HST/STB

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

INTERDEPARTMENT CORRESPONDENCE

FILE **BRS-STP-1375(6) CHEROKEE** **OFFICE** Atlanta, GA
CR 770 (Bells Ferry Rd) over Little River (Lake Allatoona)
P.I. No. 630975 **DATE** December 22, 2005

FROM Paul V. Liles, Jr., P.E, State Bridge Engineer

TO Brian Summers, State Project Review Engineer

SUBJECT **Request for a Design Variance**

Approval of a Design Variance is requested for this project.

This project is the replacement of the existing bridge on CR 770 (Bells Ferry Rd.) over the Little River (Lake Allatoona) in Cherokee County. The existing bridge is an 85.3 m (280 ft) long by 6.1 m (20 ft) wide steel beam bridge with concrete intermediate bents. The proposed replacement structure is to be a 142 m (383.9 ft) long by 25.2 m (82.7 ft) wide bridge. This site is a rural arterial road with base year (2005) and design year (2025) traffic of 10600 and 22400 ADT, respectively. A marina and boat storage facility is located at the northwest end of the bridge and a restaurant is located at the northeast end of the bridge.

Although the current sufficiency rating of the existing bridge is 66, the bridge is recommended to be replaced by the Office of Bridge Maintenance due to the fact that the width of the proposed bridge is to be increased from the existing width by over 50% and due to the maintenance costs associated with the steel beams. (See the attached letter from the State Bridge Maintenance Engineer.) The proposed bridge is to be over 30.5 m (100 ft) longer than the existing bridge, increasing the area of opening significantly. The bents of the proposed bridge are to be skewed approximately 70 degrees to the roadway centerline to approximate the flood flow at this site.

In order to assist Cherokee County in acquisition of right-of way and to provide access to the existing marina, the grade for the proposed bridge was set to keep the grade as low as possible in the area of the marina. The 50 and 100 year flood pool elevations are 262.43 m (861 ft) and 262.73 m (862 ft), respectively. The existing bridge bottom of beam elevation of 261.21 m (857 ft) does not clear these flood pool elevations. The bottom of beam elevation for the proposed bridge was set to keep the proposed bottom of beam no lower than elevation 262.13 m (860 ft). The proposed beams, although higher than the existing bottom of beam, do not provide clearance over the 50 and 100 year flood pool elevations. The proposed roadway grade allows the road to remain open during the 50 year flood pool elevation, but the subgrade has less than 0.3 m (1.0 ft) clearance over this elevation.

Due to the fact that the proposed beams are being raised approximately 1.0 m (3 ft) from the existing bottom of beam elevation this Office requests that a design variance to the Drainage Design Manual be granted, waiving the requirement of obtaining 1 ft of clearance over the flood pool elevation and 1 ft of clearance of the subgrade over the 50 year flood pool elevation. This Design Variance is requested on behalf of David Acree, the project manager.

Supporting documentation, including a location map, project concept report, roadway plans, preliminary bridge layout, and site photographs are attached for your information.

If you have any questions or comments, please contact Susan Beck of this office at (404) 656-5285 or email address susan.beck@dot.state.ga.us. We recommend this Design Variance be approved.

PVL/STB/jym

attachments

cc: Sam Teal, attn: Susan Beck
Brent Story, attn.: David Acree
Buddy Gratton

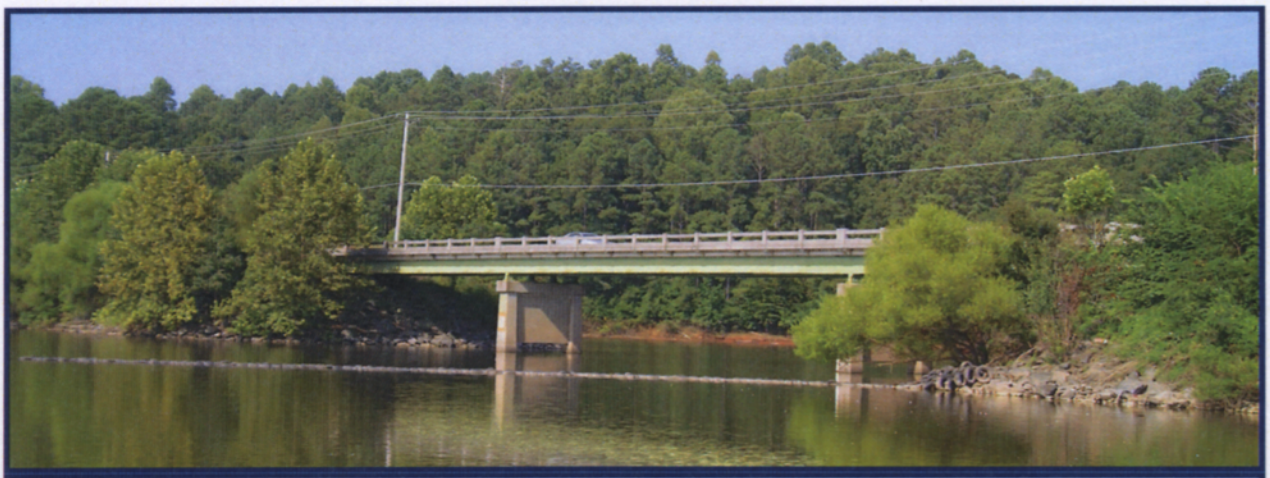
Approved: _____
David Studstill, Chief Engineer

BRS-STP-1375(6) Cherokee County
PI# 630975

Bells Ferry Road (CR 770) over Little River (Lake Allatoona)

Revised Hydraulic and Hydrological Study

December 2005



NO FEMA OR COMMUNITY COORDINATION REQUIRED

GEORGIA
REGISTERED
No. 27873
PROFESSIONAL
12-1-05
ENGINEER
JOHN K. McWHORTER III

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Suite 100
Atlanta, GA 30339-2933
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Section I
Hydraulic/Hydrologic Report

December 2005

BRS-STP-1375(6) Cherokee County
Bells Ferry Road (CR 770) over Little River (Lake Allatoona)
P.I. No. 630975

Introduction

This hydraulic and hydrological study replaces the previous study and bridge layout for this site dated August 1998. This updated study includes a lower profile grade at this crossing along with revising the Manning's "n" value used in the lake area in the original study. An administrative decision was made to lower the proposed superstructure into the 50 and 100-year lake pools in an attempt to assist Cherokee County with R/W acquisition. The project had been delayed due to adjacent property owner concerns that the proposed higher profile grade would result in access difficulties.

The new profile grade lowers the proposed minimum bottom of beam to an approximate elevation of 262.1 m, a distance of about 0.3 m and 0.6 m into the 50 and 100-year lake pools, respectively. Boat traffic will not be affected since the proposed bottom of beam is higher than the existing bottom of superstructure by 1.2 m. Since the flow velocities for the flood pool conditions are very low, the lowering of the proposed beams into these lake pools results in minimal risk to the structure. A design variance to the drainage manual is required in order to waive the vertical clearance requirements. The proposed roadway is designed to remain open during the 50-year storm event meeting the drainage manual guidelines.

Little River is not a FEMA studied waterway. Therefore, no FEMA or community coordination is required. The design storm is the 50-year storm per the GDOT Drainage Design Manual for a county road with over 1500 VPD. The design year traffic at this site is 22400 VPD. The drainage area at the proposed crossing, obtained from the USGS publication, "Drainage Area Data for Georgia Streams", is 543.9 square kilometers with a 50-year storm flow of 564.1 cms and a 100-year storm flow of 649.5 cms. The flows are calculated using the USGS Region 1 Rural Regression equations for Georgia.

The proposed bridge at this crossing will be a 142 m long bridge consisting of one 42 m long Bulb Tee PSC beam span and four 25 m long Type III PSC beam spans. The proposed bridge spans will be built at a 70-degree skew to the roadway centerline to align with the flood flow. The proposed bridge will be 25.94 m wide (out to out) based on MOG 4265-9 criteria and the typical section for this multilane highway.

Incorporated in the hydraulic models is the latest research on expanded and contracted flow for locating exit and approach sections. These locations are based on channel slope, main channel and overbank Manning's "n" values and the ratio of the bridge opening to the floodplain width. This information is used to locate the exit and approach sections. This process is discussed in the *General Modeling Considerations* section in this report. HEC-RAS models were developed for this study and the WSPRO bridge routine was selected for the proposed model. HEC-RAS version, 3.1.3 was used for the study.

Hydraulic Site Visit

A hydraulic site visit was made at the crossing of Bells Ferry Road over Little River on August 27, 2005. This crossing is within the backwaters of Lake Allatoona. The lake is approximately 250 m wide at the existing bridge. The existing 85.3 m long steel beam bridge consists of two 26.7 m long spans and one 31.9 m long span and is built on 90-degree concrete bents and spillthrough abutments. The upstream and downstream floodplains outside of the limits of the lake are wooded. Due to the depth of the lake, no channel is visible. A 0.2 m diameter water line was observed attached to the downstream side of the existing bridge. The existing roadway is a paved county road on approximately 10 meters of fill at the existing crossing. There is a marina located immediately upstream and a restaurant /general store located immediately downstream. These building structures are both located to the north of the lake.

Procedure

JBT Inc. personnel visited and photographed the site. The drainage area and Manning's "n" values were determined and storm flows were calculated for this Region 1 site. HEC-RAS computer models were developed for the existing and proposed conditions using survey data and proposed roadway improvements.

General Modeling Considerations

As previously stated, this crossing is subjected to the abnormal floodstages created from the Allatoona Dam. The 50-year and 100-year pool elevations were obtained from a previous study citing the Corps of Engineers Study as the source. The 500-year pool elevation was obtained through a phone conversation with the Mobile District of the Corps of Engineers. This information was used as the basis for the "Abnormal Flood" condition. The "River Flood" condition was modeled using the hydraulic slope obtained from the USGS quadrangle map.

In locating the approach and exit sections, new research detailed in the HEC-RAS Hydraulic Reference Manual, Version 3.1, dated November 2002, Appendix B is utilized. The expansion and contraction ratios used to locate the exit and approach sections are applicable to HEC-2, HEC-RAS and WSPRO models. The resulting coefficients are in the 1.3:1 to 2.0:1 range for expansion and 0.7:1 to 1.2:1 for contraction. These ranges were applied to the average floodplain constriction for both the proposed and existing conditions, yielding an expansion reach length range of 209 m to 322 m and a contraction reach length range of 112 m to 193 m. The actual approach section is located at river station 602, approximately 152 m upstream of the roadway and the actual exit section is located at river station -865, approximately 244 m downstream of the proposed bridge, so these values are acceptable.

Historic Drainage Patterns

The mean velocities at the existing bridge for the 50-year and 100-year storm flows (river floods) are 5.01 m/s and 5.22 m/s, respectively. These values are very high since the presence of the lake necessitates a low Manning's "n" within the limits of the lake. For the abnormal floods, the 50-year and 100-year storm mean velocities are 0.87 m/s and 0.88 m/s, respectively.

Manning's "n" values for the project site were developed using methods described in the USGS publication, *Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains,* by George J. Arcement, Jr. and Verne R. Schneider.

Proposed Drainage Patterns

The proposed 142 m long bridge consists of a 42 m long center span and 2 – 25 m long spans on each end. The proposed bridge was chosen as the minimum length structure with acceptable velocity and backwater values. The velocities for the river floods were the main design criteria. As stated above, the low Manning's "n" resulted in very high velocity values for the river floods. The GDOT Bridge Hydraulics Office contacted the Atlanta Regional Office of the USGS to determine the likelihood of a 100-year flood event occurring while the lake was low (River Flood). The response was that is was likely to occur. Correspondence on this issue is included in the Appendix.

The proposed mean velocities for the 50-year and 100-year river floods are 3.07 m/s and 3.27 m/s, respectively. The associated backwaters for proposed conditions during the 50-year and 100-year river floods are 0.41 m. and 0.51 m., respectively. This 100-year backwater value is greater than the drainage manual requirement of 0.30 m. However, the abnormal floodstage elevations are much higher and therefore are the controlling values for backwater. The 100-year backwater for the abnormal flood condition is 0.02 m, which is acceptable. The maximum calculated pier plus contraction scour depth is 4.5 m for the 100-year river flood. See the Hydraulic Tables in Section 2 of the report for additional hydraulic data pertaining to the abnormal floodstages.

Spur dike calculations were not performed due to the presence of Lake Allatoona. Riprap calculations were performed in accordance with the procedures outlined in Hydraulic Engineering Circular No. 23 *Bridge Scour and Stream Instability Countermeasures*. GDOT Type I riprap 24-inches thick is specified here. Special embankment details were provided by the Office of Materials and Research.

The profile at this crossing was raised due to the deeper superstructure. Although the proposed bottom of beam is approximately 1.2 m above the existing bottom of beam, the proposed bridge does not provide the required clearance over the lake pool elevations. An administrative decision was made to minimize the profile increase in order to reduce the impact to the marina. The Marina owner has expressed concern that a large profile change would make it difficult for customers to transport boats to and from his property, resulting in a negative impact to his business. A design variance is required since the hydraulic clearance requirement will not be met.

Summary

The appropriate GDOT hydraulic and hydrological procedures were used in this study's development. The proposed bridge meets current Georgia Department of Transportation requirements with exception to the clearance requirement for which a design variance will be obtained. Little River is not a FEMA studied waterway and therefore no FEMA or community coordination is required. The proposed bridge was selected as the minimum bridge length with acceptable velocity values for the creek floods.

References

JBT utilized the following for this study:

- The Current Georgia Department of Transportation Drainage Manual for Highways with Supplemental guidelines for Hydraulic and Hydrological Studies.

- The United States Geological Survey (USGS) publication, *Techniques for Estimating Magnitude and Frequency of Floods in Rural Basins of Georgia*--1993, Water Resources Investigations Report 93-4016.

- Hydrologic Engineering Center (HEC) River Analysis System (HEC-RAS), Water-Surface Computational Model Version 3.1.3, dated May 2005.

- Hydrologic Engineering Center (HEC) River Analysis System (HEC-RAS) Users Manual Version 3.1, dated November 2002.

- Hydrologic Engineering Center (HEC) River Analysis System (HEC-RAS) Hydraulic Reference Manual Version 3.1, dated November 2002.

- Hydraulic Engineering Circular No. 18 (HEC-18) *Evaluating Scour at Bridges,* (FHWA-NHI-01-001), dated May 2001, Fourth Edition.

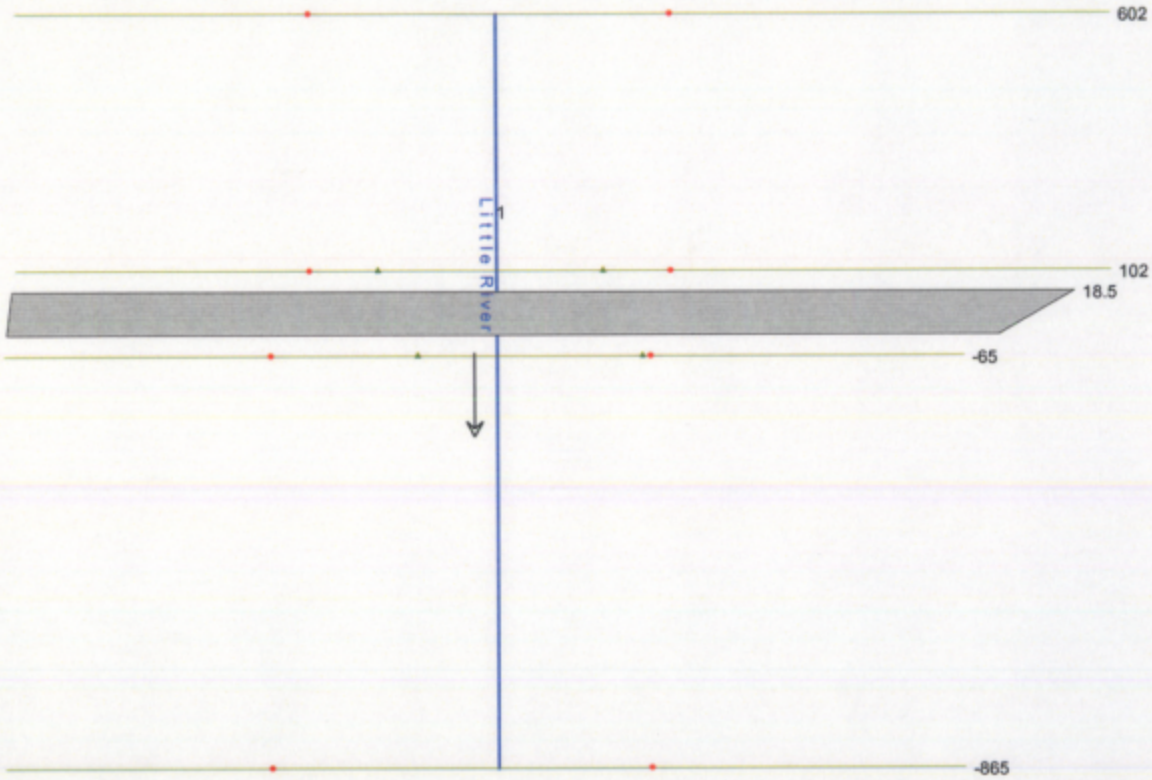
- Hydraulic Engineering Circular No. 20 (HEC-20) *Stream Stability at Highway Structures* (FHWA-NHI-01-002) dated March 2001, Third Edition.

- Hydraulic Engineering Circular No. 23 (HEC-23) *Bridge Scour and Stream Instability Countermeasures* (FHWA-NHI-01-003) dated March 2001, Second Edition.

- The United States Geological Survey (USGS) publication, *Roughness Characteristics of Natural Channels,* Harry H. Barnes, Jr.—1987 (3rd Printing), Water-Supply Paper 1849.

- The United States Geological Survey (USGS) publication, *Guide for selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains,* George J. Arcement, Jr., and Verne R. Schneider—1992 (2nd Printing); Water-Supply Paper 2339.

- *Computer Assisted Floodplain Hydrology & Hydraulics*, Daniel H. Hoggan, McGraw-Hill, New York, 1989.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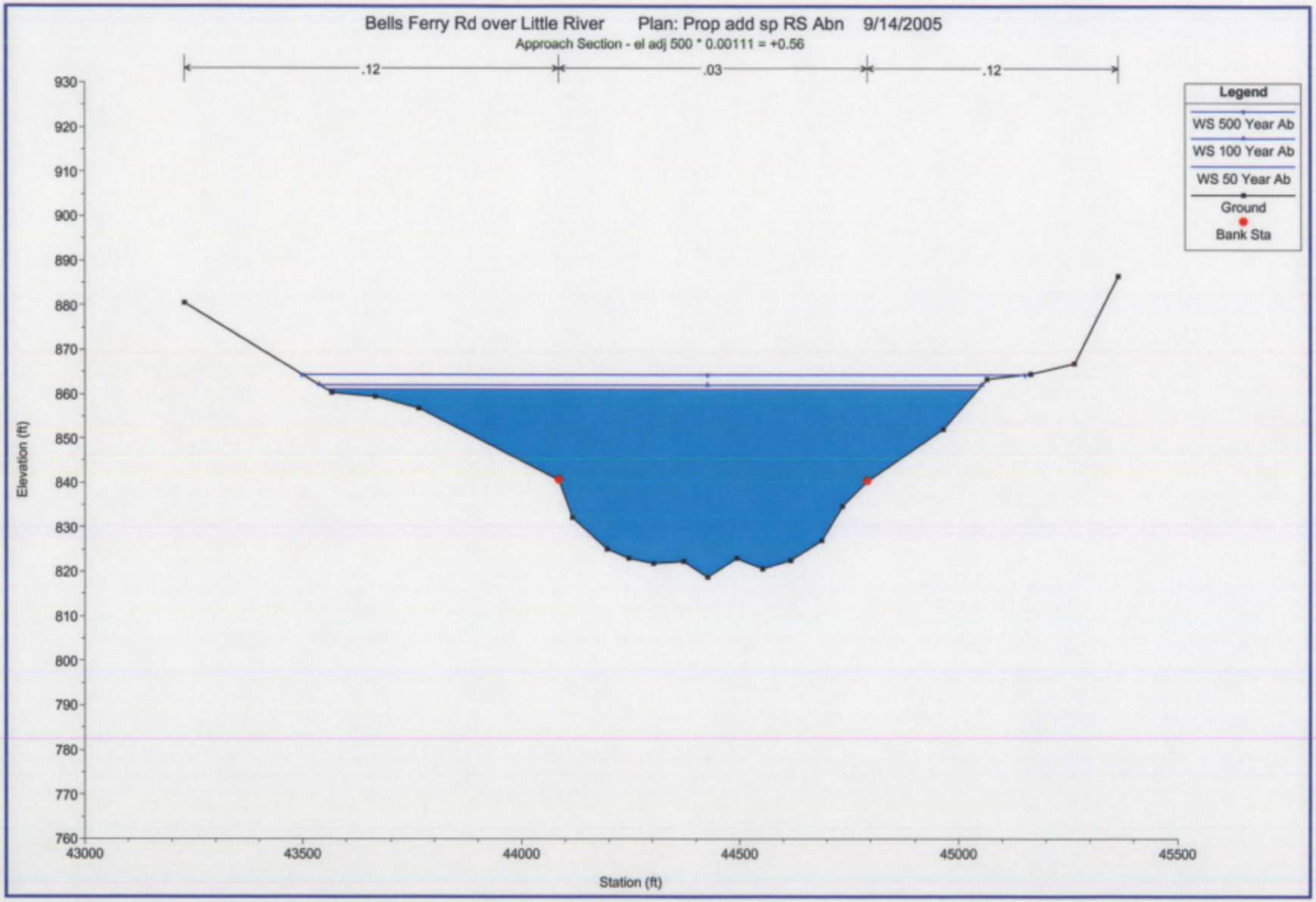
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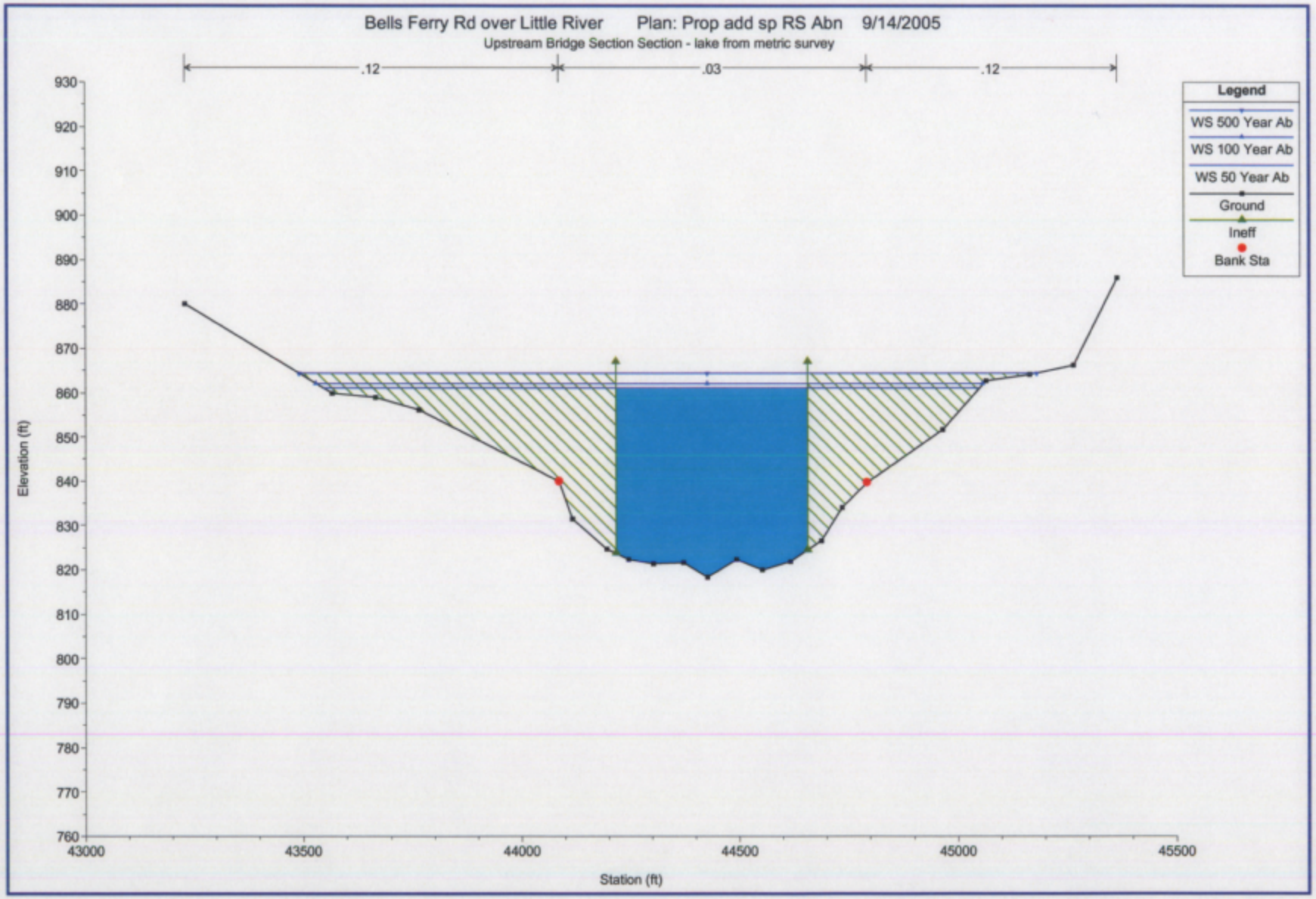
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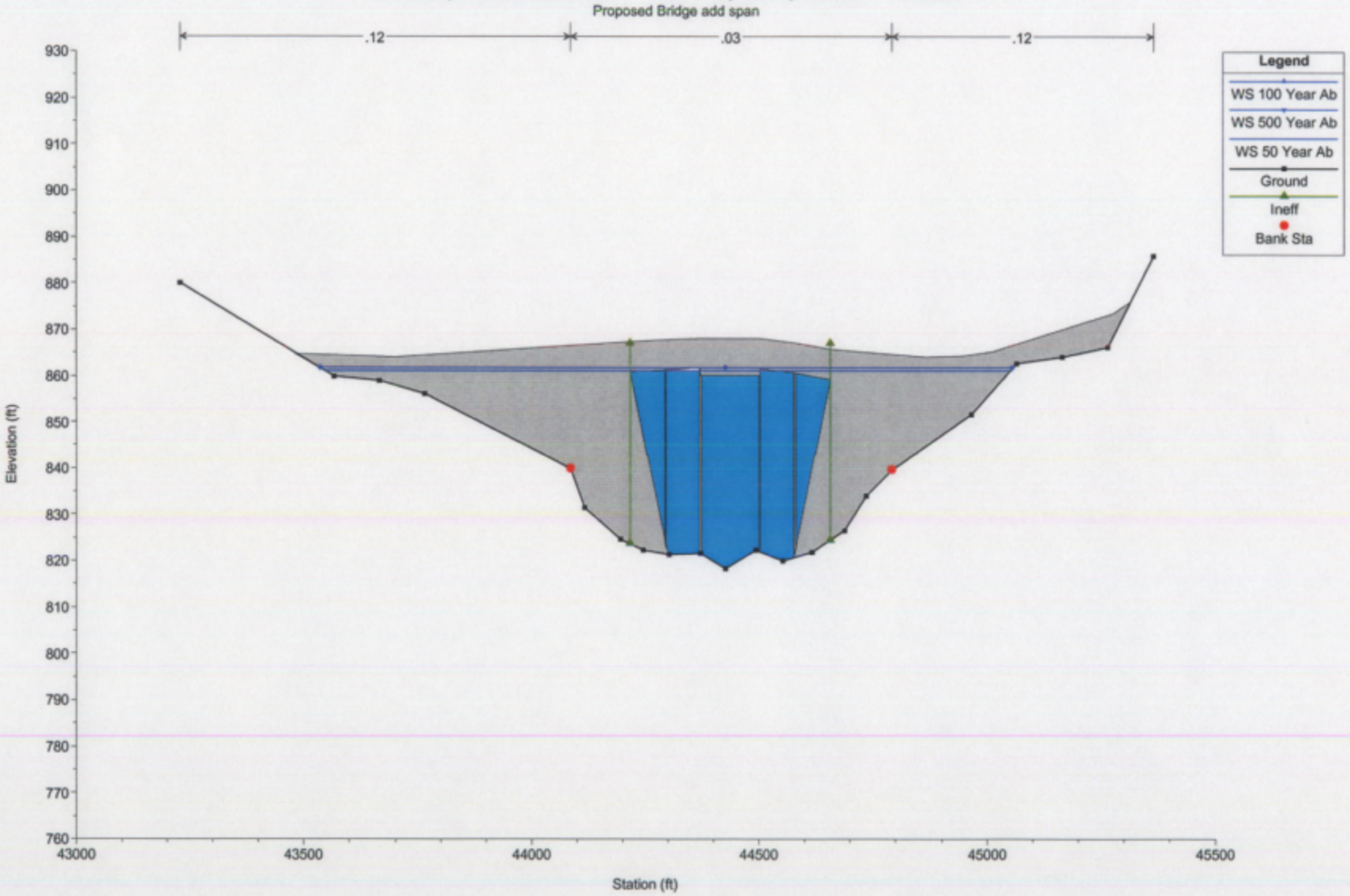

