NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE

STP00-0000-00(833), P.I. No. 0000833

Laurens County, GA

Value Engineering Study Report
Preliminary Design

March 2011

Designer

District 2

Value Engineering Consultant

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Mr. Matt Sanders
VE Coordinator
GA DOT - Engineering Services
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Atlanta, Georgia 30308

Re: Project No.STP00-0000-00(833); P.I. No. 0000833, Laurens County
New Oconee River Crossing From Country Club Road
To Ben Hall Lake Drive
Value Engineering Study Report

Date:
March 28, 2011

Contact:
Howard Greenfield

Phone:
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arcadis-us.com

Our ref:
LZ083362.0000

Dear Mr. Sanders:

Lewis & Zimmerman Associates, Inc. is pleased to submit two hard copies and one electronic copy of the referenced value engineering study report that took place on March 14-17, 2011. The objective of the VE effort was to identify opportunities to reduce costs and enhance the value of the project.

This VE workshop identified and developed several ideas which provide opportunities to improve the value of the project for GDOT. Of particular interest are alternatives to reduce the number of bridge girders from seven to six, revise the profile of the road east of the bridge to reduce earthwork and reduce the graded shoulder from 10 ft. wide to 8 ft. wide to also reduce the amount of earthwork.

We thank you for your assistance during the course of the VE team's work. Please do not hesitate to call upon us if you or any of the reviewers have questions regarding the information presented in this report.

Sincerely yours,

LZA, an ARCADIS company

Howard B. Greenfield, PE, CVS
Vice President

Attachment

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SECTION ONE – EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents the proceedings and results of the VE study conducted by Lewis & Zimmerman Associates, Inc. for the Georgia Department of Transportation (GDOT). The subject of the study was the preliminary design of the New Oconee River Crossing From Country Club Road To Ben Hall Lake Drive, Laurens County, STP00-0000-00(833), Project, P.I. No. 0000833 project developed by GDOT District #2. The study was conducted March 14-17, 2011, at GDOT Headquarters in Atlanta, GA.

The study was performed by a multidisciplinary team comprising a highway engineer, bridge engineer, construction specialist and Certified Value Specialist (CVS) team leader. The VE team followed the six-phase VE Job Plan to guide its discussions:

- Information Gathering Phase
- Function Analysis Phase
- Creative Idea Generation Phase
- Evaluation/Judgment of Creative Ideas Phase
- Alternative Development Phase
- Presentation of Results Phase

PROJECT DESCRIPTION

This project constructs a second crossing of the Oconee River near Dublin/East Dublin to provide additional connectivity with I-16 and Laurens County and a bypass around the Oconee River crossing at US 80 when it floods. The project consists of 2.6 miles of new two-lane roadway with the new Oconee River crossing north of Dublin. It begins by tying into the existing pavement of CR 454/Country Club Drive, approximately 1,000 feet south of the existing CR 455/Blackshear Ferry Road intersection. The project continues north along CR 454/Country Club Drive as a symmetrical widening to create a two-lane typical section with open ditch drainage to just southeast of the Oconee River and then proceeds onto new bridge structure to cross the river.

Once across the river on a sweeping curve, the project proceeds northeast onto a new location and intersects CR 520/Buckeye Road approximately 200 feet south of CR 9/Blackshear Ferry Road approximately 550 feet north of CR 8/Ben Hall Lake Drive. It continues east on new location and ends by tying into the existing pavement of CR 8/Ben Hall Lake Drive, approximately 1,200 feet east of CR 12/New Buckeye Road.

The bridge will be 43-ft., 3-in. wide and will have nine, 140-ft.-long spans of 72-in.-deep bulb tee, precast, prestressed concrete girders with a cast-in-place concrete deck and cast-in-place concrete pier bents supported on deep footings. Abutments will be pile supported cast-on-place concrete pier caps. Rip rap resting on plastic filter fabric slope protection will be provided on the 2 horizontal to 1 vertical earth slope in front of the abutments.

The estimated construction cost is $12.6 million. About 73% of the right-of-way has been acquired through non-solicited donations.

CONCERNS AND OBJECTIVES

This project is being developed to enhance connectivity in Laurens County and provide a second river crossing when the US 80 crossing floods. A large portion of the right-of-way has been donated indicating the community's commitment to the project. To aide in ensuring that the construction cost is optimized, GDOT engaged this VE study.

The objective of the VE team was to identify specific changes to the proposed construction that would reduce the costs yet maintain and/or enhance the functionality of the project.

RESULTS OF THE STUDY

The VE team developed eight alternatives with cost reduction opportunities and two design suggestion that will reduce environmental impacts. Each is identified with an Alternative Number (Alt. No.) with a letter prefix indicating the project element addressed and a number indicating the order in which the idea was conceived during the team's brainstorming session. These alternatives and design suggestions address the key issues described above and are summarized on the following Summary of Potential Cost Savings table and detailed in Section Two – Study Results of the report. The alternatives with the greatest potential to impact project are highlighted below.

Seven rows of bridge girders are in the current design; however, by deepening the precast, prestressed concrete girder section, six rows could be used to save substantial costs as illustrated in Alt. No. B-7. Earthwork is one of the more expensive elements of the project. By modifying the roadway profile east of the bridge, some of the earthwork costs can be eliminated as shown in Alt. No. E-1. Similarly, in Alt. No. R-1 it is suggested to narrow the graded shoulder from 10 ft. wide to 8 ft. wide to reduce embankment requirements. There is also the option of reducing the length of the New Buckeye Road tie-in work to save additional roadway costs per Alt. No. R-6.

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833); P.I. No. 0000833, Laurens County, GA

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
				PRESENT WORTH OF COST SAVINGS		
GENERAL						
G-1	Move the driveway from Country Club Road to the historic ferry dock out of the wetlands	DESIGN SUGGESTION				
G-2	Change the design speed for Country Club Road (mainline) from 55 mph to 45 mph	DESIGN SUGGESTION				
BRIDGE						
B-4	Use longer spans to eliminate one bent	$1,542,000	$1,502,000	$40,000		$40,000
B-7	Use a deeper precast concrete beam size and eliminate one line of beams from the bridge cross section	$1,472,000	$1,287,000	$185,000		$185,000
EARTHWORK						
E-1	Modify the profile grade to the east of the bridge to reduce the embankment fill quantity	$125,000	$0	$125,000		$125,000
E-2	Modify the profile grade at the end of the project to reduce the embankment fill quantity	$31,000	$0	$31,000		$3,100
ROADWAY						
R-1	Narrow the graded shoulder from 10 ft. wide to 8 ft. wide	$153,000	$0	$153,000		$153,000
R-4	Delete the right turn lanes on Buckeye Road	$24,000	$0	$24,000		$24,000
R-5	Delete the right turn lanes on New Buckeye Road	$23,000	$0	$23,000		$23,000
R-6	End the relocated New Buckeye Road tie-in at Sta. 507+00	$40,000	$0	$40,000		$40,000

SECTION TWO – STUDY RESULTS

GENERAL

The results of this value engineering study conducted on the New Oconee River Crossing From Country Club Road To Ben Hall Lake Drive, STP00-0000-00(833), P.I. No. 0000833 project portray the benefits that can be realized by GDOT, the owner, the City of Dublin/East Dublin, Laurens County, the users and the GDOT design team. The results will directly affect the project's design and will require coordination between GDOT headquarters staff and District #2 to determine the disposition of each alternative.

During the conduct of the study, many ideas for potential value enhancement were conceived and evaluated by the team for technical merit, applicability to the project, implementability considering the project's status, and the ability to meet the owner's project value objectives. Research performed on those ideas considered to have potential to enhance the value of the project resulted in the development of individual alternatives identifying specific changes to the project as a whole, or individual elements that comprise the project. For each alternative developed, the following information is provided:

- A summary of the original design;
- A description of the proposed change to the project;
- Sketches and design calculations, if appropriate;
- A capital cost comparison and life cycle discounted present worth cost comparison of the alternative and original design (where appropriate);
- A descriptive evaluation of the advantages and disadvantages of selecting the alternative; and
- A brief narrative to compare the original design and the proposed change and provide a rationale for implementing the change into the project.

The capital cost comparisons used unit quantities contained in the project cost estimate prepared by GDOT, whenever possible. If unit quantities were not available, published data bases, such as the one produced by the RS Means Company, or team member or owner data bases were consulted.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) track it through the value analysis process and thus facilitating referencing between the Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of Potential Cost Savings table. The Alt. No. includes a prefix that refers to a major project element listed below:

PROJECT ELEMENT	PREFIX
General	G
Bridge	B
Earthwork	E
Roadway	R

Summaries of the alternatives and design suggestions are provided on the Summary of Potential Cost Savings tables. The tables are divided into project elements for the convenience of the reviewer and are used to divide this section. The complete documentation of the developed alternatives and design suggestions follow each of the Summary of Potential Cost Savings tables.

KEY ISSUES

This project is being developed to improve interconnectivity within Laurens County and provide a second bridge crossing to improve movement when the US 80 bridge over the Oconee River is taken out of service because of flooding. It also provides a bypass around Dublin/East Dublin for the many businesses with transportation needs located in the area.

STUDY OBJECTIVES

To assist GDOT achieve its project goals in a cost-effective manner, it convened this VE study. The study team was tasked with identifying specific changes to the current design that will enhance its value by improving functionality, saving cost or a combination of the two.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of eight alternatives with cost reduction opportunities and two design suggestions that will reduce environmental impacts for consideration by GDOT. These alternatives and design suggestions address the key issues described above and are detailed in the remainder of this section of the report. The alternatives with the greatest potential to impact project are highlighted below.

Seven rows of bridge girders are in the current design, however by deepening the precast, prestressed concrete girder section, six rows could be used to save substantial costs as detailed in Alt. No. B-7. Earthwork is one of the more expensive elements of the project. By modifying the roadway profile east of the bridge, some of the earthwork costs can be eliminated as shown in Alt. No. E-1. Similarly, in Alt. No. R-1 it is suggested to narrow the graded shoulder from 10 ft. wide to 8 ft. wide to reduce embankment requirements. There is also the option of reducing the length of the New Buckeye Road tie-in work to save additional roadway costs per Alt. No. R-6.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

When reviewing the study results, the reader should consider each part of an alternative or design suggestion on its own merit. There may be a tendency to disregard an alternative because of a concern about one part of it. Each area within an alternative or design suggestion that is acceptable should be considered for use in the final design, even if the entire alternative or design suggestion is not implemented. Variations of these alternatives and design suggestions by the owner or designer are encouraged.

All alternatives and design suggestions were developed independently of each other to provide a broad range of options to consider for implementation. Therefore, some of them are "mutually exclusive," so acceptance of one may preclude the acceptance of another. In addition, some of the alternatives may be interrelated, so acceptance of one or more may not yield the total of the cost savings shown for each alternative. Design suggestions could also be interrelated thus precluding a part of one or more suggestions from being implemented if another design suggestion is also implemented.

The reader should evaluate all alternatives carefully in order to select the combination of ideas with the greatest beneficial impact on the project. Once this has been accomplished, the total cost savings resulting from the VE study can be calculated based on implementing a revised, all-inclusive design solution.

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833); P.I. No. 0000833, Laurens County, GA

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
				PRESENT WORTH OF COST SAVINGS		
GENERAL						
G-1	Move the driveway from Country Club Road to the historic ferry dock out of the wetlands	DESIGN SUGGESTION				
G-2	Change the design speed for Country Club Road (mainline) from 55 mph to 45 mph	DESIGN SUGGESTION				

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **G-1**

DESCRIPTION: **MOVE THE DRIVEWAY FROM COUNTRY CLUB ROAD TO THE HISTORIC FERRY LANDING AWAY FROM THE WETLAND AREAS**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (sketch attached)

The driveway from Country Club Road to the historic ferry landing passes through two wetland areas.

ALTERNATIVE: (sketch attached)

Move the driveway to the east to avoid going through the wetland areas.

ADVANTAGES:

- Avoids wetland mitigation and permitting

DISADVANTAGES:

- Requires additional driveway easement

DISCUSSION:

The current alignment of the driveway is through two wetlands. By moving the road to the east, these wetlands are avoided and mitigation is unnecessary. However, it will be necessary to obtain additional easement from A.E. Kimbell and Sonny Kimbell, the owners of the property where the driveway is located.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS (Original minus Alternative)			

ALT. NO. G-1 Sht. 2 of 2

GA | STP00-0000-00 (833)

KC6
PI Sta = 602+16.74
PI North = 949090.78
PI East = 431511.32
Delta = 22°32'55.0"
D = 10°41'27.2"
T = 106.84
L = 210.91
R = 535.93
E = 10.55
e = 6.0 %

KC1
PI Sta = 126+82.17
PI North = 950847.53
PI East = 431783.17
Delta = 49°28'13.0"
D = 2°00'02.0"
T = 1319.42
L = 2472.83
R = 2864.00
E = 289.31
e = %

GLENN SHIVER (3)
L.L. 299
L.L. 303
APPROX L.L.
600+00 50'
600+00
110+00
REQD R/W
STA 601+09.898 50'
STA 602+65.40 50
PI 602+16.74
PC 601+09.
STA 601+50 50
55°29'16.5" E
PROP EOP
CURVE KC6
N 78°02'41.5" E
78°08'05
75'R
60'R
+10.00
24" PIPE REQD
PT 603+20.8
STA 110+00 50'
STA 107+00 39.51 & 55
L.L. 299
L.L. 303
APPROX L.L.
INTERSECTION
BLACKSHEAR FERRY RD
MP 0.00
STA 603+40.220=
STA 109+45.252
COUNTRY CLUB RD
MP 3.51
N 949116.950
E 431634.821

GLENN SHIVER (3)
ESA BOUNDARY WETLAND #2
STA 113+62.752 90' & 120'
115+00
STA 111+25 20' ASPH OB
STA 111+50 100
TRACT 1
REQD R/W
PROP EOP
A. E. KIMBELL & SONNY KIMBELL (5)
STA 113+62.752 100'
ESA BOUNDARY - WETLAND #1
ALTERNATIVE ALIGNMENT

GLENN SHIVER (6)
ESA BOUNDARY WETLAND #3
ESA BOUNDARY WETLAND #7
ESA BOUNDARY - STREAM BUFFER #9
120+00
APPROX GMD LINE
L.L. 303
GMD 342
GMD 86
APPROX L.L.
STREAM #9
ESA BOUNDARY - STREAM BUFFER #9
COUNTRY CLUB RD - CR 454
CURVE KC1
EPHEMERAL STREAM #6
EPHEMERAL STREAM #5
AS DESIGNED
TRACT 1
STA 120+41.494 100'
STA 120+83.090 152.437
ESA BOUNDARY - WETLAND #4
A. E. KIMBELL & SONNY KIMBELL (5)
TRACT 2
STA 121+23.672 140'
APPROX L.L.
ESA BOUNDARY - STREAM BUFFER #9
L.L.
GMD
BEG BRIDGE STA 119+10.000
PROPOSED 1260' X 40' REINF CONC BRIDGE

INEZ CAMERON (4)

TION TABLE
- CURVE KC 1

ON	LEFT	RIGHT
97	0.0000	-0.0200
4	0.0200	-0.0200
	0.0395	-0.0395

BEGIN LIMIT OF ACCESS..... BLA
END LIMIT OF ACCESS..... ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

GEORGIA DEPARTMENT OF TRANSPORTATION

SCALE IN FEET 0 50 100 200

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN
MAINLINE PLAN
COUNTRY CLUB RD @ BLACKSHEAR FERRY RD

REVISION

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE** *STP00-0000-00(833)* *Laurens County, GA*	ALTERNATIVE NO.: **G-2**
DESCRIPTION: **CHANGE THE DESIGN SPEED FOR COUNTRY CLUB ROAD (MAINLINE) FROM 55 MPH TO 45 MPH**	SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (sketch attached)

The current design speed for Country Club Road is 55 mph.

