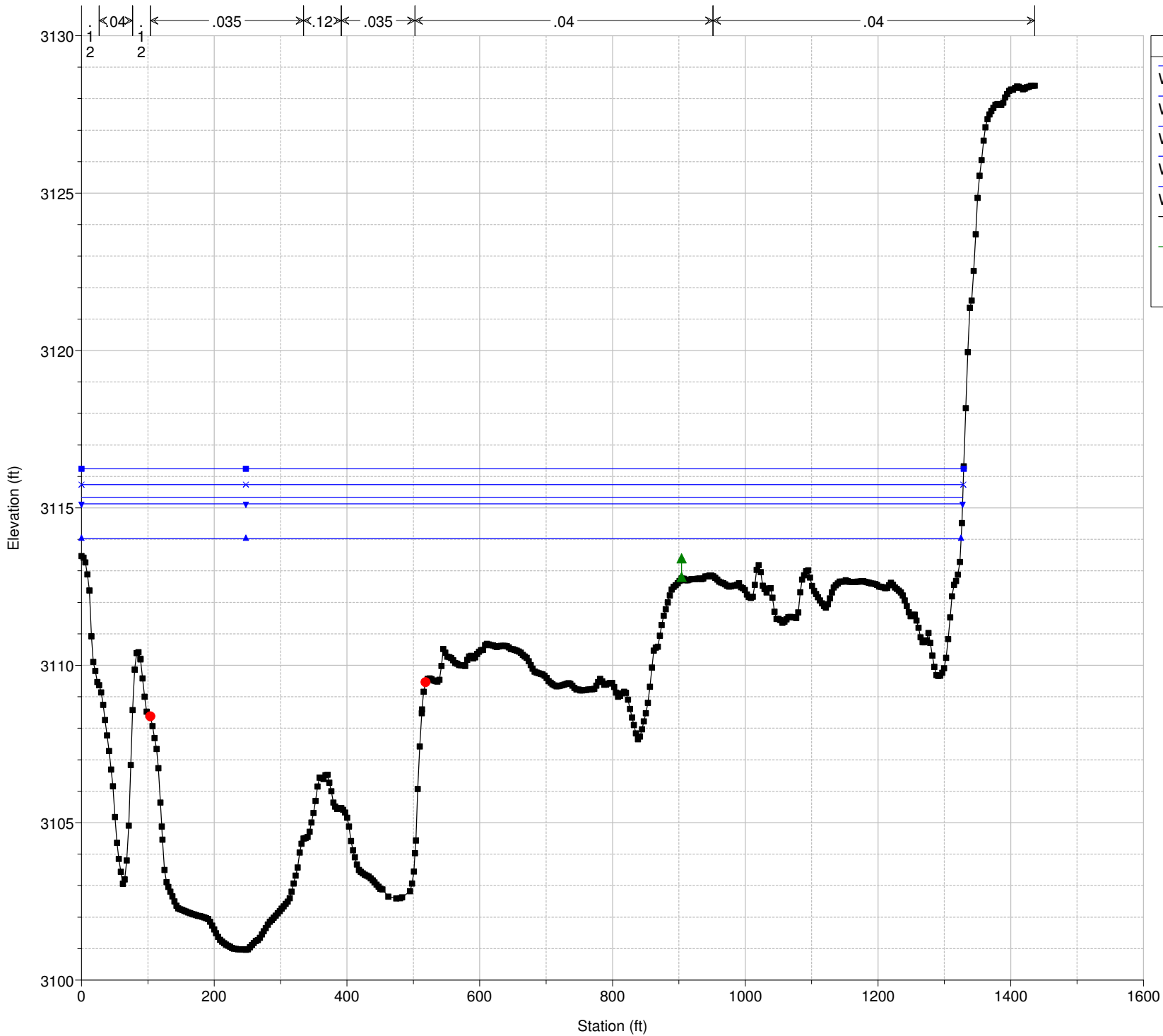
RS = 4726



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

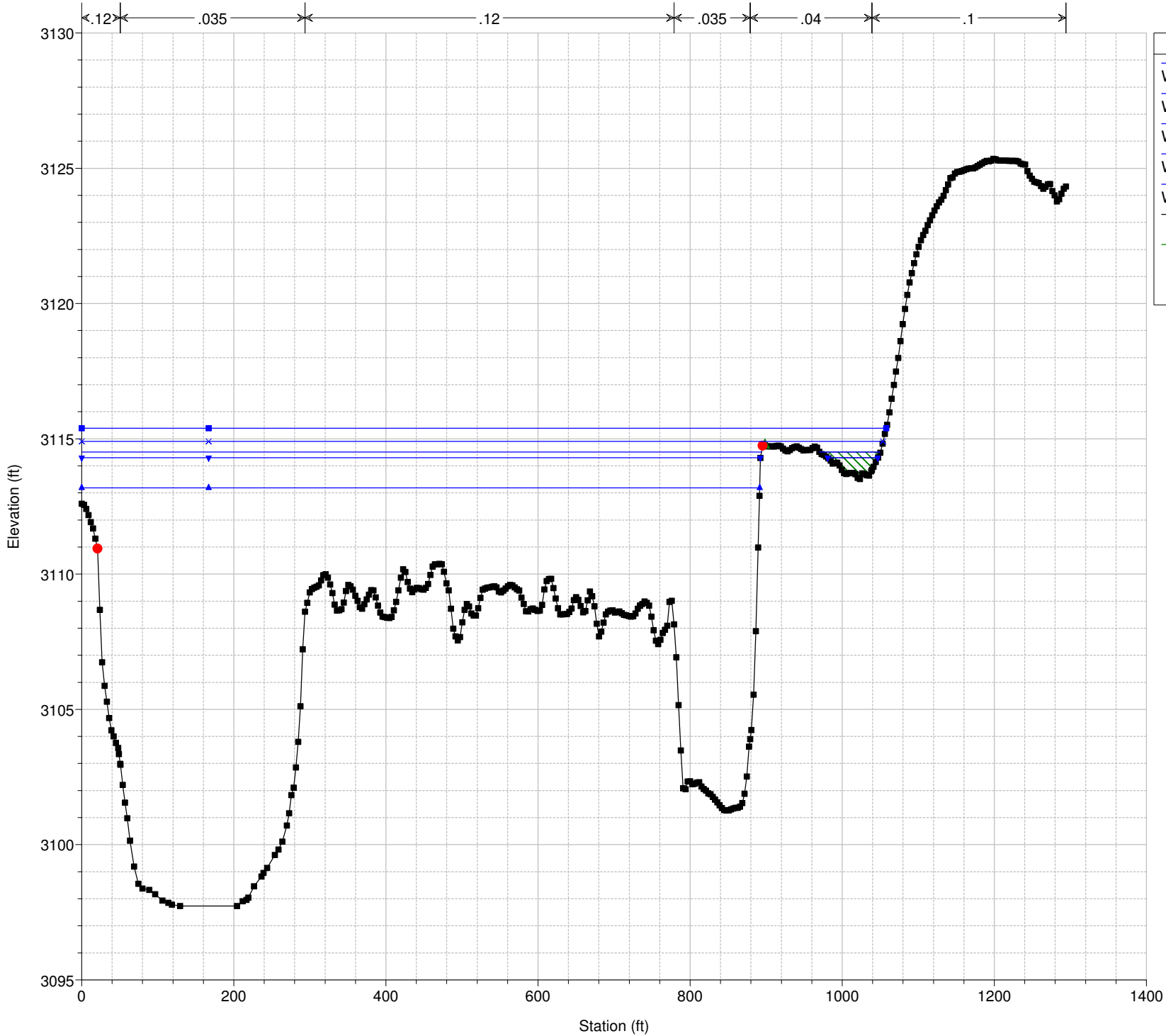
RS = 4371



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

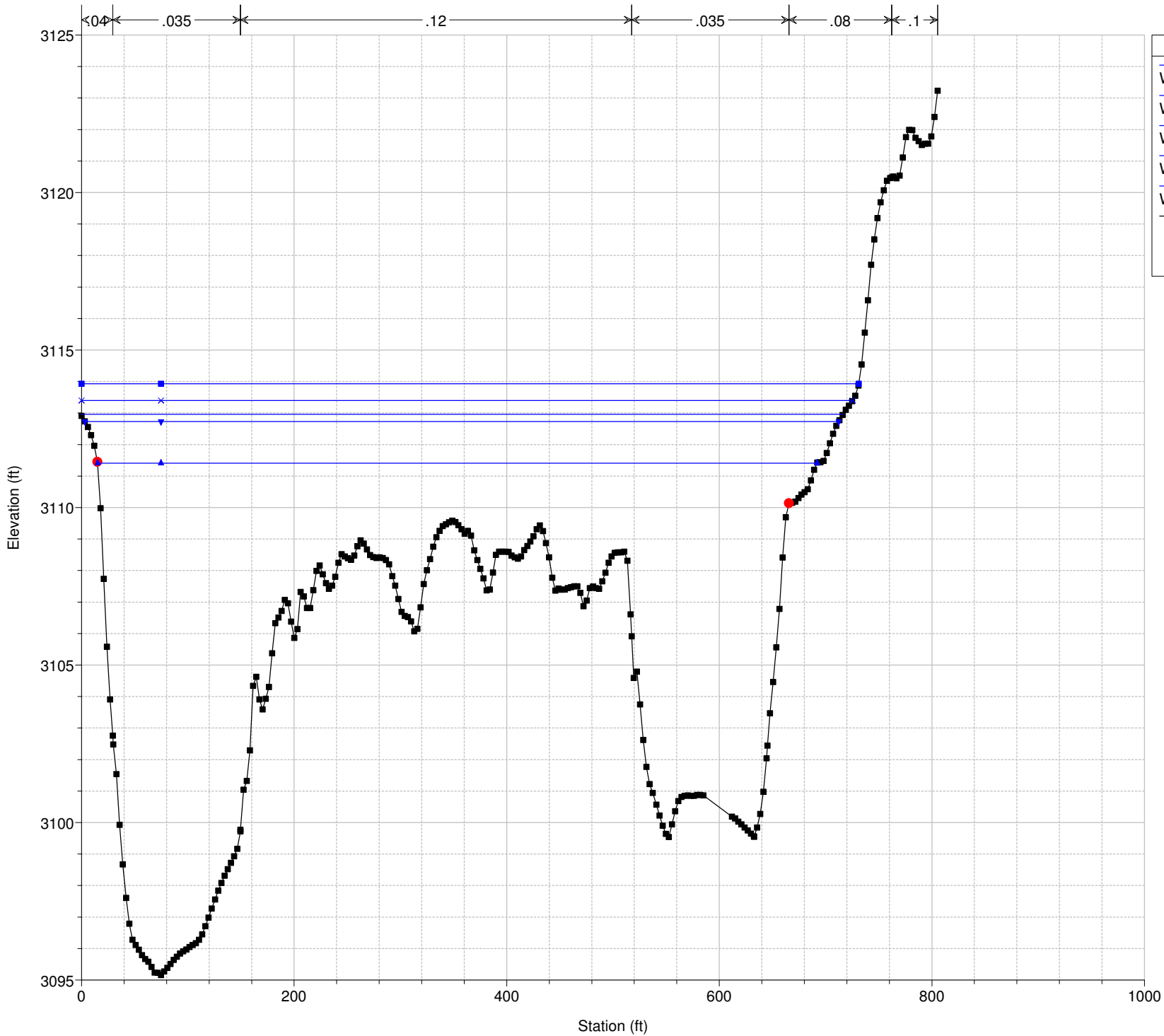
RS = 3719



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Ineff
- Bank Sta

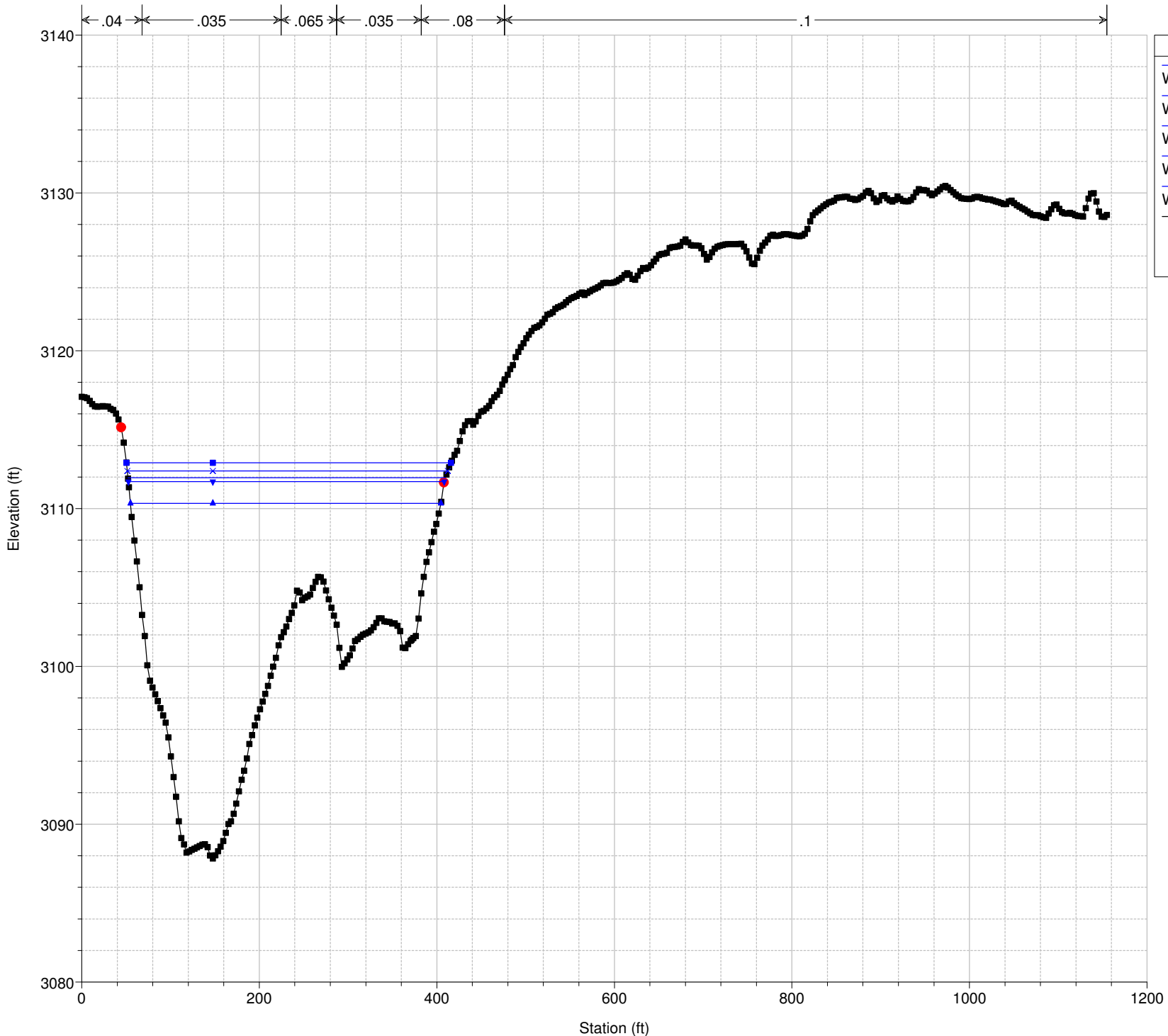
RS = 3245



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Bank Sta

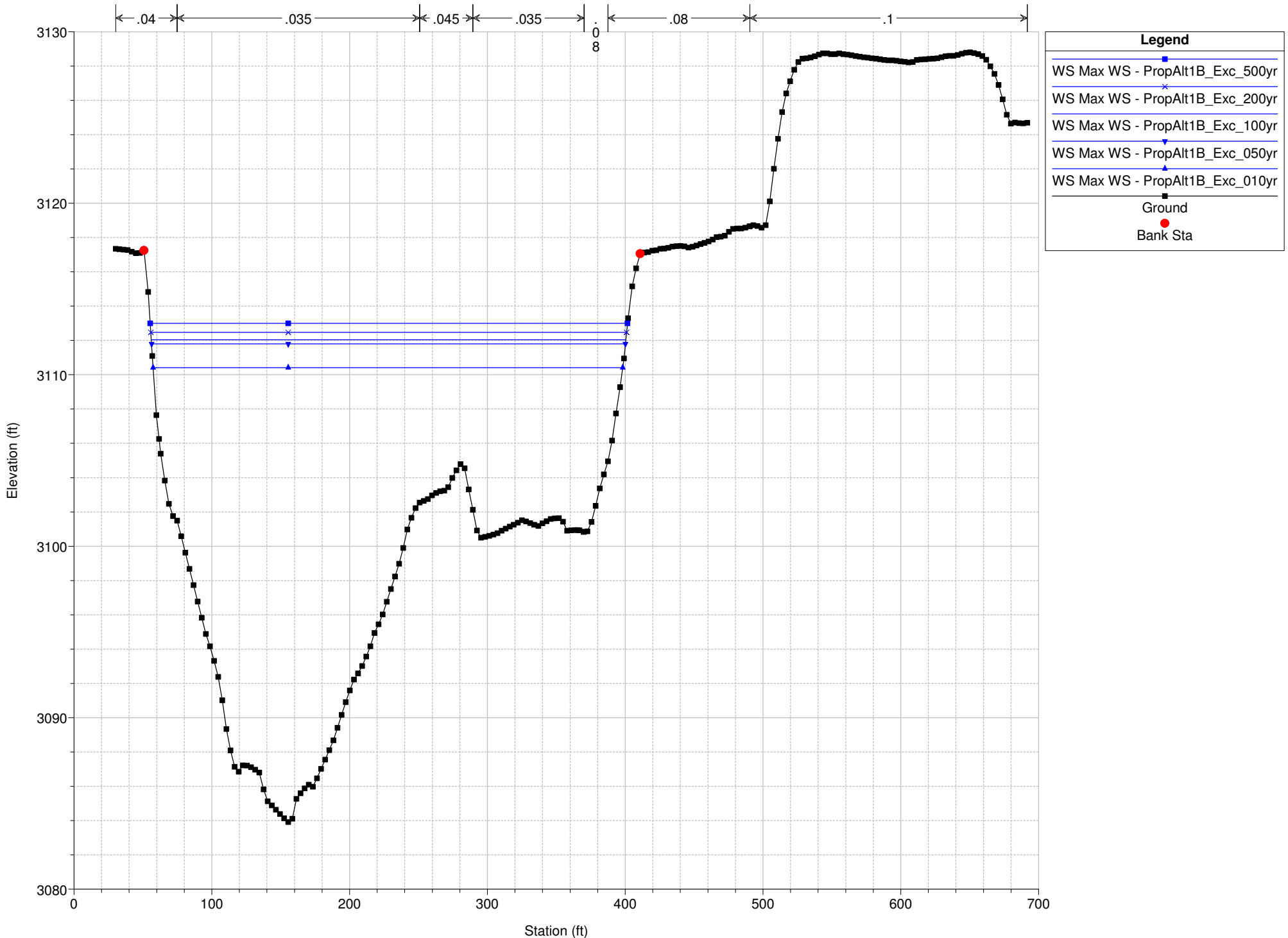
RS = 2915



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Bank Sta

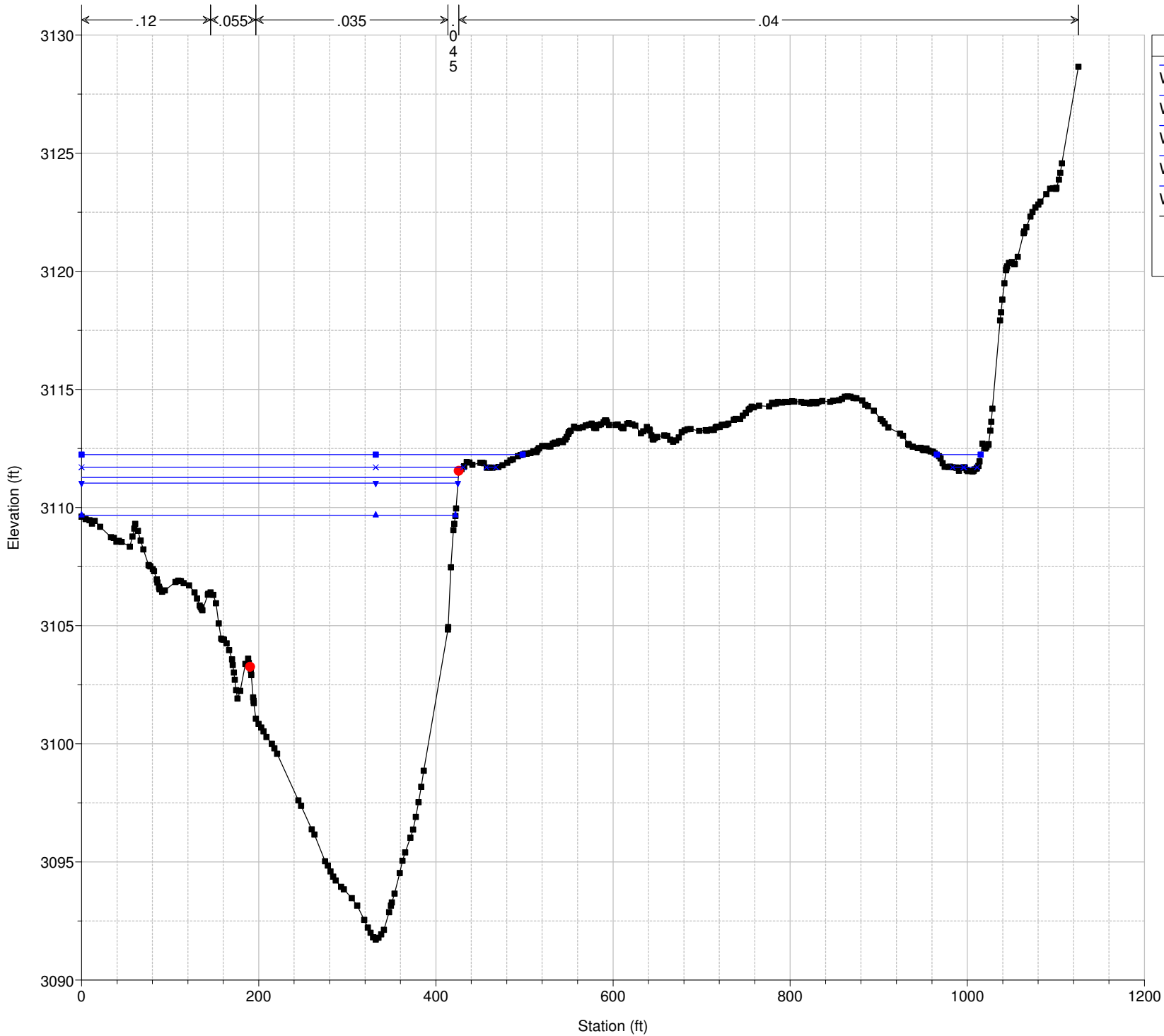
RS = 2865



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Bank Sta

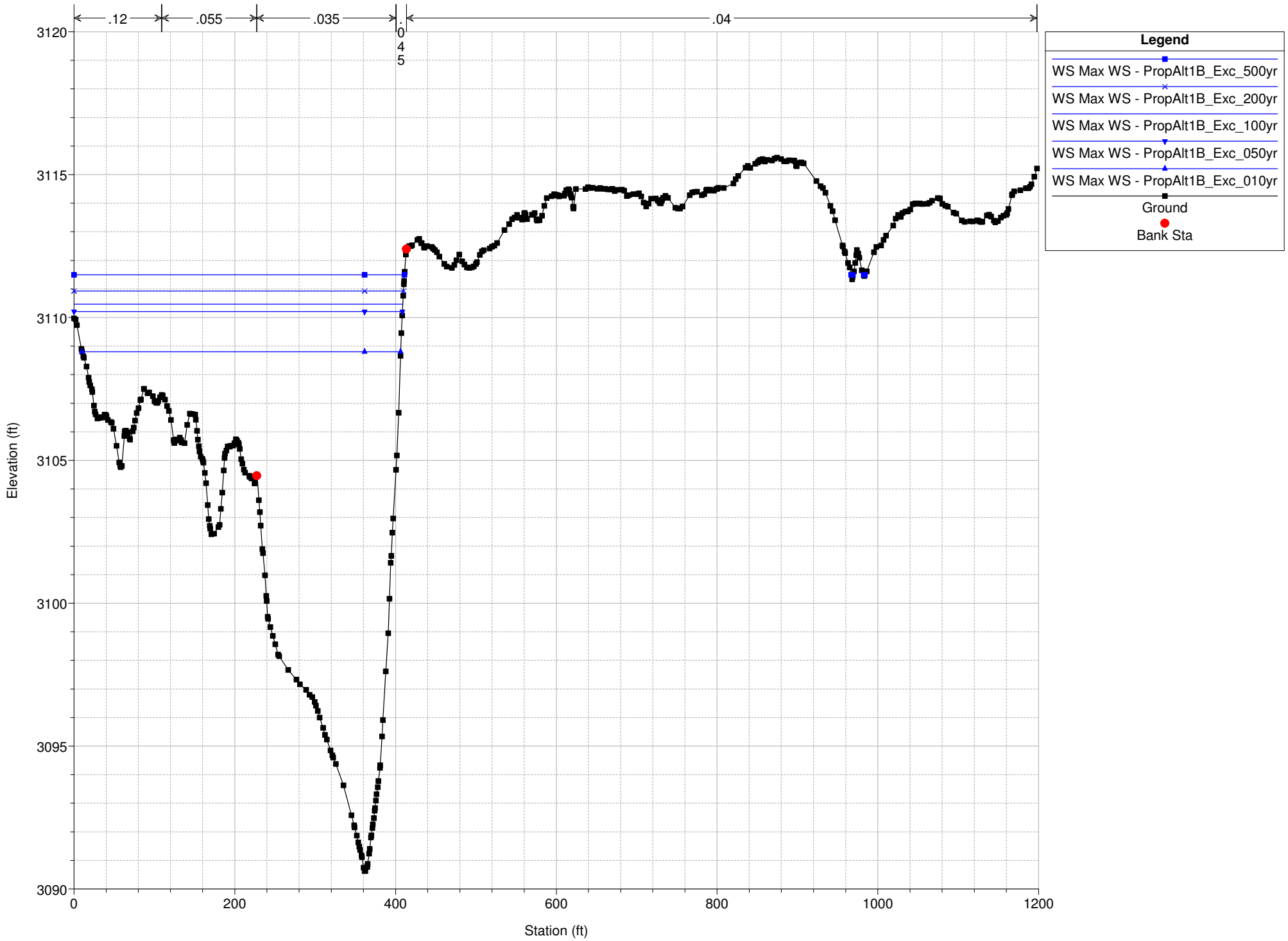
RS = 2244



Legend

- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Ground
- Bank Sta

RS = 1809

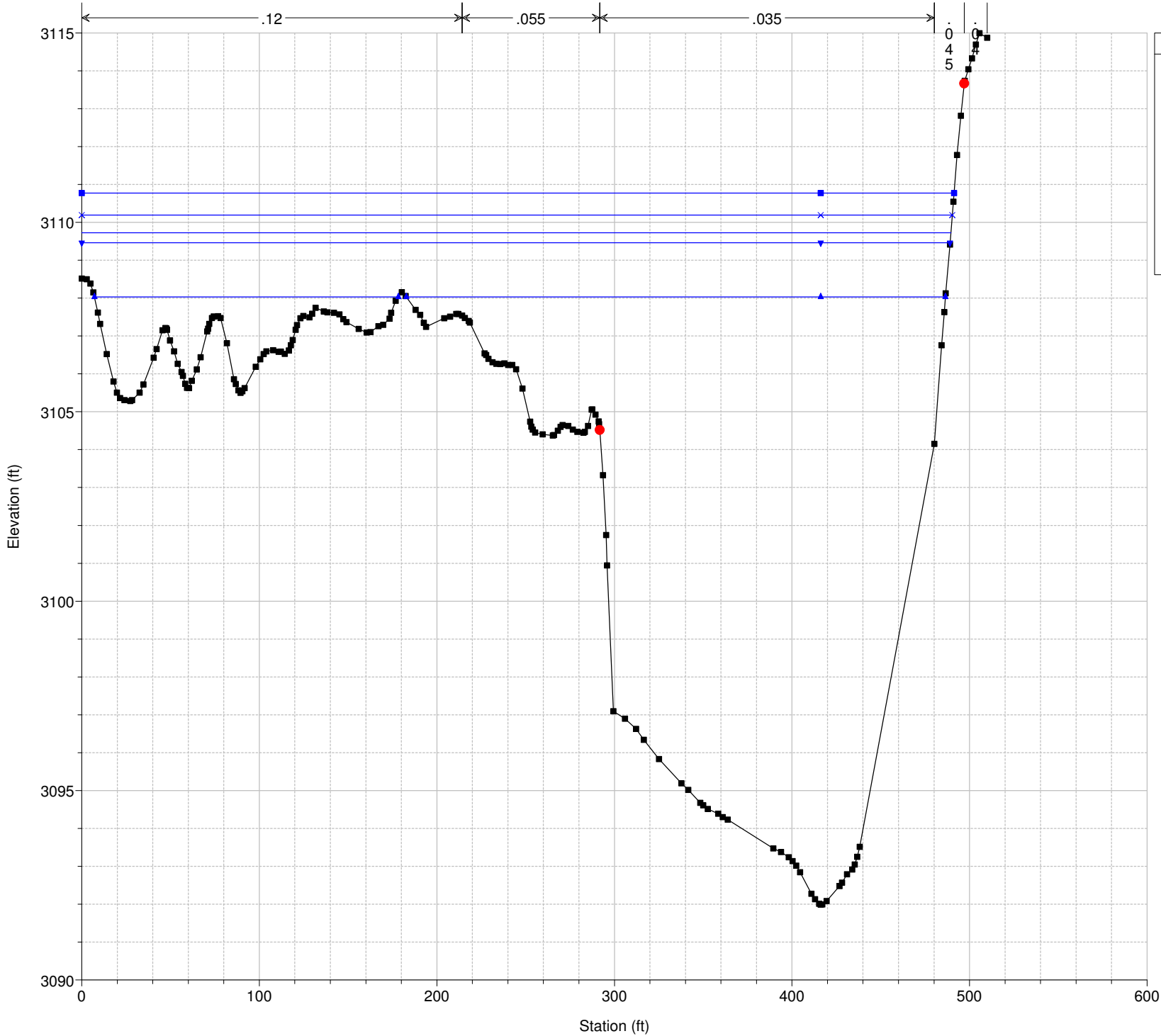


RS = 1542



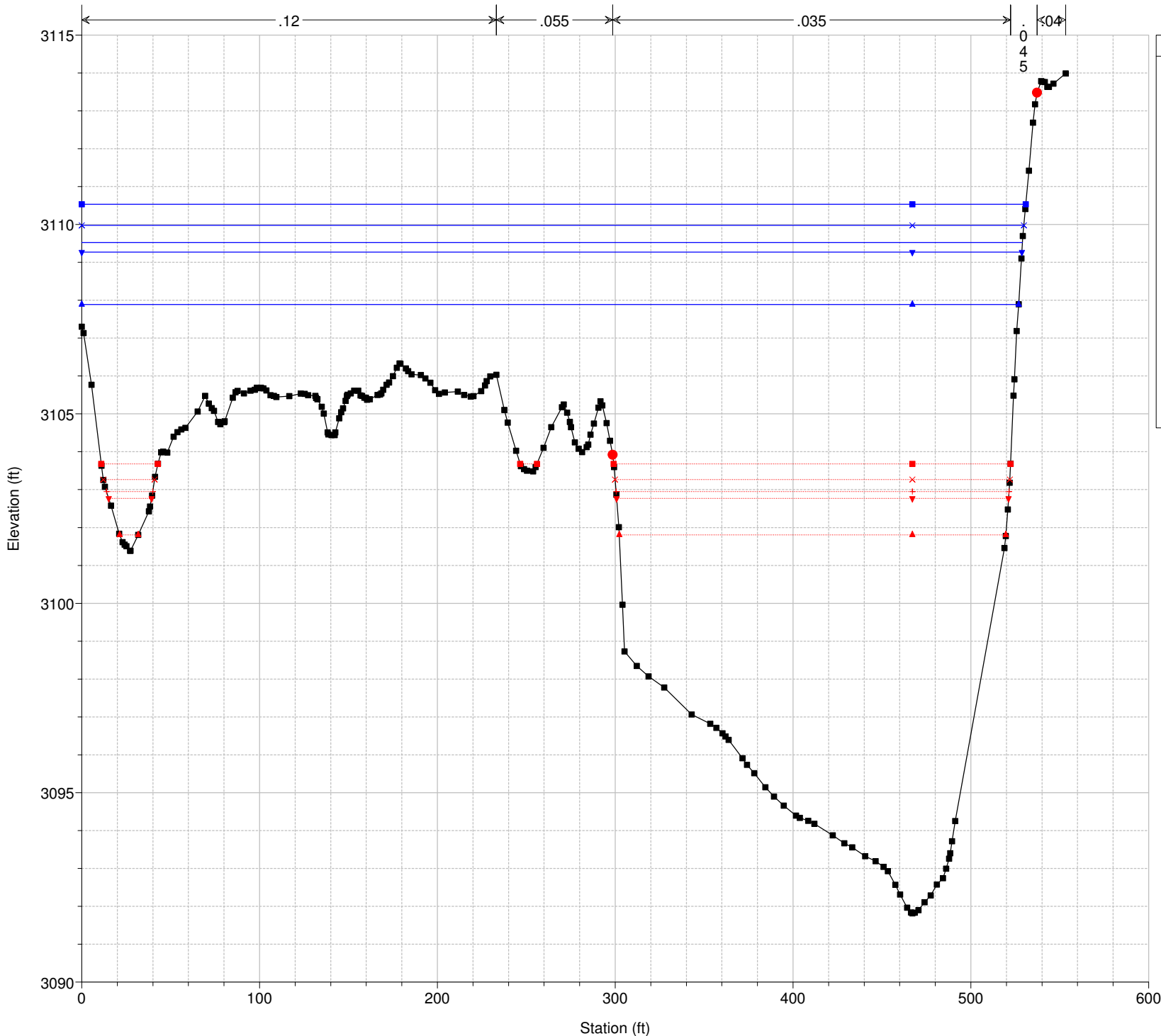
Legend	
■	WS Max WS - PropAlt1B_Exc_500yr
×	WS Max WS - PropAlt1B_Exc_200yr
▼	WS Max WS - PropAlt1B_Exc_100yr
▲	WS Max WS - PropAlt1B_Exc_050yr
■	WS Max WS - PropAlt1B_Exc_010yr
■	Ground
●	Bank Sta

RS = 1229



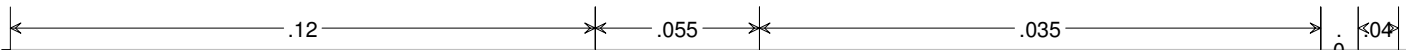
Legend	
■	WS Max WS - PropAlt1B_Exc_500yr
×	WS Max WS - PropAlt1B_Exc_200yr
▼	WS Max WS - PropAlt1B_Exc_100yr
▲	WS Max WS - PropAlt1B_Exc_050yr
■	WS Max WS - PropAlt1B_Exc_010yr
■	Ground
●	Bank Sta

RS = 918



Legend

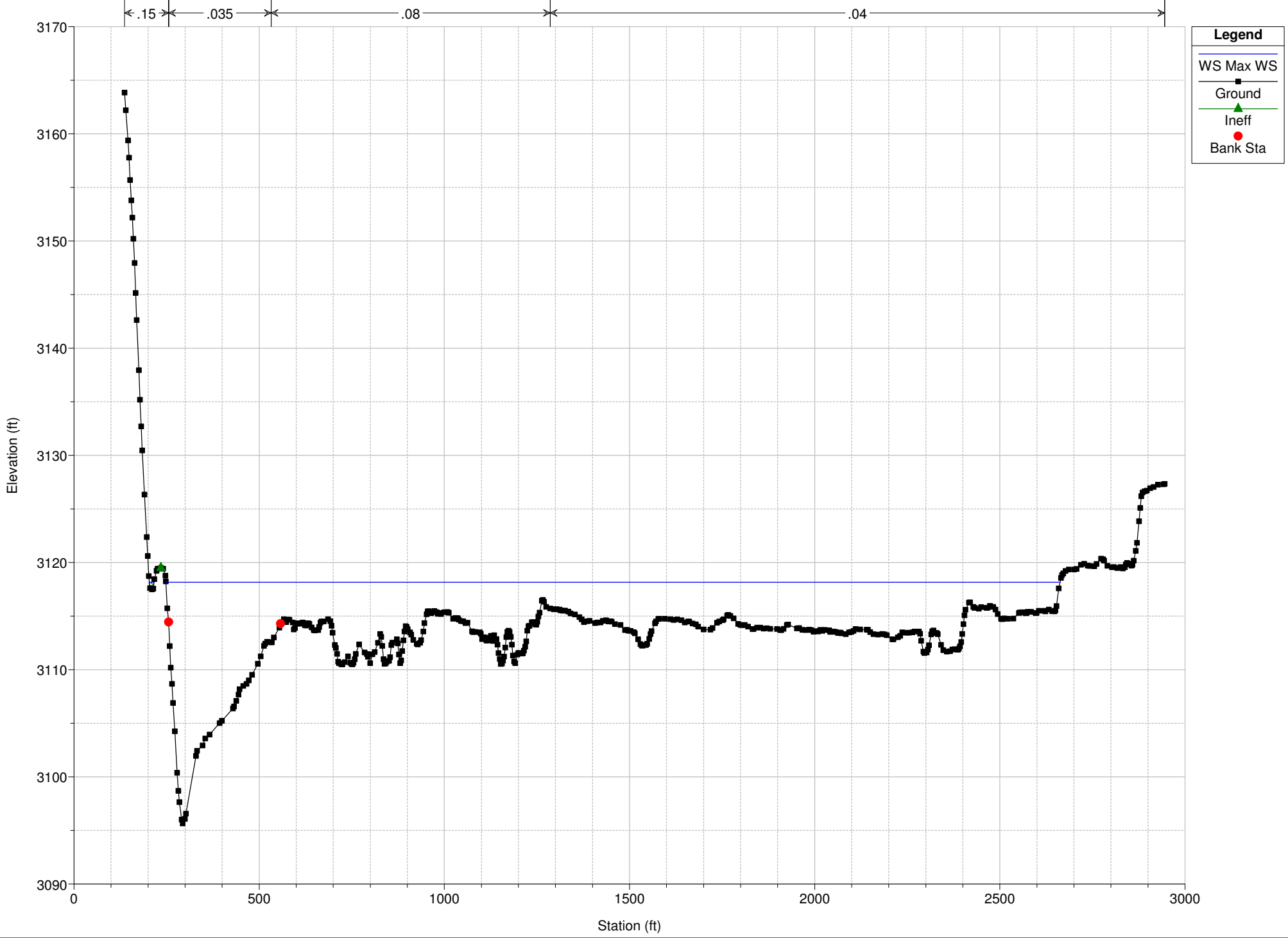
- WS Max WS - PropAlt1B_Exc_500yr
- WS Max WS - PropAlt1B_Exc_200yr
- WS Max WS - PropAlt1B_Exc_100yr
- WS Max WS - PropAlt1B_Exc_050yr
- WS Max WS - PropAlt1B_Exc_010yr
- Crit Max WS - PropAlt1B_Exc_500yr
- Crit Max WS - PropAlt1B_Exc_200yr
- Crit Max WS - PropAlt1B_Exc_100yr
- Crit Max WS - PropAlt1B_Exc_050yr
- Crit Max WS - PropAlt1B_Exc_010yr
- Ground
- Bank Sta