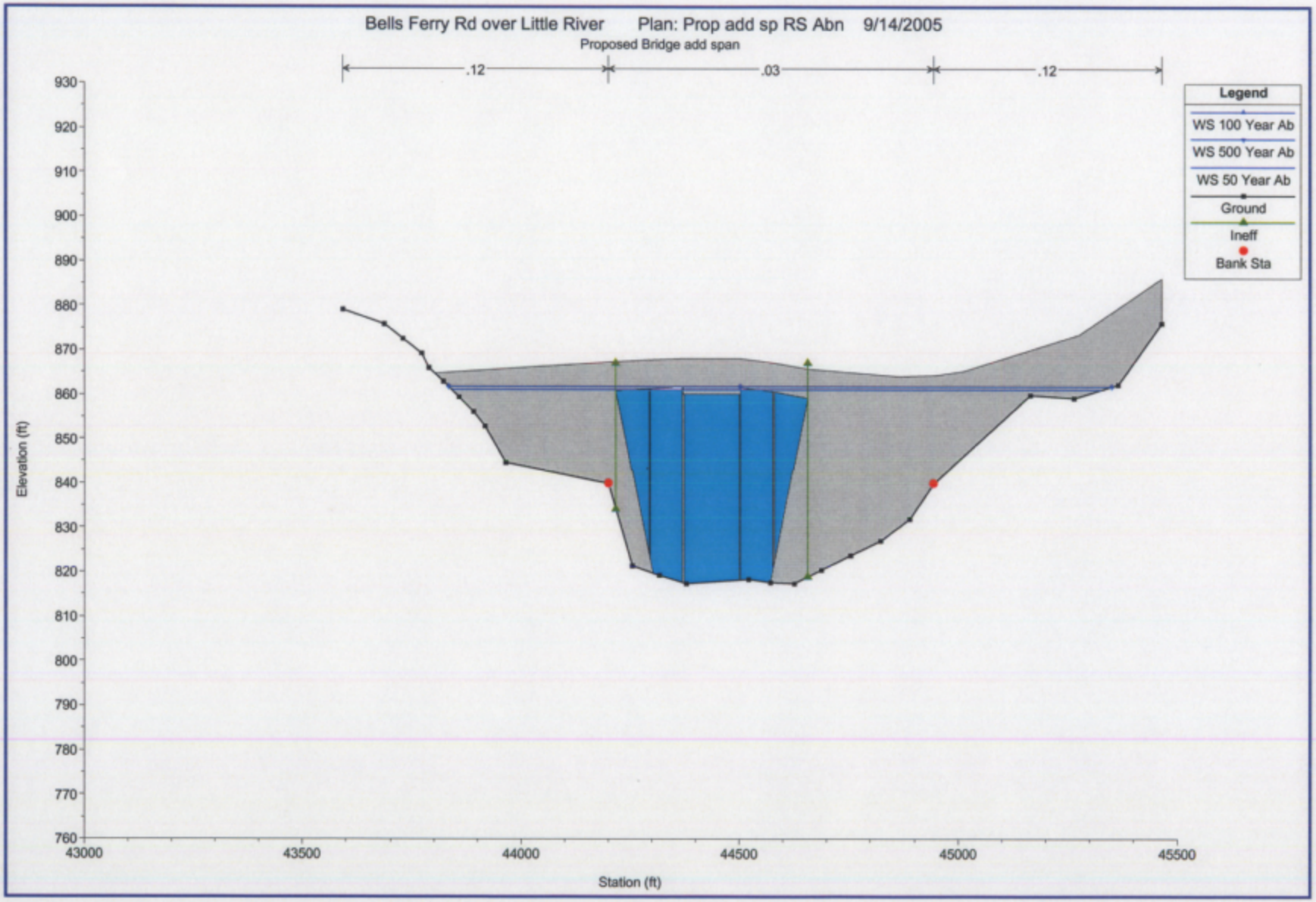
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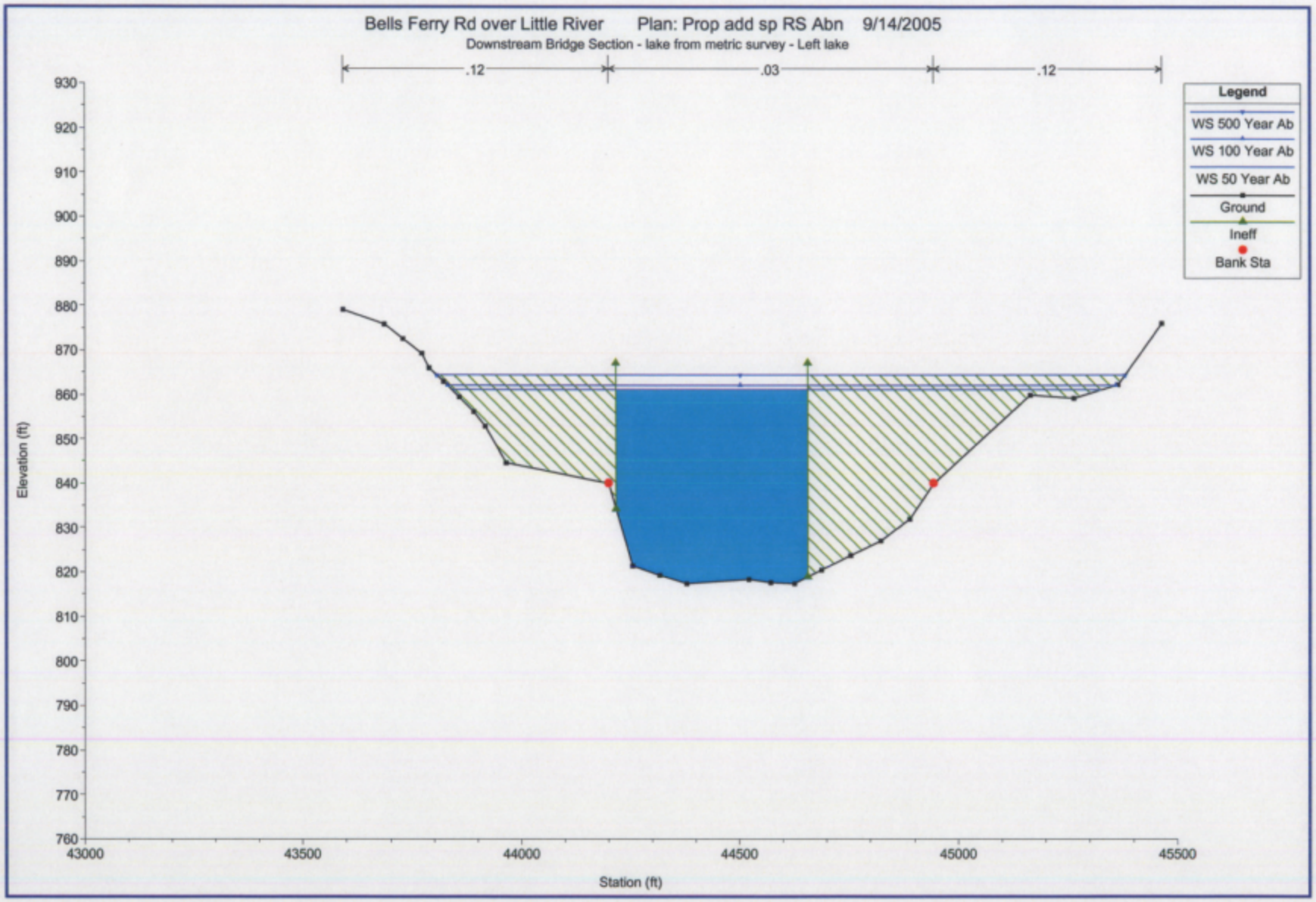
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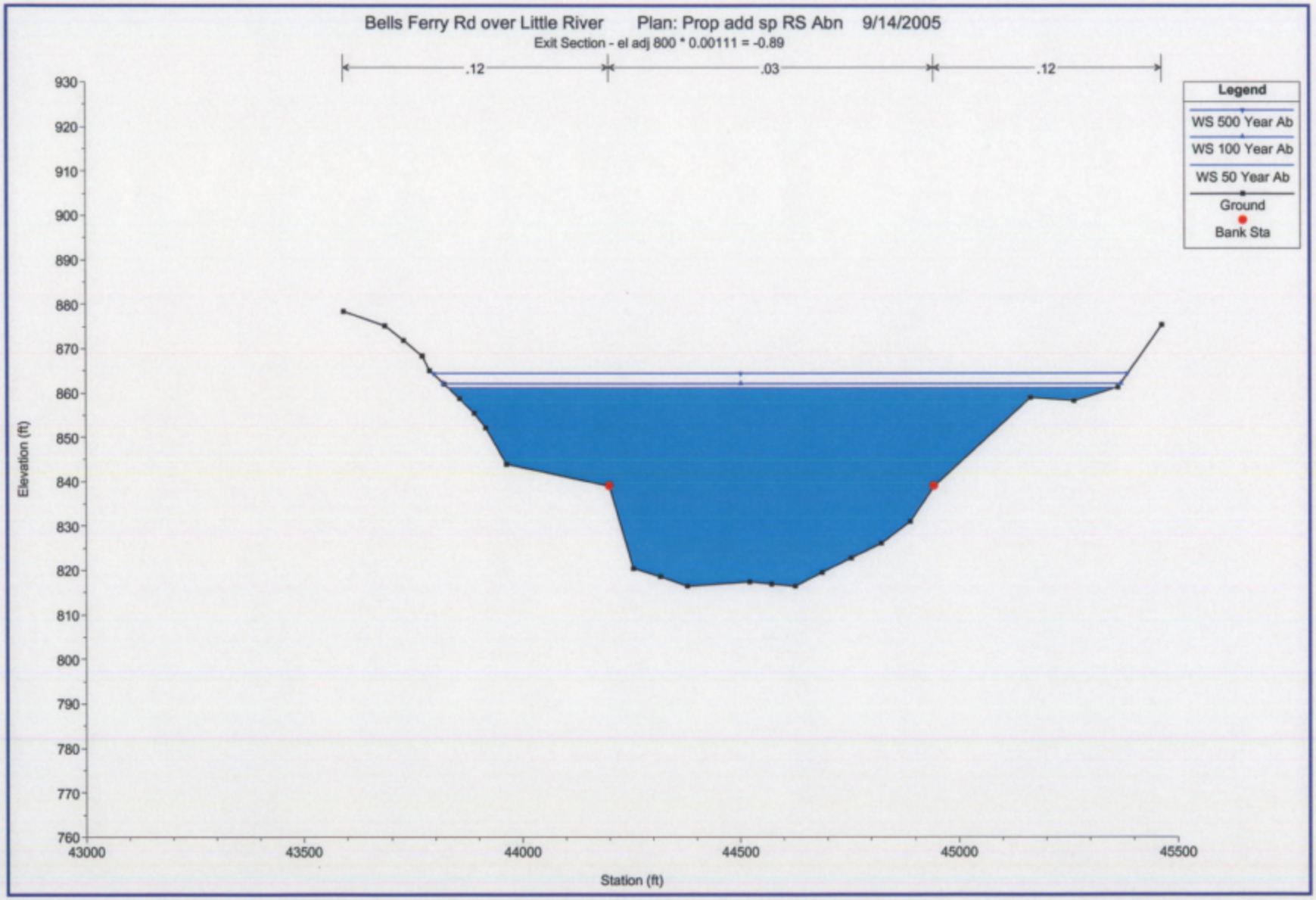
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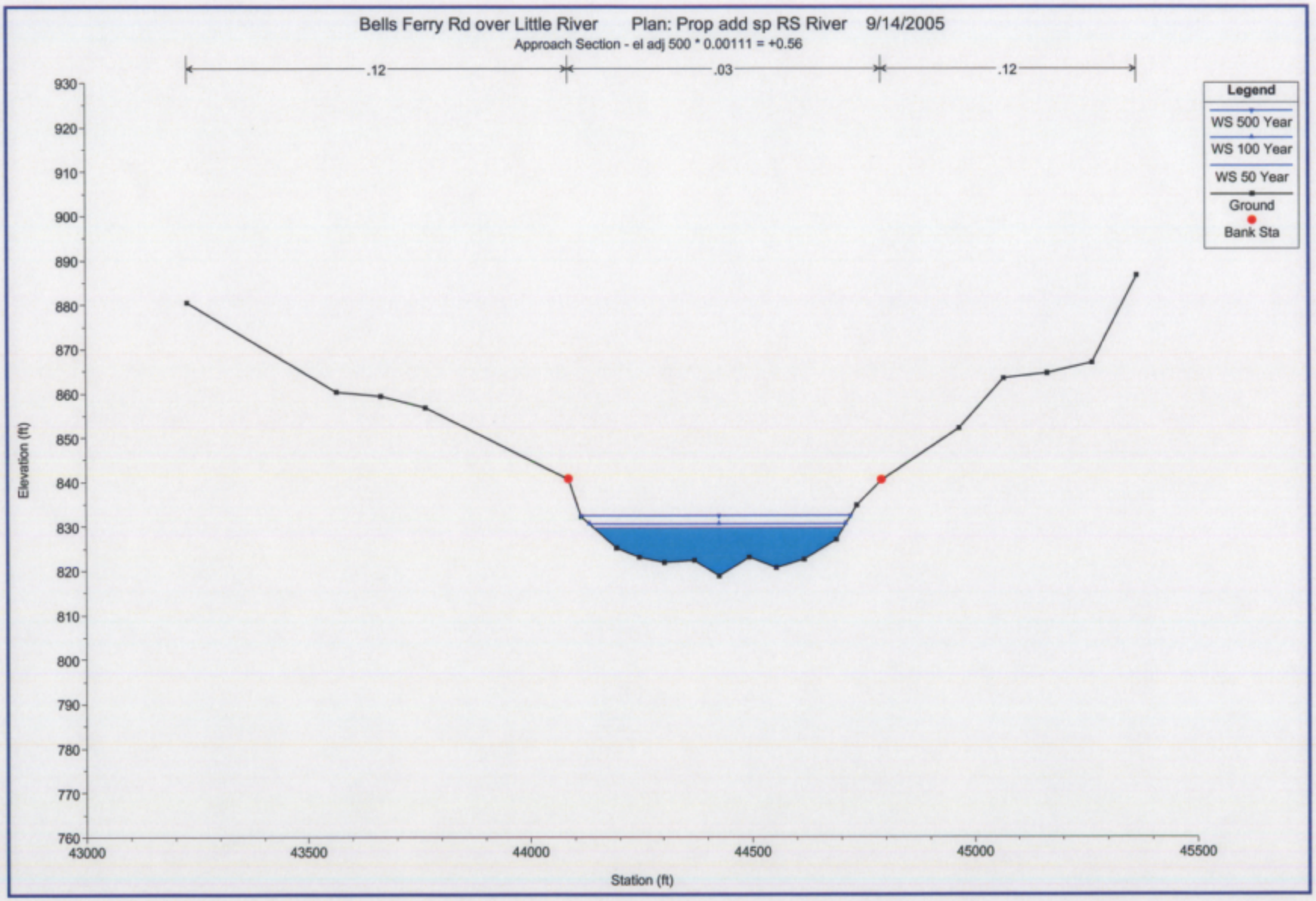
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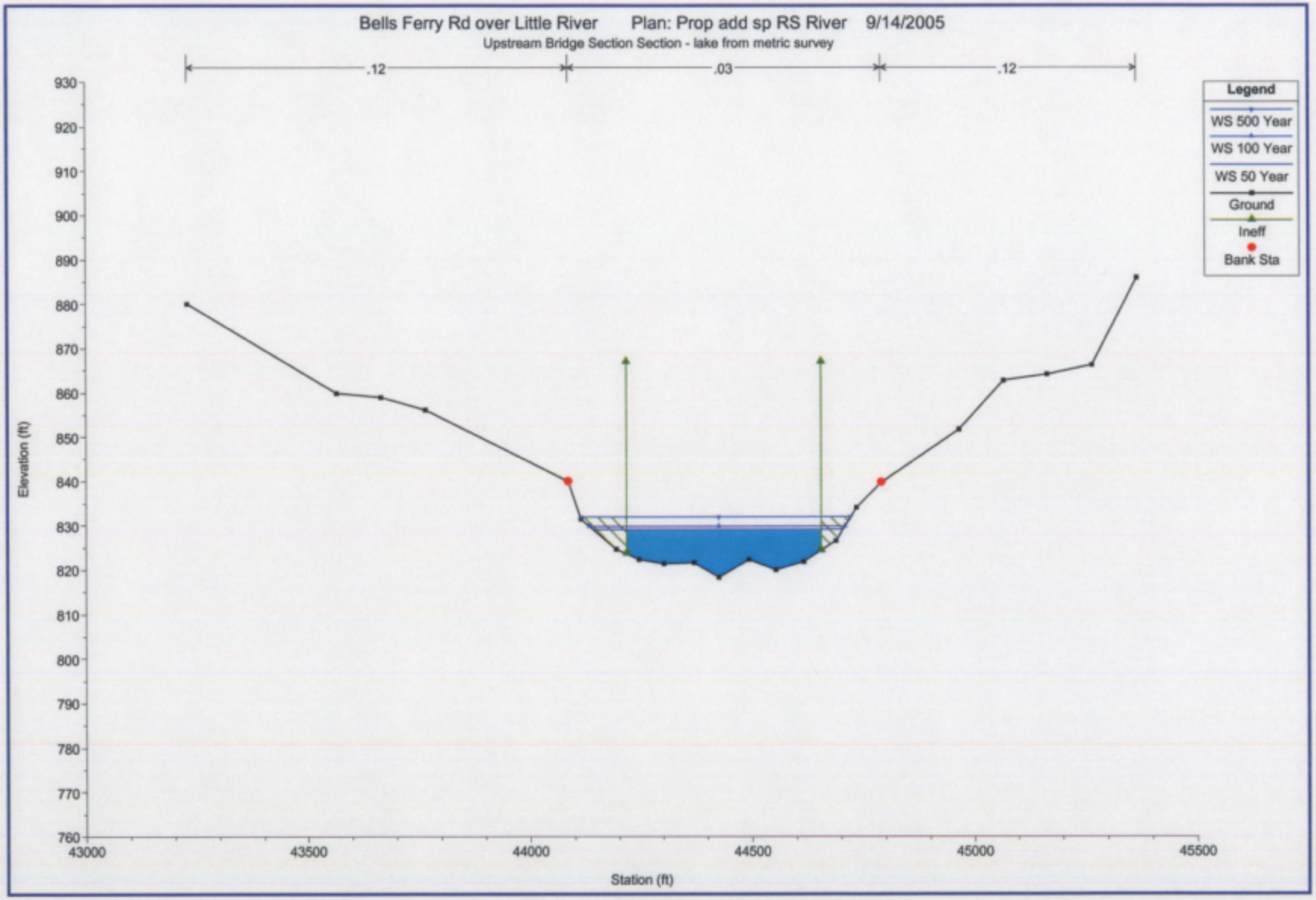
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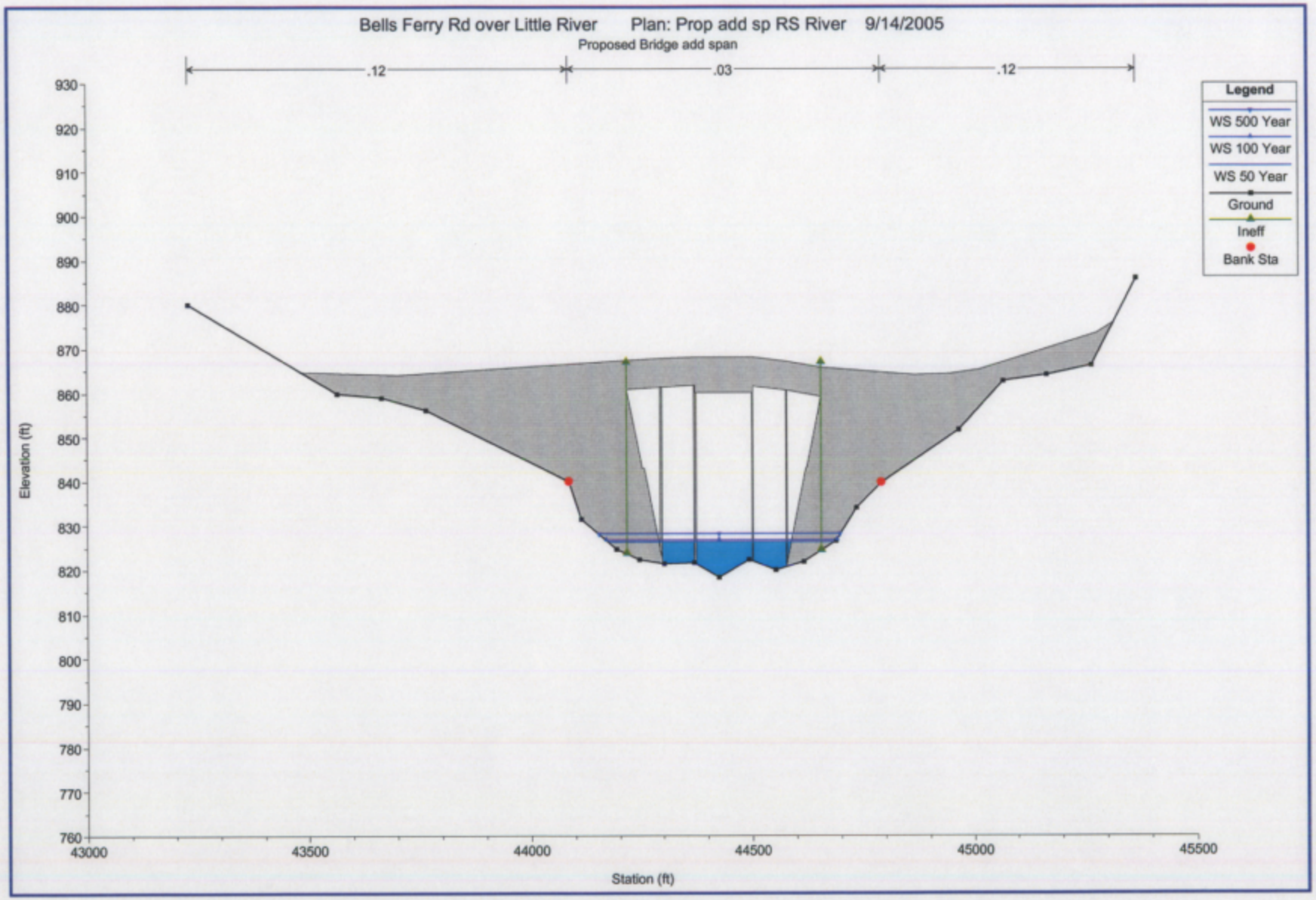
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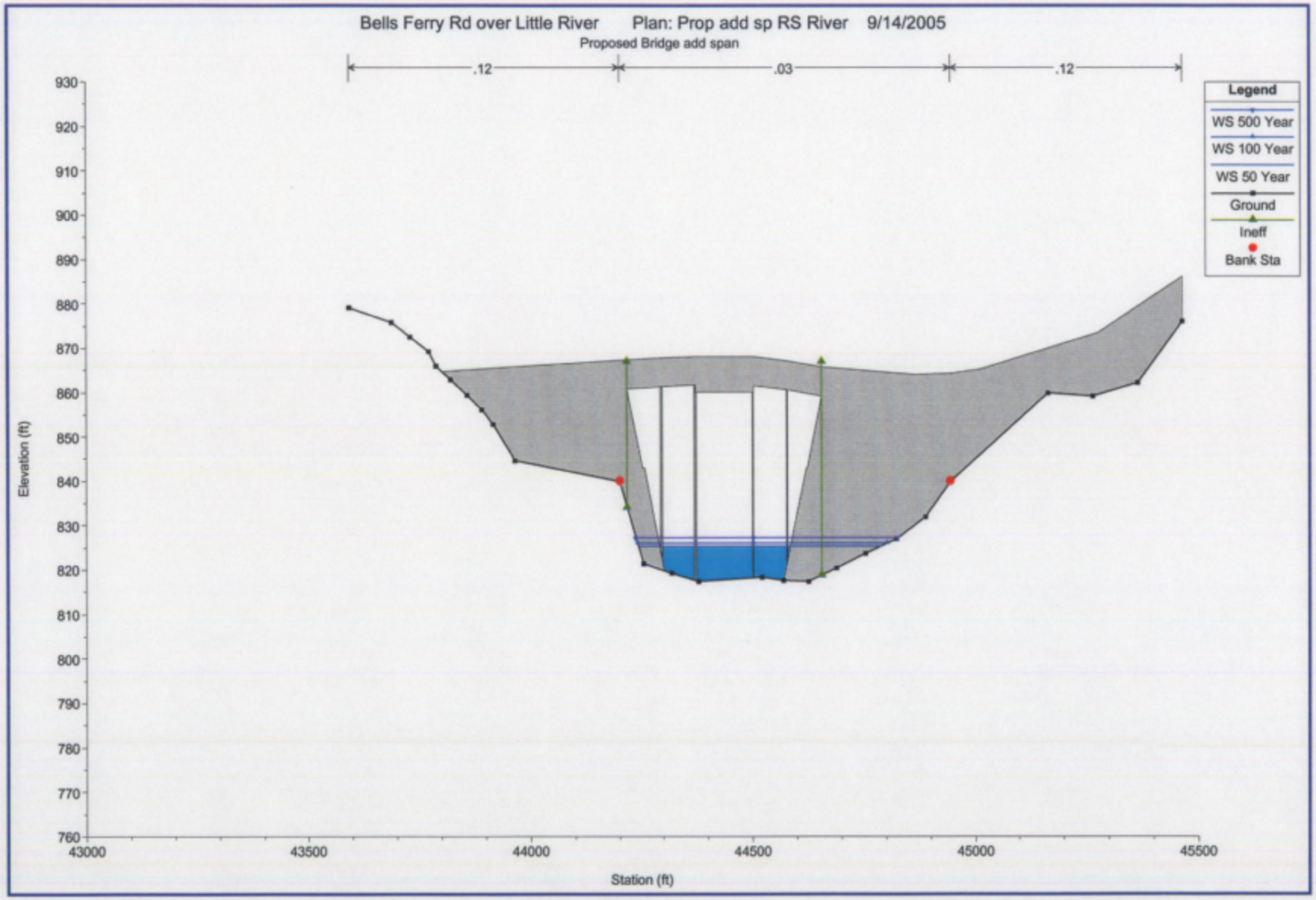
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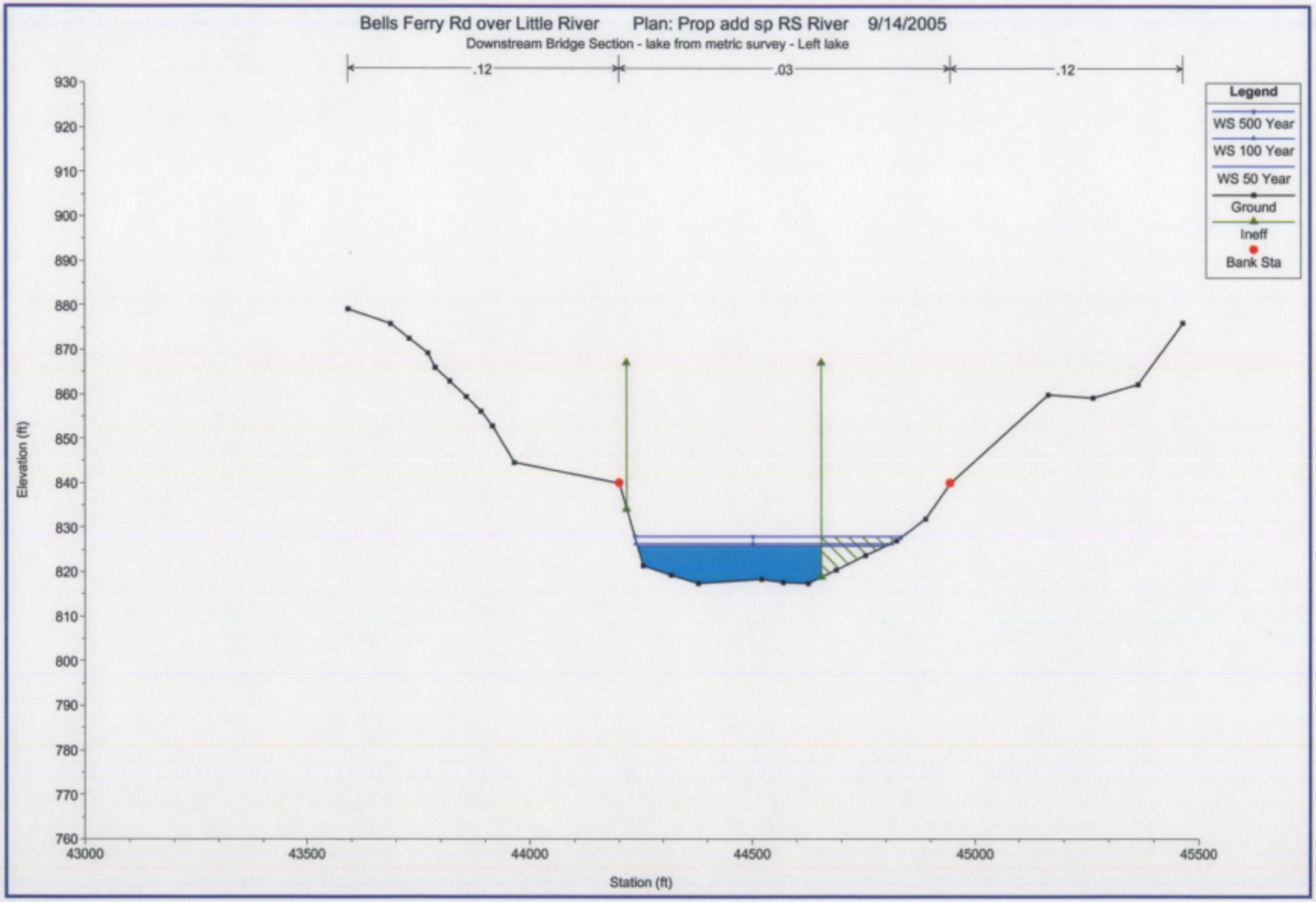
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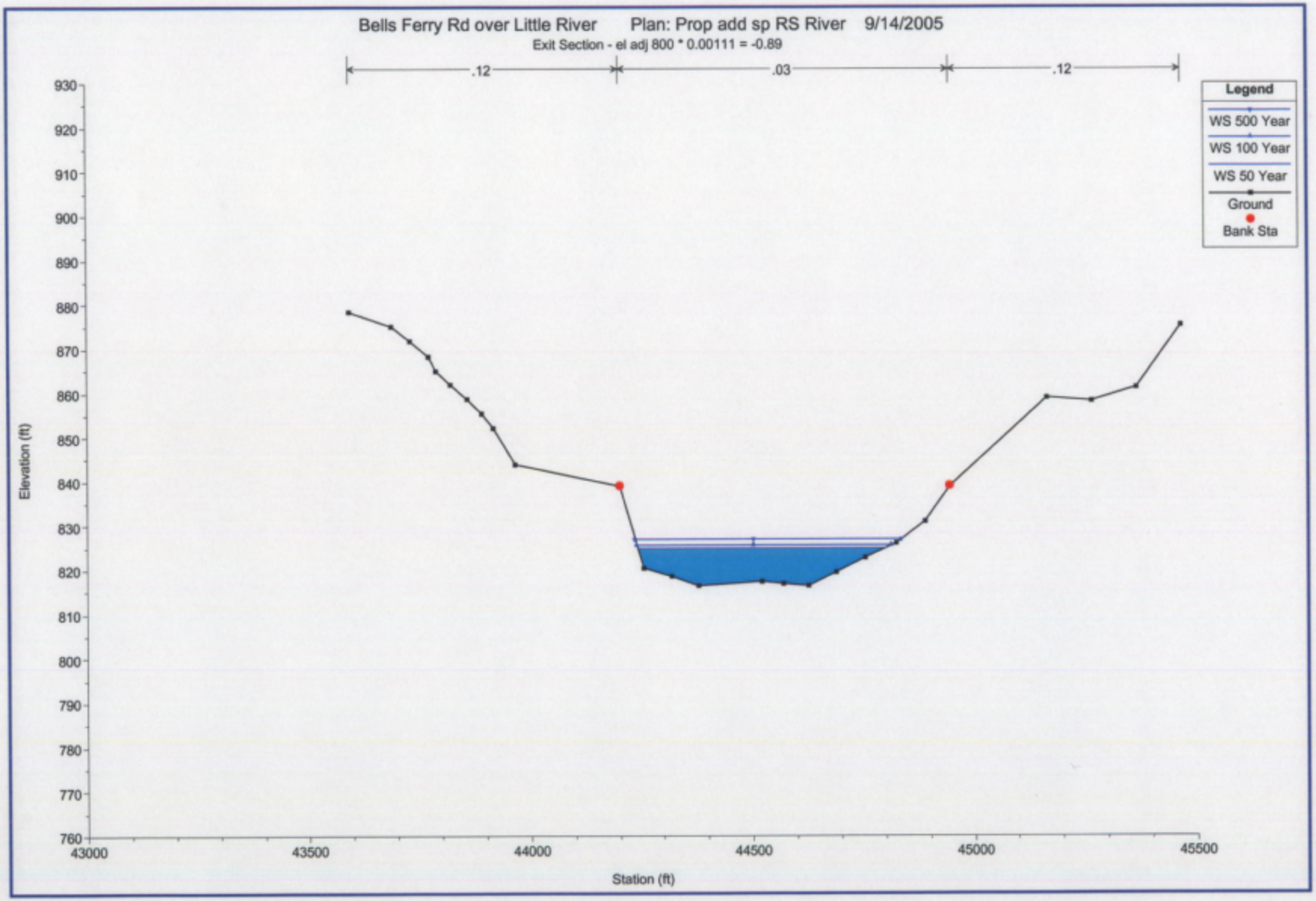
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Section II
Hydraulic Tables

