ENGINEERING

PLANNING

SURVEYING

A HYDRAULIC ANALYSIS

OF THE
PROPOSED

EAST BRANCH TRIBUTARY B BRIDGE AT PHEASANT POINT

FOR

LAND PLANNERS THREE, L.L.C.
P.O. BOX 562
CHESTERFIELD, MO 63006
(314) 537-0463

AS A PART OF THE

PHEASANT POINT APARTMENT COMPLEX

BAX PROJECT NO.: 95-7218B

MARCH 1999

BAX ENGINEERING CO., INC.
1052 South Cloverleaf Drive
St. Peters, MO 63376-6445
314-928-5552
FAX 314-928-1718

TABLE OF CONTENTS

LIST OF APPENDICES

PURPOSE

Land Planners Three, L.L.C. is planning the development of an apartment complex, Pheasant Point Apartments, in the city limits of O'Fallon, Missouri. The proposed complex is located on Pheasant Meadow Drive on the east side of Highway K (see Figure 1 for a location map). To access the development, Pheasant Meadow Drive will be extended across East Branch Tributary B, which empties into Dardenne Creek approximately one-half mile downstream.

Access to Pheasant Point Apartments will require a bridge to cross East Branch Tributary B. At the crossing, the proposed bridge and associated roadway must traverse approximately 500 feet of the 100-Year Floodway and 950 feet of the 100-Year Floodplain, as established by the Federal Emergency Management Agency (FEMA) Study dated August 2, 1996. Since a single bridge span length of 500 feet or more is not economically feasible, construction within the 100-Year Floodway will be required. Consequently, the proposed bridge and roadway cannot produce an increase in water surface elevations above the FEMA 100-Year Base Flood Elevation upstream of the proposed development, as required per O'Fallon City ordinance.

The purpose of this report is to document and summarize the results of the hydraulic analysis of the recommended bridge length and channel improvements which results in no-rise of water surface elevation as compared to the 100-Year Base Flood.

SCOPE

In performing the hydraulic analysis presented herein, Bax Engineering completed the following tasks:

1) Obtained the Federal Emergency Management Agency (FEMA) data including flowrates, flood elevations, and floodway & floodplain limits for the study area.
2) Contacted Michael Baker Jr., Inc. and the U.S. Army Corps of Engineers for pertinent existing conditions model data.
3) Created and calibrated a HEC-RAS computer model for existing conditions.
4) Created a HEC-RAS computer model for the proposed bridge and roadway.
5) Summarized the results of this analysis in a report.

EXISTING CONDITIONS HEC-RAS MODEL

Federal Emergency Management Agency (FEMA) Flood Data

From the study sponsored by FEMA, the 100-Year Flood Zone, 100-Year peak discharge, 100-Year water surface elevations, and stream bed slope were obtained. The 100-Year Flood Zone is shown in Appendix A. The 100-Year peak discharge is 7,195 cubic feet per second. It is assumed that the peak discharge does not vary within the model limits. The water surface elevations are shown in Appendix A. The stream bed slope is estimated to be 0.37%.

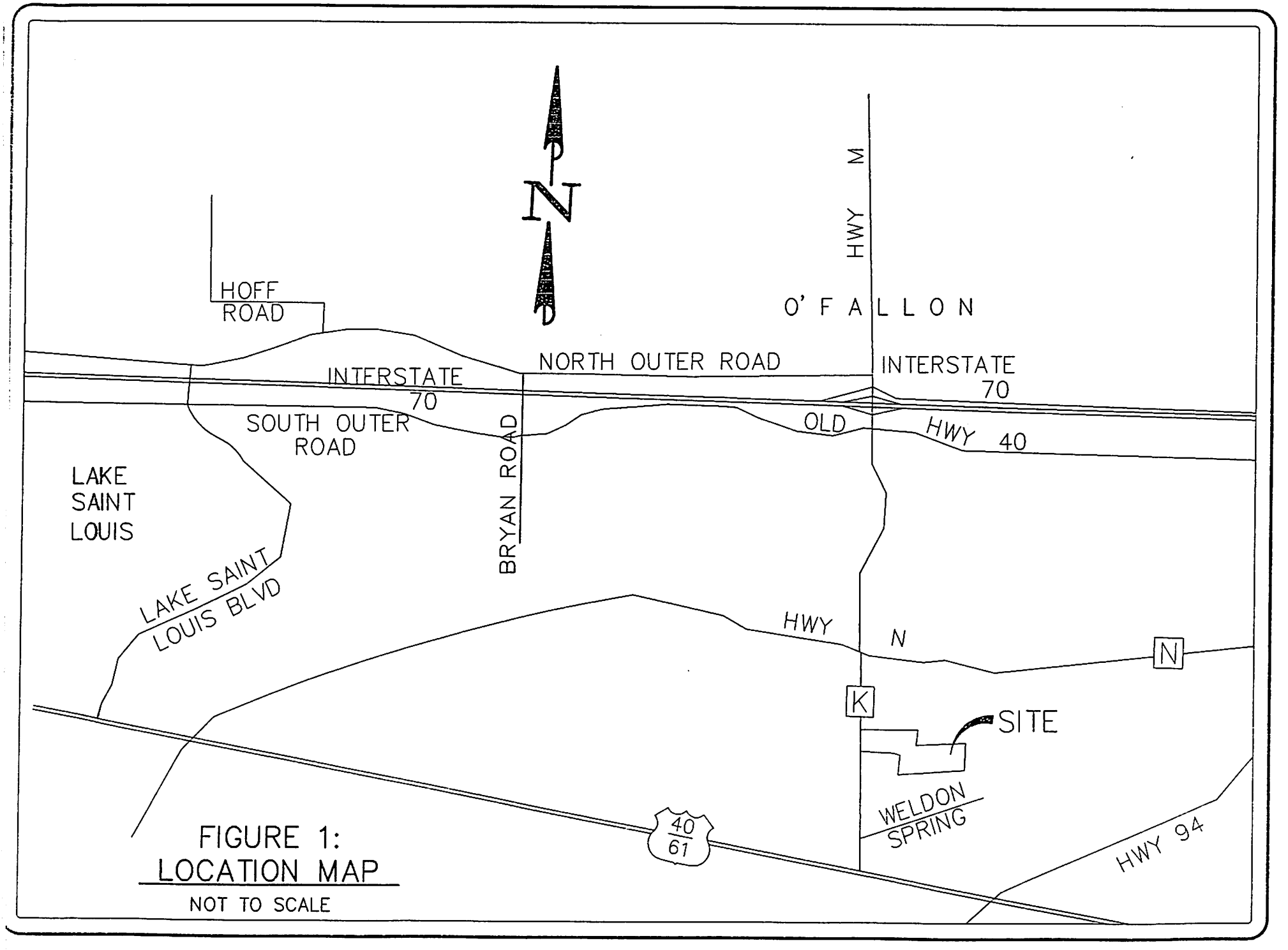


FIGURE 1:
LOCATION MAP

NOT TO SCALE

Previously Completed Existing Conditions Model Data

On June 24, 1998, Bax Engineering contacted Baker Civil for information on the flood study for East Branch Tributary B. On July 1, 1998, a letter received from Baker Civil stated that no input data was available for the study area. The letter recommended that the U.S. Army Corps of Engineers, St. Louis District, should be contacted.

Bax Engineering contacted Mr. Ron Diekmann of the U.S. Army Corps of Engineers, St. Louis District, for input data for the study area. Mr. Diekmann stated that no information was available for East Branch Tributary B. Therefore, no input data from the previously conducted hydraulic analysis of the study area was obtained.

Cross Section Data

Since input data from the hydraulic study that generated the results published in the FEMA information was not available, the cross section data for the existing conditions model was established from available resources. The cross section station and elevation data was taken from topographics generated from aerial photography performed by SURDEX Corp. dated July 3, 1998. Based on a field review, the Manning's n values were estimated using values published in "Open-Channel Hydraulics" by Chow. See attached Appendix B which depicts existing elevation data.

Model Calibration and Summary of Results

Using the available data, a HEC-RAS computer model was created and calibrated to the existing conditions. The Bax existing conditions model and FEMA study 100-Year flood profiles appear to agree to within an acceptable margin of error. The results of the Bax existing conditions model are summarized in Table 1. The existing conditions model input, output, and cross section plots are contained in Appendix B.

Table 1: 100-Year Water Surface Elevations for the FEMA Model and the Calibrated Existing Conditions Model

Cross Section Location		100-Yr.. Water Surface Elevation		
River Mile	River Station	FEMA Model (Estimated)	Bax Existing Conditions Model	Absolute Error
0.600	3168	482.30	482.29	-0.01
0.511	2700	482.00	482.03	+0.03
0.492	2600	481.95	481.94	-0.01
0.473	2500	481.90	481.87	-0.03
0.459	2425	481.85	481.75	-0.10
0.417	2200	481.65	481.60	-0.05
0.379	2000	481.50 [A]	481.50 [A]	0.00

Note: [A] Starting water surface elevation.

PROPOSED CONDITIONS HEC-RAS MODEL

Several HEC-RAS computer models were developed to determine a bridge length and associated channel improvements which resulted in no increase in the water surface elevation at the control point upstream of the proposed development. From the hydraulic models, a bridge with a length of 140 feet was selected. Along with the bridge, channel improvements are proposed. The channel improvements begin approximately 525 feet upstream of the proposed bridge and taper back to the existing channel approximately 350 feet downstream of the proposed bridge.

The proposed bridge and channel modifications result in a slight decrease in the 100-Year flood elevation at the upstream control point (River Station 3168) as compared to the existing conditions model. The flood elevations are summarized in Table 2. The HEC-RAS input, output, and cross section plots for the proposed conditions are contained in Appendix C.

Table 2: 100-Year Water Surface Elevations for the Bax Existing Conditions Model and the Proposed Conditions Model

Cross Section Location		100-Yr. Water Surface Elevation		
River Mile	River Station	Bax Existing Conditions Model	Bax Proposed Conditions Model	W.S.E. Change
0.600	3168	482.29	482.22	-0.07
0.582	3075	N/A	481.84	N/A
0.573	3025	N/A	482.13	N/A
0.511	2700	482.03	482.09 [A]	+0.06
0.492	2600	481.94	481.89	-0.05
0.473	2500	481.87	481.39	-0.48
0.459	2425	481.75	481.24	-0.51
0.417	2200	481.60	481.51	-0.06
0.379	2000	481.50 [B]	481.50 [B]	0.00

Notes: [A] The increases in water surface elevation is located within the property limits of the project. Therefore, flood rights will not be required.
[B] Starting water surface elevation.

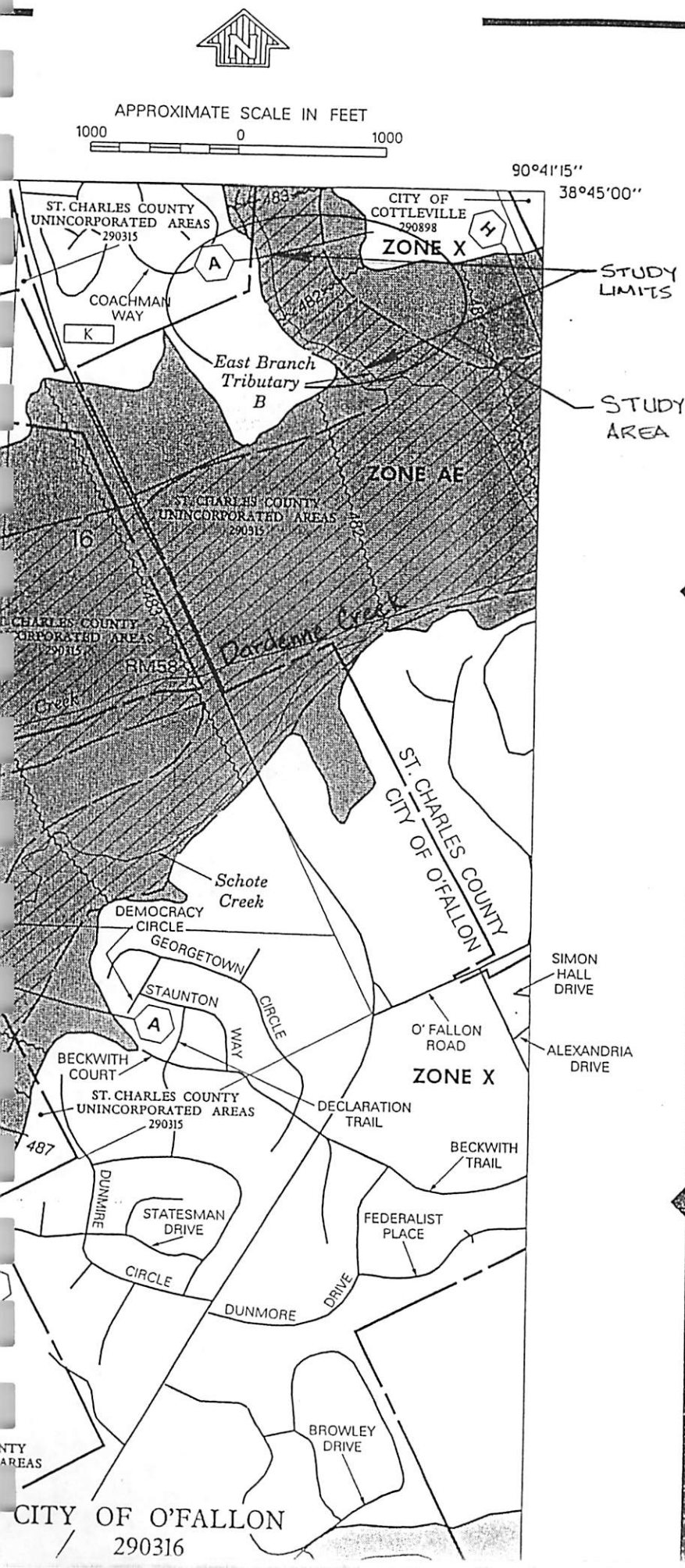
CONCLUSIONS

The proposed Pheasant Point Apartments Bridge and channel improvements will require construction within the 100-Year floodway. However, the proposed improvements will not raise the 100-Year base flood elevation upstream of the development as estimated in this study. The proposed improvements will result in a minimal decrease in the 100-Year flood profile throughout the study area with the exception of a small region immediately upstream of the

proposed bridge. However, the developer owns all the property within the area of the increased flood elevation. Therefore, flood rights acquisitions will not be required. The net results at the upstream limits of the project is no increase in the 100-Year base flood elevation.

APPENDIX A

FEDERAL EMERGENCY MANAGEMENT AGENCY
FLOOD DATA



LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Flood Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 × — Elevation Reference Mark

• M2 — River Mile

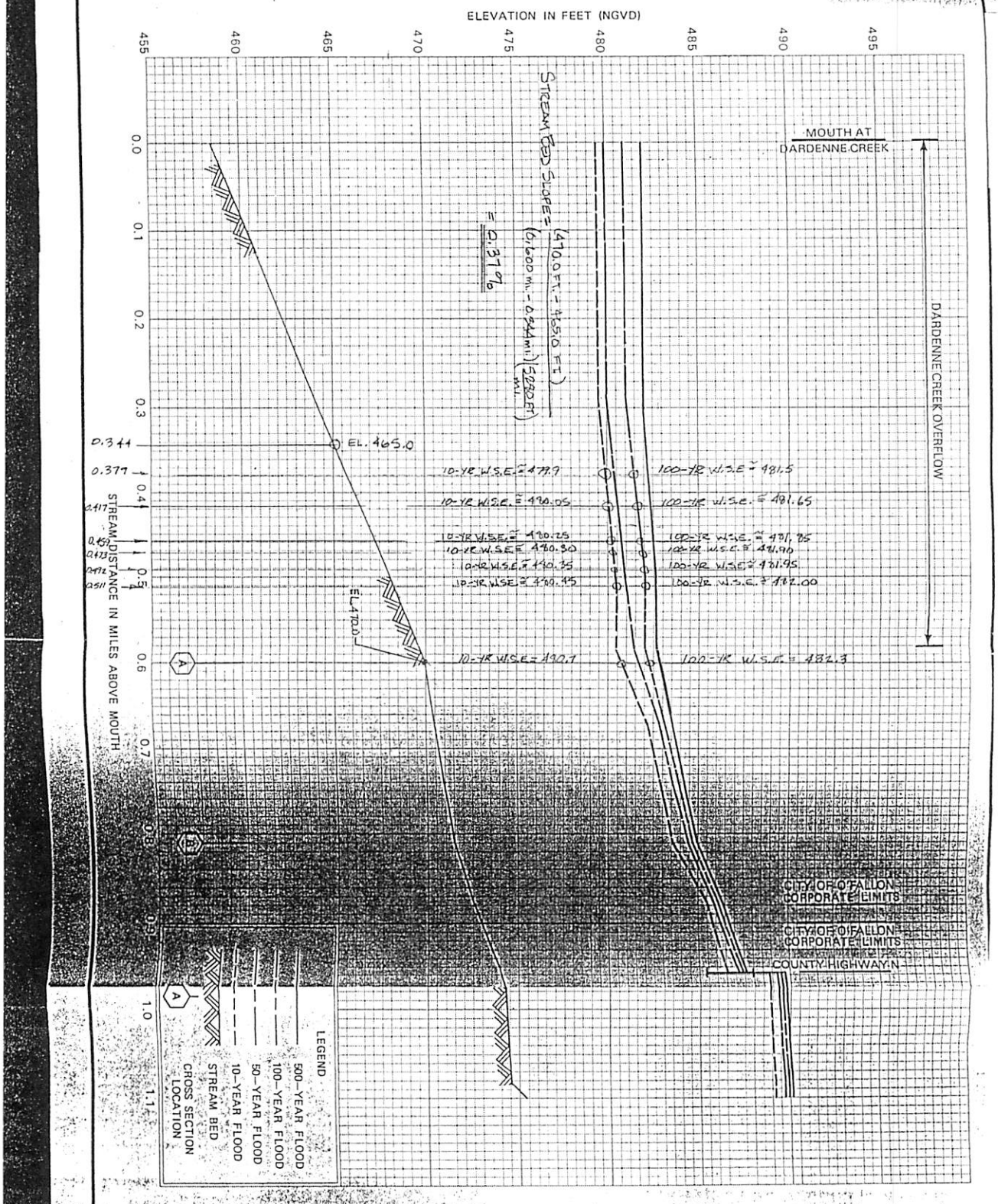
97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas.

Coastal base flood elevations apply only landward of 0.0 NGVD, and include the effects of wave action; these elevations may also differ significantly from those developed by the National Weather Service for hurricane evacuation planning.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, AH, AO, A99, V, and VE.