Appendix J – Interim Construction HEC-RAS Model Output Files

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	918	Max WS	PropAlt1A_Int100yr	24405.92	3091.81	3109.30	3102.79	3110.08	0.001004	7.36	4394.85	528.68	0.36
1	918	Max WS	PropAlt1B_Int100yr	24437.55	3091.81	3109.30	3102.79	3110.09	0.001004	7.36	4399.62	528.69	0.36
1	933		Lat Struct										
1	1229	Max WS	PropAlt1A_Int100yr	23251.65	3091.99	3109.53		3110.54	0.001278	8.29	3529.78	489.15	0.40
1	1229	Max WS	PropAlt1B_Int100yr	23293.75	3091.99	3109.54		3110.55	0.001280	8.29	3534.68	489.17	0.40
1	1320		Lat Struct										
1	1542	Max WS	PropAlt1A_Int100yr	23509.71	3092.26	3109.99		3110.90	0.001181	8.03	3808.79	467.61	0.39
1	1542	Max WS	PropAlt1B_Int100yr	23564.22	3092.26	3110.00		3110.91	0.001184	8.04	3813.01	467.71	0.39
1	1665		Lat Struct										
1	1809	Max WS	PropAlt1A_Int100yr	23502.53	3090.62	3110.27		3111.34	0.001397	8.68	3427.20	408.74	0.42
1	1809	Max WS	PropAlt1B_Int100yr	23535.87	3090.62	3110.28		3111.35	0.001398	8.68	3430.10	408.76	0.42
1	2024		Lat Struct										
1	2244	Max WS	PropAlt1A_Int100yr	23629.00	3091.72	3111.04		3111.74	0.000873	6.90	4026.25	424.92	0.33
1	2244	Max WS	PropAlt1B_Int100yr	23692.74	3091.72	3111.05		3111.75	0.000876	6.92	4029.15	424.93	0.33
1	2450		Lat Struct										
1	2865	Max WS	PropAlt1A_Int100yr	23803.89	3083.92	3111.76		3112.10	0.000491	4.68	5084.38	343.85	0.21
1	2865	Max WS	PropAlt1B_Int100yr	23832.99	3083.92	3111.77		3112.11	0.000491	4.68	5088.15	343.87	0.21
1	2890		Bridge										
1	2915	Max WS	PropAlt1A_Int100yr	23802.07	3087.83	3113.01	3103.31	3113.38	0.000701	4.90	4864.45	366.67	0.23
1	2915	Max WS	PropAlt1B_Int100yr	23832.11	3087.83	3113.02	3103.31	3113.39	0.000702	4.90	4867.76	366.76	0.23
1	3002		Lat Struct										
1	3245	Max WS	PropAlt1A_Int100yr	23829.30	3095.16	3113.70		3113.93	0.002662	3.84	6298.30	729.36	0.22
1	3245	Max WS	PropAlt1B_Int100yr	23860.91	3095.16	3113.71		3113.94	0.002660	3.84	6305.60	729.45	0.22
1	3398		Lat Struct										
1	3719	Max WS	PropAlt1A_Int100yr	25438.76	3097.73	3114.79		3114.94	0.001745	3.06	8420.62	1052.72	0.18
1	3719	Max WS	PropAlt1B_Int100yr	25484.52	3097.73	3114.80		3114.95	0.001745	3.06	8431.16	1052.81	0.18
1	4045		Lat Struct										
1	4371	Max WS	PropAlt1A_Int100yr	29130.31	3100.96	3115.49		3115.66	0.000556	3.66	9359.60	1327.98	0.18
1	4371	Max WS	PropAlt1B_Int100yr	29200.11	3100.96	3115.50		3115.67	0.000557	3.66	9372.89	1327.99	0.18
1	4549		Lat Struct										
1	4726	Max WS	PropAlt1A_Int100yr	30920.92	3101.29	3115.54		3115.85	0.000522	5.16	8674.46	1535.16	0.26
1	4726	Max WS	PropAlt1B_Int100yr	30992.95	3101.29	3115.55		3115.86	0.000522	5.16	8689.83	1535.19	0.26
1	4872		Lat Struct										
1	5061	Max WS	PropAlt1A_Int100yr	31752.14	3101.66	3115.69		3116.07	0.000941	5.57	7629.75	1536.32	0.28
1	5061	Max WS	PropAlt1B_Int100yr	31797.90	3101.66	3115.71		3116.07	0.000902	5.46	7709.05	1536.37	0.28
1	5100		Mult Open										
1	5125	Max WS	PropAlt1A_Int100yr	31751.56	3101.61	3115.61		3116.14	0.000808	6.26	6696.32	1602.30	0.32
1	5125	Max WS	PropAlt1B_Int100yr	31798.04	3101.61	3115.59		3116.12	0.000827	6.32	6592.54	1602.00	0.32
1	5150		Lat Struct										
1	5230	Max WS	PropAlt1A_Int100yr	31787.48	3101.79	3115.79		3116.18	0.000634	5.69	8664.47	1994.10	0.29
1	5230	Max WS	PropAlt1B_Int100yr	31800.05	3101.79	3115.79		3116.18	0.000635	5.69	8660.96	1993.99	0.29
1	5385	Max WS	PropAlt1A_Int100yr	31794.81	3101.66	3115.88		3116.28	0.000642	5.66	8787.96	2144.65	0.29
1	5385	Max WS	PropAlt1B_Int100yr	31800.41	3101.66	3115.88		3116.28	0.000643	5.66	8783.50	2144.52	0.29
1	6087	Max WS	PropAlt1A_Int100yr	31795.13	3102.08	3116.40		3116.92	0.001101	6.44	7219.84	1759.80	0.33
1	6087	Max WS	PropAlt1B_Int100yr	31799.87	3102.08	3116.39		3116.92	0.001102	6.44	7216.41	1758.32	0.33
1	6550	Max WS	PropAlt1A_Int100yr	31797.03	3102.37	3116.82		3117.34	0.000843	6.43	8329.18	1841.42	0.33
1	6550	Max WS	PropAlt1B_Int100yr	31800.04	3102.37	3116.82		3117.34	0.000844	6.43	8327.40	1840.91	0.33
1	7262	Max WS	PropAlt1A_Int100yr	31797.46	3101.11	3117.40		3117.67	0.000506	5.22	13000.69	2553.15	0.26
1	7262	Max WS	PropAlt1B_Int100yr	31800.51	3101.11	3117.40		3117.67	0.000506	5.22	13000.69	2553.15	0.26
1	7435	Max WS	PropAlt1A_Int100yr	31798.97	3100.79	3117.58		3117.74	0.000349	4.21	13911.45	2296.25	0.21
1	7435	Max WS	PropAlt1B_Int100yr	31798.69	3100.79	3117.58		3117.74	0.000349	4.21	13911.45	2296.25	0.21
1	7977	Max WS	PropAlt1A_Int100yr	31797.90	3099.02	3117.77		3117.91	0.000327	3.94	14778.09	2548.40	0.19
1	7977	Max WS	PropAlt1B_Int100yr	31799.75	3099.02	3117.77		3117.91	0.000327	3.95	14775.61	2548.39	0.19
1	8519	Max WS	PropAlt1A_Int100yr	31799.41	3097.10	3117.95		3118.11	0.000502	4.22	13036.47	2496.91	0.20

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	8519	Max WS	PropAlt1B_Int100yr	31798.68	3097.10	3117.95		3118.11	0.000502	4.22	13034.05	2496.89	0.20
1	9114	Max WS	PropAlt1A_Int100yr	31800.00	3095.66	3118.17		3118.37	0.000441	4.66	12738.46	2427.08	0.24
1	9114	Max WS	PropAlt1B_Int100yr	31800.00	3095.66	3118.17		3118.37	0.000442	4.66	12736.11	2427.07	0.24



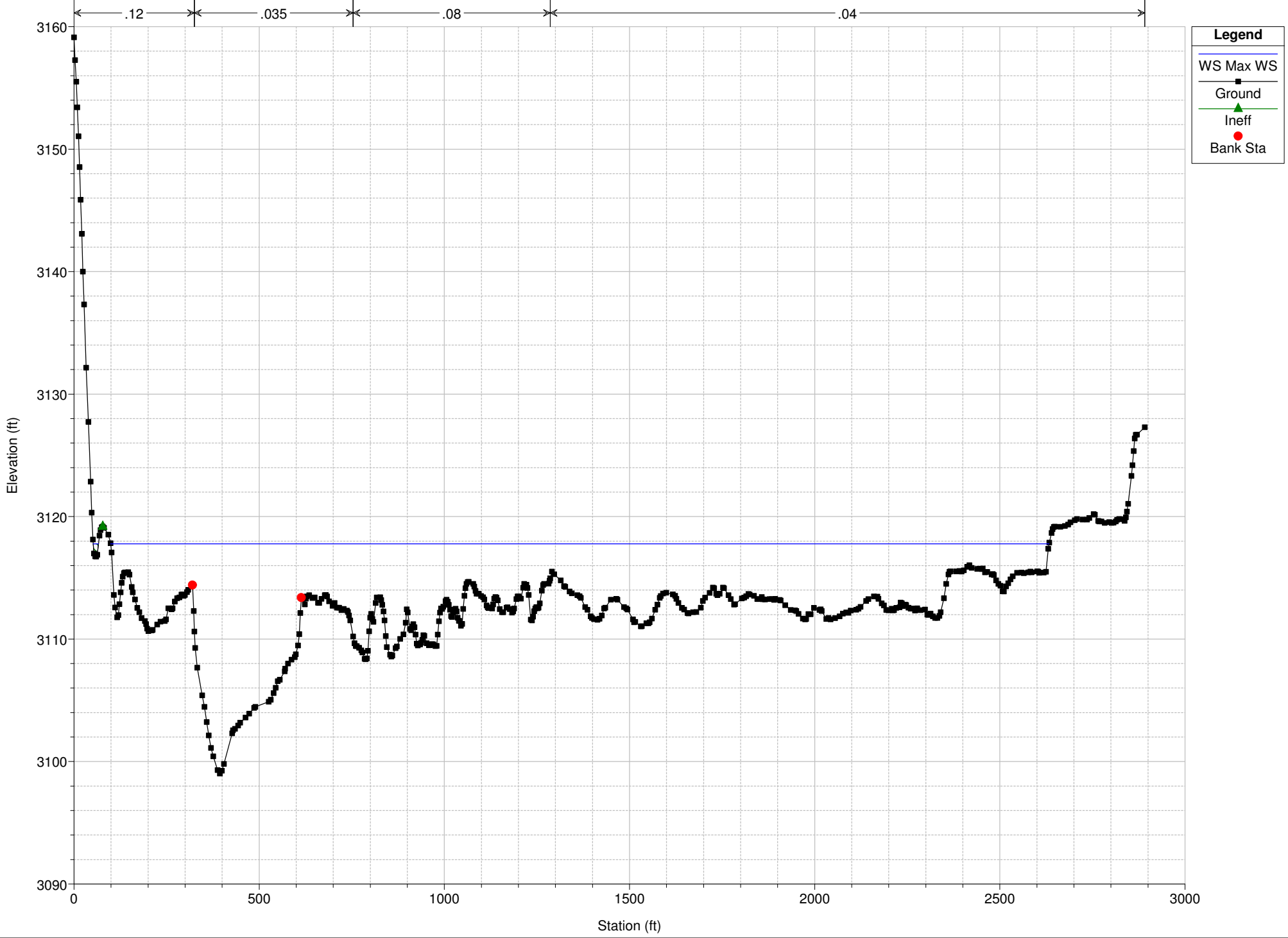
Legend

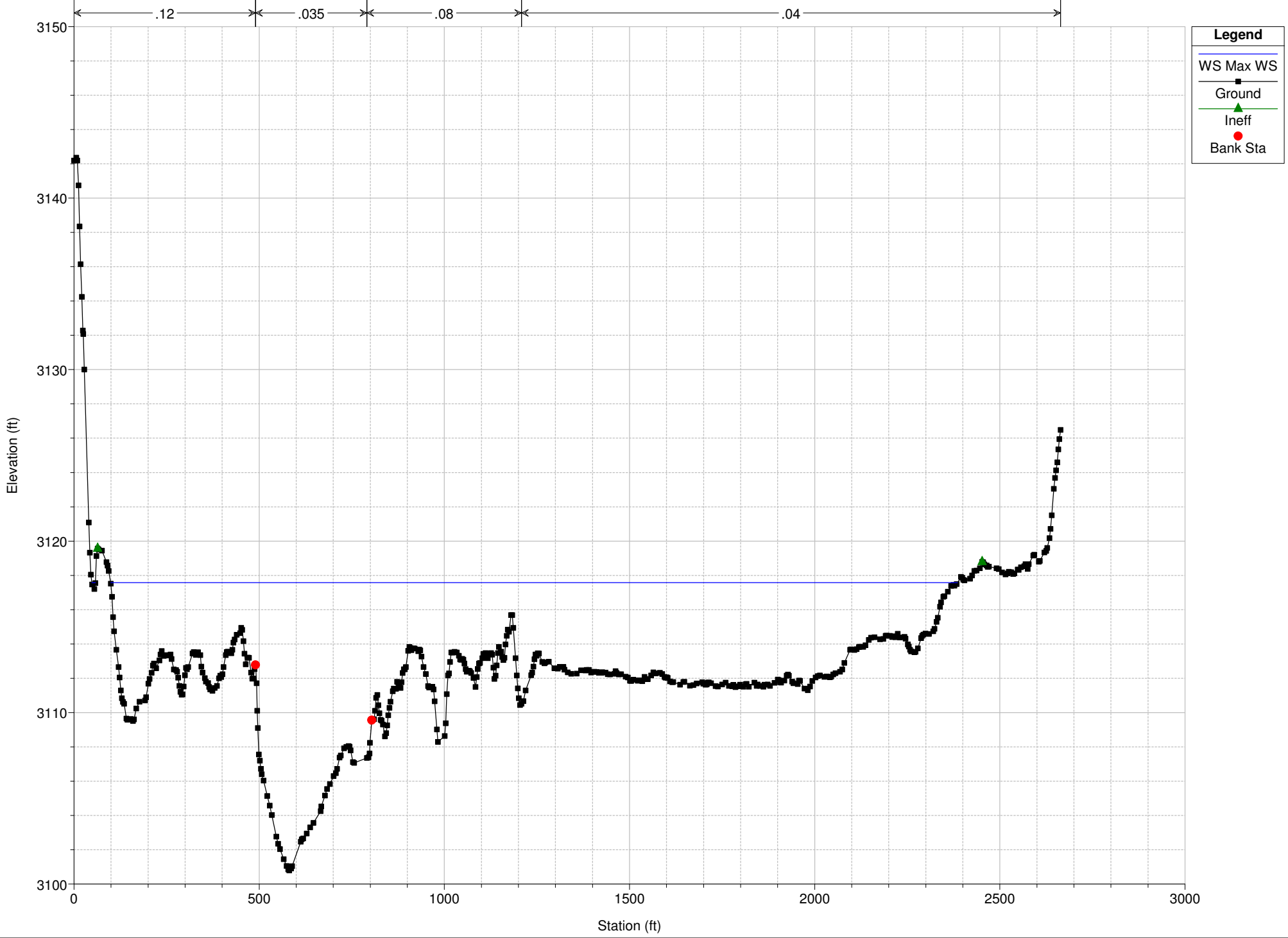
- WS Max WS
- Ground
- Ineff
- Bank Sta



Legend

- WS Max WS (Blue horizontal line)
- Ground (Black line with square markers)
- Ineff (Green line with triangle markers)
- Bank Sta (Red circle)



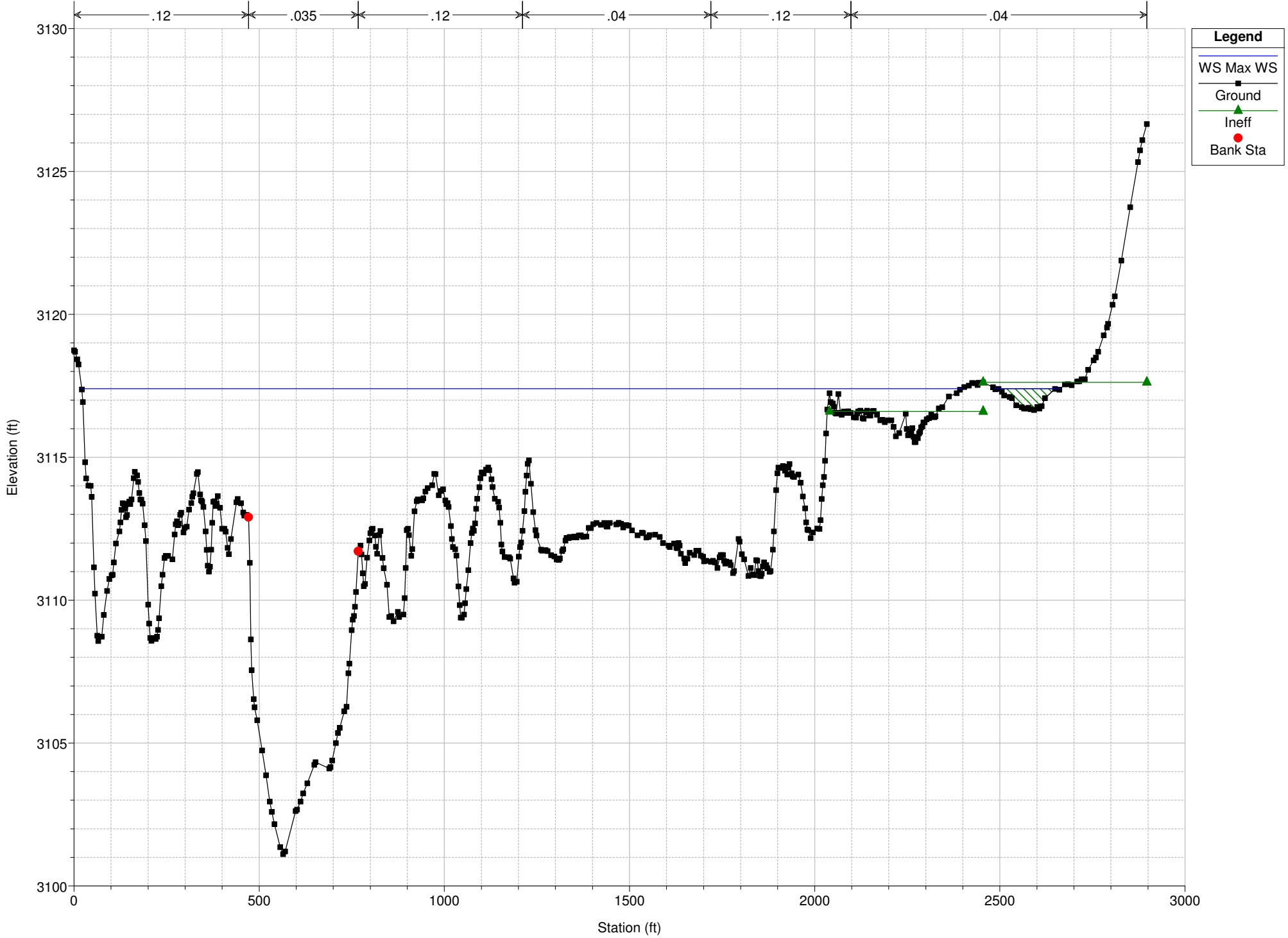


Legend

- WS Max WS
- Ground
- Ineff
- Bank Sta

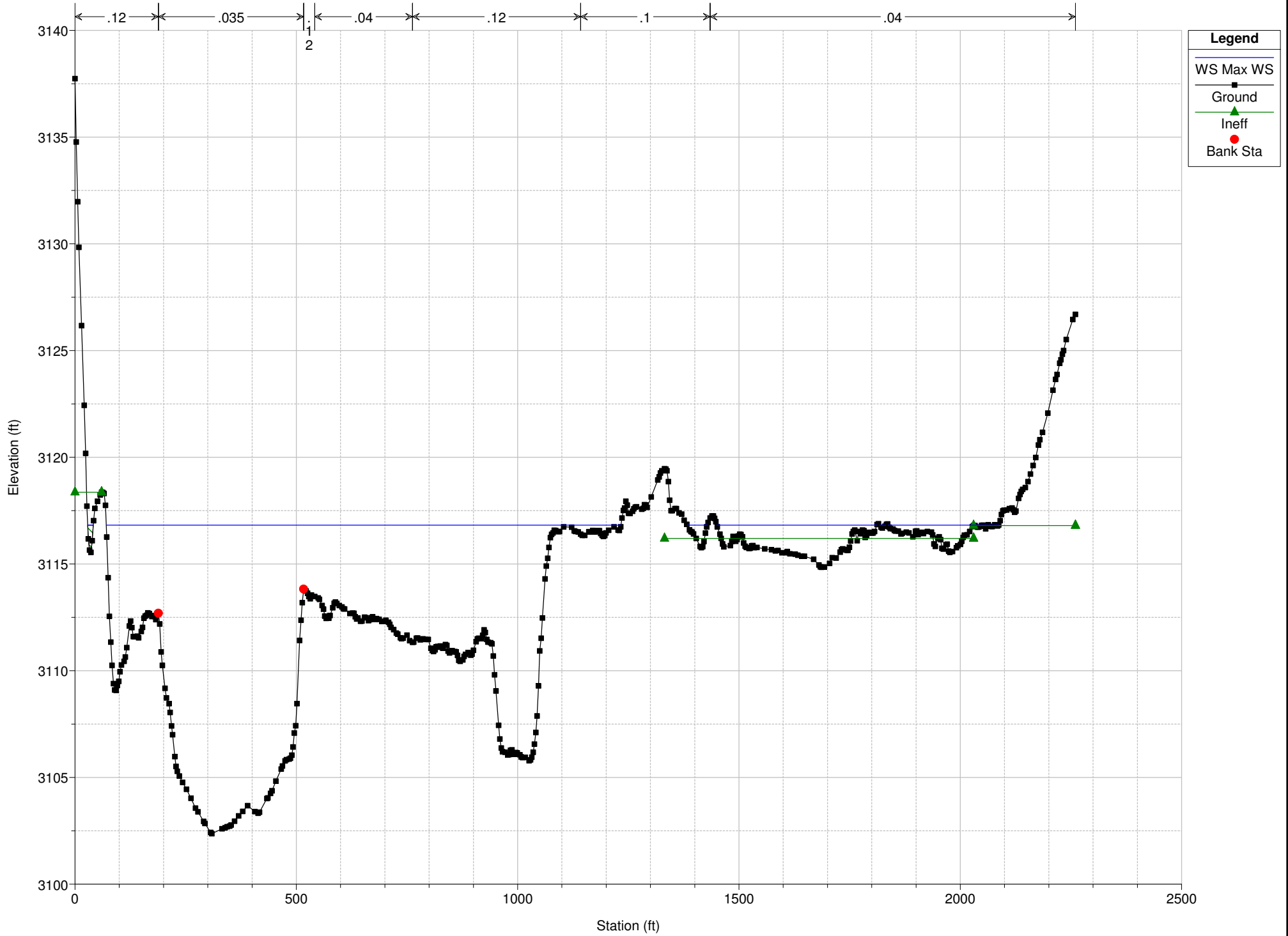
SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

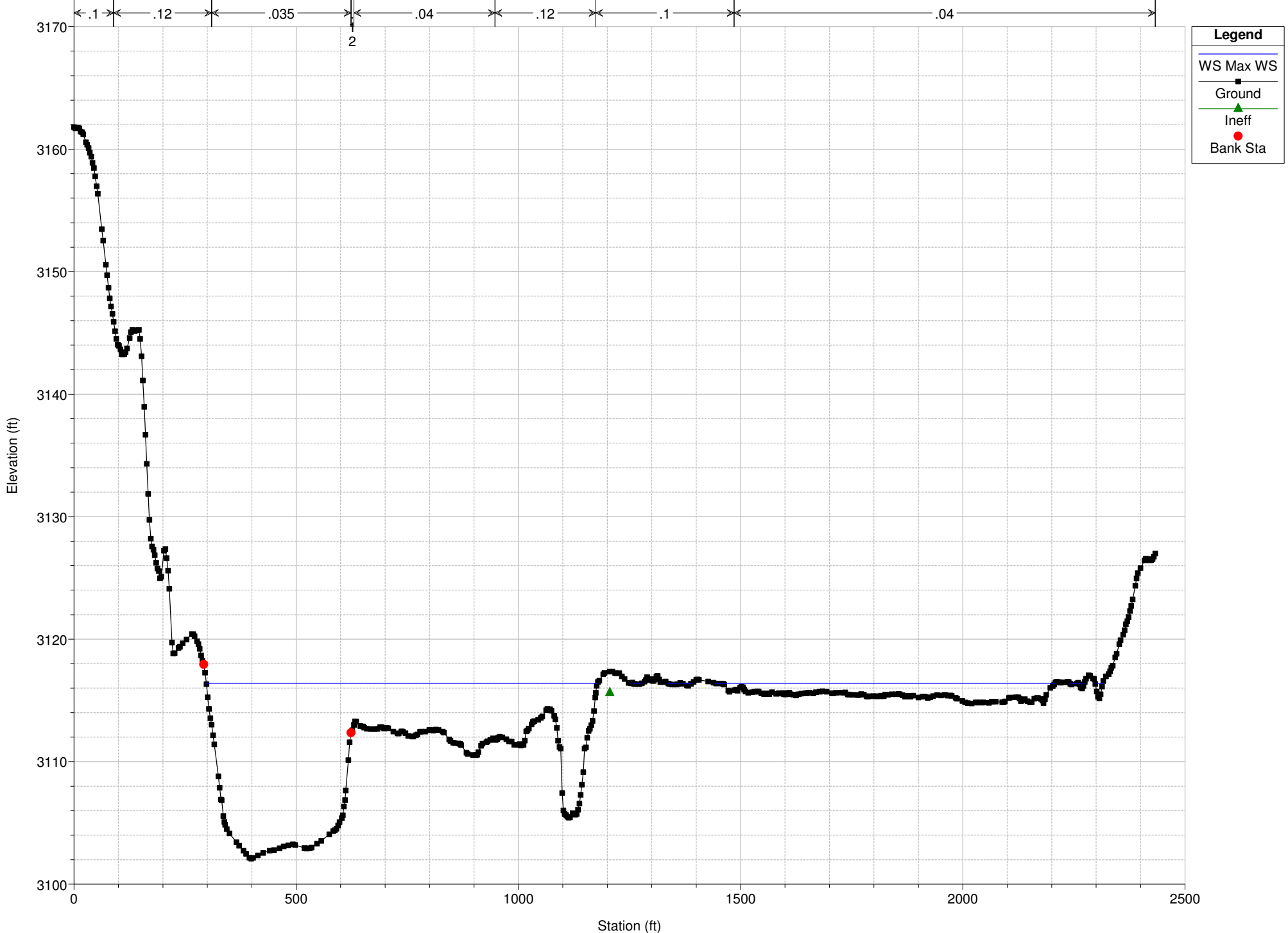
RS = 7262

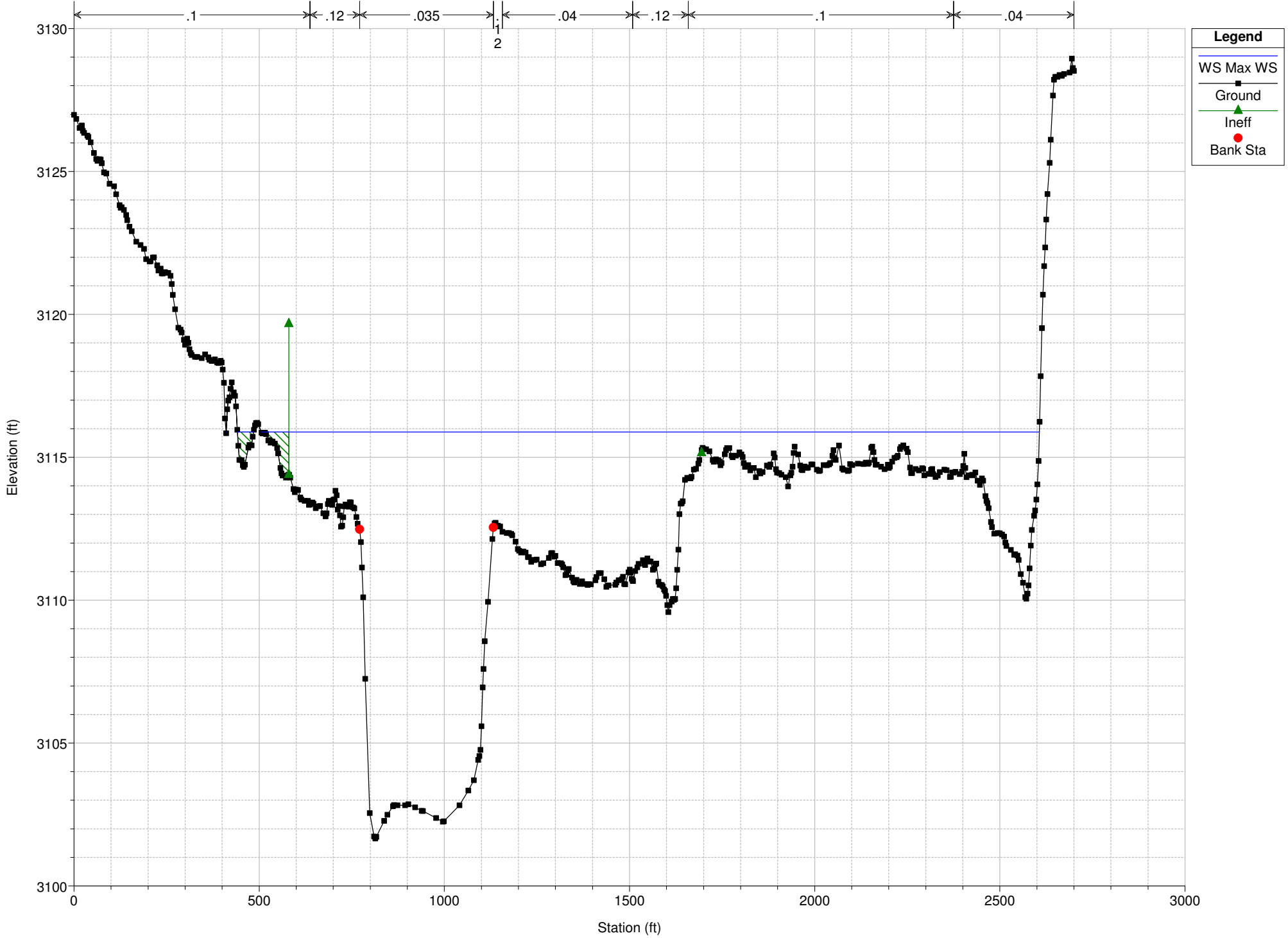


SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 6550

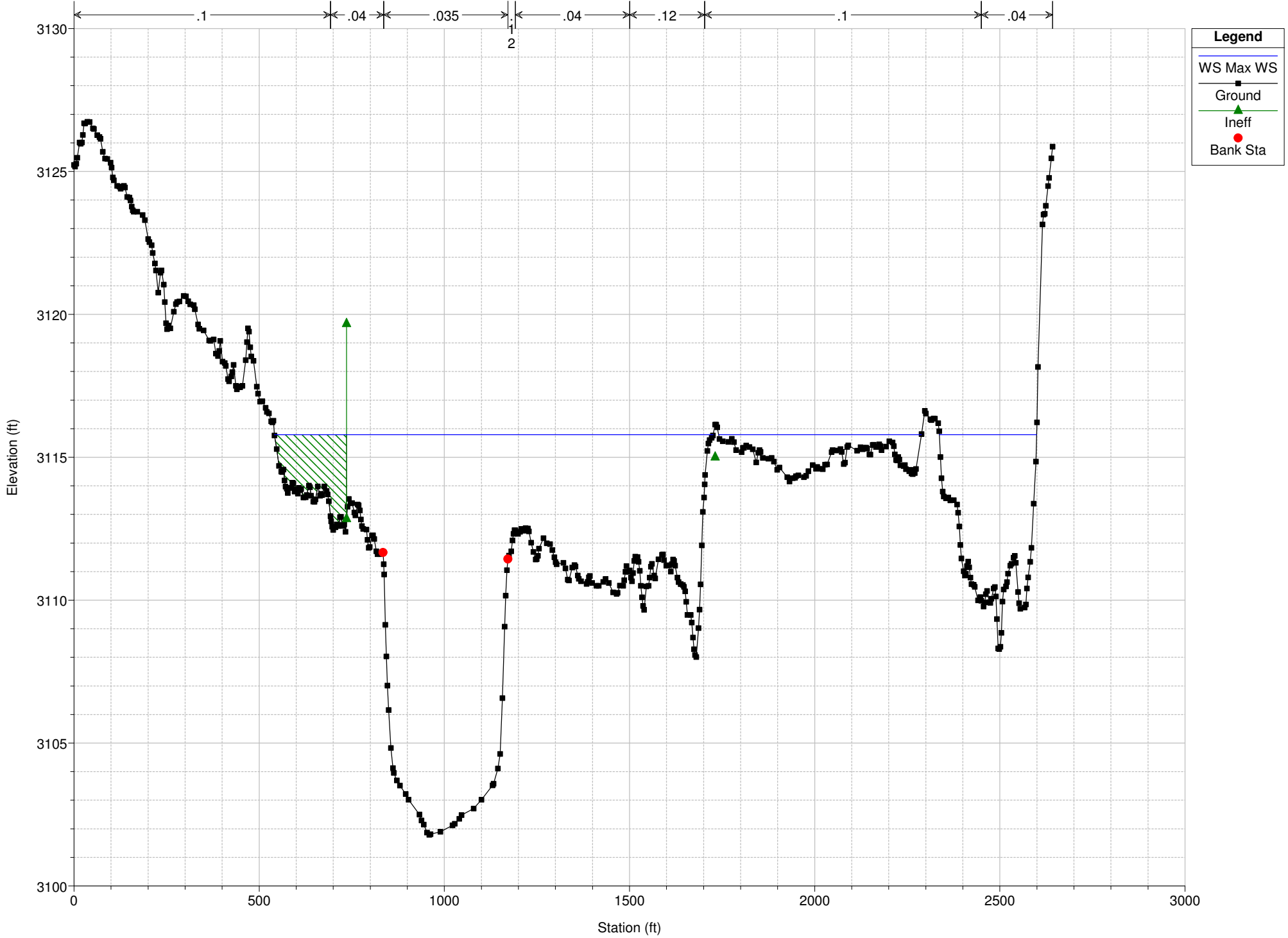






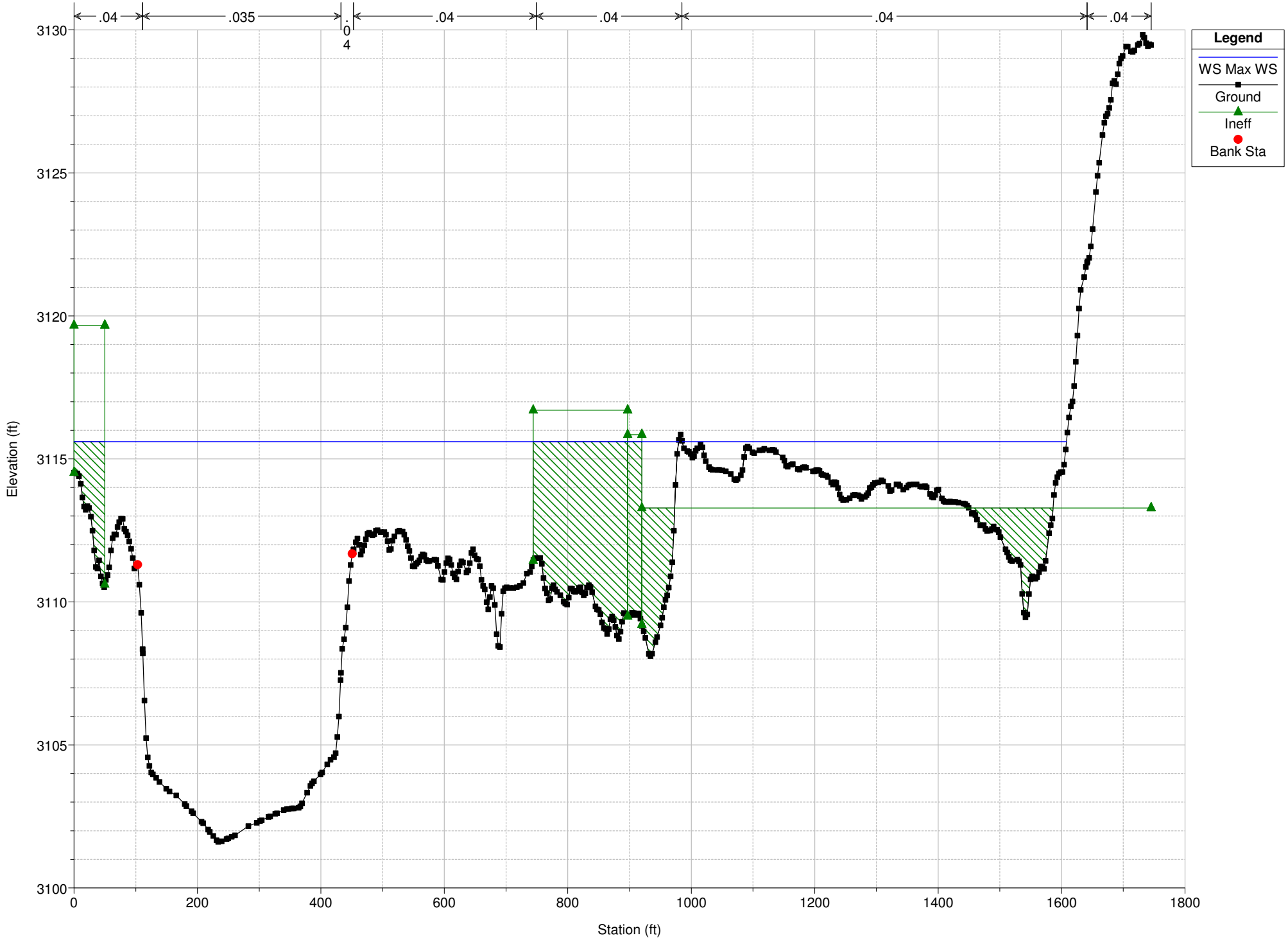
SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 5230