RIVER FLOODS

HYDRAULIC TABLE (50-YEAR STORM)

River Flood - Metric Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (m)	251.73	251.73	251.72
FLOODSTAGE ELEVATION APPROACH SECTION (m)	252.49	254.31	252.90
AREA OF OPENING UNDER FLOODSTAGE (m^2)	**********	112.5	183.9
DISCHARGE THROUGH BRIDGE (cms)	**********	564.0	564.0
DISCHARGE OVER ROADWAY (cms)	**********	0	0
CHANNEL VELOCITY (m/s)*	1.72	5.01	3.07
MEAN VELOCITY (m/s)*	1.72	5.01	3.07
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (m)	250.67	250.73	250.69
BACKWATER HEIGHT (m)	**********	1.81	0.41

* The upstream velocities are higher than the downstream velocites shown for the proposed condition. However, the downstream velocities control as a comparison with the unconstricted condition.

HYDRAULIC TABLE (100-YEAR STORM)

River Flood - Metric Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (m)	251.91	251.90	251.90
FLOODSTAGE ELEVATION APPROACH SECTION (m)	252.63	254.77	253.14
AREA OF OPENING UNDER FLOODSTAGE (m^2)	**********	124.4	198.3
DISCHARGE THROUGH BRIDGE (cms)	**********	649.5	649.5
DISCHARGE OVER ROADWAY (cms)	**********	0	0
CHANNEL VELOCITY (m/s)*	1.80	5.22	3.27
MEAN VELOCITY (m/s)*	1.80	5.22	3.27
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (m)	250.67	250.73	250.69
BACKWATER HEIGHT (m)	**********	2.14	0.51

* The upstream velocities are higher than the downstream velocites shown for the proposed condition. However, the downstream velocities control as a comparison with the unconstricted condition.

HYDRAULIC TABLE (500-YEAR STORM)

River Flood - Metric Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (m)	252.36	252.29	252.34
FLOODSTAGE ELEVATION APPROACH SECTION (m)	252.95	255.92	253.76
AREA OF OPENING UNDER FLOODSTAGE (m^2)	**********	155.4	232.0
DISCHARGE THROUGH BRIDGE (cms)	**********	879.4	879.4
DISCHARGE OVER ROADWAY (cms)	**********	0	0
CHANNEL VELOCITY (m/s)*	1.99	5.66	3.79
MEAN VELOCITY (m/s)*	1.99	5.66	3.79
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (m)	250.67	250.73	250.69
BACKWATER HEIGHT (m)	**********	2.97	0.80

* The upstream velocities are higher than the downstream velocites shown for the proposed condition. However, the downstream velocities control as a comparison with the unconstricted condition.

HYDRAULIC TABLE (50-YEAR STORM)

River Flood - English Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	825.87	825.88	825.84
FLOODSTAGE ELEVATION APPROACH SECTION (ft)	828.39	834.34	829.72
AREA OF OPENING UNDER FLOODSTAGE (ft^2)	**********	1211	1980
DISCHARGE THROUGH BRIDGE (cfs)	**********	19917	19917
DISCHARGE OVER ROADWAY (cfs)	**********	0	0
CHANNEL VELOCITY (f/s)*	5.64	16.45	10.06
MEAN VELOCITY (f/s)*	5.64	16.45	10.06
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	822.42	822.61	822.49
BACKWATER HEIGHT (ft)	**********	5.95	1.33

* The upstream velocities are higher than the downstream velocites shown for the proposed condition. However, the downstream velocities control as a comparison with the unconstricted condition.

HYDRAULIC TABLE (100-YEAR STORM)

River Flood - English Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	826.49	826.44	826.45
FLOODSTAGE ELEVATION APPROACH SECTION (ft)	828.85	835.87	830.52
AREA OF OPENING UNDER FLOODSTAGE (ft^2)	**********	1339	2135
DISCHARGE THROUGH BRIDGE (cfs)	**********	22935	22935
DISCHARGE OVER ROADWAY (cfs)	**********	0	0
CHANNEL VELOCITY (f/s)*	5.90	17.13	10.74
MEAN VELOCITY (f/s)*	5.90	17.13	10.74
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	822.42	822.61	822.49
BACKWATER HEIGHT (ft)	**********	7.02	1.67

* The upstream velocities are higher than the downstream velocites shown for the proposed condition. However, the downstream velocities control as a comparison with the unconstricted condition.

HYDRAULIC TABLE (500-YEAR STORM)

River Flood - English Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	827.96	827.73	827.89
FLOODSTAGE ELEVATION APPROACH SECTION (ft)	829.90	839.64	832.53
AREA OF OPENING UNDER FLOODSTAGE (ft^2)	**********	1673	2497
DISCHARGE THROUGH BRIDGE (cfs)	**********	31053	31053
DISCHARGE OVER ROADWAY (cfs)	**********	0	0
CHANNEL VELOCITY (f/s)*	6.54	18.56	12.44
MEAN VELOCITY (f/s)*	6.54	18.56	12.44
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	822.42	822.61	822.49
BACKWATER HEIGHT (ft)	**********	9.74	2.63

* The upstream velocities are higher than the downstream velocites shown for the proposed condition. However, the downstream velocities control as a comparison with the unconstricted condition.

BRS-STP-1375(6) Cherokee County
CR 770 (Bells Ferry Road) over Little River (Lake Allatoona)
PI # 630975

River Floods

	Metric	English
MIN PROFILE GRADE ELEVATION	263.81	865.52
DEPTH OF CROSS SLOPE	0.27	0.90
DEPTH OF SLAB AND BEAM	1.48	4.86
BOTTOM OF BEAM ELEVATION	262.06	859.76
MINIMUM BOTTOM OF BEAM ELEVATION	262.06	859.76
50 YEAR FLOODSTAGE ELEVATION*	251.72	825.84
CLEARANCE	10.34	33.92
MIMIMUM BOTTOM OF BEAM ELEVATION	262.06	859.76
100 YEAR FLOODSTAGE ELEVATION*	251.90	826.45
CLEARANCE	10.16	33.31

*Floodstage taken from proposed conditions river floods model.

ABNORMAL FLOODS (LAKE ALLATOONA)

HYDRAULIC TABLE (50-YEAR STORM)

Abnormal Flood - Metric Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (m)	262.43	262.43	262.43
FLOODSTAGE ELEVATION APPROACH SECTION (m)	262.43	262.50	262.44
AREA OF OPENING UNDER FLOODSTAGE (m^2)	**********	647.2	1341.7
DISCHARGE THROUGH BRIDGE (cms)	**********	549.4	564.0
DISCHARGE OVER ROADWAY (cms)	**********	14.6	0
CHANNEL VELOCITY (m/s)	0.21	0.87	0.42
MEAN VELOCITY (m/s)	0.21	0.87	0.42
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (m)	**********	**********	**********
BACKWATER HEIGHT (m)	**********	0.06	0.01

HYDRAULIC TABLE (100-YEAR STORM)

Abnormal Flood - Metric Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (m)	262.74	262.73	262.73
FLOODSTAGE ELEVATION APPROACH SECTION (m)	262.74	262.79	262.76
AREA OF OPENING UNDER FLOODSTAGE (m^2)	**********	736.0	1346.8
DISCHARGE THROUGH BRIDGE (cms)	**********	515.4	649.5
DISCHARGE OVER ROADWAY (cms)	**********	134.1	0
CHANNEL VELOCITY (m/s)	0.23	0.88	0.48
MEAN VELOCITY (m/s)	0.23	0.88	0.48
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (m)	**********	**********	**********
BACKWATER HEIGHT (m)	**********	0.05	0.02

HYDRAULIC TABLE (500-YEAR STORM)

Abnormal Flood - Metric Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (m)	263.44	263.43	263.44
FLOODSTAGE ELEVATION APPROACH SECTION (m)	263.44	263.48	263.47
AREA OF OPENING UNDER FLOODSTAGE (m^2)	**********	980.9	1346.8
DISCHARGE THROUGH BRIDGE (cms)	**********	721.1	879.4
DISCHARGE OVER ROADWAY (cms)	**********	158.4	0
CHANNEL VELOCITY (m/s)	0.29	1.01	0.65
MEAN VELOCITY (m/s)	0.29	0.90	0.65
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (m)	**********	**********	**********
BACKWATER HEIGHT (m)	**********	0.05	0.03

HYDRAULIC TABLE (50-YEAR STORM)

Abnormal Flood - English Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	861.00	860.98	861.00
FLOODSTAGE ELEVATION APPROACH SECTION (ft)	861.00	861.21	861.02
AREA OF OPENING UNDER FLOODSTAGE (ft^2)	**********	6967	14442
DISCHARGE THROUGH BRIDGE (cfs)	**********	19400	19917
DISCHARGE OVER ROADWAY (cfs)	**********	517	0
CHANNEL VELOCITY (f/s)	0.68	2.86	1.38
MEAN VELOCITY (f/s)	0.68	2.86	1.38
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	**********	**********	**********
BACKWATER HEIGHT (ft)	**********	0.21	0.02

HYDRAULIC TABLE (100-YEAR STORM)

Abnormal Flood - English Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	862.00	861.98	861.99
FLOODSTAGE ELEVATION APPROACH SECTION (ft)	862.00	862.18	862.06
AREA OF OPENING UNDER FLOODSTAGE (ft^2)	**********	7923	14497
DISCHARGE THROUGH BRIDGE (cfs)	**********	18200	22935
DISCHARGE OVER ROADWAY (cfs)	**********	4735	0
CHANNEL VELOCITY (f/s)	0.76	2.89	1.58
MEAN VELOCITY (f/s)	0.76	2.89	1.58
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	**********	**********	**********
BACKWATER HEIGHT (ft)	**********	0.18	0.06

HYDRAULIC TABLE (500-YEAR STORM)

Abnormal Flood - English Units

	UNCONSTRICTED SECTION	*EXISTING CONDITIONS*	*PROPOSED CONDITIONS*
FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	864.30	864.27	864.29
FLOODSTAGE ELEVATION APPROACH SECTION (ft)	864.30	864.45	864.41
AREA OF OPENING UNDER FLOODSTAGE (ft^2)	**********	10559	14497
DISCHARGE THROUGH BRIDGE (cfs)	**********	25461	31053
DISCHARGE OVER ROADWAY (cfs)	**********	5592	0
CHANNEL VELOCITY (f/s)	0.96	3.30	2.14
MEAN VELOCITY (f/s)	0.96	2.94	2.14
2-YEAR FLOODSTAGE ELEVATION BRIDGE SECTION (ft)	**********	**********	**********
BACKWATER HEIGHT (ft)	**********	0.15	0.11

BRS-STP-1375(6) Cherokee County
CR 770 (Bells Ferry Road) over Little River (Lake Allatoona)
PI # 630975

Abnormal Floods*

	Metric	English
MIN PROFILE GRADE ELEVATION	263.81	865.52
DEPTH OF CROSS SLOPE	0.27	0.90
DEPTH OF SLAB AND BEAM	1.48	4.86
BOTTOM OF BEAM ELEVATION	262.06	859.76
MINIMUM BOTTOM OF BEAM ELEVATION	262.06	859.76
50 YEAR FLOODSTAGE ELEVATION	262.43	861.00
CLEARANCE	-0.37	-1.24
MIMIMUM BOTTOM OF BEAM ELEVATION	262.06	859.76
100 YEAR FLOODSTAGE ELEVATION	262.73	861.99
CLEARANCE	-0.67	-2.23

*Due to roadway contraints, clearance requirements are not being met. A design varience is provided.

Section III
Peak Flow Summary

BRS-STP-1375(6) Cherokee County
CR 770 (Bells Ferry Road) over Little River (Lake Allatoona)
PI # 630975

Drainage Area (sq. mi.)	210.0
Region No.	1
Impervious Area (%)	
USGS Gage No.	N/A
Drainage Area @ Gage	
Q2	
Q5	
Q10	
Q25	
Q50	
Q100	
Q500	

Discharge (cfs)

	Regional	Urbanized	Qu(w) Weighted Discharge
Q2	6834	0	0
Q5	10479	0	0
Q10	13198	0	0
Q25	16921	0	0
Q50	19917	0	0
Q100	22935	0	0
Q500	31053	0	0

Hydraulic Slope Calculation

Based on USGS quad

Upstream Elevation =	880	
Downstream Elevation =	860	
Horizontal Distance =	18000	
Slope =	0.00111	ft/ft
	5.87	ft/mi

Metric Discharges (m^3/s)

Q2	193.6
Q5	296.8
Q10	373.8
Q25	479.2
Q50	564.1
Q100	649.5
Q500	879.4

/Index number applies to figures 19A & 19B/

INDEX NO.	STREAM	TRIBUTARY TO	LOCATION	DRAINAGE AREA (SQ. MI.)
106A	Little River	Etowah River	Cherokee County, lat 34°07', long 84°30', at State Highway 5, 1¾ miles north of Woodstock	137
106C	Little River	Etowah River	Cherokee County, lat 34°08', long 84°31', at junction with Allatoona Reservoir	139
106B	Noonday Creek	Little River	Cobb County, lat 34°00', long 84°36', at State Highway 3, 4 miles northwest of Marietta	4.1
107	Noonday Creek	Little River	USGS Gaging Station 1939; Noonday Creek near Woodstock, Ga. Cherokee County, lat 34°05', long 84°32', at county road, 1¼ miles southwest of Woodstock	42.8
107A	Noonday Creek	Little River	Cherokee County, lat 34°08', long 84°33', at junction with Allatoona Reservoir	50
106D	Little River	Etowah River	Cherokee County, lat 34°10', long 84°36', at confluence of Little River arm of Allatoona Reservoir with main Reservoir	210
111	Stamp Creek	Etowah River	Bartow County, lat 34°14', long 84°41', near county road, 8 miles northeast of Cartersville	16.2
111A	Proctor Creek	Etowah River	Cobb County, lat 34°02', long 84°40', at State Highway 3, 3 miles west of Kennesaw	7.9
112A	Allatoona Creek	Etowah River	Cobb County, lat 34°02', long 80°43', at junction with Allatoona Reservoir	28
113	Tanyard Creek	Allatoona Creek (Arm of Reservoir)	Cobb County, lat 34°04', long 84°41', at State Highway 92, at Acworth	2.19
114A	Etowah River	Coosa River	Bartow County, lat 34°10', long 84°44', at Allatoona Dam, 4 miles east of Cartersville	1,110

FROM THE USGS PUBLICATION - "DRAINAGE AREA DATA FOR GEORGIA STREAMS"

USGS
science for a changing world

Water Resources Data
Georgia
Water Year 1998

Water-Data Report GA-98-1

U.S. Department of the Interior
U.S. Geological Survey

Prepared in cooperation with the
State of Georgia
and with other agencies

LAKES AND RESERVOIRS IN MOBILE RIVER BASIN--Continued

02393500 ALLATOONA RESERVOIR NEAR CARTERSVILLE, GA.

LOCATION.--Lat 34°09'46", long 84°43'40", Bartow County, Hydrologic Unit 03150104, at forebay of dam on Etowah River, 2.8 mi upstream from Nashville, Chattanooga, & St. Louis Railway bridge, 4 mi east of Cartersville, and 6 mi upstream from Pumpkinvine Creek.
DRAINAGE AREA.--1,120 mi^2.
PERIOD OF RECORD.--December 1949 to current year.
REVISED RECORDS.--WRD GA-80-1: Drainage area.
GAGE.--Water-stage recorder. Datum of gage is at sea level (levels by U.S. Army Corps of Engineers).
REMARKS.--Lake is formed by concrete gravity dam. Spillway (crest elevation, 835.0 ft) is equipped with nine tainter gates 40 ft wide by 25 ft high. There are four sluices 5.67 ft by 10 ft high and one sluice 4.0 ft in diameter. Storage began Dec. 27, 1949; water in lake first reached minimum pool elevation Feb. 5, 1950. Total capacity at elevation 860.0 ft, top of gates, is 670,000 acre-ft, of which 587,100 acre-ft is controlled storage above 800 ft, minimum pool. Lake is used for flood control and power. Records furnished by U.S. Army Corps of Engineers.
EXTREMES FOR PERIOD OF RECORD: Maximum contents, 693,800 acre-ft Apr. 10, 1964, elevation, 861.19 ft; minimum, 119,600 acre-ft Dec. 4, 1954, elevation, 809.34 ft
EXTREMES FOR CURRENT YEAR: Maximum contents, 907,800 acre-ft Oct. 28, elevation, 843.27 ft; minimum, 200,800 acre-ft Dec. 17, elevation, 822.74 ft.

MONTHEND ELEVATION AND CONTENTS AT 2400, WATER YEAR OCTOBER 1997 TO SEPTEMBER 1998

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)	Change in contents (equivalent in cubic feet per second)
Sept. 30	839.56	362300	-	-
Oct. 31	841.22	382200	+19900	+324
Nov. 30	827.51	239500	-142700	-2398
Dec. 31	825.38	221600	-17900	-291
CAL YR 1997	-	-	+15200	+21
Jan. 31	827.18	236600	+15000	+244
Feb. 28	833.36	294500	+57900	+1043
Mar. 31	838.33	348100	+53600	+872
Apr. 30	841.73	388400	+40300	+677
May 31	841.84	389800	+1400	+23
June 30	840.66	375400	-14400	-242
July 31	839.03	356100	-19300	-314
Aug. 31	837.43	337900	-18200	-296
Sept. 30	832.58	286700	-51200	-860
WTR YR 1998	-	-	-75600	-104

Expansion and Contraction Reach Length Computation

Little River (Lake Allatoona)

Expansion Reach Length Computation

b - bridge opening width	265
B - floodplain width	1320
b/B	**0.20**
(B-b)/2 avg. obs. Length	527.5
n(ob)	0.12
n(mc)	0.03
n(ob)/n(mc)	**4.00**
S (ft/ft)	0.0011
S (ft/mile)	**5.86**

Ranges of Expansion Ratios

		n(ob)/n(mc)=1	n(ob)/n(mc)=2	n(ob)/n(mc)=4
b/B=0.10	**S=1 ft/mile**	1.4-3.6	1.3-3.0	1.2-2.1
	5 ft/mile	1.0-2.5	0.8-2.0	0.8-2.0
	10 ft/mile	1.0-2.2	0.8-2.0	0.8-2.0
b/B=0.25	**S=1 ft/mile**	1.6-3.0	1.4-2.5	1.2-2.0
	5 ft/mile	1.5-2.5	1.3-2.0	1.3-2.0
	10 ft/mile	1.5-2.0	1.3-2.0	1.3-2.0
b/B=0.50	**S=1 ft/mile**	1.4-2.6	1.3-1.9	1.2-1.4
	5 ft/mile	1.3-2.1	1.2-1.6	1.0-1.4
	10 ft/mile	1.3-2.0	1.2-1.5	1.0-1.4

Er-Exp. rate from chart	1.3	2.0	
Exp. Reach Length	**685.75**	**1055**	**Use 800 ft**

Contraction Reach Length Computation

Ranges of Contraction Ratios

	n(ob)/n(mc)=1	n(ob)/n(mc)=2	n(ob)/n(mc)=4
S=1 ft/mile	1.0-2.3	0.8-1.7	0.7-1.3
5 ft/mile	1.0-1.9	0.8-1.5	0.7-1.2
10 ft/mile	1.0-1.9	0.8-1.4	0.7-1.2

Cr-Contr. rate from chart	0.7	1.2	
Contr. Reach Length	**369.25**	**633**	**Use 500 ft**

Reference : Hydrologic Engineering Center (HEC) Research Document No. 42 ***Flow Transitions in Bridge Backwater Analysis*** , John H. Hunt and Gary Brunner, dated September 1995.

Section IV
Hydraulic Engineering Field Report

HYDRAULIC ENGINEERING FIELD REPORT

I. HYDRAULIC AND HYDROLOGICAL DATA REQUIRED FOR ALL BRIDGE STREAM CROSSING PROJECTS

A. PROJECT LOCATION

District 6 County CHEROKEE Project # BHS-1375 (6)
PI# 630975 Route CO. RD. 710 Stream Name LITTLE RIVER
Surveyed By DANNY C. WILBANKS/PARTY 64 Date 8-28-97

NOTE: ALL ELEVATIONS SHOULD BE REFERENCED TO NGVD. BENCHMARK DESCRIPTIONS, LOCATIONS AND ELEVATIONS ARE REQUIRED. ALL SURVEY DATA SHOULD BE REFERENCED TO THE PROJECT STATIONS. THIS SURVEY DATA SHOULD BE SUBMITTED ALONG WITH 3 SETS OF ROADWAY PLANS.

B. SITE INFORMATION

Floodplain description:
a) Flat, rolling, mountainous, etc. ROLLING
b) Wooded, heavily vegetated, pasture, swampy, etc. PART ON LAKE FRONTAGE, PART WOODED
Stream channel description: well-defined banks, meandering, debris, etc. BRIDGE CROSSES ALLATOONA LAKE UNABLE TO DETERMINE STREAM BED
Is there any fill in the upstream or downstream floodplains which will affect the natural drainage or limit the floodplain width at this site? NO

C. REQUIRED EXISTING BRIDGE DATA AT PROJECT SITE

Bridge identification # 028-0205-0570N Date built 1950
Skew angle of bridge bents 90°
Substructure information:
a) Column type(concrete, steel, etc) CONC.
b) Size of column
c) Number of columns per bent 2 WITH CONC. WEB WALL BETWEEN
Height of curb, parapet or barrier 0.35 m
Spur dike length, elevation and location if applicable N/A
Note any scour problems at intermediate bents or abutments: NO

REQUIRED SURVEY INFORMATION

1) Centerline stations and top of deck elevations at begin and end bridge (BFPR). Centerline stations and top of deck elevations at the intersection with the centerline of each bent;
2) Elevations of bottoms of outside beams at each bent;

3) Profile of the groundline and endrolls under the bridge. This profile should be in stations and elevations. The toe of endrolls and top of stream channel banks should be labeled.

Note: For bridge replacement projects, the above data should be provided for all bridges located within the floodplain. Invert elevations and size and number of barrels should be provided for all box culverts located within the floodplain.

D. NORMAL WATER SURFACE DATA

WATER SURFACE ELEVATIONS

500 feet upstream of the survey centerline NA
At the survey centerline NA
500 feet downstream of the survey centerline NA

Is site affected by tides? NO
Normal high tide NA. Normal low tide NA

E. HISTORICAL FLOOD DATA

Extreme High Water Elevation at Site 262.490m Date 4-9-64
If site is tidal, highest observed tide NA Date NA
Location where taken (upstream, downstream, centerline) HIGH WATER MARK IS ALLATOONA LAKES HIGHEST MARK
Source of highwater information CORP OF ENGINEERS @ ALLATOONA LAKE RESOURCE OFFICE
Are there any houses that have been flooded? NO
Provide location and floor elevation NA

Information about flood (number of times house has been flooded, elevations and dates of flood) NA

Are there any other houses that may be flooded (with floor elevations within 2 feet of the Flood of Record)? NA
Provide location and floor elevation

F. MISCELLANEOUS INFORMATION

Are water surfaces at site affected by other factors (highwater from other streams, reservoirs, etc.)? ALLATOONA LAKE DAM

Give location, length, width and elevations of dam and spillway, if applicable DAM LENGTH 1250 FT. AND 190 FT. HIGH

Note: If the project site is affected by the above factors, additional floodplain cross sections may be required. The Office of Bridge Design Hydraulics can be contacted during the survey phase to identify the required cross sections.

II. BRIDGE REPLACEMENT PROJECTS/NEW LOCATIONS

A. FLOODPLAIN SURVEY DATA

1) Floodplain cross sections are required upstream and downstream of the bridge site. These cross sections should be located 50 to 100 feet from the roadway centerline, on original ground. New location projects should include the floodplain cross section along the centerline. These cross sections should be parallel to the existing bridge and be extended on both sides of the stream channel until an elevation is reached that is a minimum of 2.0 feet higher than the Flood of Record Elevation. The top of stream banks and channel cross section should be included. A sufficient number of streambed shots should be taken to insure an accurate stream channel cross section. The floodplain cross sections should include shots where there is a significant change in elevation (2.0 ft). For wide, flat floodplains these shots can be as much as 500 feet apart. These cross sections should be accurate to 0.5 ft.

2) A profile along the existing roadway extending the full length of the floodplain. This profile should include shots along the centerline and edges of the roadway.

3) A stream traverse extending 500 feet upstream and 500 feet downstream of the bridge site. Cross sections of the stream channel are required at 100 ft. intervals along this traverse. These cross sections should include stream banks, edge of water and streambed elevations. Traverses should be provided for all stream channels in the floodplain.

4) Profiles of all intersecting roads that are located within the limits of the floodplain. These profiles should extend 500 feet upstream and downstream of the intersection with the project road. Elevations should be given at 100 ft. intervals.

5) If the project is on a new location, the project alignment should be accurately located on a USGS quadrangle map.

B. UPSTREAM AND DOWNSTREAM BRIDGE CROSSINGS

1) All the information in this section is needed for bridges and/or box culverts within 1 mile upstream and downstream of the project site.