54P

FEDERAL EMERGENCY MANAGEMENT AGENCY

ST. CHARLES COUNTY, MO AND INCORPORATED AREAS

FLOOD PROFILES

EAST BRANCH TRIBUTARY B

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
EAST BRANCH TRIBUTARY B								
A	0.600	465	1820	4.0	482.3	482.3	483.3	1.0
B	0.808	345	1314	5.4	484.7	484.7	485.6	0.9
C	1.264	250	991	3.2	492.6	492.6	493.3	0.7
D	1.453	247	755	3.4	498.9	498.9	499.6	0.7
E	1.718	57	323	5.5	506.5	506.5	507.2	0.7
WEST BRANCH TRIBUTARY B								
A	0.284	250	981	2.9	493.8	493.8	494.8	1.0
B	0.691	75	345	7.5	499.7	499.7	500.7	1.0
C	1.256	79	246	6.5	513.8	513.8	514.5	0.7
D	1.746	54	249	4.0	533.9	533.9	533.9	0.0
E	2.017	27	92	10.7	548.0	548.0	548.0	0.0
TRIBUTARY A								
A	0.30	895	3201	2.9	469.7	463.5[2]	464.5	1.0
B	0.90	479	1993	4.3	470.8	470.8	471.6	0.8
C	1.80	253	1234	4.2	483.0	483.0	483.2	0.2
D	2.67	73	309	8.8	497.4	497.4	497.4	0.0
E	2.80	297	767	3.5	502.9	502.9	503.5	0.6
TRIBUTARY NO. 1								
A	4.2	281	1316	1.6	461.0	453.8[2]	454.8	1.0

[1]MILES ABOVE MOUTH
[2]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM DARDENNE CREEK

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

ST. CHARLES COUNTY, MO
AND INCORPORATED AREAS

FLOODWAY DATA

EAST BRANCH TRIBUTARY B–WEST BRANCH TRIBUTARY B–TRIBUTARY A–TRIBUTARY NO. 1

TABLE 1 - SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
TRIBUTARY A					
at mouth	6.08	5,980	8,220	9,360	10,570
at Dingledine Road	1.85	1,980	2,970	3,400	4,390
about 0.14 mile upstream of Gregory Lane	0.12	200	290	330	425
TRIBUTARY NO. 3					
at mouth	0.70	630	950	1,090	1,390
TRIBUTARY NO. 4					
at mouth	1.69	1,620	2,480	2,860	3,740
at St. Peters Road	1.56	1,205	1,830	2,100	2,730
about 0.14 mile upstream of Woodstream Drive	1.04	1,100	1,670	1,920	2,490
EAST BRANCH TRIBUTARY B					
about 0.60 mile upstream of mouth	4.43	4,535	6,375	7,195	8,050
downstream of confluence of West Branch Tributary B	3.95	4,590	6,255	6,990	7,740
upstream of confluence of West Branch Tributary B	1.61	2,390	3,245	3,620	3,965
about 0.3 mile upstream of confluence of West Branch Tributary B	1.06	1,670	2,270	2,540	2,800
at County Highway K	0.55	740	1,005	1,120	1,230
WEST BRANCH TRIBUTARY B					
at mouth	2.19	1,460	2,350	2,810	3,810
about 0.69 mile upstream of mouth	1.82	1,345	2,180	2,605	3,520
about 1.26 miles upstream of mouth	1.16	840	1,340	1,605	2,170
about 2.02 miles upstream of mouth	0.59	505	830	990	1,360

APPENDIX B

EXISTING CONDITIONS HEC-RAS MODEL

- INPUT
- OUTPUT
- CROSS SECTION PLOTS

HEC-RAS Version 2.0 April 1997
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: Project #95-7218B; Pheasant Point
Project File : 95-7218b.prj
Run Date and Time: 2/25/99 2:13:56 PM

Project in English units

Project Description:
Pheasant Point Flood Study (Existing Conditions and Proposed Conditions)
09
FEB 1999
Sean Martin

PLAN DATA

Plan Title: Existing Conditions Model
Plan File : c:\hec\ras\data\7218b\95-7218b.p09

Geometry Title: Existing Conditions
Geometry File : c:\hec\ras\data\7218b\95-7218b.g01

Flow Title : 10-YR and 100-YR Flowrates
Flow File : c:\hec\ras\data\7218b\95-7218b.f01

Plan Summary Information:

Number of:	Cross Sections	= 7	Mulitple Openings	=	0
	Culverts	= 0	Inline Weirs	=	0
	Bridges	= 0			

Computational Information

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

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: 10-YR and 100-YR Flowrates
Flow File : c:\hec\ras\data\7218b\95-7218b.f01

Flow Data (cfs)

River	Reach	RS	10-Yr	100-Yr
E. Branch Trib.	Pheasant Point	3168	4535	7195

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
E. Branch Trib.	Pheasant Point	10-Yr		Known WS = 479.9
E. Branch Trib.	Pheasant Point	100-Yr		Known WS = 481.5

GEOMETRY DATA

Geometry Title: Existing Conditions
Geometry File : c:\hec\ras\data\7218b\95-7218b.g01

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 3168

INPUT

Description: Upstream Boundary Condition (River Mile 0.6)
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	490	30.18	486.56	36.18	485.91	64.86	484.29	77.52	482.88
99.04	480.02	160.69	478.91	224.28	478.65	274.84	478.92	312.68	478.92
331.02	478.87	375.79	479.2	385.48	479.24	446.53	479.05	470.6	479.13
487.27	479.39	501.93	479.58	520.87	480	538.8	480.34	576.03	480.63
599.7	480.44	619.34	480.24	633.34	480.08	645.9	479.74	651.72	478.67
654.67	478	667.33	477.47	674.57	477.15	679.94	476.01	681.25	475.29
682.94	474.01	686.14	472	688.06	470.63	689.15	470	706.47	470
711.69	471.95	717.19	474	720.77	475.33	722.59	476	725.17	476.74
729.12	478	733.19	479.38	735.23	480	739.97	481.66	749.81	483.28
754.7	484	760.06	484.67	771.18	486	778.5	486.92	788.17	488
804.44	490								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	645.9	.04	735.23	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
645.9	735.23	280	468	485	.1 .3

CROSS SECTION OUTPUT Profile #10-Yr

			Left OB	Channel	Right OB
W.S. Elev (ft)	481.33	Element			
Vel Head (ft)	0.15	Wt. n-Val.	0.033	0.040	0.060
E.G. Elev (ft)	481.48	Reach Len. (ft)	280.00	468.00	485.00
Crit W.S. (ft)		Flow Area (sq ft)	1076.18	571.21	2.54
E.G. Slope (ft/ft)	0.000961	Area (sq ft)	1076.18	571.21	2.54
Q Total (cfs)	4535.00	Flow (cfs)	2330.15	2203.41	1.43
Top Width (ft)	649.88	Top Width (ft)	556.75	89.33	3.81
Vel Total (ft/s)	2.75	Avg. Vel. (ft/s)	2.17	3.86	0.56
Max Chl Dpth (ft)	11.33	Hydr. Depth (ft)	1.93	6.39	0.67
Conv. Total (cfs)	146323.2	Conv. (cfs)	75183.1	71093.8	46.2
Length Wtd. (ft)	364.87	Wetted Per. (ft)	556.86	93.14	4.04
Min Ch El (ft)	470.00	Shear (lb/sq ft)	0.12	0.37	0.04
Alpha	1.28	Stream Power (lb/ft s)	0.25	1.42	0.02
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	20.01	11.59	9.95
C & E Loss (ft)	0.01	Cum SA (acres)	11.29	1.59	4.62

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2700

INPUT
Description: Upstream Bridge Contraction Section (1 x Bridge Length)
Station Elevation Data num= 55

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	490	19.4	488.27	44.03	486	63.58	485.88	79.38	483.91
94.44	482.03	101.08	481.17	110.41	480	132.67	478.77	141.38	478.25
160.78	478.27	215.24	478.41	250.43	478.49	287.49	478.49	337.23	478.53
358.98	478.6	387.46	478.82	402.38	478.74	425.56	478.73	464.8	478.66
486.18	479.24	512.03	479.07	539.45	478.72	598.73	479.16	616.5	479.23
665.98	479.9	687.97	480	701.4	480	704.43	478.93	706.9	478
712.19	476.09	715.8	474	717.11	472.89	720.17	470.54	720.92	470
723.37	468.24	730.58	468.24	737.34	470	738.12	470.22	744.92	472
749.02	473.09	752.44	474	754.79	474.62	759.76	476	763.04	476.92
766.95	478	775.9	479.47	778.95	480	792.84	481.53	797.33	481.98
812.25	483.78	818.07	484.55	828.92	486	844.04	488	859.18	490

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	701.4	.04	778.95	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
701.4	778.95	80	100	85	.1	.3

CROSS SECTION OUTPUT Profile #10-Yr

W.S. Elev (ft)	481.05	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.	0.033	0.040	0.060
E.G. Elev (ft)	481.17	Reach Len. (ft)	80.00	100.00	85.00
Crit W.S. (ft)		Flow Area (sq ft)	1303.79	538.06	5.04
E.G. Slope (ft/ft)	0.000724	Area (sq ft)	1303.79	538.06	5.04
Q Total (cfs)	4535.00	Flow (cfs)	2651.11	1881.70	2.18
Top Width (ft)	686.51	Top Width (ft)	599.39	77.55	9.57
Vel Total (ft/s)	2.46	Avg. Vel. (ft/s)	2.03	3.50	0.43
Max Chl Dpth (ft)	12.81	Hydr. Depth (ft)	2.18	6.94	0.53
Conv. Total (cfs)	168566.2	Conv. (cfs)	98542.0	69943.1	81.1
Length Wtd. (ft)	87.23	Wetted Per. (ft)	599.53	82.20	9.63
Min Ch El (ft)	468.24	Shear (lb/sq ft)	0.10	0.30	0.02
Alpha	1.24	Stream Power (lb/ft s)	0.20	1.03	0.01
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	12.36	5.63	9.91
C & E Loss (ft)	0.00	Cum SA (acres)	7.57	0.70	4.55

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2600

INPUT
Description: Section Upstream of Bridge Face
Station Elevation Data num= 71

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	490	16.29	488.7	34.22	487.3	58.22	486.39	66.58	486

70.6	485.42	75.32	484.77	80.84	484	88.59	482.91	95.22	482
109.01	480.1	157.49	478.38	169.39	478.52	195.55	478.29	228.62	478.16
247.74	478.18	273.93	478.23	326.15	478.41	333.83	478.46	373.34	478.69
381.2	478.63	403.53	478.6	436.23	478.54	449.16	478.56	463.7	478.74
473.37	478.85	496.76	479	509.84	478.94	524.56	479.15	550.58	479.14
589.57	479.13	622.12	479.1	663.72	479.15	676.3	479.48	693.91	479.79
705.27	480	719.81	480	722.12	478	723.17	476.84	723.87	476
724.85	474.69	725.7	473.67	726.4	472.72	726.9	472.2	727.37	471.59
728.78	470	730.67	467.89	739.77	467.89	742.5	470	743.72	470.83
744.56	471.16	745.32	471.6	746.06	472	746.91	472.28	748.74	473.49
749.66	474	750.74	474.6	753.26	476	754.52	476.7	756.86	478
758.24	478.77	760.46	480	761.92	480.81	764.06	482	791.9	483.46
801.19	484	809.63	485.48	815.11	486.44	823.63	488	833.64	489.87
834.31	490								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	719.81	.04	764.06	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
719.81	764.06	80	100	105	.1	.3

CROSS SECTION OUTPUT Profile #10-Yr

W.S. Elev (ft)	480.94	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.	0.033	0.040	
E.G. Elev (ft)	481.09	Reach Len. (ft)	80.00	100.00	105.00
Crit W.S. (ft)		Flow Area (sq ft)	1301.72	332.56	
E.G. Slope (ft/ft)	0.001060	Area (sq ft)	1301.72	332.56	
Q Total (cfs)	4535.00	Flow (cfs)	3138.54	1396.46	
Top Width (ft)	659.28	Top Width (ft)	616.93	42.35	
Vel Total (ft/s)	2.77	Avg. Vel. (ft/s)	2.41	4.20	
Max Chl Dpth (ft)	13.05	Hydr. Depth (ft)	2.11	7.85	
Conv. Total (cfs)	139311.3	Conv. (cfs)	96413.2	42898.1	
Length Wtd. (ft)	86.07	Wetted Per. (ft)	617.04	51.40	
Min Ch El (ft)	467.89	Shear (lb/sq ft)	0.14	0.43	
Alpha	1.23	Stream Power (lb/ft s)	0.34	1.80	
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	9.97	4.63	9.90
C & E Loss (ft)	0.00	Cum SA (acres)	6.46	0.56	4.54

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2500

INPUT
Description: Section Downstream of Bridge
Station Elevation Data num= 68

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	490	11.11	489.08	23.44	488	26.89	487.71	59.35	486.06
63.78	486	67.77	485.39	77.38	484	88.39	482.4	91.12	482
95.73	481.33	104.61	480	133.9	479.18	160.92	478.29	188.63	478.4
212.58	478.46	251.59	478.44	287.19	478.17	299.57	478.42	327.28	478.14
346.63	478.11	358.6	478.29	395.46	478.59	460.36	478.16	468.92	478.15
494.81	478.3	522	478.43	540.84	478.5	578.39	478.81	613.13	478.58
661.24	480	668.75	480.05	674.82	480.09	679.12	480	693.97	480
706.04	480.16	712.61	480.18	719	480.22	751.11	480	753.19	478
754.94	476.43	757.14	474.21	759.06	472.25	759.31	472	759.66	471.66
761.22	470	763.55	467.52	771.79	467.52	775.45	470	777.12	471.13
778.34	472	779.4	472.78	781.16	474	782.33	474.88	784.05	476
785.22	476.85	786.8	478	788.01	478.84	789.48	480	790.99	481.16
792.12	482	795.66	483.16	798.98	484	808.86	485.45	815.75	486.5
825.97	488	833.92	489.16	839.21	490				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	751.11	.04	792.12	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
751.11	792.12	45	75	80	.1	.3

CROSS SECTION OUTPUT Profile #10-Yr

			Left OB	Channel	Right OB
W.S. Elev (ft)	480.86	Element			
Vel Head (ft)	0.14	Wt. n-Val.	0.033	0.040	
E.G. Elev (ft)	481.00	Reach Len. (ft)	45.00	75.00	80.00
Crit W.S. (ft)		Flow Area (sq ft)	1355.14	324.09	
E.G. Slope (ft/ft)	0.001023	Area (sq ft)	1355.14	324.09	
Q Total (cfs)	4535.00	Flow (cfs)	3177.09	1357.91	
Top Width (ft)	691.72	Top Width (ft)	652.23	39.49	
Vel Total (ft/s)	2.70	Avg. Vel. (ft/s)	2.34	4.19	
Max Chl Dpth (ft)	13.34	Hydr. Depth (ft)	2.08	8.21	
Conv. Total (cfs)	141799.8	Conv. (cfs)	99340.7	42459.1	
Length Wtd. (ft)	55.40	Wetted Per. (ft)	652.36	48.93	
Min Ch El (ft)	467.52	Shear (lb/sq ft)	0.13	0.42	
Alpha	1.25	Stream Power (lb/ft s)	0.31	1.77	
Frctn Loss (ft)	0.08	Cum Volume (acre-ft)	7.53	3.87	9.90
C & E Loss (ft)	0.02	Cum SA (acres)	5.29	0.46	4.54

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2425

INPUT
Description: Section 2425
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	490	33.89	486.89	44.72	486.22	51.53	486.12	59.98	486
67.94	484.76	98.78	481	168.26	478.49	181.58	478.45	239.03	478.52
251.1	478.58	298.56	478.16	327.59	478.18	348.66	478.14	374.96	478.55
403.4	478.95	422.83	479.1	449.31	478.89	464.58	479.01	516.34	479.35
551.99	478.92	577.6	479.39	605.57	479.71	638.7	480	669.28	479.71
681.6	479.65	714.11	480	761.87	480	763.47	478	763.91	477.43
765.09	476	765.89	475.08	766.8	474	768.01	472.65	768.55	472
770.2	470	772.61	467.25	780.1	467.25	783.89	470	784.5	470.44
786.64	472	788.1	473.07	789.4	474	791.43	475.46	792.17	476
793.08	476.67	794.91	478	797	479.52	797.66	480	798.39	480.53
800.42	482	801.21	482.57	803.18	484	816.16	485.74	820.41	486.29
834.19	488	848.06	490						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	761.87	.04	803.18	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
761.87	803.18	135	225	220	.1	.3

CROSS SECTION OUTPUT Profile #10-Yr

			Left OB	Channel	Right OB
W.S. Elev (ft)	480.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.29	Wt. n-Val.	0.033	0.040	
E.G. Elev (ft)	480.90	Reach Len. (ft)	135.00	225.00	220.00
Crit W.S. (ft)		Flow Area (sq ft)	986.51	299.13	
E.G. Slope (ft/ft)	0.002198	Area (sq ft)	986.51	299.13	
Q Total (cfs)	4535.00	Flow (cfs)	2743.48	1791.52	
Top Width (ft)	688.97	Top Width (ft)	652.34	36.63	
Vel Total (ft/s)	3.53	Avg. Vel. (ft/s)	2.78	5.99	
Max Chl Dpth (ft)	13.36	Hydr. Depth (ft)	1.51	8.17	
Conv. Total (cfs)	96734.6	Conv. (cfs)	58520.3	38214.4	
Length Wtd. (ft)	170.79	Wetted Per. (ft)	652.40	46.91	
Min Ch El (ft)	467.25	Shear (lb/sq ft)	0.21	0.88	
Alpha	1.51	Stream Power (lb/ft s)	0.58	5.24	
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	6.32	3.34	9.90
C & E Loss (ft)	0.00	Cum SA (acres)	4.62	0.40	4.54

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2200

INPUT
Description: Section for Change in Channel Geometry
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	490	20.96	488	40.32	488	74.06	482.42	95.14	479.91
148.94	478.23	171.31	478.57	185.41	478.5	212.14	478.2	286.03	478.25
368.31	479.28	436.66	479.04	445.59	478.92	492.27	479.47	559.41	479.33
607.23	478.89	616.74	478.75	632.72	478.7	673.06	478.76	716.41	478.67
791.75	478.33	808.1	478	809.38	476	810.66	474	812	472
813.48	470	816.13	466.42	821.44	466.42	827.71	470	830.99	472
834.43	474	837.83	476	841.22	478	844.6	480	847.98	482
850.91	482.55	855.84	484	877.87	486	900.29	487.94	908.62	488.7
922.25	490								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	808.1	.04	855.84	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
808.1	855.84	145	200	215	.1	.3

CROSS SECTION OUTPUT Profile #10-Yr

			Left OB	Channel	Right OB
W.S. Elev (ft)	480.24	Element			
Vel Head (ft)	0.29	Wt. n-Val.	0.033	0.040	
E.G. Elev (ft)	480.53	Reach Len. (ft)	145.00	200.00	215.00
Crit W.S. (ft)		Flow Area (sq ft)	1026.66	303.34	
E.G. Slope (ft/ft)	0.002141	Area (sq ft)	1026.66	303.34	
Q Total (cfs)	4535.00	Flow (cfs)	2720.61	1814.39	
Top Width (ft)	752.68	Top Width (ft)	715.77	36.91	
Vel Total (ft/s)	3.41	Avg. Vel. (ft/s)	2.65	5.98	
Max Chl Dpth (ft)	13.82	Hydr. Depth (ft)	1.43	8.22	
Conv. Total (cfs)	98000.0	Conv. (cfs)	58791.6	39208.5	
Length Wtd. (ft)	173.29	Wetted Per. (ft)	715.84	46.74	
Min Ch El (ft)	466.42	Shear (lb/sq ft)	0.19	0.87	
Alpha	1.59	Stream Power (lb/ft s)	0.51	5.19	
Frctn Loss (ft)	0.31	Cum Volume (acre-ft)	3.20	1.78	9.90
C & E Loss (ft)	0.00	Cum SA (acres)	2.50	0.21	4.54

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2000

INPUT
Description: Downstream Boundary Condition
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	490	13.21	489.06	32.59	488.11	48.85	488	56.69	487.07
83.15	483.94	91.72	483.18	102.63	482.22	105.16	482	117.11	481.42
126.12	480.97	143.31	480.06	196.97	478.83	253.14	478.28	274.65	478.17
311.69	478.38	363.54	478.9	384.05	478.93	428.21	478.84	475.47	479.51
537.47	478.78	574.72	478.64	642.78	478.68	698.14	478.29	756.13	479.37
771.34	479.18	855.5	479.2	871.22	478.95	902.69	478	934.57	476
939.94	474	945.48	472	950.95	470	952.24	465.68	960.72	465.68
970.5	470	975.01	472	979.44	474	983.92	476	988.42	478
1006.61	478.45	1028.74	478.42	1036.01	478.38	1064.61	478.5	1080.3	478.62
1092.47	478.56	1116.5	478.05	1164.27	477.64	1252.11	477.6	1857.54	477.6
1903.07	480	1934.88	480.8	1963.49	480	1999.42	477.6	2883.5	477.6
2920.7	490	3000	490						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.033	934.57	.04	988.42	.06	1080.3	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
934.57	988.42	0	0	0	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
1055	3000	490

CROSS SECTION OUTPUT Profile #10-Yr

W.S. Elev (ft)	479.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.32	Wt. n-Val.	0.033	0.040	0.060
E.G. Elev (ft)	480.22	Reach Len. (ft)			
Crit W.S. (ft)	477.42	Flow Area (sq ft)	896.80	473.02	101.90
E.G. Slope (ft/ft)	0.001514	Area (sq ft)	896.80	473.02	4012.85
Q Total (cfs)	4535.00	Flow (cfs)	1718.20	2686.38	130.42
Top Width (ft)	2676.30	Top Width (ft)	784.28	53.85	1838.17
Vel Total (ft/s)	3.08	Avg. Vel. (ft/s)	1.92	5.68	1.28
Max Chl Dpth (ft)	14.22	Hydr. Depth (ft)	1.14	8.78	1.53
Conv. Total (cfs)	116533.2	Conv. (cfs)	44151.6	69030.2	3351.4
Length Wtd. (ft)		Wetted Per. (ft)	784.40	60.75	66.59
Min Ch El (ft)	465.68	Shear (lb/sq ft)	0.11	0.74	0.14
Alpha	2.16	Stream Power (lb/ft s)	0.21	4.18	0.19
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning - Divided flow computed for this cross-section.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
Note - Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

SUMMARY OF MANNING'S N VALUES

River:E. Branch Trib.