ALTERNATIVE: (sketch attached)

Make the design speed 45 mph for Country Club Road.

ADVANTAGES:

- Incorporates more cost saving design features
- Design will allow changing the profile grade to reduce the earthwork balance
- Design speed will now comply with the Design Policy Manual for a 2-lane Rural collector
- Less severe crashes will occur at lower speeds

DISADVANTAGES:

- Lower design speed

DISCUSSION:

Functional classification and traffic volumes/capacity are the principal characteristics that determine the design speed of a roadway, especially for relocated or new roadways. The functional classification for this road is a two-lane Rural Collector with low traffic, a present volume of 1,600 vehicles per day (vpd) (2009) and design year volume of 3,000 vpd (2029). The design speed determines the geometric features of a roadway. Therefore a 45 mph design speed would allow reduced, but acceptable, design features to be considered such as narrower graded shoulders, narrower paved shoulders, steeper grades, shorter vertical curves, shorter clear zone and less superelevation.

It is not recommended to adjust the horizontal alignment since most of the required right-of-way has been acquired. It is important to mention the original design proposes a vertical profile alignment that only meets a design speed of 45 mph as evidenced by the vertical curve at VPI Sta. 142+00 that has a K = 82, which has a maximum design speed of 45 mph. Because of the roadway's function, required traffic capacity, design

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS (Original minus Alternative)			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **G-2**

DESCRIPTION: **CHANGE THE DESIGN SPEED FOR COUNTRY CLUB ROAD (MAINLINE) FROM 55 MPH TO 45 MPH**

SHEET NO.: **2 of 6**

DISCUSSION: (continued)

characteristics (two-lanes) and no median separation for opposing traffic, it is recommended by the VE Team that this roadway have a design speed of 45 mph. Attached is supporting design information for a moderate design speed (45mph) from the GDOT Design Policy Manual and AASHTO Geometric Design of Highways 2004.

See Alt. No. R-1 for the effect on earthwork if narrower graded shoulders are used. If the 55 mph design speed is retained, then the earthwork will probably increase to correct the vertical curves which are designed for a 45 mph design speed.

ALT. NO. G-2 Sht. 3 of 6

Table 6.5. Design Criteria for Collector Roadways

Cross Section Element	Rural (open ditch sections) (ADT > 2000)[1]		Urban (curbed sections) (ADT > 2000)[1]		
	2-Lane	4-Lane	2-Lane	4-Lane	
Design Speed	**45 mph**	**55 mph**	**25 mph**	**35 mph**	**45 mph**
Appropriate Level of Service (LOS)	C	C	C or D[2]	C or D[2]	C or D[2]
Traveled – Way					
Lane width (min-desirable)[3]	11-12-ft	11-12-ft	11-12-ft	11-12-ft	11-12-ft
Cross Slope (normal)	2%	2%	2%	2%	2%
Superelevation (max)	6%	6%	4%	4%	4%
Shoulders (outside)					
Overall width	8-ft	10-ft	n/a	n/a	n/a
Paved width	4-ft/6.5-ft[4]	6.5-ft	n/a	n/a	n/a
Cross Slope (normal)	6%	6%	n/a	n/a	n/a
Shoulders (median)					
Overall width	n/a	6-ft	n/a	n/a	n/a
Paved width	n/a	2-ft	n/a	n/a	n/a
Cross Slope (normal)	n/a	4%	n/a	4%	4%
Border Area (urban shoulder) (width)	n/a	n/a	10 -16-ft	10 -16-ft	10 -16-ft
Cross Slope (normal)	n/a	n/a	2%	2%	2%
Width of Median					
Depressed	n/a	32 - 44-ft	n/a	n/a	n/a
Raised	n/a	24-ft	n/a	20-ft	20-ft
Flush	n/a	n/a	n/a	14-ft	14-ft
Sidewalk (SW)					
Width of Sidewalk	n/a	n/a	5-ft	5-ft	5-ft
Desirable buffer from back of curb to SW	n/a	n/a	6-ft	6-ft	6-ft
Cross Slope (max)	n/a	n/a	2%	2%	2%
Width of Bike Lanes	4-ft[4]	4-ft[4]	4-ft[5]	4-ft[5]	4-ft[5]
Foreslope (max/normal)[6]	2:1/4:1	2:1/4:1	2:1/4:1	2:1/4:1	2:1/4:1
Width of foreslope in cut	12-ft	12-ft	n/a	n/a	n/a
Ditch Bottom (width)	2-ft	4-ft	n/a	n/a	n/a
Backslope (max/normal)[6]	2:1/4:1	2:1/4:1	2:1/4:1	2:1/4:1	2:1/4:1
Vertical Clearance (min-desirable)[7](ft)	16.5 -16.75	16.5 -16.75	16.5-16.75	16.5 -16.75	16.5 -16.75
Lateral Offset to Obstruction[8]	Ch. 5	Ch. 5	Ch. 5	Ch. 5	Ch. 5
Clear Zone[9]	24-ft	26-ft	AASHTO	AASHTO	AASHTO

Notes:

(1) Values shown are for roadways with ADT > 2000. Refer to the current AASHTO Green Book for design criteria on roadways with ADT < 2000, and the AASHTO "Guidelines for Geometric Design of Very Low-Volume Local Roads" for design criteria on roadways with ADT ≤ 400.

(2) LOS D is appropriate in heavily developed urban and suburban areas.

(3) See AASHTO Green Book, Chapter 6, Collector Roads and Streets, for conditions to construct or retain 11-ft lanes.

(4) Bike Lane is incorporated into the overall width of a 6.5-ft paved shoulder to include a 16-inch rumble strip and total 12-inch buffer area (refer to Ga. Construction Detail S-8). See **Section 9.4.2 Bicycle Warrants**.

(5) Bike Lane measured from the outside edge of traveled-way outward. Does not include curb & gutter or header curb.

(6) The use of a slope inside the "Clear Zone" that is steeper than 4:1 will require the installation of a roadside barrier (i.e. guardrail, barrier wall, crash attenuator, etc...) (See Ga.Std.Details, 4000 series).

(7) For additional guidelines, refer to Chapter 2.3.2 of the GDOT Bridge and Structures Policy Manual.

(8) For rural roadways, lateral offset is measured from the edge of traveled way outward. For urban roadways with curbed sections, lateral offset is measured from the face of curb outward. See Chapter 5 of this Manual for GDOT standard criteria for lateral offset to signs, light poles, utility installations, signal poles and hardware, and trees and shrubs.

(9) AASHTO defines Clear Zone as the unobstructed, relatively flat area beyond the edge of traveled way for the recovery of errant vehicles. Clear zone recommendations are a function of design speed, traffic volumes, and embankment slope. For Clear Zone recommendations, refer to the current edition of the AASHTO Roadside Design Guide, Ch 3.

Rural Minor Arterial System

The rural minor arterial road system, in conjunction with the rural principal arterial system, forms a network with the following service characteristics:

1. Linkage of cities, larger towns, and other traffic generators (such as major resort areas) that are capable of attracting travel over similarly long distances.
2. Integrated interstate and intercounty service.
3. Internal spacing consistent with population density, so that all developed areas of the state are within reasonable distances of arterial highways.
4. Corridor movements consistent with items (1) through (3) with trip lengths and travel densities greater than those predominantly served by rural collector or local systems.

Minor arterials therefore constitute routes, the design of which should be expected to provide for relatively high travel speeds and minimum interference to through movement.

Rural Collector System

The rural collector routes generally serve travel of primarily intracounty rather than statewide importance and constitute those routes on which (regardless of traffic volume) predominant travel distances are shorter than on arterial routes. Consequently, more moderate speeds may be typical. To define rural collectors more clearly, this system is subclassified according to the following criteria:

- **Major Collector Roads**. These routes (1) serve county seats not on arterial routes, larger towns not directly served by the higher systems, and other traffic generators of equivalent intracounty importance, such as consolidated schools, shipping points, county parks, and important mining and agricultural areas; (2) link these places with nearby larger towns or cities, or with routes of higher classifications; and (3) serve the more important intracounty travel corridors.
- **Minor Collector Roads**. These routes should (1) be spaced at intervals consistent with population density to accumulate traffic from local roads and bring all developed areas within reasonable distances of collector roads; (2) provide service to the remaining smaller communities; and (3) link the locally important traffic generators with their rural hinterland.

Rural Local Road System

The rural local road system, in comparison to collectors and arterial systems, primarily provides access to land adjacent to the collector network and serves travel over relatively short distances. The local road system constitutes all rural roads not classified as principal arterials, minor arterials, or collector roads.

ACT. NO.
G-2
Sht. 5 of 6

Metric					US Customary				
Design speed (km/h)	Minimum width of traveled way (m) for specified design volume (veh/day)[a]				Design speed (mph)	Minimum width of traveled way (ft) for specified design volume (veh/day)[a]			
	under 400	400 to 1500	1500 to 2000	over 2000		under 400	400 to 1500	1500 to 2000	over 2000
30	6.0[b]	6.0	6.6	7.2	20	20[b]	20	22	24
40	6.0[b]	6.0	6.6	7.2	25	20[b]	20	22	24
50	6.0[b]	6.0	6.6	7.2	30	20[b]	20	22	24
60	6.0[b]	6.6	6.6	7.2	35	20[b]	22	22	24
70	6.0	6.6	6.6	7.2	40	20[b]	22	22	24
80	6.0	6.6	6.6	7.2	45	20	22	22	24
90	6.6	6.6	7.2	7.2	50	20	22	22	24
100	6.6	6.6	7.2	7.2	55	22	22	24	24
					60	22	22	24	24
	Width of shoulder on each side of road (m)					Width of shoulder on each side of road (ft)			
All speeds	0.6	1.5[c]	1.8	2.4	All speeds	2.0	5.0[c]	6.0	8.0

in Lieu of 10'

[a] On roadways to be reconstructed, a 6.6-m [22-ft] traveled way may be retained where the alignment and safety records are satisfactory.

[b] A 5.4-m [18-ft] minimum width may be used for roadways with design volumes under 250 veh/day.

[c] Shoulder width may be reduced for design speeds greater than 50 km/h [30 mph] as long as a minimum roadway width of 9 m [30 ft] is maintained.

See text for roadside barrier and offtracking considerations.

Exhibit 6-5. Minimum Width of Traveled Way and Shoulders

Drivers who inadvertently leave the traveled way can often recover control of their vehicles if foreslopes are 1V:4H or flatter and shoulders and ditches are well rounded or otherwise made traversable. Such recoverable slopes should be provided where terrain and right-of-way conditions allow.

Where provision of recoverable slopes is not practical, the combinations of rate and height of slope provided should be such that occupants of an out-of-control vehicle have a good chance of survival. Where high fills, right-of-way restrictions, watercourses, or other problems render such designs impractical, roadside barriers should be considered, in which case the maximum rate of fill slope may be used. Reference should be made to the current edition of the AASHTO *Roadside Design Guide* (**3**). For further information, see the section on "Traffic Barriers" in Chapter 4.

Cut sections should be designed with adequate ditches. Preferably, the foreslope should not be steeper than 1V:3H and, where practical, should be 1V:4H or flatter. The ditch bottom and slopes should be well rounded, and the backslope should not exceed the maximum needed for stability.

ALT. NO. 9-2 Sht. 6 of 6

Type of terrain	Metric: Design speed (km/h) for specified design volume (veh/day)			US Customary: Design speed (mph) for specified design volume (veh/day)		
	0 to 400	400 to 2000	over 2000	0 to 400	400 to 2000	over 2000
Level	60	80	100	40	50	60
Rolling	50	60	80	30	40	50
Mountainous	30	50	60	20	30	40

Note: Where practical, design speeds higher than those shown should be considered.

Exhibit 6-1. Minimum Design Speeds for Rural Collectors

Metric				US Customary			
Design speed (km/h)	Design stopping sight distance (m)	Rate of vertical curvature, K^a (m/%) Crest	Sag	Design speed (mph)	Design stopping sight distance (ft)	Rate of vertical curvature, K^a (ft/%) Crest	Sag
20	20	1	3	15	80	3	10
30	35	2	6	20	115	7	17
40	50	4	9	25	155	12	26
50	65	7	13	30	200	19	37
60	85	11	18	35	250	29	49
70	105	17	23	40	305	44	64
80	130	26	30	45	360	(61)	(79)
90	160	39	38	50	425	84	96
100	185	52	45	55	495	114	115
				60	570	151	136

→ S+A. 142+00
K = 82

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference in the intersecting grades (i.e., $K = L/A$). (See Chapter 3 for details.)

Exhibit 6-2. Design Controls for Stopping Sight Distance and for Crest and Sag Vertical Curves

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833); P.I. No. 0000833, Laurens County, GA

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS: INITIAL COST SAVINGS	PRESENT WORTH OF COST SAVINGS: RECURRING COST SAVINGS	PRESENT WORTH OF COST SAVINGS: TOTAL PW LCC SAVINGS
BRIDGE						
B-4	Use longer spans to eliminate one bent	$1,542,000	$1,502,000	$40,000		$40,000
B-7	Use a deeper precast concrete beam size and eliminate one line of beams from the bridge cross section	$1,472,000	$1,287,000	$185,000		$185,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **B-4**

DESCRIPTION: **USE LONGER BRIDGE SPANS TO ELIMINATE ONE PIER**

SHEET NO.: **1 of 7**

ORIGINAL DESIGN: (sketch attached)

Nine (9) 140 foot spans using AASHTO BT-72 PSC beams are designed for the bridge.

ALTERNATIVE: (sketch attached)

Use eight (8) 157.5 foot spans using AASHTO BT-74 PSC beams.