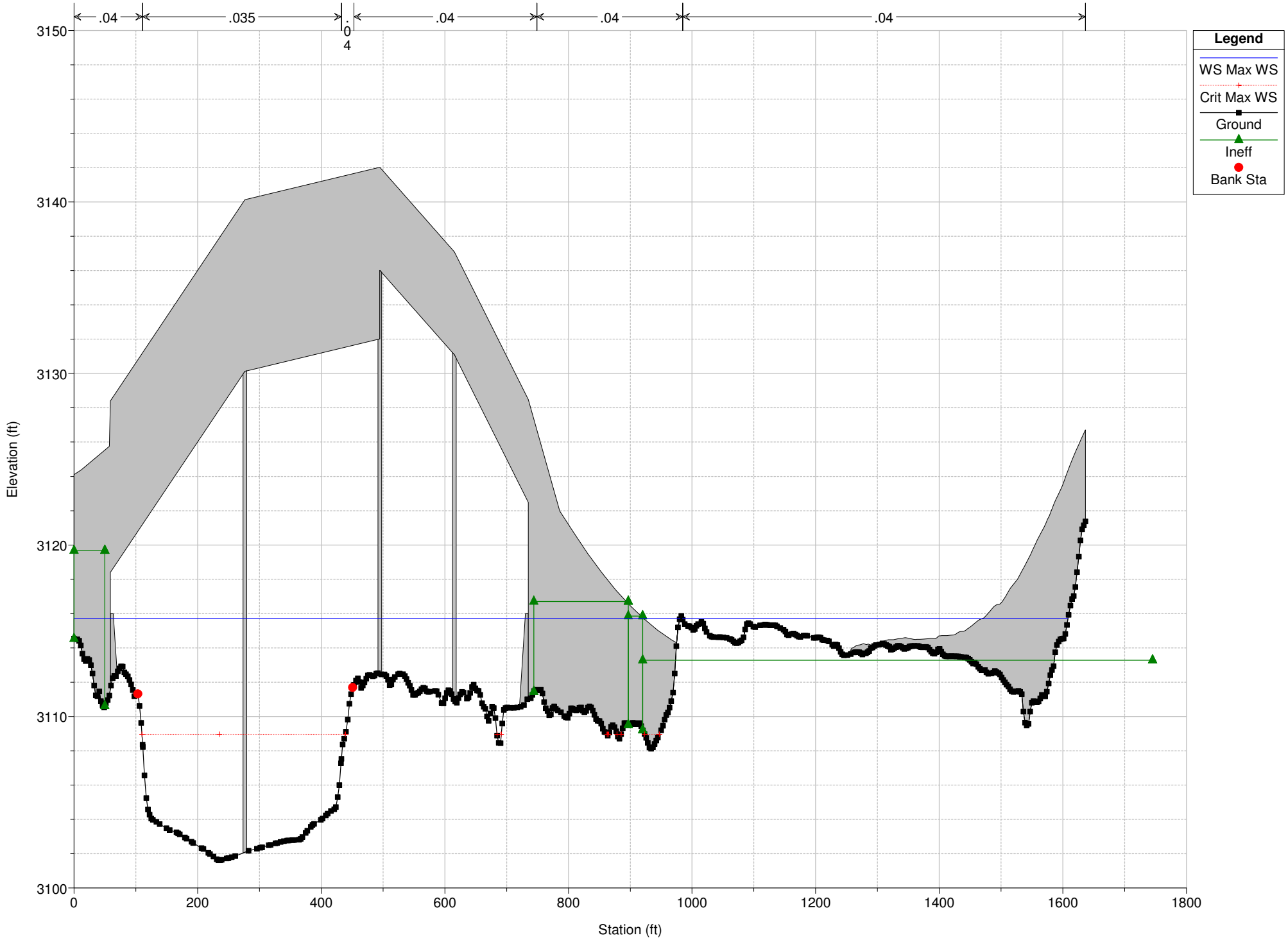
SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 5125



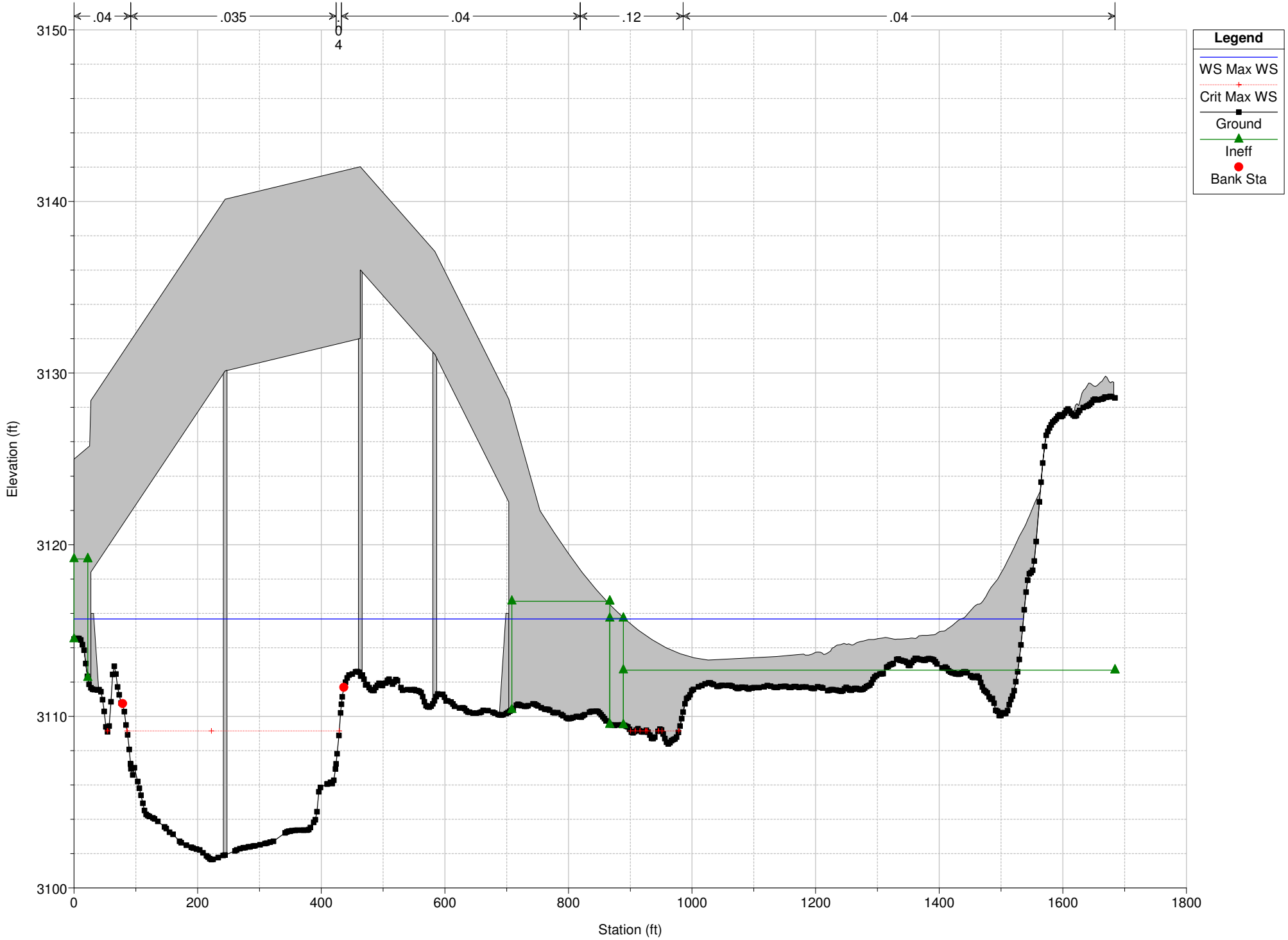
SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 5100 MO



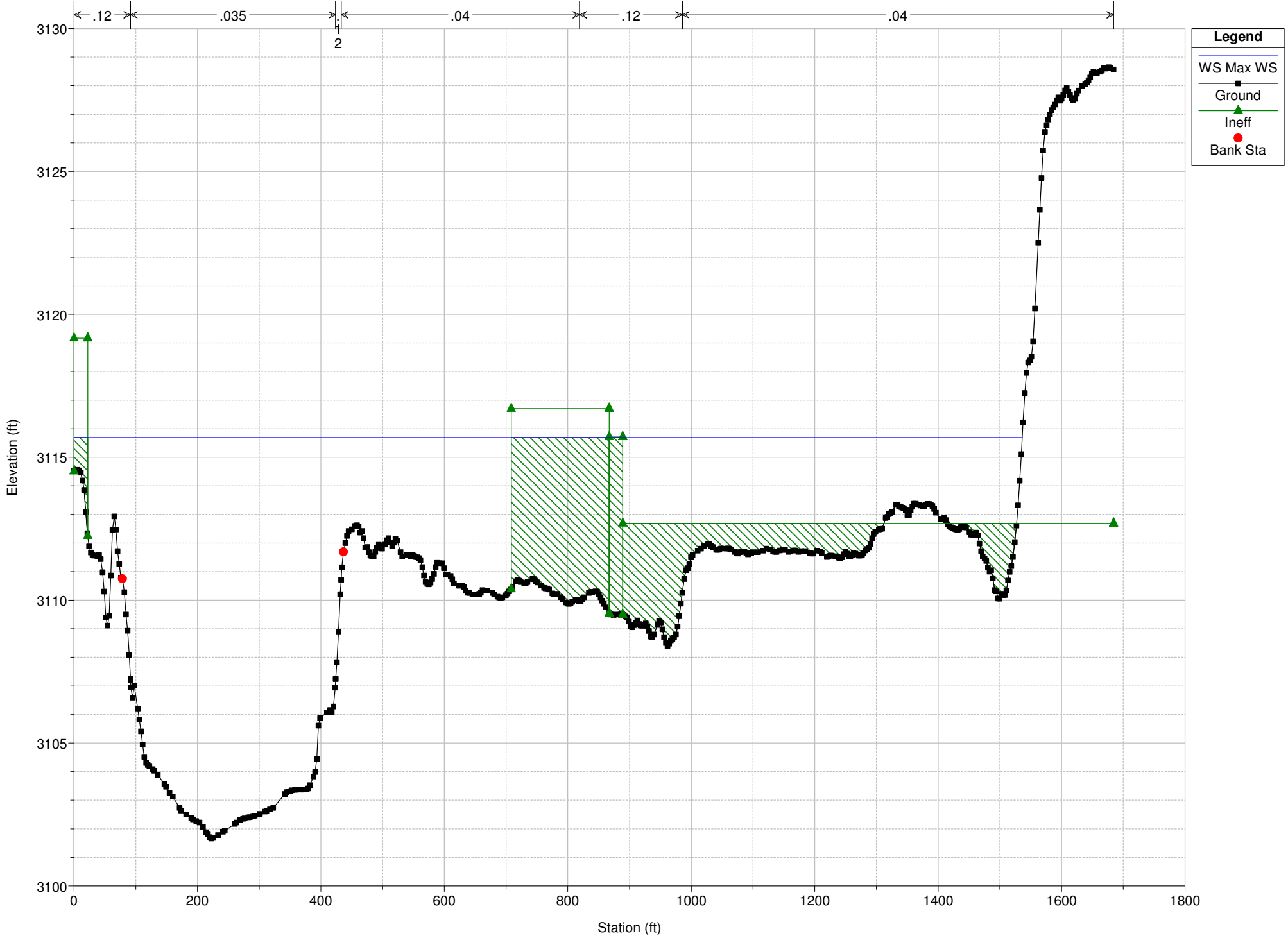
SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 5100 MO



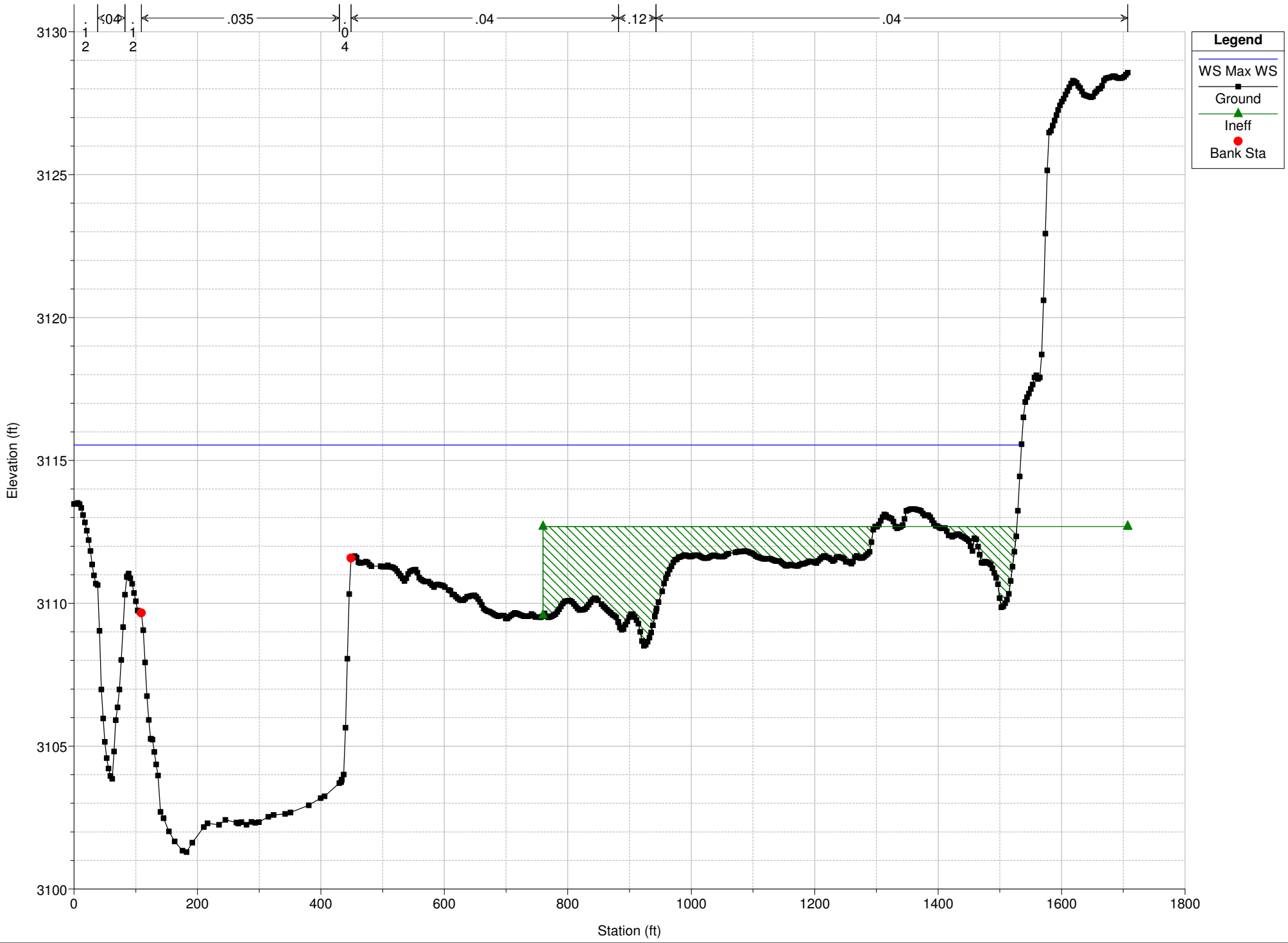
SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 5061



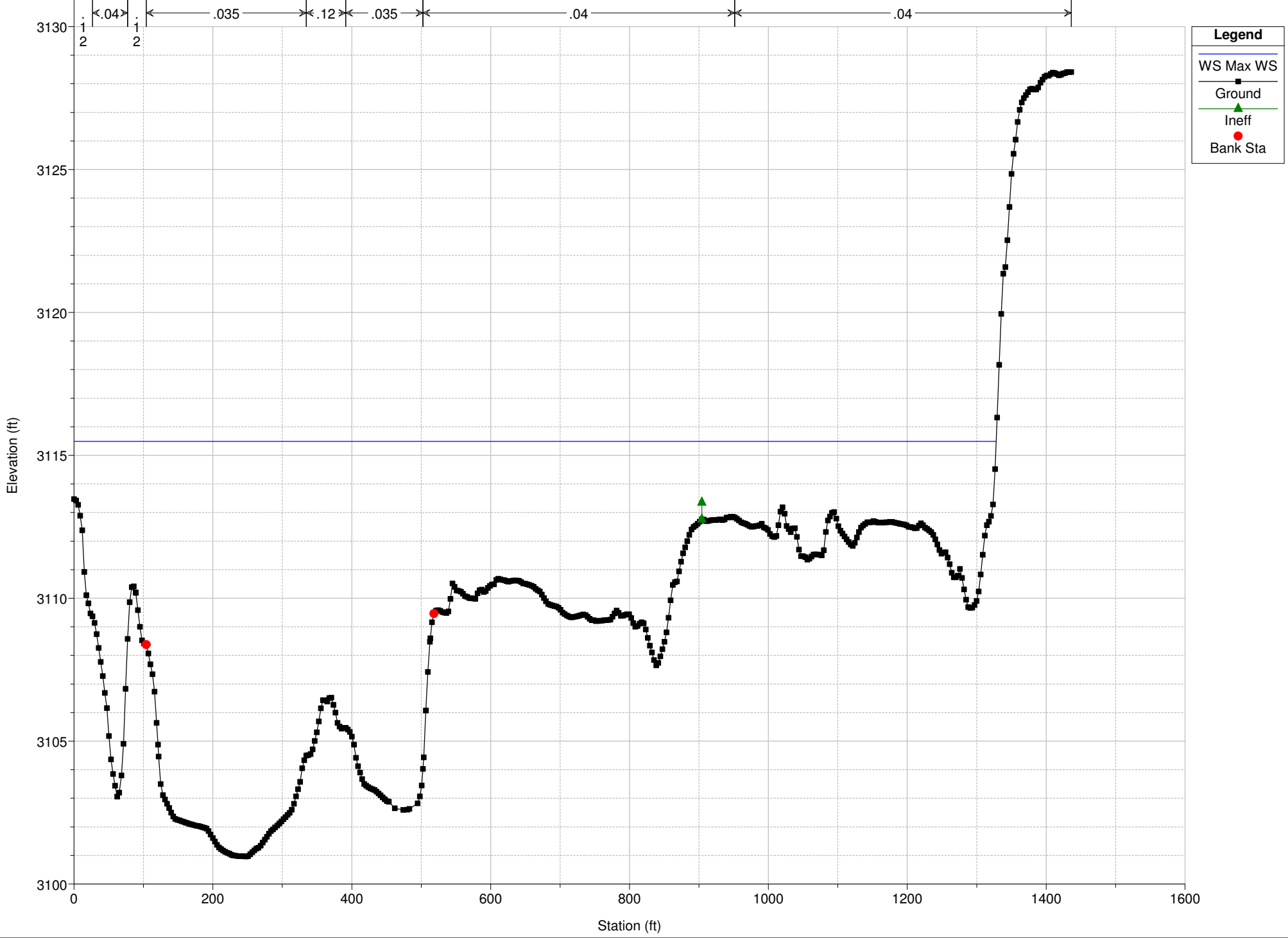
SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 4726



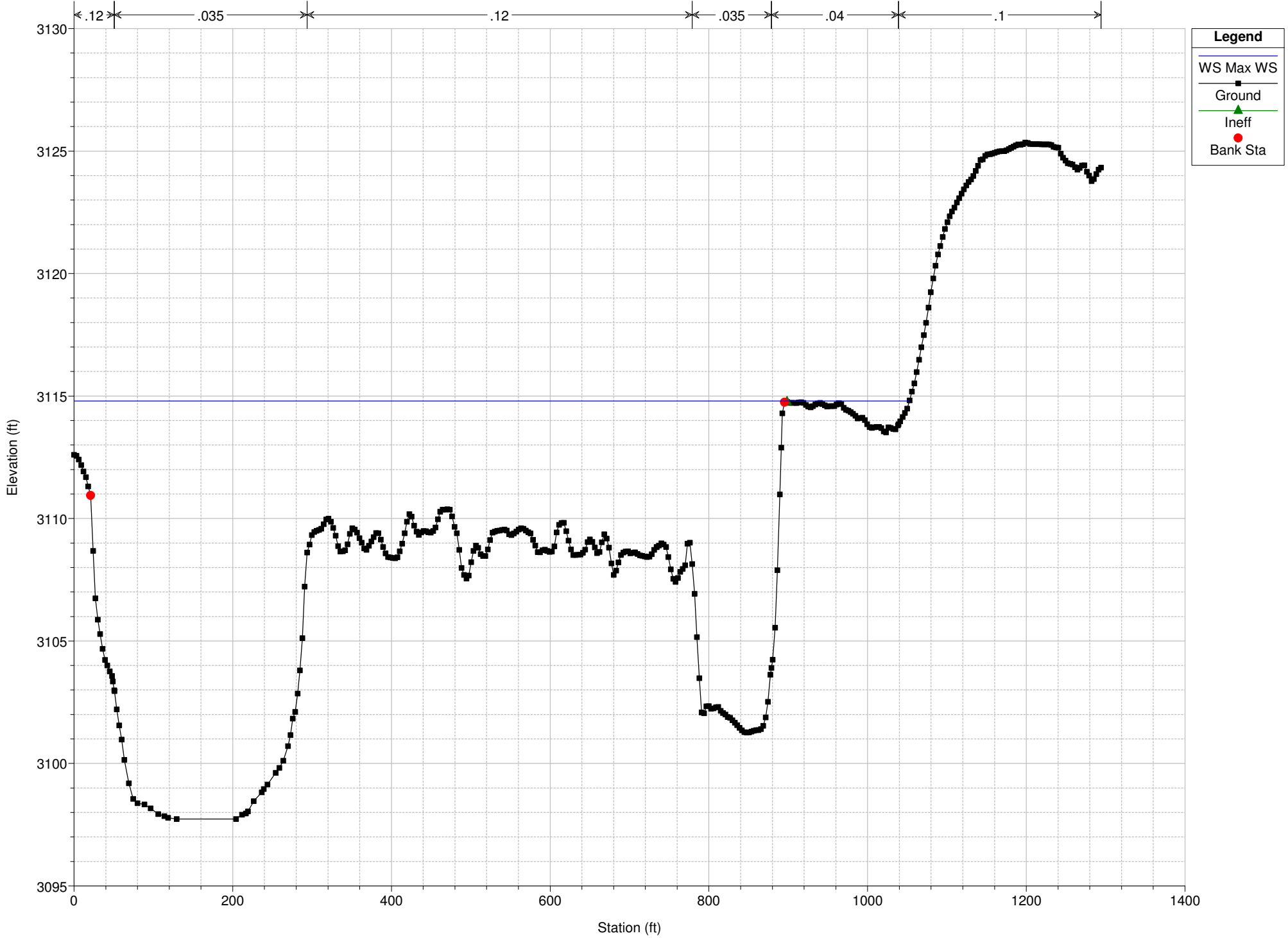
Legend

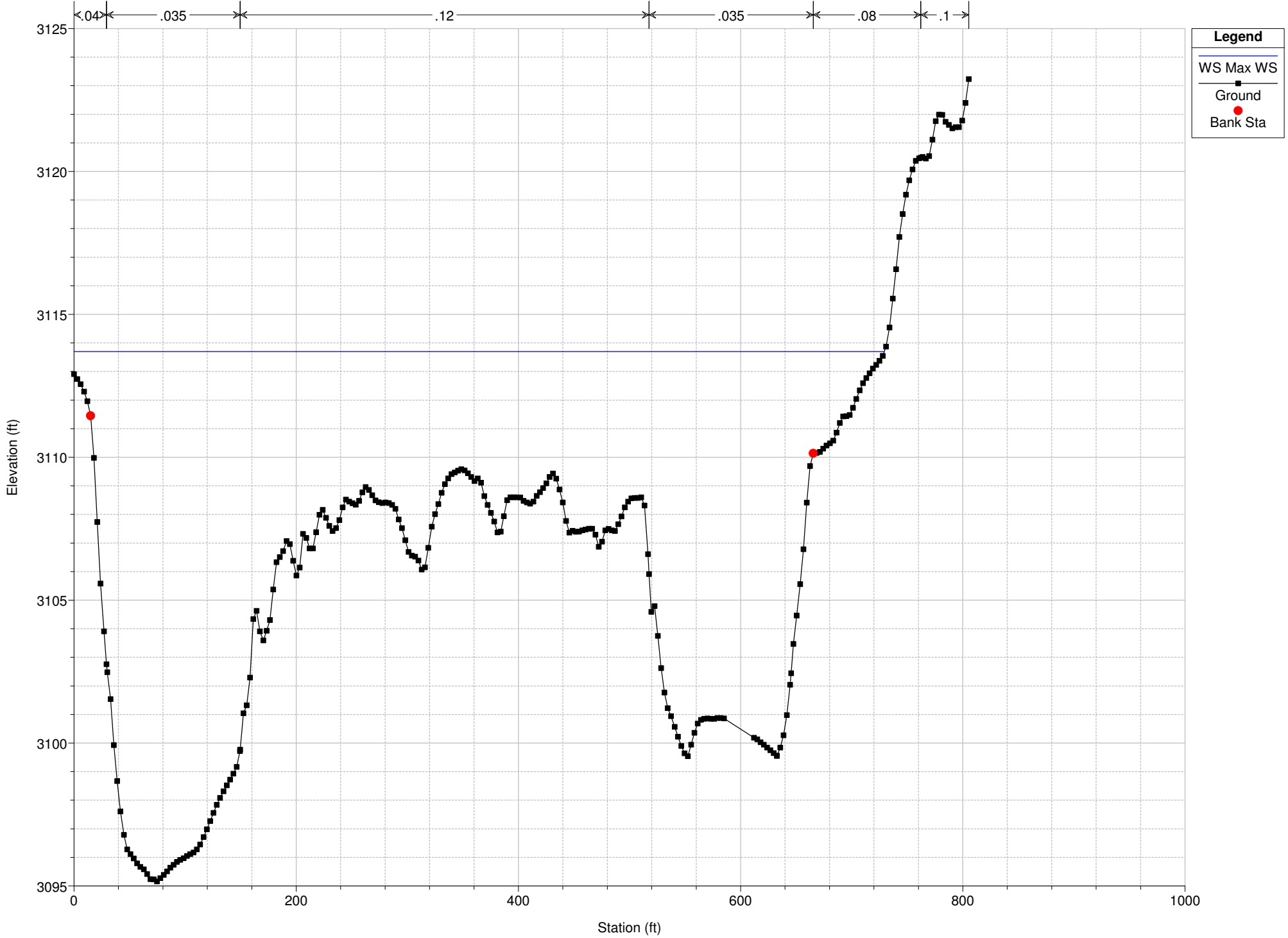
- WS Max WS
- Ground
- Ineff
- Bank Sta

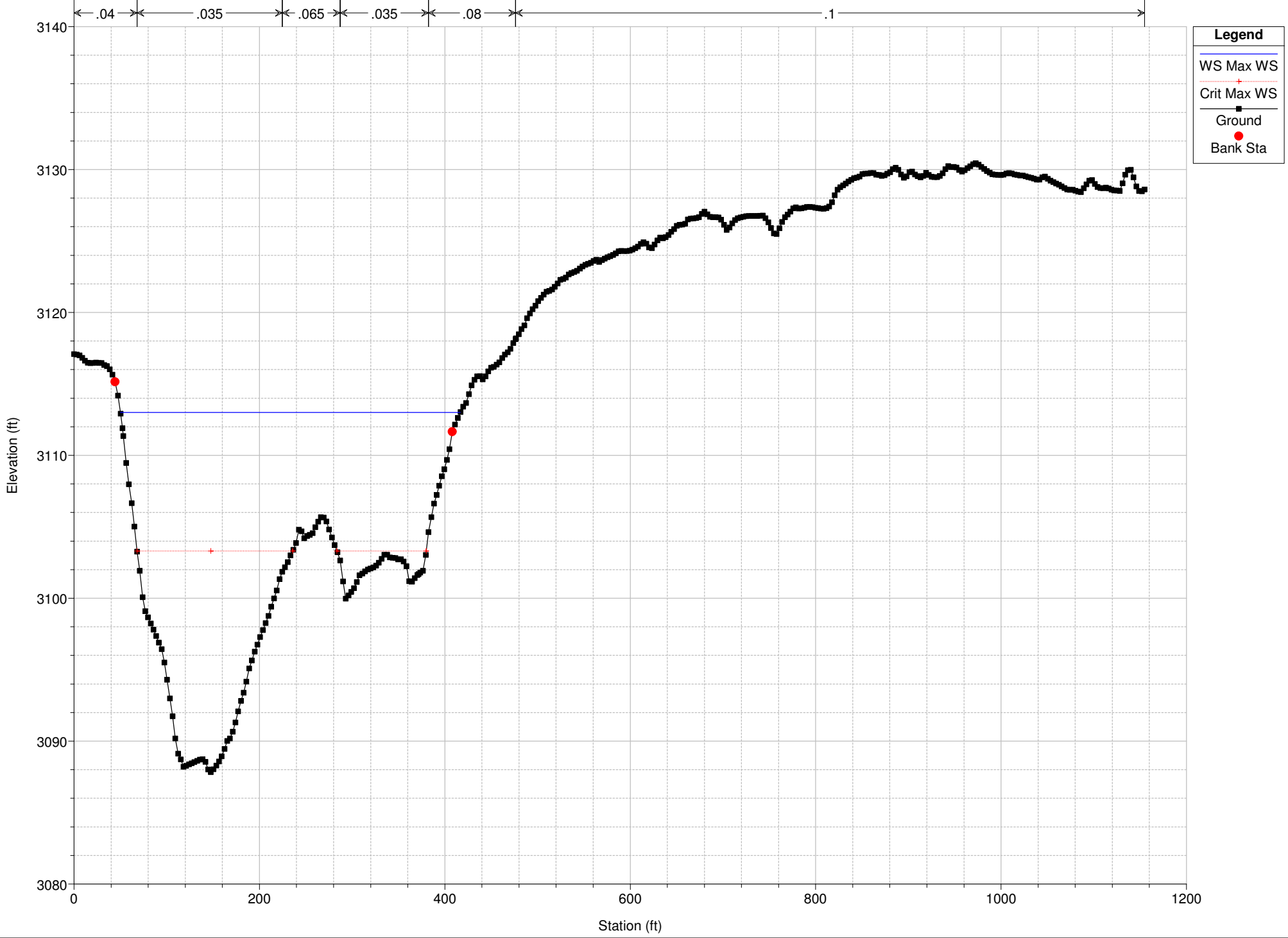


Legend

- WS Max WS
- Ground
- Ineff
- Bank Sta



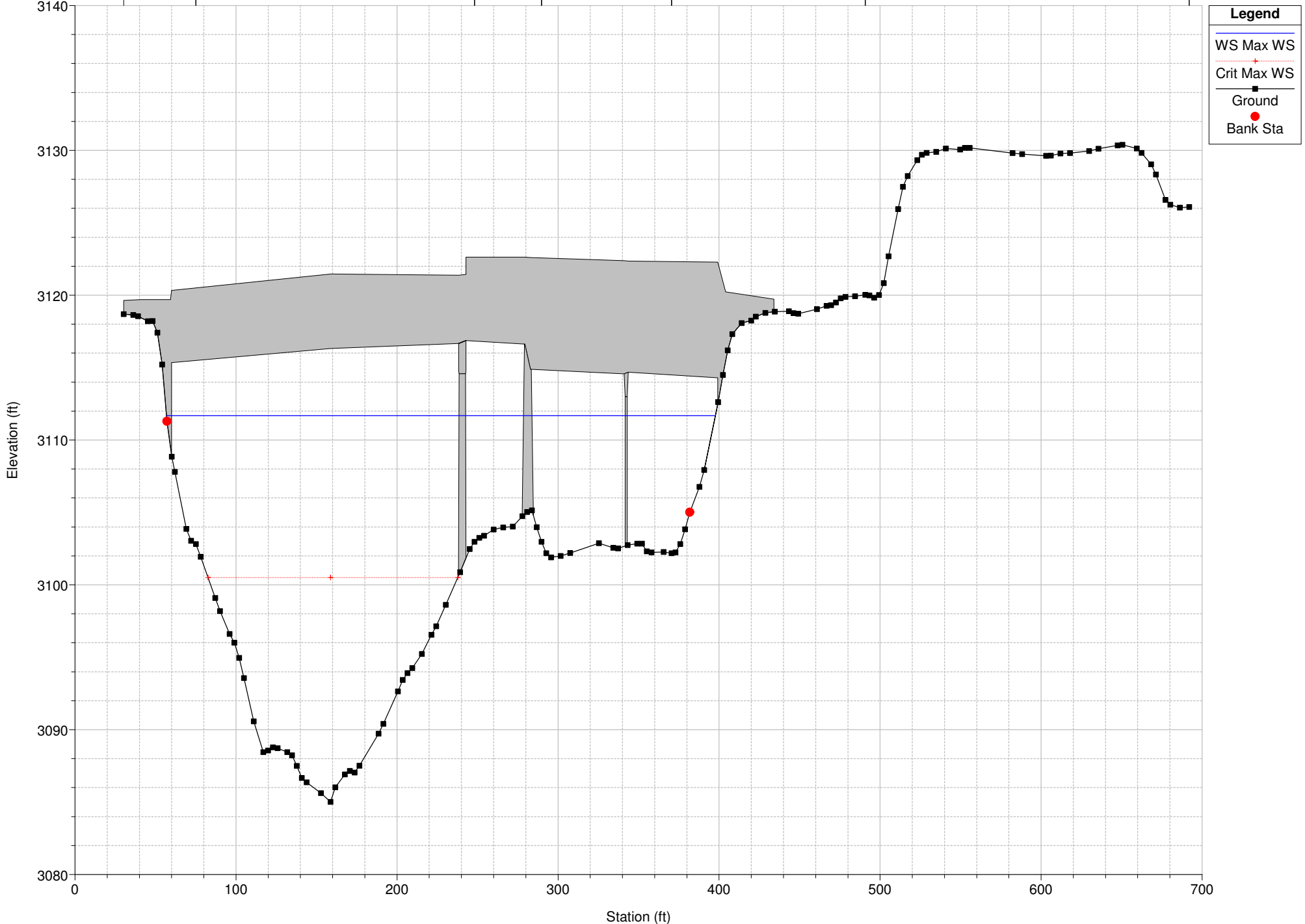
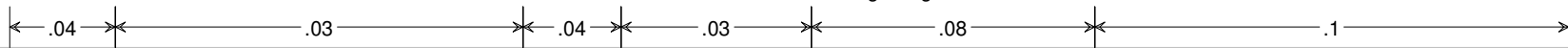






SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 2890 BR Existing Bridge

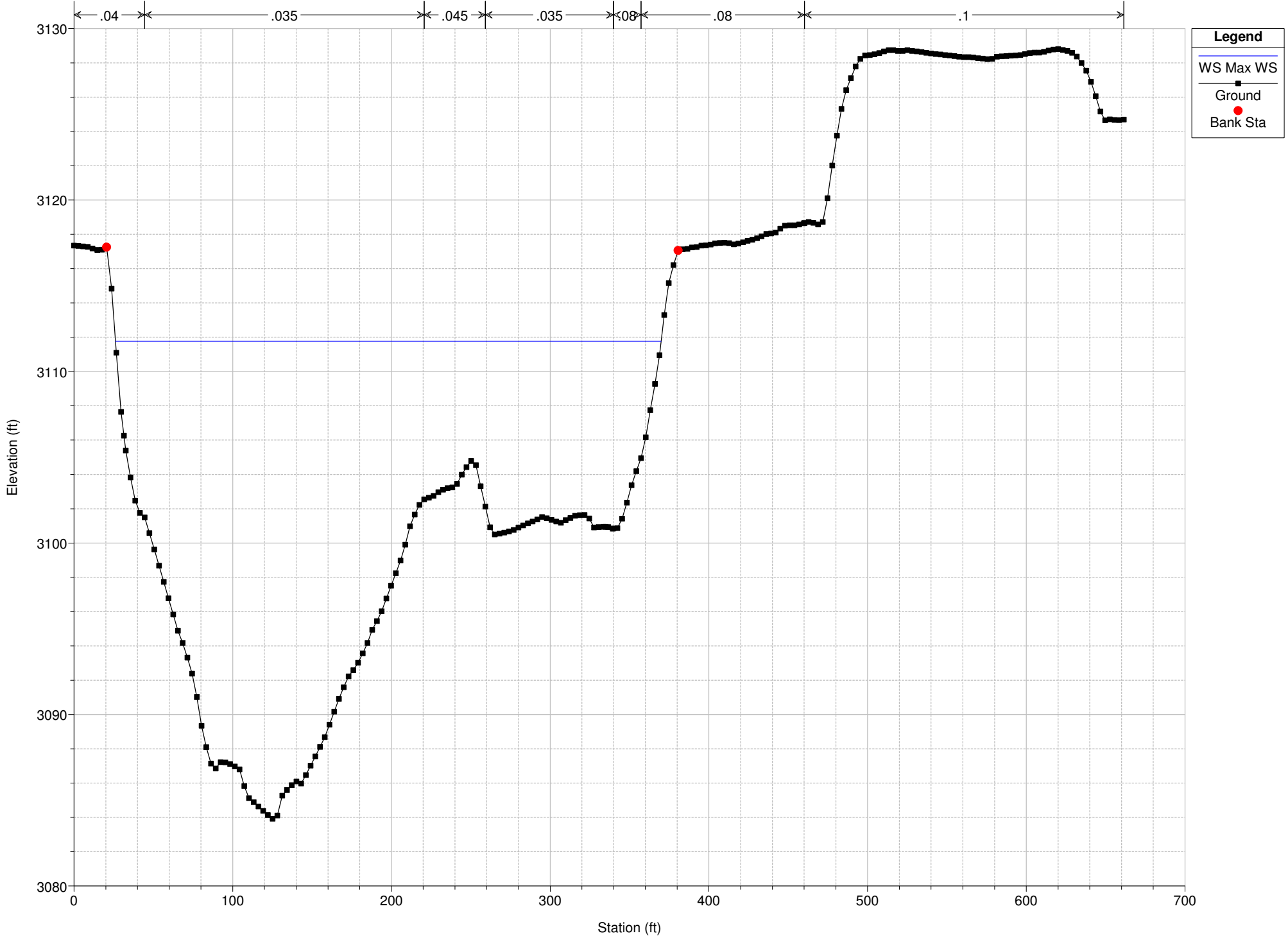


Legend

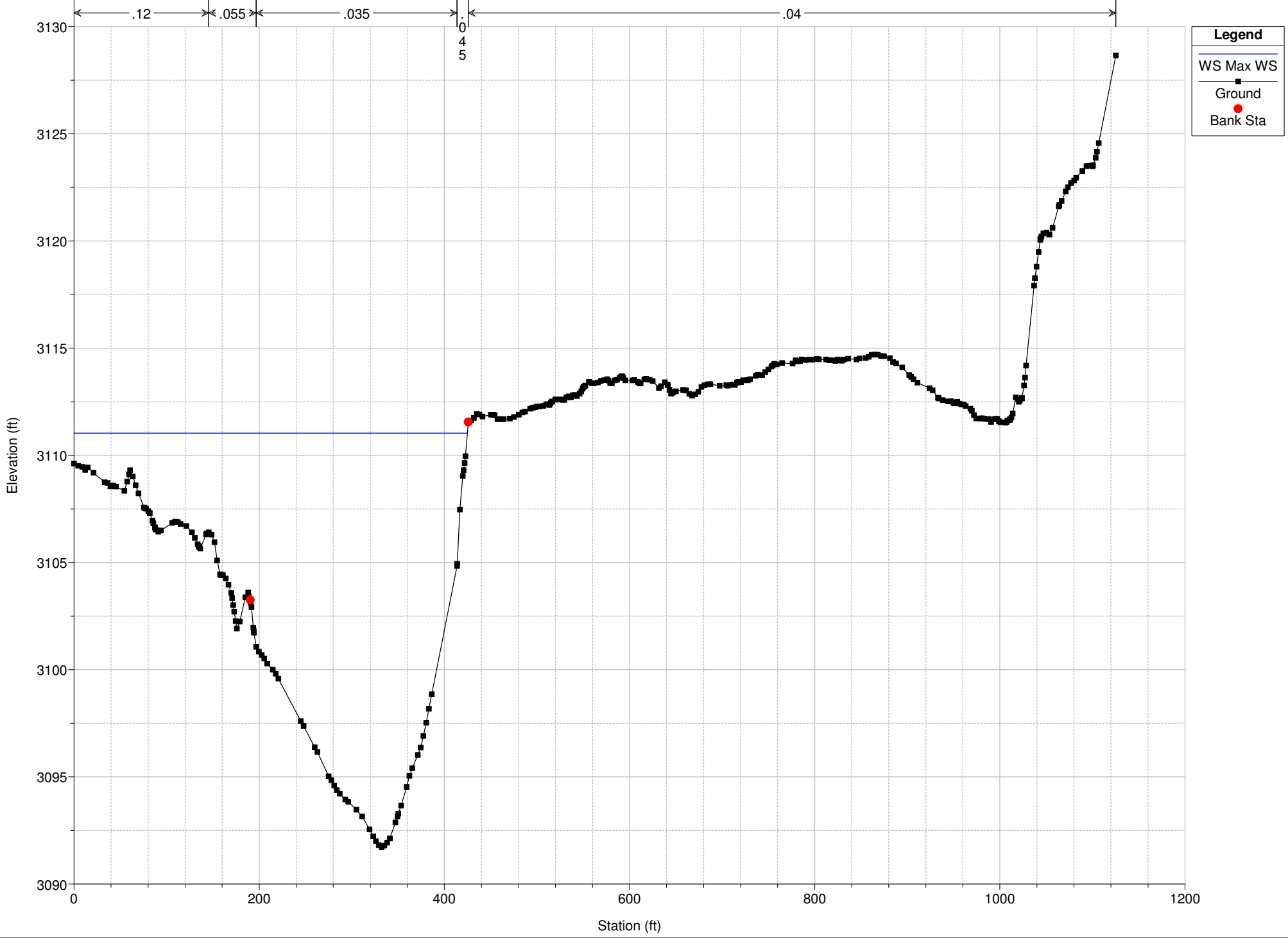
- WS Max WS
- Crit Max WS
- Ground
- Bank Sta

SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 2865

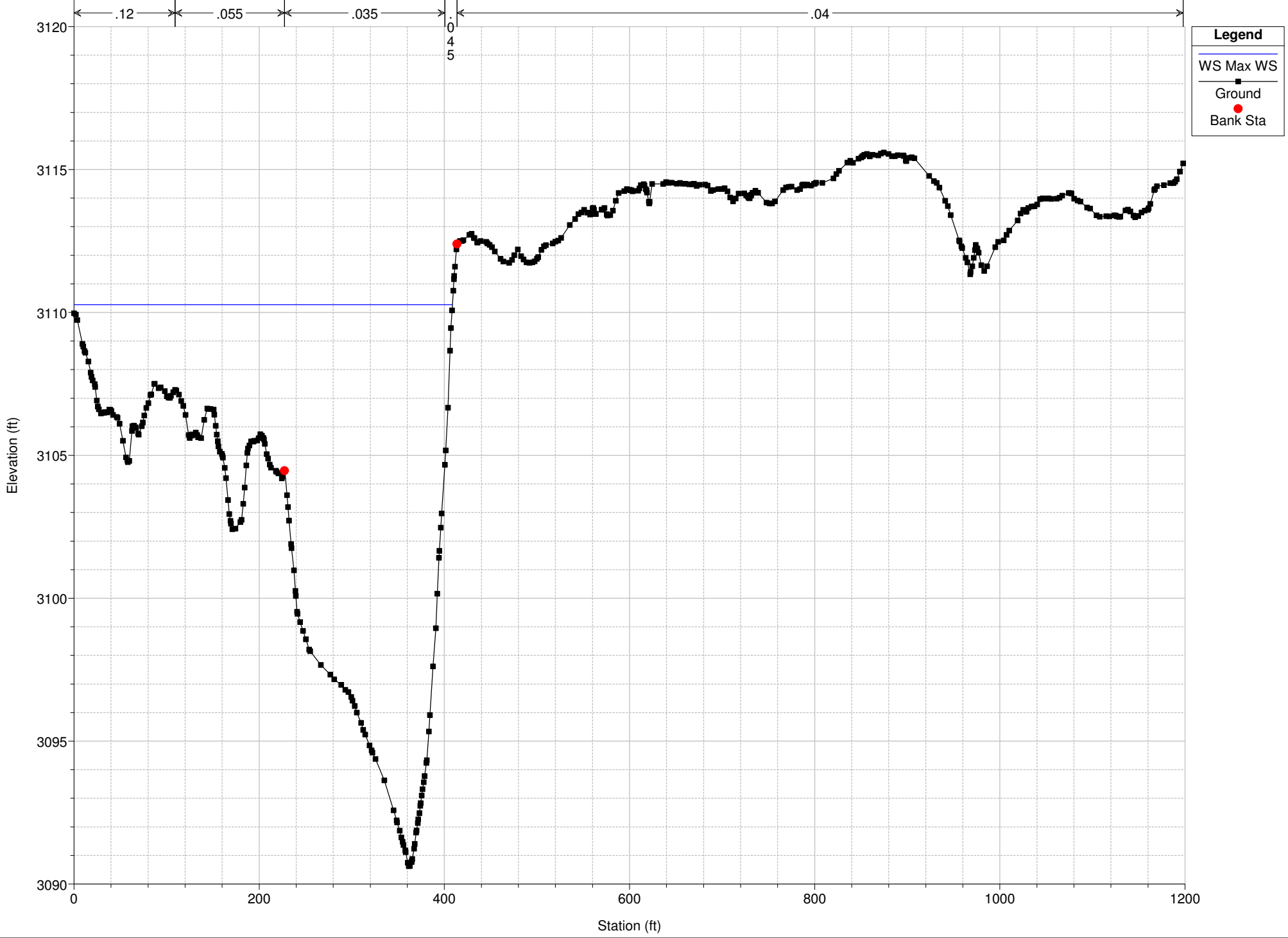


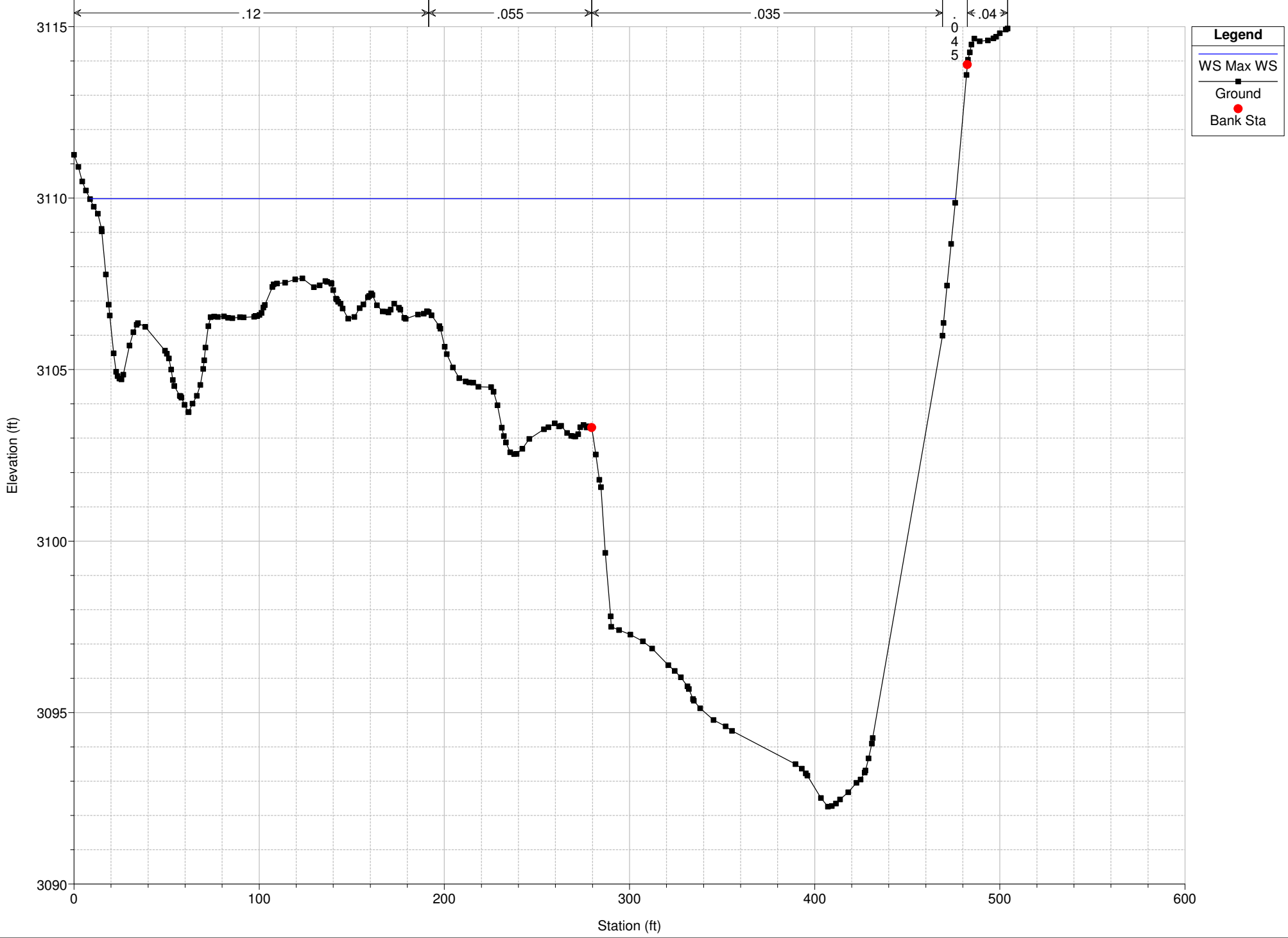
SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016
RS = 2244



Legend

- WS Max WS
- Ground
- Bank Sta



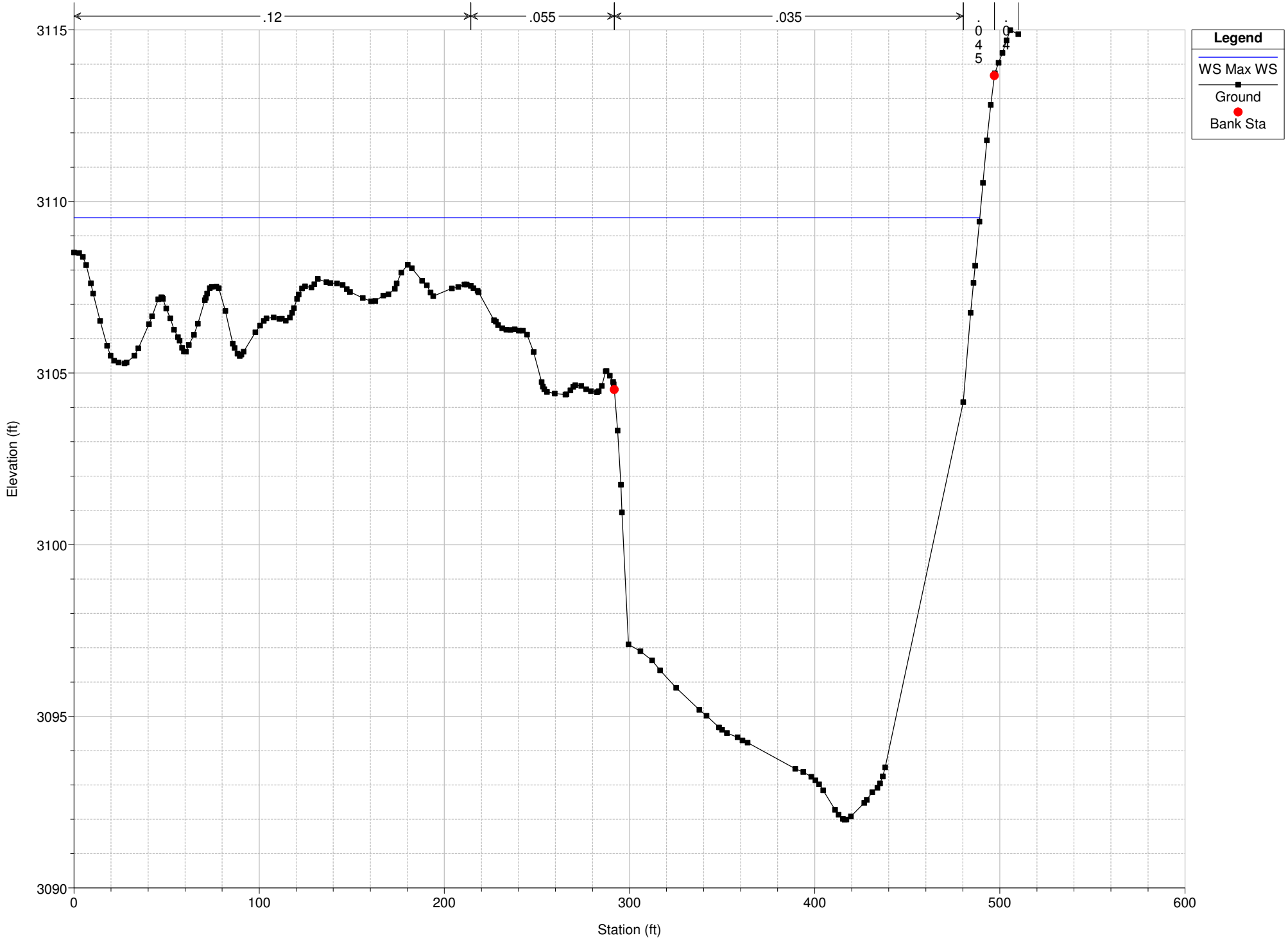


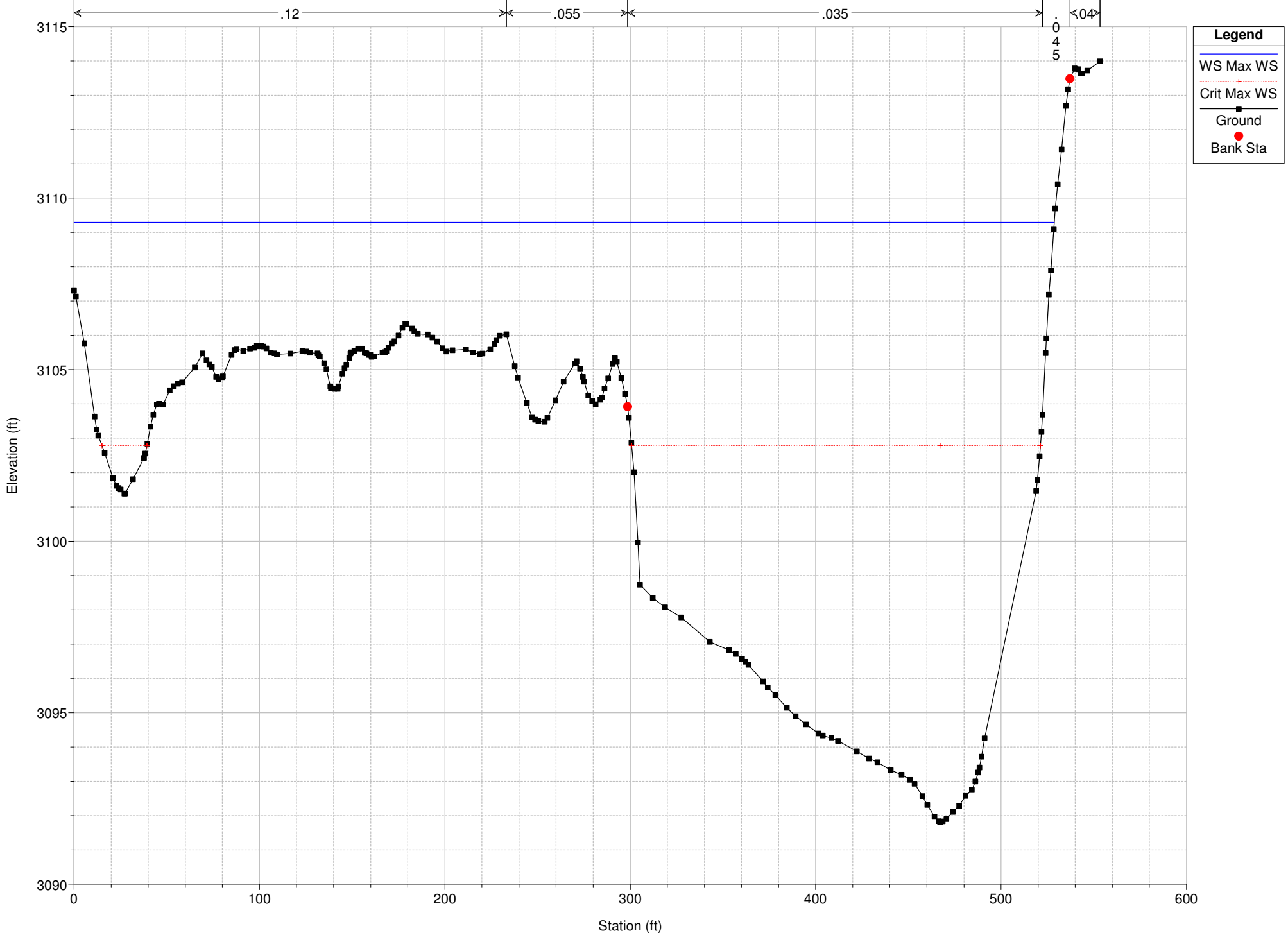
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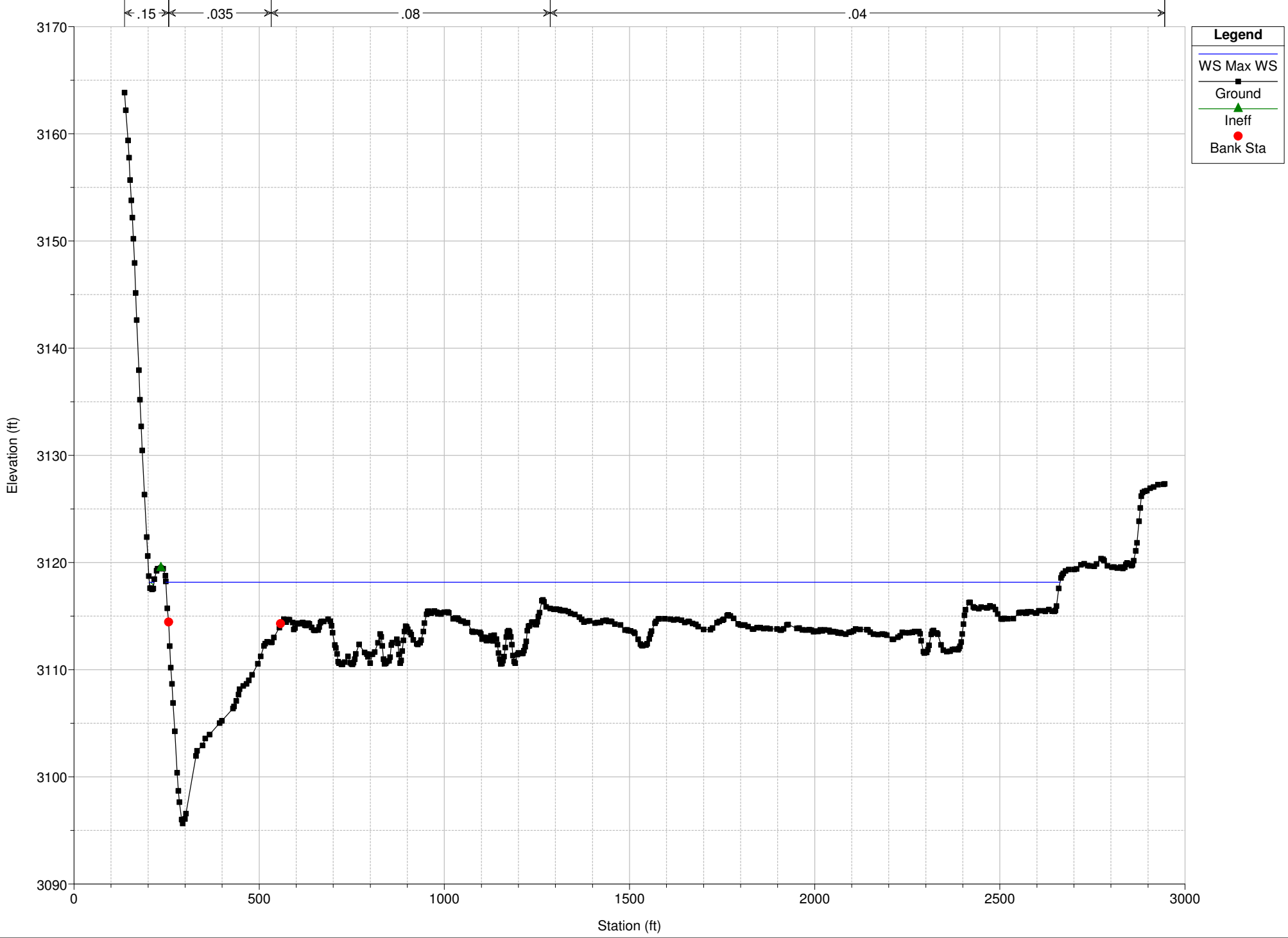
- WS Max WS
- Ground
- Bank Sta

SouthAveBridge Plan: PropAlt1A_Interim100yr 7/15/2016

RS = 1229







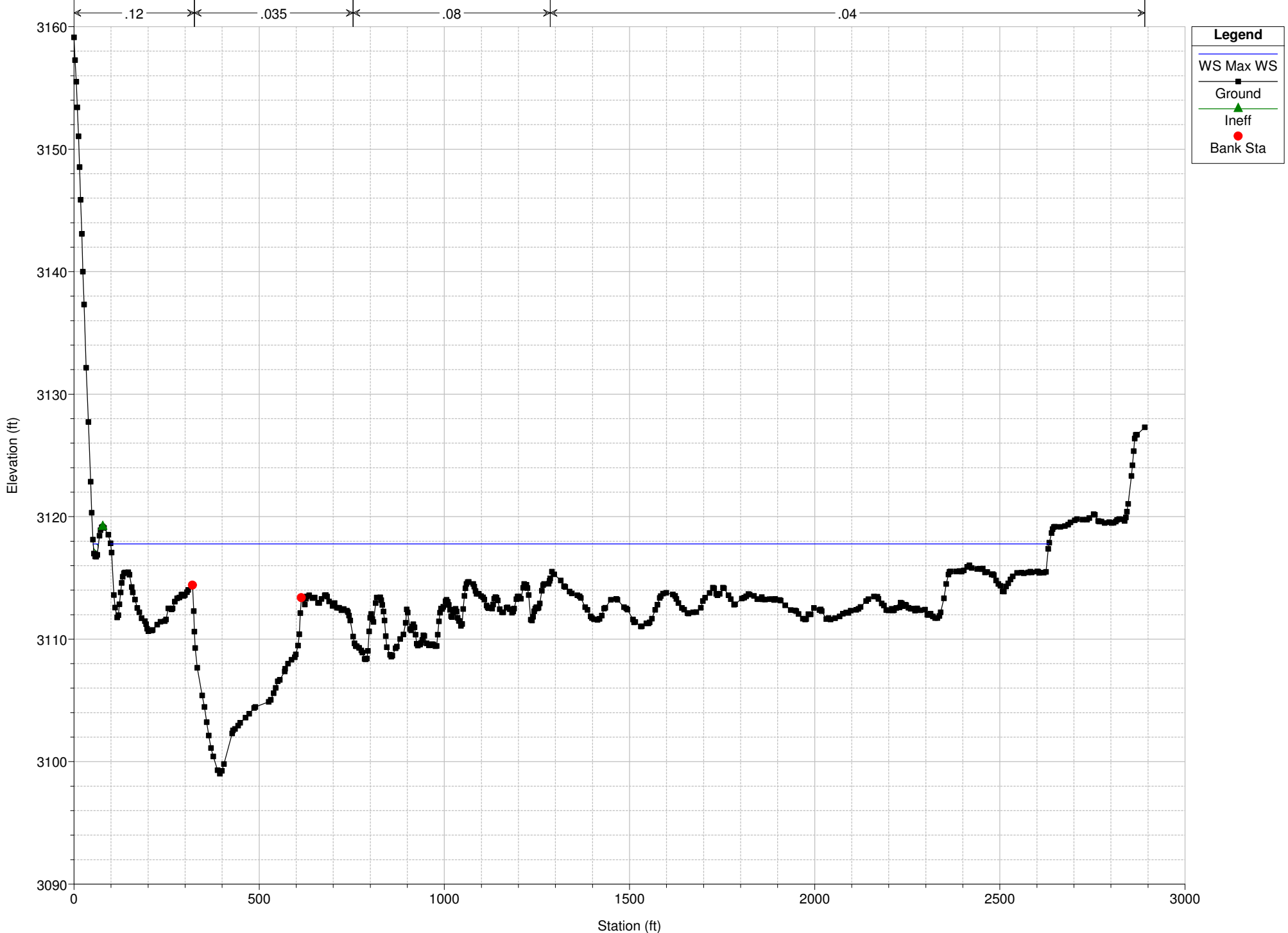
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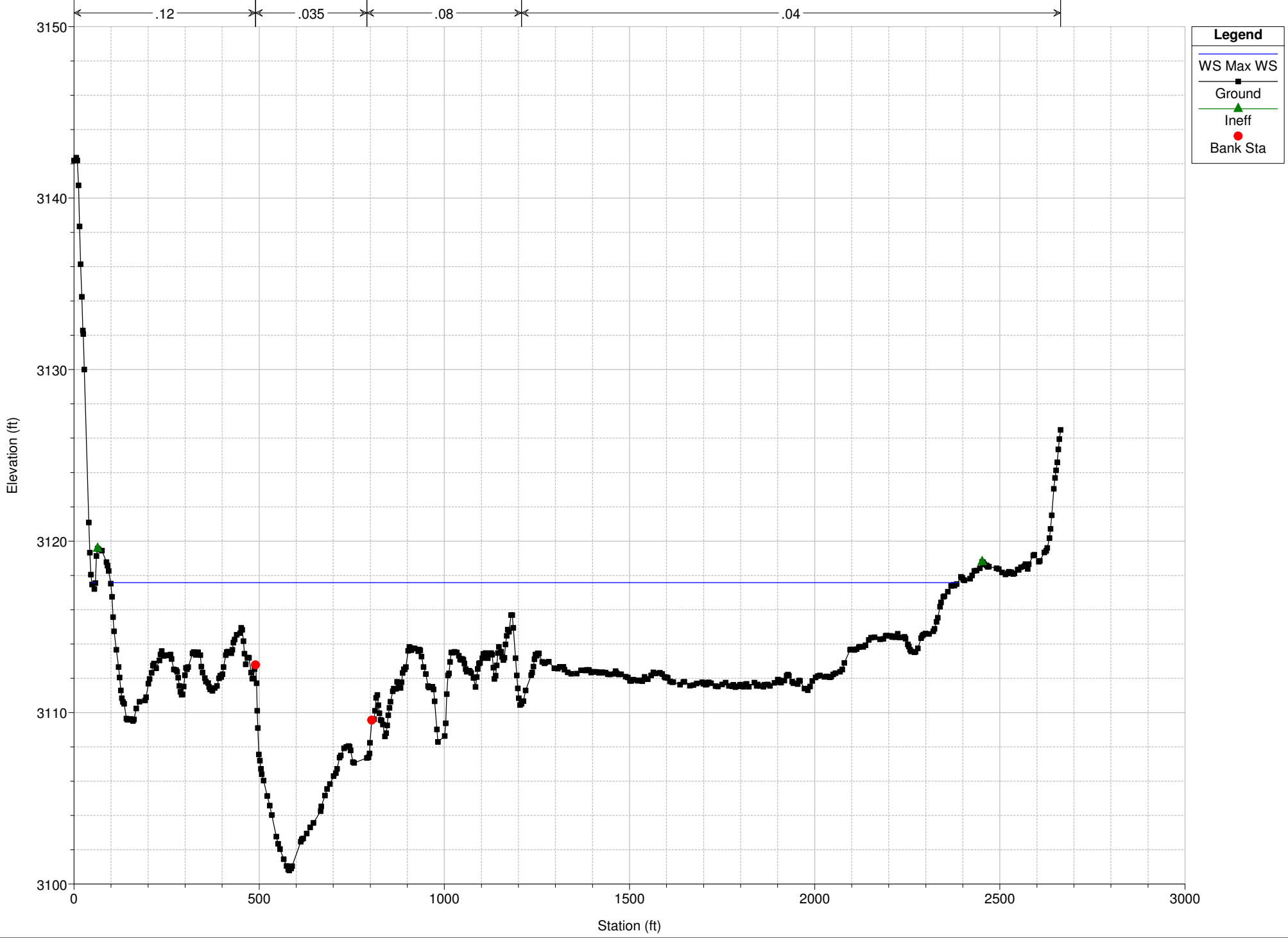
- WS Max WS
- Ground
- Ineff
- Bank Sta



Legend

- WS Max WS
- Ground
- Ineff
- Bank Sta



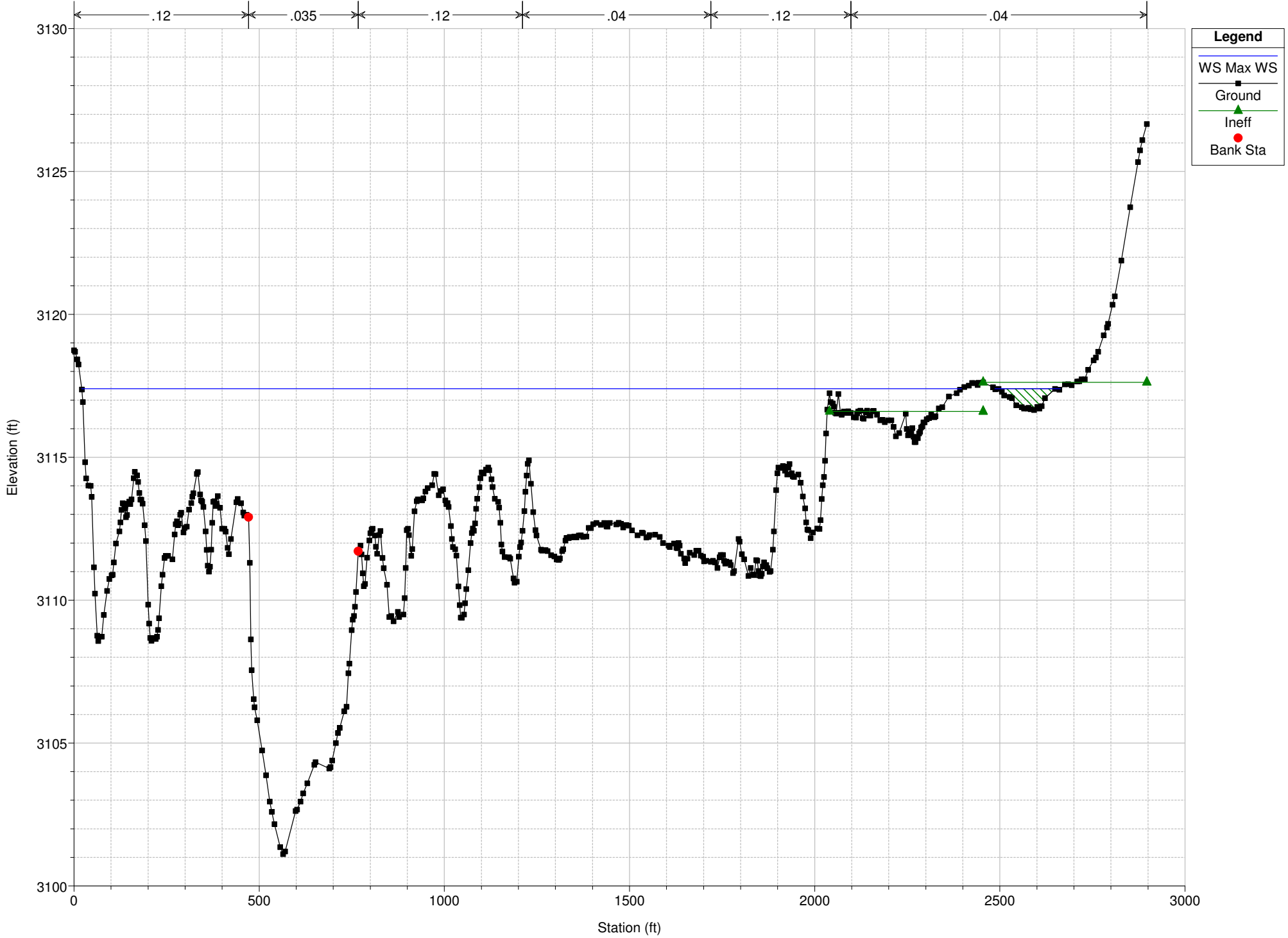


Legend

- WS Max WS
- Ground
- Ineff
- Bank Sta

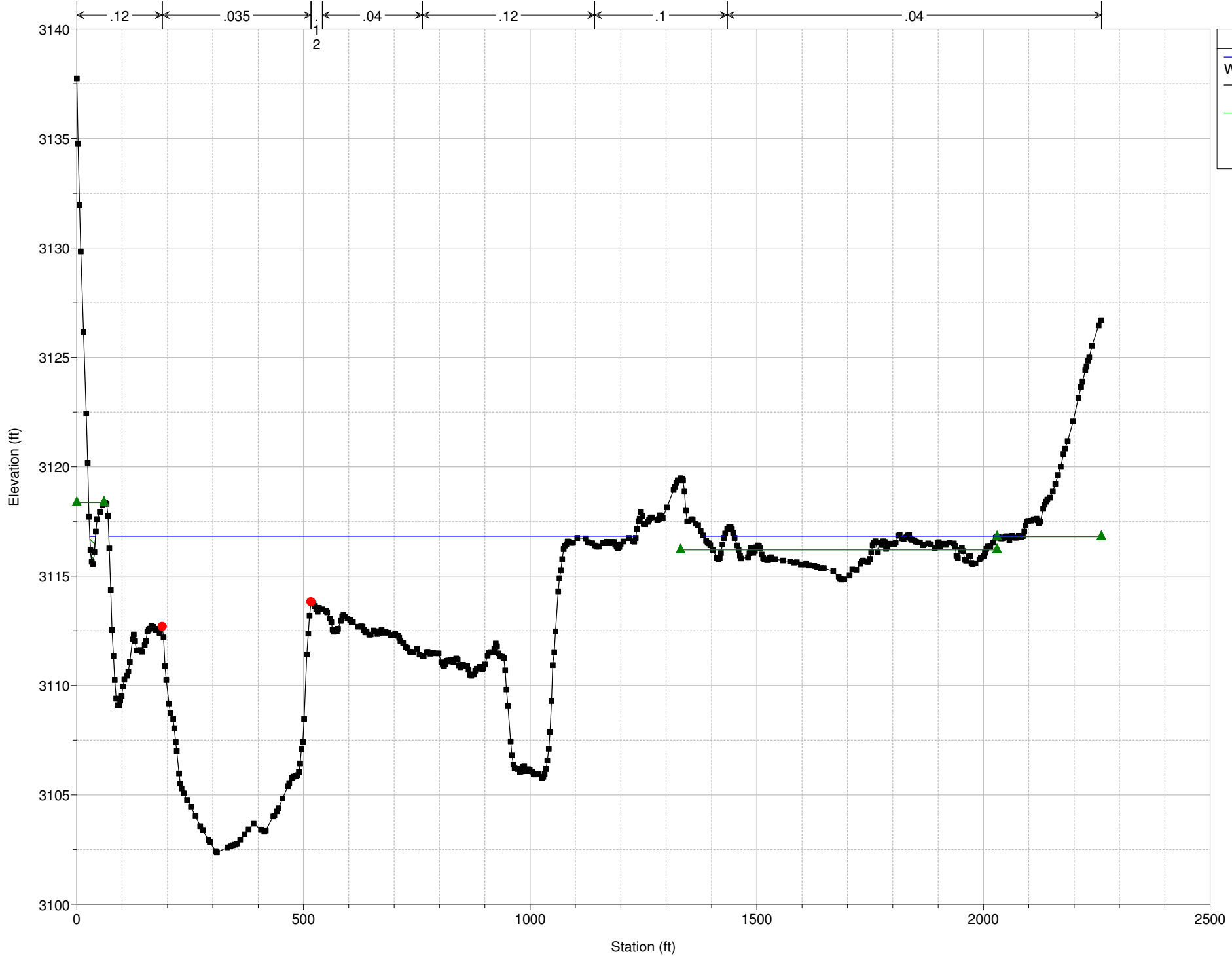
SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