Reach	River Sta.	n1	n2	n3	n4
Pheasant Point	3168	.033	.04	.06	
Pheasant Point	2700	.033	.04	.06	
Pheasant Point	2600	.033	.04	.06	
Pheasant Point	2500	.033	.04	.06	
Pheasant Point	2425	.033	.04	.06	
Pheasant Point	2200	.033	.04	.06	
Pheasant Point	2000	.033	.04	.06	.035

SUMMARY OF REACH LENGTHS

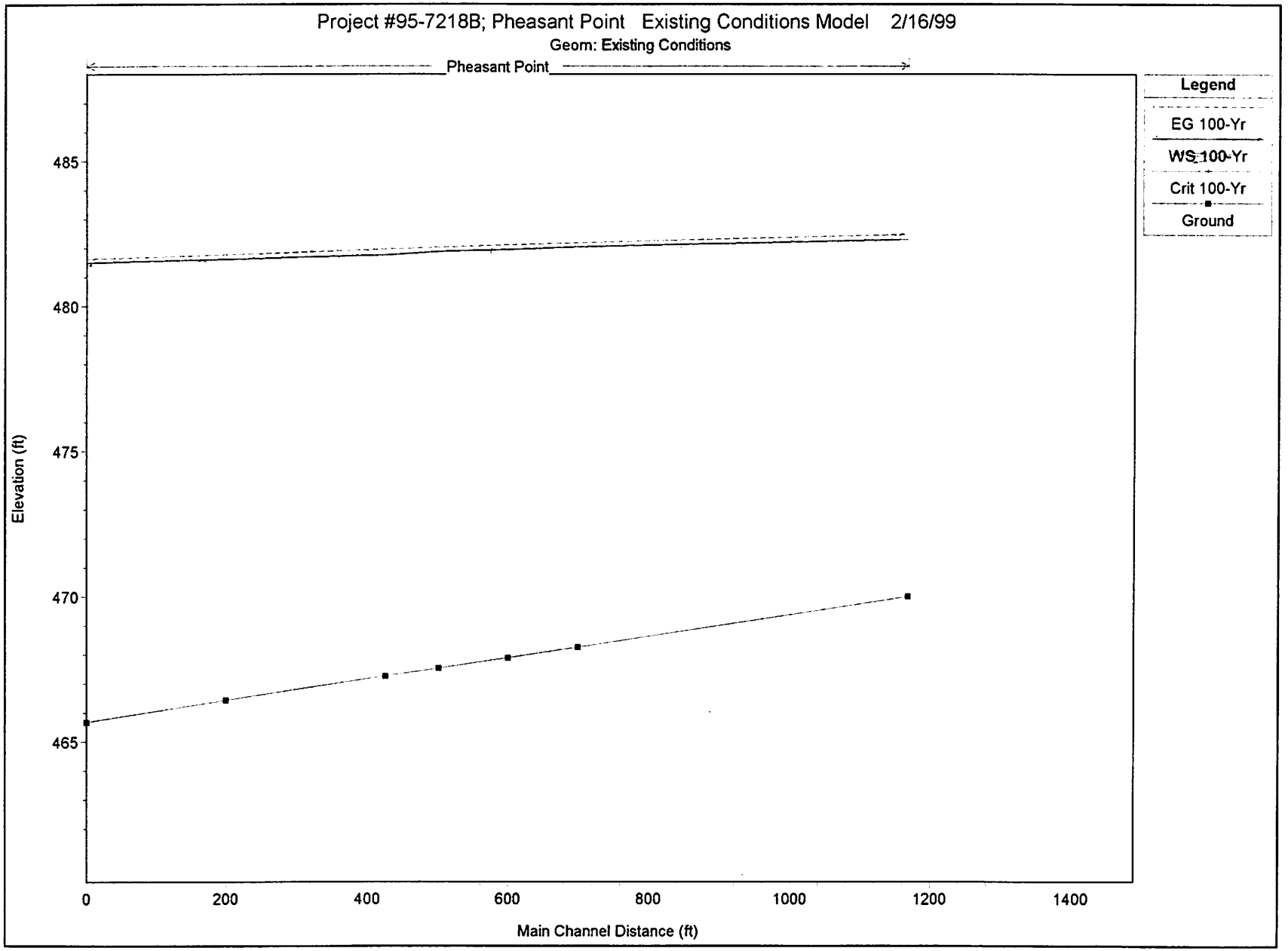
River: E. Branch Trib.

Reach	River Sta.	Left	Channel	Right
Pheasant Point	3168	280	468	485
Pheasant Point	2700	80	100	85
Pheasant Point	2600	80	100	105
Pheasant Point	2500	45	75	80
Pheasant Point	2425	135	225	220
Pheasant Point	2200	145	200	215
Pheasant Point	2000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: E. Branch Trib.

Reach	River Sta.	Contr.	Expan.
Pheasant Point	3168	.1	.3
Pheasant Point	2700	.1	.3
Pheasant Point	2600	.1	.3
Pheasant Point	2500	.1	.3

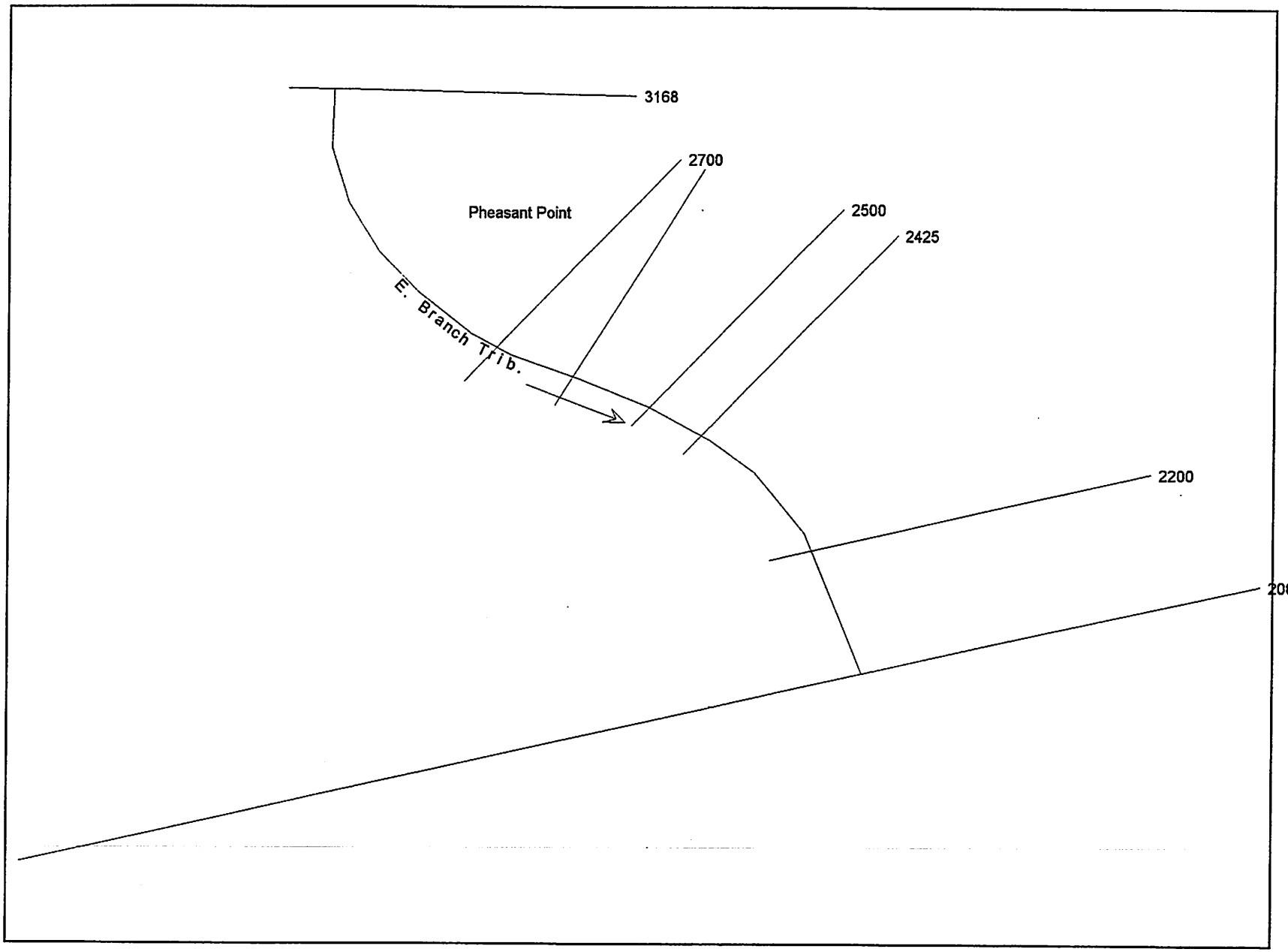
Pheasant Point	2425	.1	.3
Pheasant Point	2200	.1	.3
Pheasant Point	2000	.1	.3

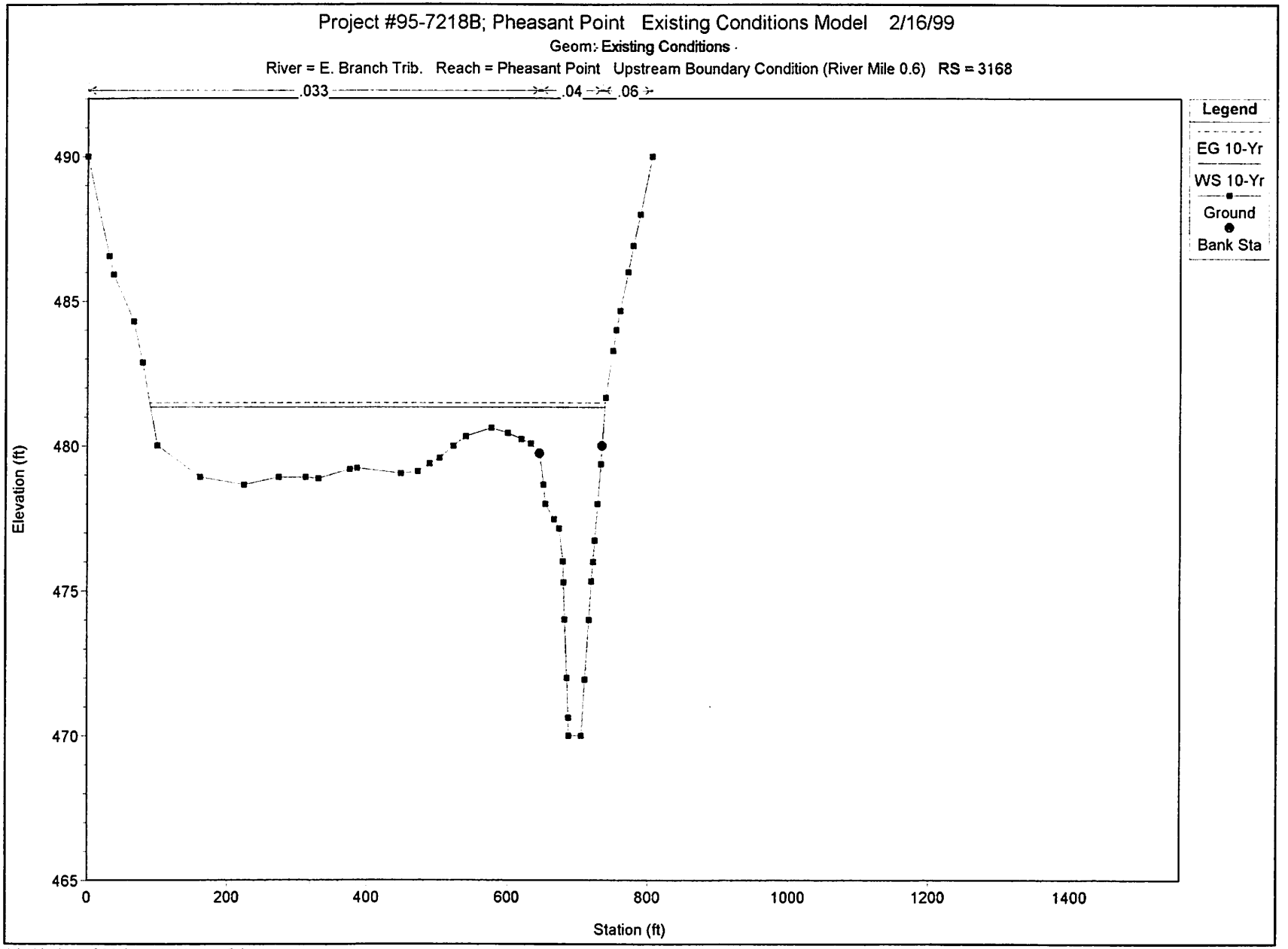


1 in Horiz. = 200 ft 1 in Vert. = 5 ft

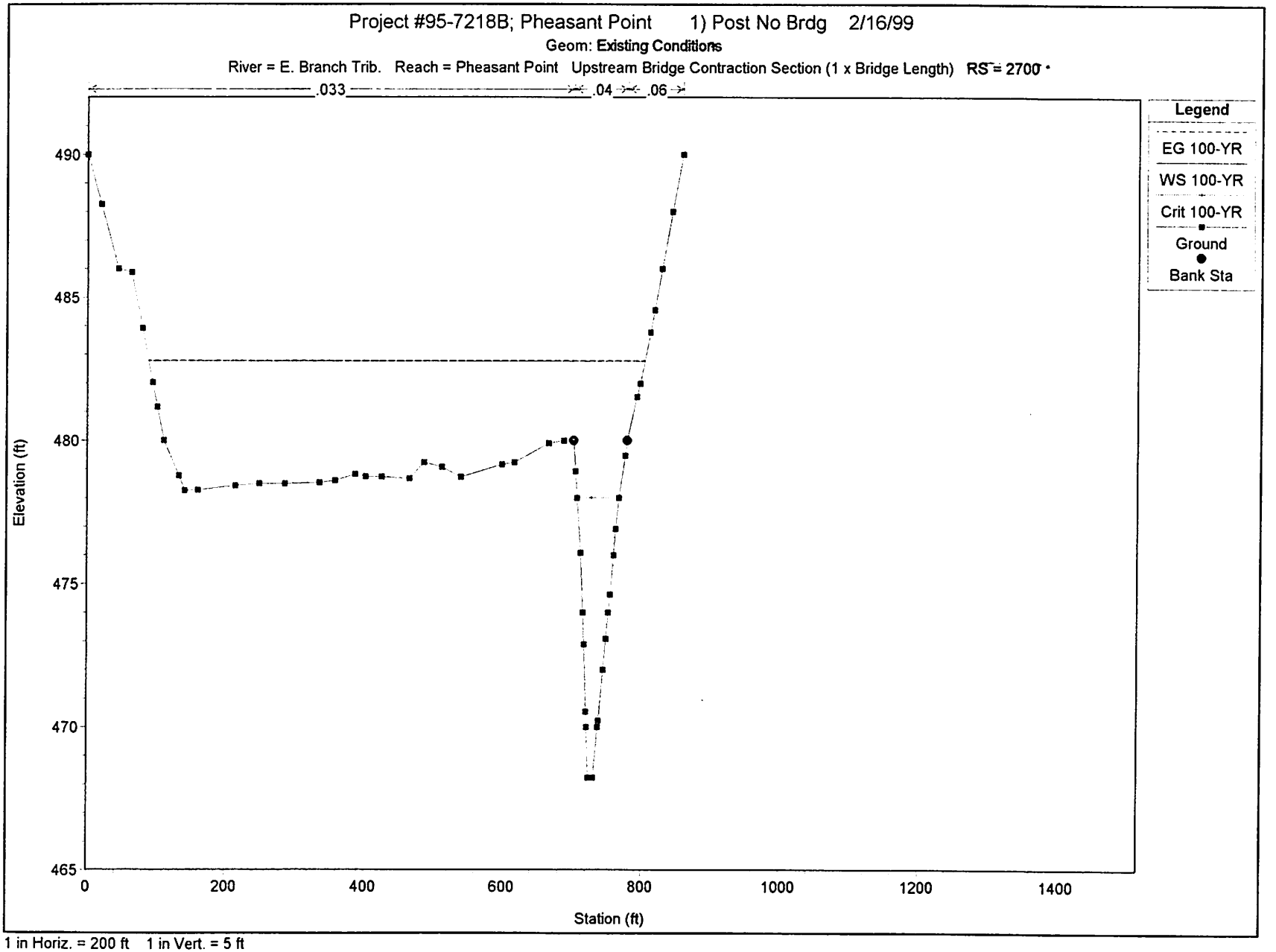
HEC-RAS Plan: Existing River: E. Branch Trib. Reach: Pheasant Point