ADVANTAGES:

- Eliminates the cost of one concrete bent
- Faster construction
- Longer spans improves hydraulic flow

DISADVANTAGES:

- Larger dead loads require more piles per bent
- Longer beams may be difficult to ship to the site
- Longer spans may be difficult to handle and erect

DISCUSSION:

Lengthening the bridge spans to 157.5 feet each will reduce the number of spans from nine to eight and save the cost and time necessary to construct one bridge bent. The longer spans will allow better hydraulic flow through the bridge.

One less bent will reduce the amount of concrete, reinforcing, cofferdams and prestressed concrete (PSC) piles or drilled shafts necessary to construct the bridge. It will also reduce the amount of time needed to construct the bridge.

To achieve 157.5 foot spans, high performance concrete with a strength of 10 ksi will be required. The longer beams will also need to be checked to ensure that they can be delivered to the site over the road. The proximity of I-16 to the site increases the probability that they can be shipped.

For the 157.5 foot spans, the girders will be about 10% heavier than the 140 foot spans. Since foundation information is unknown at this time, it could not be determined if there would be any impact to the foundations. PSC pile foundations may require an extra pile or two while drilled shafts would not be significantly impacted by the extra load. 16 in. square PSC piles were assumed at a nominal depth below the scour line.

A relatively large crane or cranes will be necessary to construct bridge for either the original design or the proposed alternative. The 140 foot spans and 157.5 foot spans will have the similar challenges due to the length and will have to be dealt with in either condition.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,542,000	—	$ 1,542,000
ALTERNATIVE	$ 1,502,000	—	$ 1,502,000
SAVINGS (Original minus Alternative)	$ 40,000	—	$ 40,000

SKETCHES

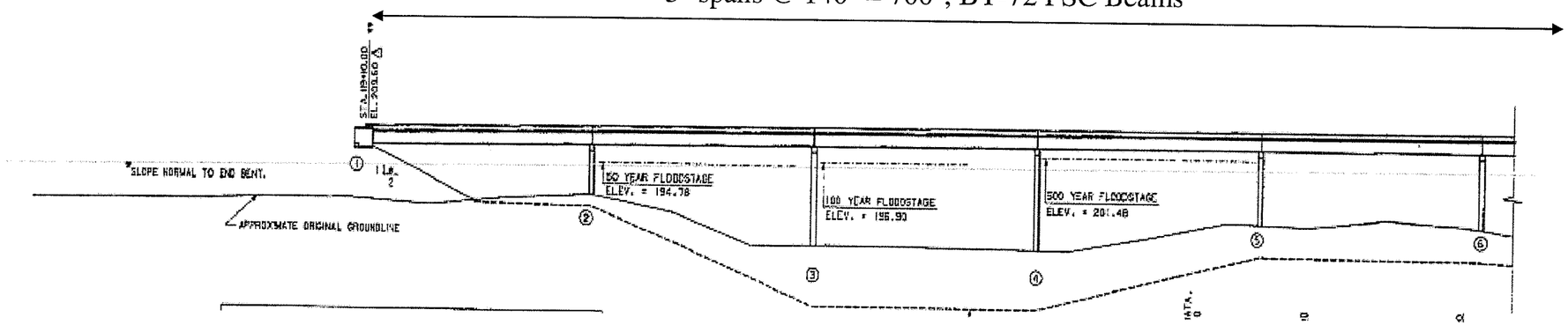
PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **B-4**

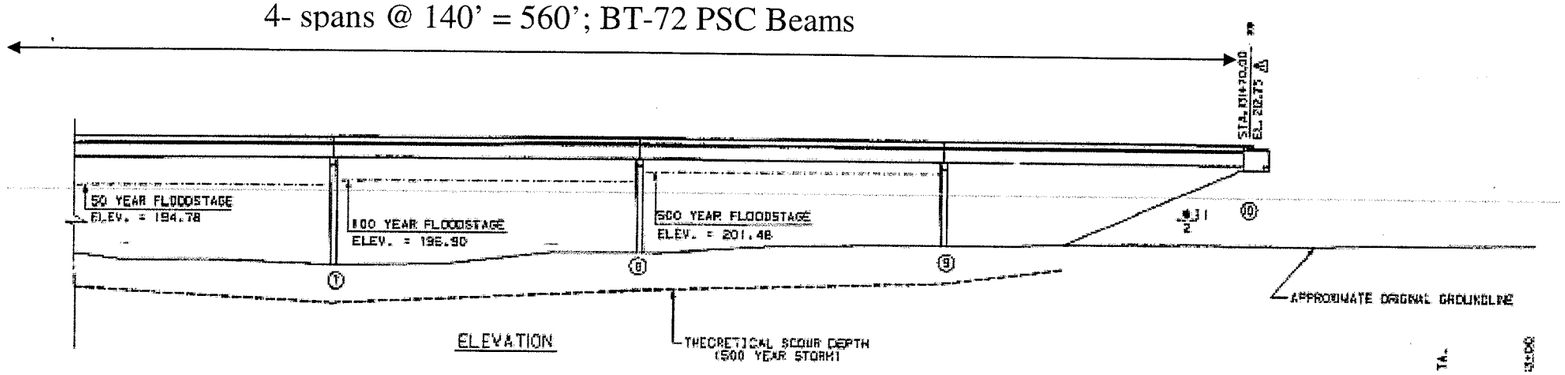
☒ AS DESIGNED ☐ ALTERNATIVE ☐ BOTH

SHEET NO.: **2 of 7**

5- spans @ 140' = 700'; BT-72 PSC Beams



4- spans @ 140' = 560'; BT-72 PSC Beams



Original Design
9 Spans @ 140'= 1260'
BT-72 PSC Beams

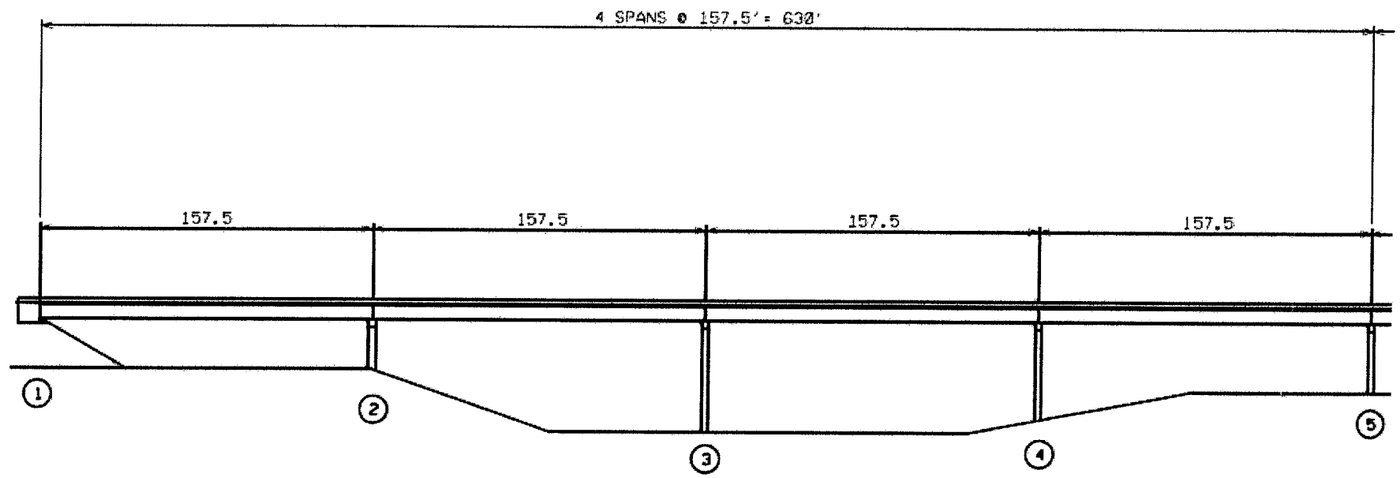
SKETCHES

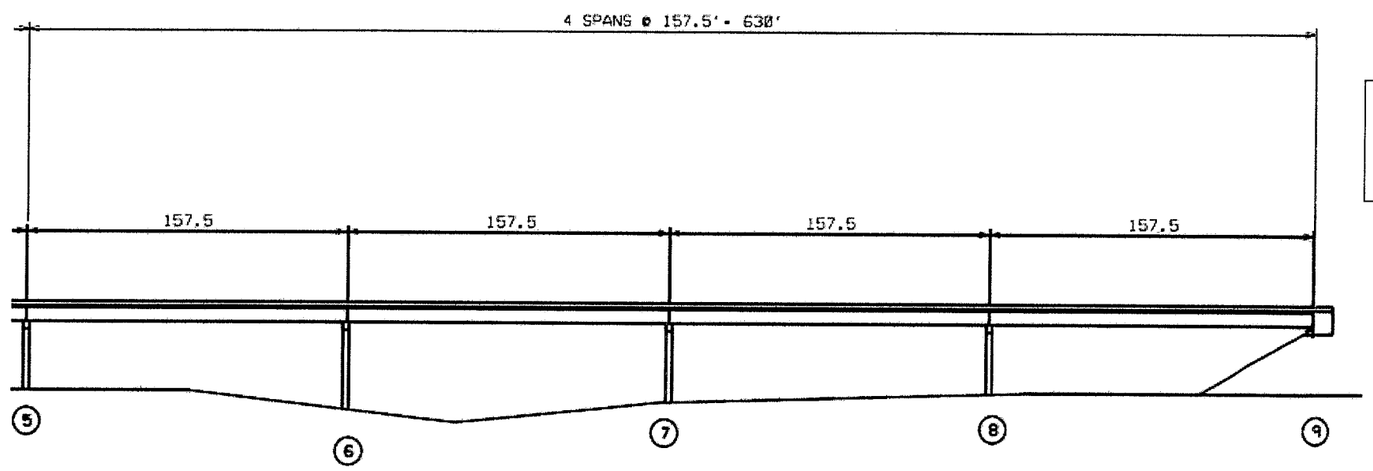
PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **B-4**

☐ AS DESIGNED ☒ ALTERNATIVE ☐ BOTH

SHEET NO.: **3 of 7**





Proposed Design
8 Spans @ 157.5'= 1260'
BT-74 PSC Beams

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **B-4**

SHEET NO.: **4 of 7**

Concrete Bent Cost

Bent Caps

50'long x 4' deep x 3.5' wide

(50'x4'x3.5')/27= 26 cy/cap

Columns

2 per bent 3'x3'

avg height 42.6 ~say 45 ft

(45'x 3'x3')/27= 15 cy/column X 2 columns = Total= 30 cy

Total Volume per bent= 56 cy

841 $/cy Class 'A' incl. reinf- Concrete Cost from Georgia DOT Item Mean Summary

56 cy x $841/cy= $47,096

Piles & pile caps

Assume 2-pile cap footings: 8'x8'x4'

2(8'x 8' x4')/27 cf/cy= 18.96cy

18.96 cy x $841/cy= $15,947

Total cost concrete and steel: $63,043 / bent

Foundations are assumed to be PSC piles. Assume 4 PSC (16") Piles per column- 8 piles per bent.

Pile lengths based off of 500 year scour depth + 20 feet

	# bents	Scour Depth	Pile length	Total pile length
Bent 2	1	6.4	26.4	105.6
Bent 3-4	2	31.4	51.4	411.2
bent 5-9	5	17.5	37.5	750
				1266.8
Cost/pile	46	$/LF		
Total cost	$58,272			
Average cost/bent	$7284			

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **B-4**

SHEET NO.: **5 of 7**

72" Bulb Tee Beam

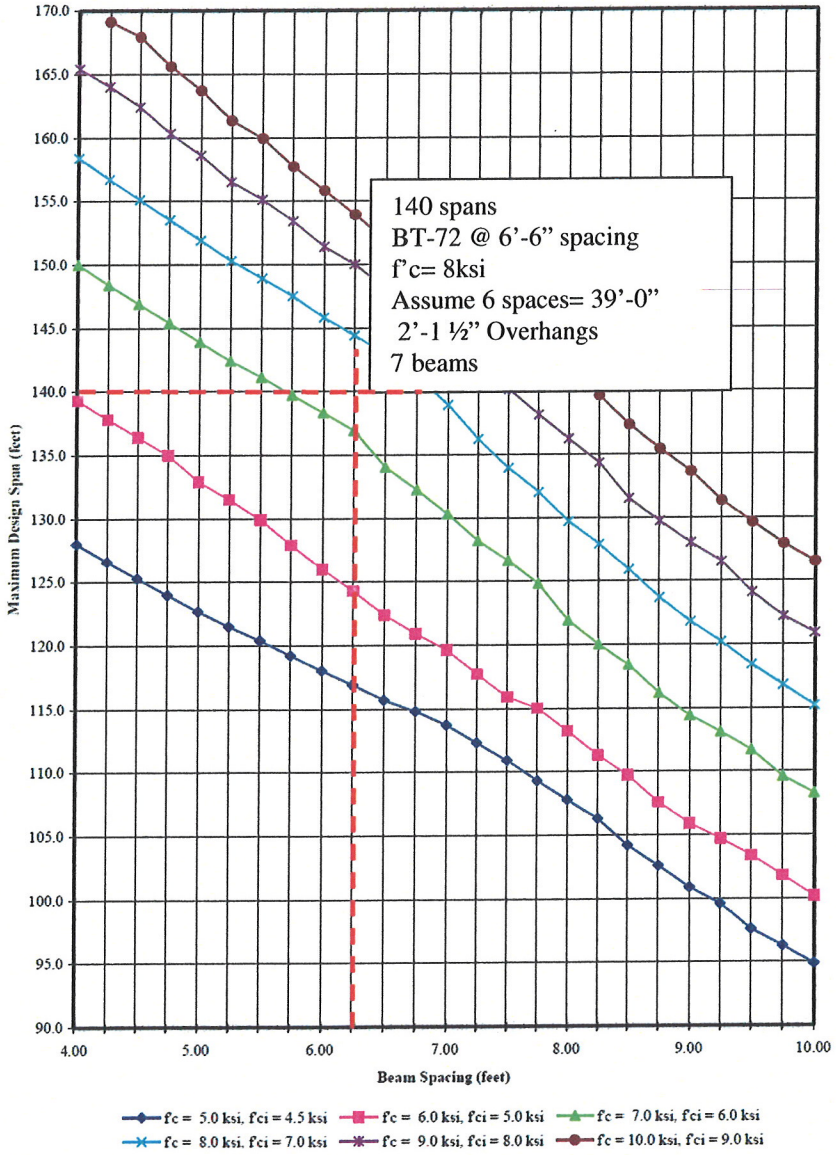


Figure 3-10

All strands are .6" diameter low relaxation strands. The 4 top flange strands are stressed to 10,000 pounds each and all remaining strands are stressed to 43,943 pounds each.