	UPSTREAM	DOWNSTREAM
Distance from proposed structure	_____	_____
Railroad or highway bridge	_____	_____
Route # if highway bridge	_____	_____
Length of bridge (or culvert size)	_____	_____
Substructure information:		
a) Column type(concrete,steel,etc)	_____	_____
b) Size of column	_____	_____

c) Number of columns per bent _____ _____
Length of overflow bridge or culvert size, if applicable _____ _____

2) The following additional information is required for bridges and/or box culverts within 2000 feet of the proposed bridge:

a) Floodplain cross sections and roadway profiles at the upstream/downstream site as specified in Section II.A, items 1 and 2 in the Floodplain Survey Data section.

b) Bridge information as required in Section I.C, Required Existing Bridge Data at Project Site.

III. BRIDGE WIDENING AND PARALLELING PROJECTS

A. FLOODPLAIN SURVEY DATA

Traverses of all stream channels at the site. These stream traverses should show the top of banks and edge of water and be extended a distance of 100 feet upstream and 100 feet downstream of the proposed construction centerline.

B. REQUIRED EXISTING BRIDGE DATA

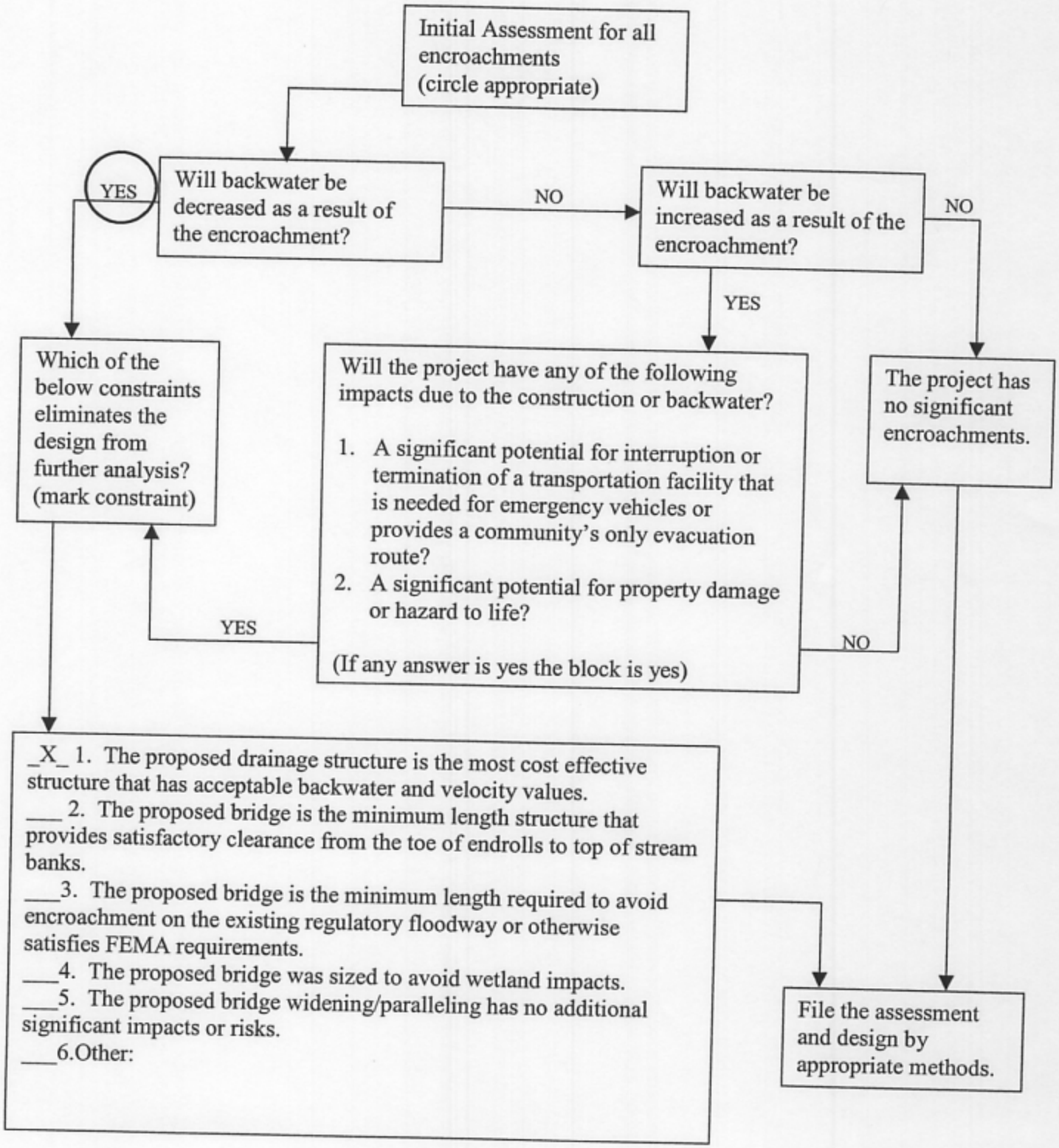
In addition to the required existing bridge data in section I.C, provide top of deck elevations at BFPR, centerline bents and at midspan, along centerline of bridge and gutterlines.

C. PHOTOGRAPHS

Photographs of the stream, floodplain and bridge at the project site should be provided. These photographs should be taken by district personnel.

RISK ASSESSMENT

Bells Ferry Road over Little River



Section V
HEC-RAS Computer Model Output

RIVER FLOODS

HEC-RAS FULL VALLEY MODEL

HEC-RAS Plan: Jnc RS Riv River: Little River Reach: 1

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	-865	2 Year	6834.00	816.61	821.53	819.48	821.77	0.001110	3.91	1746.14	477.84	0.36
1	-865	50 Year	19917.00	816.61	824.98	821.64	825.48	0.001110	5.64	3532.86	558.55	0.40
1	-865	100 Year	22935.00	816.61	825.61	822.05	826.15	0.001111	5.90	3885.33	573.35	0.40
1	-865	500 Year	31053.00	816.61	827.08	823.02	827.74	0.001110	6.54	4750.93	601.39	0.41
1	-65	2 Year	6834.00	817.50	822.42	820.37	822.66	0.001112	3.92	1745.35	477.80	0.36
1	-65	50 Year	19917.00	817.50	825.87	822.55	826.36	0.001111	5.64	3531.76	558.51	0.40
1	-65	100 Year	22935.00	817.50	826.49		827.04	0.001111	5.90	3884.42	573.32	0.40
1	-65	500 Year	31053.00	817.50	827.96		828.63	0.001111	6.54	4749.94	601.37	0.41
1	102	2 Year	6834.00	818.40	823.24	823.24	824.28	0.010534	8.18	835.21	408.64	1.01
1	102	50 Year	19917.00	818.40	825.41	825.41	827.29	0.008498	11.00	1809.89	483.21	1.00
1	102	100 Year	22935.00	818.40	825.91	825.80	827.85	0.007686	11.17	2052.49	496.67	0.97
1	102	500 Year	31053.00	818.40	827.51		829.32	0.004988	10.78	2880.38	531.69	0.82
1	602	2 Year	6834.00	818.96	825.58	823.80	825.86	0.001397	4.21	1622.80	472.57	0.40
1	602	50 Year	19917.00	818.96	828.39	825.97	829.05	0.001722	6.53	3048.45	537.27	0.48
1	602	100 Year	22935.00	818.96	828.85	826.36	829.60	0.001794	6.95	3297.65	545.44	0.50
1	602	500 Year	31053.00	818.96	829.90	827.30	830.89	0.001996	8.00	3882.99	564.17	0.54

```
                        HEC-RAS Version 3.1.3 May 2005
                         U.S. Army Corp of Engineers
                        Hydrologic Engineering Center
                              609 Second Street
                              Davis, California


            X     X  XXXXXX    XXXX        XXXX       XX      XXXX
            X     X  X        X    X       X   X     X  X    X
            X     X  X        X            X   X    X    X   X
            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
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PROJECT DATA
Project Title: Bells Ferry Rd over Little River
Project File : 630975.prj
Run Date and Time: 9/7/2005 9:26:23 AM

Project in English units

PLAN DATA

Plan Title: Uncon RS RIv
Plan File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.p07

Geometry Title: Uncon RS River
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g06

Flow Title : River Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f01

Plan Summary Information:

Number of:	Cross Sections	= 4	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

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

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

FLOW DATA

Flow Title: River Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f01

Flow Data (cfs)

River	Reach	RS	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Little River	1	602	6834	10479	13198	16921	19917	22935	31053

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Little River	1	2 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	5 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	10 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	25 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	50 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	100 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	500 Year	Normal S = 0.00111	Normal S = 0.00111

GEOMETRY DATA

Geometry Title: Uncon RS River
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g06

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 602

INPUT
Description: Approach Section - el adj 500 * 0.00111 = +0.56
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880.56	43565.2	860.36	43665.2	859.46	43765.2	856.76	44085.8	840.56
44115.8	832.12	44194.6	825.26	44245.4	822.96	44301.2	821.96	44370.1	822.26
44425.9	818.96	44491.5	822.96	44552.2	820.66	44616.1	822.56	44688.3	827.16
44735.9	834.76	44791.7	840.36	44965.2	852.16	45065.2	863.36	45165.2	864.56
45265.2	866.86	45365.2	886.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43228	.12	44085.8	.03	44791.7	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44085.8	44791.7	500	500	500	.1	.3

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 102

INPUT
Description: Upstream Bridge Section Section - lake from metric survey
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880	43565.2	859.8	43665.2	858.9	43765.2	856.2	44085.8	840
44115.8	831.56	44194.6	824.7	44245.4	822.4	44301.2	821.4	44370.1	821.7
44425.9	818.4	44491.5	822.4	44552.2	820.1	44616.1	822	44688.3	826.6

```
 44735.9   834.2 44791.7   839.8 44965.2   851.6 45065.2   862.8 45165.2     864
 45265.2   866.3 45365.2     886

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   43228     .12 44085.8     .03 44791.7     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       44085.8 44791.7              167     167     167             .1       .3

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: -65

INPUT
Description: Downstream Bridge Section - lake from metric survey - Left lake
             limited due to DS FP.
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         44200 44944.2              800     800     800             .1       .3

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: -865

INPUT
Description: Exit Section - el adj 800 * 0.00111 = -0.89
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  878.34   43687  875.04 43729.7  871.74 43772.3  868.44 43788.7  865.14
 43821.5  861.94 43857.6  858.64 43890.4  855.34 43916.7  852.04 43965.2  843.85
   44200  839.11 44253.6  820.51 44317.6  818.51 44378.3  816.61   44521  817.51
 44570.2  816.91   44626  816.61 44688.3  819.51 44753.9  822.81 44822.8  826.11
 44890.1  831.01 44944.2  839.11 45165.2  859.01 45265.2  858.32 45365.2  861.24
 45465.2  875.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         44200 44944.2                0       0       0             .1       .3
```

SUMMARY OF MANNING'S N VALUES

River:Little River

Reach	River Sta.	n1	n2	n3
1	602	.12	.03	.12
1	102	.12	.03	.12
1	-65	.12	.03	.12
1	-865	.12	.03	.12

SUMMARY OF REACH LENGTHS

River: Little River

Reach	River Sta.	Left	Channel	Right
1	602	500	500	500
1	102	167	167	167
1	-65	800	800	800
1	-865	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Little River

Reach	River Sta.	Contr.	Expan.
1	602	.1	.3
1	102	.1	.3
1	-65	.1	.3
1	-865	.1	.3

HEC-RAS EXISTING MODEL

HEC-RAS Pl ex RS Riv River: Little River Reach: 1

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	-865	2 Year	6834.00	816.61	821.53	819.48	821.77	0.001110	3.91	1746.14	477.84	0.36
1	-865	50 Year	19917.00	816.61	824.98	821.64	825.48	0.001110	5.64	3532.86	558.55	0.40
1	-865	100 Year	22935.00	816.61	825.61	822.06	826.15	0.001111	5.90	3885.37	573.36	0.40
1	-865	500 Year	31053.00	816.61	827.08	823.00	827.74	0.001110	6.54	4750.93	601.39	0.41
1	0	2 Year	6834.00	817.50	822.61		823.12	0.001820	5.76	1187.27	482.00	0.48
1	0	50 Year	19917.00	817.50	825.88		827.34	0.002494	9.71	2052.07	558.74	0.61
1	0	100 Year	22935.00	817.50	826.44		828.13	0.002621	10.42	2200.39	572.09	0.64
1	0	500 Year	31053.00	817.50	827.73		830.05	0.002978	12.23	2539.90	597.45	0.69
1	51		Bridge									
1	102	2 Year	6834.00	818.40	827.01	823.53	827.27	0.000616	4.16	1643.62	522.72	0.29
1	102	50 Year	19917.00	818.40	833.82	826.36	834.34	0.000445	5.79	3442.35	625.74	0.28
1	102	100 Year	22935.00	818.40	835.33	826.93	835.88	0.000410	5.97	3841.20	644.75	0.28
1	102	500 Year	31053.00	818.40	839.04	828.32	839.69	0.000352	6.44	4821.00	694.93	0.27
1	602	2 Year	6834.00	818.96	827.40	823.80	827.52	0.000362	2.70	2529.18	519.83	0.22
1	602	50 Year	19917.00	818.96	834.34	825.96	834.48	0.000166	3.05	6540.63	625.32	0.17
1	602	100 Year	22935.00	818.96	835.87	826.34	836.01	0.000144	3.05	7510.64	644.43	0.16
1	602	500 Year	31053.00	818.96	839.64	827.33	839.79	0.000112	3.09	10039.87	695.46	0.14

HEC-RAS Pl RS Riv River: Little River Reach: 1

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn Loss	C & E Loss	Top Width	Q Left	Q Channel	Q Right	Vel Chnl	Vel Total	Flow Area
			(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(sq ft)
1	-865	2 Year	821.77	821.53	819.48			477.84		6834.00		3.91	3.91	1746.14
1	-865	50 Year	825.48	824.98	821.64			558.55		19917.00		5.64	5.64	3532.86
1	-865	100 Year	826.15	825.61	822.06			573.36		22935.00		5.90	5.90	3885.37
1	-865	500 Year	827.74	827.08	823.00			601.39		31053.00		6.54	6.54	4750.93
1	0	2 Year	823.12	822.61		1.21	0.14	482.00		6834.00		5.76	5.76	1187.27
1	0	50 Year	827.34	825.88		1.38	0.48	558.74		19917.00		9.71	9.71	2052.07
1	0	100 Year	828.13	826.44		1.41	0.57	572.09		22935.00		10.42	10.42	2200.39
1	0	500 Year	830.05	827.73		1.48	0.83	597.45		31053.00		12.23	12.23	2539.90
1	51 BR D	2 Year	826.15	822.89	822.89	0.04	0.00	124.02		6834.00		12.10	12.10	564.88
1	51 BR D	50 Year	834.14	827.71	827.71	0.05	0.00	143.66		19917.00		16.45	16.45	1210.52
1	51 BR D	100 Year	835.69	828.60	828.60	0.05	0.00	147.26		22935.00		17.13	17.13	1339.12
1	51 BR D	500 Year	839.52	830.80	830.80	0.05	0.00	156.23		31053.00		18.56	18.56	1673.38
1	51 BR U	2 Year	827.18	825.00	825.00	0.23	0.00	132.63		6834.00		11.84	11.84	577.13
1	51 BR U	50 Year	834.28	831.79	829.61	0.15	0.00	160.25		19917.00		12.68	12.68	1570.65
1	51 BR U	100 Year	835.83	833.41	830.48	0.14	0.00	166.86		22935.00		12.49	12.49	1836.42
1	51 BR U	500 Year	839.65	837.27	832.60	0.12	0.00	182.57		31053.00		12.37	12.37	2510.35
1	102	2 Year	827.27	827.01	823.53	0.09	0.00	522.72		6834.00		4.16	4.16	1643.62
1	102	50 Year	834.34	833.82	826.36	0.05	0.00	625.74		19917.00		5.79	5.79	3442.35
1	102	100 Year	835.88	835.33	826.93	0.05	0.00	644.75		22935.00		5.97	5.97	3841.20
1	102	500 Year	839.69	839.04	828.32	0.04	0.00	694.93		31053.00		6.44	6.44	4821.00
1	602	2 Year	827.52	827.40	823.80	0.24	0.00	519.83		6834.00		2.70	2.70	2529.18
1	602	50 Year	834.48	834.34	825.96	0.14	0.00	625.32		19917.00		3.05	3.05	6540.63
1	602	100 Year	836.01	835.87	826.34	0.13	0.00	644.43		22935.00		3.05	3.05	7510.64
1	602	500 Year	839.79	839.64	827.33	0.10	0.00	695.46		31053.00		3.09	3.09	10039.87

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U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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PROJECT DATA
Project Title: Bells Ferry Rd over Little River
Project File : 630975.prj
Run Date and Time: 9/13/2005 7:30:25 AM

Project in English units

PLAN DATA

Plan Title: Existing RS Riv
Plan File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.p09

Geometry Title: Existing Conditions RS
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g08

Flow Title : River Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f01

Plan Summary Information:

Number of:	Cross Sections	= 4	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 1	Lateral Structures	=	0

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

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

FLOW DATA

Flow Title: River Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f01

Flow Data (cfs)

River	Reach	RS	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Little River	1	602	6834	10479	13198	16921	19917	22935	31053

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Little River	1	2 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	5 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	10 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	25 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	50 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	100 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	500 Year	Normal S = 0.00111	Normal S = 0.00111

GEOMETRY DATA

Geometry Title: Existing Conditions RS
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g08

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 602

INPUT
Description: Approach Section - el adj 494 * 0.00111 = +0.55
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880.56	43565.2	860.36	43665.2	859.46	43765.2	856.76	44085.8	840.56
44115.8	832.12	44194.6	825.26	44245.4	822.96	44301.2	821.96	44370.1	822.26
44425.9	818.96	44491.5	822.96	44552.2	820.66	44616.1	822.56	44688.3	827.16
44735.9	834.76	44791.7	840.36	44965.2	852.16	45065.2	863.36	45165.2	864.56
45265.2	866.86	45365.2	886.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43228	.12	44085.8	.03	44791.7	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44085.8	44791.7	500	500	500	.3	.5

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 102

INPUT
Description: Upstream Bridge Section Section - lake from metric survey
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880	43565.2	859.8	43665.2	858.9	43765.2	856.2	44085.8	840
44115.8	831.56	44194.6	824.7	44245.4	822.4	44301.2	821.4	44370.1	821.7
44425.9	818.4	44491.5	822.4	44552.2	820.1	44616.1	822	44688.3	826.6

```
 44735.9   834.2 44791.7   839.8 44965.2   851.6 45065.2   862.8 45165.2     864
 45265.2   866.3 45365.2     886

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   43228     .12 44085.8     .03 44791.7     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       44085.8 44791.7              102     102     102             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   43228 44314.1  860.91       T
 44578.1 45365.2  860.91       T

BRIDGE


RIVER: Little River
REACH: 1                  RS: 51

INPUT
Description: Existing Bridge
Distance from Upstream XS =      39
Deck/Roadway Width        =      24
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       8
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   42979   866.5       0 43700.8   860.8       0 44314.1  860.91       0
 44314.1  860.91   855.3 44578.1  860.91   855.3 44578.1  860.91       0
 44947.5   860.8       0 45657.8   899.3       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   43228     880 43565.2   859.8 43665.2   858.9 43765.2   856.2 44085.8     840
 44115.8  831.56 44194.6   824.7 44245.4   822.4 44301.2   821.4 44370.1   821.7
 44425.9   818.4 44491.5   822.4 44552.2   820.1 44616.1     822 44688.3   826.6
 44735.9   834.2 44791.7   839.8 44965.2   851.6 45065.2   862.8 45165.2     864
 45265.2   866.3 45365.2     886

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   43228     .12 44085.8     .03 44791.7     .12

Bank Sta: Left   Right    Coeff Contr.   Expan.
       44085.8 44791.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   43228 44314.1  860.91       T
 44578.1 45365.2  860.91       T

Downstream  Deck/Roadway Coordinates
    num=       8
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   42979   866.5       0 43700.8   860.8       0 44314.1  860.91       0
 44314.1  860.91   855.3 44578.1  860.91   855.3 44578.1  860.91       0
 44947.5   860.8       0 45657.8   899.3       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

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

```
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Coeff Contr.   Expan.
         44200 44944.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 43591.9 44314.1  860.91       T
 44578.1 45465.2  860.91       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
 44314.1   855.3 44394.1   815.3
Downstream     num=       2
     Sta    Elev     Sta    Elev
 44314.1   855.3 44394.1   815.3

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
 44498.1   815.3 44578.1   855.3
Downstream     num=       2
     Sta    Elev     Sta    Elev
 44498.1   815.3 44578.1   855.3

Number of Piers =  2

Pier Data
Pier Station     Upstream= 44396.7    Downstream= 44396.7
Upstream     num=       2
    Width   Elev    Width   Elev
       6     800       4   855.3
Downstream     num=       2
    Width   Elev    Width   Elev
       6     800       4   855.3

Pier Data
Pier Station     Upstream= 44495.4    Downstream= 44495.4
Upstream     num=       2
    Width   Elev    Width   Elev
       6     800       4   855.3
Downstream     num=       2
    Width   Elev    Width   Elev
       6     800       4   855.3

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 856.6
       El of the toe of the abutment   = 821
    Right Embankment
       El of the top of the embankment = 856.6
       El of the toe of the abutment   = 821
    Abtument Type                      = 3 Sloping abutments and sloping embankments
    Slope of abutments                 = 2
    Top with of embankment             = 24
    Centroid station of bridge opening =
```

```
    Wing Wall Type                     = No wing walls present
       Width                           =
       Angle                           =
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
       Angle                           =

Selected Low Flow Methods = W.S.Pro Method

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

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

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: 0

INPUT
Description: Downstream Bridge Section - lake from metric survey - Left lake
             limited due to DS FP.
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         44200 44944.2              865     865     865             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 43591.9 44314.1  860.91       T
 44578.1 45465.2  860.91       T

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: -865

INPUT
Description: Exit Section - el adj 800 * 0.00111 = -0.89
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  878.34   43687  875.04 43729.7  871.74 43772.3  868.44 43788.7  865.14
 43821.5  861.94 43857.6  858.64 43890.4  855.34 43916.7  852.04 43965.2  843.85
   44200  839.11 44253.6  820.51 44317.6  818.51 44378.3  816.61   44521  817.51
 44570.2  816.91   44626  816.61 44688.3  819.51 44753.9  822.81 44822.8  826.11
 44890.1  831.01 44944.2  839.11 45165.2  859.01 45265.2  858.32 45365.2  861.24
 45465.2  875.25

Manning's n Values        num=       3
```

Sta	n Val	Sta	n Val	Sta	n Val
43591.9	.12	44200	.03	44944.2	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44200	44944.2	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Little River

Reach	River Sta.	n1	n2	n3
1	602	.12	.03	.12
1	102	.12	.03	.12
1	51	Bridge		
1	0	.12	.03	.12
1	-865	.12	.03	.12

SUMMARY OF REACH LENGTHS

River: Little River

Reach	River Sta.	Left	Channel	Right
1	602	500	500	500
1	102	102	102	102
1	51	Bridge		
1	0	865	865	865
1	-865	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Little River

Reach	River Sta.	Contr.	Expan.
1	602	.3	.5
1	102	.3	.5
1	51	Bridge	
1	0	.3	.5
1	-865	.1	.3

HEC-RAS PROPOSED MODEL

HEC-RAS Pl r RS addR River: Little River Reach: 1

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	-865	2 Year	6834.00	816.61	821.53	819.48	821.77	0.001110	3.91	1746.14	477.84	0.36
1	-865	50 Year	19917.00	816.61	824.98	821.64	825.48	0.001110	5.64	3532.86	558.55	0.40
1	-865	100 Year	22935.00	816.61	825.61	822.06	826.15	0.001111	5.90	3885.37	573.36	0.40
1	-865	500 Year	31053.00	816.61	827.08	823.00	827.74	0.001110	6.54	4750.93	601.39	0.41
1	-65	2 Year	6834.00	817.50	822.49	820.38	822.81	0.001089	4.16	1644.28	479.50	0.36
1	-65	50 Year	19917.00	817.50	825.84		826.52	0.001267	6.61	3015.40	557.74	0.43
1	-65	100 Year	22935.00	817.50	826.45		827.21	0.001290	7.01	3269.78	572.28	0.44
1	-65	500 Year	31053.00	817.50	827.89		828.89	0.001364	8.02	3872.90	600.14	0.47
1	18.5		Bridge									
1	102	2 Year	6834.00	818.40	824.65	823.24	825.00	0.001883	4.75	1439.95	462.04	0.46
1	102	50 Year	19917.00	818.40	829.14	825.36	829.67	0.000905	5.84	3408.22	560.61	0.37
1	102	100 Year	22935.00	818.40	829.94	825.75	830.52	0.000866	6.10	3758.40	574.79	0.37
1	102	500 Year	31053.00	818.40	831.90	826.72	832.60	0.000800	6.73	4617.22	606.88	0.37
1	602	2 Year	6834.00	818.96	825.55	823.80	825.83	0.001441	4.25	1606.41	471.63	0.41
1	602	50 Year	19917.00	818.96	829.72	825.97	830.15	0.000891	5.27	3780.34	560.93	0.36
1	602	100 Year	22935.00	818.96	830.52	826.35	830.98	0.000834	5.41	4238.40	575.24	0.35
1	602	500 Year	31053.00	818.96	832.53	827.32	833.04	0.000722	5.72	5426.55	607.58	0.34

HEC-RAS Pla RS addR River: Little River Reach: 1

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn Loss	C & E Loss	Top Width	Q Left	Q Channel	Q Right	Vel Chnl	Vel Total	Flow Area
			(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(sq ft)
1	-865	2 Year	821.77	821.53	819.48			477.84		6834.00		3.91	3.91	1746.14
1	-865	50 Year	825.48	824.98	821.64			558.55		19917.00		5.64	5.64	3532.86
1	-865	100 Year	826.15	825.61	822.06			573.36		22935.00		5.90	5.90	3885.37
1	-865	500 Year	827.74	827.08	823.00			601.39		31053.00		6.54	6.54	4750.93
1	-65	2 Year	822.81	822.49	820.38	0.88	0.16	479.50		6834.00		4.16	4.16	1644.28
1	-65	50 Year	826.52	825.84		0.95	0.09	557.74		19917.00		6.61	6.61	3015.40
1	-65	100 Year	827.21	826.45		0.96	0.11	572.28		22935.00		7.01	7.01	3269.78
1	-65	500 Year	828.89	827.89		0.98	0.17	600.14		31053.00		8.02	8.02	3872.90
1	18.5 BR D	2 Year	822.89	822.11	820.95	0.08	0.00	272.93		6834.00		6.52	6.52	1048.02
1	18.5 BR D	50 Year	827.05	825.48	823.78	0.08	0.45	282.20		19917.00		10.06	10.06	1979.93
1	18.5 BR D	100 Year	827.81	826.02	824.32	0.09	0.51	284.39		22935.00		10.74	10.74	2135.16
1	18.5 BR D	500 Year	829.69	827.28	825.69	0.09	0.70	289.44		31053.00		12.44	12.44	2497.19
1	18.5 BR U	2 Year	824.82	823.50	823.50	0.47	0.00	276.40		6834.00		9.24	9.24	739.52
1	18.5 BR U	50 Year	828.95	826.30	826.30	0.46	0.54	285.50		19917.00		13.07	13.07	1524.38
1	18.5 BR U	100 Year	829.74	826.83	826.83	0.48	0.56	287.61		22935.00		13.69	13.69	1675.44
1	18.5 BR U	500 Year	831.68	828.16	828.16	0.51	0.56	292.96		31053.00		15.05	15.05	2063.97
1	102	2 Year	825.00	824.65	823.24	0.18	0.00	462.04		6834.00		4.75	4.75	1439.95
1	102	50 Year	829.67	829.14	825.36	0.08	0.64	560.61		19917.00		5.84	5.84	3408.22
1	102	100 Year	830.52	829.94	825.75	0.08	0.70	574.79		22935.00		6.10	6.10	3758.40
1	102	500 Year	832.60	831.90	826.72	0.08	0.84	606.88		31053.00		6.73	6.73	4617.22
1	602	2 Year	825.83	825.55	823.80	0.82	0.00	471.63		6834.00		4.25	4.25	1606.41
1	602	50 Year	830.15	829.72	825.97	0.45	0.03	560.93		19917.00		5.27	5.27	3780.34
1	602	100 Year	830.98	830.52	826.35	0.43	0.04	575.24		22935.00		5.41	5.41	4238.40
1	602	500 Year	833.04	832.53	827.32	0.38	0.06	607.58		31053.00		5.72	5.72	5426.55

```
                        HEC-RAS Version 3.1.3 May 2005
                         U.S. Army Corp of Engineers
                        Hydrologic Engineering Center
                              609 Second Street
                              Davis, California


            X     X  XXXXXX    XXXX        XXXX       XX      XXXX
            X     X  X        X    X       X   X     X  X    X
            X     X  X        X            X   X    X    X   X
            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: Bells Ferry Rd over Little River
Project File : 630975.prj
Run Date and Time: 9/13/2005 8:56:54 AM

Project in English units

PLAN DATA

Plan Title: Prop add sp RS River
Plan File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.p08

Geometry Title: Proposed Conditions add span RS
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g07

Flow Title : River Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f01

Plan Summary Information:

Number of:	Cross Sections	= 4	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 1	Lateral Structures	=	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 40
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

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

FLOW DATA

Flow Title: River Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f01

Flow Data (cfs)

River	Reach	RS	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Little River	1	602	6834	10479	13198	16921	19917	22935	31053

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Little River	1	2 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	5 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	10 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	25 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	50 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	100 Year	Normal S = 0.00111	Normal S = 0.00111
Little River	1	500 Year	Normal S = 0.00111	Normal S = 0.00111

GEOMETRY DATA

Geometry Title: Proposed Conditions add span RS
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g07

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 602

INPUT
Description: Approach Section - el adj 500 * 0.00111 = +0.56
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880.56	43565.2	860.36	43665.2	859.46	43765.2	856.76	44085.8	840.56
44115.8	832.12	44194.6	825.26	44245.4	822.96	44301.2	821.96	44370.1	822.26
44425.9	818.96	44491.5	822.96	44552.2	820.66	44616.1	822.56	44688.3	827.16
44735.9	834.76	44791.7	840.36	44965.2	852.16	45065.2	863.36	45165.2	864.56
45265.2	866.86	45365.2	886.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43228	.12	44085.8	.03	44791.7	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44085.8	44791.7	500	500	500	.3	.5

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 102

INPUT
Description: Upstream Bridge Section Section - lake from metric survey
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880	43565.2	859.8	43665.2	858.9	43765.2	856.2	44085.8	840
44115.8	831.56	44194.6	824.7	44245.4	822.4	44301.2	821.4	44370.1	821.7
44425.9	818.4	44491.5	822.4	44552.2	820.1	44616.1	822	44688.3	826.6