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)	
Pheasant Point	3168	100-Yr	7195.00	470.00	482.29		482.46	0.000931	4.17	2275.48	661.81	0.27
Pheasant Point	2700	100-Yr	7195.00	468.24	482.03		482.17	0.000712	3.79	2526.11	703.33	0.24
Pheasant Point	2600	100-Yr	7195.00	467.89	481.94		482.10	0.000950	4.20	2292.28	668.26	0.25
Pheasant Point	2500	100-Yr	7195.00	467.52	481.87		482.02	0.000886	4.12	2380.40	699.90	0.24
Pheasant Point	2425	100-Yr	7195.00	467.25	481.75		481.96	0.001369	5.03	2081.05	707.41	0.30
Pheasant Point	2200	100-Yr	7195.00	466.42	481.60		481.76	0.001009	4.39	2359.46	766.36	0.26
Pheasant Point	2000	100-Yr	7195.00	465.68	481.50	480.01	481.63	0.000611	4.03	2949.61	2779.74	0.22

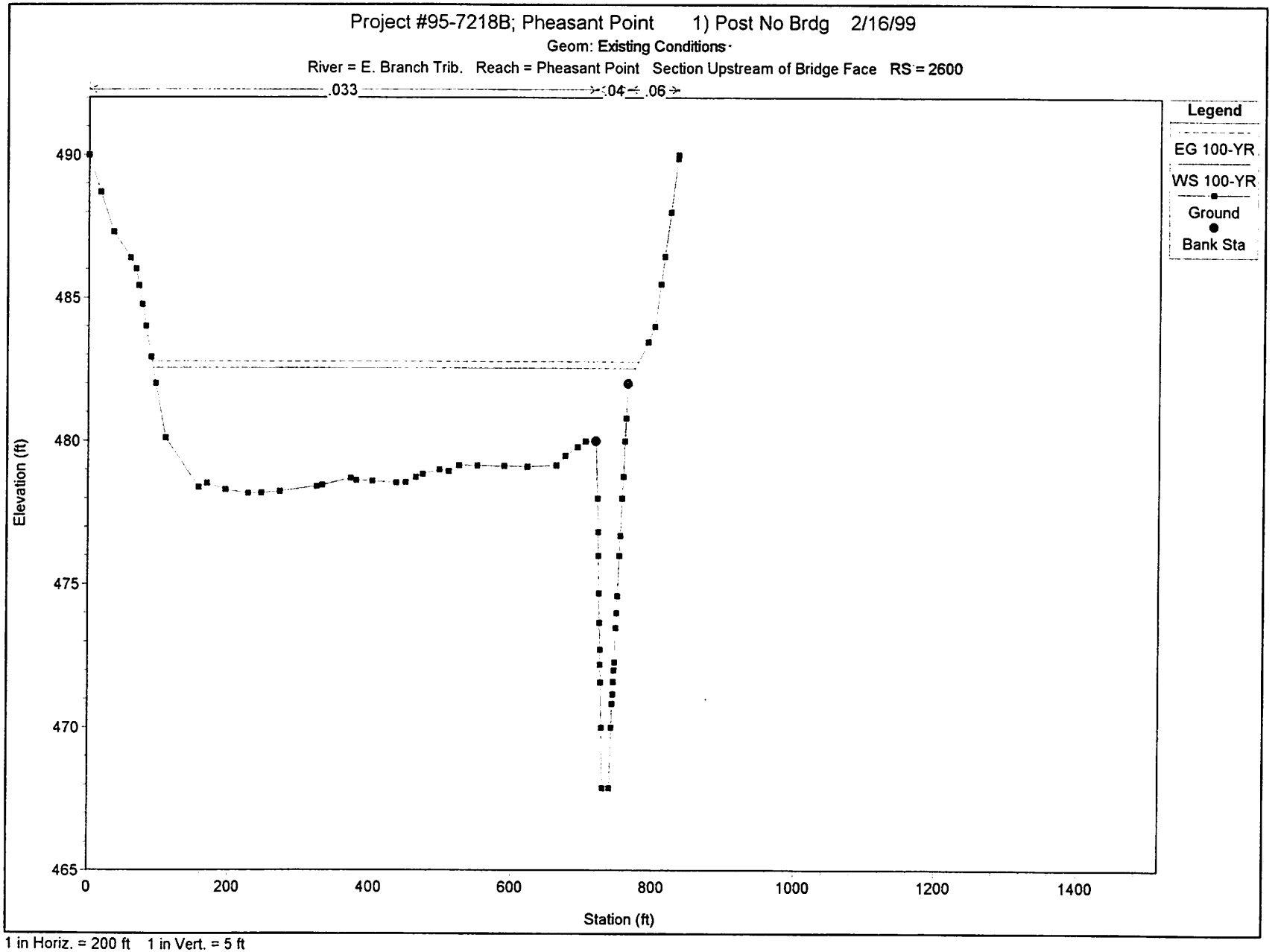

3168
2700
Pheasant Point
2500
2425
E. Branch Tfib.
2200
2000



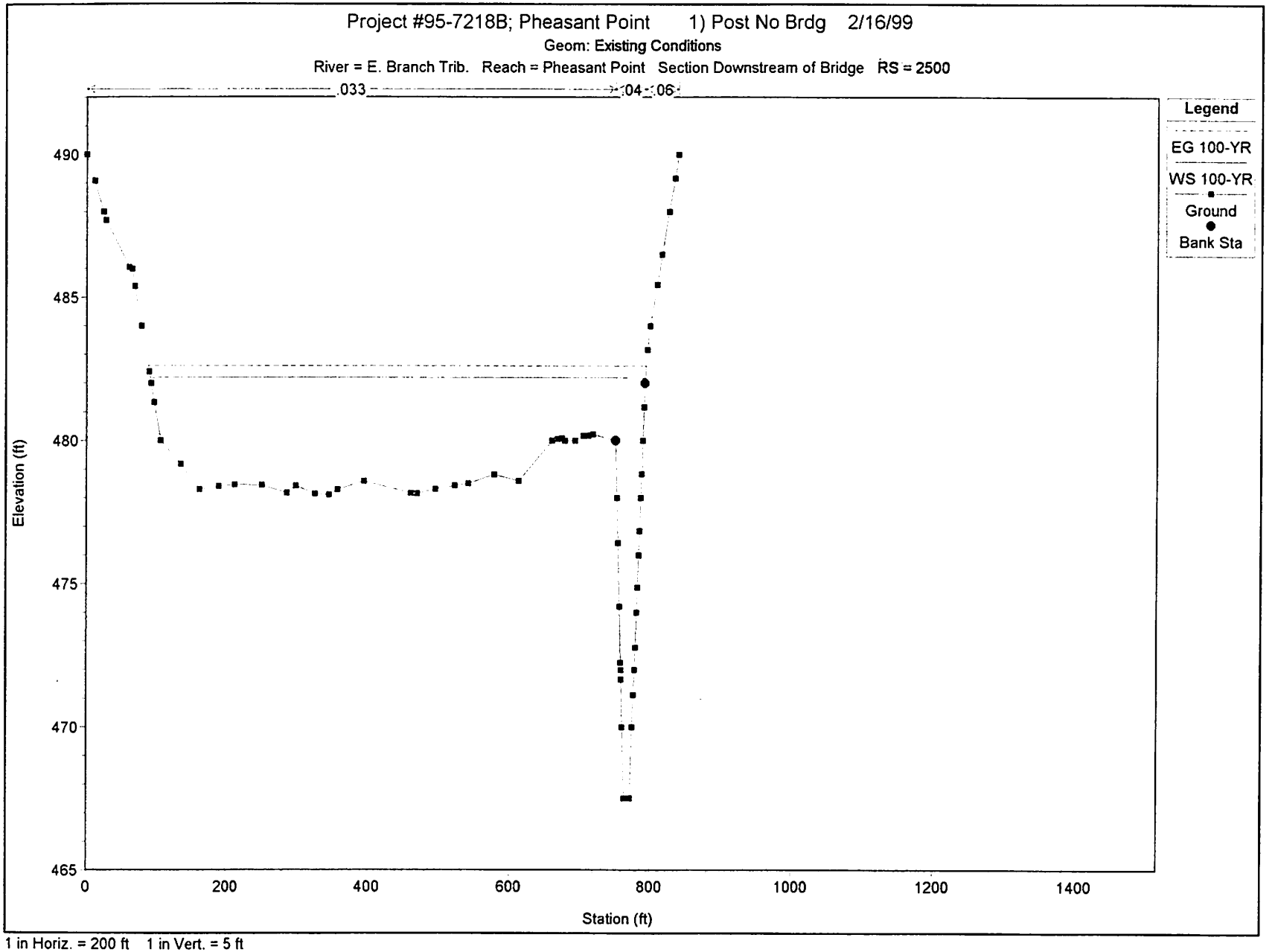
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



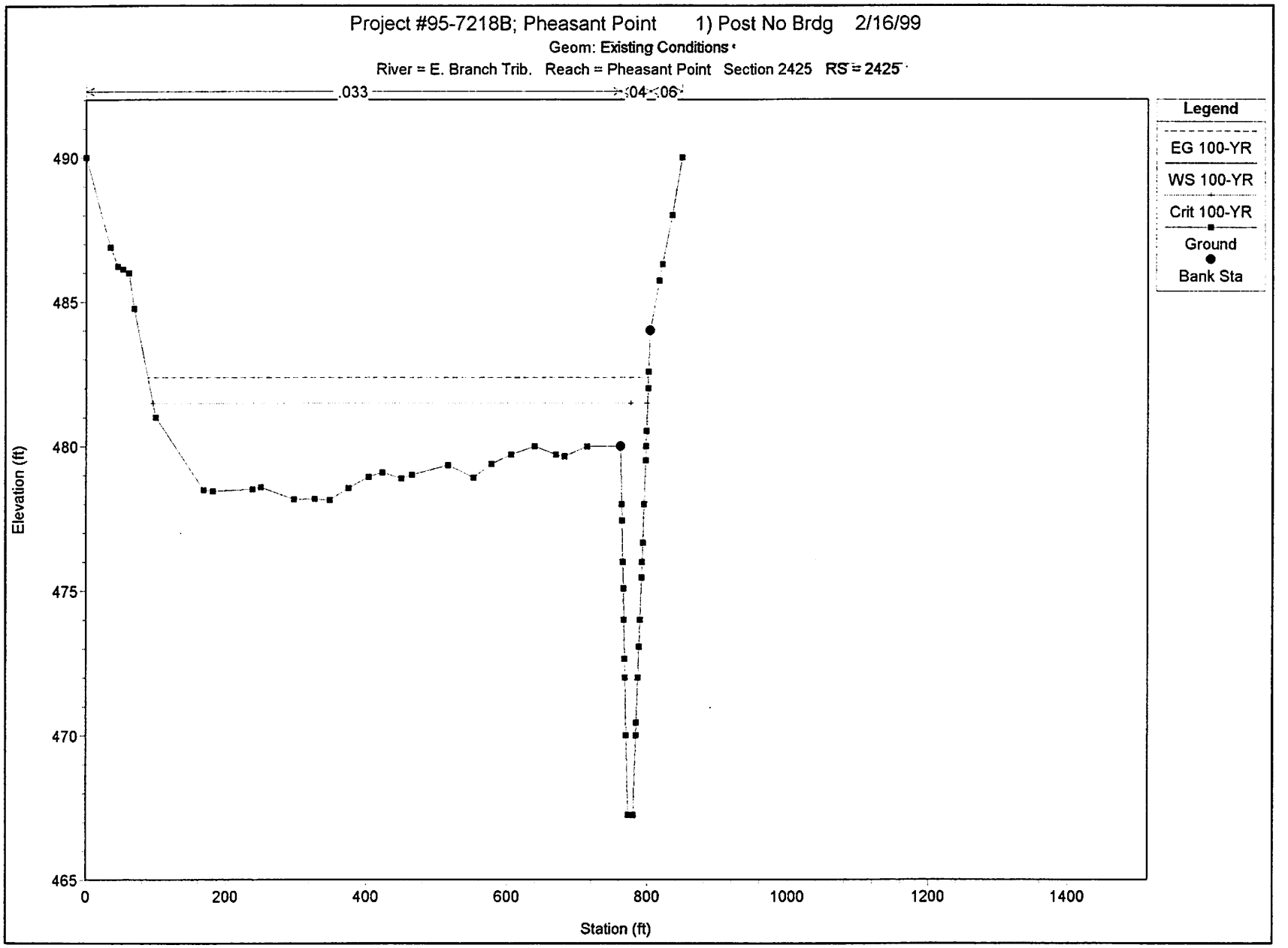
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



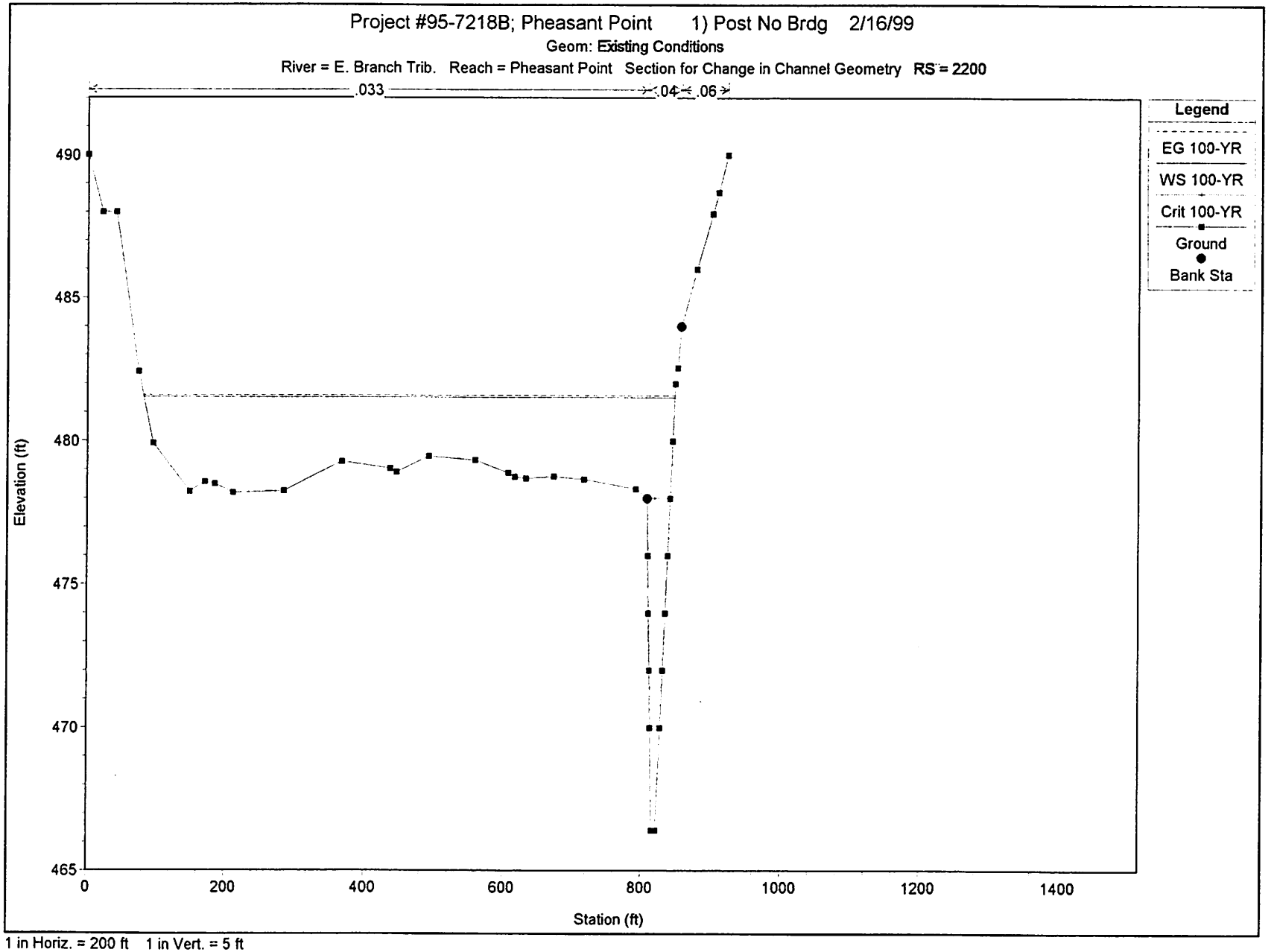
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



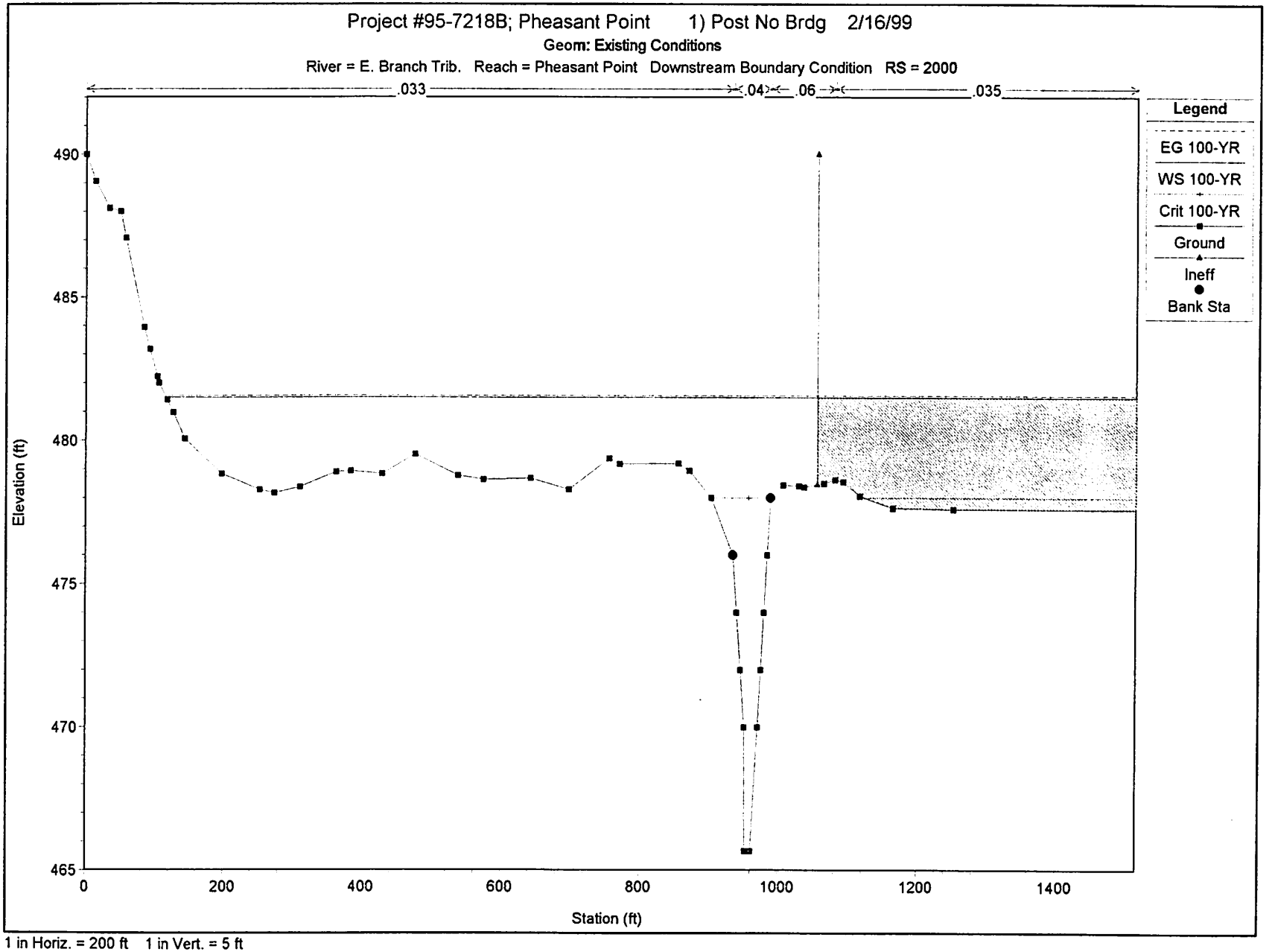
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