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **B-4**

SHEET NO.: **6 of 7**

74" Bulb Tee Beam

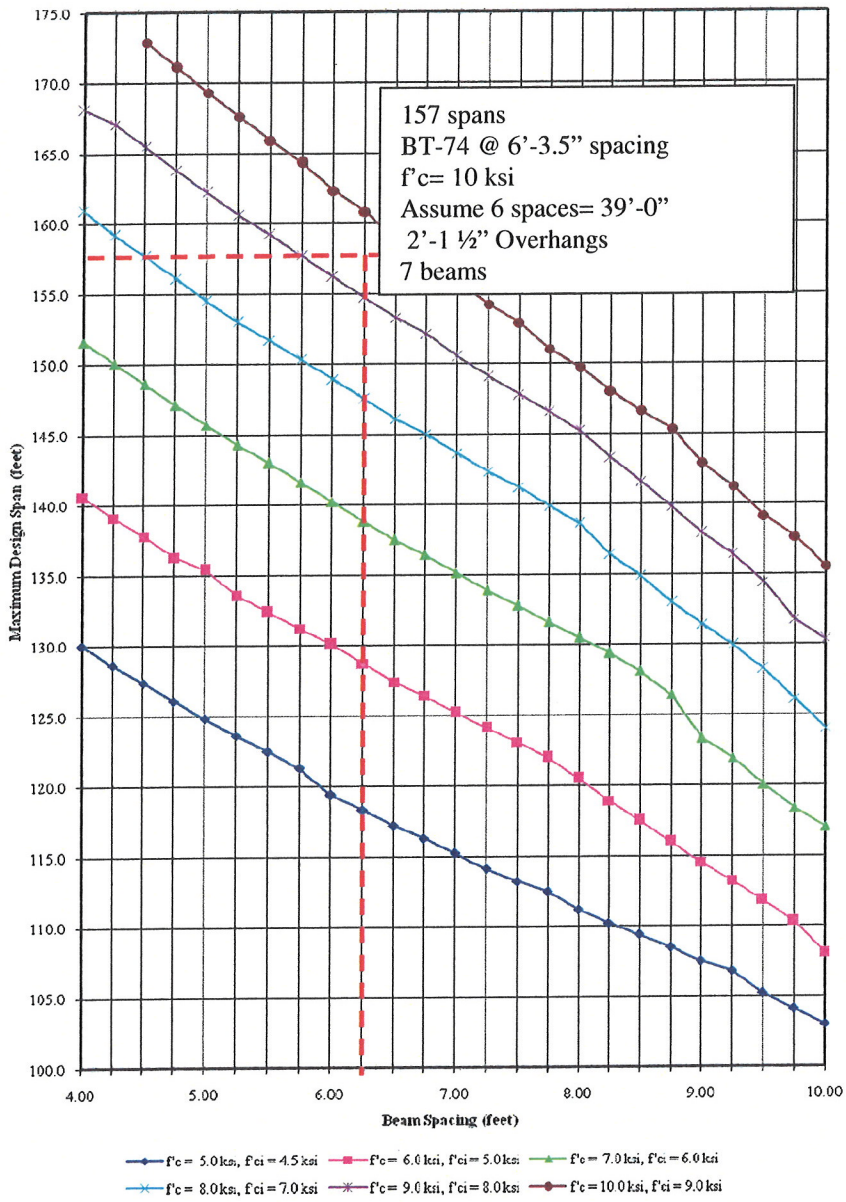


Figure 3-11

All strands are .6" diameter low relaxation strands. The 4 top flange strands are stressed to 10,000 pounds each and all remaining strands are stressed to 43,943 pounds each.

COST WORKSHEET

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)

ALTERNATIVE NO.: **B-4**

SHEET NO.: **7 of 7**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Concrete Bents	LS	1	63,043.00	63,043			
PSC Piles	LS	1	7,284.00	7,284			
PSC Beams - BT 72	LF	8,820	166.90	1,472,058			
PSC Beams - BT 74	LF				8,820	170.25	1,501,605
Subtotal				1,542,385			1,501,605
Markup (%) at							
TOTAL				1,542,385			1,501,605
TOTAL (ROUNDED)				1,542,000			1,502,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **B-7**

DESCRIPTION: **USE DEEPER BEAM SIZE TO ELIMINATE ONE LINE OF BEAMS FROM THE BRIDGE CROSS SECTION**

SHEET NO.: **1 of 7**

ORIGINAL DESIGN: (sketch attached)

The preliminary layout for the bridge uses AASHTO BT-72 PSC beams.

ALTERNATIVE: (sketch attached)

Use AASHTO BT-74 PSC beams.

ADVANTAGES:

- Fewer beams required
- Less overall cost

DISADVANTAGES:

- Heavier beam may require relatively large equipment to place beams

DISCUSSION:

The preliminary design drawings show BT-72 PSC beams as the proposed design. Assuming the maximum strength of the concrete is set at 8,000 psi as (maximum allowable per the bridge manual without using high performance concrete) the number of beams required is 7 beams spaced at 6 ft. 6 in. per the beam charts (attached). Comparatively increasing the beam size to BT-74 PSC beams using the same strength parameters as the BT-72 PSC beams reduces the number of beams to six beams spaced at 7 ft. 3 in. per the beam charts. The required deck thickness for each of these sections is 7 in. according to the beam charts in the current GDOT Bridge Design Manual.

The additional depth required for the BT-74 is only 2 in. and will not have significant impact on the hydraulics based on the current vertical profile provided in the roadway drawings.

A relatively large crane or cranes will be necessary to construct the bridge for either the original design or the proposed alternative due to the long span, so the additional weight of the BT-74s should not be a significant factor.

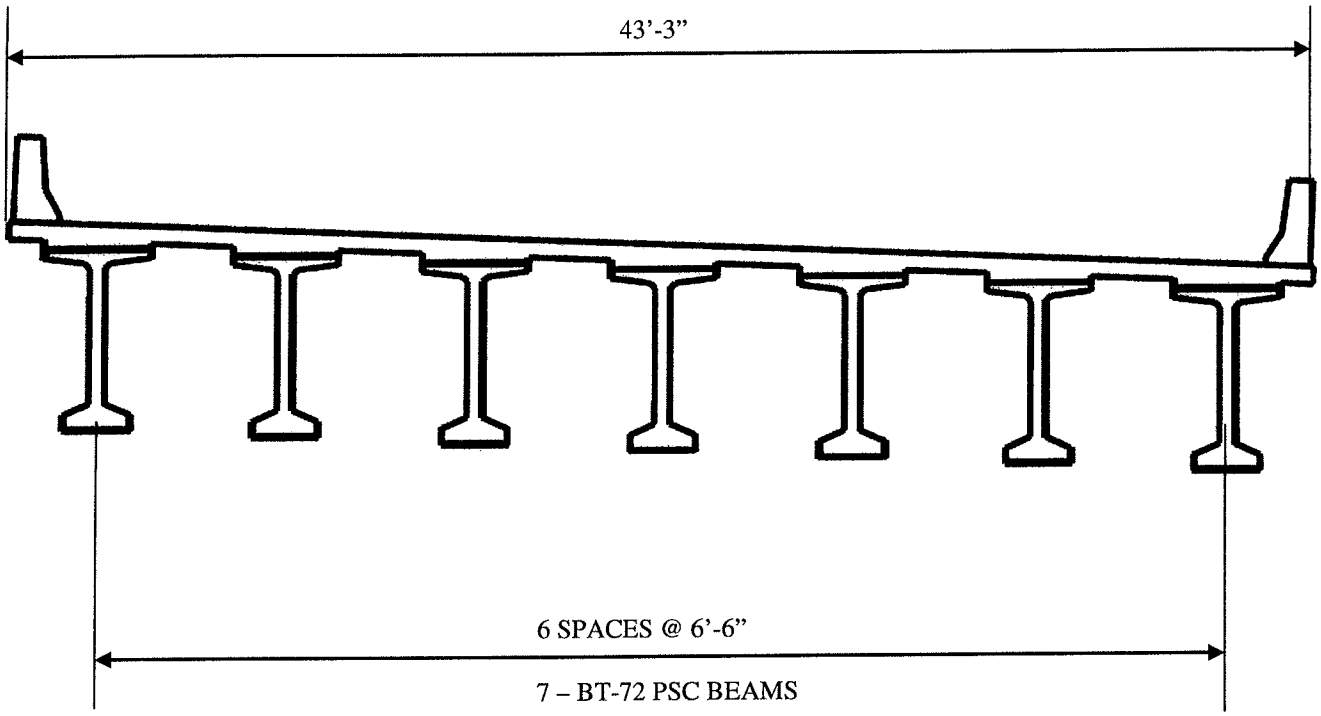
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,472,000	—	$ 1,472,000
ALTERNATIVE	$ 1,287,000	—	$ 1,287,000
SAVINGS (Original minus Alternative)	$ 185,000	—	$ 185,000

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **B-7**

☒ AS DESIGNED ☐ ALTERNATIVE ☐ BOTH

SHEET NO.: **2 of 7**



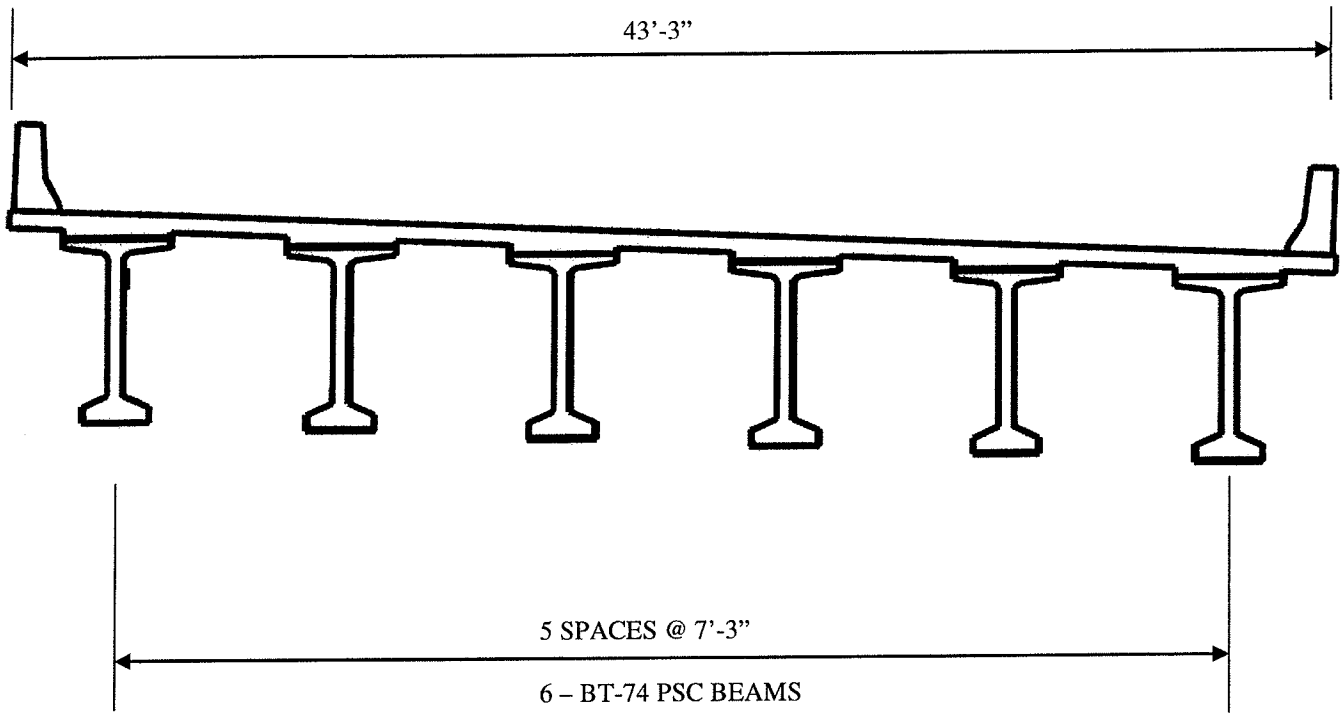
Original Design

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **B-7**

☐ AS DESIGNED ☒ ALTERNATIVE ☐ BOTH

SHEET NO.: **3 of 7**



Proposed Design

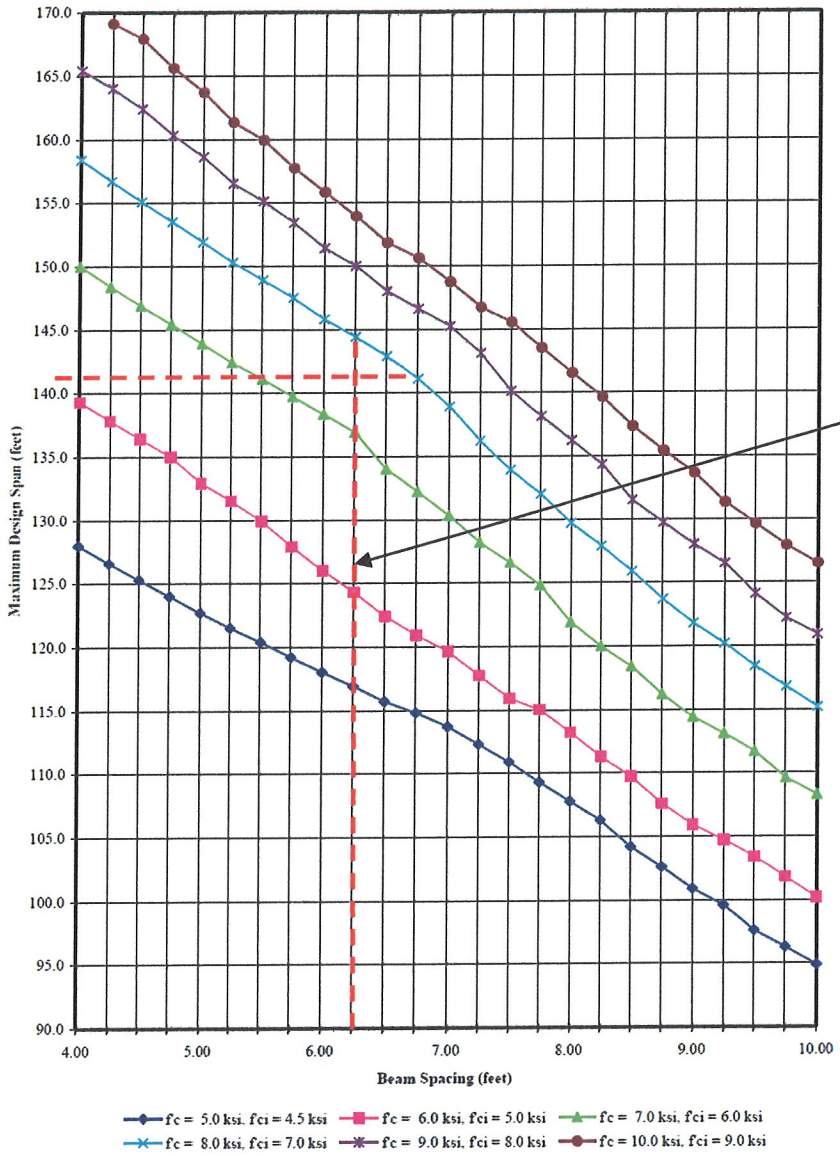
PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **B-7**

SHEET NO.: **4 of 7**

Beam Design Charts, from GDOT bridge design manual

72" Bulb Tee Beam



140 spans
BT-72 @ 6'-6" spacing
f'c= 8ksi
Assume 6 spaces= 39'-0"
2'-1 ½" Overhangs
7 beams

Figure 3-10

All strands are .6" diameter low relaxation strands. The 4 top flange strands are stressed to 10,000 pounds each and all remaining strands are stressed to 43,943 pounds each.