```
 44735.9   834.2 44791.7   839.8 44965.2   851.6 45065.2   862.8 45165.2     864
 45265.2   866.3 45365.2     886

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   43228     .12 44085.8     .03 44791.7     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       44085.8 44791.7              167     167     167             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   43228 44217.2     867       T
 44655.7 45365.2     867       T

BRIDGE


RIVER: Little River
REACH: 1                  RS: 18.5

INPUT
Description: Proposed Bridge add span
Distance from Upstream XS =      41
Deck/Roadway Width        =      85
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      17
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   42979   866.5       0 43700.8   860.8       0 44217.2  867.36       0
 44217.2  867.36  860.86 44294.3  867.78  861.28 44371.4   868.2   861.7
 44371.4   868.2   860.2   44501  868.01  860.21   44501  868.01  861.51
 44578.1  867.11  860.61 44655.7  865.77  859.27 44655.7  865.77       0
 44865.5     864         44947.5   864.4       0 45013.1   865.2       0
 45275.6   873.4       0 45657.8   899.3       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   43228     880 43565.2   859.8 43665.2   858.9 43765.2   856.2 44085.8     840
 44115.8  831.56 44194.6   824.7 44245.4   822.4 44301.2   821.4 44370.1   821.7
 44425.9   818.4 44491.5   822.4 44552.2   820.1 44616.1     822 44688.3   826.6
 44735.9   834.2 44791.7   839.8 44965.2   851.6 45065.2   862.8 45165.2     864
 45265.2   866.3 45365.2     886

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   43228     .12 44085.8     .03 44791.7     .12

Bank Sta: Left   Right    Coeff Contr.   Expan.
       44085.8 44791.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   43228 44217.2     867       T
 44655.7 45365.2     867       T

Downstream  Deck/Roadway Coordinates
    num=      17
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   42979   866.5       0 43700.8   860.8       0 44217.2  867.36       0
 44217.2  867.36  860.86 44294.3  867.78  861.28 44371.4   868.2   861.7
 44371.4   868.2   860.2   44501  868.01  860.21   44501  868.01  861.51
 44578.1  867.11  860.61 44655.7  865.77  859.27 44655.7  865.77       0
 44865.5     864         44947.5   864.4       0 45013.1   865.2       0
 45275.6   873.4       0 45657.8   899.3       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
```

```
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Coeff Contr.   Expan.
         44200 44944.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 43591.9 44217.2  866.85       T
 44655.7 45465.2  866.85       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 44217.2  860.86 44252.9     843 44255.9     843 44315.9     813
Downstream     num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 44217.2  860.86 44252.9     843 44255.9     843 44315.9     813

Abutment Data
Upstream     num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 44560.2     813 44620.2     843 44623.2     843 44655.7  859.27
Downstream     num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 44560.2     813 44620.2     843 44623.2     843 44655.7  859.27

Number of Piers =  4

Pier Data
Pier Station     Upstream= 44294.3    Downstream= 44294.3
Upstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863
Downstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863

Pier Data
Pier Station     Upstream= 44371.4    Downstream= 44371.4
Upstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863
Downstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863

Pier Data
Pier Station     Upstream=   44501    Downstream=   44501
Upstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863
Downstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863

Pier Data
```

```
Pier Station     Upstream= 44578.1    Downstream= 44578.1
Upstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863
Downstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 856.6
       El of the toe of the abutment   = 821
    Right Embankment
       El of the top of the embankment = 856.6
       El of the toe of the abutment   = 821
    Abtument Type                      = 3 Sloping abutments and sloping embankments
    Slope of abutments                 = 2
    Top with of embankment             = 24
    Centroid station of bridge opening =
    Wing Wall Type                     = No wing walls present
       Width                           =
       Angle                           =
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
       Angle                           =

Selected Low Flow Methods = W.S.Pro Method

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

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

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: -65

INPUT
Description: Downstream Bridge Section - lake from metric survey - Left lake
             limited due to DS FP.
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

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

```
         44200 44944.2              800     800     800             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 43591.9 44217.2  866.85       T
 44655.7 45465.2  866.85       T

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: -865

INPUT
Description: Exit Section - el adj 800 * 0.00111 = -0.89
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  878.34   43687  875.04 43729.7  871.74 43772.3  868.44 43788.7  865.14
 43821.5  861.94 43857.6  858.64 43890.4  855.34 43916.7  852.04 43965.2  843.85
   44200  839.11 44253.6  820.51 44317.6  818.51 44378.3  816.61   44521  817.51
 44570.2  816.91   44626  816.61 44688.3  819.51 44753.9  822.81 44822.8  826.11
 44890.1  831.01 44944.2  839.11 45165.2  859.01 45265.2  858.32 45365.2  861.24
 45465.2  875.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         44200 44944.2                0       0       0             .1       .3
```

SUMMARY OF MANNING'S N VALUES

River:Little River

Reach	River Sta.	n1	n2	n3
1	602	.12	.03	.12
1	102	.12	.03	.12
1	18.5	Bridge		
1	-65	.12	.03	.12
1	-865	.12	.03	.12

SUMMARY OF REACH LENGTHS

River: Little River

Reach	River Sta.	Left	Channel	Right
1	602	500	500	500
1	102	167	167	167
1	18.5	Bridge		
1	-65	800	800	800
1	-865	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Little River

Reach	River Sta.	Contr.	Expan.
1	602	.3	.5
1	102	.3	.5
1	18.5	Bridge	
1	-65	.3	.5
1	-865	.1	.3

ABNORMAL FLOODS (LAKE ALLATOONA)

HEC-RAS FULL VALLEY MODEL

HEC-RAS Pl ,nc RS Abn River: Little River Reach: 1

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	-865	50 Year Ab	19917.00	816.61	861.00	821.65	861.01	0.000001	0.66	37816.01	1525.20	0.02
1	-865	100 Year Ab	22935.00	816.61	862.00	822.05	862.01	0.000002	0.74	39355.97	1549.74	0.02
1	-865	500 Year Ab	31053.00	816.61	864.30	823.02	864.31	0.000002	0.94	42966.34	1589.73	0.03
1	-65	50 Year Ab	19917.00	817.50	861.00		861.01	0.000001	0.68	36477.73	1485.02	0.02
1	-65	100 Year Ab	22935.00	817.50	862.00		862.01	0.000002	0.76	37985.62	1530.21	0.02
1	-65	500 Year Ab	31053.00	817.50	864.30		864.32	0.000003	0.96	41560.84	1574.28	0.03
1	102	50 Year Ab	19917.00	818.40	861.00		861.01	0.000002	0.76	33215.16	1503.96	0.02
1	102	100 Year Ab	22935.00	818.40	862.00		862.01	0.000002	0.85	34731.92	1529.58	0.02
1	102	500 Year Ab	31053.00	818.40	864.30		864.32	0.000004	1.07	38399.40	1688.15	0.03
1	602	50 Year Ab	19917.00	818.96	861.00		861.01	0.000002	0.77	32378.14	1489.63	0.02
1	602	100 Year Ab	22935.00	818.96	862.00		862.01	0.000002	0.86	33880.77	1515.25	0.03
1	602	500 Year Ab	31053.00	818.96	864.30		864.32	0.000004	1.09	37467.13	1644.22	0.03

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
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: Bells Ferry Rd over Little River
Project File : 630975.prj
Run Date and Time: 9/13/2005 10:16:41 AM

Project in English units

PLAN DATA

Plan Title: Uncon RS Abn
Plan File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.p15

Geometry Title: Uncon RS River
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g06

Flow Title : Abnormal Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f02

Plan Summary Information:

Number of:	Cross Sections	= 4	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

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

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

FLOW DATA

Flow Title: Abnormal Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f02

Flow Data (cfs)

River	Reach	RS	50 Year Ab	100 Year Ab	500 Year Ab
Little River	1	602	19917	22935	31053

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Little River	1	50 Year Ab		Known WS = 861
Little River	1	100 Year Ab		Known WS = 862
Little River	1	500 Year Ab		Known WS = 864.3

GEOMETRY DATA

Geometry Title: Uncon RS River
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g06

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 602

INPUT
Description: Approach Section - el adj 500 * 0.00111 = +0.56
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880.56	43565.2	860.36	43665.2	859.46	43765.2	856.76	44085.8	840.56
44115.8	832.12	44194.6	825.26	44245.4	822.96	44301.2	821.96	44370.1	822.26
44425.9	818.96	44491.5	822.96	44552.2	820.66	44616.1	822.56	44688.3	827.16
44735.9	834.76	44791.7	840.36	44965.2	852.16	45065.2	863.36	45165.2	864.56
45265.2	866.86	45365.2	886.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43228	.12	44085.8	.03	44791.7	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44085.8	44791.7	500	500	500	.1	.3

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 102

INPUT
Description: Upstream Bridge Section Section - lake from metric survey
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880	43565.2	859.8	43665.2	858.9	43765.2	856.2	44085.8	840
44115.8	831.56	44194.6	824.7	44245.4	822.4	44301.2	821.4	44370.1	821.7
44425.9	818.4	44491.5	822.4	44552.2	820.1	44616.1	822	44688.3	826.6
44735.9	834.2	44791.7	839.8	44965.2	851.6	45065.2	862.8	45165.2	864
45265.2	866.3	45365.2	886						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43228	.12	44085.8	.03	44791.7	.12

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

```
       44085.8 44791.7              167     167     167             .1       .3

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: -65

INPUT
Description: Downstream Bridge Section - lake from metric survey - Left lake
             limited due to DS FP.
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         44200 44944.2              800     800     800             .1       .3

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: -865

INPUT
Description: Exit Section - el adj 800 * 0.00111 = -0.89
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  878.34   43687  875.04 43729.7  871.74 43772.3  868.44 43788.7  865.14
 43821.5  861.94 43857.6  858.64 43890.4  855.34 43916.7  852.04 43965.2  843.85
   44200  839.11 44253.6  820.51 44317.6  818.51 44378.3  816.61   44521  817.51
 44570.2  816.91   44626  816.61 44688.3  819.51 44753.9  822.81 44822.8  826.11
 44890.1  831.01 44944.2  839.11 45165.2  859.01 45265.2  858.32 45365.2  861.24
 45465.2  875.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         44200 44944.2                0       0       0             .1       .3
```

SUMMARY OF MANNING'S N VALUES

River:Little River

Reach	River Sta.	n1	n2	n3
1	602	.12	.03	.12
1	102	.12	.03	.12
1	-65	.12	.03	.12
1	-865	.12	.03	.12

SUMMARY OF REACH LENGTHS

River: Little River

Reach	River Sta.	Left	Channel	Right
1	602	500	500	500
1	102	167	167	167
1	-65	800	800	800
1	-865	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Little River

Reach	River Sta.	Contr.	Expan.
1	602	.1	.3
1	102	.1	.3
1	-65	.1	.3
1	-865	.1	.3

HEC-RAS EXISTING MODEL

HEC-RAS Pla RS Abn River: Little River Reach: 1

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn Loss	C & E Loss	Top Width	Q Left	Q Channel	Q Right	Vel Chnl	Vel Total	Flow Area
			(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(sq ft)
1	-865	50 Year Ab	861.01	861.00	821.65			1525.20	486.27	19270.42	160.31	0.66	0.53	37816.01
1	-865	100 Year Ab	862.01	862.00	822.05			1549.74	585.35	22134.40	215.25	0.74	0.58	39355.97
1	-865	500 Year Ab	864.31	864.30	823.02			1589.73	872.25	29785.90	394.85	0.94	0.72	42966.34
1	0	50 Year Ab	861.03	860.98		0.00	0.02	1484.20	0.31	19916.39	0.30	1.75	1.75	11404.80
1	0	100 Year Ab	862.04	861.98		0.00	0.02	1529.27	28.69	22878.21	28.11	1.89	1.78	12871.29
1	0	500 Year Ab	864.35	864.27		0.01	0.03	1573.81	213.93	30605.67	233.40	2.22	1.89	16424.92
1	51 BR D	50 Year Ab	861.20	861.13	827.71			1113.47	264.76	19651.24	1.16	2.85	2.86	6966.71
1	51 BR D	100 Year Ab	862.17	861.98	828.60			1138.48	2506.92	20392.69	34.91	2.71	2.89	7923.26
1	51 BR D	500 Year Ab	864.40	864.23	830.80	0.00	0.05	1203.71	639.83	30373.20	39.98	3.30	2.94	10558.96
1	51 BR U	50 Year Ab	861.20	861.15	829.61			1297.18	266.90	19645.53	4.73	2.96	2.94	6766.87
1	51 BR U	100 Year Ab	862.17	862.11	830.48			1436.26	2541.54	20316.59	76.40	2.78	2.84	8069.38
1	51 BR U	500 Year Ab	864.41	864.24	832.60	0.01	0.00	1519.86	911.17	29835.38	306.45	3.38	2.77	11227.70
1	102	50 Year Ab	861.20	861.15	826.40			1507.75	3.61	19912.07	1.32	1.85	1.82	10940.28
1	102	100 Year Ab	862.17	862.11	826.95			1532.31	55.60	22859.01	20.39	2.00	1.86	12348.69
1	102	500 Year Ab	864.44	864.36	828.31	0.00	0.03	1691.55	353.70	30555.41	143.89	2.35	1.95	15898.77
1	602	50 Year Ab	861.22	861.21		0.00	0.01	1494.95	324.77	19324.54	267.70	0.77	0.61	32687.82
1	602	100 Year Ab	862.19	862.18		0.00	0.02	1519.73	420.75	22185.14	329.11	0.86	0.67	34146.21
1	602	500 Year Ab	864.46	864.45		0.00	0.02	1658.82	720.48	29890.39	442.13	1.09	0.82	37708.15

HEC-RAS P[illegible] :x RS Abn River: Little River Reach: 1

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	-865	50 Year Ab	19917.00	816.61	861.00	821.65	861.01	0.000001	0.66	37816.01	1525.20	0.02
1	-865	100 Year Ab	22935.00	816.61	862.00	822.05	862.01	0.000002	0.74	39355.97	1549.74	0.02
1	-865	500 Year Ab	31053.00	816.61	864.30	823.02	864.31	0.000002	0.94	42966.34	1589.73	0.03
1	0	50 Year Ab	19917.00	817.50	860.98		861.03	0.000033	1.75	11404.80	1484.20	0.08
1	0	100 Year Ab	22935.00	817.50	861.98		862.04	0.000036	1.89	12871.29	1529.27	0.08
1	0	500 Year Ab	31053.00	817.50	864.27		864.35	0.000041	2.22	16424.92	1573.81	0.09
1	51		Bridge									
1	102	50 Year Ab	19917.00	818.40	861.15	826.40	861.20	0.000037	1.85	10940.28	1507.75	0.08
1	102	100 Year Ab	22935.00	818.40	862.11	826.95	862.17	0.000040	2.00	12348.69	1532.31	0.09
1	102	500 Year Ab	31053.00	818.40	864.36	828.31	864.44	0.000046	2.35	15898.77	1691.55	0.10
1	602	50 Year Ab	19917.00	818.96	861.21		861.22	0.000002	0.77	32687.82	1494.95	0.02
1	602	100 Year Ab	22935.00	818.96	862.18		862.19	0.000002	0.86	34146.21	1519.73	0.02
1	602	500 Year Ab	31053.00	818.96	864.45		864.46	0.000004	1.09	37708.15	1658.82	0.03

Plan: Ex RS Abn Little River 1 RS: 51 Profile: 50 Year Ab

E.G. US. (ft)	861.20	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	861.15	E.G. Elev (ft)	861.20	861.20
Q Total (cfs)	19917.00	W.S. Elev (ft)	861.15	861.13
Q Bridge (cfs)	19399.73	Crit W.S. (ft)	829.61	827.71
Q Weir (cfs)	517.27	Max Chl Dpth (ft)	42.75	43.56
Weir Sta Lft (ft)	43650.01	Vel Total (ft/s)	2.94	2.86
Weir Sta Rgt (ft)	44954.90	Flow Area (sq ft)	6766.87	6966.71
Weir Submerg	0.25	Froude # Chl	0.09	0.09
Weir Max Depth (ft)	0.29	Specif Force (cu ft)	138323.80	148924.50
Min El Weir Flow (ft)	860.92	Hydr Depth (ft)	5.22	6.26
Min El Prs (ft)	855.30	W.P. Total (ft)	1959.43	1789.96
Delta EG (ft)	0.17	Conv. Total (cfs)		
Delta WS (ft)	0.17	Top Width (ft)	1297.18	1113.47
BR Open Area (sq ft)	6464.25	Frctn Loss (ft)		
BR Open Vel (ft/s)	3.00	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)		

Plan: Ex RS Abn Little River 1 RS: 51 Profile: 100 Year Ab

E.G. US. (ft)	862.17	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	862.11	E.G. Elev (ft)	862.17	862.17
Q Total (cfs)	22935.00	W.S. Elev (ft)	862.11	861.98
Q Bridge (cfs)	18199.92	Crit W.S. (ft)	830.48	828.60
Q Weir (cfs)	4735.08	Max Chl Dpth (ft)	43.71	44.41
Weir Sta Lft (ft)	43527.51	Vel Total (ft/s)	2.84	2.89
Weir Sta Rgt (ft)	44972.75	Flow Area (sq ft)	8069.38	7923.26
Weir Submerg	0.84	Froude # Chl	0.09	0.09
Weir Max Depth (ft)	1.26	Specif Force (cu ft)	145765.40	155621.90
Min El Weir Flow (ft)	860.92	Hydr Depth (ft)	5.62	6.96
Min El Prs (ft)	855.30	W.P. Total (ft)	2098.55	1815.02
Delta EG (ft)	0.13	Conv. Total (cfs)		
Delta WS (ft)	0.13	Top Width (ft)	1436.26	1138.48
BR Open Area (sq ft)	6464.25	Frctn Loss (ft)		
BR Open Vel (ft/s)	2.82	C & E Loss (ft)		
Coef of Q		Shear Total (lb/sq ft)		
Br Sel Method	Press/Weir	Power Total (lb/ft s)		

Plan: Ex RS Abn Little River 1 RS: 51 Profile: 500 Year Ab

E.G. US. (ft)	864.44	Element	Inside BR US	Inside BR DS
W.S. US. (ft)	864.36	E.G. Elev (ft)	864.41	864.40
Q Total (cfs)	31053.00	W.S. Elev (ft)	864.24	864.23
Q Bridge (cfs)	25460.57	Crit W.S. (ft)	832.60	830.80
Q Weir (cfs)		Max Chl Dpth (ft)	45.84	46.66
Weir Sta Lft (ft)		Vel Total (ft/s)	2.77	2.94
Weir Sta Rgt (ft)		Flow Area (sq ft)	11227.70	10558.96
Weir Submerg		Froude # Chl	0.08	0.09
Weir Max Depth (ft)		Specif Force (cu ft)	167268.30	177380.70
Min El Weir Flow (ft)	860.92	Hydr Depth (ft)	7.39	8.77
Min El Prs (ft)	855.30	W.P. Total (ft)	2182.26	1880.43
Delta EG (ft)	0.09	Conv. Total (cfs)	1573277.0	1617452.0
Delta WS (ft)	0.08	Top Width (ft)	1519.86	1203.71
BR Open Area (sq ft)	6464.25	Frctn Loss (ft)	0.01	0.00
BR Open Vel (ft/s)	3.94	C & E Loss (ft)	0.00	0.05
Coef of Q		Shear Total (lb/sq ft)	0.13	0.13
Br Sel Method	Energy only	Power Total (lb/ft s)	0.35	0.38

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
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: Bells Ferry Rd over Little River
Project File : 630975.prj
Run Date and Time: 9/13/2005 10:24:09 AM

Project in English units

PLAN DATA

Plan Title: Existing RS Abn
Plan File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.p11

Geometry Title: Existing Conditions RS
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g08

Flow Title : Abnormal Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f02

Plan Summary Information:

Number of:	Cross Sections	= 4	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 1	Lateral Structures	=	0

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

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

FLOW DATA

Flow Title: Abnormal Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f02

Flow Data (cfs)

River	Reach	RS	50 Year Ab	100 Year Ab	500 Year Ab
Little River	1	602	19917	22935	31053

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Little River	1	50 Year Ab	Known WS = 861	
Little River	1	100 Year Ab	Known WS = 862	
Little River	1	500 Year Ab	Known WS = 864.3	

GEOMETRY DATA

Geometry Title: Existing Conditions RS
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g08

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 602

INPUT
Description: Approach Section - el adj 494 * 0.00111 = +0.55
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880.56	43565.2	860.36	43665.2	859.46	43765.2	856.76	44085.8	840.56
44115.8	832.12	44194.6	825.26	44245.4	822.96	44301.2	821.96	44370.1	822.26
44425.9	818.96	44491.5	822.96	44552.2	820.66	44616.1	822.56	44688.3	827.16
44735.9	834.76	44791.7	840.36	44965.2	852.16	45065.2	863.36	45165.2	864.56
45265.2	866.86	45365.2	886.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43228	.12	44085.8	.03	44791.7	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44085.8	44791.7	500	500	500	.3	.5

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 102

INPUT
Description: Upstream Bridge Section Section - lake from metric survey
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880	43565.2	859.8	43665.2	858.9	43765.2	856.2	44085.8	840
44115.8	831.56	44194.6	824.7	44245.4	822.4	44301.2	821.4	44370.1	821.7
44425.9	818.4	44491.5	822.4	44552.2	820.1	44616.1	822	44688.3	826.6
44735.9	834.2	44791.7	839.8	44965.2	851.6	45065.2	862.8	45165.2	864
45265.2	866.3	45365.2	886						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43228	.12	44085.8	.03	44791.7	.12

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

```
       44085.8 44791.7              102     102     102             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   43228 44314.1  860.91       T
 44578.1 45365.2  860.91       T

BRIDGE


RIVER: Little River
REACH: 1                  RS: 51

INPUT
Description: Existing Bridge
Distance from Upstream XS =      39
Deck/Roadway Width        =      24
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       8
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   42979   866.5       0 43700.8   860.8       0 44314.1  860.91       0
 44314.1  860.91   855.3 44578.1  860.91   855.3 44578.1  860.91       0
 44947.5   860.8       0 45657.8   899.3       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   43228     880 43565.2   859.8 43665.2   858.9 43765.2   856.2 44085.8     840
 44115.8  831.56 44194.6   824.7 44245.4   822.4 44301.2   821.4 44370.1   821.7
 44425.9   818.4 44491.5   822.4 44552.2   820.1 44616.1     822 44688.3   826.6
 44735.9   834.2 44791.7   839.8 44965.2   851.6 45065.2   862.8 45165.2     864
 45265.2   866.3 45365.2     886

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   43228     .12 44085.8     .03 44791.7     .12

Bank Sta: Left   Right    Coeff Contr.   Expan.
       44085.8 44791.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   43228 44314.1  860.91       T
 44578.1 45365.2  860.91       T

Downstream  Deck/Roadway Coordinates
    num=       8
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   42979   866.5       0 43700.8   860.8       0 44314.1  860.91       0
 44314.1  860.91   855.3 44578.1  860.91   855.3 44578.1  860.91       0
 44947.5   860.8       0 45657.8   899.3       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Coeff Contr.   Expan.
         44200 44944.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 43591.9 44314.1  860.91       T
 44578.1 45465.2  860.91       T
```

```
Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
 44314.1   855.3 44394.1   815.3
Downstream     num=       2
     Sta    Elev     Sta    Elev
 44314.1   855.3 44394.1   815.3

Abutment Data
Upstream     num=       2
     Sta    Elev     Sta    Elev
 44498.1   815.3 44578.1   855.3
Downstream     num=       2
     Sta    Elev     Sta    Elev
 44498.1   815.3 44578.1   855.3

Number of Piers =  2

Pier Data
Pier Station     Upstream= 44396.7    Downstream= 44396.7
Upstream     num=       2
    Width   Elev    Width   Elev
       6     800       4   855.3
Downstream     num=       2
    Width   Elev    Width   Elev
       6     800       4   855.3

Pier Data
Pier Station     Upstream= 44495.4    Downstream= 44495.4
Upstream     num=       2
    Width   Elev    Width   Elev
       6     800       4   855.3
Downstream     num=       2
    Width   Elev    Width   Elev
       6     800       4   855.3

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 856.6
       El of the toe of the abutment   = 821
    Right Embankment
       El of the top of the embankment = 856.6
       El of the toe of the abutment   = 821
    Abtument Type                      = 3 Sloping abutments and sloping embankments
    Slope of abutments                 = 2
    Top with of embankment             = 24
    Centroid station of bridge opening =
    Wing Wall Type                     = No wing walls present
       Width                           =
       Angle                           =
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
       Angle                           =
```

```
Selected Low Flow Methods = W.S.Pro Method

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

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

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: 0

INPUT
Description: Downstream Bridge Section - lake from metric survey - Left lake
             limited due to DS FP.
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         44200 44944.2              865     865     865             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 43591.9 44314.1  860.91       T
 44578.1 45465.2  860.91       T

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: -865

INPUT
Description: Exit Section - el adj 800 * 0.00111 = -0.89
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  878.34   43687  875.04 43729.7  871.74 43772.3  868.44 43788.7  865.14
 43821.5  861.94 43857.6  858.64 43890.4  855.34 43916.7  852.04 43965.2  843.85
   44200  839.11 44253.6  820.51 44317.6  818.51 44378.3  816.61   44521  817.51
 44570.2  816.91   44626  816.61 44688.3  819.51 44753.9  822.81 44822.8  826.11
 44890.1  831.01 44944.2  839.11 45165.2  859.01 45265.2  858.32 45365.2  861.24
 45465.2  875.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         44200 44944.2                0       0       0             .1       .3
```

SUMMARY OF MANNING'S N VALUES

River:Little River

Reach	River Sta.	n1	n2	n3
1	602	.12	.03	.12
1	102	.12	.03	.12
1	51	Bridge		
1	0	.12	.03	.12
1	-865	.12	.03	.12

SUMMARY OF REACH LENGTHS

River: Little River

Reach	River Sta.	Left	Channel	Right
1	602	500	500	500
1	102	102	102	102
1	51	Bridge		
1	0	865	865	865
1	-865	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Little River

Reach	River Sta.	Contr.	Expan.
1	602	.3	.5
1	102	.3	.5
1	51	Bridge	
1	0	.3	.5
1	-865	.1	.3

HEC-RAS PROPOSED MODEL

HEC-RAS Plan: S addA River: Little River Reach: 1

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Crit W.S.	Frctn Loss	C & E Loss	Top Width	Q Left	Q Channel	Q Right	Vel Chnl	Vel Total	Flow Area
			(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(sq ft)
1	-865	50 Year Ab	861.01	861.00	821.65			1525.20	486.27	19270.42	160.31	0.66	0.53	37816.01
1	-865	100 Year Ab	862.01	862.00	822.06			1549.74	585.35	22134.40	215.25	0.74	0.58	39355.97
1	-865	500 Year Ab	864.31	864.30	823.00			1589.73	872.25	29785.90	394.85	0.94	0.72	42966.34
1	-65	50 Year Ab	861.01	861.00		0.00	0.01	1484.79		19917.00		1.09	1.09	18335.09
1	-65	100 Year Ab	862.02	861.99		0.00	0.01	1529.92		22935.00		1.22	1.22	18773.03
1	-65	500 Year Ab	864.33	864.29		0.00	0.01	1574.09		31053.00		1.57	1.57	19779.81
1	18.5 BR D	50 Year Ab	861.02	860.99	823.78	0.00	0.01	168.77		19917.00		1.38	1.38	14441.92
1	18.5 BR D	100 Year Ab	862.02	861.69	824.32					22935.00		1.58	1.58	14497.01
1	18.5 BR D	500 Year Ab	864.33	861.69	825.69					31053.00		2.14	2.14	14497.01
1	18.5 BR U	50 Year Ab	861.02	860.99	826.30	0.00	0.00	168.62		19917.00		1.45	1.45	13752.72
1	18.5 BR U	100 Year Ab	862.06	861.69	826.83					22935.00		1.66	1.66	13807.71
1	18.5 BR U	500 Year Ab	864.41	861.69	828.16					31053.00		2.25	2.25	13807.71
1	102	50 Year Ab	861.03	861.01	825.36	0.00	0.00	1504.15		19917.00		1.15	1.15	17381.98
1	102	100 Year Ab	862.06	862.04	825.75			1530.50		22935.00		1.29	1.29	17833.00
1	102	500 Year Ab	864.41	864.37	826.72			1692.44		31053.00		1.65	1.65	18857.04
1	602	50 Year Ab	861.03	861.02	825.97	0.00	0.00	1490.21	388.21	19239.13	289.66	0.77	0.61	32412.06
1	602	100 Year Ab	862.07	862.06	826.35	0.00	0.00	1516.68	496.17	22079.99	358.84	0.85	0.68	33965.06
1	602	500 Year Ab	864.42	864.41		0.00	0.01	1654.64	717.69	29892.42	442.89	1.09	0.83	37638.98