1 in Horiz. = 200 ft 1 in Vert. = 5 ft



1 in Horiz. = 200 ft 1 in Vert. = 5 ft



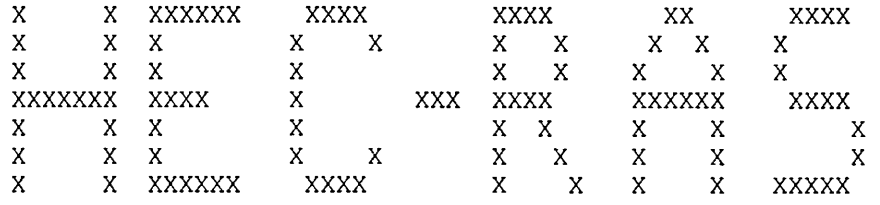
1 in Horiz. = 200 ft 1 in Vert. = 5 ft

APPENDIX C

PROPOSED CONDITIONS HEC-RAS MODEL

- INPUT
- OUTPUT
- CROSS SECTION PLOTS

HEC-RAS Version 2.0 April 1997
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104



PROJECT DATA
Project Title: Project #95-7218B; Pheasant Point
Project File : 95-7218b.prj
Run Date and Time: 2/25/99 1:31:02 PM

Project in English units

Project Description:
Pheasant Point Flood Study (Existing Conditions and Proposed Conditions)
09
FEB 1999
Sean Martin

PLAN DATA

Plan Title: New 140' Br w/ Chan. Mod. 1
Plan File : c:\hec\ras\data\7218b\95-7218b.p27

Geometry Title: New 140' Br w/ Chan. Mod. 1
Geometry File : c:\hec\ras\data\7218b\95-7218b.g23

Flow Title : 100-YR Flood
Flow File : c:\hec\ras\data\7218b\95-7218b.f03

Plan Summary Information:
Number of: Cross Sections = 9 Mulitple Openings = 0
Culverts = 0 Inline Weirs = 0
Bridges = 1

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

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: 100-YR Flood
Flow File : c:\hec\ras\data\7218b\95-7218b.f03

Flow Data (cfs)

River	Reach	RS	100-YR
E. Branch Trib.	Pheasant Point	3168	7195

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
E. Branch Trib.	Pheasant Point	100-YR		Known WS = 481.5

GEOMETRY DATA

Geometry Title: New 140' Br w/ Chan. Mod. 1
Geometry File : c:\hec\ras\data\7218b\95-7218b.g23

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 3168

INPUT
Description: Upstream Boundary Condition (River Mile 0.6)

Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	15.11	482	30.15	480	91.8	478.9	106.57	478.83
155.21	478.65	180.61	478.77	205.94	478.91	243.78	478.91	257.66	478.87
306.9	479.19	316.41	479.24	377.45	479.05	401.71	479.11	418.19	479.39
432.85	479.58	451.8	480	458.47	480.15	506.95	480.63	522.87	480.51
537.95	480.37	550.27	480.24	564.15	480.08	575.5	480	585.59	478
605.49	477.15	611.05	476	614.04	474	617.08	472	620.08	470
637.58	470	642.61	471.95	648.11	474	651.69	475.33	656.1	476.74
660.05	478	664.12	479.38	666.15	480	672.04	482	685.62	484

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	575.5	.04	666.15	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
575.5	666.15	40	93	.1	.3

CROSS SECTION OUTPUT Profile #100-YR

			Left OB	Channel	Right OB
W.S. Elev (ft)	482.22	Element			
Vel Head (ft)	0.18	Wt. n-Val.	0.033	0.040	0.060
E.G. Elev (ft)	482.41	Reach Len. (ft)	40.00	93.00	93.00
Crit W.S. (ft)		Flow Area (sq ft)	1573.76	654.11	7.37
E.G. Slope (ft/ft)	0.000986	Area (sq ft)	1573.76	654.11	7.37
Q Total (cfs)	7195.00	Flow (cfs)	4418.75	2770.71	5.54
Top Width (ft)	660.13	Top Width (ft)	562.08	90.65	7.40
Vel Total (ft/s)	3.22	Avg. Vel. (ft/s)	2.81	4.24	0.75
Max Chl Dpth (ft)	12.22	Hydr. Depth (ft)	2.80	7.22	1.00
Conv. Total (cfs)	229170.5	Conv. (cfs)	140743.0	88250.9	176.6
Length Wtd. (ft)	62.26	Wetted Per. (ft)	562.25	94.50	7.75
Min Ch El (ft)	470.00	Shear (lb/sq ft)	0.17	0.43	0.06
Alpha	1.13	Stream Power (lb/ft s)	0.48	1.80	0.04
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	55.22	30.03	17.39
C & E Loss (ft)	0.03	Cum SA (acres)	7.56	2.94	5.00

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 3075

INPUT
Description: Cross Sections at RS=3075
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	484	25	482	65	479.25	211.37	479.25	245.18	479.5
273	480	444.91	480	448	478	450.93	476	453.97	474
457.04	472	460.14	470	460.68	469.65	476.99	469.65	478.82	470
484.05	472	489.28	474	494.51	476	499.3	478	504.09	480
508.89	482	527.19	484						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	444.91	.04	508.89	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
444.91	508.89	32	50	50 .1	.3

CROSS SECTION OUTPUT Profile #100-YR

W.S. Elev (ft)	481.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.46	Wt. n-Val.	0.025	0.040	
E.G. Elev (ft)	482.29	Reach Len. (ft)	32.00	50.00	50.00
Crit W.S. (ft)		Flow Area (sq ft)	884.55	511.16	
E.G. Slope (ft/ft)	0.002051	Area (sq ft)	884.55	511.16	
Q Total (cfs)	7195.00	Flow (cfs)	3926.79	3268.21	
Top Width (ft)	481.13	Top Width (ft)	417.54	63.59	
Vel Total (ft/s)	5.16	Avg. Vel. (ft/s)	4.44	6.39	
Max Chl Dpth (ft)	12.19	Hydr. Depth (ft)	2.12	8.04	
Conv. Total (cfs)	158873.4	Conv. (cfs)	86707.9	72165.6	
Length Wtd. (ft)	36.95	Wetted Per. (ft)	417.64	68.99	
Min Ch El (ft)	469.65	Shear (lb/sq ft)	0.27	0.95	
Alpha	1.10	Stream Power (lb/ft s)	1.20	6.07	
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	54.09	28.79	17.38
C & E Loss (ft)	0.13	Cum SA (acres)	7.11	2.77	4.99

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 3025

INPUT
Description: Cross Section at RS=3025
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	25	482	31.83	478	37.84	476	43.85	474
113.39	473	226.75	472	453.19	470	454.81	469.46	499.03	469.46
500.42	470	505.58	472	510.76	474	515.95	476	521.92	478
532.31	480	550.52	482	599.2	482	616.7	484		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	453.19	.04	550.52	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
453.19	550.52	290	325	410	.1	.3

CROSS SECTION OUTPUT Profile #100-YR

W.S. Elev (ft)	482.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.025	0.040	0.060
E.G. Elev (ft)	482.16	Reach Len. (ft)	290.00	325.00	410.00
Crit W.S. (ft)		Flow Area (sq ft)	4300.02	822.96	6.36
E.G. Slope (ft/ft)	0.000030	Area (sq ft)	4300.02	822.96	6.36
Q Total (cfs)	7195.00	Flow (cfs)	6506.30	688.49	0.22
Top Width (ft)	576.94	Top Width (ft)	429.80	97.33	49.81
Vel Total (ft/s)	1.40	Avg. Vel. (ft/s)	1.51	0.84	0.03
Max Chl Dpth (ft)	12.67	Hydr. Depth (ft)	10.00	8.46	0.13
Conv. Total (cfs)	1308702.0	Conv. (cfs)	1183433.0	125228.9	39.9
Length Wtd. (ft)	296.48	Wetted Per. (ft)	431.56	99.26	49.82
Min Ch El (ft)	469.46	Shear (lb/sq ft)	0.02	0.02	0.00
Alpha	1.09	Stream Power (lb/ft s)	0.03	0.01	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	52.18	28.02	17.38
C & E Loss (ft)	0.00	Cum SA (acres)	6.80	2.68	4.96

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2700

INPUT
Description: Upstream Bridge Contraction Section (1 x Bridge Length)
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	25	482	46.9	478	52.91	476	59.61	474
70.05	472	296.21	470	409.63	469	411.91	468.24	498.13	468.24
504.93	470	512.66	472	520.14	474	527.37	476	534.55	478
546.55	480	564.93	482	653.79	484				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.025	409.63	.04	564.93	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
409.63	564.93	100	100	85	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	216.2	483.5	587.61	653.79	483.5

CROSS SECTION OUTPUT Profile #100-YR

W.S. Elev (ft)	482.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.025	0.040	0.060
E.G. Elev (ft)	482.15	Reach Len. (ft)	100.00	100.00	85.00
Crit W.S. (ft)	472.00	Flow Area (sq ft)	2366.41	1611.24	0.17
E.G. Slope (ft/ft)	0.000049	Area (sq ft)	4153.76	1611.24	0.17
Q Total (cfs)	7195.00	Flow (cfs)	5219.25	1975.74	0.00
Top Width (ft)	544.89	Top Width (ft)	385.72	155.30	3.87
Vel Total (ft/s)	1.81	Avg. Vel. (ft/s)	2.21	1.23	0.02
Max Chl Dpth (ft)	13.85	Hydr. Depth (ft)	12.23	10.38	0.04
Conv. Total (cfs)	1029436.0	Conv. (cfs)	746752.4	282682.8	0.5
Length Wtd. (ft)	100.00	Wetted Per. (ft)	193.44	156.98	3.87
Min Ch El (ft)	468.24	Shear (lb/sq ft)	0.04	0.03	0.00
Alpha	1.20	Stream Power (lb/ft s)	0.08	0.04	0.00
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	24.04	18.94	17.35
C & E Loss (ft)	0.02	Cum SA (acres)	4.08	1.74	4.71

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
Note - Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2600

INPUT
Description: Section Upstream of Bridge Face
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	25	482	71.65	478.27	103.41	478.4	122.99	478.19
139.44	478.58	150.61	478.65	175.07	478.64	202.6	478.56	219.81	478.52
262.17	478.43	277.39	478.7	320.48	479.2	323.96	479.19	333.94	479.18
342.01	478.96	346.1	478	354.58	476	363.07	474	371.56	472
380.04	470	388.04	468	388.37	467.89	477.26	467.89	481.06	470
484.66	472	487.92	474	491.52	476	495.12	478	498.72	480
502.32	482	539.45	484						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	342.01	.04	502.32	.06

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

342.01	502.32		100	100	105		.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	313.96	483.5	519.85	539.45	483.5

CROSS SECTION OUTPUT Profile #100-YR

W.S. Elev (ft)	481.89	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.	0.033	0.040	
E.G. Elev (ft)	482.12	Reach Len. (ft)	37.35	37.35	37.35
Crit W.S. (ft)	473.41	Flow Area (sq ft)	76.84	1806.88	
E.G. Slope (ft/ft)	0.000454	Area (sq ft)	967.29	1806.88	
Q Total (cfs)	7195.00	Flow (cfs)	144.33	7050.67	
Top Width (ft)	475.71	Top Width (ft)	315.60	160.11	
Vel Total (ft/s)	3.82	Avg. Vel. (ft/s)	1.88	3.90	
Max Chl Dpth (ft)	14.00	Hydr. Depth (ft)	2.74	11.29	
Conv. Total (cfs)	337657.6	Conv. (cfs)	6773.3	330884.3	
Length Wtd. (ft)	37.35	Wetted Per. (ft)	28.05	165.09	
Min Ch El (ft)	467.89	Shear (lb/sq ft)	0.08	0.31	
Alpha	1.03	Stream Power (lb/ft s)	0.15	1.21	
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	18.17	15.02	17.35
C & E Loss (ft)	0.01	Cum SA (acres)	3.28	1.38	4.71

BRIDGE RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2542.56

INPUT
Description: New 130' Bridge w/ Channel Modifications
Distance from Upstream XS = 37.35
Deck/Roadway Width = 35.67
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew =
Upstream Deck/Roadway Coordinates
num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	483.5	400	354.26	483.5	400	354.26	487.5	483.5
509.37	487.5	483.5	509.37	483.5	400	1000	483.5	400

Upstream Bridge Cross Section Data
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	25	482	71.65	478.27	103.41	478.4	122.99	478.19
139.44	478.58	150.61	478.65	175.07	478.64	202.6	478.56	219.81	478.52
262.17	478.43	277.39	478.7	320.48	479.2	323.96	479.19	333.94	479.18
342.01	478.96	346.1	478	354.58	476	363.07	474	371.56	472
380.04	470	388.04	468	388.46	467.75	477.01	467.75	481.06	470

484.66	472	487.92	474	491.52	476	495.12	478	498.72	480
502.32	482	539.45	484						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	342.01	.04	502.32	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
342.01	502.32	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	313.96	483.5	519.85	539.45	483.5

Downstream Deck/Roadway Coordinates

num= 6

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	483.5	400	406.45	483.5	400	406.45	487.5	483.5
530.64	487.5	483.5	530.64	483.5	400	1000	483.5	400

Downstream Bridge Cross Section Data

Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	25	482	60.38	479.17	97.52	479.46	116.93	479.47
172.01	479.47	220.64	479.45	254.51	478.88	270.91	479.15	307.12	479.41
314.71	479.4	360.44	479.35	378.17	479.89	386.06	480.07	407.71	480.34
415.79	478	422.69	476	448.25	468	449.44	467.62	507.19	467.62
510.7	470	513.59	472	516.46	474	519.3	476	522.1	478
524.71	480	527.28	482	534.03	484				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	407.71	.04	527.28	.06

Bank Sta: Left	Right	Coeff Contr.	Expan.
407.71	527.28	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev
0	386.83	483.5

Upstream Embankment side slope	= 0 horiz. to 1.0 vertical
Downstream Embankment side slope	= 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	= .95
Elevation at which weir flow begins	= 483.5
Energy head used in spillway design	=
Spillway height used in design	=
Weir crest shape	= Broad Crested

Number of Piers = 2

Pier Data
Pier Station Upstream= 400.94 Downstream= 451.35
Upstream num= 2

Width	Elev	Width	Elev
1.25	460	1.25	484

Downstream num= 2

Width	Elev	Width	Elev
1.25	460	1.25	484

Pier Data
Pier Station Upstream= 447.6 Downstream= 497.77
Upstream num= 2

Width	Elev	Width	Elev
1.25	460	1.25	484

Downstream num= 2

Width	Elev	Width	Elev
1.25	460	1.25	484

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Energy Only

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

BRIDGE OUTPUT Profile #100-YR
Opening : Bridge #1

		Element	Inside BR US	Inside BR DS
E.G. US. (ft)	482.12	E.G. Elev (ft)	482.09	481.96
W.S. US. (ft)	481.89	W.S. Elev (ft)	481.82	481.41
Q Total (cfs)	7195.00	Crit W.S. (ft)	473.39	474.86
Q Bridge (cfs)	7195.00	Max Chl Dpth (ft)	14.07	13.79
Q Weir (cfs)		Vel Total (ft/s)	4.18	5.97
Weir Sta Lft (ft)		Flow Area (sq ft)	1720.00	1204.60
Weir Sta Rgt (ft)				

Weir Submerg		Froude # Chl	0.21	0.33
Weir Max Depth (ft)		Specif Force (cu ft)	11999.43	8618.46
Min Top Rd (ft)	483.50	Hydr Depth (ft)	11.84	10.25
Min El Prs (ft)	483.50	W.P. Total (ft)	206.20	179.03
Delta EG (ft)	0.22	Conv. Total (cfs)	262798.2	160003.9
Delta WS (ft)	0.50	Top Width (ft)	145.23	117.57
BR Open Area (sq ft)	1455.51	Frctn Loss (ft)	0.04	0.04
BR Open Vel (ft/s)	5.97	C & E Loss (ft)	0.08	0.02
Coef of Q		Shear Total (lb/sq ft)	0.39	0.85
Br Sel Mthd	Energy only	Power Total (lb/ft s)	1.63	5.07

Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2500

INPUT
Description: Section Downstream of Bridge
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	25	482	60.38	479.17	97.52	479.46	116.93	479.47
172.01	479.47	220.64	479.45	254.51	478.88	270.91	479.15	307.12	479.41
314.71	479.4	360.44	479.35	378.17	479.89	386.06	480.07	407.71	480.34
415.79	478	422.69	476	448.25	468	449.75	467.52	507.04	467.52
510.7	470	513.59	472	516.46	474	519.3	476	522.1	478
524.71	480	527.28	482	534.03	484				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	407.71	.04	527.28	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
407.71	527.28	42	75	22 .3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev
0	386.83	483.5

CROSS SECTION OUTPUT Profile #100-YR

W.S. Elev (ft)	481.39	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.51	Wt. n-Val.	0.033	0.040	
E.G. Elev (ft)	481.90	Reach Len. (ft)	42.00	75.00	22.00
Crit W.S. (ft)	474.63	Flow Area (sq ft)	24.58	1241.19	
E.G. Slope (ft/ft)	0.001130	Area (sq ft)	709.79	1241.19	
Q Total (cfs)	7195.00	Flow (cfs)	41.47	7153.53	

Top Width (ft)	493.83	Top Width (ft)	375.05	118.78	
Vel Total (ft/s)	5.68	Avg. Vel. (ft/s)	1.69	5.76	
Max Chl Dpth (ft)	13.87	Hydr. Depth (ft)	1.18	10.45	
Conv. Total (cfs)	214081.6	Conv. (cfs)	1233.8	212847.8	
Length Wtd. (ft)	74.47	Wetted Per. (ft)	20.88	125.14	
Min Ch El (ft)	467.52	Shear (lb/sq ft)	0.08	0.70	
Alpha	1.02	Stream Power (lb/ft s)	0.14	4.03	
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	17.53	11.55	17.35
C & E Loss (ft)	0.01	Cum SA (acres)	3.03	1.07	4.71

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2425

INPUT
Description: Section 2425
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	25	482	37.99	479.57	41.99	479.55	67.19	479.84
114.91	479.62	143.8	479.41	210.52	479.41	263.73	479.03	295.31	479.54
318.4	479.71	373.6	480	380.1	480	410.34	478	440.58	468
442.85	467.25	495.6	467.25	499.35	470	502.12	472	504.87	474
507.61	476	510.36	478	513.11	480	515.87	482	518.63	484

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	410.34	.04	518.63	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
410.34	518.63	150	225	225	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev
0	373.59	483.5