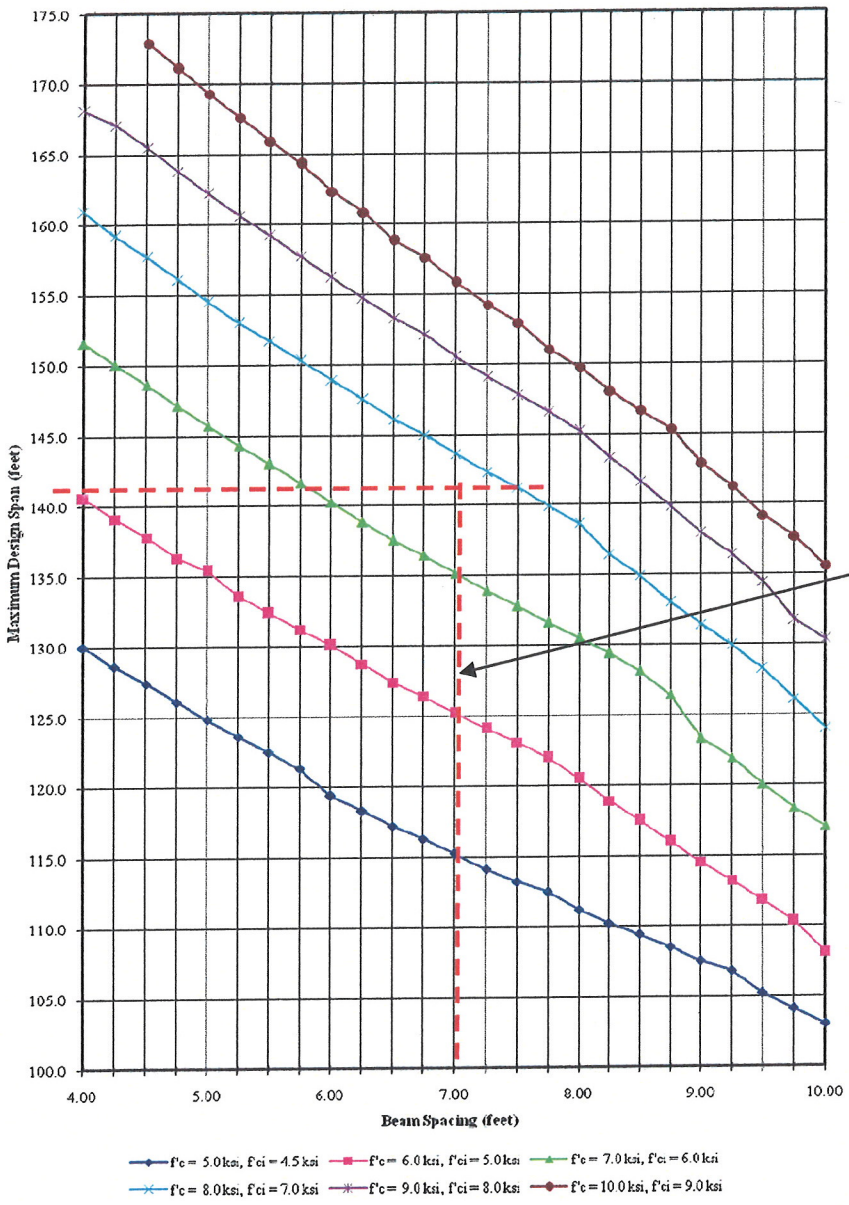
PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **B-7**

SHEET NO.: **5 of 7**

74" Bulb Tee Beam

Beam Design Charts, from GDOT bridge design manual



140 spans
BT-74 @ 7'-3" spacing
f'c= 8 ksi
Assume 5 spaces= 36'-3"
3'-6" Overhangs
6 beams

Figure 3-11

All strands are .6" diameter low relaxation strands. The 4 top flange strands are stressed to 10,000 pounds each and all remaining strands are stressed to 43,943 pounds each.

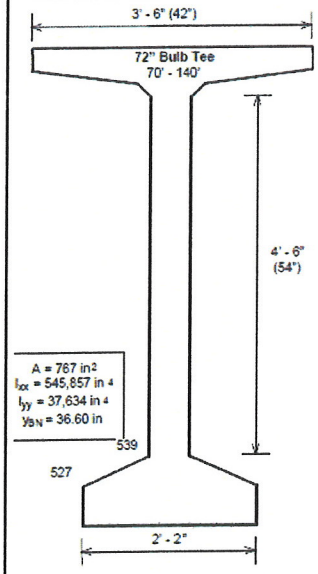
PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **B-7**

SHEET NO.: **6 of 7**

Seff =Spacing1 – TF/2

Slab Design Charts, from GDOT bridge design manual



SERVICE LOAD DESIGN OF BRIDGE SLAB
Minimum slab thickness is 7"
Maximum main reinforcement spacing is 9"

Georgia Department of Transportation 19-OCT-07
Office of Bridge and Structural Design 16:53:08
May 2007

WHEEL LOAD (Kips)	fc (ksi)	fs (ksi)	n	SLAB COVER (in)	FUTURE PAVING (kips/ft^2)	CONTINUITY FACTOR
16.00	1.400	24.000	9	2.000	0.030	0.8

EFFECTIVE SPAN LENGTH (ft-in)	SLAB THICKNESS MINIMUM (in)	SLAB THICKNESS ACTUAL (in)	SIZE AND SPACING OF MAIN REINFORCEMENT (in)	DISTRIBUTION REINFORCEMENT MIDDLE HALF	DISTRIBUTION REINFORCEMENT OUTER QUARTERS
3- 6	6.0650	7.000	# 5 at 9.000	3-# 4	2-# 4
3- 7	6.0963	7.000	# 5 at 9.000	3-# 4	2-# 4
3- 8	6.1274	7.000	# 5 at 9.000	3-# 4	2-# 4
3- 9	6.1583	7.000	# 5 at 9.000	3-# 4	2-# 4
3-10	6.1891	7.000	# 5 at 9.000	3-# 4	2-# 4
3-11	6.2198	7.000	# 5 at 9.000	3-# 4	2-# 4
4- 0	6.2503	7.000	# 5 at 9.000	3-# 4	2-# 4
4- 1	6.2807	7.000	# 5 at 9.000	3-# 4	2-# 4
4- 2	6.3110	7.000	# 5 at 9.000	3-# 4	2-# 4
4- 3	6.3411	7.000	# 5 at 8.875	3-# 4	2-# 4
4- 4	6.3711	7.000	# 5 at 8.750	4-# 4	2-# 4
4- 5	6.4009	7.000	# 5 at 8.625	4-# 4	2-# 4
4- 6	6.4307	7.000	# 5 at 8.500	4-# 4	2-# 4
4- 7	6.4603	7.000	# 5 at 8.375	4-# 4	2-# 4
4- 8	6.4898	7.000	# 5 at 8.250	4-# 4	2-# 4
4- 9	6.5192	7.000	# 5 at 8.125	4-# 4	2-# 4
4-10	6.5484	7.000	# 5 at 8.000	4-# 4	2-# 4
4-11	6.5776	7.000	# 5 at 7.875	4-# 4	2-# 4
5- 0	6.6067	7.000	# 5 at 7.750	4-# 4	2-# 4
5- 1	6.6356	7.000	# 5 at 7.625	5-# 4	4-# 4
5- 2	6.6644	7.000	# 5 at 7.625	5-# 4	4-# 4
5- 3	6.6932	7.000	# 5 at 7.500	5-# 4	4-# 4
5- 4	6.7218	7.000	# 5 at 7.375	5-# 4	4-# 4
5- 5	6.7503	7.000	# 5 at 7.250	5-# 4	4-# 4
5- 6	6.7788	7.000	# 5 at 7.250	5-# 4	4-# 4
5- 7	6.8071	7.000	# 5 at 7.125	5-# 4	4-# 4
5- 8	6.8354	7.000	# 5 at 7.000	5-# 4	4-# 4
5- 9	6.8635	7.000	# 5 at 6.875	6-# 4	4-# 4
5-10	6.8916	7.000	# 5 at 6.875	6-# 4	4-# 4
5-11	6.9196	7.000	# 5 at 6.750	6-# 4	4-# 4
6- 0	6.9475	7.000	# 5 at 6.625	6-# 4	4-# 4
6- 1	6.9753	7.000	# 5 at 6.625	6-# 4	4-# 4
6- 2	7.0060	7.125	# 5 at 6.625	6-# 4	4-# 4
6- 3	7.0337	7.125	# 5 at 6.625	6-# 4	4-# 4
6- 4	7.0613	7.125	# 5 at 6.500	6-# 4	4-# 4
6- 5	7.0889	7.125	# 5 at 6.500	7-# 4	4-# 4

Seff =6.5' -1.75'
Seff = 4.75'

Seff =7.25' -1.75'
Seff = 5.5'

COST WORKSHEET

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)

ALTERNATIVE NO.: **B-7**

SHEET NO.: **7 of 7**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
BT-72 PSC Beams	LF	8,820	166.90	1,472,058			
BT-74 PSC Beams	LF				7,560	170.25	1,287,090
Subtotal				1,472,058			1,287,090
Markup (%) at							
TOTAL				1,472,058			1,287,090
TOTAL (ROUNDED)				1,472,000			1,287,000

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833); P.I. No. 0000833, Laurens County, GA

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS: INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
EARTHWORK						
E-1	Modify the profile grade to the east of the bridge to reduce the embankment fill quantity	$125,000	$0	$125,000		$125,000
E-2	Modify the profile grade at the end of the project to reduce the embankment fill quantity	$31,000	$0	$31,000		$3,100

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **E-1**

DESCRIPTION: **MODIFY PROFILE GRADE EAST OF BRIDGE TO REDUCE EARTHWORK EMBANKMENT (BORROW) REQUIREMENT**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The current profile grade requires a large quantity of borrow material to balance the project's earthwork.

ALTERNATIVE: (sketch attached)

Lower the profile grade from Sta. 132+00 to Sta. 151+00 to reduce the earthwork embankment quantity and borrow material requirement.

ADVANTAGES:

- Reduces earthwork borrow quantity
- Reduces wetland displacement impact

DISADVANTAGES:

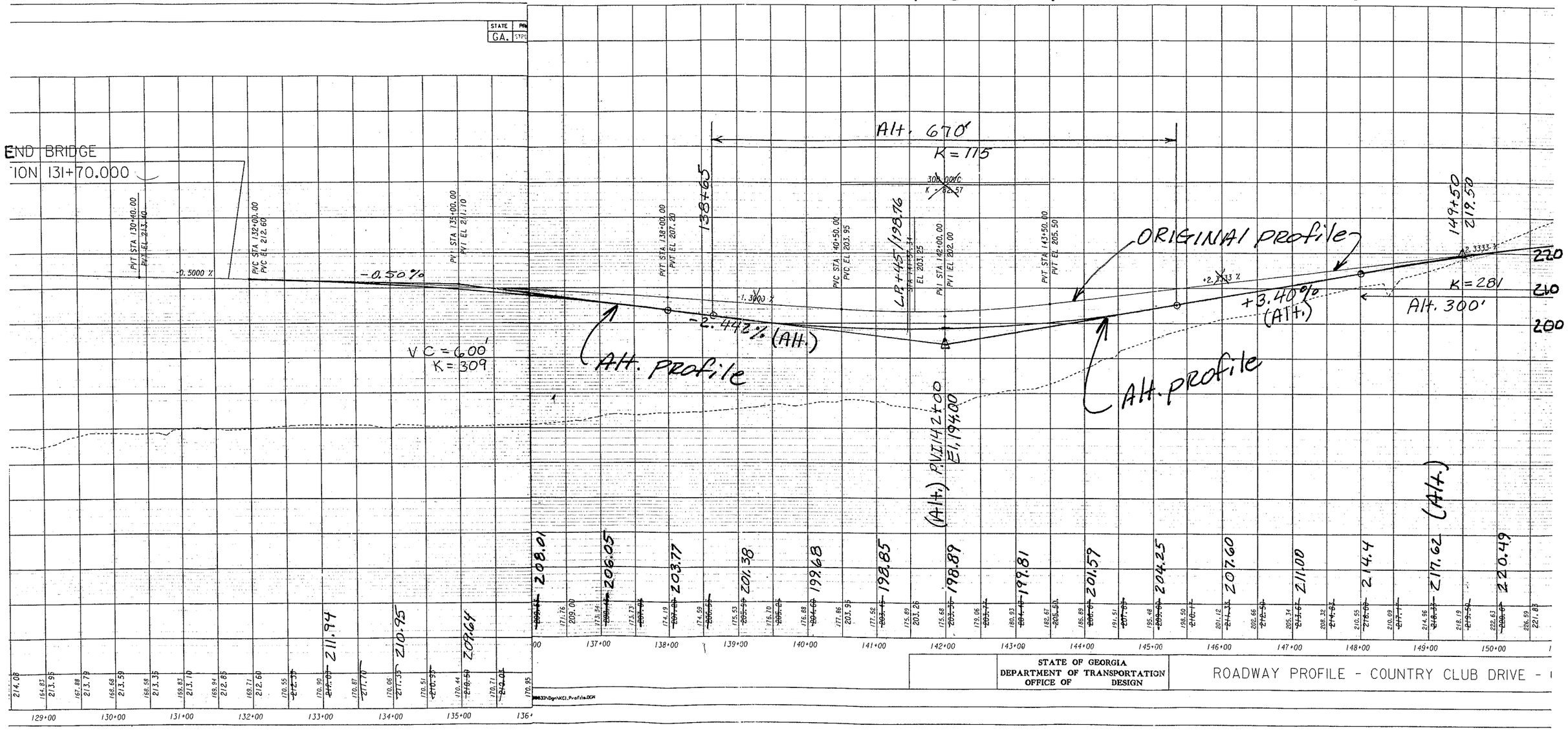
- None apparent

DISCUSSION:

The profile grade that is required for the river crossing to meet the river's hydraulic requirements requires a large amount of embankment (borrow material). The bridge profile grade cannot be changed, however the fill embankment just east of the bridge can be lowered. The lowering of the profile grade in this area would also reduce the construction limits thus reducing the wetland impacts by 3,100 sf.