RS = 7262



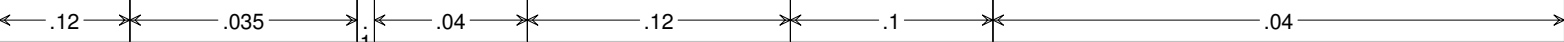
SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

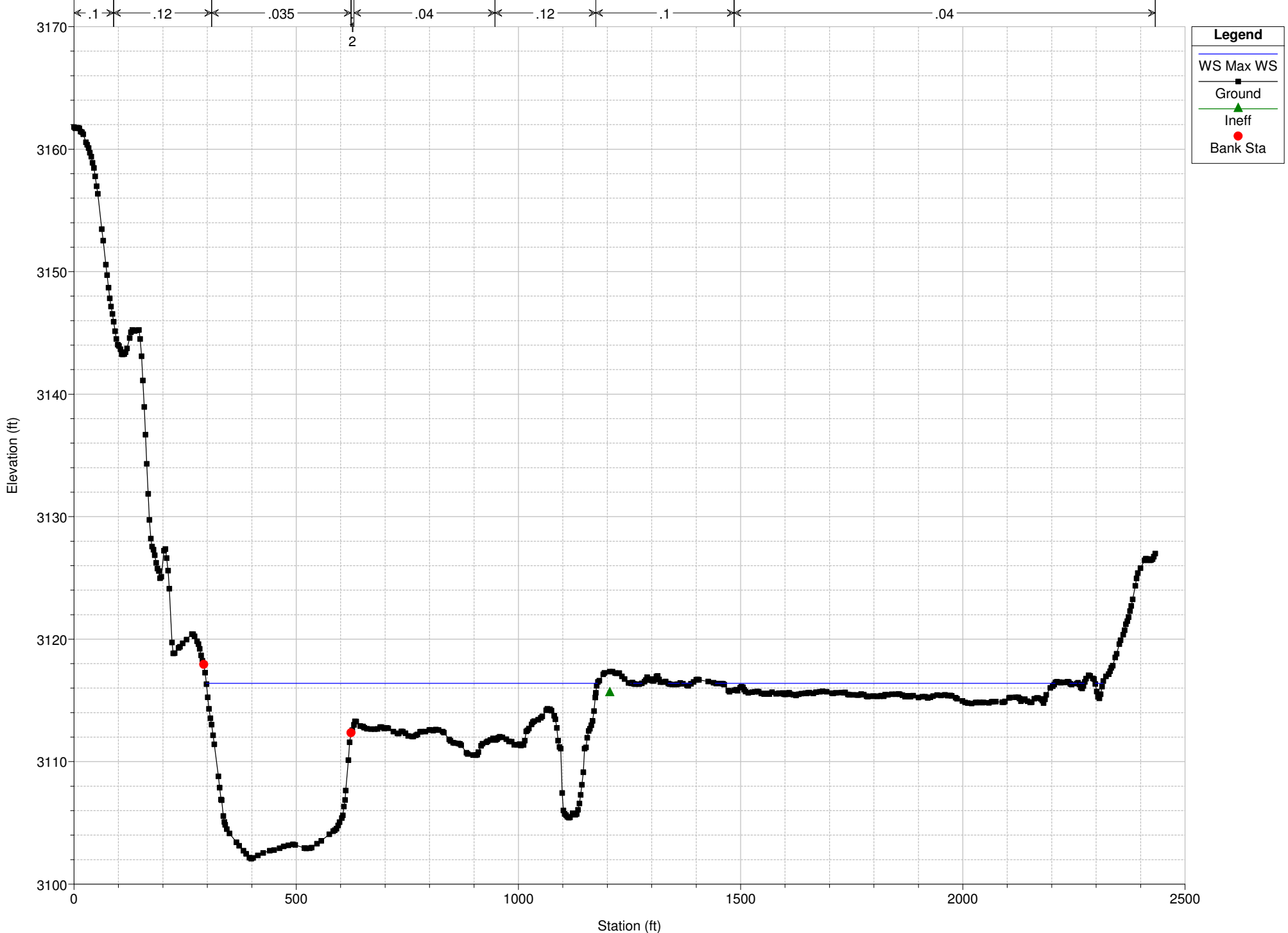
RS = 6550



Legend

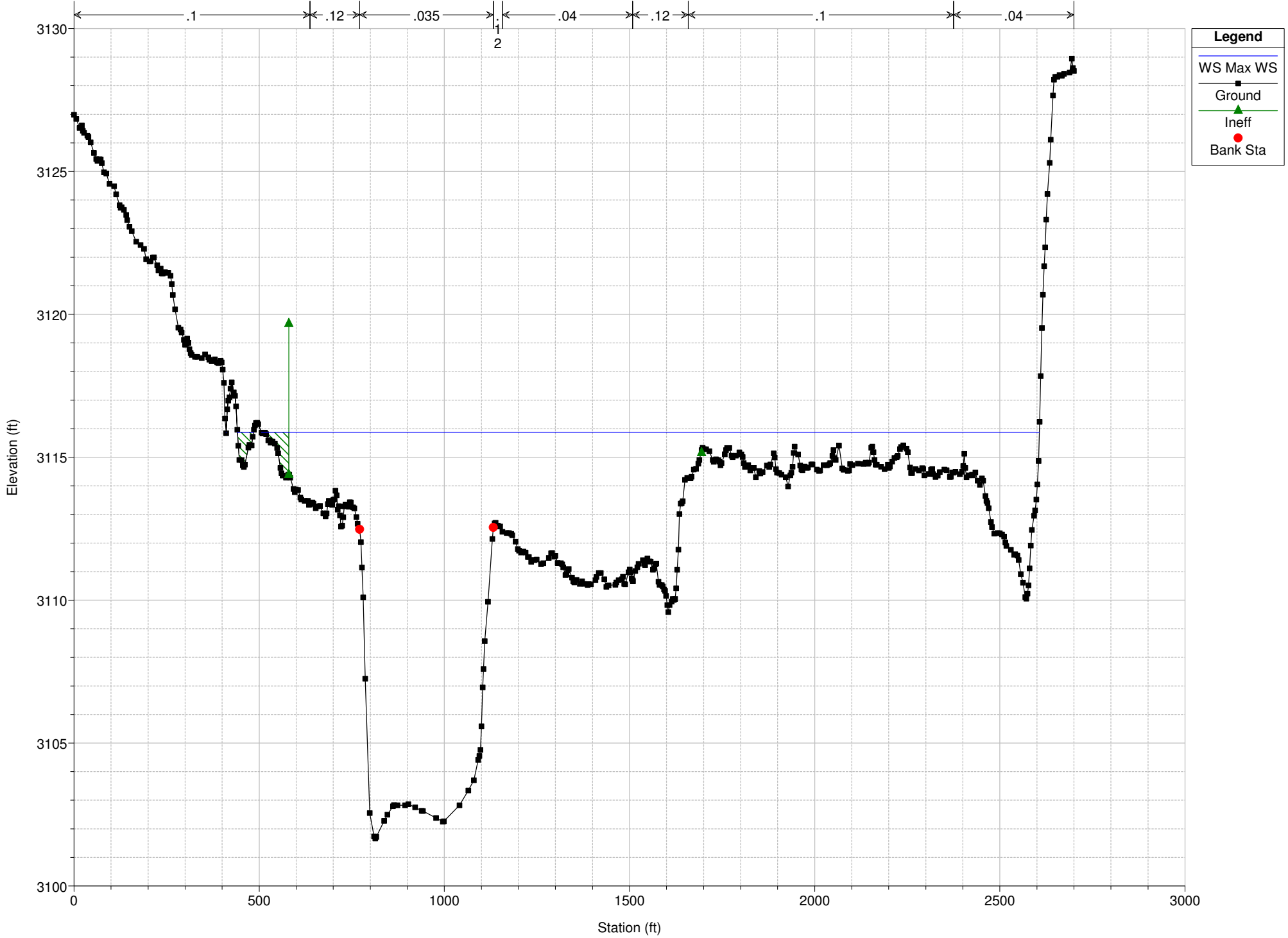
- WS Max WS
- Ground
- Ineff
- Bank Sta





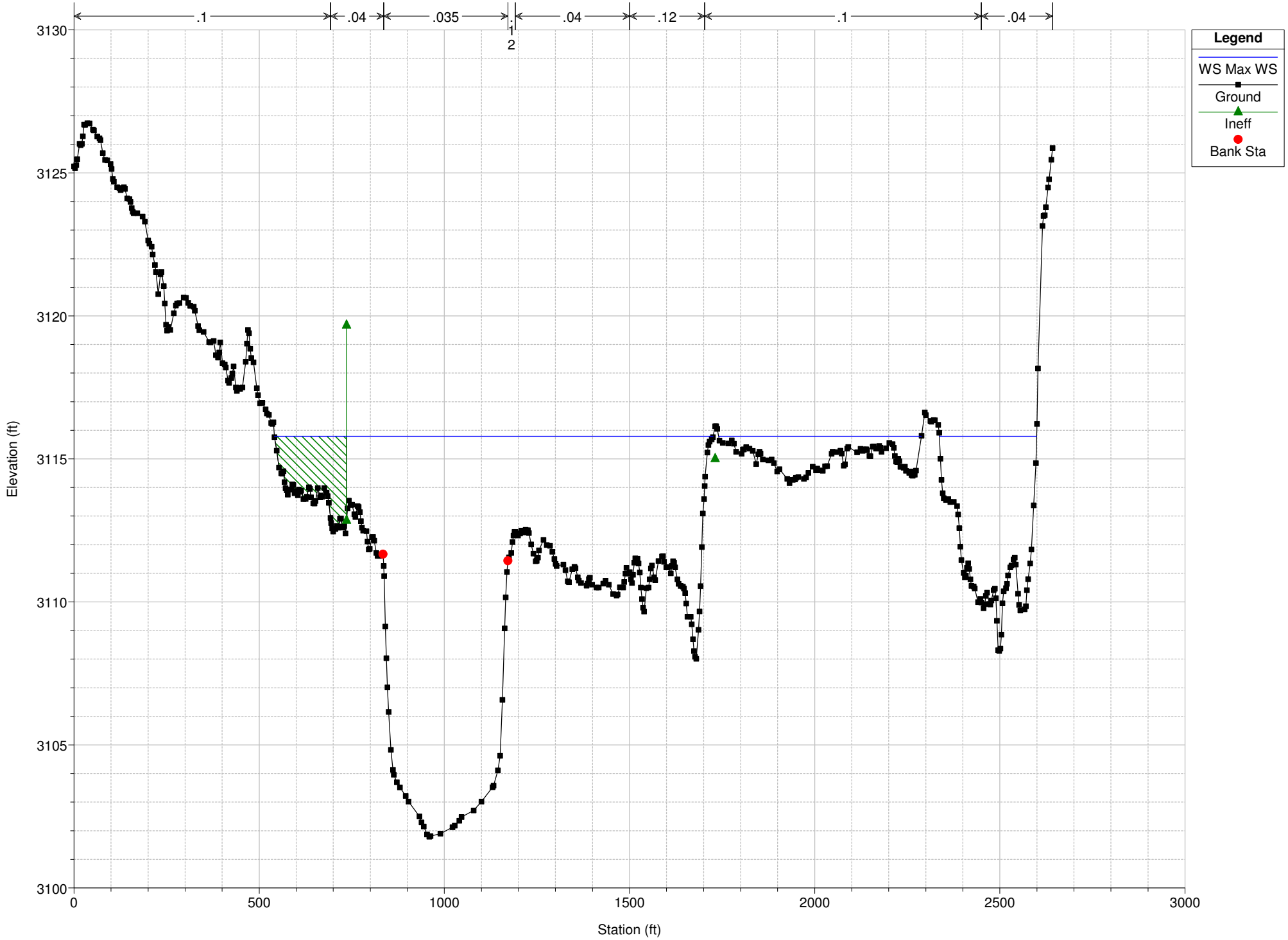
SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

RS = 5385



SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

RS = 5230

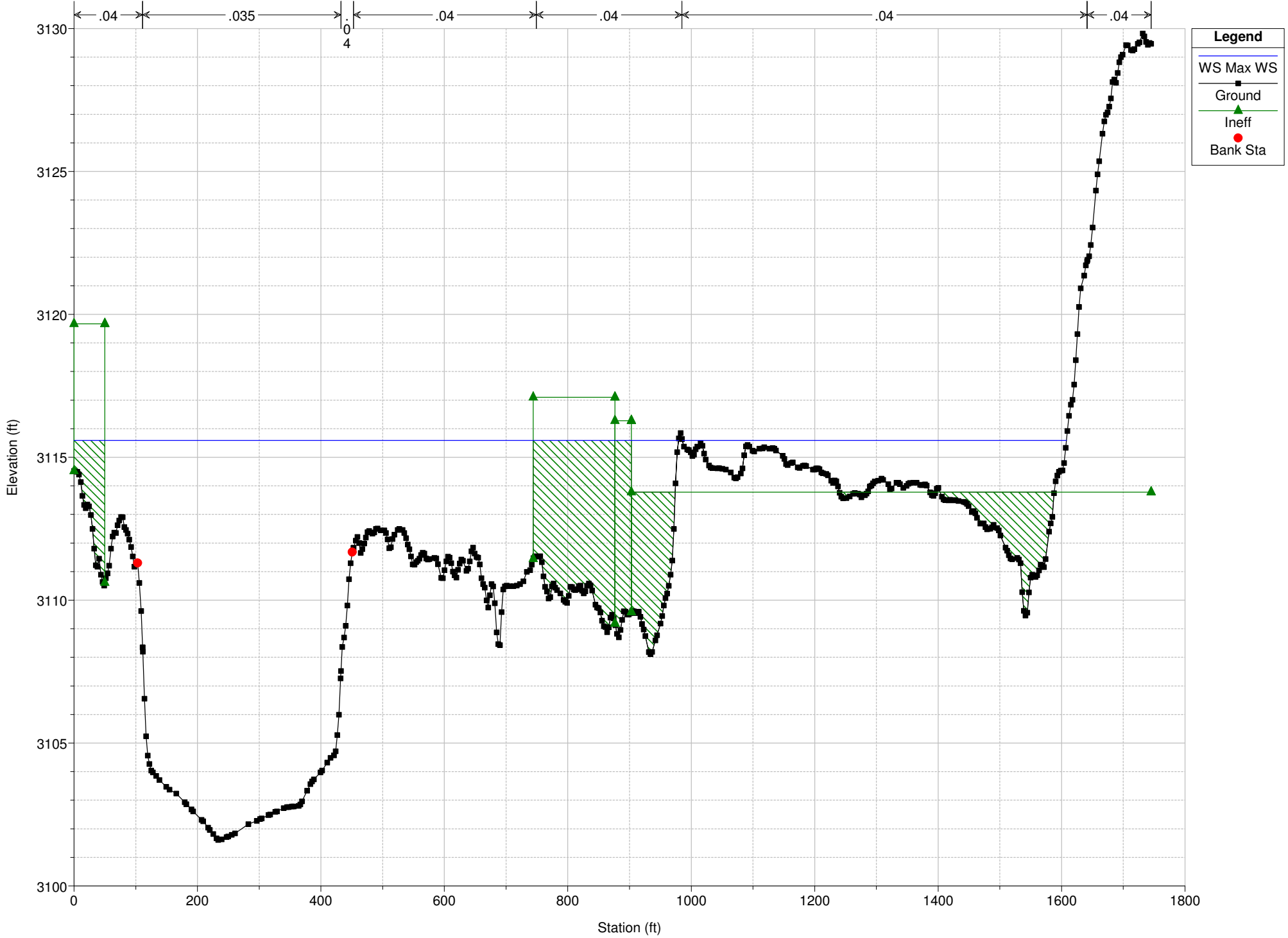


Legend

- WS Max WS
- Ground
- Ineff
- Bank Sta

SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

RS = 5125

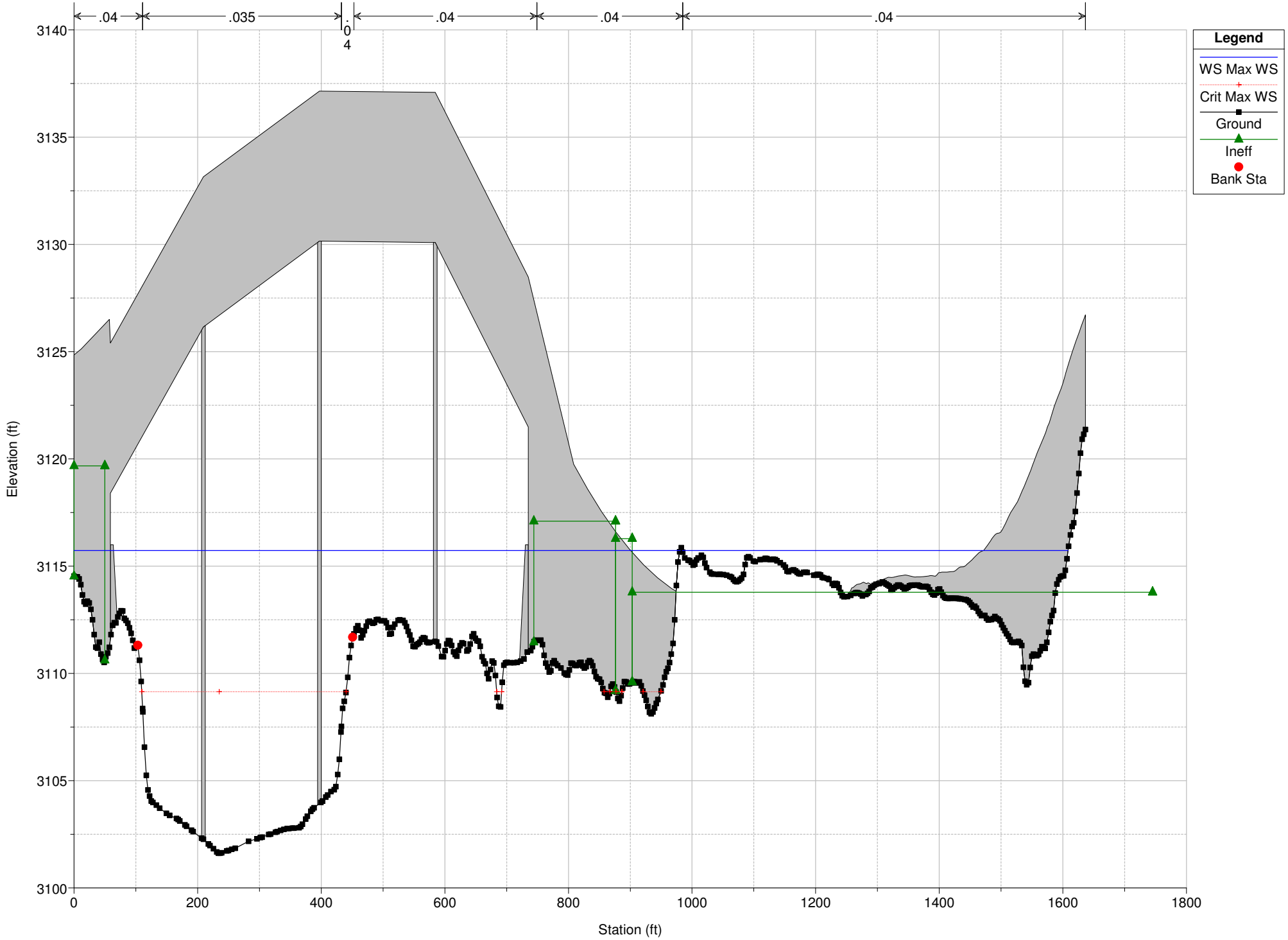


Legend

- WS Max WS
- Ground
- Ineff
- Bank Sta

SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

RS = 5100 MO

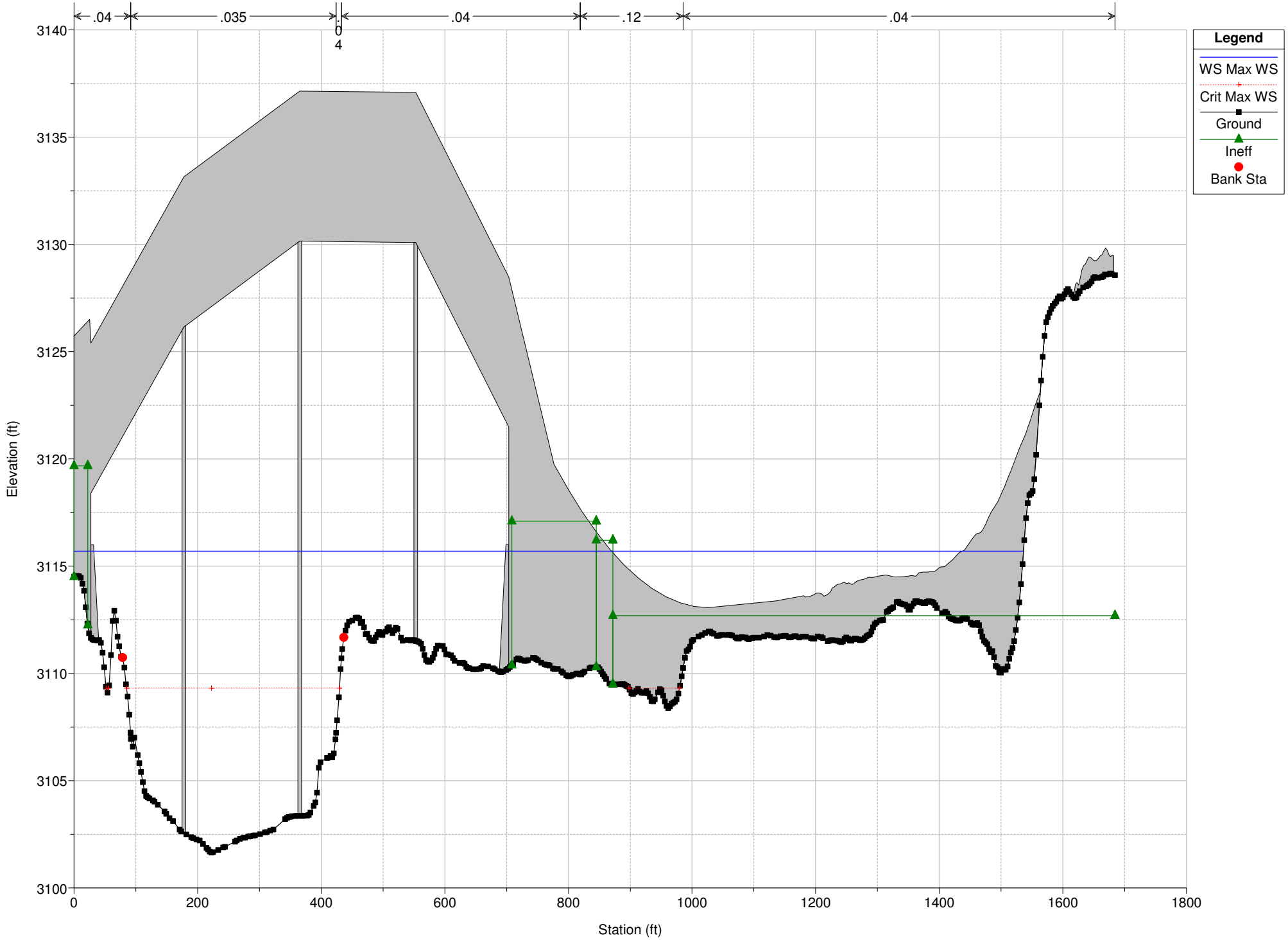


Legend

- WS Max WS
- Crit Max WS
- Ground
- Ineff
- Bank Sta

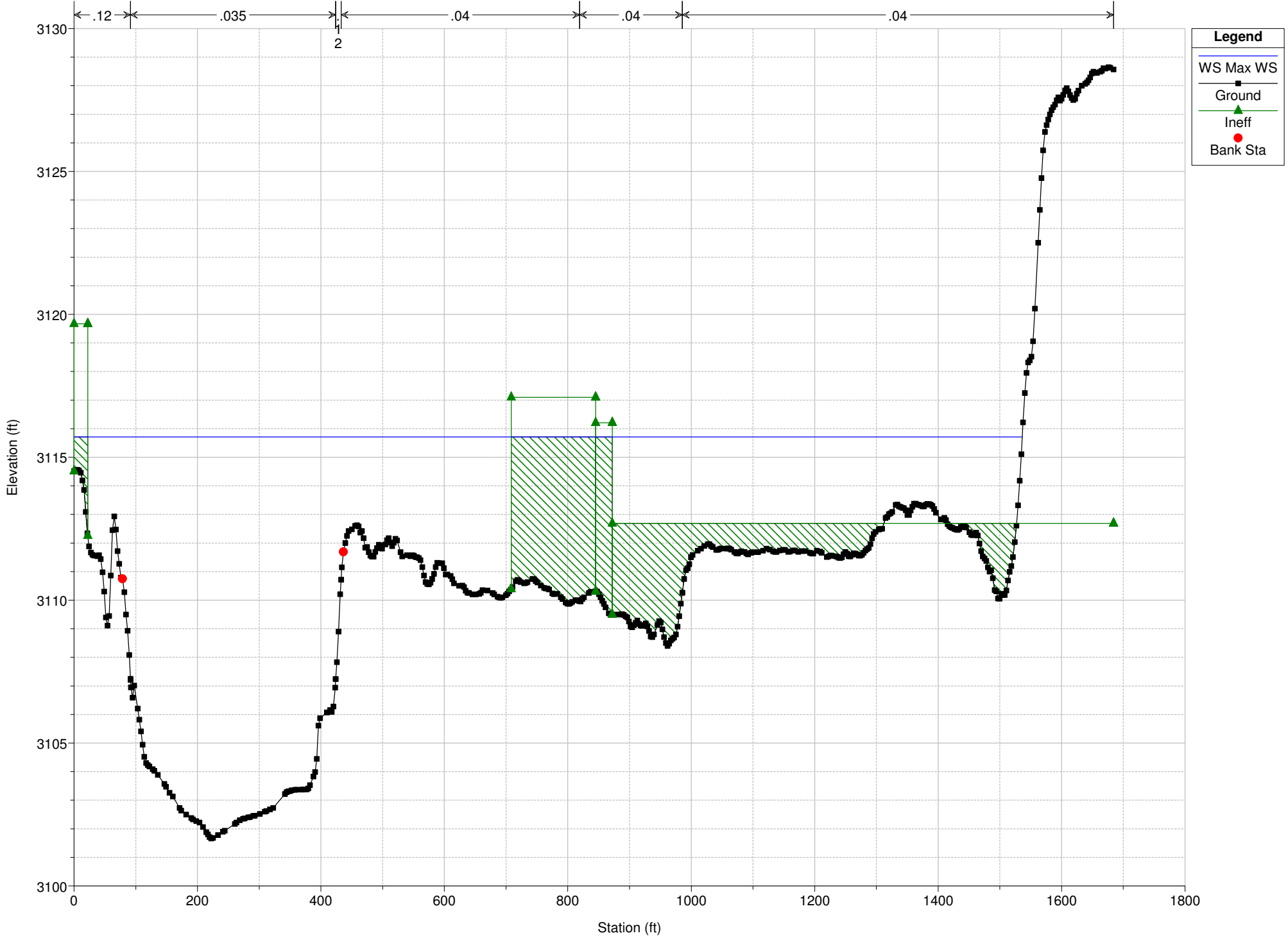
SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

RS = 5100 MO



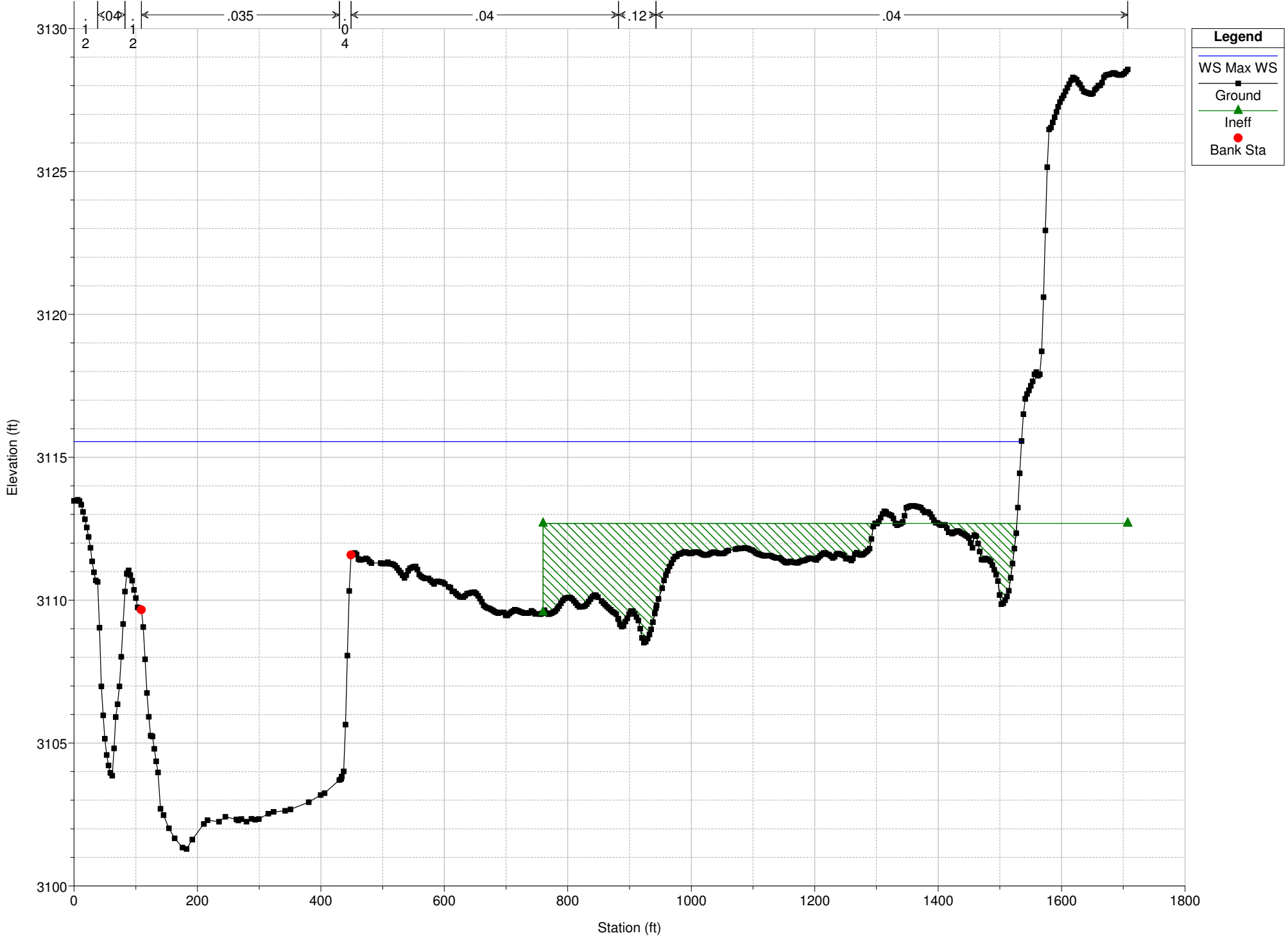
SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