CROSS SECTION OUTPUT Profile #100-YR

W.S. Elev (ft)	481.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.56	Wt. n-Val.	0.033	0.040	
E.G. Elev (ft)	481.80	Reach Len. (ft)	150.00	225.00	225.00
Crit W.S. (ft)	474.69	Flow Area (sq ft)	75.74	1152.16	
E.G. Slope (ft/ft)	0.001180	Area (sq ft)	655.10	1152.16	
Q Total (cfs)	7195.00	Flow (cfs)	189.47	7005.53	
Top Width (ft)	485.75	Top Width (ft)	381.27	104.48	
Vel Total (ft/s)	5.86	Avg. Vel. (ft/s)	2.50	6.08	
Max Chl Dpth (ft)	13.99	Hydr. Depth (ft)	2.06	11.03	
Conv. Total (cfs)	209468.9	Conv. (cfs)	5516.1	203952.7	
Length Wtd. (ft)	196.69	Wetted Per. (ft)	36.82	110.76	

Min Ch El (ft)	467.25	Shear (lb/sq ft)	0.15	0.77	
Alpha	1.05	Stream Power (lb/ft s)	0.38	4.66	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	16.87	9.49	17.35
C & E Loss (ft)	0.15	Cum SA (acres)	2.66	0.87	4.71

Warning - The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning - The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2200

INPUT
Description: Section for Change in Channel Geometry
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	25	482	50.29	478	74.33	470	257.42	470
282.02	478	284.36	478.76	297.37	478.73	323.62	478.67	359.72	478
389.72	468	394.46	466.42	430.95	466.42	437.08	470	440.51	472
443.95	474	447.35	476	450.74	478	454.12	480	459.51	482
473.73	484								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.033	359.72	.04	473.73	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
359.72	473.73	180	200	215	.1

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
0	282.02	478	0	259.27	483.5

CROSS SECTION OUTPUT Profile #100-YR

W.S. Elev (ft)	481.54	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.033	0.040	
E.G. Elev (ft)	481.60	Reach Len. (ft)	180.00	200.00	215.00
Crit W.S. (ft)	475.16	Flow Area (sq ft)	2753.97	1072.72	
E.G. Slope (ft/ft)	0.000108	Area (sq ft)	2753.97	1072.72	
Q Total (cfs)	7195.00	Flow (cfs)	5241.39	1953.61	
Top Width (ft)	430.38	Top Width (ft)	331.83	98.56	
Vel Total (ft/s)	1.88	Avg. Vel. (ft/s)	1.90	1.82	
Max Chl Dpth (ft)	15.12	Hydr. Depth (ft)	8.30	10.88	
Conv. Total (cfs)	693656.1	Conv. (cfs)	505312.6	188343.5	
Length Wtd. (ft)	185.29	Wetted Per. (ft)	334.80	104.40	

Min Ch El (ft)	466.42	Shear (lb/sq ft)	0.06	0.07	
Alpha	1.00	Stream Power (lb/ft s)	0.11	0.13	
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	11.00	3.75	17.35
C & E Loss (ft)	0.00	Cum SA (acres)	1.43	0.35	4.71

CROSS SECTION RIVER: E. Branch Trib.
REACH: Pheasant Point RS: 2000

INPUT
Description: Downstream Boundary Condition
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	484	25.11	482	42.74	478	48.75	476	54.76	474
60.77	472	66.78	470	218.85	470	224.9	472	230.95	474
237	476	243.02	478	246.68	479.22	310.66	479.2	327.19	478.93
333.8	478.73	357.86	478	389.74	476	395.17	474	400.65	472
406.15	470	407.44	465.68	415.87	465.68	425.67	470	430.2	472
434.71	474	439.18	476	443.68	478	454.31	478.26	461.77	478.45
483.9	478.42	491.18	478.38	501.2	478.4	519.77	478.5	530.19	478.58
539.73	478.63	554.34	478.44	573.63	478	619.43	477.64	707.27	477.6
1312.71	477.6	1358.23	480	1390.04	480.8	1418.65	480	1454.58	477.6
2338.66	477.6	2375.86	490						

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.033	389.74	.04	443.68	.06	539.73	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
389.74	443.68	0	0	.1	.3

Ineffective Flow num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
42.74	243.02	478	0	194.39	483.5	581.6	3000	483.5

CROSS SECTION OUTPUT Profile #100-YR

W.S. Elev (ft)	481.50	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.	0.033	0.040	0.049
E.G. Elev (ft)	481.57	Reach Len. (ft)			
Crit W.S. (ft)	478.00	Flow Area (sq ft)	2571.34	559.68	430.68
E.G. Slope (ft/ft)	0.000175	Area (sq ft)	2571.34	559.68	7030.21
Q Total (cfs)	7195.00	Flow (cfs)	5618.11	1206.92	369.97
Top Width (ft)	2323.05	Top Width (ft)	362.43	53.94	1906.68
Vel Total (ft/s)	2.02	Avg. Vel. (ft/s)	2.18	2.16	0.86
Max Chl Dpth (ft)	15.82	Hydr. Depth (ft)	7.09	10.38	3.12
Conv. Total (cfs)	544236.0	Conv. (cfs)	424958.6	91292.7	27984.6
Length Wtd. (ft)		Wetted Per. (ft)	365.68	60.83	137.93

Min Ch El (ft)	465.68	Shear (lb/sq ft)	0.08	0.10	0.03
Alpha	1.11	Stream Power (lb/ft s)	0.17	0.22	0.03
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning - The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
Note - Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

SUMMARY OF MANNING'S N VALUES

River:E. Branch Trib.

Reach	River Sta.	n1	n2	n3	n4
Pheasant Point	3168	.033	.04	.06	
Pheasant Point	3075	.025	.04	.06	
Pheasant Point	3025	.025	.04	.06	
Pheasant Point	2700	.025	.04	.06	
Pheasant Point	2600	.033	.04	.06	
Pheasant Point	2542.56	Bridge			
Pheasant Point	2500	.033	.04	.06	
Pheasant Point	2425	.033	.04	.06	
Pheasant Point	2200	.033	.04	.06	
Pheasant Point	2000	.033	.04	.06	.035

SUMMARY OF REACH LENGTHS

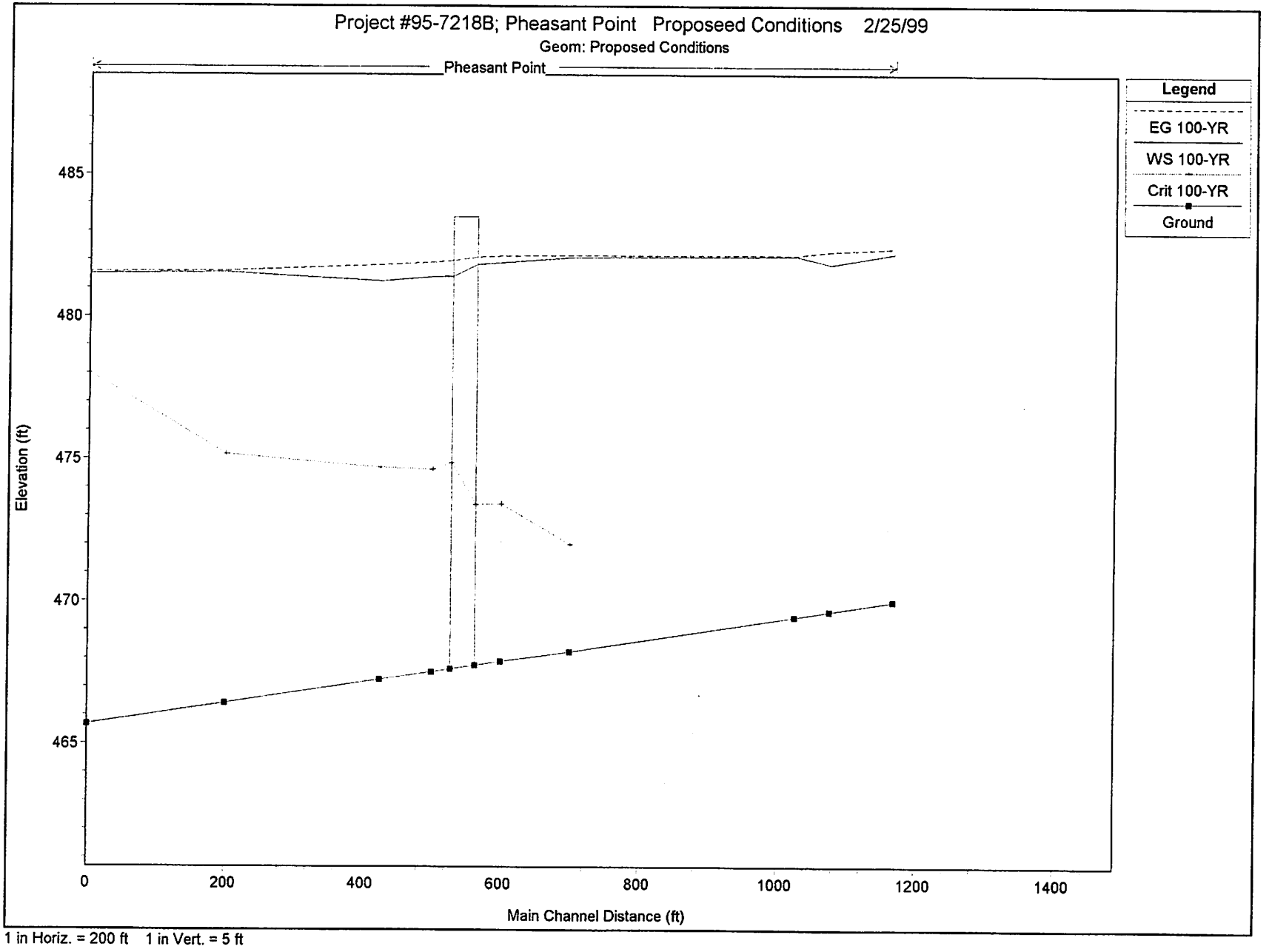
River: E. Branch Trib.

Reach	River Sta.	Left	Channel	Right
Pheasant Point	3168	40	93	93
Pheasant Point	3075	32	50	50
Pheasant Point	3025	290	325	410
Pheasant Point	2700	100	100	85
Pheasant Point	2600	100	100	105
Pheasant Point	2542.56	Bridge		
Pheasant Point	2500	42	75	22
Pheasant Point	2425	150	225	225

Pheasant Point	2200	180	200	215
Pheasant Point	2000	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: E. Branch Trib.

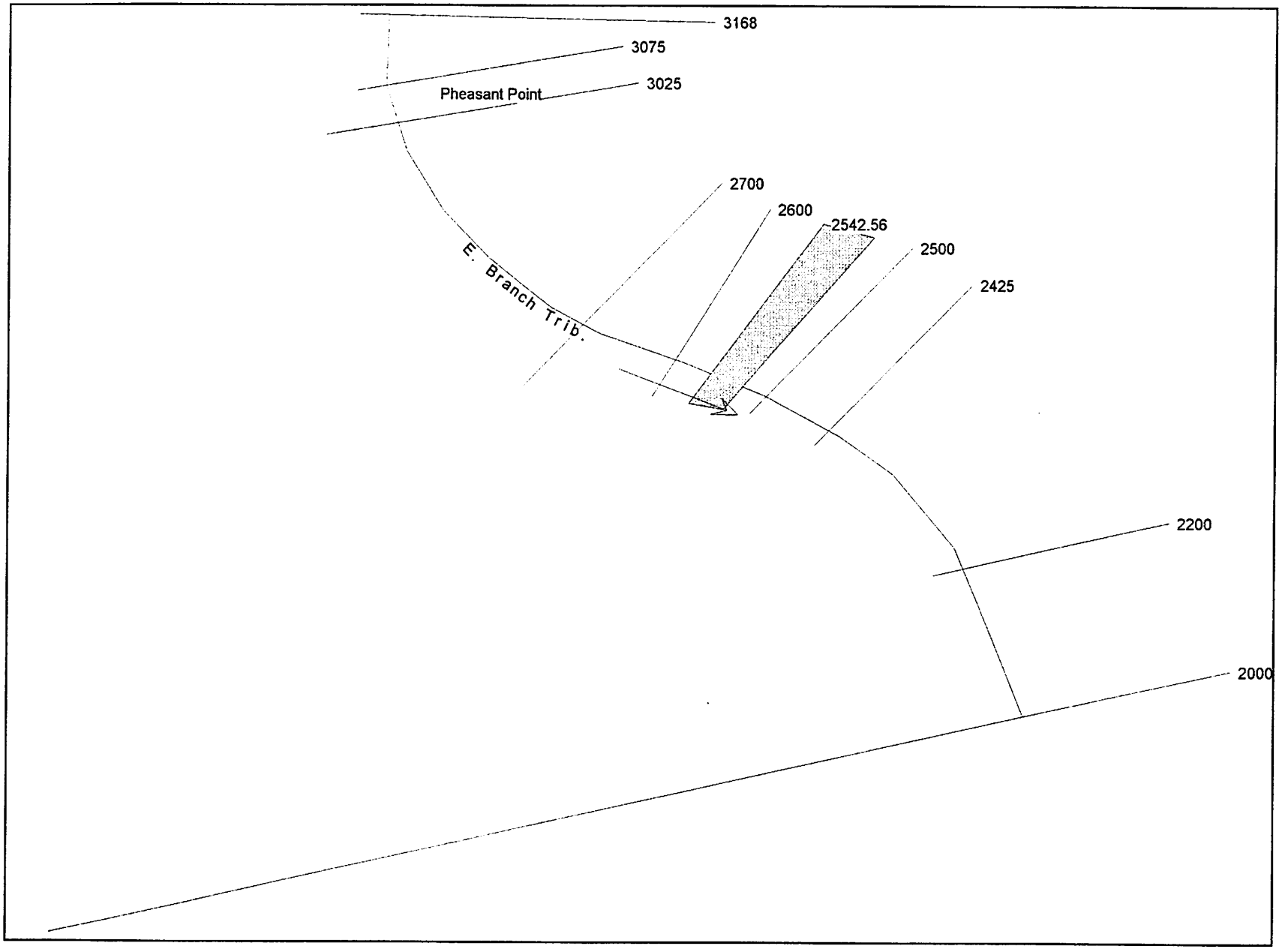
Reach	River Sta.		Contr.	Expan.
Pheasant Point	3168		.1	.3
Pheasant Point	3075		.1	.3
Pheasant Point	3025		.1	.3
Pheasant Point	2700		.1	.3
Pheasant Point	2600		.3	.5
Pheasant Point	2542.56	Bridge		
Pheasant Point	2500		.3	.5
Pheasant Point	2425		.1	.3
Pheasant Point	2200		.1	.3
Pheasant Point	2000		.1	.3

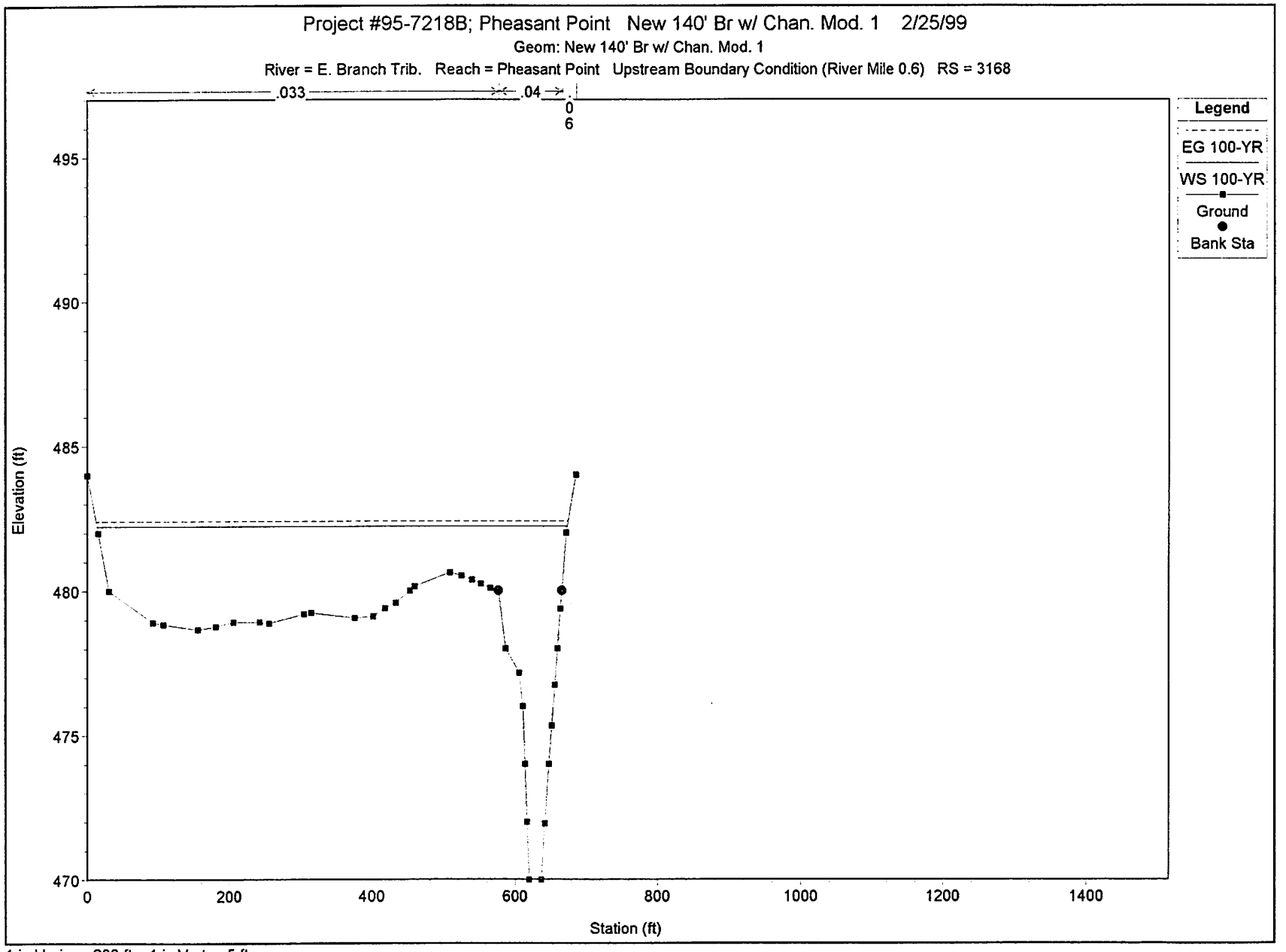


1 in Horiz. = 200 ft 1 in Vert. = 5 ft

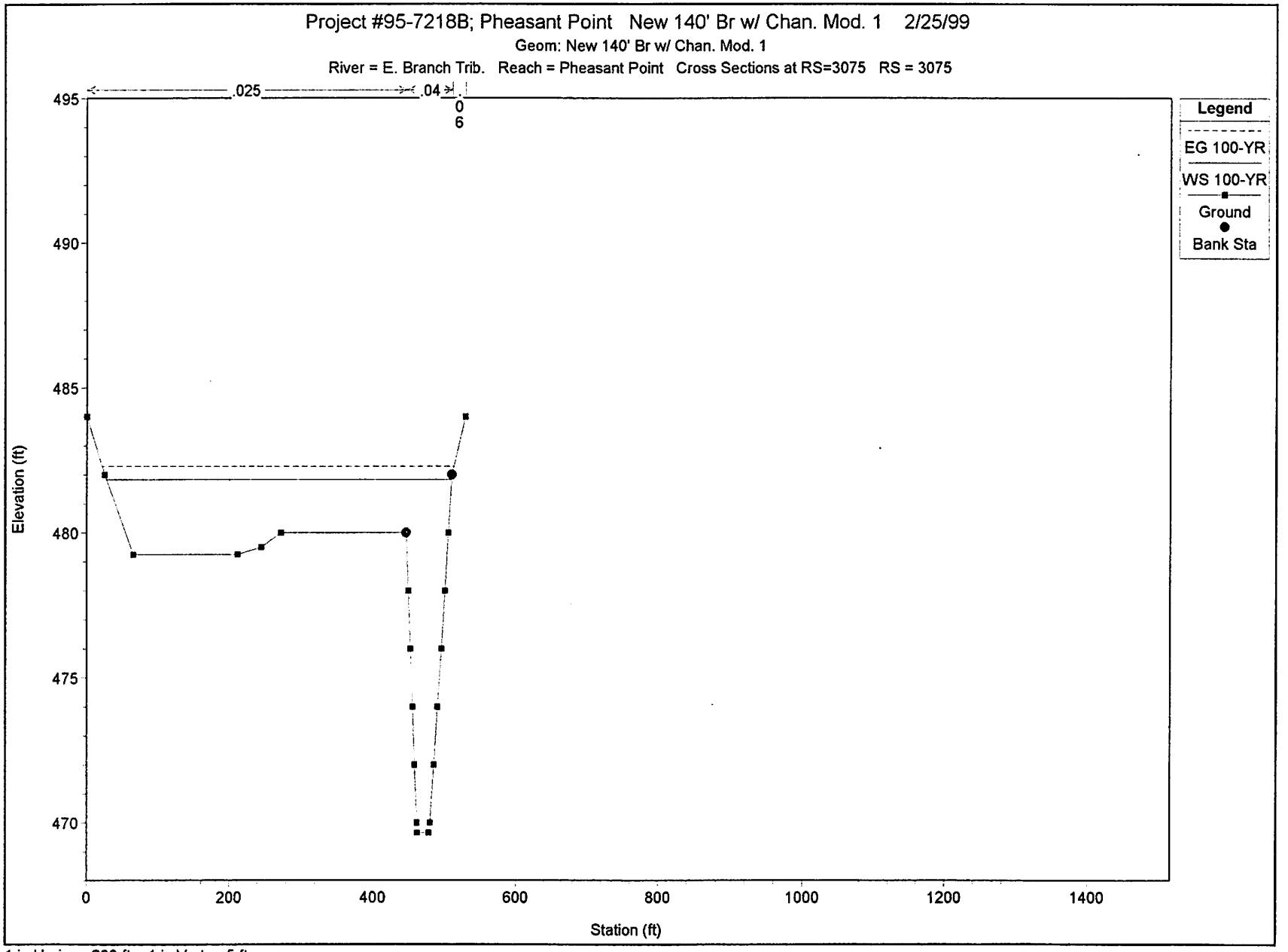
HEC-RAS Plan: Proposed River: E. Branch Trib. Reach: Pheasant Point