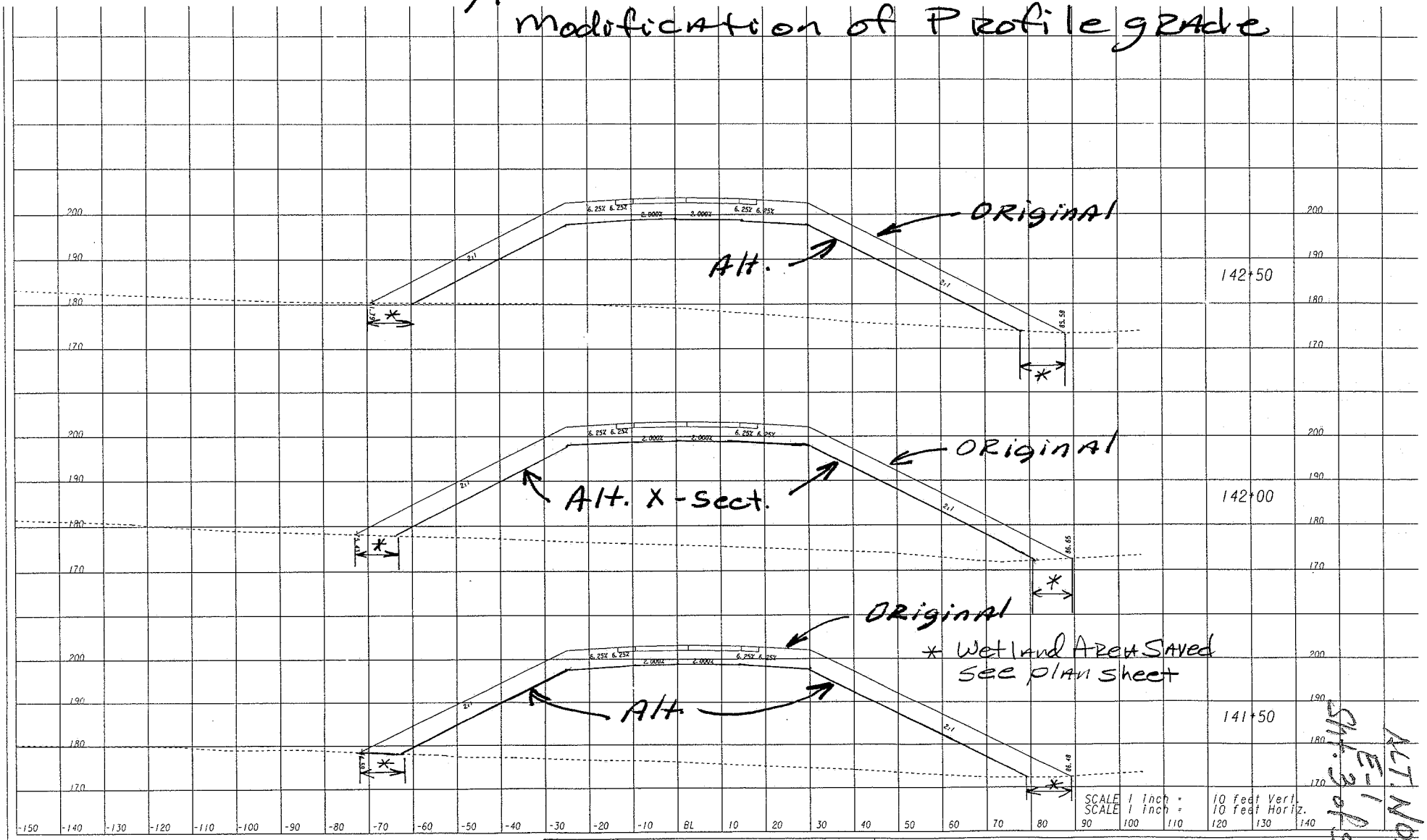
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 125,000	—	$ 125,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 125,000	—	$ 125,000

Sketch Alt. E-1 2/5



Sketch Alt. E-1

Typical X-Sections for Modification of Profile grade



ALT. No. SHEET 1 of 5

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE OF DESIGN

ROADWAY PROFILE - COUNTRY CLUB DRIVE - CR 454

2/21/2011
C:\MCData\998033\Dgn\MCI_Yeacs.DGN

CALCULATIONS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **E-1**

SHEET NO.: **4 of 5**

The earthwork embankment saved from Sta. 132+00 to Sta. 149+50 =

[(400' x 4.5'/2 x 210') + (300' x 4.7' x 150') + (300' x 4.8' x 130') + (500' x 4.7'/2 x 65')]/27cf =

7,000 cy + 7,800 cy + 6,900 cy + 2,800 cy = 24,500 cy (rounded)

Borrow material saved = 24,500cy x 1.25 (swelled) = 30,625 cy (31,000 cy rounded)

Wetland impact area saved (area of Sta. 142+00 to Sta. 144+00) =

Left side (210' x 10') + Right side (100' x 10') = 3,100 sf or 0.071 ac

COST WORKSHEET

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)

ALTERNATIVE NO.: **E-1**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original costs saved:							
Borrow Material saved	CY	31,000	$4.03	$124,930			
Subtotal				$124,930			
Markup (%) at							
TOTAL				$124,930			
TOTAL (ROUNDED)				$125,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **E-2**

DESCRIPTION: **MODIFY PROFILE GRADE AT THE END OF THE PROJECT TO REDUCE EARTHWORK EMBANKMENT (BORROW) REQUIREMENT**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The current profile grade requires a large quantity of borrow material to balance the project's earthwork.

ALTERNATIVE: (sketch attached)

Lower the profile grade from Sta. 214+00 to Sta. 229+50 to reduce the earthwork embankment quantity and borrow material requirement.

ADVANTAGES:

- Reduces earthwork borrow quantity
- Reduces construction time
- Reduces environmental impact with "narrower" construction limits

DISADVANTAGES:

- None apparent

DISCUSSION:

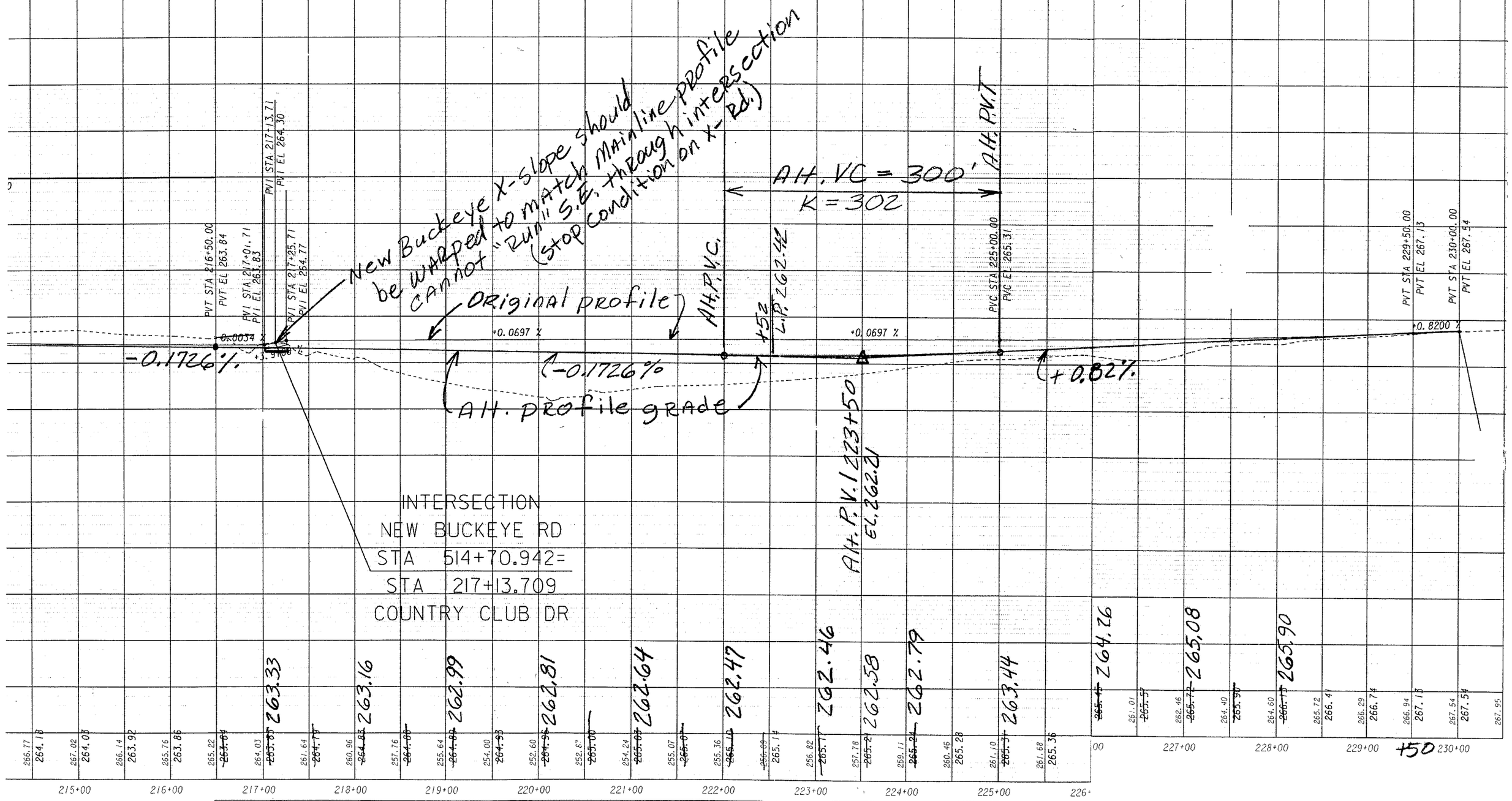
The profile grade that is required for the river crossing to meet the hydraulic requirements requires a large amount of embankment (borrow material). The bridge profile grade cannot be changed, however the fill embankment at the end of the project can be lowered. The lowering of the profile grade in this area (Sta. 214+00 to Sta. 229+50) would also reduce the construction limits and earthwork borrow requirement by 7,750 cy.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 31,000	—	$ 31,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 31,000	—	$ 31,000

GA.

Sketch

Sketch Alt. E-2 2/5



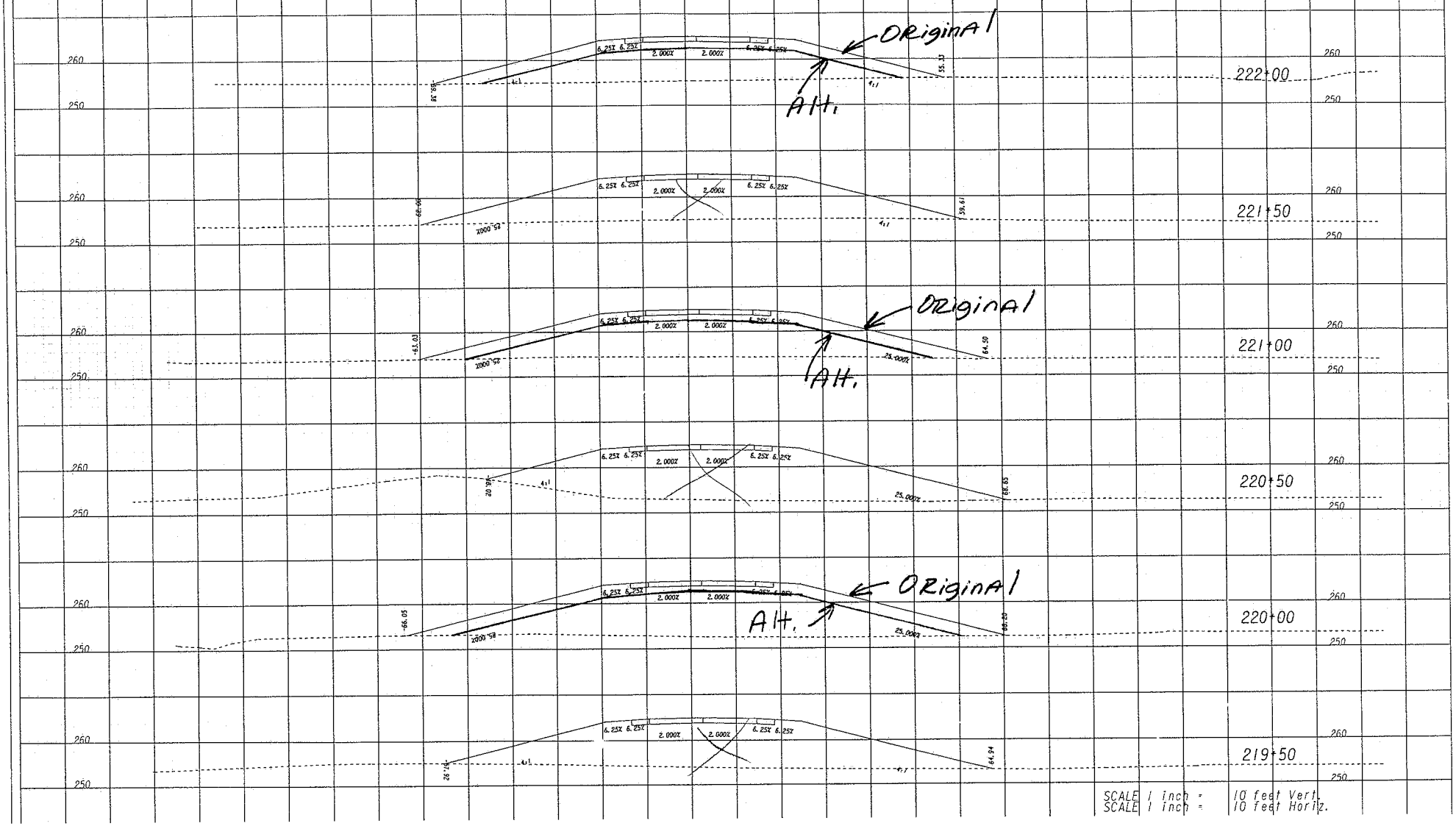
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE OF DESIGN

ROADWAY PROFILE - COUNTRY CLUB DRIVE - CF

00833\Dgn\KCI_Profile.DGN

STATE	PROJECT NUMBER
GA.	STP00-0000-00 (833)

Sample of modified X-Sections



SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.