HEC-RAS Pl r RS addA River: Little River Reach: 1

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	-865	50 Year Ab	19917.00	816.61	861.00	821.65	861.01	0.000001	0.66	37816.01	1525.20	0.02
1	-865	100 Year Ab	22935.00	816.61	862.00	822.06	862.01	0.000002	0.74	39355.97	1549.74	0.02
1	-865	500 Year Ab	31053.00	816.61	864.30	823.00	864.31	0.000002	0.94	42966.34	1589.73	0.03
1	-65	50 Year Ab	19917.00	817.50	861.00		861.01	0.000003	1.09	18335.09	1484.79	0.03
1	-65	100 Year Ab	22935.00	817.50	861.99		862.02	0.000004	1.22	18773.03	1529.92	0.03
1	-65	500 Year Ab	31053.00	817.50	864.29		864.33	0.000006	1.57	19779.81	1574.09	0.04
1	18.5		Bridge									
1	102	50 Year Ab	19917.00	818.40	861.01	825.36	861.03	0.000004	1.15	17381.98	1504.15	0.03
1	102	100 Year Ab	22935.00	818.40	862.04	825.75	862.06	0.000005	1.29	17833.00	1530.50	0.04
1	102	500 Year Ab	31053.00	818.40	864.37	826.72	864.41	0.000007	1.65	18857.04	1692.44	0.04
1	602	50 Year Ab	19917.00	818.96	861.02	825.97	861.03	0.000002	0.77	32412.06	1490.21	0.02
1	602	100 Year Ab	22935.00	818.96	862.06	826.35	862.07	0.000002	0.85	33965.06	1516.68	0.02
1	602	500 Year Ab	31053.00	818.96	864.41		864.42	0.000004	1.09	37638.98	1654.64	0.03

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
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: Bells Ferry Rd over Little River
Project File : 630975.prj
Run Date and Time: 9/13/2005 10:35:03 AM

Project in English units

PLAN DATA

Plan Title: Prop add sp RS Abn
Plan File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.p10

Geometry Title: Proposed Conditions add span RS
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g07

Flow Title : Abnormal Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f02

Plan Summary Information:

Number of:	Cross Sections	= 4	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 1	Lateral Structures	=	0

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

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

FLOW DATA

Flow Title: Abnormal Floods
Flow File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.f02

Flow Data (cfs)

River	Reach	RS	50 Year Ab	100 Year Ab	500 Year Ab
Little River	1	602	19917	22935	31053

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Little River	1	50 Year Ab	Known WS = 861	
Little River	1	100 Year Ab	Known WS = 862	
Little River	1	500 Year Ab	Known WS = 864.3	

GEOMETRY DATA

Geometry Title: Proposed Conditions add span RS
Geometry File : m:\TRA\31-5031 GDOT Task Order 2005\TO 21 Bells Ferry over Little River\Hydraulics\Hec-Ras\630975.g07

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 602

INPUT
Description: Approach Section - el adj 500 * 0.00111 = +0.56
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880.56	43565.2	860.36	43665.2	859.46	43765.2	856.76	44085.8	840.56
44115.8	832.12	44194.6	825.26	44245.4	822.96	44301.2	821.96	44370.1	822.26
44425.9	818.96	44491.5	822.96	44552.2	820.66	44616.1	822.56	44688.3	827.16
44735.9	834.76	44791.7	840.36	44965.2	852.16	45065.2	863.36	45165.2	864.56
45265.2	866.86	45365.2	886.56						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43228	.12	44085.8	.03	44791.7	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44085.8	44791.7	500	500	500	.3	.5

CROSS SECTION

RIVER: Little River
REACH: 1 RS: 102

INPUT
Description: Upstream Bridge Section Section - lake from metric survey
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43228	880	43565.2	859.8	43665.2	858.9	43765.2	856.2	44085.8	840
44115.8	831.56	44194.6	824.7	44245.4	822.4	44301.2	821.4	44370.1	821.7
44425.9	818.4	44491.5	822.4	44552.2	820.1	44616.1	822	44688.3	826.6
44735.9	834.2	44791.7	839.8	44965.2	851.6	45065.2	862.8	45165.2	864
45265.2	866.3	45365.2	886						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43228	.12	44085.8	.03	44791.7	.12

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

```
       44085.8 44791.7              167     167     167             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   43228 44217.2     867       T
 44655.7 45365.2     867       T

BRIDGE


RIVER: Little River
REACH: 1                  RS: 18.5

INPUT
Description: Proposed Bridge add span
Distance from Upstream XS =      41
Deck/Roadway Width        =      85
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      17
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   42979   866.5       0 43700.8   860.8       0 44217.2  867.36       0
 44217.2  867.36  860.86 44294.3  867.78  861.28 44371.4   868.2   861.7
 44371.4   868.2   860.2   44501  868.01  860.21   44501  868.01  861.51
 44578.1  867.11  860.61 44655.7  865.77  859.27 44655.7  865.77       0
 44865.5     864         44947.5   864.4       0 45013.1   865.2       0
 45275.6   873.4       0 45657.8   899.3       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
   43228     880 43565.2   859.8 43665.2   858.9 43765.2   856.2 44085.8     840
 44115.8  831.56 44194.6   824.7 44245.4   822.4 44301.2   821.4 44370.1   821.7
 44425.9   818.4 44491.5   822.4 44552.2   820.1 44616.1     822 44688.3   826.6
 44735.9   834.2 44791.7   839.8 44965.2   851.6 45065.2   862.8 45165.2     864
 45265.2   866.3 45365.2     886

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
   43228     .12 44085.8     .03 44791.7     .12

Bank Sta: Left   Right    Coeff Contr.   Expan.
       44085.8 44791.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   43228 44217.2     867       T
 44655.7 45365.2     867       T

Downstream  Deck/Roadway Coordinates
    num=      17
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   42979   866.5       0 43700.8   860.8       0 44217.2  867.36       0
 44217.2  867.36  860.86 44294.3  867.78  861.28 44371.4   868.2   861.7
 44371.4   868.2   860.2   44501  868.01  860.21   44501  868.01  861.51
 44578.1  867.11  860.61 44655.7  865.77  859.27 44655.7  865.77       0
 44865.5     864         44947.5   864.4       0 45013.1   865.2       0
 45275.6   873.4       0 45657.8   899.3       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12
```

```
Bank Sta: Left   Right    Coeff Contr.   Expan.
         44200 44944.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 43591.9 44217.2  866.85       T
 44655.7 45465.2  866.85       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 44217.2  860.86 44252.9     843 44255.9     843 44315.9     813
Downstream     num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 44217.2  860.86 44252.9     843 44255.9     843 44315.9     813

Abutment Data
Upstream     num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 44560.2     813 44620.2     843 44623.2     843 44655.7  859.27
Downstream     num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 44560.2     813 44620.2     843 44623.2     843 44655.7  859.27

Number of Piers =  4

Pier Data
Pier Station     Upstream= 44294.3    Downstream= 44294.3
Upstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863
Downstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863

Pier Data
Pier Station     Upstream= 44371.4    Downstream= 44371.4
Upstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863
Downstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863

Pier Data
Pier Station     Upstream=   44501    Downstream=   44501
Upstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863
Downstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863

Pier Data
Pier Station     Upstream= 44578.1    Downstream= 44578.1
Upstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863
Downstream     num=       2
    Width   Elev    Width   Elev
       3     800       3     863
```

```
Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 856.6
       El of the toe of the abutment   = 821
    Right Embankment
       El of the top of the embankment = 856.6
       El of the toe of the abutment   = 821
    Abtument Type                      = 3 Sloping abutments and sloping embankments
    Slope of abutments                 = 2
    Top with of embankment             = 24
    Centroid station of bridge opening =
    Wing Wall Type                     = No wing walls present
       Width                           =
       Angle                           =
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
       Angle                           =

Selected Low Flow Methods = W.S.Pro Method

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

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

CROSS SECTION


RIVER: Little River
REACH: 1                  RS: -65

INPUT
Description: Downstream Bridge Section - lake from metric survey - Left lake
             limited due to DS FP.
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
 43591.9  879.23   43687  875.93 43729.7  872.63 43772.3  869.33 43788.7  866.03
 43821.5  862.83 43857.6  859.53 43890.4  856.23 43916.7  852.93 43965.2  844.74
   44200     840 44253.6   821.4 44317.6   819.4 44378.3   817.5   44521   818.4
 44570.2   817.8   44626   817.5 44688.3   820.4 44753.9   823.7 44822.8     827
 44890.1   831.9 44944.2     840 45165.2   859.9 45265.2  859.21 45365.2  862.13
 45465.2  876.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
 43591.9     .12   44200     .03 44944.2     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         44200 44944.2              800     800     800             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 43591.9 44217.2  866.85       T
 44655.7 45465.2  866.85       T

CROSS SECTION
```

RIVER: Little River
REACH: 1 RS: -865

INPUT
Description: Exit Section - el adj 800 * 0.00111 = -0.89
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
43591.9	878.34	43687	875.04	43729.7	871.74	43772.3	868.44	43788.7	865.14
43821.5	861.94	43857.6	858.64	43890.4	855.34	43916.7	852.04	43965.2	843.85
44200	839.11	44253.6	820.51	44317.6	818.51	44378.3	816.61	44521	817.51
44570.2	816.91	44626	816.61	44688.3	819.51	44753.9	822.81	44822.8	826.11
44890.1	831.01	44944.2	839.11	45165.2	859.01	45265.2	858.32	45365.2	861.24
45465.2	875.25								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
43591.9	.12	44200	.03	44944.2	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
44200	44944.2	0	0	0	.1	.3

SUMMARY OF MANNING'S N VALUES

River:Little River

Reach	River Sta.	n1	n2	n3
1	602	.12	.03	.12
1	102	.12	.03	.12
1	18.5	Bridge		
1	-65	.12	.03	.12
1	-865	.12	.03	.12

SUMMARY OF REACH LENGTHS

River: Little River

Reach	River Sta.	Left	Channel	Right
1	602	500	500	500
1	102	167	167	167
1	18.5	Bridge		
1	-65	800	800	800
1	-865	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Little River

Reach	River Sta.	Contr.	Expan.
1	602	.3	.5
1	102	.3	.5
1	18.5	Bridge	
1	-65	.3	.5
1	-865	.1	.3

Section VI
Scour Summary and Additional Calculations

PROPOSED MODEL BRIDGE SCOUR

100 Year Storm

Scour Calculations – 100 year Storm

Hydraulic Design Data
Contraction Scour

	Left	Channel	Right
Input Data			
Average Depth (ft):		7.37	
Approach Velocity (ft/s):		5.41	
Br Average Depth (ft):		5.83	
BR Opening Flow (cfs):		22935.00	
BR Top WD (ft):		287.61	
Grain Size D50 (mm):		.37	
Approach Flow (cfs):		22935.00	
Approach Top WD (ft):		575.24	
K1 Coefficient:		0.690	
Results			
Scour Depth Ys (ft):		6.06	
Critical Velocity (ft/s):		1.67	
Equation:		Live	

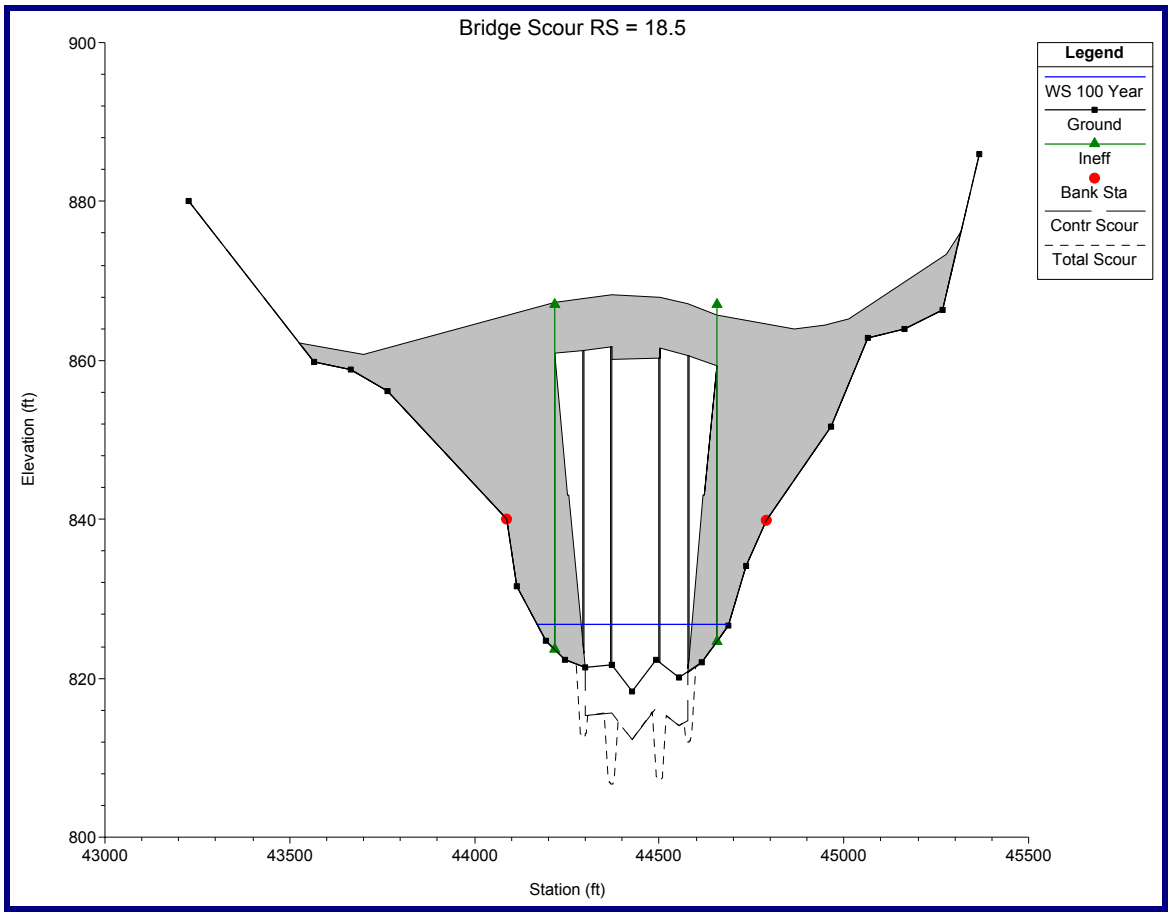
Pier Scour

All piers have the same scour depth

Input Data	
Pier Shape:	Square nose
Pier Width (ft):	3.00
Grain Size D50 (mm) :	0.37000
Depth Upstream (ft):	11.11
Velocity Upstream (ft/s):	7.18
K1 Nose Shape:	1.10
Pier Angle:	5.00
Pier Length (ft):	9.00
K2 Angle Coef:	1.17
K3 Bed Cond Coef:	1.10
Grain Size D90 (mm):	0.47000
K4 Armouring Coef:	1.00
Results	
Scour Depth Ys (ft):	8.86
Froude #:	0.38
Equation:	CSU equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):
Channel: 14.92


Bridge Scour RS = 18.5
Legend
WS 100 Year
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
900
880
860
840
820
800
43000
43500
44000
44500
45000
45500
Station (ft)

500 Year Storm

Scour Calculations – 500 year Storm

Hydraulic Design Data
Contraction Scour

	Left	Channel	Right
Input Data			
Average Depth (ft):		8.93	
Approach Velocity (ft/s):		5.72	
Br Average Depth (ft):		7.05	
BR Opening Flow (cfs):		31053.00	
BR Top WD (ft):		292.96	
Grain Size D50 (mm):		0.37	
Approach Flow (cfs):		31053.00	
Approach Top WD (ft):		607.58	
K1 Coefficient:		0.690	
Results			
Scour Depth Ys (ft):		7.72	
Critical Velocity (ft/s):		1.72	
Equation:		Live	

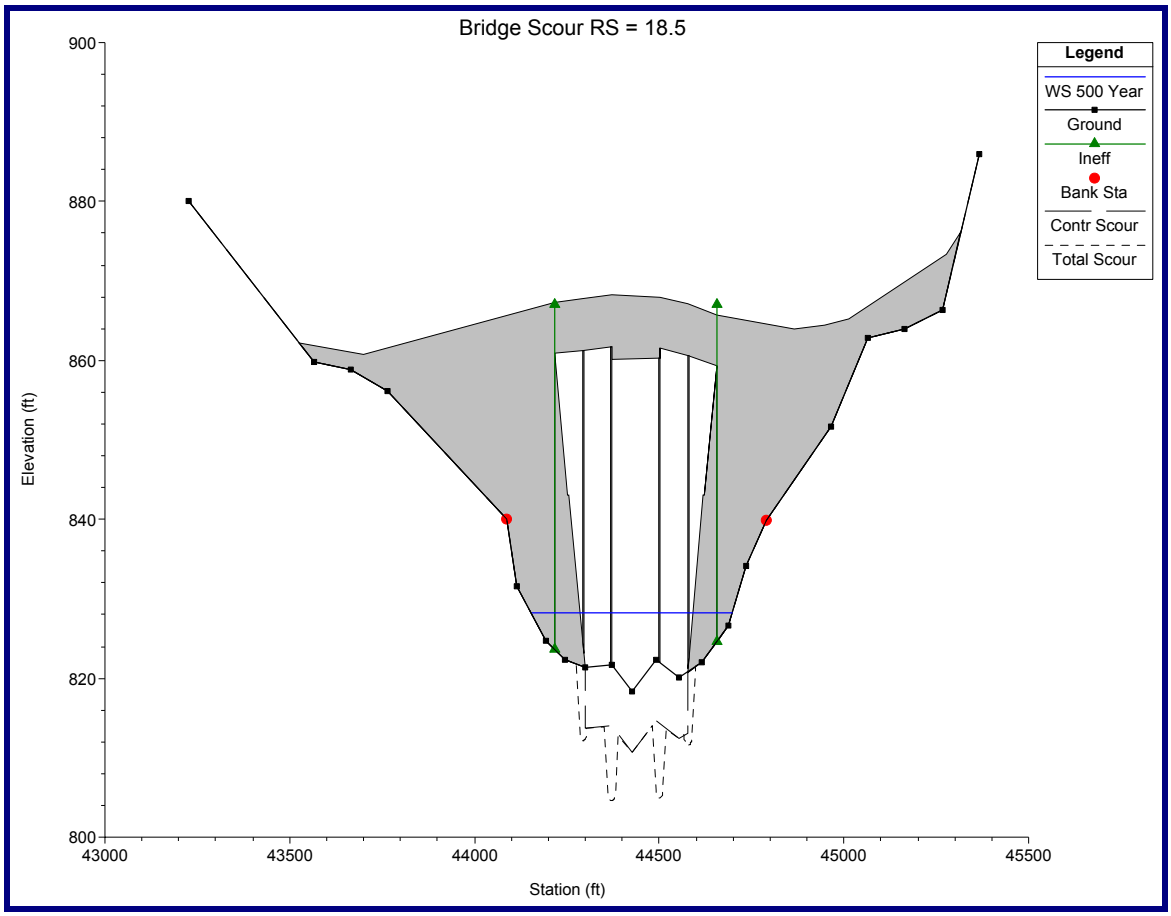
Pier Scour

All piers have the same scour depth

Input Data	
Pier Shape:	Square nose
Pier Width (ft):	3.00
Grain Size D50 (mm):	0.37000
Depth Upstream (ft):	13.07
Velocity Upstream (ft/s):	7.71
K1 Nose Shape:	1.10
Pier Angle:	5.00
Pier Length (ft):	9.00
K2 Angle Coef:	1.17
K3 Bed Cond Coef:	1.10
Grain Size D90 (mm) :	0.47000
K4 Armouring Coef:	1.00
Results	
Scour Depth Ys (ft):	9.34
Froude #:	0.38
Equation:	CSU equation

Combined Scour Depths

Pier Scour + Contraction Scour (ft):
Channel: 17.06


Bridge Scour RS = 18.5
Legend
WS 500 Year
Ground
Ineff
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
900
880
860
840
820
800
43000
43500
44000
44500
45000
45500
Station (ft)

BRS-STP-1375(6) Cherokee County
CR 770 (Bells Ferry Road) over Little River (Lake Allatoona)
PI # 630975

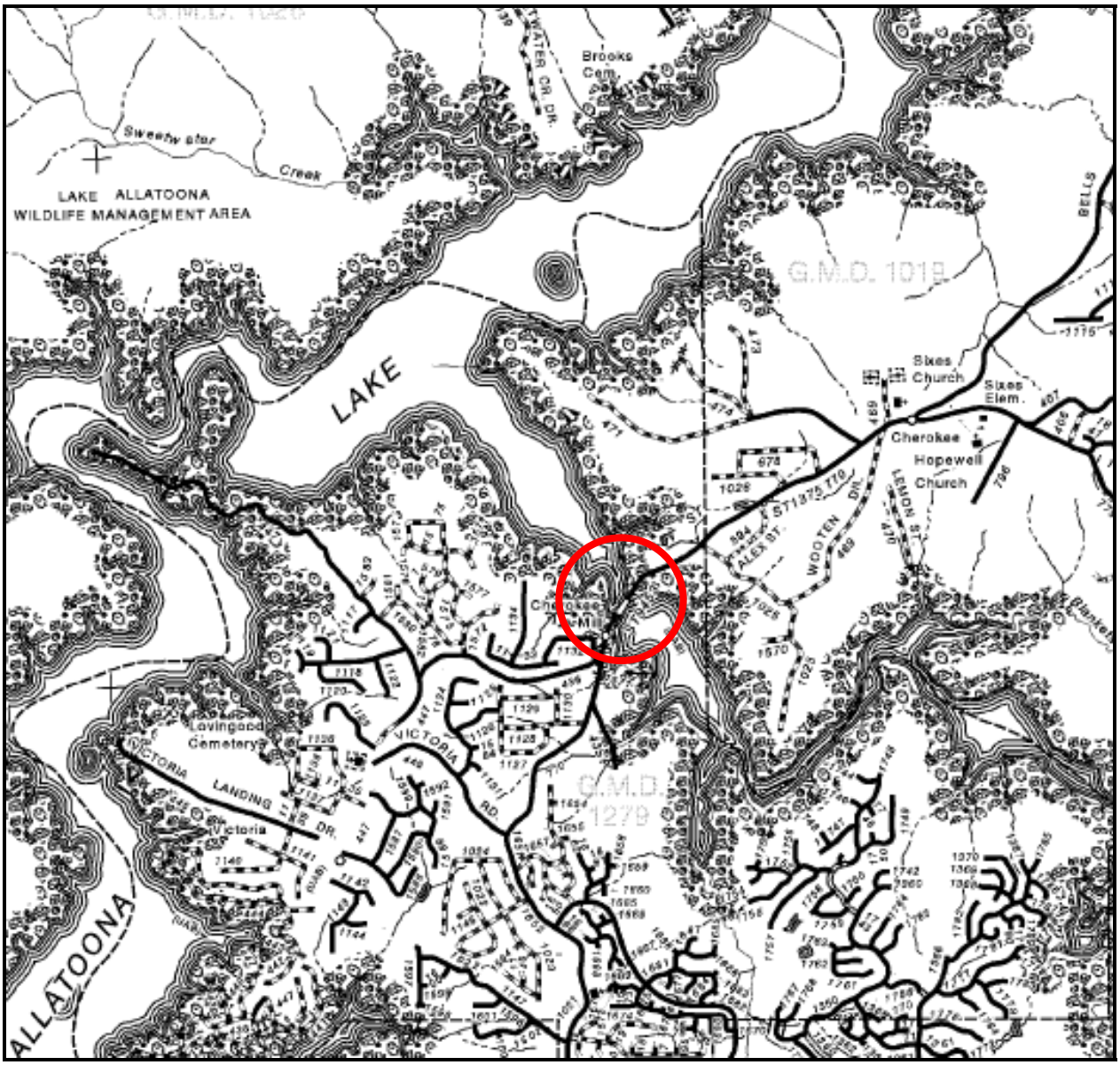
ENDROLL RIPRAP CALCULATIONS (100 YEAR STORM)
METHOD IN HEC-18,"EVALUATING SCOUR AT BRIDGES"

BRIDGE ABUTMENT LOCATION	13+479	13+621
SET BACK LENGTH =	0	0
MAIN CHANNEL AREA @ BRIDGE =	2135	2135
TOP WIDTH OF MAIN CHANNEL @ BRIDGE =	417	417
AVERAGE DEPTH OF MAIN CHANNEL @ BR =	9.93	9.93
SET BACK RATIO =	0.000	0.000
CHARACTERISTIC AVG VELOCITY CALCULATIONS		
(SEE PAGES 120,121)		
DISCHARGE @ ABUTMENT =	22935	22935
AREA @ ABUTMENT =	2135	2135
AVERAGE VELOCITY, V =	10.74	10.74
AREA OF OVERBANK FLOW @ BRIDGE =	2135	2135
LENGTH OF OVERBANK FLOW @ BRIDGE =	417	417
AVERAGE DEPTH OF OVERBANK FLOW =	5.12	5.12
FROUDE NUMBER =	0.837	0.837
IF FROUDE NUMBER <= 0.80, THEN D50 =	1.933	1.933
IF FROUDE NUMBER > 0.80, THEN D50 =	1.801	1.801
MEDIAN STONE DIAMETER REQUIRED, D50 =	1.801	1.801
TYPE OF RIPRAP REQUIRED =	TYPE 1	TYPE 1

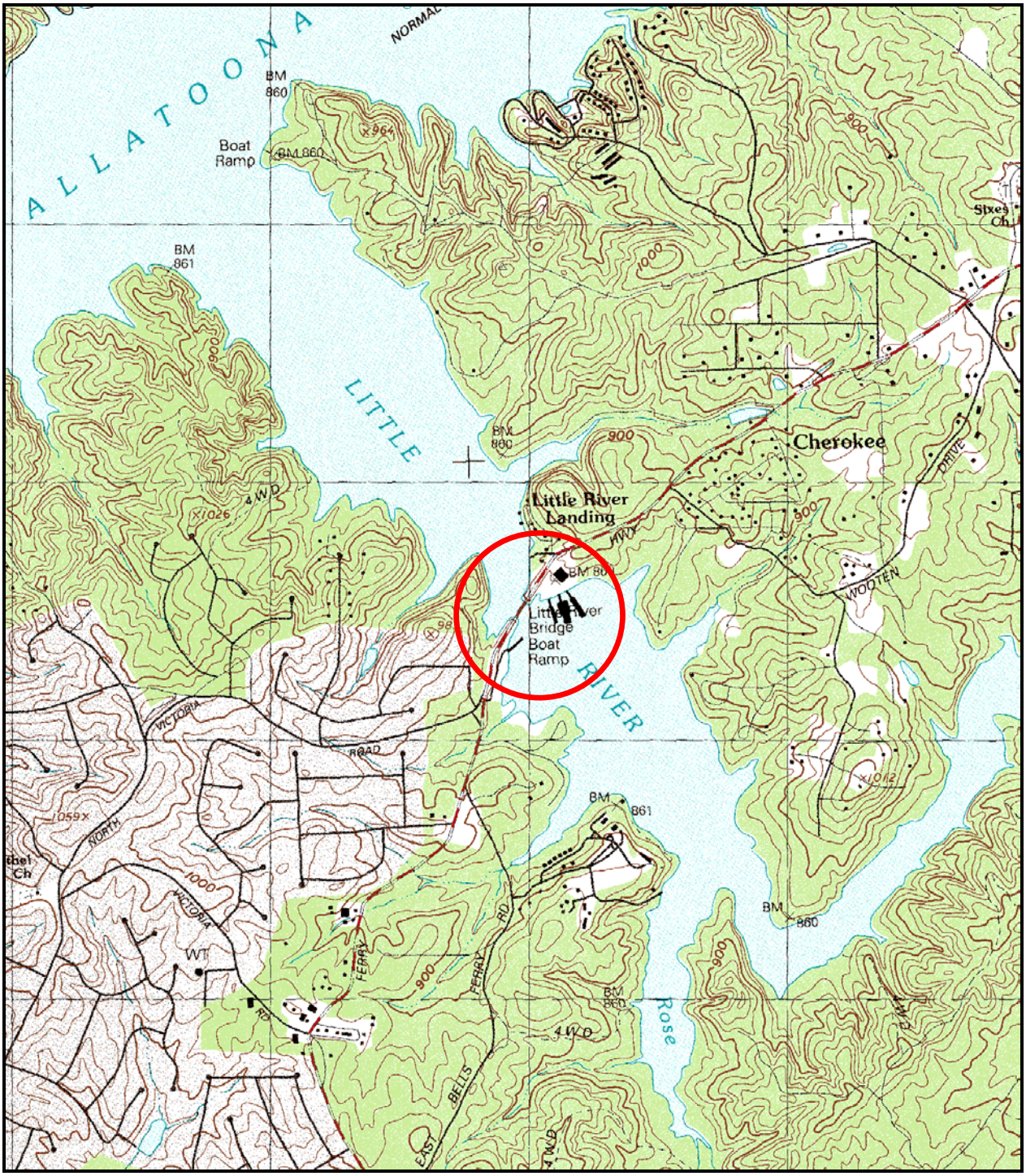
Note : Type I Riprap will be used at this site.