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)	
Pheasant Point	3168	100-YR	7195.00	470.00	482.22		482.41	0.000986	4.24	2235.24	660.13	0.28
Pheasant Point	3075	100-YR	7195.00	469.65	481.84		482.29	0.002051	6.39	1395.71	481.13	0.40
Pheasant Point	3025	100-YR	7195.00	469.46	482.13		482.16	0.000030	0.84	5129.34	576.94	0.05
Pheasant Point	2700	100-YR	7195.00	468.24	482.09	472.00	482.15	0.000049	1.23	3977.81	544.89	0.07
Pheasant Point	2600	100-YR	7195.00	467.89	481.89	473.41	482.12	0.000454	3.90	1883.71	475.71	0.20
Pheasant Point	2542.56		Bridge									
Pheasant Point	2500	100-YR	7195.00	467.52	481.39	474.63	481.90	0.001130	5.76	1265.76	493.83	0.31
Pheasant Point	2425	100-YR	7195.00	467.25	481.24	474.69	481.80	0.001180	6.08	1227.89	485.75	0.32
Pheasant Point	2200	100-YR	7195.00	466.42	481.54	475.16	481.60	0.000108	1.82	3826.69	430.38	0.10
Pheasant Point	2000	100-YR	7195.00	465.68	481.50	478.00	481.57	0.000175	2.16	3561.70	2323.05	0.12

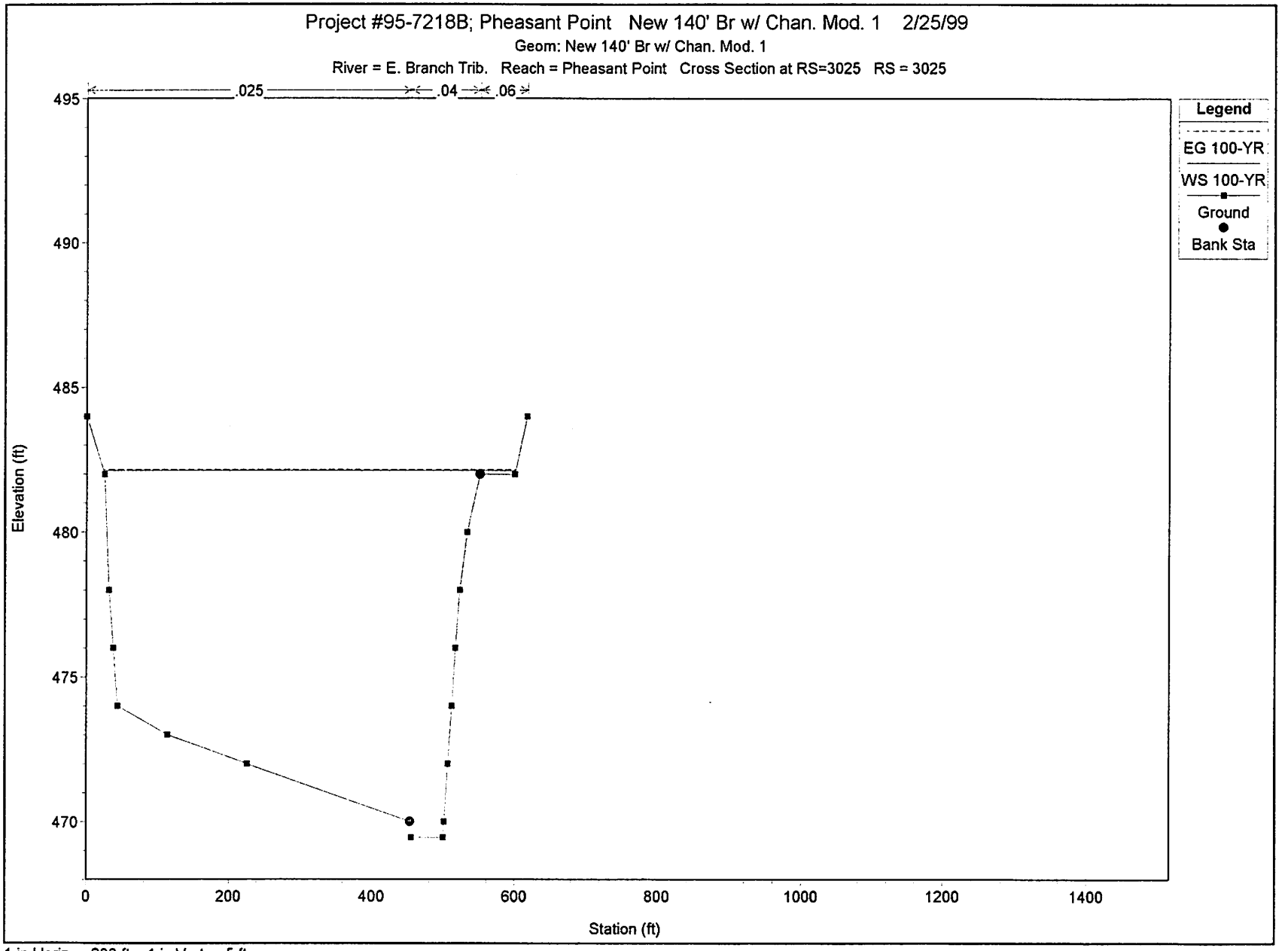

3168
3075
Pheasant Point
3025
2700
2600
2542.56
2500
2425
E. Branch Trib.
2200
2000



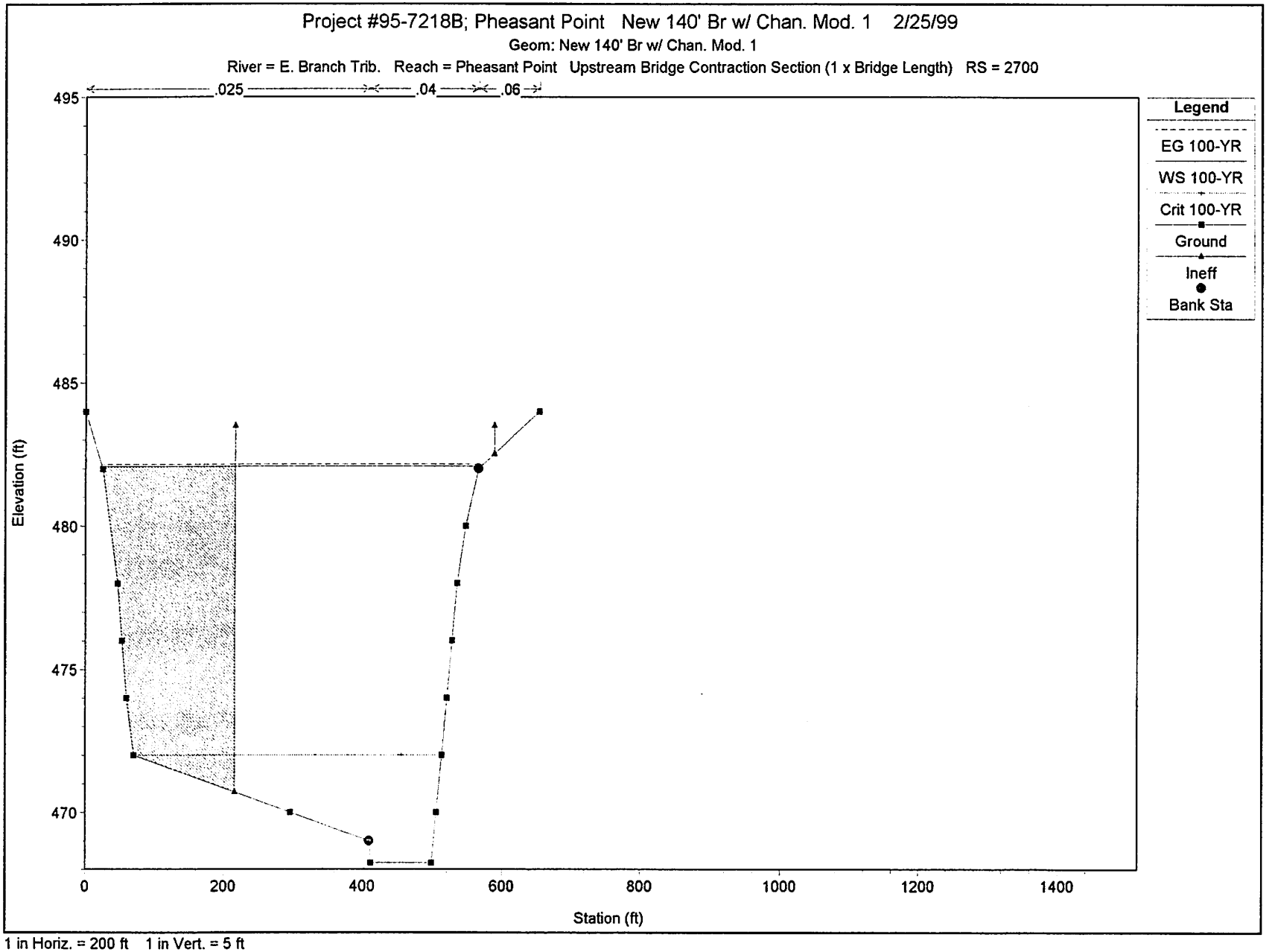
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



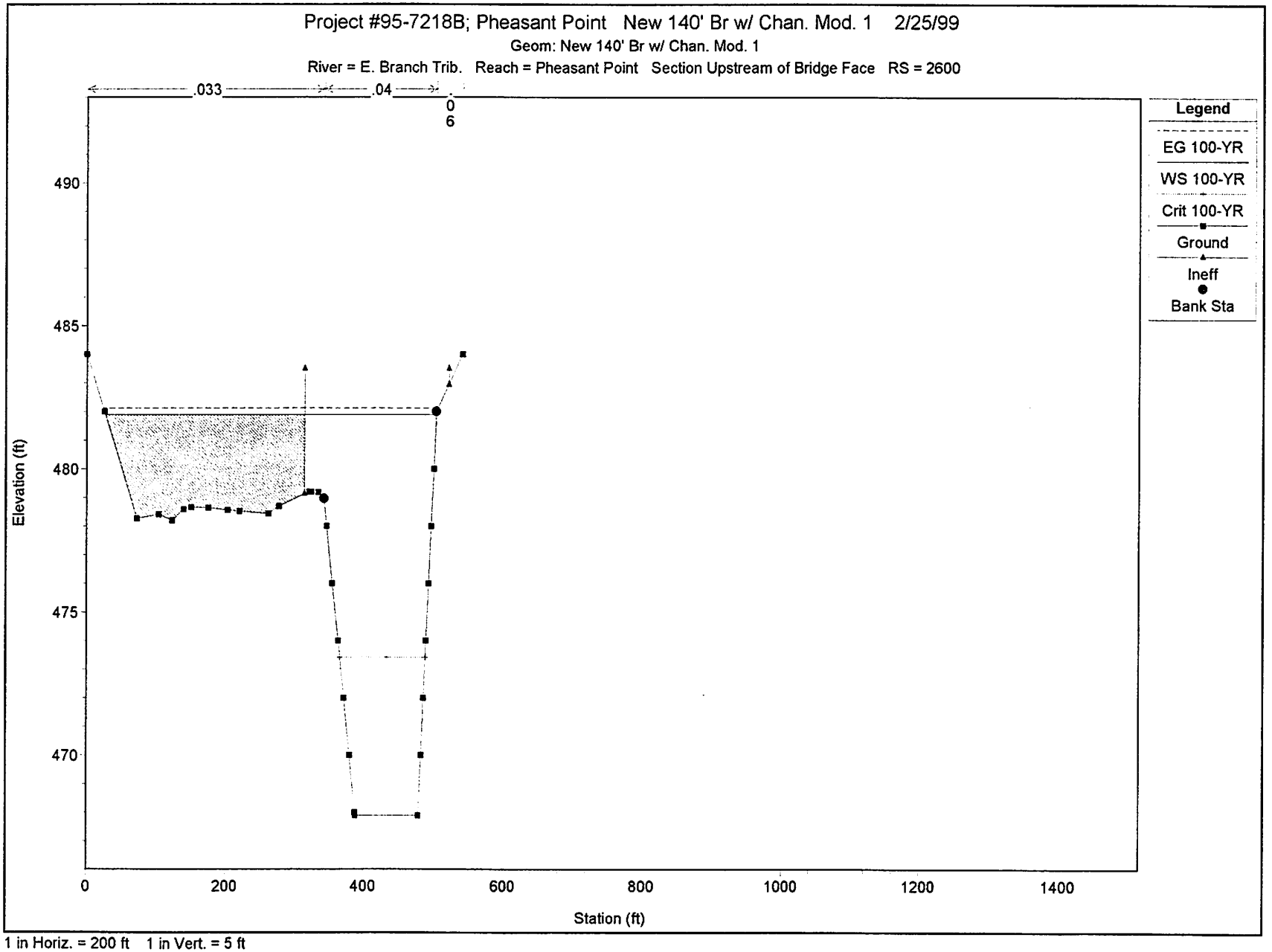
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



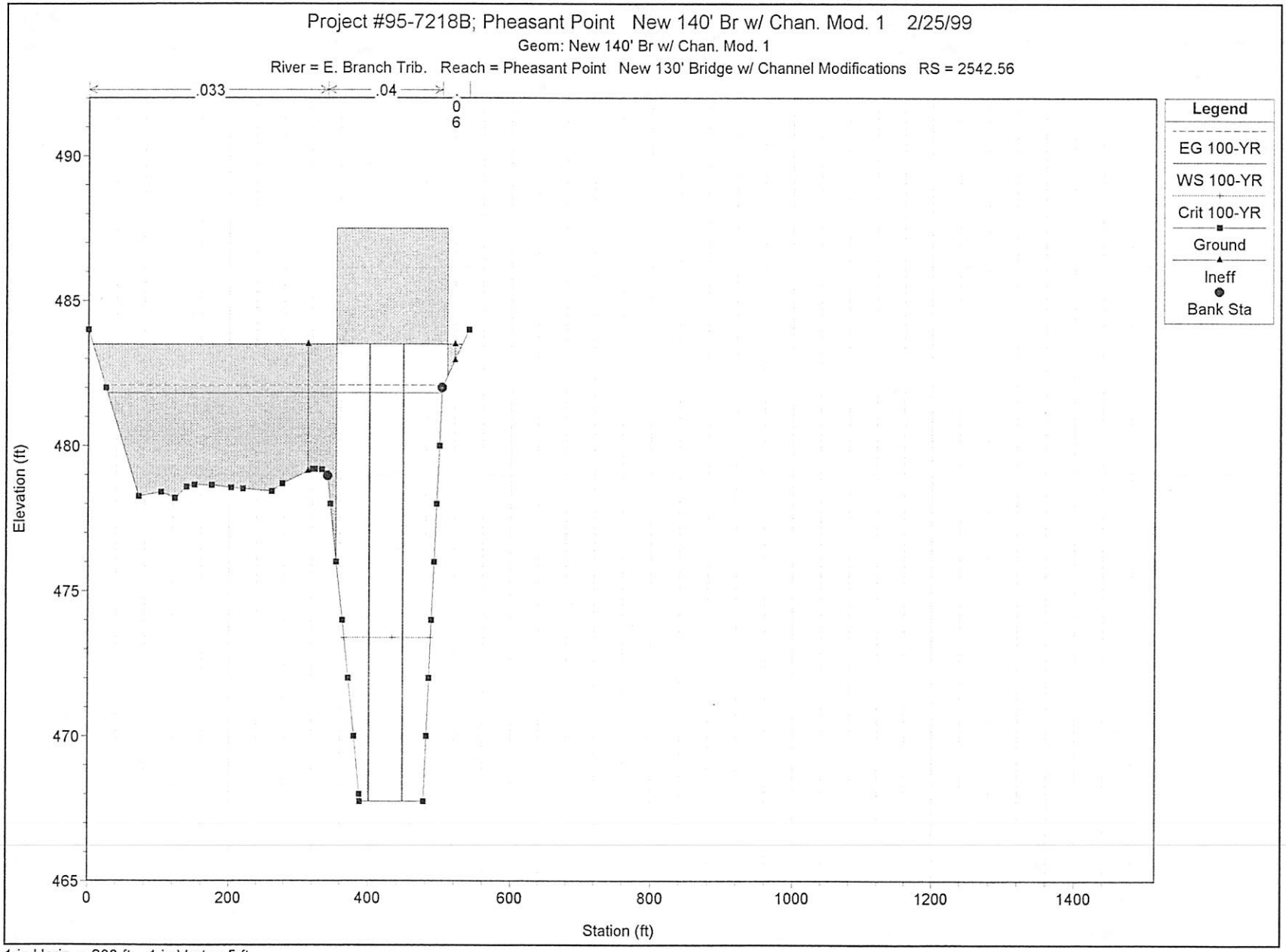
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