Sketch Alt. E-2

3/5

CALCULATIONS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **E-2**

SHEET NO.: **4 of 5**

The earthwork embankment saved from Sta. 214+00 to 229+50 =

[(800' x 2.8'/2 x 76') + (300' x 2.6' x 66') + (450' x 2.4'/2 x 56')]/27cf/cy =

3,200 cy + 1,900 cy + 1,100 cy = 6,200 cy (rounded)

Borrow material saved = 6,200cy x 1.25 (swelled) = 7,750 cy (25% from GaDOT shrinkage by county)

COST WORKSHEET

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)

ALTERNATIVE NO.: **E-2**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original costs saved:							
Borrow Material saved	CY	7,750	$4.03	$31,233			
Subtotal				$31,233			
Markup (%) at							
TOTAL				$31,233			
TOTAL (ROUNDED)				$31,000			

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833); P.I. No. 0000833, Laurens County, GA

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS: INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
ROADWAY						
R-1	Narrow the graded shoulder from 10 ft. wide to 8 ft. wide	$153,000	$0	$153,000		$153,000
R-4	Delete the right turn lanes on Buckeye Road	$24,000	$0	$24,000		$24,000
R-5	Delete the right turn lanes on New Buckeye Road	$23,000	$0	$23,000		$23,000
R-6	End the relocated New Buckeye Road tie-in at Sta. 507+00	$40,000	$0	$40,000		$40,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **R-1**

DESCRIPTION: **NARROW THE GRADED SHOULDER FROM 10 FT. WIDE TO 8 FT. WIDE**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The current design typical section for Country Club Road uses 10-ft.-wide graded shoulders.

ALTERNATIVE: (sketch attached)

Use 8-ft.-wide graded shoulders for Country Club Road.

ADVANTAGES:

- Less earthwork required
- Less construction time
- Less grassing required

DISADVANTAGES:

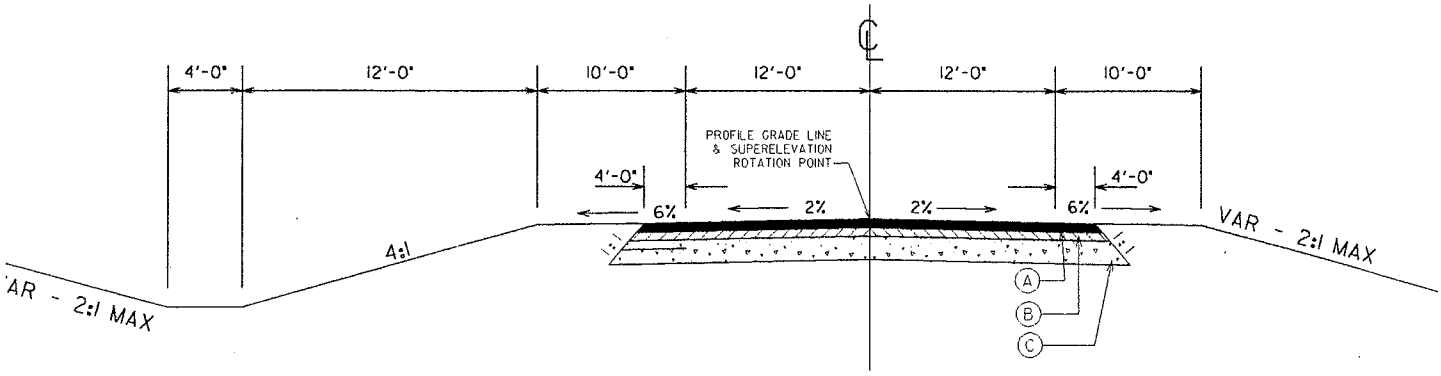
- Less clear zone (24 ft. vs. 26 ft.)

DISCUSSION:

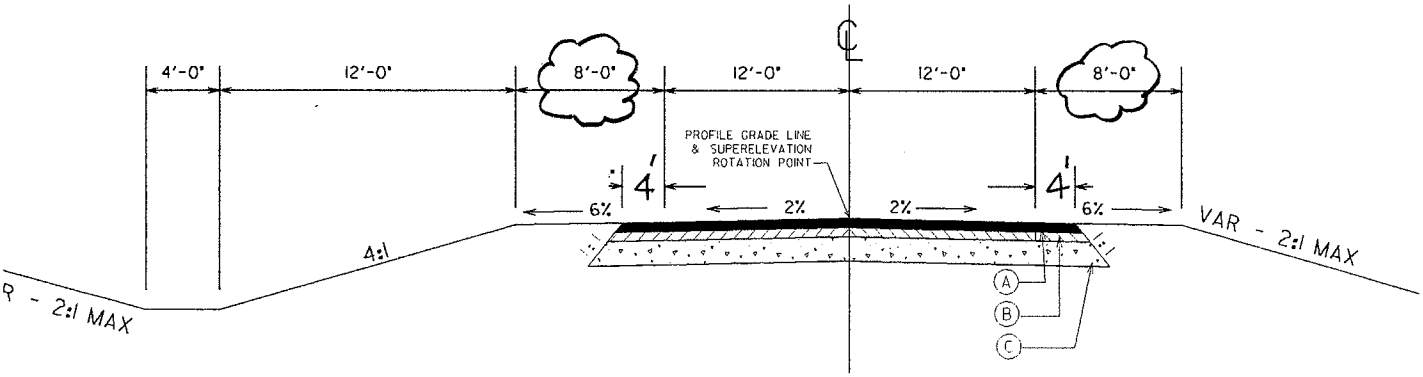
The proposed typical section is a two-lane roadway and, based on the 20 year design traffic volumes, Country Club Road will not be expanded to a four-lane roadway. Therefore using a 45 mph design speed would be more practical than the current 55 mph for a two-lane with relatively low volumes. It is important to point out that the GDOT Policy Design Manual (DPM) provides design criteria for only a design speed of 45 mph for a two-lane, Rural Collector and not for 55 mph (see pages 6-8 of the DPM). Only four-lane Rural Collectors are designed for 55 mph. A 45 mph speed design has a 24 ft. clear zone with 4:1 front slopes, therefore a 8-ft.-wide graded shoulder could be used (clear zone = 8 ft. shoulder + 12 ft. front slope + 4 ft. ditch = 24 ft.).

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 153,000	—	$ 153,000
ALTERNATIVE	$	—	$
SAVINGS (Original minus Alternative)	$ 153,000	—	$ 153,000

TYPICAL SECTION
COUNTRY CLUB RD - ORIGINAL



TYPICAL SECTION
COUNTRY CLUB Rd - Alternative



Sketch Alt. R-1 3/5

Table 6.5. Design Criteria for Collector Roadways

Cross Section Element	Rural (open ditch sections) (ADT > 2000)[1]		Urban (curbed sections) (ADT > 2000)[1]		
	2-Lane	4-Lane	2-Lane	4-Lane	
Design Speed	**45 mph**	**55 mph**	**25 mph**	**35 mph**	**45 mph**
Appropriate Level of Service (LOS)	C	C	C or D[2]	C or D[2]	C or D[2]
Traveled – Way					
Lane width (min-desirable)[3]	11-12-ft	11-12-ft	11-12-ft	11-12-ft	11-12-ft
Cross Slope (normal)	2%	2%	2%	2%	2%
Superelevation (max)	6%	6%	4%	4%	4%
Shoulders (outside)					
Overall width	8-ft	10-ft	n/a	n/a	n/a
Paved width	4-ft	6.5-ft	n/a	n/a	n/a
Cross Slope (normal)	6%	6%	n/a	n/a	n/a
Shoulders (median)					
Overall width	n/a	6-ft	n/a	n/a	n/a
Paved width	n/a	2-ft	n/a	n/a	n/a
Cross Slope (normal)	n/a	4%	n/a	4%	4%
Border Area (urban shoulder) (width)	n/a	n/a	10 -16-ft	10 -16-ft	10 -16-ft
Cross Slope (normal)	n/a	n/a	2%	2%	2%
Width of Median					
Depressed	n/a	32 - 44-ft	n/a	n/a	n/a
Raised	n/a	24-ft	n/a	20-ft	20-ft
Flush	n/a	n/a	n/a	14-ft	14-ft
Sidewalk (SW)					
Width of Sidewalk	n/a	n/a	5-ft	5-ft	5-ft
Desirable buffer from back of curb to SW	n/a	n/a	6-ft	6-ft	6-ft
Cross Slope (max)	n/a	n/a	2%	2%	2%
Width of Bike Lanes	4-ft[4]	4-ft[4]	4-ft[5]	4-ft[5]	4-ft[5]
Foreslope (max/normal)[6]	2:1/4:1	2:1/4:1	2:1/4:1	2:1/4:1	2:1/4:1
Width of foreslope in cut	12-ft	12-ft	n/a	n/a	n/a
Ditch Bottom (width)	2-ft	4-ft	n/a	n/a	n/a
Backslope (max/normal)[6]	2:1/4:1	2:1/4:1	2:1/4:1	2:1/4:1	2:1/4:1
Vertical Clearance (min-desirable)[7](ft)	16.5 -16.75	16.5 -16.75	16.5-16.75	16.5 -16.75	16.5 -16.75
Lateral Offset to Obstruction[8]	Ch. 5	Ch. 5	Ch. 5	Ch. 5	Ch. 5
Clear Zone[9]	24-ft	26-ft	AASHTO	AASHTO	AASHTO

Notes:

(1) Values shown are for roadways with ADT > 2000. Refer to the current AASHTO Green Book for design criteria on roadways with ADT < 2000, and the AASHTO "Guidelines for Geometric Design of Very Low-Volume Local Roads" for design criteria on roadways with ADT ≤ 400.

(2) LOS D is appropriate in heavily developed urban and suburban areas.

(3) See AASHTO Green Book, Chapter 6, Collector Roads and Streets, for conditions to construct or retain 11-ft. lanes.

(4) Bike Lane is incorporated into the overall width of paved shoulder to include a 16-inch rumble strip and total 14-inch buffer area (refer to Ga. Construction Detail S-8).

(5) Bike Lane measured from the outside edge of traveled-way outward. Does not include curb & gutter or header curb.

(6) The use of a slope inside the "Clear Zone" that is steeper than 4:1 will require the installation of a roadside barrier (i.e. guardrail, barrier wall, crash attenuator, etc...) (See Ga.Std.Details, 4000 series).

(7) For additional guidelines, refer to Chapter 2.3.2 of the GDOT Bridge and Structures Policy Manual.

(8) For rural roadways, lateral offset is measured from the edge of traveled way outward. For urban roadways with curbed sections, lateral offset is measured from the face of curb outward. See Chapter 5 of this Manual for GDOT standard criteria for lateral offset to signs, light poles, utility installations, signal poles and hardware, and trees and shrubs.

(9) AASHTO defines Clear Zone as the unobstructed, relatively flat area beyond the edge of traveled way for the recovery of errant vehicles. Clear zone recommendations are a function of design speed, traffic volumes, and embanckment slope. For Clear Zone recommendations, refer to the current edition of the AASHTO Roadside Design Guide, Ch 3.

CALCULATIONS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **R-1**

SHEET NO.: **4 of 5**

Earthwork saved with Alternative design = [(2' +2') x (2.091mi. x 5,280'/mi.) x 18' avg.]/27cf/cy = 30,000 cy

Less grassing area = [(2' + 2") x (2.091 x 5,280')/43,569sf/ac] = 1.014 ac

Use $3,000/ac for all grassing items

COST WORKSHEET

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)

ALTERNATIVE NO.: **R-1**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Earthwork saved:							
Earthwork	CY	30,000	$5.00	$150,000			
Grassing itmes saved	AC	1	$3,000.00	$3,042			
Subtotal				$153,042			
Markup (%) at							
TOTAL				$153,042			
TOTAL (ROUNDED)				$153,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833) Laurens County, GA

ALTERNATIVE NO.: **R-4**

DESCRIPTION: **DELETE THE RIGHT TURN LANES ON BUCKEYE ROAD, NORTH AND SOUTH**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The original design indicates right turn lanes on Buckeye Road in the northbound and southbound directions.

ALTERNATIVE: (sketch attached)

Eliminate the right turn lanes due to low traffic turn volumes for the design year.

ADVANTAGES:

- Reduces construction schedule
- Reduces construction costs

DISADVANTAGES:

- None apparent

DISCUSSION:

The projected right turning movement volumes are low based on the traffic analysis data through the design year. Consideration for removing the turn lanes at Buckeye Road does not appear to affect projected traffic movements.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 24,000	—	$ 24,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 24,000	—	$ 24,000

ALT. NO. R-4
Sht. 2 of 5

STATE	PROJECT NUMBER	SHEET NO.	TOTAL
GA	STP00-0000-00 (833)		

EXISTING R/W L.
V LINE
V LIMITS
R CONSTR

KC3
PI Sta = 308+52.96
PI North = 954957.66
PI East = 436828.40
Delta = 28°30'46.2"
D = 3°05'37.5"
L = 470.56
R = 921.62
T = 1851.98
E = 58.85 %

LIMIT OF CONS
BUCKEYE RD
STA 315+00.000
N 955249.695
E 436229.232

8 CLAUDE GRAHAM

16 CLAUDE GRAHAM

9 CLAUDE GRAHAM

17 MERVIN M. BRANTLEY & LENORA SLADE

CLAUDE GRAHAM

COUNTRY CLUB RD - CR 454

BUCKEYE RD - CR 520

BLACKSHEAR FERRY RD

COUNTRY C

REOD R/W

EXIST R/W

PROP EOP

N 54°22'11" E

12' N 35°30'45" W

12' N 64°00'55" W

CURVE KC3

REMOVED TURN LANE

STA 186+00 100' & 125'

STA 188+50 100'

STA 188+75.000 -125

STA 302+50 -60

STA 306+50 -60

STA 299+14.399 01 & -60

STA 299+14.399 46.85 & 75

STA 315+00 -39.69 & -60

STA 312+44 14' ASPH DR

STA 313+92 14' ASPH DR

STA 191+50 100'

PC 303+82.392

PT 313+04.