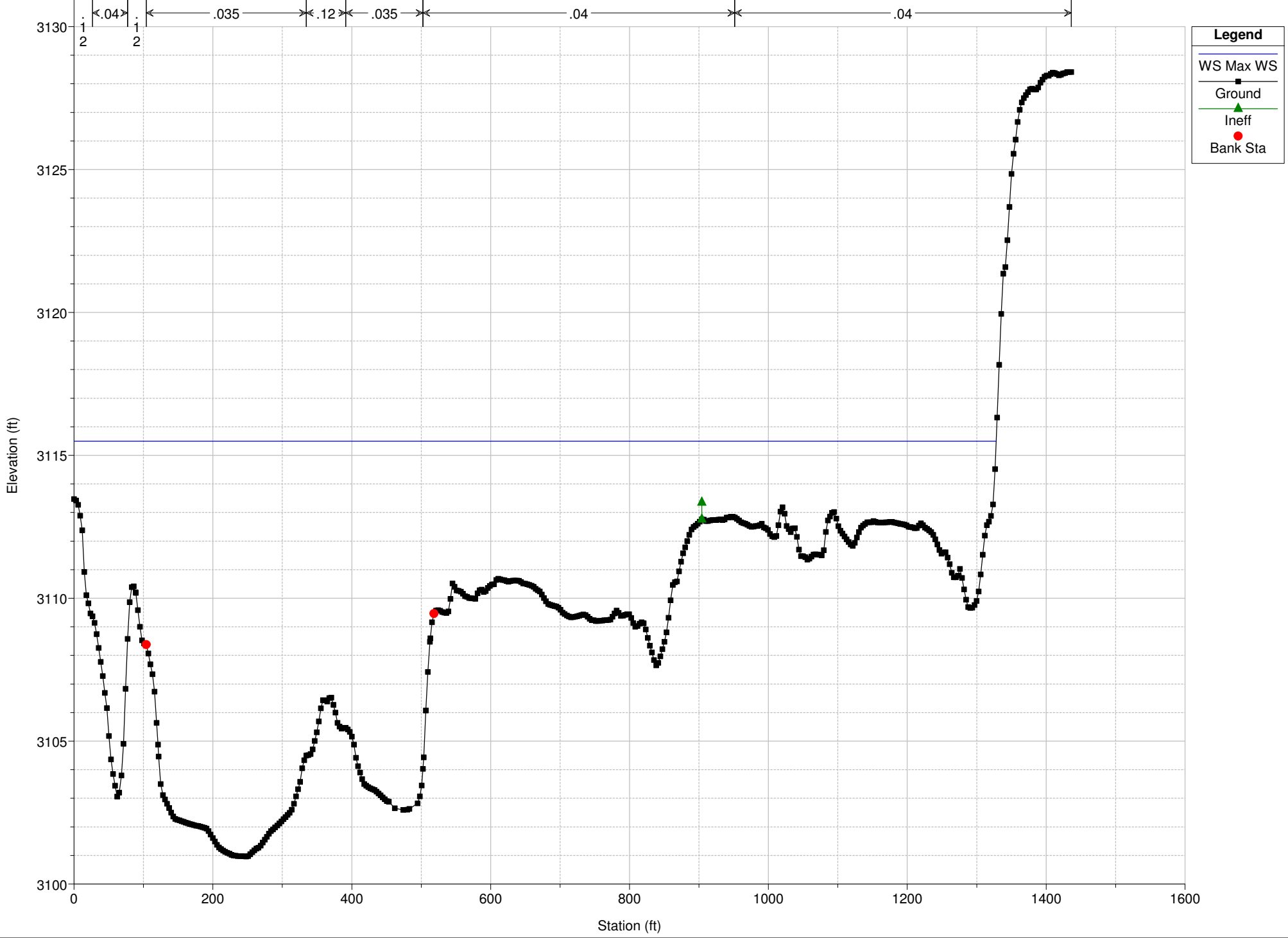
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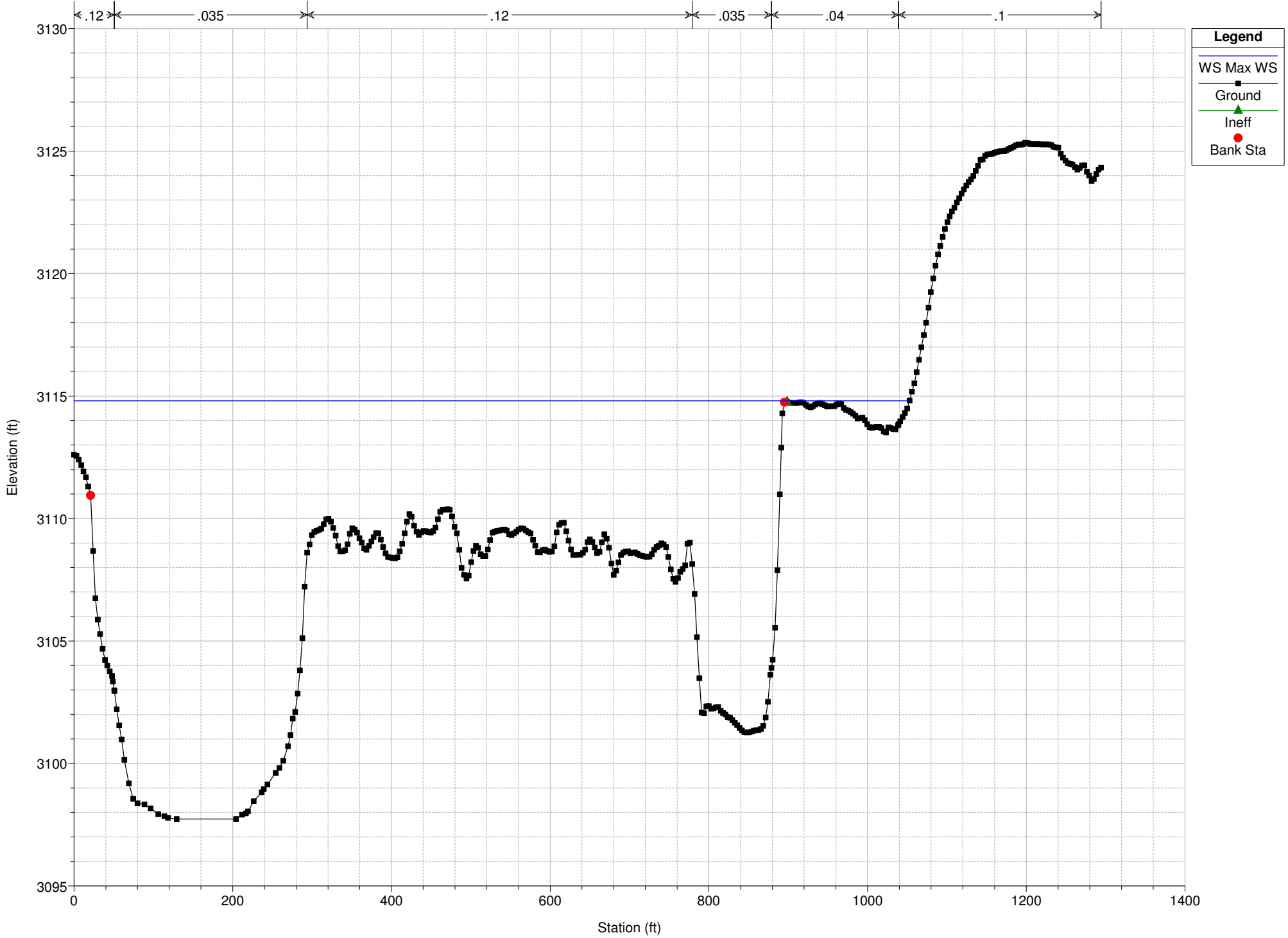


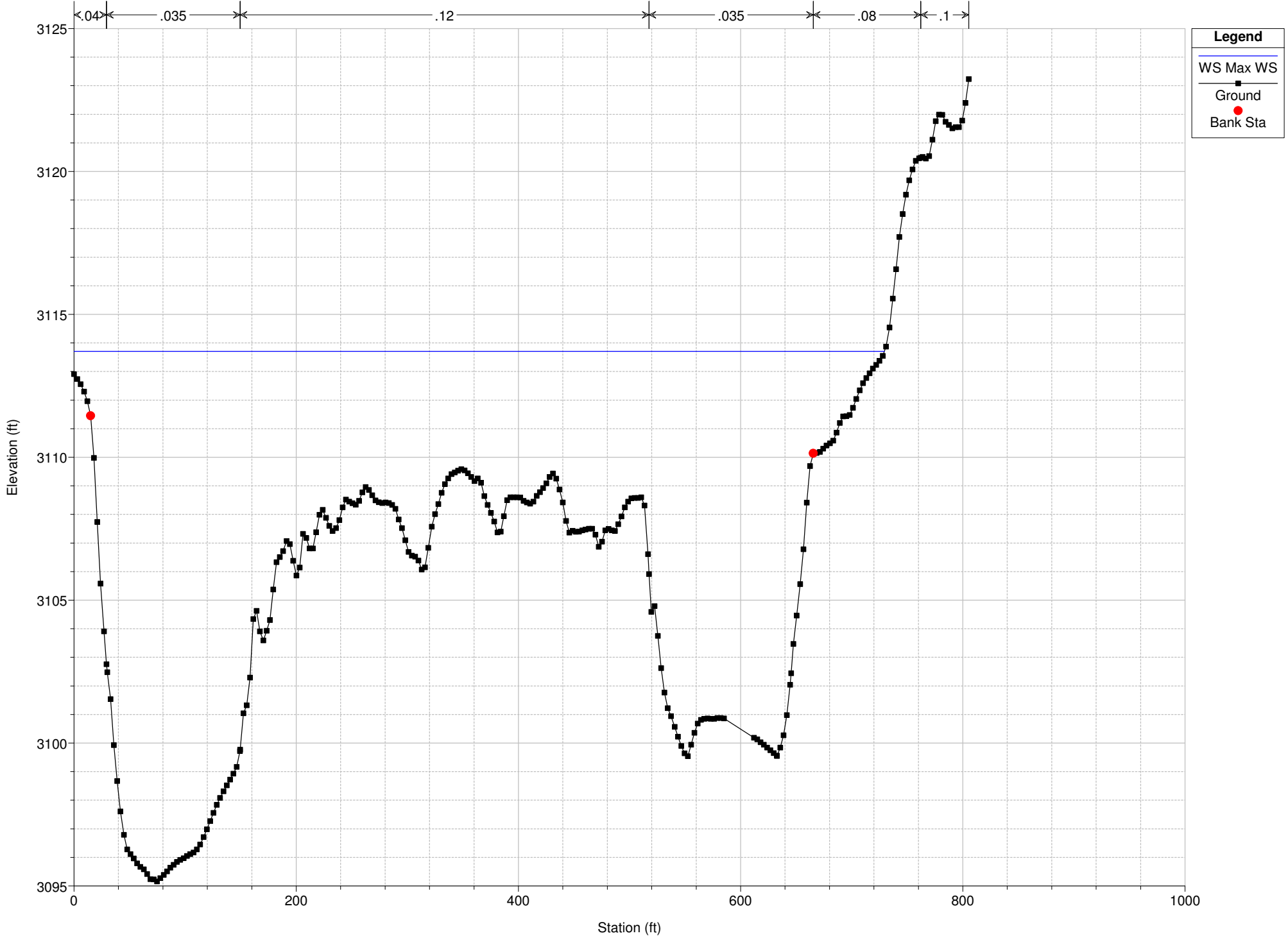
SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

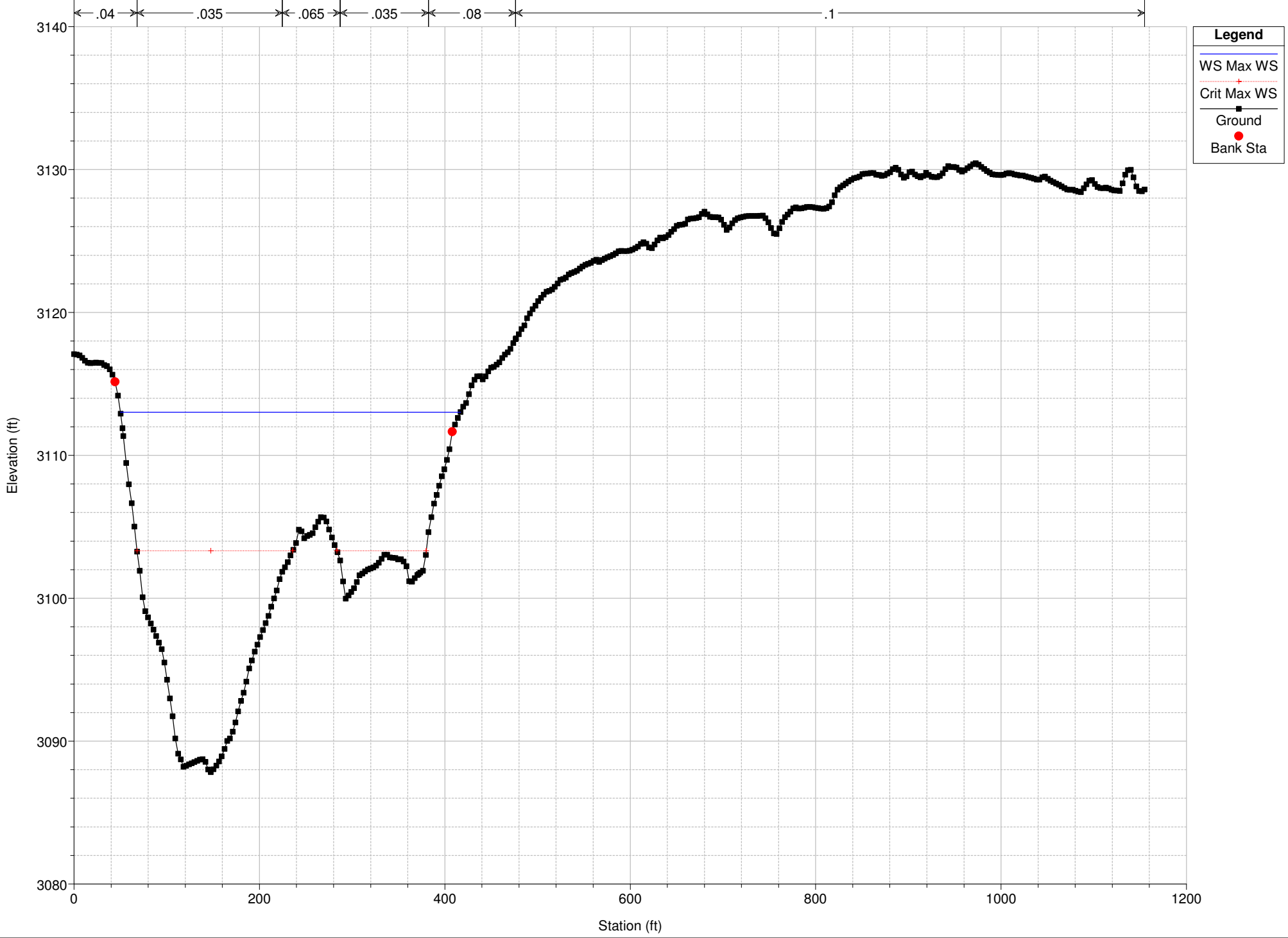
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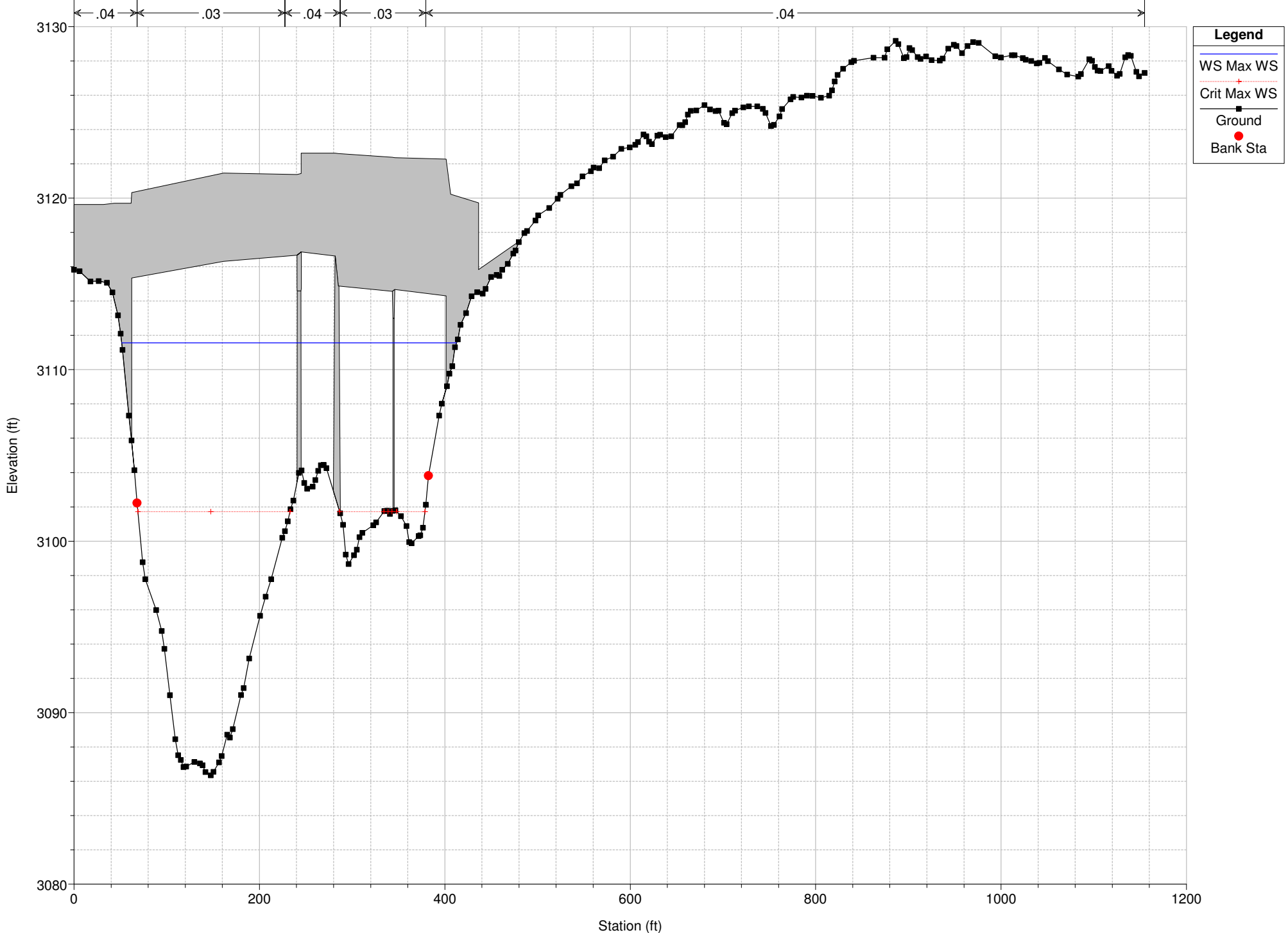










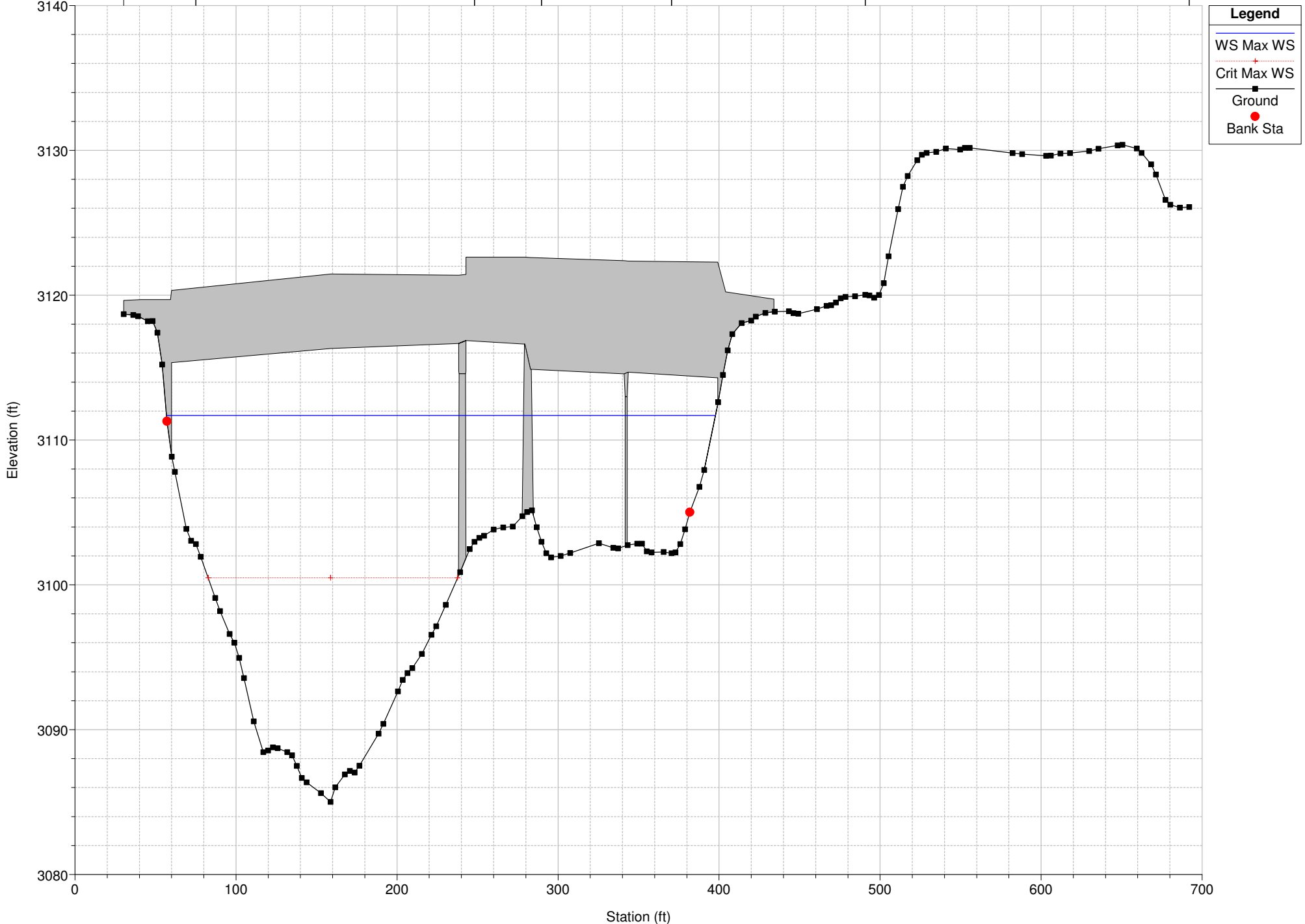
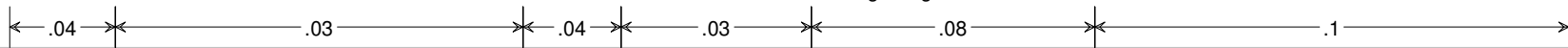


Legend

- WS Max WS
- Crit Max WS
- Ground
- Bank Sta

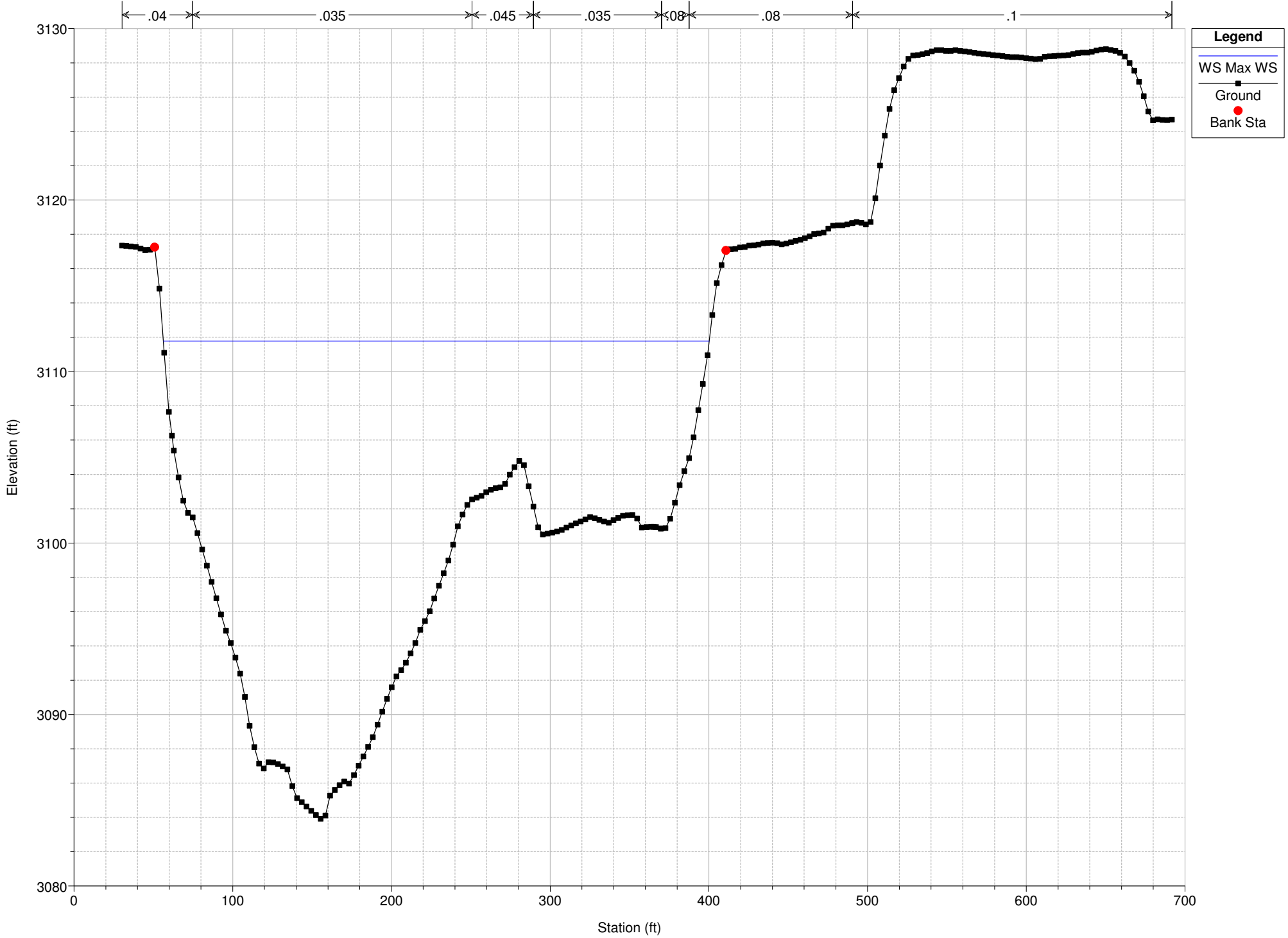
SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

RS = 2890 BR Existing Bridge

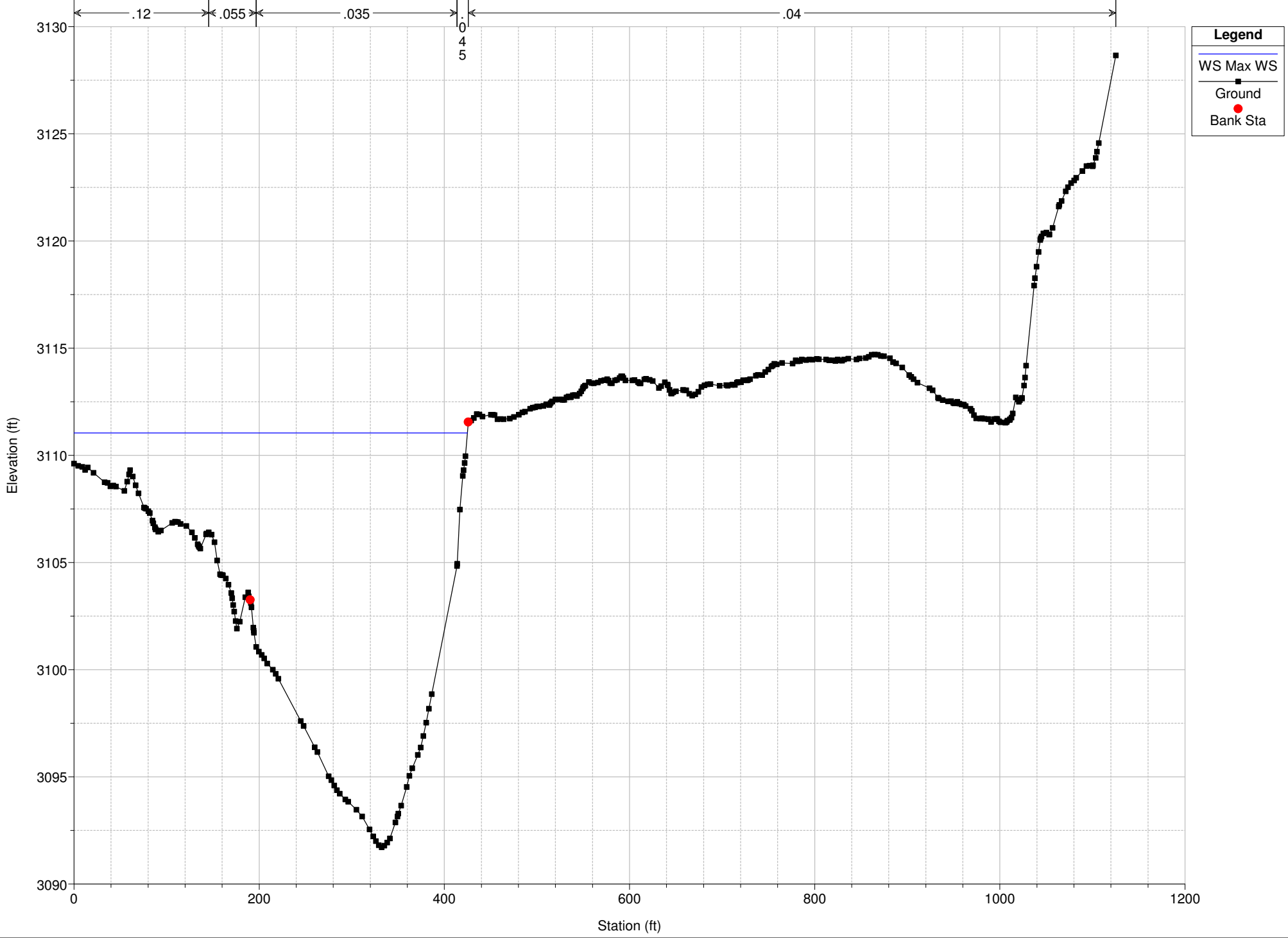


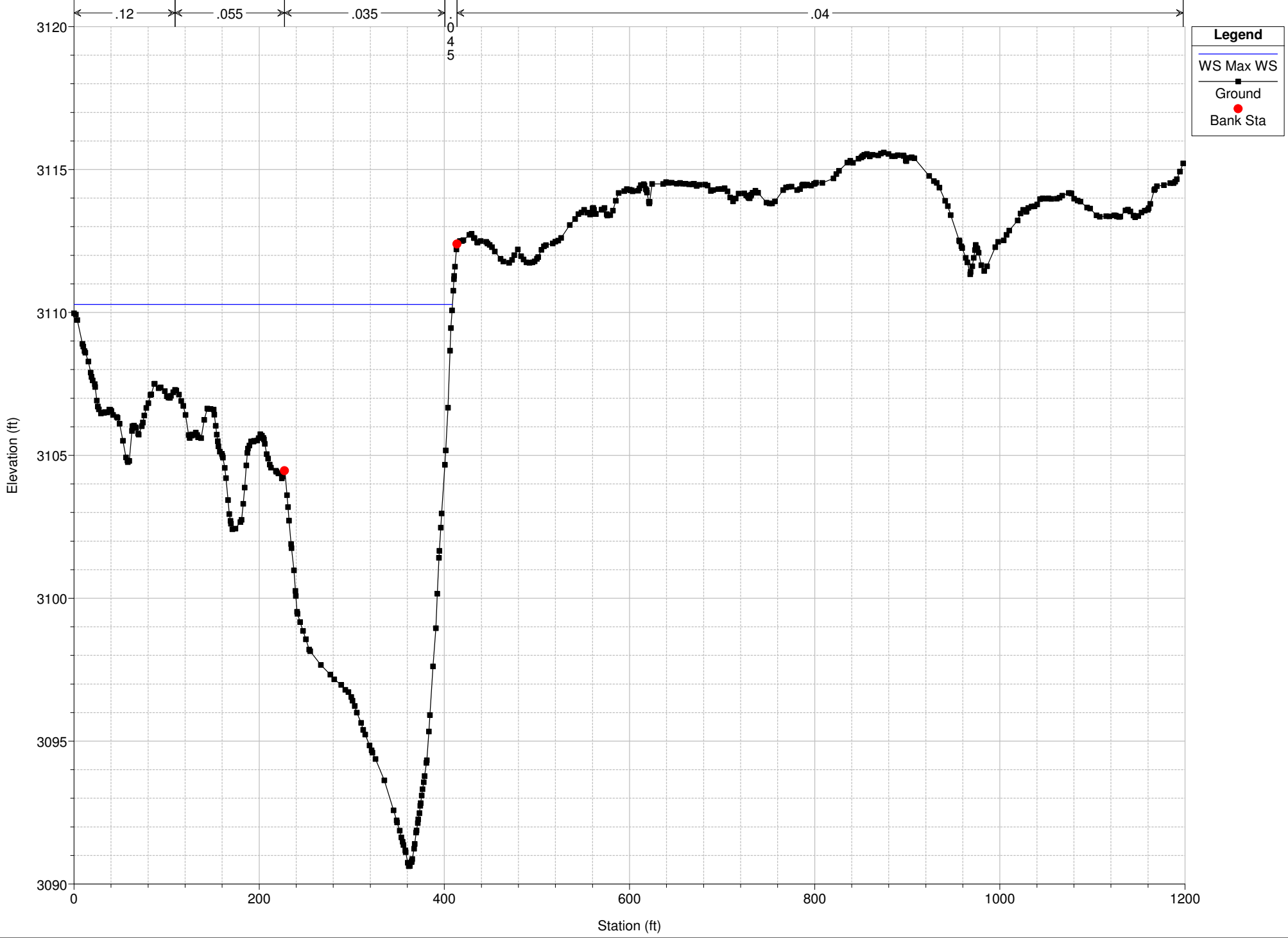
SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

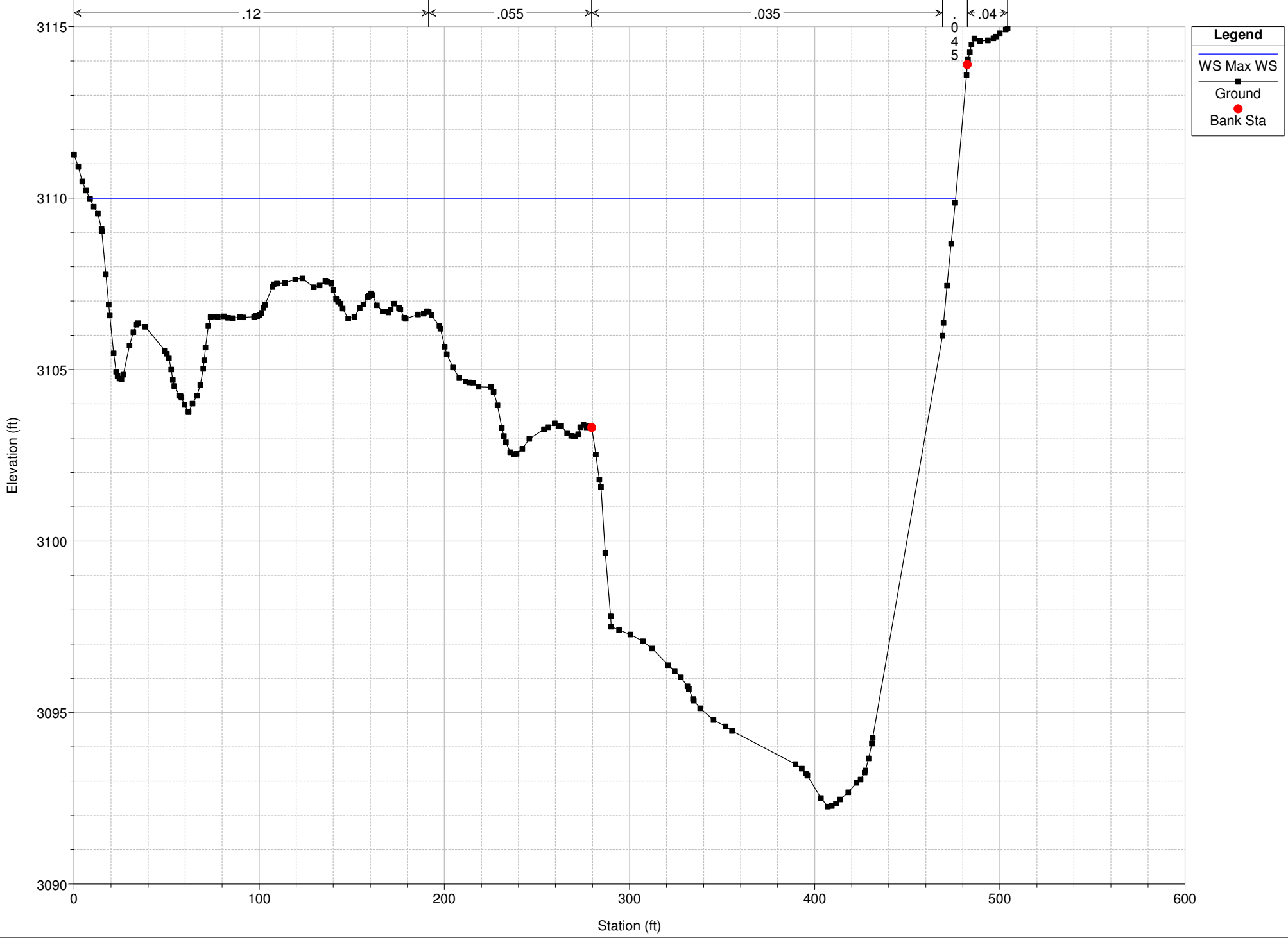
RS = 2865



SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016
RS = 2244





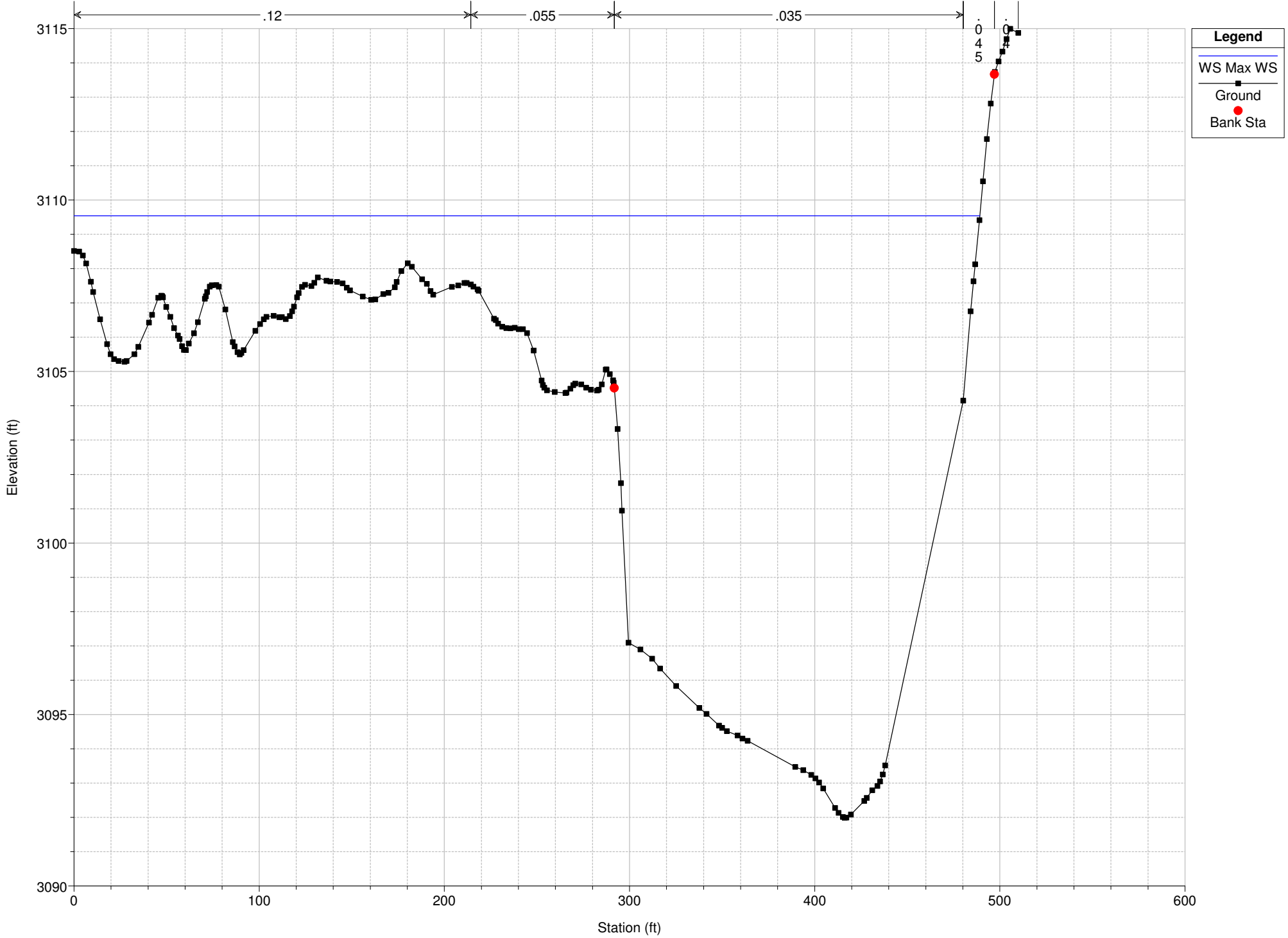


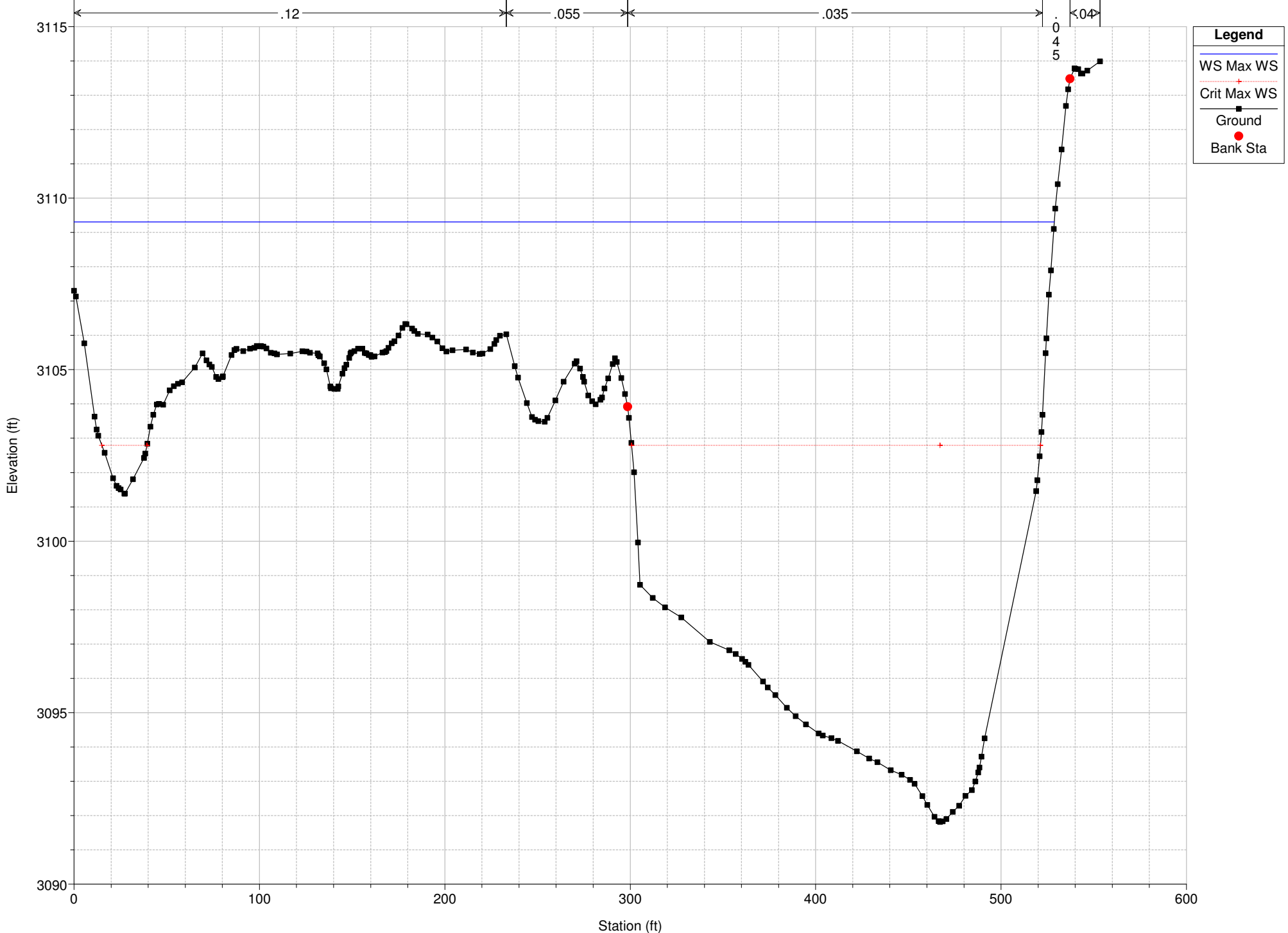
Legend

- WS Max WS
- Ground
- Bank Sta

SouthAveBridge Plan: PropAlt1B_Interim100yr 7/15/2016

RS = 1229





Appendix K – Scour and Abutment Protection Calculations

Project Name: South Ave Bridge - Alternative 1A

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure Location: Missoula Co., MT