Section VII
Appendix

LOCATION MAPS



Cherokee County
CR 770 (Bells Ferry Road) over Little River (Lake Allatoona)
Project # BRS-STP-1375(6)
PI # 630975



Cherokee County
CR 770 (Bells Ferry Road) over Little River (Lake Allatoona)
Project # BRS-STP-1375(6)
PI # 630975

PROJECT PHOTOGRAPHS

Looking downstream (west) at the existing bridge.

Looking southwest along the upstream side of the existing bridge.

Looking upstream (southeast) from the existing bridge.

Looking downstream (west) from the existing bridge.

Looking downstream (northwest) from the existing bridge.

Looking north along Bells Ferry Road. Note the Marina on the right.

Looking north along the downstream side of the existing bridge.

Looking north along the upstream side of the existing bridge.

Looking north along the upstream side of the existing bridge.

Looking south along the upstream side of the existing bridge.

Looking downstream at restaurant across from the Marina.

Looking across the Marina parking lot at the driveway onto Bells Ferry Road.

Looking north along Bells Ferry Road. The driveway to the Marina is to the right.

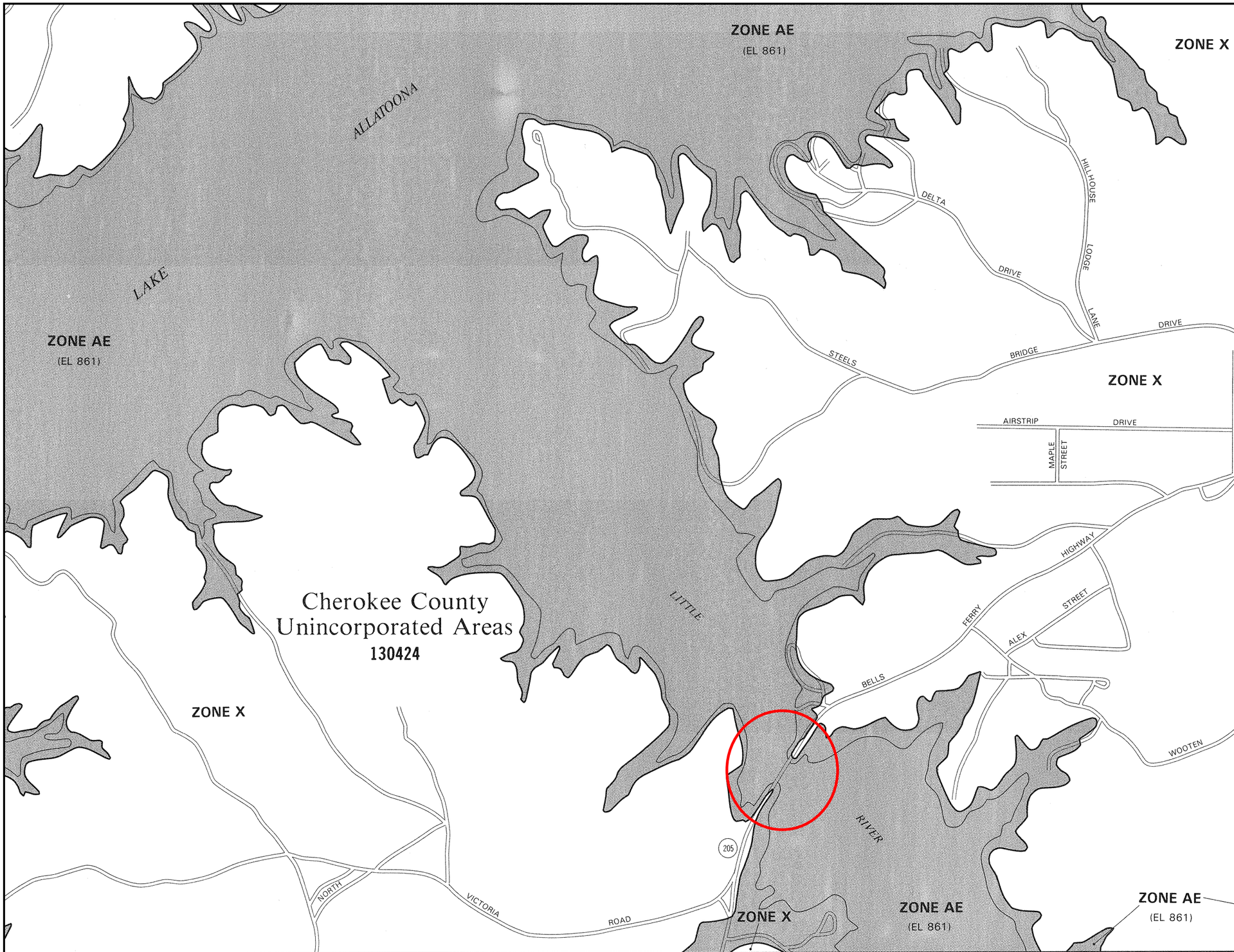
Looking upstream at the Allatoona Dam.

Looking downstream from the toe of Allatoona Dam along the Etowah River.

Looking north across Allatoona Dam.

Looking north across Allatoona Dam.

FEMA DATA



APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

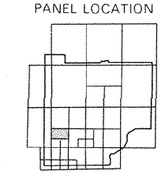
CHEROKEE COUNTY,
GEORGIA AND
INCORPORATED AREAS

PANEL 215 OF 335

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
UNINCORPORATED AREAS	130424	0215	B

PANEL LOCATION



MAP NUMBER:
13057C0215 B

EFFECTIVE DATE:
JULY 15, 1988

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

MISCELLANEOUS PROJECT DATA

John McWhorter

From: Sanders, Matt [Matt.Sanders@dot.state.ga.us]
Sent: Tuesday, October 11, 2005 3:33 PM
To: John McWhorter
Cc: Beck, Susan; Acree, David
Subject: RE: BRS-STP-1375(6) Cherokee Co. PI# 630975

John,
David managed to discuss this 1 foot of cover issue with Susan after I emailed you, so I will go ahead and send you the information you requested. Granted, these elevations are computed to take in account of a 25" pavement section at each location at the low sides of the edges of pavement. At any rate, the elevations are as follows:
STA. 13+280 = 262.571 M
STA. 13+680 = 262.511 M

You will note that these elevations are higher than the 50 yr. lake elevation of 262.43 M, but are slightly lower than being able to make the one foot of cover you mentioned. Susan directed us to go forward with giving you this data and if we end up needing a Variance for this then she would take care of it once we have an updated and approved pavement design. Attached are the two sheets that include Station 13+280 as per your earlier request.

Matt Sanders, ADGM
GDOT, Road & Airport Design
☎ Phone: (404) 656-5180

SOUTHERN POLYTECHNIC
RUNNIN' HORNETS

From: John McWhorter [mailto:jmcwhorter@JBTrimble.com]
Sent: Tuesday, October 11, 2005 11:46 AM
To: Sanders, Matt
Cc: Robbie Frizzell; Beck, Susan
Subject: RE: BRS-STP-1375(6) Cherokee Co. PI# 630975

Matt,

Thanks for the plans. I did receive both emails. As far as the minimums for subgrade clearance, I was referring to the low points on the roadway (before and after the bridge) at approximate stations 13+280 and 13+680. The low point near 13+280 has allot going on with SE transition and a tapering width. I spoke with David about this the other day. By the book, we need to have 1 ft of clearance between the bottom of the subgrade and the 50 year lake elevation, which is 861.0 (262.43m). If we are not meeting this with the current profile, a design variance will be required. Also, I'll need the plan and profile sheet before the bridge to cover the area discussed above.

Thanks for your help and please let me know if you have any questions.

John

I-575-1 (6) 07 CHEROKEE COUNTY

LITTLE RIVER

HYDRAULIC AND HYDROLOGICAL STUDY

EXAMINED AND APPROVED:

9-7-78
(Date)

J. T. Kratzer, P. E.
State Bridge Engineer

SAG/kg

9-6-78

I-575-1 (6) 07 CHEROKEE COUNTY

HYDRAULIC AND HYDROLOGICAL STUDY

The I-575 crossing over the Little River on the above project number is to consist of dual bridges 380 feet in length and skewed 70° left. The hydraulic study on this site was performed by the U. S. Geological Survey. The 380 foot bridge length is the shortest bridge length that can be used at this site and maintain bank stability.

The profile grade for the bridge site was set because of roadway conditions and not hydraulic conditions. The bridge provides for approximately 27 feet of clearance above the 50 year floodstage.

Attached is the preliminary layout and USGS Hydraulic Study for the site.

Prepared By: Allen Groover

SAG/kg

9-6-78

Form 9-014

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
RESTON, VA. 22092

MEMORANDUM REPORT

Flood-Flow Characteristics

Little River at Interstate Highway 575

Project I-575 - Cherokee County

Georgia District
Water Resources Division
U.S. Geological Survey
Doraville, Georgia

July 1978

FOR ADMINISTRATIVE USE ONLY

U.S. GOVERNMENT PRINTING OFFICE / 1977—O-234-199

MEMORANDUM REPORT

Flood-Flow Characteristics

Little River near Woodstock, Georgia

Project I-575 - Cherokee County

INTRODUCTION

This report has been prepared as part of a program of water-resources investigations under the provisions of a cooperative agreement between the Highway Division, Department of Transportation, State of Georgia, and the U.S. Geological Survey. The Highway Division plans construction of a bridge crossing Little River on Interstate 575, about 3 miles northwest of Woodstock, Georgia.

The purpose of this study was to determine the flood-flow characteristics for Little River at the proposed bridge crossing for floods having a recurrence of 50 and 100 years. In addition, the study included computations of flood elevation, area of opening under highwater, average velocity, and backwater for 2 alternate bridge openings. Alternate No. 1 is dual bridges 450 feet in length (Station 705+25 to Station 709+75) at a 90 percent skew from highway centerline. Alternate No. 2 is dual bridges ~~390~~ 380 feet in length (Station 705+50 to 709+40) at a 70 percent skew from the highway centerline. The backwater effects of these Interstate bridges on the bridge at Rope Mill Road, 1,000 feet upstream from the proposed bridges, was comput

The highway Division provided a transverse profile of the channel and floodway, proposed location of the roadway and drainage structure, and a 2 foot contour map of the flood plain from 1,000 feet below the proposed bridge to Rope Mill Road. All elevations used in this report are to highway datum, which is National Geodetic Vertical Datum.

Topographic features and the location of the crossing site are shown in figure 1. Little River drains an area of 139 square miles at the proposed crossing site.

FLOOD FREQUENCY

The discharges for the 50- and 100-year floods have been estimated to be 12,700 and 14,300 ft^3/s (cubic feet per second), respectively, based on regional relationships, $Q = 727\ A^{0.58}$ and $Q = 862\ A^{0.57}$ from the report, "Magnitude and Frequency of Floods in Georgia" (in review).

ELEVATION-DISCHARGE RELATION

During part of the year, the elevation-discharge relation at this site is controlled by backwater from Allatoona Reservoir located downstream on the Etowah River. From oral communication with the U.S. Army Corps of Engineers (June 21, 1978), the elevations of the 50- and 100-year floods for Allatoona Reservoir were estimated to be 861 and 862 feet (NGVD), respectively.

Slope-conveyance studies were used to compute the stage-discharge relation for the 50- and 100-year floods for low pool elevations in Allatoona Reservoir. The slope of Little River at the proposed bridge site was estimated from contour maps to be about 6 feet per mile. The conveyance at the proposed bridge was computed using roughness values selected during a field reconnaissance of the site on July 24, 1978. The elevations of the 50- and 100-year floods were computed to be 847.5 and 848.5 feet, respectively.

The elevation-discharge relation for the 50- and 100-year floods have been obtained from flood routing studies using the U.S. Geological Survey Step-Backwater Program (E-431) for the reach from the proposed bridge site to Rope Mill Road for (1) 50- and 100-year flood pool elevations and (2) low pool elevations in Allatoona Dam. The locations of the cross sections used are shown in figure 1.

BACKWATER EFFECTS

The computed flood elevations, area of opening under highwater conditions, average velocity, and backwater for the 50- and 100-year floods on Little River for the two alternate bridge lengths for Interstate Highway 575 are listed in table 1 for (1) 50- and 100-year flood pool elevations and (2) low pool elevations in Allatoona Reservoir.

The maximum velocity and maximum backwater caused by the proposed bridge will be produced by a flood on Little River coincident with a low pool elevation (condition 2) in Allatoona Reservoir.

As indicated in table 1, neither of the alternate bridge openings will produce appreciable backwater for either high or low pool elevations in Allatoona Reservoir.

Mr Glone Price
7/27/78

Table 1.—Little River at Interstate 575, near Woodstock, Georgia.

Condition	Discharge (ft^3/s)	Elevation ft (NGVD)	Area (ft^2)	Average velocity (ft/sec)	Little River backwater (ft)	Elevation Rope Mill Road ft (NVGD)	Backwater Rope Mill Road (ft)
Proposed Bridge (Sta. 705+25 to 709+75							
With Allatoona Reservoir at 50- and 100-year pool elevations, respectively							
50-year flood	12,700	861.0	5,500	2.3	< 0.1	861.2	< 0.1
100-year flood	14,300	862.0	5,850	2.5	< 0.1	862.2	< 0.1
With Allatoona Reservoir at low pool elevation, no backwater at bridge							
50-year flood	12,700	847.5	2,380	5.4	0.1	849.7	0.1
100-year flood	14,300	848.5	2,590	5.5	0.1	850.7	0.1
Proposed Bridge (Sta. ~~705+50~~ 705+60 to 709+40							
With Allatoona Reservoir at 50- and 100-year flood elevations, respectively							
50-year flood	12,700	861.0	5,010	2.5	< 0.1	861.2	< 0.1
100-year flood	14,300	862.0	5,260	2.7	< 0.1	862.2	
With Allatoona Reservoir at low pool elevation, no backwater at bridge							
50-year flood	12,700	847.5	2,280	5.6	0.1	849.7	0.1
100-year flood	14,300	848.5	2,470	5.8	0.1	850.7	0.1

Teal, Sam

From: Timothy C Stamey [tcstamey@usgs.gov]
Sent: Tuesday, January 20, 2004 12:08 PM
To: Teal, Sam
Cc: Timothy C Stamey
Subject: Re: Probability of major floods occurring during winter months at Lak e Allatoona

Historically, most of the peak flows occur during the winter months and in early March and April. Although there are major flood events that have occurred in all months of the year , it is more routine for the flood events in North Georgia to occur during the winter and spring time periods.

Tim Stamey...

```
|---------+---------------------------->
|         |          "Teal, Sam"       |
|         |          <Sammy.Teal@dot.s|
|         |          tate.ga.us>       |
|         |                            |
|         |          01/20/2004 11:18  |
|         |          AM                |
|         |                            |
|---------+---------------------------->

>-----------------------------------------------------------------------------------------------
-----------------------------|
  |

  |       To:       tcstamey@usgs.gov
|
  |       cc:
|
  |       Subject:  Probability of major floods occurring during winter months at Lak
e Allatoona                    |

>-----------------------------------------------------------------------------------------------
-----------------------------|
```

Hi Tim,

I am sizing a bridge over Lake Allatoona (Little River), and of course, the highest flow velocities are when Lake Allatoona is at low pool elevation during the winter months of November through February, mid-March.

Is there a low probability of major storms occurring during this time period? Is so, I could justify going with higher flow velocities for the 50 and 100 year storms than I normally would for this low water condition, since the lake would normally return to the pool elevation and lower velocities the rest of the year.

Thanks,
Sam

ROADWAY PLAN AND PROFILE

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	BRS-STP-1375(6)	1	

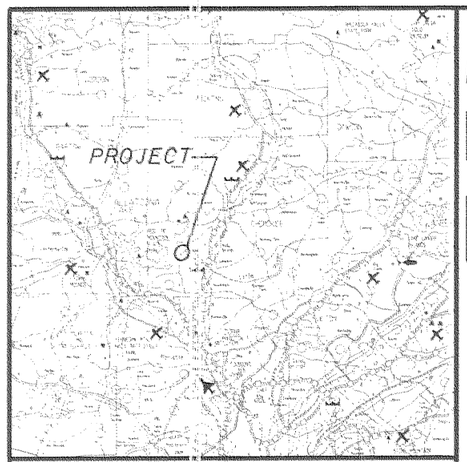
DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

Metric

PLAN AND PROFILE OF PROPOSED
BELLS FERRY ROAD BRIDGE REPLACEMENT
OVER LITTLE RIVER
CHEROKEE COUNTY

FEDERAL AID PROJECT
BRS-STP-1375(6)
CHEROKEE COUNTY

FEDERAL ROUTE * NONE
STATE ROUTE * NONE
P. I. NO. 630975



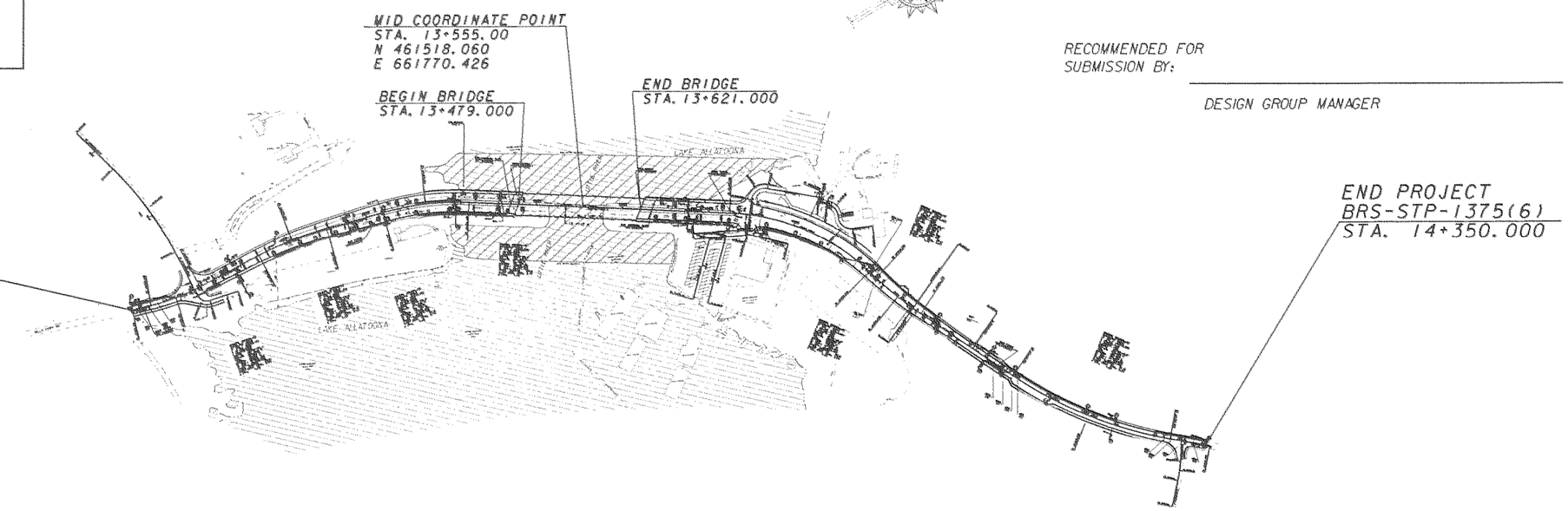
LOCATION SKETCH

DESIGN DATA:	
TRAFFIC A.D.T.:	10600 (2005)
TRAFFIC A.D.T.:	22400 (2025)
TRAFFIC D.H.V.:	2270(2025)
DIRECTIONAL DIST.:	
% TRUCKS:	2%
24 HR. TRUCKS %:	3%
SPEED DESIGN:	70 km/h

FUNCTIONAL CLASS:	RURAL ARTERIAL
DESIGNATION:	N/A
VERTICAL DATUM:	NAVD29
HORIZONTAL DATUM:	NAD27
COORDINATE ZONES:	WEST
PROJECT UNITS:	SI

NOTE :
ALL REFERENCES IN THIS DOCUMENT, WHICH INCLUDES ALL PAPERS, WRITINGS, DOCUMENTS, DRAWINGS, OR PHOTOGRAPHS USED, OR TO BE USED IN CONNECTION WITH THIS DOCUMENT, TO " STATE HIGHWAY DEPARTMENT OF GEORGIA ", "STATE HIGHWAY DEPARTMENT ", GEORGIA STATE HIGHWAY DEPARTMENT ", " HIGHWAY DEPARTMENT ", OR " DEPARTMENT " WHEN THE CONTEXT THEREOF MEANS THE STATE HIGHWAY DEPARTMENT OF GEORGIA MEAN, AND SHALL BE DEEMED TO MEAN THE DEPARTMENT OF TRANSPORTATION.

RECOMMENDED FOR SUBMISSION BY: _____
DESIGN GROUP MANAGER



BRS-STP-1375(6)
CHEROKEE COUNTY

SUBMITTED BY: _____
STATE ROAD AND AIRPORT DESIGN ENGINEER

RATIO = 1 : 5000

0 100 200 400
SCALE IN METERS

DATE	CHIEF ENGINEER

LENGTH OF PROJECT	KILOMETERS
NET LENGTH OF ROADWAY	1.2010
NET LENGTH OF BRIDGES	0.1420
NET LENGTH OF PROJECT	1.3430
NET LENGTH OF EXCEPTIONS	0.0000
GROSS LENGTH OF PROJECT	1.3430

L & D APPROVAL DATE	JANUARY 28, 1999
PLANS COMPLETED - -	
REVISIONS	

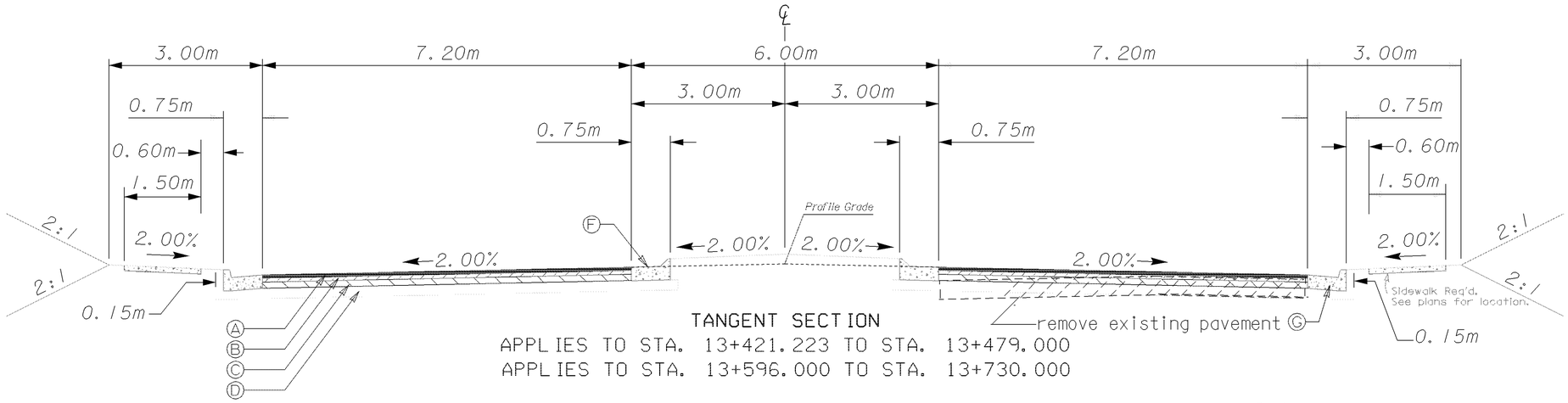
THIS PROJECT IS LOCATED 100 PERCENT WITHIN CONGRESSIONAL DISTRICT NO. 8.

THIS PROJECT IS LOCATED 100 PERCENT WITHIN CHEROKEE COUNTY.

THE DATA, TOGETHER WITH ALL OTHER INFORMATION SHOWN ON THESE PLANS OR IN ANYWAY INDICATED THEREBY, WHETHER BY DRAWINGS OR NOTES, OR IN ANY OTHER MANNER, ARE BASED UPON FIELD INVESTIGATIONS AND ARE BELIEVED TO BE INDICATIVE OF ACTUAL CONDITIONS. HOWEVER, THE SAME ARE SHOWN AS INFORMATION ONLY, ARE NOT GUARANTEED, AND DO NOT BIND THE DEPARTMENT OF TRANSPORTATION IN ANY WAY. THE ATTENTION OF BIDDER IS SPECIFICALLY DIRECTED TO SUBSECTIONS 102.04, 102.05, AND 104.03 OF THE SPECIFICATIONS.

SHOWDATETIME$$$$$$
DGN$SPECIFICATION$$$$$$$$$$$$$$$$$$$$$$

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	BRS-STP-1375(6)		



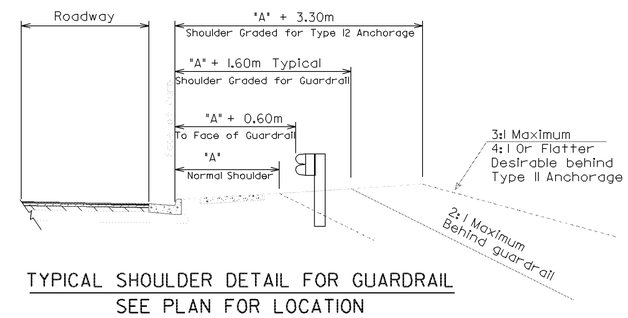
TANGENT SECTION

APPLIES TO STA. 13+421.223 TO STA. 13+479.000

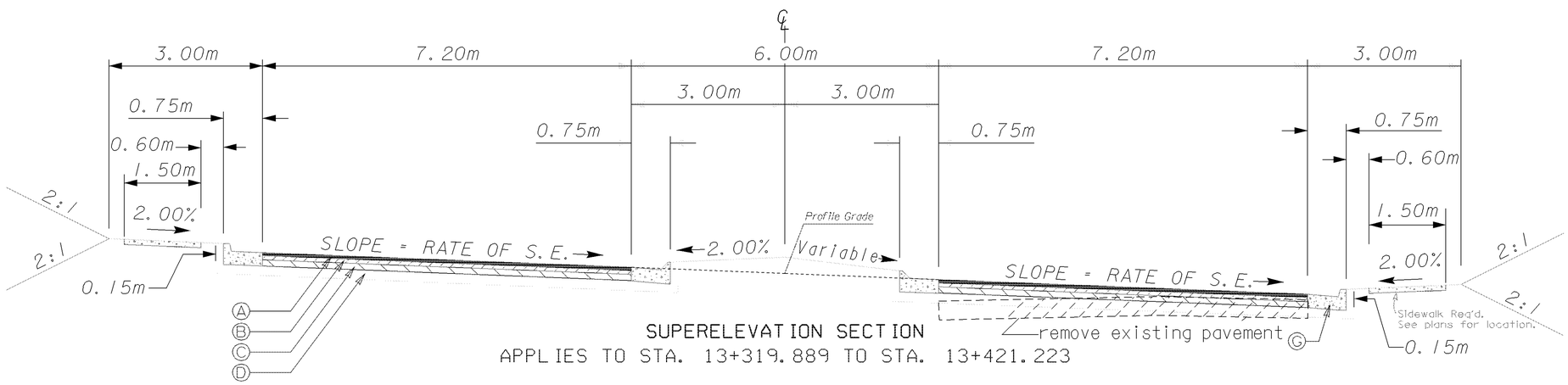
APPLIES TO STA. 13+596.000 TO STA. 13+730.000

REQUIRED PAVEMENT

Ⓐ 9.5 mm SUPERPAVE ASPHALTIC CONCRETE (90 kg/m²)
Ⓑ 19 mm SUPERPAVE ASPHALTIC CONCRETE (120 kg/m²)
Ⓒ 25 mm SUPERPAVE ASPHALTIC CONCRETE BASE (360 kg/m²)
Ⓓ 250 mm GRADED AGGREGATE BASE COURSE
Ⓕ 200 mm x 750 mm CONC. CURB & GUTTER, GA. STD. 9032 B. TYPE 7
Ⓖ 200 mm x 750 mm CONC. CURB & GUTTER, GA. STD. 9032 B. TYPE 2



TYPICAL SHOULDER DETAIL FOR GUARDRAIL
SEE PLAN FOR LOCATION



SUPERELEVATION SECTION

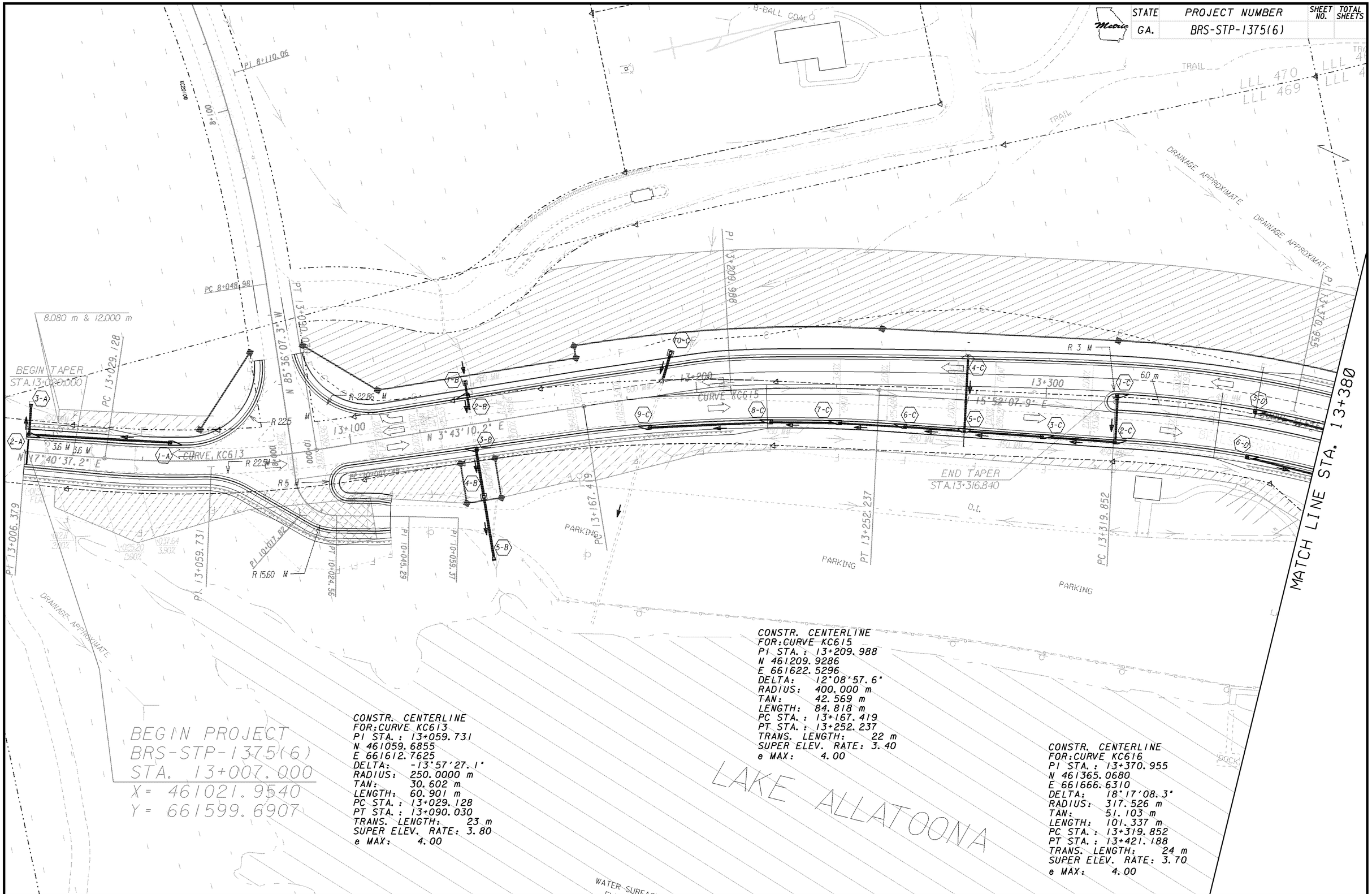
APPLIES TO STA. 13+319.889 TO STA. 13+421.223

NOTE: A 300 mm BLANKET OF CLASS IIB2 OR BETTER MATERIAL SHALL BE PLACED ON THE SUBGRADE OF THIS ENTIRE PROJECT, INCLUDING CROSSROADS.