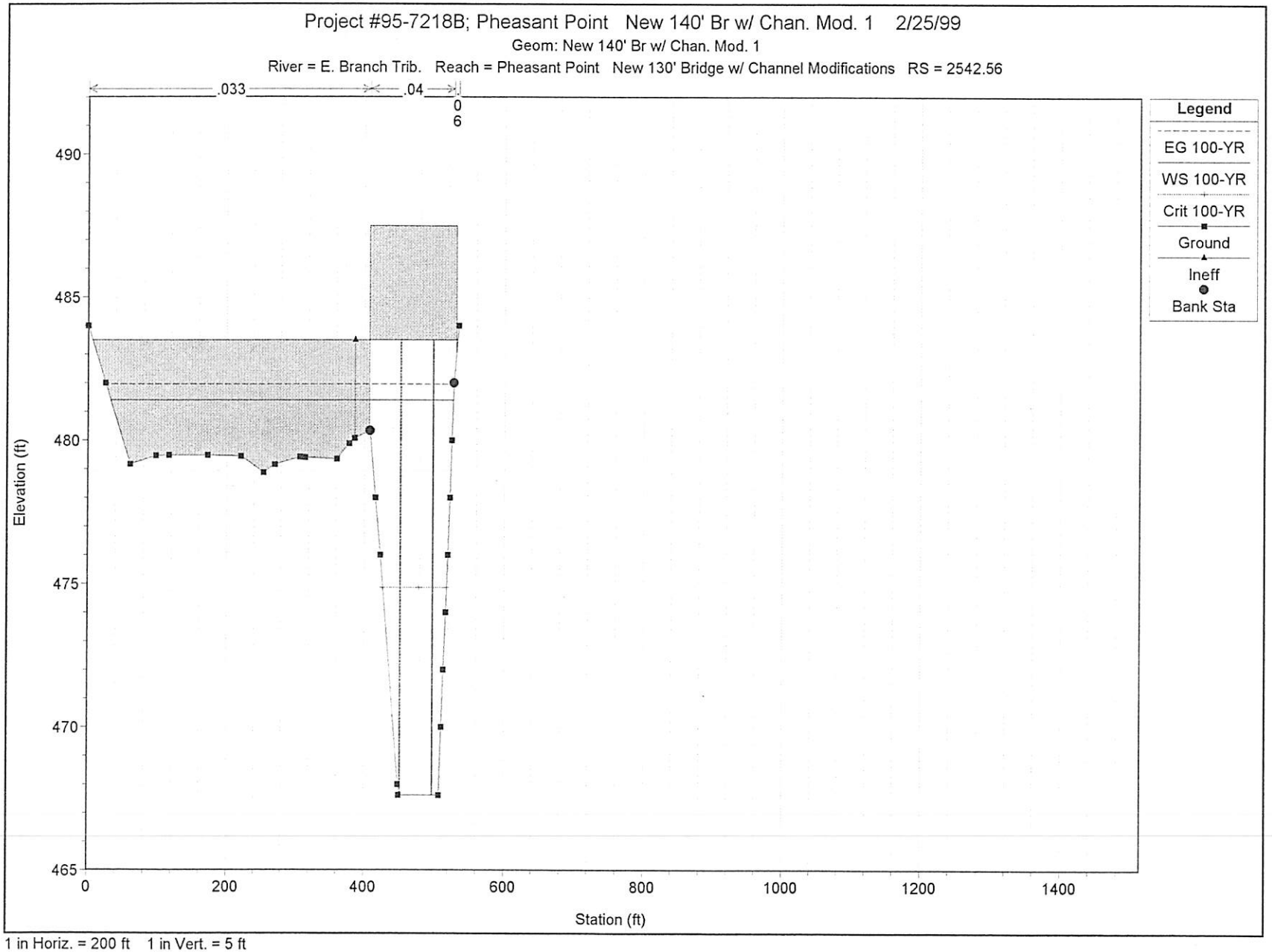
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



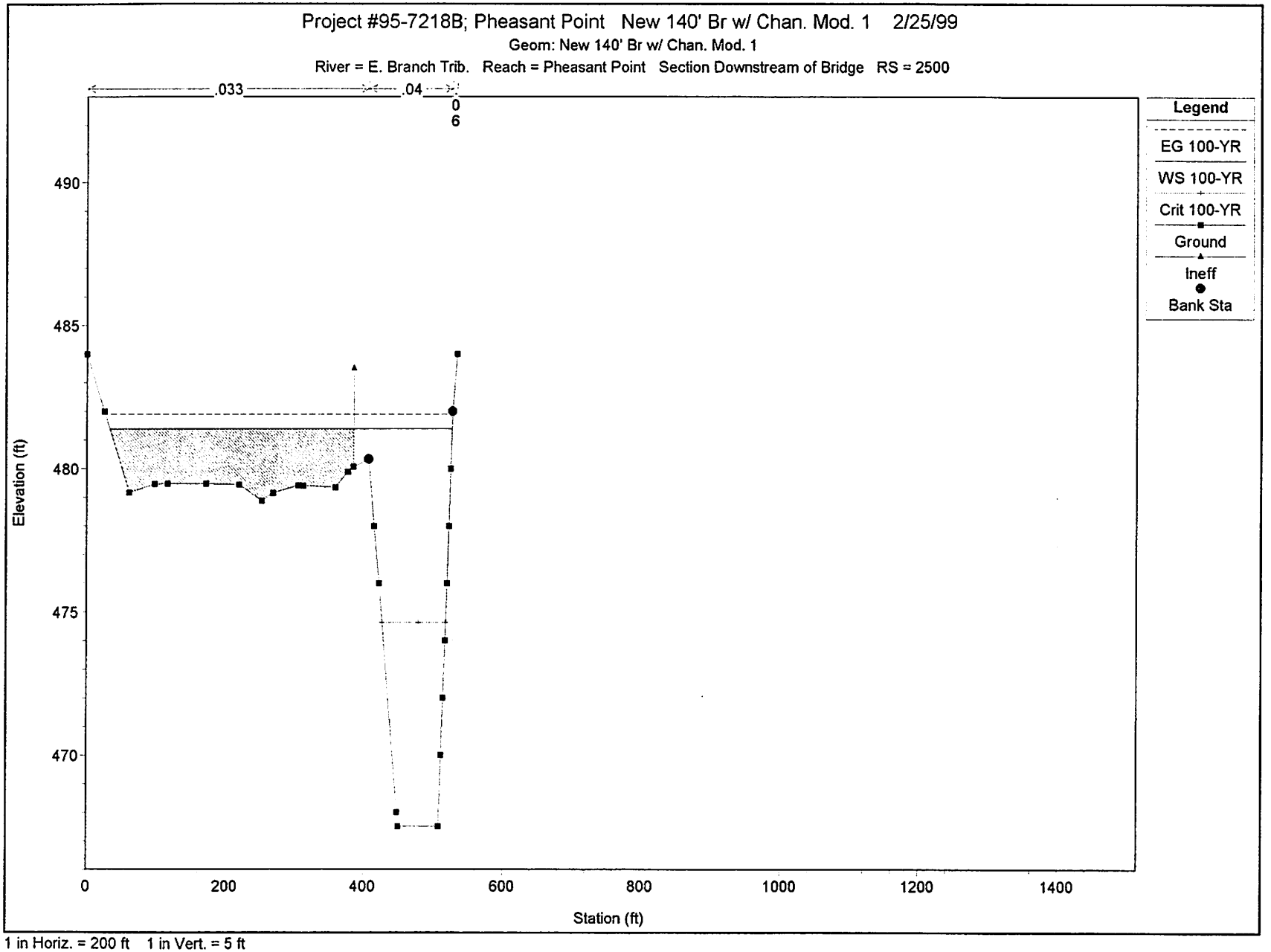
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



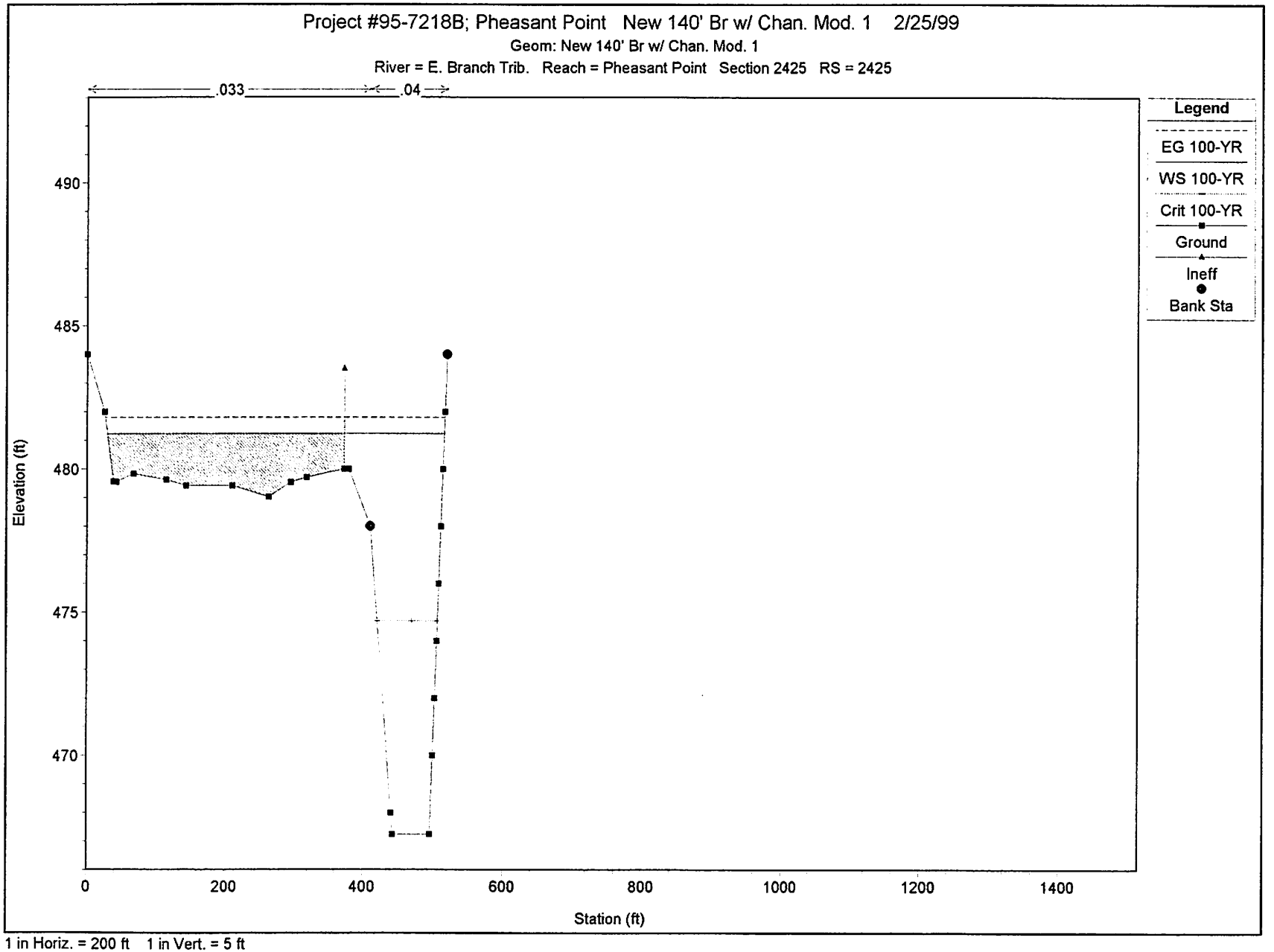
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



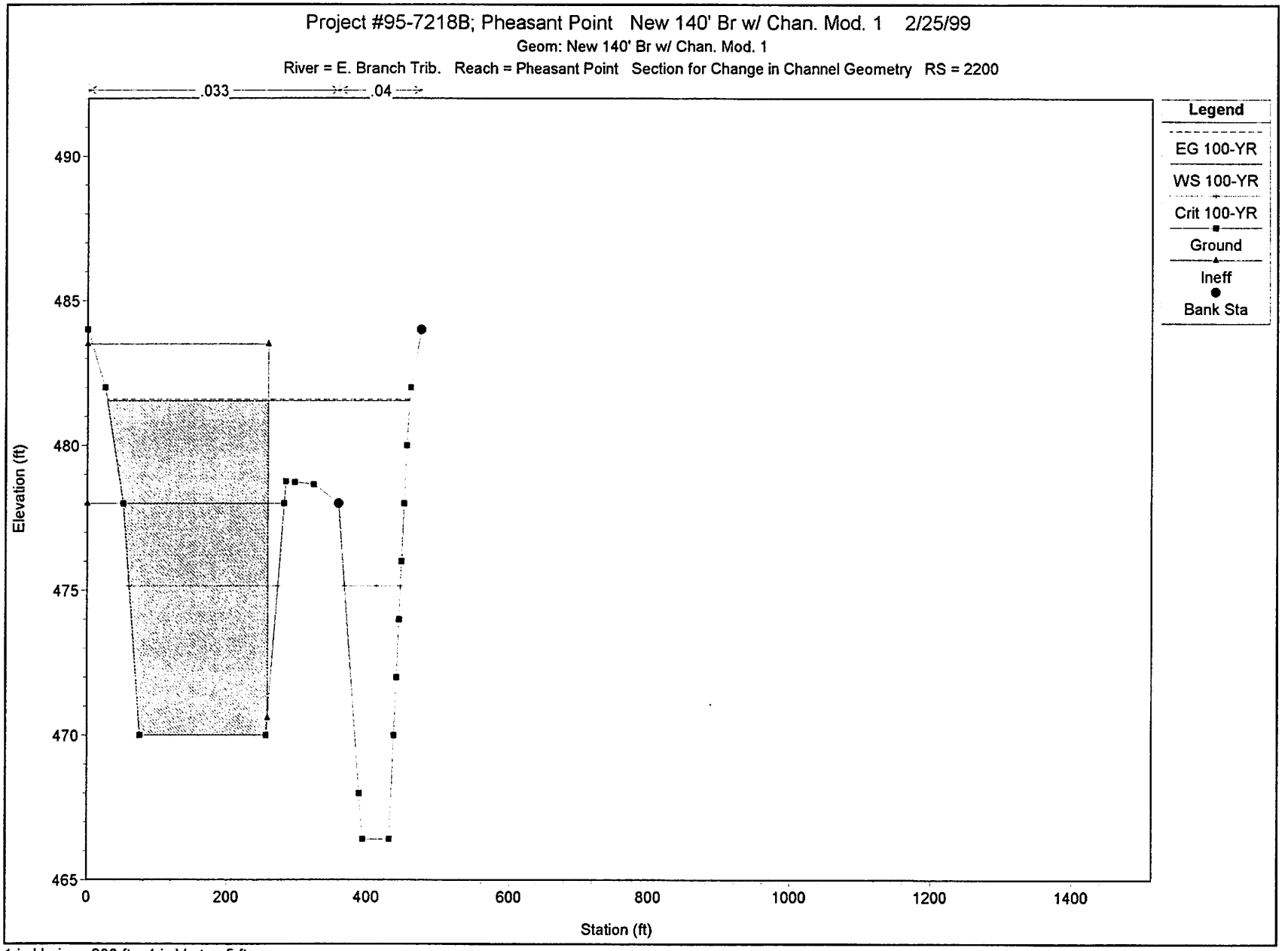
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



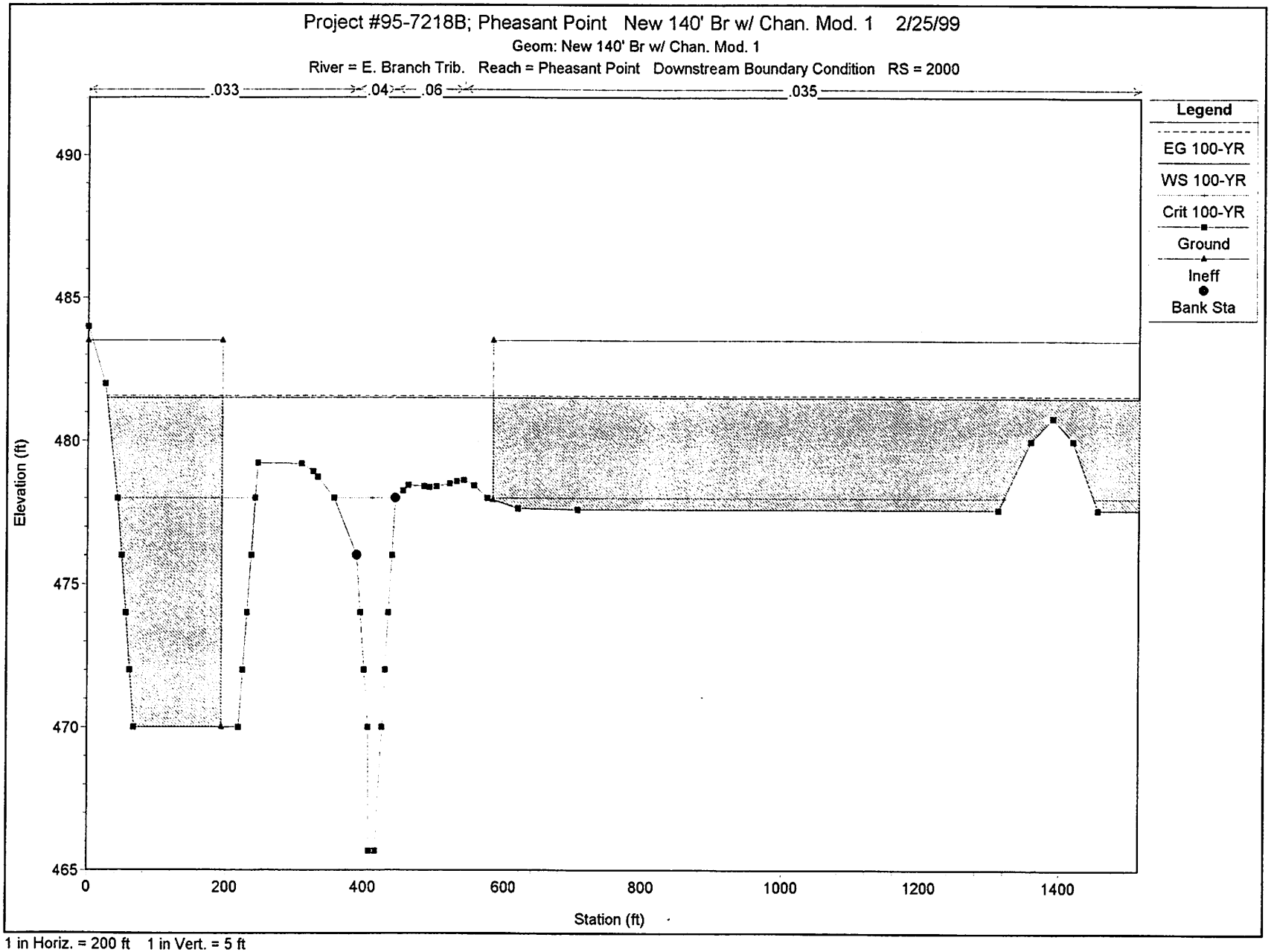
1 in Horiz. = 200 ft 1 in Vert. = 5 ft



1 in Horiz. = 200 ft 1 in Vert. = 5 ft



1 in Horiz. = 200 ft 1 in Vert. = 5 ft



1 in Horiz. = 200 ft 1 in Vert. = 5 ft

APPENDIX D

DRAWINGS

- PROPOSED PLAN & PROFILE
- PROPOSED GRADING PLAN