Determine if flow conditions are Live-Bed, or Clear Water

$$V_{cDx} = K_{u1} * y_1^{1/6} * D_x^{1/3}$$

V_{cDx} = Critical velocity above which bed material of size D_x and smaller will be transported, (m/s, ft/s)

V_a = Average flow velocity in upstream section (m/s, ft/s)

y_1 = Average depth of flow upstream of the bridge, m (ft)

D_x = Particle size in a mixture of which X percent are smaller, m (ft)

K_{u1} = 6.19 SI units / 11.17 English units

Live Bed Contraction Scour

$$(y_2 / y_1) = (Q_2 / Q_1)^{(6/7)} * (W_1 / W_2)^{k_1}$$

y_0 = Average existing depth in the contracted section, ft (m)

y_1 = Average depth in the upstream main channel, m (ft)

y_2 = Average equilibrium depth in the contracted section after contraction scour, ft (m)

Q_1 = Flow in the upstream channel transporting sediment, m³/s (ft³/s)

Q_2 = Flow in the contracted channel, m³/s (ft³/s)

W_1 = Bottom width of the upstream main channel that is transporting bed material, m (ft)

W_2 = Bottom width of the main channel in the contracted section less pier width(s), m (ft)

k_1 = Exponent determined below

V_s / ω	k_1	Mode of Bed Material Transport
<0.50	0.59	Mostly contact bed material discharge
0.50 to 2.0	0.64	Some suspended bed material discharge
>2.0	0.69	Mostly suspended bed material discharge

$V_s = (\tau_o/\rho)^{1/2} = g * y_1 * S_f^{1/2}$, shear velocity in the upstream section, m/s (ft/s)

ω = Fall velocity of bed material based on the D_{50} , (m/s, ft/s) (From Figure 1)

g = Acceleration of gravity (9.81 m/s²) (32.2 ft/s²)

S_f = Slope of energy grade line of main channel, m/m (ft/ft)

ρ = Density of water (1000 kg/m³) (1.94 slugs/ft³)

γ = Unit weight of water (9.8 kN/m³, 62.4 lbf/ft³)

Clear Water Contraction Scour

$$y_2 = [(K_{U2} * Q_2) / (D_m^{2/3} * W_2)]^{3/7}$$

y_2 = Average equilibrium depth in the contracted section after contraction scour, ft (m)

Q_2 = Discharge through the bridge or on the set-back overbank area at the bridge associated with the width W , ft³/s (m³/s)

D_m = Diameter of the smallest nontransportable particle in the bed material (1.25 * D_{50}) in the contracted section, ft (m)

W_2 = Bottom width of the contracted section less pier widths, ft (m)

y_0 = Average existing depth in the contracted section, ft (m)

K_{U2} = 0.0077 English units / 0.025 SI units

$$y_s = y_2 - y_0 \quad \text{Average contraction scour depth}$$

Hydraulic Design Flood:**100 year RI**

$Q_D =$	31800 cfs
$V_a =$	6.55 ft/s
$y_0 =$	11.97 ft
$y_4 =$	11.82 ft
$Q_1 =$	25174.5 cfs
$Q_2 =$	26552.67 cfs
$W_1 =$	325.3 ft
$W_2 =$	341.73 ft
$\omega =$	10.50 ft/s
$S_f =$	0.000853 ft
$D_{50} =$	0.1837 ft
$K_{u1} =$	11.17
$V_{cD50} =$	9.58 ft/s
$D_{95} =$	0.361 ft
$V_{cD95} =$	12.00 ft/s

ClearWaterConditions**Live Bed Contraction Scour****100 year RI**

$y_2 =$	12.0 ft
$k_1 =$	0.59
$V_s =$	0.57 ft/s
$g =$	32.2 ft
$y_s =$	0.0 ft

Clear Water Contraction Scour**100 year RI**

$y_2 =$	7.9 ft
$D_m =$	0.2297 ft
$K_{U2} =$	0.0077
$y_s =$	0.0 ft

Scour Design Flood:**200 year RI**

$Q_S =$	36000 cfs
$V_a =$	6.81 ft/s
$y_0 =$	12.35 ft
$y_4 =$	12.24 ft
$Q_1 =$	27240.25 cfs
$Q_2 =$	29179.38 cfs
$W_1 =$	326.77 ft
$W_2 =$	341.73 ft
$\omega =$	10.50 ft/s
$S_f =$	0.000926 ft
$D_{50} =$	0.1837 ft
$K_{u1} =$	11.17
$V_{cD50} =$	9.64 ft/s
$D_{95} =$	0.361 ft
$V_{cD95} =$	12.07 ft/s

ClearWaterConditions**Live Bed Contraction Scour****200 year RI**

$y_2 =$	12.6 ft
$k_1 =$	0.59
$V_s =$	0.60 ft/s
$g =$	32.2 ft
$y_s =$	0.3 ft

Clear Water Contraction Scour**200 year RI**

$y_2 =$	8.6 ft
$D_m =$	0.2297 ft
$K_{U2} =$	0.0077
$y_s =$	0.0 ft

Scour Check Flood:**500 year RI**

$Q_C =$	42000 cfs
$V_a =$	7.11 ft/s
$y_0 =$	12.83 ft
$y_4 =$	12.76 ft
$Q_1 =$	29835.28 cfs
$Q_2 =$	32916.07 cfs
$W_1 =$	328.81 ft
$W_2 =$	341.73 ft
$\omega =$	10.50 ft/s
$S_f =$	0.001040 ft
$D_{50} =$	0.1837 ft
$K_{u1} =$	11.17
$V_{cD50} =$	9.71 ft/s
$D_{95} =$	0.361 ft
$V_{cD95} =$	12.16 ft/s

ClearWaterConditions**Live Bed Contraction Scour****500 year RI**

$y_2 =$	13.6 ft
$k_1 =$	0.59
$V_s =$	0.65 ft/s
$g =$	32.2 ft
$y_s =$	0.7 ft

Clear Water Contraction Scour**500 year RI**

$y_2 =$	9.5 ft
$D_m =$	0.2297 ft
$K_{U2} =$	0.0077
$y_s =$	0.0 ft

Project Name: South Ave Bridge - Alternative 1A

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure Location: Missoula Co., MT

Local Pier Scour Equation HEC-18 5th Edition

$$(y_s / y_1) = 2.0 * K_1 * K_2 * K_3 * K_4 * (a / y_1)^{0.65} * Fr^{0.43}$$

y_s = Scour depth

y_1 = Flow depth directly upstream of pier

K_1 = Correction factor for shape of pier nose table 1

K_2 = Correction factor for angle of attack of flow = $(\cos\theta + (L/a) * \sin\theta)^{0.65}$

K_3 = Correction factor for bed condition table 2

a = Pier width

L = Length of pier

Fr = Froude number directly upstream of the pier = $V_1 / (g * y_1)^{0.5}$

V_1 = Mean velocity directly upstream of the pier

g = Acceleration of gravity (9.81 m/s²) (32.2 ft/s²)

θ = Skew angle of flow to pier in degrees

$V_R = (V_1 - V_{icD50}) / (V_{cD50} - V_{icD95}) > 0$

V_{icDx} = Approach velocity required to initiate scour at the pier for the grain size $D_x = 0.645 * (D_x / a)^{0.053} * V_{cDx}$ (ft/s, m/s)

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$y_1 = 13.85$ ft

$V_1 = 6.95$ ft/s

$K_1 = 1.0$

$K_2 = 1.0$

$K_3 = 1.1$

$a = 6.0$ ft

$L = 6.0$ ft

$\theta = 0.0$ degrees

$g = 32.2$ ft/s²

$Fr = 0.33$

$y_s = 11.0$ ft

$V_{cD50} = 9.58$ ft/s

$V_{cD95} = 12.00$ ft/s

$V_{icD50} = 5.1$ ft/s

$V_{icD95} = 6.7$ ft/s

$V_R = 0.62$ ft/s

$L / a = 1.0$

$0.4 * V_R^{0.15} = 0.37$

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$y_1 = 14.24$ ft

$V_1 = 7.38$ ft/s

$K_1 = 1.0$

$K_2 = 1.0$

$K_3 = 1.1$

$a = 6.0$ ft

$L = 6.0$ ft

$\theta = 0.0$ degrees

$g = 32.2$ ft/s²

$Fr = 0.34$

$y_s = 11.3$ ft

$V_{cD50} = 9.64$ ft/s

$V_{cD95} = 12.07$ ft/s

$V_{icD50} = 5.2$ ft/s

$V_{icD95} = 6.7$ ft/s

$V_R = 0.75$ ft/s

$L / a = 1.0$

$0.4 * V_R^{0.15} = 0.38$

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$y_1 = 14.71$ ft

$V_1 = 8.01$ ft/s

$K_1 = 1.0$

$K_2 = 1.0$

$K_3 = 1.1$

$a = 6.0$ ft

$L = 6.0$ ft

$\theta = 0.0$ degrees

$g = 32.2$ ft/s²

$Fr = 0.37$

$y_s = 11.8$ ft

$V_{cD50} = 9.71$ ft/s

$V_{cD95} = 12.16$ ft/s

$V_{icD50} = 5.2$ ft/s

$V_{icD95} = 6.8$ ft/s

$V_R = 0.95$ ft/s

$L / a = 1.0$

$0.4 * V_R^{0.15} = 0.40$

Project Name: South Ave Bridge - Alternative 1A

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure Location: Missoula Co., MT

Local Pier Scour HEC-18 Fifth Edition Coarse Bed

$$y_s = 1.1 * K_1 * K_2 * a^{0.62} * y_1^{0.38} * \tanh[(H^2 / (1.97 * \sigma^{1.5})]$$

y_s = Scour depth

y_1 = Flow directly upstream of pier

K_1 = Correction factor for shape of pier nose table 1

K_2 = Correction factor for angel of attack of flow = $(\text{Cos}\theta + (L/a) * \text{Sin}\theta)^{0.65}$

a = Pier width

L = Length of pier

V_1 = Mean velocity directly upstream of the pier

θ = Skew angle of flow to pier

H = Densimetric particle Froude Number = $V_1 / [g * (S_g - 1) * D_{50}]^{0.5}$

S_g = Sediment specific Gravity

σ = Sediment gradation coefficient D_{84} / D_{50}

g = Acceleration of gravity (9.81 m/s²) (32.2 ft/s²)

Table 1	
Shape of Pier Nose	K_1
Square nose	1.1
Round nose	1
Circular cylinder	1
Group of cylinders	1
Sharp nose	0.9

Hydraulic Design Flood:

100 year RI

Q_D = 31800 cfs

y_1 = 13.85 ft

V_1 = 6.95 ft/s

K_1 = 1.0

K_2 = 1.0

a = 6.0 ft

L = 6.0 ft

θ = 0.0 degrees

S_g = 2.65

g = 32.2 ft/s²

H = 2.2 ft

y_s = 5.9 ft

σ = 2.2

L / a = 1.0

$\tanh[f(H)]$ = 0.65

Scour Design Flood:

200 year RI

Q_S = 36000 cfs

y_1 = 14.24 ft

V_1 = 7.38 ft/s

K_1 = 1.0

K_2 = 1.0

a = 6.0 ft

L = 6.0 ft

θ = 0.0 degrees

S_g = 2.65

g = 32.2 ft/s²

H = 2.4 ft

y_s = 6.4 ft

σ = 2.2

L / a = 1.0

$\tanh[f(H)]$ = 0.70

Scour Check Flood:

500 year RI

Q_C = 42000 cfs

y_1 = 14.71 ft

V_1 = 8.01 ft/s

K_1 = 1.0

K_2 = 1.0

a = 6.0 ft

L = 6.0 ft

θ = 0.0 degrees

S_g = 2.65

g = 32.2 ft/s²

H = 2.6 ft

y_s = 7.2 ft

σ = 2.2

L / a = 1.0

$\tanh[f(H)]$ = 0.77

Validity Note: Corse bed equation only valid if the following criteria are met.

Ok

- Clear-water flow conditions.

Ok

- Streambed $D_{50} > 20\text{mm}$

Ok

- Streambed gradation coefficient σ (D_{84}/D_{50}) > 1.5

Blue Cells require user input

Yellow cells values are based on system of units used.

Green cells are calculated values

Project Name: South Ave Bridge - Alternative 1A

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure No: N/A

Structure Location: Missoula Co., MT

Froehlich's Live-Bed Abutment Scour Equation

$$y_s = (2.27 * K_1 * K_2 * (L'/y_a)^{0.43} * Fr^{0.61} + 1) * y_a$$

K_1 = Coefficient for abutment shape Table 8.1

$$K_2 = (\theta / 90)^{0.13}$$

L_1 = Length of embankment projected normal to the flow m (ft)

Q_e = Flow obstructed by the abutment and approach embankment m³/sec (ft³/sec)

A_e = Flow Area of the approach cross-section obstructed by the embankment m² (ft²)

y_a = Average Depth of Flow in the floodplain m (ft)

$$V_e = Q_e / A_e$$

$$Fr = V_e / (g * y_a)^{0.5}$$

$$L' = L * \cos(\theta)$$

$$g = 32.2 \text{ ft/s}^2$$

θ = Orientation of Embankment Angle to Flow Degrees

Does the abutment point upstream? (Y or N)

$\theta < 90$ If Embankment points downstream

$\theta > 90$ If Embankment points upstream

Description	K_1
Vertical-Wall Abutment	1.00
Vertical-Wall Abutment with wing walls	0.82
Spill-Through Abutment	0.55

Blue Cells require user input

Yellow cells values are based on system of units used.

Green cells are calculated values

Project Name: South Ave Bridge - Alternative 1A

UPN: 6296

Project Station: 0

Stream: Bitterroot River

Structure No: N/A

Structure Location: Missoula Co., MT

LEFT ABUTMENT

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63.00$ ft

$Q_{el} = 240.48$ cfs

$A_{el} = 193.41$ ft²

$y_{al} = 3.07$ ft

$V_{el} = 1.24$ ft/s

$F_{rl} = 0.13$

$L'_1 = 63.00$ ft

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63.00$ ft

$Q_{el} = 300.17$ cfs

$A_{el} = 221.13$ ft²

$y_{al} = 3.51$ ft

$V_{el} = 1.36$ ft/s

$F_{rl} = 0.13$

$L'_1 = 63.00$ ft

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63.00$ ft

$Q_{el} = 394.75$ cfs

$A_{el} = 253.26$ ft²

$y_{al} = 4.02$ ft

$V_{el} = 1.56$ ft/s

$F_{rl} = 0.14$

$L'_1 = 63.00$ ft

Froehlich's Live-Bed Abutment Scour Equation

$y_{sL} = 7.02$ ft

Validity Check Left OK Use Froehlich

$y_{sL} = 7.83$ ft

Validity Check Left OK Use Froehlich

$y_{sL} = 8.89$ ft

Validity Check Left OK Use Froehlich

RIGHT ABUTMENT

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$K_1 = 1$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245.00$ ft

$Q_{er} = 5850.13$ cfs

$A_{er} = 752.15$ ft²

$y_{aR} = 3.07$ ft

$V_{er} = 7.78$ ft/s

$F_{rr} = 0.78$

$L'_r = 245.00$ ft

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$K_1 = 1$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245.00$ ft

$Q_{er} = 6823.24$ cfs

$A_{er} = 859.95$ ft²

$y_{aR} = 3.51$ ft

$V_{er} = 7.93$ ft/s

$F_{rr} = 0.75$

$L'_r = 245.00$ ft

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$K_1 = 1$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245.00$ ft

$Q_{er} = 8925.88$ cfs

$A_{er} = 984.90$ ft²

$y_{aR} = 4.02$ ft

$V_{er} = 9.06$ ft/s

$F_{rr} = 0.80$

$L'_r = 245.00$ ft

Froehlich's Live-Bed Abutment Scour Equation

$y_{sr} = 42.51$ ft

Validity Check Right Check Hire Eqn

$y_{sr} = 44.88$ ft

Validity Check Right Check Hire Eqn

$y_{sr} = 50.53$ ft

Validity Check Right Check Hire Eqn

Project Name: South Ave Bridge - Alternative 1A

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure No: N/A

Structure Location: Missoula Co., MT

Hire Abutment Scour Equation

$$y_s = (4 * Fr^{0.33} * (K_1 / 0.55) * K_2) * y_1$$

K_1 = Coefficient for abutment shape Table 7.1

$$K_2 = (\theta / 90)^{0.13}$$

L_1 = Length of embankment projected normal to the flow m (ft)

Q_e = Flow obstructed by the abutment and approach embankment m^3/sec (ft^3/sec)

A_e = Flow Area of the approach cross-section obstructed by the embankment m^2 (ft^2)

y_1 = Depth of Flow at the abutment on the overbank or in the main channel m (ft)

V_1 = Velocity at the toe of the abutment

$$Fr = V_e / (g * y_1)^{0.5}$$

$$L' = L * \cos(\theta)$$

$$g = 32.2 \text{ ft/s}^2$$

θ = Orientation of Embankment Angle to Flow Degrees

Does the abutment point upstream? (Y or N)

$\theta < 90$ If Embankment points downstream

$\theta > 90$ If Embankment points upstream

Description	K_1
Vertical-Wall Abutment	1.00
Vertical-Wall Abutment with wing walls	0.82
Spill-Through Abutment	0.55

Blue Cells require user input

Yellow cells values are based on system of units used.

Green cells are calculated values

Project Name: South Ave Bridge - Alternative 1A

UPN: 6296

Project Station: 0

Stream: Bitterroot River

Structure No: N/A

Structure Location: Missoula Co., MT

LEFT ABUTMENT

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63$ ft

$Q_{el} = 240.4754$ cfs

$A_{el} = 193.41$ ft²

$y_{1L} = 2.73$ ft

$V_{1L} = 0.69$ ft/s

$F_{r1} = 0.07$

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63$ ft

$Q_{el} = 300.1671$ cfs

$A_{el} = 221.13$ ft²

$y_{1L} = 3.41$ ft

$V_{1L} = 0.87$ ft/s

$F_{r1} = 0.08$

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63$ ft

$Q_{el} = 394.748$ cfs

$A_{el} = 253.26$ ft²

$y_{1L} = 5.68$ ft

$V_{1L} = 1.29$ ft/s

$F_{r1} = 0.10$

Hire Live-Bed Abutment Scour Equation

$y_{sL} = 4.62$ ft

Validity Check Left Check Froehlich Eqn

$y_{sL} = 6.00$ ft

Validity Check Left Check Froehlich Eqn

$y_{sL} = 10.46$ ft

Validity Check Left Check Froehlich Eqn

RIGHT ABUTMENT

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$K_1 = 1.00$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245$ ft

$Q_{er} = 5850.13$ cfs

$A_{er} = 752.15$ ft²

$y_{1R} = 5.05$ ft

$V_{1r} = 2.44$ ft/s

$F_{r1} = 0.19$

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$K_1 = 1.00$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245$ ft

$Q_{er} = 6823.236$ cfs

$A_{er} = 859.95$ ft²

$y_{1R} = 5.49$ ft

$V_{1r} = 2.58$ ft/s

$F_{r1} = 0.19$

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$K_1 = 1.00$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245$ ft

$Q_{er} = 8925.879$ cfs

$A_{er} = 984.9$ ft²

$y_{1R} = 6.00$ ft

$V_{1r} = 2.82$ ft/s

$F_{r1} = 0.20$

Hire Live-Bed Abutment Scour Equation

$y_{sr} = 21.28$ ft

Validity Check Right Use Hire

$y_{sr} = 23.24$ ft

Validity Check Right Use Hire

$y_{sr} = 25.78$ ft

Validity Check Right Use Hire

DESIGN OF RIPRAP PROTECTION AT BRIDGES

Project: South Ave Bridge - Alternative 1A
UPN: 6296
Location: Missoula Co., MT
Designer: Ben Fennelly, PE, CFM
Company: HDR Engineering, Inc.

RIPRAP AT BRIDGE ABUTMENTS

For Froude Numbers < or = 0.80:

$$D_{50}/y = [K/(S_s-1)][V^2/gy]$$

Eq. 14.1, HEC-23 "Bridge Scour and Stream Instability Measures", September 2009

where:

D_{50} = median stone diameter, m (ft)
 V = characteristic average velocity in the contracted section, m/s (ft/s)
 S_s = specific gravity of riprap (normally 2.65)
 g = 9.81 m/s/s (32.2 ft/s/s)
 y = depth of flow in the contracted bridge opening, m (ft)
 K = 0.89 for a spill-through abutment or 1.02 for a vertical wall abutment

For Froude Numbers > 0.80:

$$D_{50}/y = [K/(S_s-1)][V^2/gy]^{0.14}$$

Eq. 14.2, HEC-23 "Bridge Scour and Stream Instability Measures", September 2009

where:

K = 0.61 for a spill-through abutment or 0.69 for a vertical wall abutment

Design Case:

F_r = 0.23 <--Used Eqn 14.1, HEC-23
 V = 4.98 ft/s <--Used HEC-RAS 200-yr RS 5100 BR U Channel Ave Vel
 S_s = 2.65
 g = 32.2 ft/s²
 y = 14.39 ft <--Used HEC-RAS 200-yr RS 5100 BR U Channel Hydraulic Depth
 K = 0.89

$K/(S_s-1)$ = 0.539394
 $V^2/(gy)$ = 0.053523

Calculated D_{50} = **0.42 ft**

Selected D_{50} = 1.32 ft

Selected Class = Class II

MDT Riprap Classes

Class 1 = 0.66 ft
 Class 2 = 1.32 ft
 Class 3 = 2.00 ft

Riprap Gradation: D_{100} = 2.0 to 2.2 ft
 D_{85} = 1.6 to 1.8 ft
 D_{50} = 1.3 to 1.5 ft
 D_{15} = 0.5 to 0.8 ft

Embankment Blanket Thickness: **2.5 ft** - Per MDT Standard Drawings, the blanket thickness will be 3.0'

Toe Trench Blanket Thickness **3.0 ft** - Per MDT Standard Drawings, the blanket thickness will be 3.0' plus 0.5'

Project Name: South Ave Bridge - Alternative 1B

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure Location: Missoula Co., MT

Determine if flow conditions are Live-Bed, or Clear Water

$$V_{cDx} = K_{u1} * y_1^{1/6} * D_x^{1/3}$$

V_{cDx} = Critical velocity above which bed material of size D_x and smaller will be transported, (m/s, ft/s)

V_a = Average flow velocity in upstream section (m/s, ft/s)

y_1 = Average depth of flow upstream of the bridge, m (ft)

D_x = Particle size in a mixture of which X percent are smaller, m (ft)

K_{u1} = 6.19 SI units / 11.17 English units

Live Bed Contraction Scour

$$(y_2 / y_1) = (Q_2 / Q_1)^{(6/7)} * (W_1 / W_2)^{k_1}$$

y_0 = Average existing depth in the contracted section, ft (m)

y_1 = Average depth in the upstream main channel, m (ft)

y_2 = Average equilibrium depth in the contracted section after contraction scour, ft (m)

Q_1 = Flow in the upstream channel transporting sediment, m³/s (ft³/s)

Q_2 = Flow in the contracted channel, m³/s (ft³/s)

W_1 = Bottom width of the upstream main channel that is transporting bed material, m (ft)

W_2 = Bottom width of the main channel in the contracted section less pier width(s), m (ft)

k_1 = Exponent determined below

V_s / ω	k_1	Mode of Bed Material Transport
<0.50	0.59	Mostly contact bed material discharge
0.50 to 2.0	0.64	Some suspended bed material discharge
>2.0	0.69	Mostly suspended bed material discharge

$V_s = (\tau_o/\rho)^{1/2} = g * y_1 * S_f^{1/2}$, shear velocity in the upstream section, m/s (ft/s)

ω = Fall velocity of bed material based on the D_{50} , (m/s, ft/s) (From Figure 1)

g = Acceleration of gravity (9.81 m/s²) (32.2 ft/s²)

S_f = Slope of energy grade line of main channel, m/m (ft/ft)

ρ = Density of water (1000 kg/m³) (1.94 slugs/ft³)

γ = Unit weight of water (9.8 kN/m³, 62.4 lbf/ft³)

Clear Water Contraction Scour

$$y_2 = [(K_{U2} * Q_2) / (D_m^{2/3} * W_2)]^{3/7}$$

y_2 = Average equilibrium depth in the contracted section after contraction scour, ft (m)

Q_2 = Discharge through the bridge or on the set-back overbank area at the bridge associated with the width W , ft³/s (m³/s)

D_m = Diameter of the smallest nontransportable particle in the bed material (1.25 * D_{50}) in the contracted section, ft (m)

W_2 = Bottom width of the contracted section less pier widths, ft (m)

y_0 = Average existing depth in the contracted section, ft (m)

K_{U2} = 0.0077 English units / 0.025 SI units

$$y_s = y_2 - y_0 \quad \text{Average contraction scour depth}$$

Hydraulic Design Flood:**100 year RI**

$Q_D =$	31800 cfs
$V_a =$	6.55 ft/s
$y_0 =$	11.95 ft
$y_4 =$	11.82 ft
$Q_1 =$	25182.82 cfs
$Q_2 =$	26805.1 cfs
$W_1 =$	325.3 ft
$W_2 =$	335.73 ft
$\omega =$	10.50 ft/s
$S_f =$	0.000873 ft
$D_{50} =$	0.1837 ft
$K_{u1} =$	11.17
$V_{cD50} =$	9.58 ft/s
$D_{95} =$	0.361 ft
$V_{cD95} =$	12.00 ft/s

ClearWaterConditions**Live Bed Contraction Scour****100 year RI**

$y_2 =$	12.2 ft
$k_1 =$	0.59
$V_s =$	0.58 ft/s
$g =$	32.2 ft
$y_s =$	0.3 ft

Clear Water Contraction Scour**100 year RI**

$y_2 =$	8.1 ft
$D_m =$	0.2297 ft
$K_{U2} =$	0.0077
$y_s =$	0.0 ft

Scour Design Flood:**200 year RI**

$Q_S =$	36000 cfs
$V_a =$	6.81 ft/s
$y_0 =$	12.33 ft
$y_4 =$	12.24 ft
$Q_1 =$	27254.4 cfs
$Q_2 =$	29510.04 cfs
$W_1 =$	326.77 ft
$W_2 =$	335.73 ft
$\omega =$	10.50 ft/s
$S_f =$	0.000952 ft
$D_{50} =$	0.1837 ft
$K_{u1} =$	11.17
$V_{cD50} =$	9.64 ft/s
$D_{95} =$	0.361 ft
$V_{cD95} =$	12.07 ft/s

ClearWaterConditions**Live Bed Contraction Scour****200 year RI**

$y_2 =$	12.9 ft
$k_1 =$	0.59
$V_s =$	0.61 ft/s
$g =$	32.2 ft
$y_s =$	0.6 ft

Clear Water Contraction Scour**200 year RI**

$y_2 =$	8.8 ft
$D_m =$	0.2297 ft
$K_{U2} =$	0.0077
$y_s =$	0.0 ft

Scour Check Flood:**500 year RI**

$Q_C =$	42000 cfs
$V_a =$	7.09 ft/s
$y_0 =$	12.84 ft
$y_4 =$	12.78 ft
$Q_1 =$	29775.85 cfs
$Q_2 =$	33196.15 cfs
$W_1 =$	328.89 ft
$W_2 =$	335.73 ft
$\omega =$	10.50 ft/s
$S_f =$	0.001055 ft
$D_{50} =$	0.1837 ft
$K_{u1} =$	11.17
$V_{cD50} =$	9.71 ft/s
$D_{95} =$	0.361 ft
$V_{cD95} =$	12.16 ft/s

ClearWaterConditions**Live Bed Contraction Scour****500 year RI**

$y_2 =$	13.9 ft
$k_1 =$	0.59
$V_s =$	0.66 ft/s
$g =$	32.2 ft
$y_s =$	1.0 ft

Clear Water Contraction Scour**500 year RI**

$y_2 =$	9.7 ft
$D_m =$	0.2297 ft
$K_{U2} =$	0.0077
$y_s =$	0.0 ft

Project Name: South Ave Bridge - Alternative 1B

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure Location: Missoula Co., MT

Local Pier Scour Equation HEC-18 5th Edition

$$(y_s / y_1) = 2.0 * K_1 * K_2 * K_3 * K_4 * (a / y_1)^{0.65} * Fr^{0.43}$$

y_s = Scour depth

y_1 = Flow depth directly upstream of pier

K_1 = Correction factor for shape of pier nose table 1

K_2 = Correction factor for angle of attack of flow = $(\cos\theta + (L/a) * \sin\theta)^{0.65}$

K_3 = Correction factor for bed condition table 2

a = Pier width

L = Length of pier

Fr = Froude number directly upstream of the pier = $V_1 / (g * y_1)^{0.5}$

V_1 = Mean velocity directly upstream of the pier

g = Acceleration of gravity (9.81 m/s²) (32.2 ft/s²)

θ = Skew angle of flow to pier in degrees

$V_R = (V_1 - V_{icD50}) / (V_{cD50} - V_{icD95}) > 0$

V_{icDx} = Approach velocity required to initiate scour at the pier for the grain size $D_x = 0.645 * (D_x / a)^{0.053} * V_{cDx}$ (ft/s, m/s)

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$y_1 = 13.83$ ft

$V_1 = 7.02$ ft/s

$K_1 = 1.0$

$K_2 = 1.0$

$K_3 = 1.1$

$a = 6.0$ ft

$L = 6.0$ ft

$\theta = 0.0$ degrees

$g = 32.2$ ft/s²

$Fr = 0.33$

$y_s = 11.0$ ft

$V_{cD50} = 9.58$ ft/s

$V_{cD95} = 12.00$ ft/s

$V_{icD50} = 5.1$ ft/s

$V_{icD95} = 6.7$ ft/s

$V_R = 0.65$ ft/s

$L / a = 1.0$

$0.4 * V_R^{0.15} = 0.37$

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$y_1 = 14.22$ ft

$V_1 = 7.48$ ft/s

$K_1 = 1.0$

$K_2 = 1.0$

$K_3 = 1.1$

$a = 6.0$ ft

$L = 6.0$ ft

$\theta = 0.0$ degrees

$g = 32.2$ ft/s²

$Fr = 0.35$

$y_s = 11.4$ ft

$V_{cD50} = 9.64$ ft/s

$V_{cD95} = 12.07$ ft/s

$V_{icD50} = 5.2$ ft/s

$V_{icD95} = 6.7$ ft/s

$V_R = 0.79$ ft/s

$L / a = 1.0$

$0.4 * V_R^{0.15} = 0.39$

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$y_1 = 14.72$ ft

$V_1 = 8.07$ ft/s

$K_1 = 1.0$

$K_2 = 1.0$

$K_3 = 1.1$

$a = 6.0$ ft

$L = 6.0$ ft

$\theta = 0.0$ degrees

$g = 32.2$ ft/s²

$Fr = 0.37$

$y_s = 11.8$ ft

$V_{cD50} = 9.71$ ft/s

$V_{cD95} = 12.16$ ft/s

$V_{icD50} = 5.2$ ft/s

$V_{icD95} = 6.8$ ft/s

$V_R = 0.97$ ft/s

$L / a = 1.0$

$0.4 * V_R^{0.15} = 0.40$

Project Name: South Ave Bridge - Alternative 1B

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure Location: Missoula Co., MT

Local Pier Scour HEC-18 Fifth Edition Coarse Bed

$$y_s = 1.1 * K_1 * K_2 * a^{0.62} * y_1^{0.38} * \tanh[(H^2 / (1.97 * \sigma^{1.5})]$$

y_s = Scour depth

y_1 = Flow directly upstream of pier

K_1 = Correction factor for shape of pier nose table 1

K_2 = Correction factor for angel of attack of flow = $(\text{Cos}\theta + (L/a) * \text{Sin}\theta)^{0.65}$

a = Pier width

L = Length of pier

V_1 = Mean velocity directly upstream of the pier

θ = Skew angle of flow to pier

H = Densimetric particle Froude Number = $V_1 / [g * (S_g - 1) * D_{50}]^{0.5}$

S_g = Sediment specific Gravity

σ = Sediment gradation coefficient D_{84} / D_{50}

g = Acceleration of gravity (9.81 m/s²) (32.2 ft/s²)

Table 1	
Shape of Pier Nose	K_1
Square nose	1.1
Round nose	1
Circular cylinder	1
Group of cylinders	1
Sharp nose	0.9

Hydraulic Design Flood:

100 year RI

Q_D = 31800 cfs

y_1 = 13.83 ft

V_1 = 7.02 ft/s

K_1 = 1.0

K_2 = 1.0

a = 6.0 ft

L = 6.0 ft

θ = 0.0 degrees

S_g = 2.65

g = 32.2 ft/s²

H = 2.2 ft

y_s = 6.0 ft

σ = 2.2

L / a = 1.0

$\tanh[f(H)]$ = 0.66

Scour Design Flood:

200 year RI

Q_S = 36000 cfs

y_1 = 14.22 ft

V_1 = 7.48 ft/s

K_1 = 1.0

K_2 = 1.0

a = 6.0 ft

L = 6.0 ft

θ = 0.0 degrees

S_g = 2.65

g = 32.2 ft/s²

H = 2.4 ft

y_s = 6.5 ft

σ = 2.2

L / a = 1.0

$\tanh[f(H)]$ = 0.71

Scour Check Flood:

500 year RI

Q_C = 42000 cfs

y_1 = 14.72 ft

V_1 = 8.07 ft/s

K_1 = 1.0

K_2 = 1.0

a = 6.0 ft

L = 6.0 ft

θ = 0.0 degrees

S_g = 2.65

g = 32.2 ft/s²

H = 2.6 ft

y_s = 7.2 ft

σ = 2.2

L / a = 1.0

$\tanh[f(H)]$ = 0.78

Validity Note: Corse bed equation only valid if the following criteria are met.