TYPICAL SECTIONS
BRS-STP-1375(6)
CHEROKEE COUNTY
BELLS FERRY ROAD
AT LITTLE RIVER

10/11/2005 9:50:59 AM \\GDOT-DSNI\GOPLOT\QCE\PDF Out mono 200dpi acf msanders L:\630975\METRIC FILES\630975typ5.pcf GO-BD3

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	BRS-STP-1375(6)		



CONSTR. CENTERLINE
FOR:CURVE KC613
PI STA.: 13+059.731
N 461059.6855
E 661612.7625
DELTA: -13°57'27.1"
RADIUS: 250.0000 m
TAN: 30.602 m
LENGTH: 60.901 m
PC STA.: 13+029.128
PT STA.: 13+090.030
TRANS. LENGTH: 23 m
SUPER ELEV. RATE: 3.80
e MAX: 4.00

CONSTR. CENTERLINE
FOR:CURVE KC615
PI STA.: 13+209.988
N 461209.9286
E 661622.5296
DELTA: 12°08'57.6"
RADIUS: 400.000 m
TAN: 42.569 m
LENGTH: 84.818 m
PC STA.: 13+167.419
PT STA.: 13+252.237
TRANS. LENGTH: 22 m
SUPER ELEV. RATE: 3.40
e MAX: 4.00

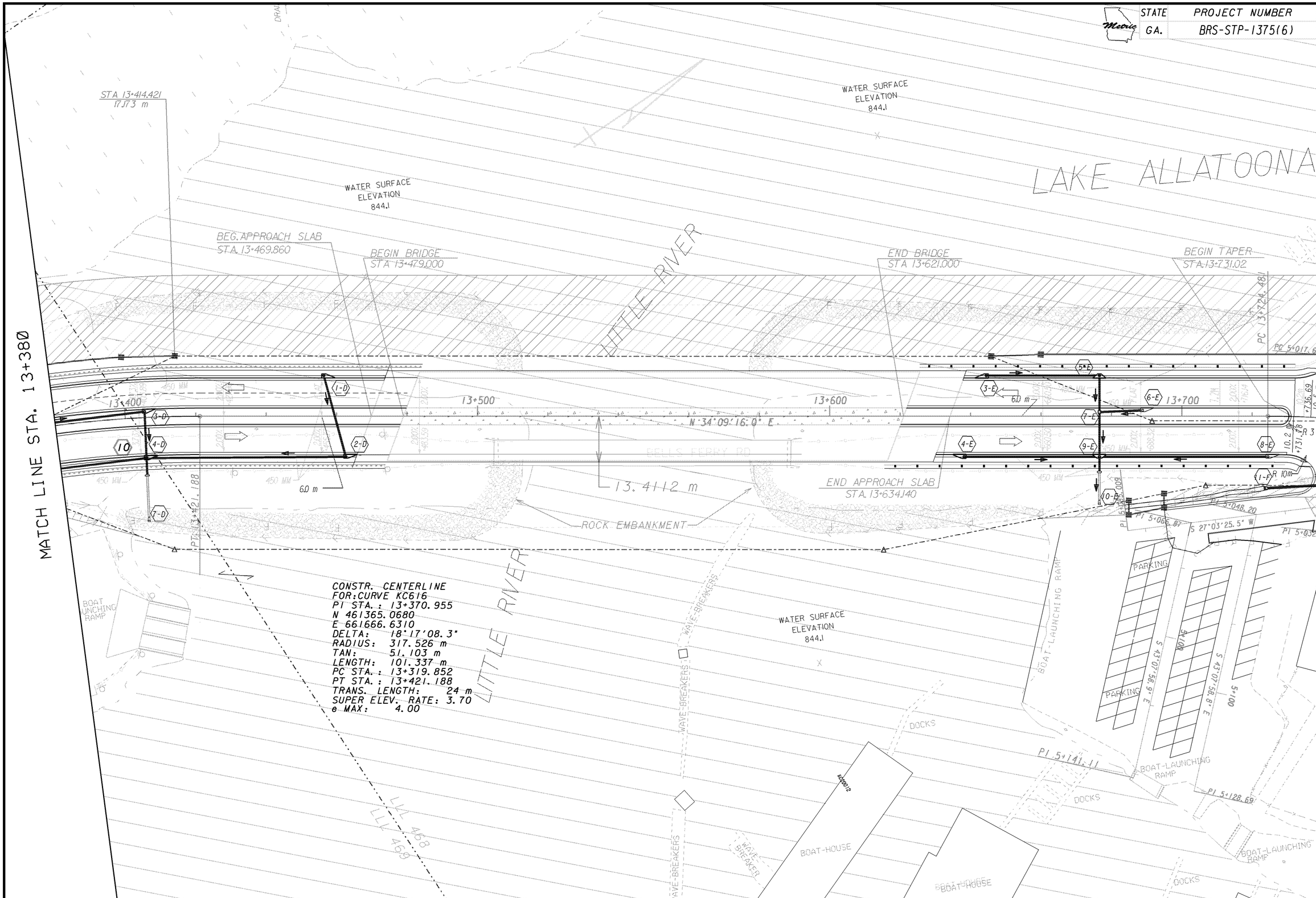
CONSTR. CENTERLINE
FOR:CURVE KC616
PI STA.: 13+370.955
N 461365.0680
E 661666.6310
DELTA: 18°17'08.3"
RADIUS: 317.526 m
TAN: 51.103 m
LENGTH: 101.337 m
PC STA.: 13+319.852
PT STA.: 13+421.188
TRANS. LENGTH: 24 m
SUPER ELEV. RATE: 3.70
e MAX: 4.00

RATIO=1:500
0 10 20 40
SCALE IN METERS

DATE	REVISIONS	DATE	REVISIONS

GEORGIA
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION PLAN
PROJECT BRS-STP-1375(6)
COUNTY CHEROKEE
SH 13 - 1

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	BRS-STP-1375(6)		



RATIO=1:500

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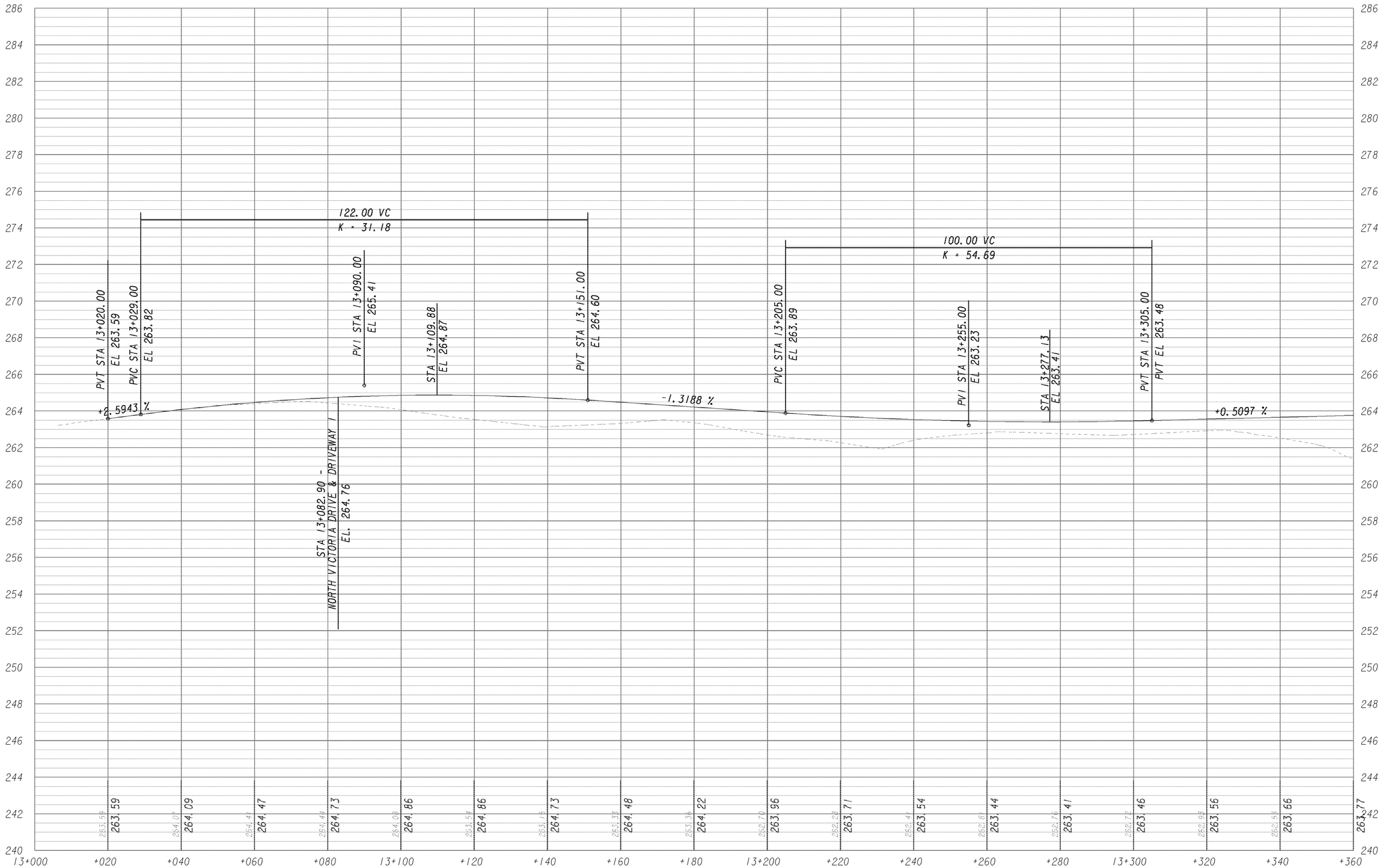
SCALE IN METERS

DATE	REVISIONS	DATE	REVISIONS

GEORGIA
DEPARTMENT OF TRANSPORTATION
CONSTRUCTION PLAN
PROJECT BRS-STP-1375(6)
COUNTY CHEROKEE
SH 13 - 2

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	BRS-STP-1375(6)		

REVISION DATES



STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE OF DESIGN

BELLS FERRY ROAD PROFILE

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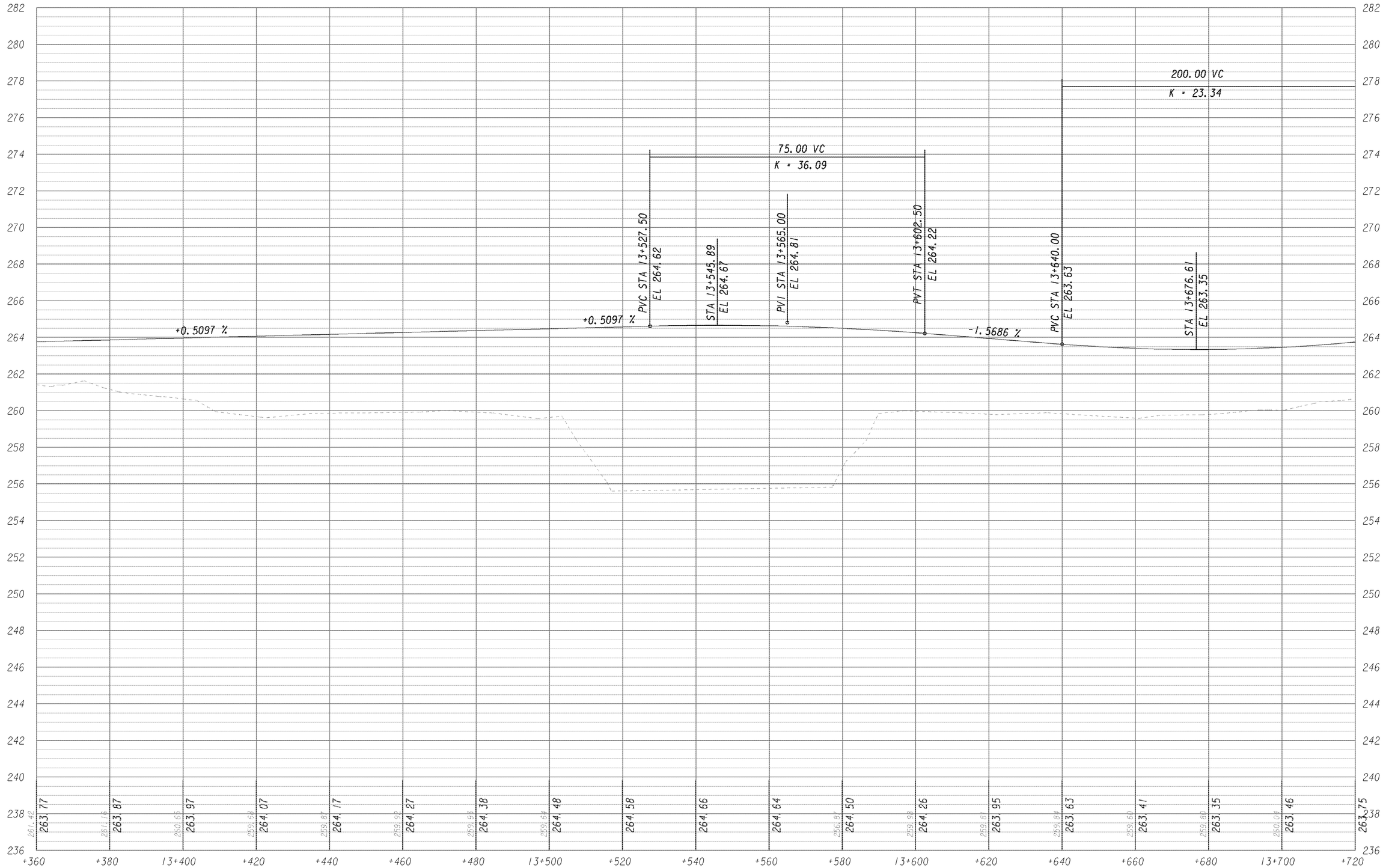
STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA.	BRS-STP-1375(6)		

REVISION DATES



STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE OF DESIGN

BELLS FERRY ROAD PROFILE

DRAWING No.

11-Oct-2005 09:46:08
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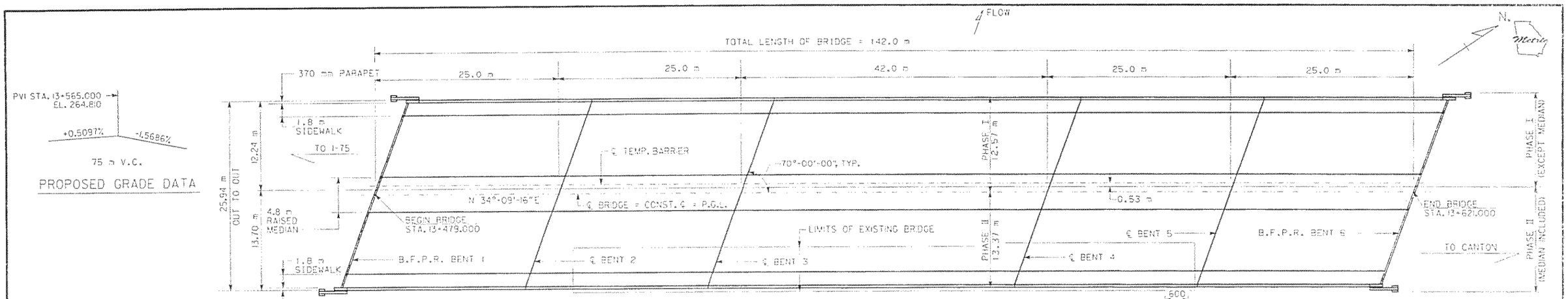
PRELIMINARY BRIDGE PLAN AND ELEVATION SECTION



PLAN

-----TRAFFIC DATA-----

TRAFFIC ---------- ADT = 10600(2005)
ADT = 22400(2025)
DHV = 2270(2025)
24 HR TRUCKS ---------- 3%
TRUCKS ---------- 2%
SPEED DESIGN ---------- 70 km/h

-----CONSTRUCTION SEQUENCE-----

1. MAINTAIN TWO LANES OF TRAFFIC ON THE EXISTING BRIDGE.
2. PROVIDE TEMPORARY SHORING AS NECESSARY FOR PHASE I CONSTRUCTION.
3. COMPLETE PHASE I CONSTRUCTION.
4. PLACE TEMPORARY BARRIER ON BRIDGE.
5. SHIFT AND MAINTAIN TWO LANES OF TRAFFIC ON PHASE I SECTION.
6. PROVIDE TEMPORARY SHORING AS NECESSARY FOR PHASE II CONSTRUCTION.
7. REMOVE EXISTING BRIDGE. REMOVE EXISTING SUBSTRUCTURE AS PER THE SPECIFICATIONS.
8. COMPLETE PHASE II CONSTRUCTION.
9. REMOVE TEMPORARY BARRIER FROM BRIDGE.

NOTE: THE ABOVE SEQUENCE SHALL BE COORDINATED WITH ROADWAY OPERATIONS. ***SEE ROADWAY PLANS*** IN LIEU OF THE ABOVE CONSTRUCTION SEQUENCE, THE CONTRACTOR MAY SUBMIT, FOR APPROVAL BY THE ENGINEER, HIS OWN CONSTRUCTION SEQUENCE.

DRAINAGE DATA

DRAINAGE AREA ---------- 543.9 km²

(FLOOD POOLS)- LAKE ALLATOONA

FLOOD FREQUENCY	TOTAL DISCHARGE	AREA OF OPENING BELOW FLOODSTAGE	MEAN VELOCITY	BACKWATER
50 YEAR	564.0 m³/s	1341.7 m²	0.42 m/s	0.01 m
100 YEAR	649.5 m³/s	1346.8 m²	0.48 m/s	0.02 m
500 YEAR	879.4 m³/s	1346.8 m²	0.65 m/s	0.03 m

(RIVER FLOOD)

FLOOD FREQUENCY	TOTAL DISCHARGE	AREA OF OPENING BELOW FLOODSTAGE	MEAN VELOCITY	BACKWATER
50 YEAR	564.0 m³/s	183.9 m²	3.07 m/s	0.41 m
100 YEAR	649.5 m³/s	198.3 m²	3.27 m/s	0.51 m
500 YEAR	879.4 m³/s	232.0 m²	3.79 m/s	0.80 m

-----BRIDGE CONSISTS OF-----

1 - 42.0 m BULB TEE, 1830 mm, PSC BEAM SPAN ------ SPECIAL DESIGN
4 - 25.0 m TYPE II PSC BEAM SPANS ---------- SPECIAL DESIGN
4 - CONCRETE INTERMEDIATE BENTS ---------- SPECIAL DESIGN
2 - PILE END BENTS ---------- SPECIAL DESIGN
ONE PIPE ALUMINUM HANDRAIL ---------- (GA STD. 3528)
600 mm TYPE I RIPRAP
SPECIAL ROCK EMBANKMENT

NOTES:
- THE PROPOSED BRIDGE DECK IS TO BE BUILT ON SUPERELEVATION TRANSITION. SEE SE TRANSITION DETAIL.
- MINIMUM BOTTOM OF BEAM ELEVATION FOR PROPOSED BRIDGE SHALL BE NO LOWER THAN ELEVATION 262.0
- REMOVE EXISTING BRIDGE. REMOVE EXISTING SUBSTRUCTURE AS PER THE SPECIFICATIONS.
- THE PROPOSED BRIDGE IS TO BE STAGE CONSTRUCTED.
- THE END BENT PILES ARE TO BE DRIVEN BEFORE THE NO. 4 STONE IS PLACED. PILES ARE TO BE PROTECTED BY PILE CANS DURING PLACEMENT OF NO. 4 STONE.

-----DESIGN DATA-----

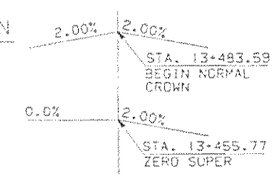
TYPICAL MS-18 AND/OR MILITARY LOADING -------- IMPACT ALLOWED
SPECIFICATIONS ---------- AASHTO 17th EDITION, 2002

** STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R.

----- FLOODSTAGE ELEVATIONS -----

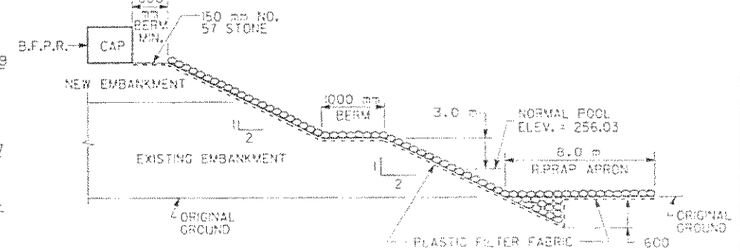
FLOOD POOLS
"A" = NORMAL POOL ELEV. = 256.03
"B" = 50 YEAR FLOODSTAGE ELEV. = 262.43
"C" = 100 YEAR FLOODSTAGE ELEV. = 262.73
"D" = 500 YEAR FLOODSTAGE ELEV. = 263.44

RIVER FLOODS
"E" = 50 YEAR FLOODSTAGE ELEV. = 251.72
"F" = 100 YEAR FLOODSTAGE ELEV. = 251.90
"G" = 500 YEAR FLOODSTAGE ELEV. = 252.34



SUPERELEVATION DETAIL

LOOKING AHEAD

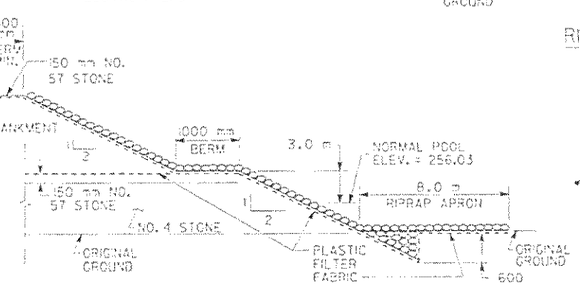


RIPRAP DETAIL-EXISTING EMBANKMENT***

NO SCALE

PLACE RIPRAP AND FILTER FABRIC FROM 600 mm BELOW ORIGINAL GROUND TO 600 mm ABOVE THE 100 YEAR FLOOD POOL ELEVATION. EXTEND RIPRAP AND FILTER FABRIC ALONG THE ROADWAY EMBANKMENT WITHIN THE LIMITS OF THE LAKE. WHERE CAP BERM ELEVATION IS LOWER THAN 600 mm ABOVE THE 100 YEAR FLOOD POOL ELEVATION, EXTEND RIPRAP AND FILTER FABRIC ACROSS CAP BERM.

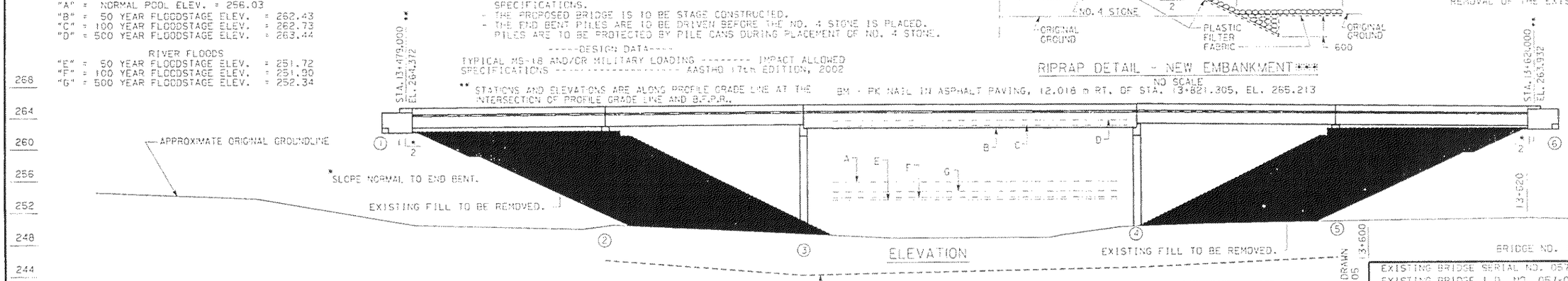
*** NOTE: SEE ROADWAY PLANS FOR COMPLETE DETAILS ON THE EMBANKMENT CONSTRUCTION AND THE REMOVAL OF THE EXISTING EMBANKMENT.



RIPRAP DETAIL - NEW EMBANKMENT***

NO SCALE

BM - PK NAIL IN ASPHALT PAVING, 12.018 m RT. OF STA. 13+821.305, EL. 265.213



ELEVATION

THEORETICAL SCOUR DEPTHS (m)						
	100 YEAR STORM			500 YEAR STORM		
BENT LOCATION	GENERAL	LOCAL	TOTAL	GENERAL	LOCAL	TOTAL
BENTS 2 - 5	1.8	2.7	4.5	2.4	2.6	5.2

-----UTILITIES-----

- 200 mm DIAMETER WATER LINE ATTACHED TO DOWNSTREAM FACE OF EXISTING BRIDGE
- PROPOSED 200 mm DIAMETER HP NATURAL GAS STEEL MAIN, ATLANTA GAS LIGHT COMPANY
- TWO PROPOSED 150 mm DIA. PVC PIPES, COBB EMC

BERM ELEVATIONS ⊛	
END BENT	ELEVATIONS
1 LT	262.061
1 RT	261.994
6 LT	262.226
6 RT	262.001

⊛ NOTE: FOR BRIDGE ENDROLL STAKING PURPOSES ONLY.

13+440 13+460 13+480 13+500 13+520 13+540 13+560 13+580

REVISION: REVISED AND REDRAWN BY: STB 10/07/05

BRIDGE NO. 1

EXISTING BRIDGE SERIAL NO. 057-0030-0
EXISTING BRIDGE I.D. NO. 057-01375F-007.1CN
P.I. NO. 630975

PRELIMINARY LAYOUT
PROJECT : BRS-STP-1375(6)
NAME: C.R. 770 (BELLS FERRY ROAD) OVER LITTLE RIVER (LAKE ALLATOONA)
CHEROKEE CO.
DRAWN BY : ELS
DATE : OCTOBER 7, 2005 PREPARED BY : STB
SCALE : 1 m = 250 m

B630975C.DGN