Ok

- Clear-water flow conditions.

Ok

- Streambed $D_{50} > 20\text{mm}$

Ok

- Streambed gradation coefficient σ (D_{84}/D_{50}) > 1.5

Blue Cells require user input

Yellow cells values are based on system of units used.

Green cells are calculated values

Project Name: South Ave Bridge - Alternative 1B

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure No: N/A

Structure Location: Missoula Co., MT

Froehlich's Live-Bed Abutment Scour Equation

$$y_s = (2.27 * K_1 * K_2 * (L'/y_a)^{0.43} * Fr^{0.61} + 1) * y_a$$

K_1 = Coefficient for abutment shape Table 8.1

$$K_2 = (\theta / 90)^{0.13}$$

L_1 = Length of embankment projected normal to the flow m (ft)

Q_e = Flow obstructed by the abutment and approach embankment m^3/sec (ft^3/sec)

A_e = Flow Area of the approach cross-section obstructed by the embankment m^2 (ft^2)

y_a = Average Depth of Flow in the floodplain m (ft)

$$V_e = Q_e / A_e$$

$$Fr = V_e / (g * y_a)^{0.5}$$

$$L' = L * \cos(\theta)$$

$$g = 32.2 \text{ ft/s}^2$$

θ = Orientation of Embankment Angle to Flow Degrees

Does the abutment point upstream? (Y or N)

$\theta < 90$ If Embankment points downstream

$\theta > 90$ If Embankment points upstream

Description	K_1
Vertical-Wall Abutment	1.00
Vertical-Wall Abutment with wing walls	0.82
Spill-Through Abutment	0.55

Blue Cells require user input

Yellow cells values are based on system of units used.

Green cells are calculated values

Project Name: South Ave Bridge - Alternative 1B

UPN: 6296

Project Station: 0

Stream: Bitterroot River

Structure No: N/A

Structure Location: Missoula Co., MT

LEFT ABUTMENT

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63.00$ ft

$Q_{el} = 236.14$ cfs

$A_{el} = 195.30$ ft²

$y_{al} = 3.10$ ft

$V_{el} = 1.21$ ft/s

$F_{rl} = 0.12$

$L'_1 = 63.00$ ft

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63.00$ ft

$Q_{el} = 302.10$ cfs

$A_{el} = 220.50$ ft²

$y_{al} = 3.50$ ft

$V_{el} = 1.37$ ft/s

$F_{rl} = 0.13$

$L'_1 = 63.00$ ft

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63.00$ ft

$Q_{el} = 401.38$ cfs

$A_{el} = 253.26$ ft²

$y_{al} = 4.02$ ft

$V_{el} = 1.58$ ft/s

$F_{rl} = 0.14$

$L'_1 = 63.00$ ft

Froehlich's Live-Bed Abutment Scour Equation

$y_{sL} = 7.00$ ft

Validity Check Left **OK Use Froehlich**

$y_{sL} = 7.84$ ft

Validity Check Left **OK Use Froehlich**

$y_{sL} = 8.94$ ft

Validity Check Left **OK Use Froehlich**

RIGHT ABUTMENT

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$K_1 = 1$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245.00$ ft

$Q_{er} = 4667.15$ cfs

$A_{er} = 1408.75$ ft²

$y_{aR} = 5.75$ ft

$V_{er} = 3.31$ ft/s

$F_{rr} = 0.24$

$L'_r = 245.00$ ft

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$K_1 = 1$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245.00$ ft

$Q_{er} = 5860.27$ cfs

$A_{er} = 1506.75$ ft²

$y_{aR} = 6.15$ ft

$V_{er} = 3.89$ ft/s

$F_{rr} = 0.28$

$L'_r = 245.00$ ft

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$K_1 = 1$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245.00$ ft

$Q_{er} = 7630.71$ cfs

$A_{er} = 1634.15$ ft²

$y_{aR} = 6.67$ ft

$V_{er} = 4.67$ ft/s

$F_{rr} = 0.32$

$L'_r = 245.00$ ft

Froehlich's Live-Bed Abutment Scour Equation

$y_{sr} = 33.43$ ft

Validity Check Right **Check Hire Eqn**

$y_{sr} = 37.22$ ft

Validity Check Right **Check Hire Eqn**

$y_{sr} = 42.16$ ft

Validity Check Right **Check Hire Eqn**

Project Name: South Ave Bridge - Alternative 1B

UPN: 6296

Project Station: -

Stream: Bitterroot River

Structure No: N/A

Structure Location: Missoula Co., MT

Hire Abutment Scour Equation

$$y_s = (4 * Fr^{0.33} * (K_1 / 0.55) * K_2) * y_1$$

K_1 = Coefficient for abutment shape Table 7.1

$$K_2 = (\theta / 90)^{0.13}$$

L_1 = Length of embankment projected normal to the flow m (ft)

Q_e = Flow obstructed by the abutment and approach embankment m³/sec (ft³/sec)

A_e = Flow Area of the approach cross-section obstructed by the embankment m² (ft²)

y_1 = Depth of Flow at the abutment on the overbank or in the main channel m (ft)

V_1 = Velocity at the toe of the abutment

$$Fr = V_e / (g*y_1)^{0.5}$$

$$L' = L * \cos(\theta)$$

$$g = 32.2 \text{ ft/s}^2$$

θ = Orientation of Embankment Angle to Flow Degrees

Does the abutment point upstream? (Y or N)

$\theta < 90$ If Embankment points downstream

$\theta > 90$ If Embankment points upstream

Description	K_1
Vertical-Wall Abutment	1.00
Vertical-Wall Abutment with wing walls	0.82
Spill-Through Abutment	0.55

Blue Cells require user input

Yellow cells values are based on system of units used.

Green cells are calculated values

Project Name: South Ave Bridge - Alternative 1B

UPN: 6296

Project Station: 0

Stream: Bitterroot River

Structure No: N/A

Structure Location: Missoula Co., MT

LEFT ABUTMENT

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63$ ft

$Q_{el} = 236.142$ cfs

$A_{el} = 195.3$ ft²

$y_{1L} = 2.73$ ft

$V_{1L} = 0.69$ ft/s

$F_{r1} = 0.07$

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63$ ft

$Q_{el} = 302.095$ cfs

$A_{el} = 220.5$ ft²

$y_{1L} = 3.41$ ft

$V_{1L} = 0.87$ ft/s

$F_{r1} = 0.08$

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$K_1 = 0.55$

$K_2 = 1$

$\theta = 90$

$L_1 = 63$ ft

$Q_{el} = 401.378$ cfs

$A_{el} = 253.26$ ft²

$y_{1L} = 5.68$ ft

$V_{1L} = 1.29$ ft/s

$F_{r1} = 0.10$

Hire Live-Bed Abutment Scour Equation

$y_{sL} = 4.62$ ft

$y_{sL} = 6.00$ ft

$y_{sL} = 10.46$ ft

Validity Check Left **Check Froehlich Eqn**

Validity Check Left **Check Froehlich Eqn**

Validity Check Left **Check Froehlich Eqn**

RIGHT ABUTMENT

Hydraulic Design Flood:

100 year RI

$Q_D = 31800$ cfs

$K_1 = 1.00$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245$ ft

$Q_{er} = 4667.15$ cfs

$A_{er} = 1408.75$ ft²

$y_{1R} = 5.08$ ft

$V_{1r} = 2.71$ ft/s

$F_{r1} = 0.21$

Scour Design Flood:

200 year RI

$Q_S = 36000$ cfs

$K_1 = 1.00$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245$ ft

$Q_{er} = 5860.27$ cfs

$A_{er} = 1506.75$ ft²

$y_{1R} = 5.48$ ft

$V_{1r} = 2.89$ ft/s

$F_{r1} = 0.22$

Scour Check Flood:

500 year RI

$Q_C = 42000$ cfs

$K_1 = 1.00$

$K_2 = 1.00$

$\theta = 90$

$L_r = 245$ ft

$Q_{er} = 7630.708$ cfs

$A_{er} = 1634.15$ ft²

$y_{1R} = 6.00$ ft

$V_{1r} = 2.89$ ft/s

$F_{r1} = 0.21$

Hire Live-Bed Abutment Scour Equation

$y_{sr} = 22.14$ ft

$y_{sr} = 24.09$ ft

$y_{sr} = 25.99$ ft

Validity Check Right **Use Hire**

Validity Check Right **Use Hire**

Validity Check Right **Use Hire**

DESIGN OF RIPRAP PROTECTION AT BRIDGES

Project: South Ave Bridge - Alternative 1B
UPN: 6296
Location: Missoula Co., MT
Designer: Ben Fennelly, PE, CFM
Company: HDR Engineering, Inc.

RIPRAP AT BRIDGE ABUTMENTS

For Froude Numbers < or = 0.80:

$$D_{50}/y = [K/(S_s-1)][V^2/gy]$$

Eq. 14.1, HEC-23 "Bridge Scour and Stream Instability Measures", September 2009

where:

D_{50} = median stone diameter, m (ft)
 V = characteristic average velocity in the contracted section, m/s (ft/s)
 S_s = specific gravity of riprap (normally 2.65)
 g = 9.81 m/s/s (32.2 ft/s/s)
 y = depth of flow in the contracted bridge opening, m (ft)
 K = 0.89 for a spill-through abutment or 1.02 for a vertical wall abutment

For Froude Numbers > 0.80:

$$D_{50}/y = [K/(S_s-1)][V^2/gy]^{0.14}$$

Eq. 14.2, HEC-23 "Bridge Scour and Stream Instability Measures", September 2009

where:

K = 0.61 for a spill-through abutment or 0.69 for a vertical wall abutment

Design Case:

F_r = 0.24 <--Used Eqn 14.1, HEC-23
 V = 5.19 ft/s <--Used HEC-RAS 200-yr RS 5100 BR U Channel Ave Vel
 S_s = 2.65
 g = 32.2 ft/s²
 y = 14.38 ft <--Used HEC-RAS 200-yr RS 5100 BR U Channel Hydraulic Depth
 K = 0.89

$$K/(S_s-1) = 0.539394$$

$$V^2/(gy) = 0.058173$$

Calculated D_{50} = **0.45 ft**

Selected D_{50} = 1.32 ft

Selected Class = Class II

MDT Riprap Classes

Class 1 = 0.66 ft
 Class 2 = 1.32 ft
 Class 3 = 2.00 ft

Riprap Gradation: D_{100} = 2.0 to 2.2 ft
 D_{85} = 1.6 to 1.8 ft
 D_{50} = 1.3 to 1.5 ft
 D_{15} = 0.5 to 0.8 ft

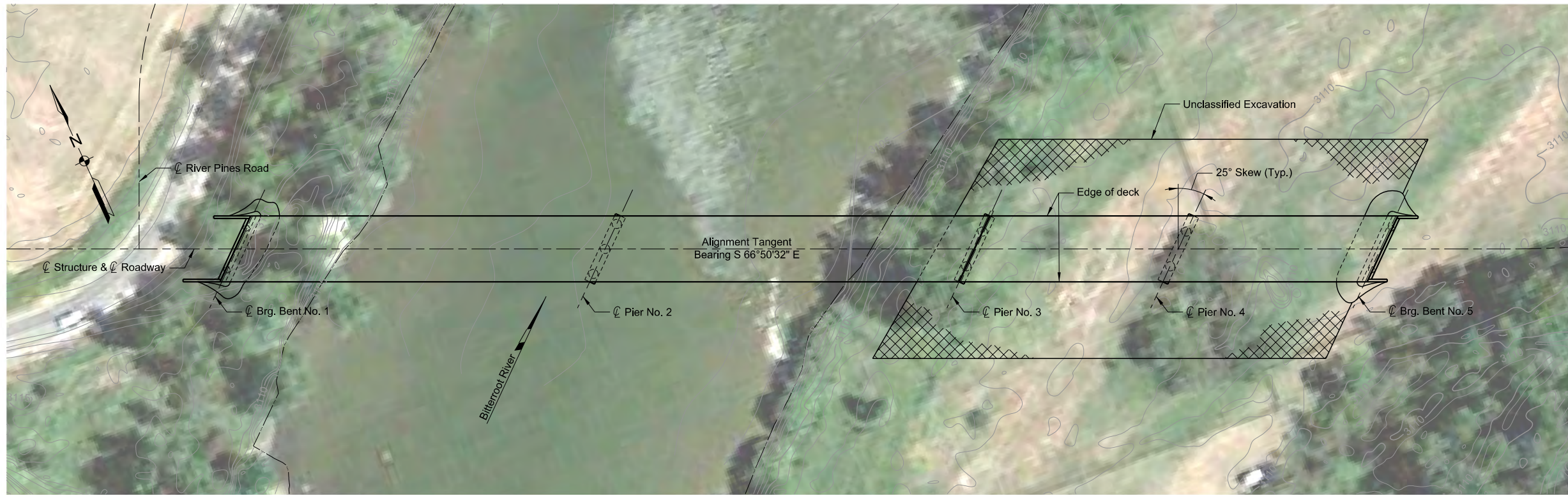
Embankment Blanket Thickness: **2.5 ft** - Per MDT Standard Drawings, the blanket thickness will be 3.0'

Toe Trench Blanket Thickness **3.0 ft** - Per MDT Standard Drawings, the blanket thickness will be 3.0' plus 0.5'

Appendix L – Preliminary Bridge Layouts



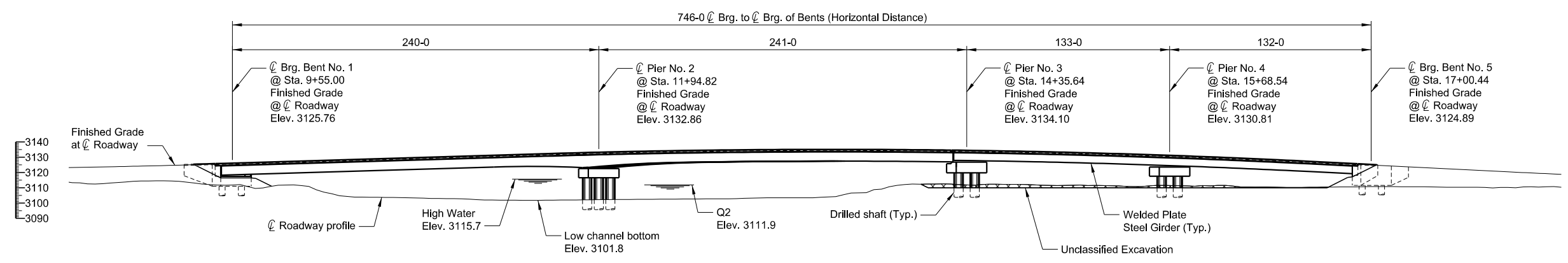
Alternate 1A



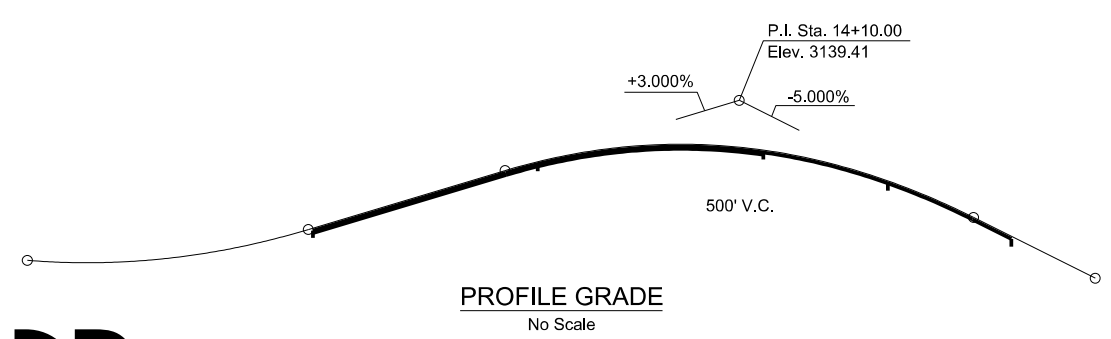
PLAN

STREAM DATA

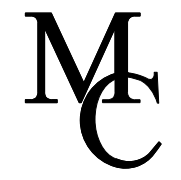
Drift:	High
Pier Scour (Q100):	10.9'
Contraction Scour (Q100):	0.0'
Ice:	Yes
Drainage Area:	2,855 sq. mi.
2-year Stage (Q2):	3111.9
Base Flood Flow (Q100):	31,800 cfs
Base Flood Stage:	3115.7
Base Flood Velocity:	4.8 fps
Low Beam Elevation:	3118.12



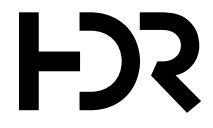
ELEVATION



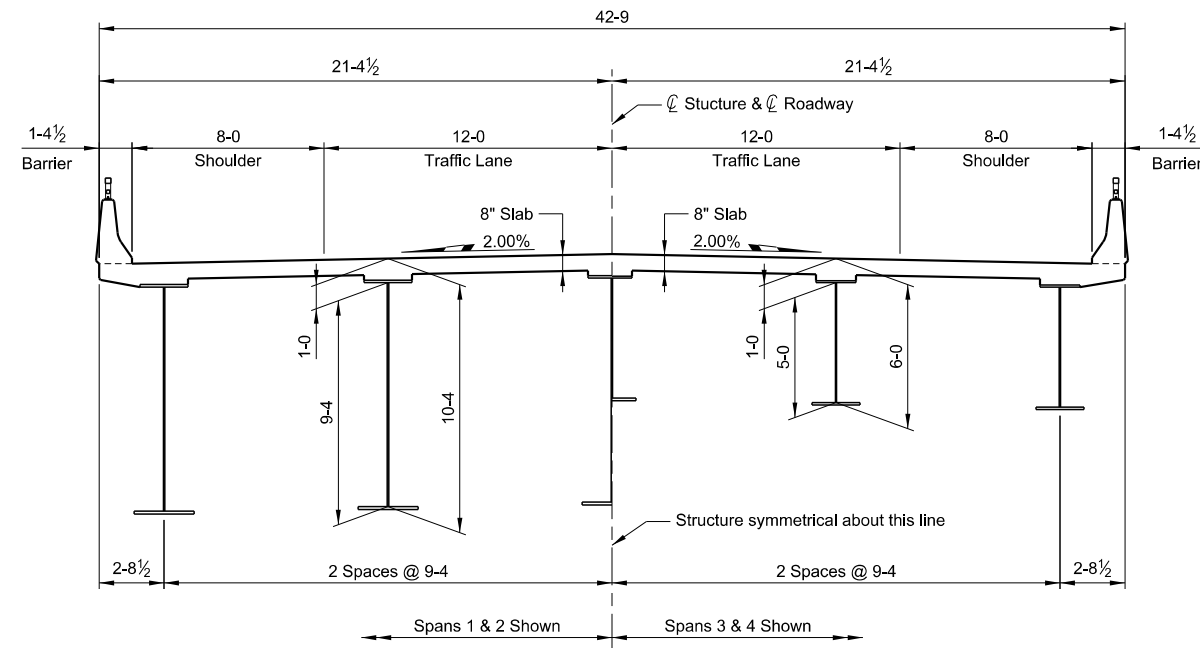
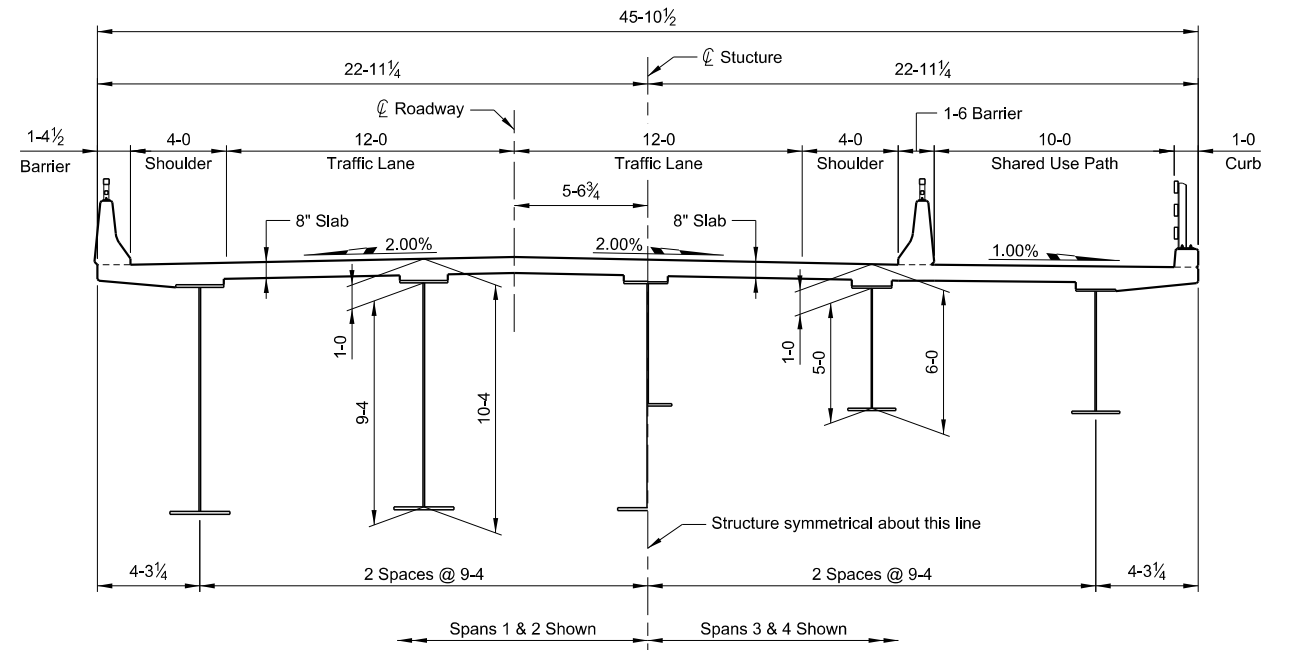
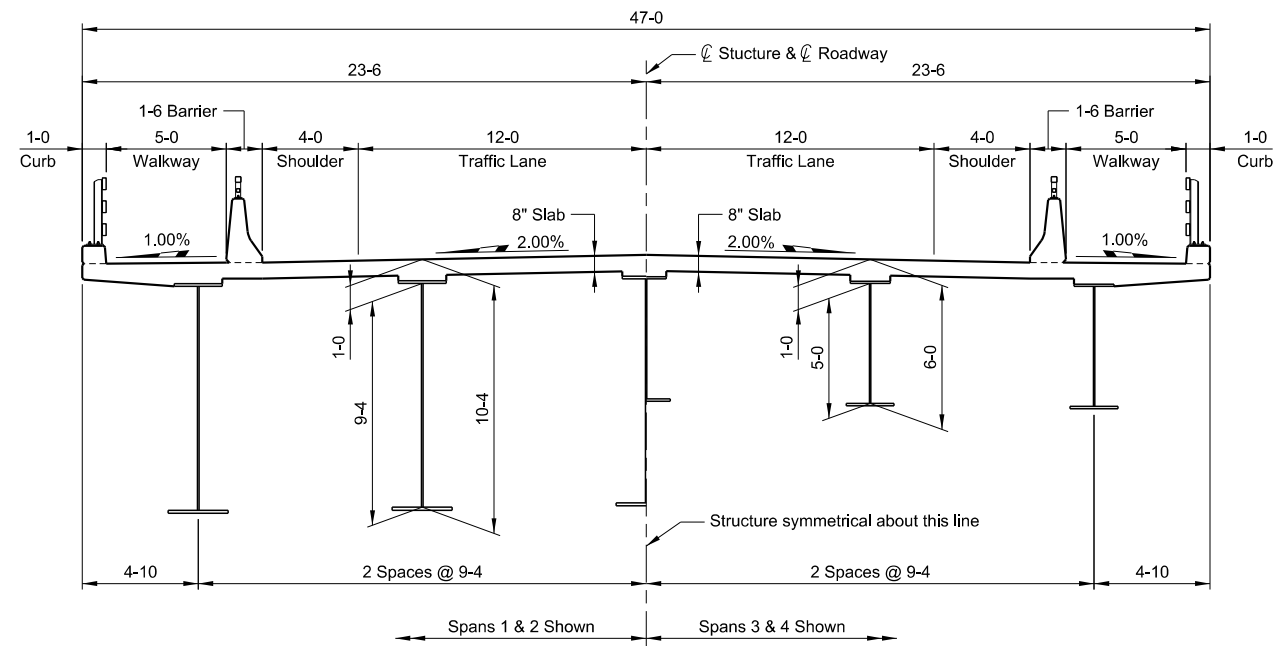
PROFILE GRADE
No Scale



**SOUTH AVENUE BRIDGE
OVER BITTERROOT RIVER
TYPE SIZE AND LOCATION STUDY
ALTERNATE 1A PLAN & ELEVATION
JULY 2016
Scale 1" = 80'-0"**



PRELIMINARY

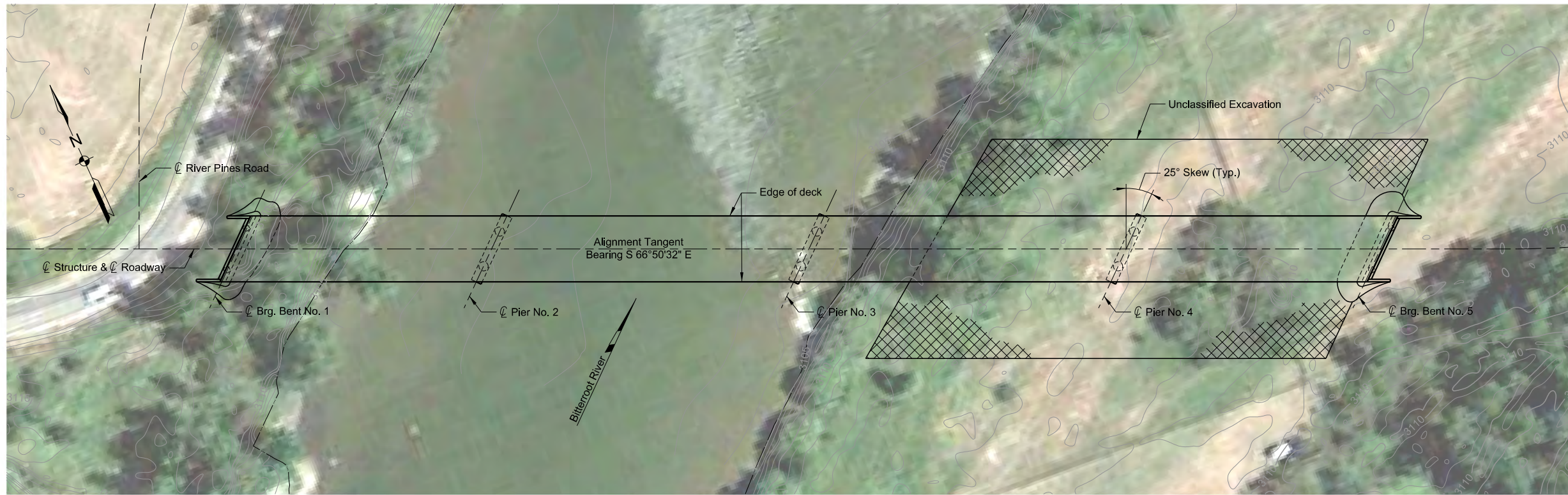


SOUTH AVENUE BRIDGE
OVER BITTERROOT RIVER
TYPE SIZE AND LOCATION STUDY
ALTERNATE 1A DECK OPTIONS
JULY 2016
Scale 1/8" = 1'-0"



PRELIMINARY

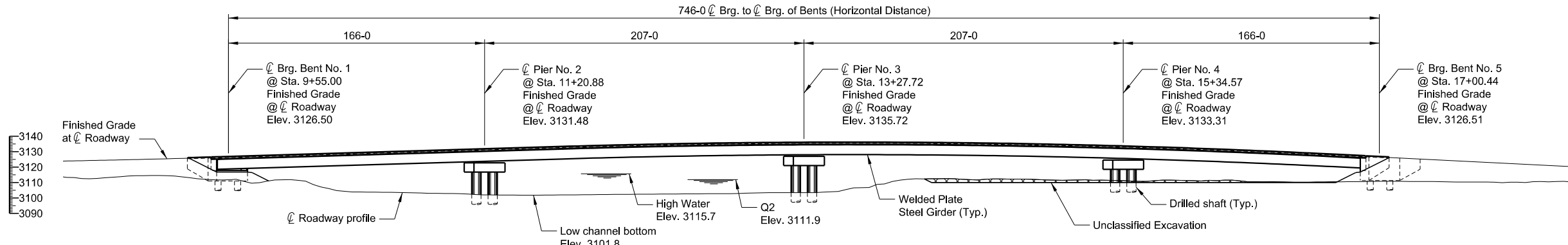
Alternate 1B



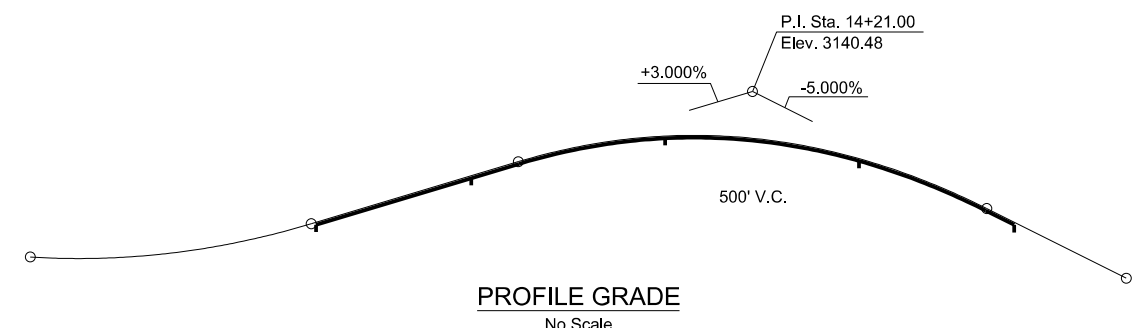
PLAN

STREAM DATA

Drift:	High
Pier Scour (Q100):	12.0'
Contraction Scour (Q100):	0.0'
Ice:	Yes
Drainage Area:	2,855 sq. mi.
2-year Stage (Q2):	3111.9
Base Flood Flow (Q100):	31,800 cfs
Base Flood Stage:	3115.7
Base Flood Velocity:	4.8 fps
Low Beam Elevation:	3118.22



ELEVATION



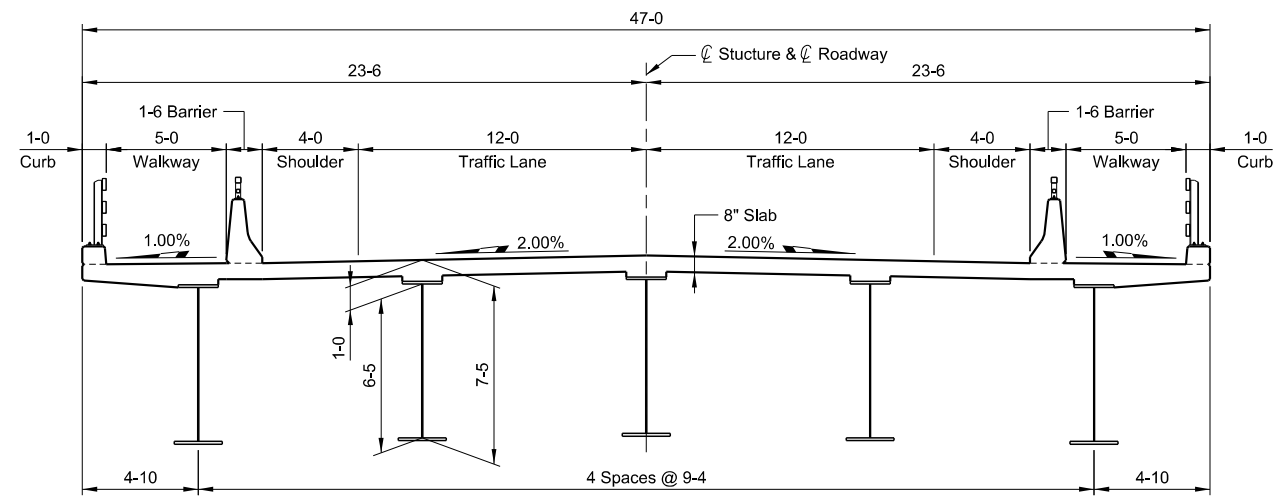
PROFILE GRADE
No Scale



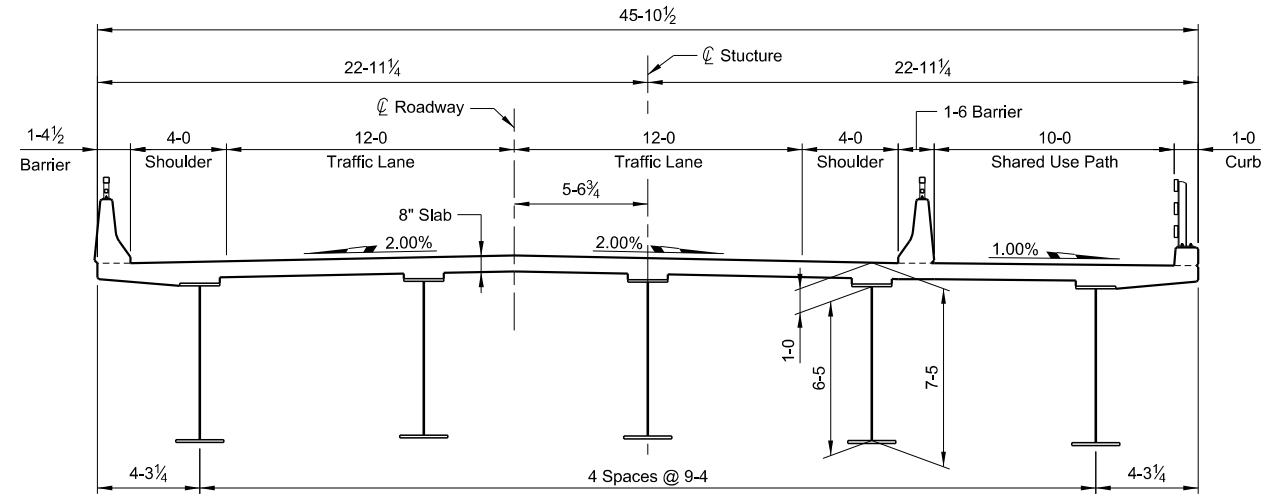
**SOUTH AVENUE BRIDGE
OVER BITTERROOT RIVER
TYPE SIZE AND LOCATION STUDY
ALTERNATE 1B PLAN & ELEVATION
JULY 2016
Scale 1" = 80'-0"**



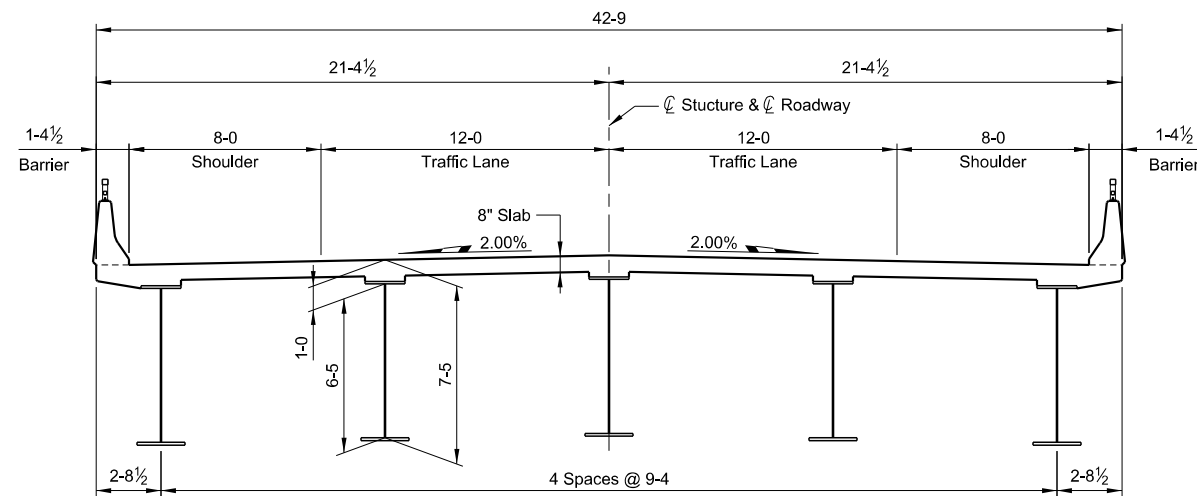
PRELIMINARY



SECTION WITH FIVE FOOT WALKWAYS
(Looking Ahead on Line)



SECTION WITH TEN FOOT SHARED USE PATH
(Looking Ahead on Line)



SECTION
(Looking Ahead on Line)



**SOUTH AVENUE BRIDGE
OVER BITTERROOT RIVER
TYPE SIZE AND LOCATION STUDY
ALTERNATE 1B DECK OPTIONS
JULY 2016
Scale 1/8" = 1'-0"**



PRELIMINARY