PI 308+52.955

INTERSECTION
BUCKEYE RD
MP X
STA 304+51.286=
STA 190+12.074
COUNTRY CLUB RD
MP 5.04
N 954629.991
E 437060.566

BEGIN LIMIT OF ACCESS
END LIMIT OF ACCESS
LIMIT OF ACCESS
REO'D R/W & LIMIT OF ACCESS

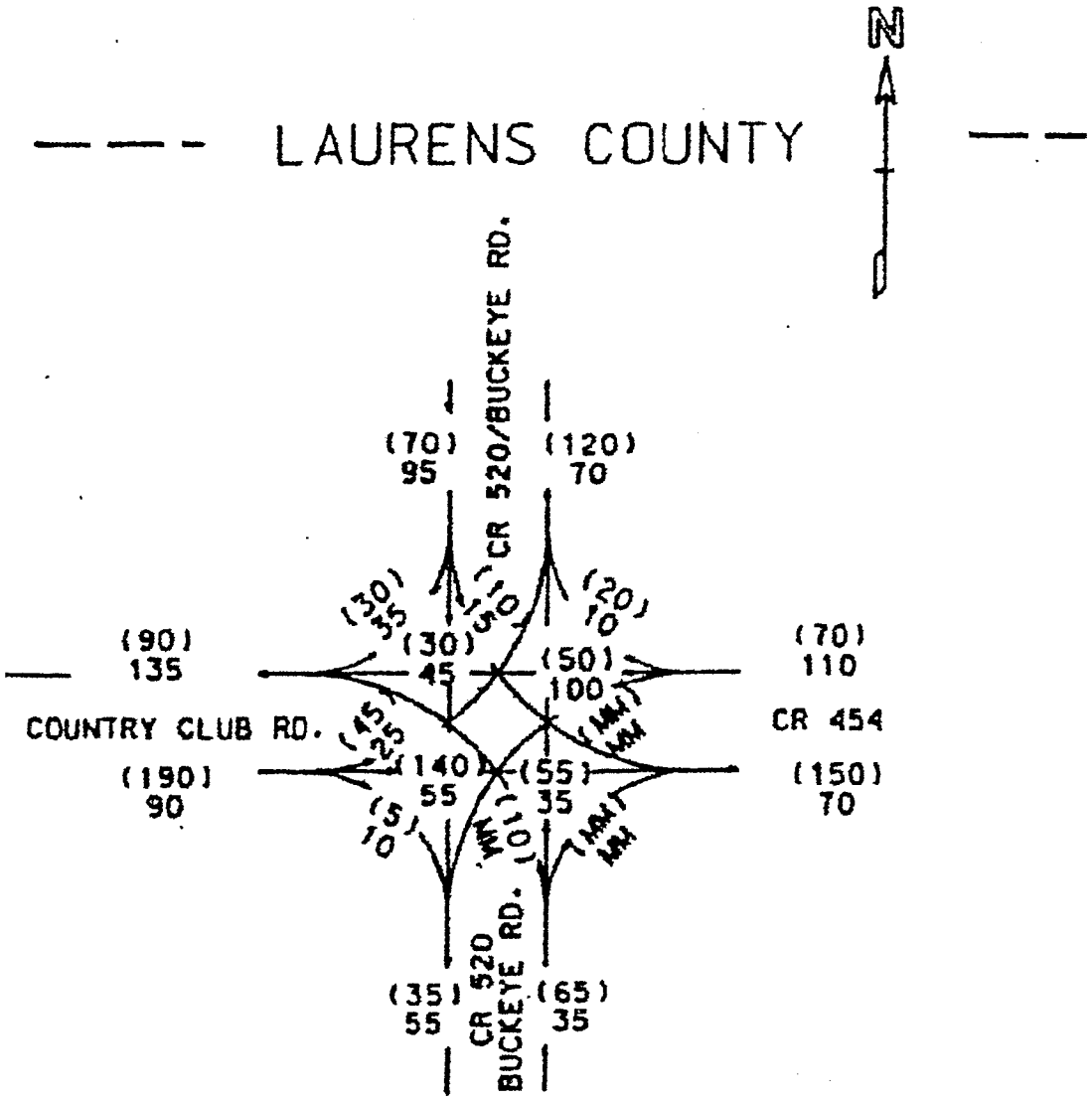
PERTY AND EXISTING R/W LINE
D R/W LINE
ON LIMITS
CONSTR
SLOPES
SLOPES

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **R-4**

☒ AS DESIGNED ☐ ALTERNATIVE ☐ BOTH

SHEET NO.: **3 of 5**



PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833) Laurens County, GA
DELETE RIGHT TURN LANES ON BUCKEYE ROAD, NORTH AND SOUTH

ALTERNATIVE NO.: **R-4**

SHEET NO.: **4 of 5**

Area 1
A1 = 280' x 12' = 3,360 SF
A2 = .5(12')x100' = 600 SF
A3 = .5(12')x70' = 420 SF

A1 Total SF = 4,380 SF

Area 2
A1 = .5(12')x100' = 600 SF
A2 = 260' x 12' = 3,120 SF
A3 = .5(12')x110' = 660 SF

A2 Total SF = 4,380 SF

A1 + A2 Total = 8760 SF/9=973.33 SY

RECYCL. AC 9.5 MM
110 LBS/YD2 (1.5-in)(973.33)/2000 = 80.29 TNS(0.05) = 4.01 + 80.3 = 84.31 TNS

COST
$78.06 x 84.31 TNS = **$6,581.24**

RECYCL. AC 19 MM
110 LBS/YD2 (2 In)(973.33)/2000 = 107.06 TNS(0.05) = 5.35 + 107.03 = 112.42 TNS

COST
$64.91 x 112.42 TNS = **$7,297.18**

GR AGGR BASE CRS
135 LBS/CF·IN (.83 In)(7,271CF)/2000 = 407.35 TNS(0.10) = 40.74 + 407 = 448.09 TNS

COST
$16.71 x 448.09 = **$7,487.58**

Bituminous Tack Coat

0.035 Gal/YD2 x 973.33 YD2 = 34.07 GAL x .05 = 1.70 + 34.07 = 35.77 GAL
35.77 GAL x $3.25 = **$116.25**

Total Costs Savings:
$21,482.25

Use for contingency mark-up 5% for asphalt and 10% for rock

COST WORKSHEET

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)

DELETE RIGHT TURN LANES ON BUCKEYE ROAD

ALTERNATIVE NO.: **R-4**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
310-1101 GR AGGR BASE CRS	TN	448	16.71	7,488			
402-3103 RECY AC 9.5 mm	TN	84	78.06	6,581			
402-3190 RECY AC 19 mm	TN	112	64.91	7,297			
413-1000 BITUM TACK COAT	GL	36	3.25	116			
Subtotal				21,482			
Markup (%) at 10%				2,148			
TOTAL				23,630			
TOTAL (ROUNDED)				24,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **R-5**

DESCRIPTION: **DELETE RIGHT TURN LANES ON NEW BUCKEYE ROAD, NORTH AND SOUTH**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The original design indicates right turn lanes on New Buckeye Road for the northbound and southbound directions.

ALTERNATIVE: (sketch attached)

Eliminate the right turn lanes on the north and south side locations due to low traffic turn volumes.

ADVANTAGES:

- Reduces construction schedule
- Reduces construction costs

DISADVANTAGES:

- None apparent

DISCUSSION:

The current and projected turning movement volumes remain low based on the traffic analysis data through the design year. Consideration for removing the turn lanes at New Buckeye Road does not appear to affect future traffic movements.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 23,000	—	$ 23,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 23,000	—	$ 23,000

ALT. NO. R-5
Sht. 2 of 5

PROJECT NUMBER
STP00-0000-00 (833)
SHEET NO.

CURVE TABLE 4 - CURVE KC		
	LEFT	RIGHT
	0.03905	0.03905
	0.0000	0.0000

INTERSECTION
NEW BUCKEYE RD
MP 0.09
STA 514+70.942=
STA 217+13.706
COUNTRY CLUB RD
MP 5.55

BEN HALL LAKE DR
MP 1.17
N 955793.937
E 439469.438

LIMIT OF CONSTRUCTIO
NEW BUCKEYE RD
MP 0.19
STA 520+00.000
N 956318.929
E 439404.061

GAY LAND, INC. (10)
KING, JR. (15)
THOMAS B. KING, JR. (20)
THOMAS B. KING, JR. (11)
THOMAS B. KING, JR. (21)

MATCH LINE STA 510+00

COUNTRY CLUB RD - CR 454
NEW BUCKEYE RD - CR 12
BEN HALL LAKE DR - CR 12
CURVE KC4
TRACT 2
EXIST R/W
REQD R/W
PROP EOP
REMOVED TURN LANE
EPHEMERAL STREAM #24
ESA BOUNDARY WETLAND #23
ESA BOUNDARY - WETLAND #22
2-48" PIPES REQD
STA 520+00.000 -38.85 & -65
STA 520+00.000 40.14 & 65

KC4	
PI Sta :	511+87.69
PI North :	955509.08
PI East :	439506.90
Delta :	14°35'37.8"
D :	1°57'47.0"
T :	373.73
L :	743.42
R :	2918.69
E :	23.83
e :	%

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN
CROSSROAD PLAN

REVISION DATES

Y AND EXISTING R/W LINE
ED R/W LINE
UCTION LIMITS
NT FOR CONSTR

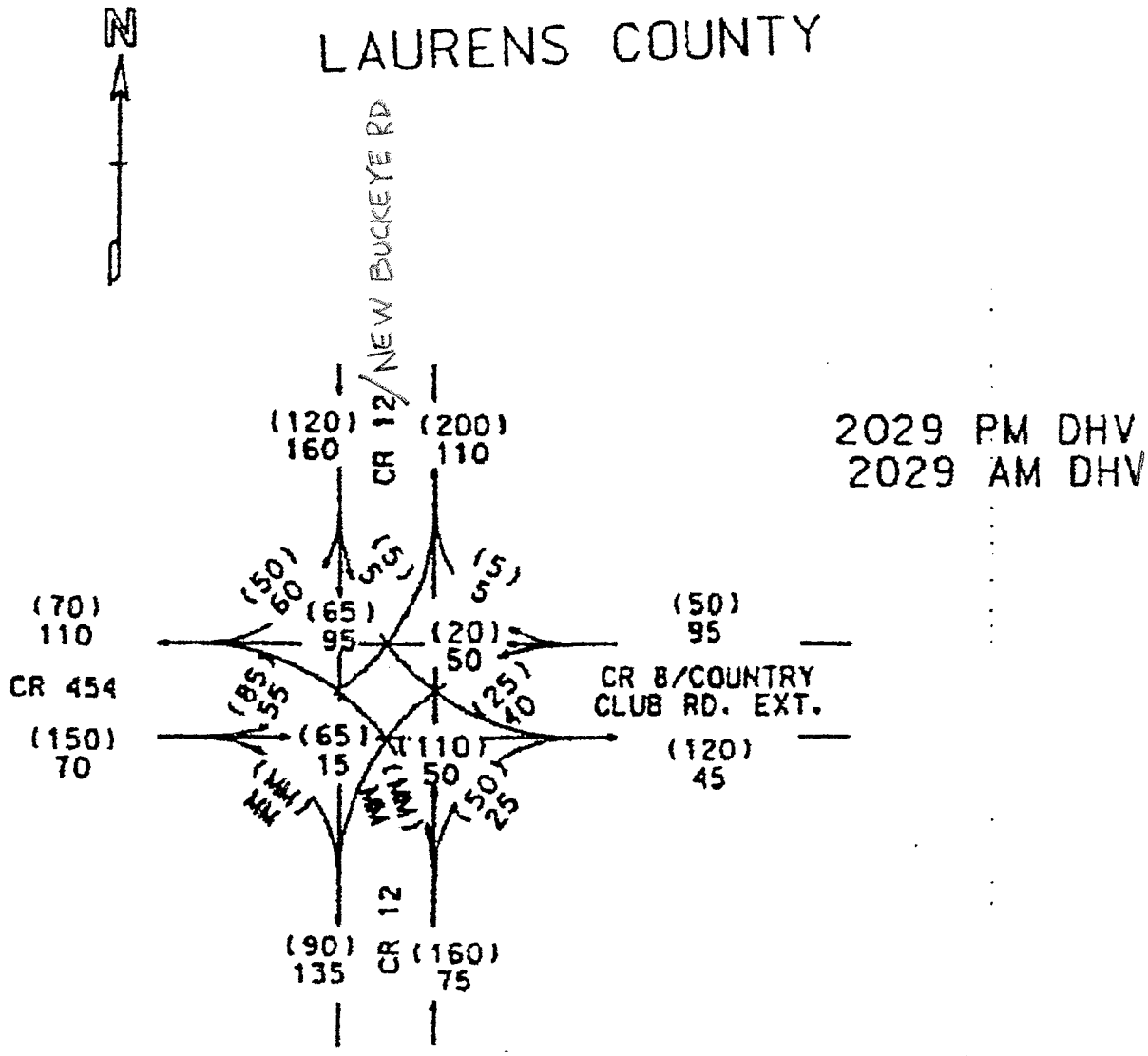
BEGIN LIMIT OF ACCESS.....
END LIMIT OF ACCESS.....
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCES

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **R-5**

☒ AS DESIGNED ☐ ALTERNATIVE ☐ BOTH

SHEET NO.: **3 of 5**



CALCULATIONS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833), Laurens County, GA

ALTERNATIVE NO.: **R-5**

SHEET NO.: **4 of 5**

Area 1
A1 = 260' x 12' = 3,120 SF
A2 = .5(12')x100' = 600 SF
A3 = .5(12')x90' = 540 SF

Total SF = **4,260 SF**

Area 2
A1 = .5(12')x100' = 600 SF
A2 = 270' x 12' = 3,240 SF
A3 = .5(12')x95' = 570 SF

Total SF = **4,410 SF**

A1 + A2 Total = 8670 SF/9 = **963.33 SY**

RECYCL. AC 9.5 MM
110 LBS/SY·IN (1.5 IN)(963.33SY)/2000 = 79.47 TNS(0.05) = 3.97 + 79.47 = 83.44 TNS

COST
$78.06 x 83.44 TNS = **$6,513.32**

RECYCL. AC 19 MM
110 LBS/SY · IN(2 IN)(963.33SY)/2000 = 105.97 TNS(0.05) = 5.30 + 105.97 = 111.27 TNS

COST
$64.91 x 111.27 = **$7,222.54**

GR AGGR BASE CRS
135 LBS/CF·IN (.83 IN)(7196.1CF)/2000 = 403.16 TNS(0.10) = 40.32 + 403.16 = 443.47 TNS

COST
$16.71 x 443.47 SY = **$7,410.38**

BITUMINOUS TACK COAT
.035 GAL/SY x 963.33 SY = 33.72 GAL x .05 = 1.69 + 33.72 = 35.41GAL

$3.25 x 35.41 GAL = **$115.08**

Total Costs Savings:
$21,261.32

Use for contingency mark-up 5% for asphalt and 10% for rock

COST WORKSHEET

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)

ALTERNATIVE NO.: **R-5**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
310-1101 GR AGGR BASE CRS	TN	443	16.71	7,410			
402-3103 RECY AC 9.5 mm	TN	83	78.06	6,513			
402-3190 RECY AC 19 mm	TN	111	64.91	7,223			
413-1000 BITUM TACK COAT	GL	35	3.25	115			
Subtotal				21,261			
Markup (%) at 10%				2,126			
TOTAL				23,387			
TOTAL (ROUNDED)				23,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **R-6**

DESCRIPTION: **END RELOCATED NEW BUCKEYE ROAD TIE-IN AT STA. 507+00**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The current design ends the tie-in for Relocated New Buckeye Road at Sta. 502+50.

ALTERNATIVE: (sketch attached)

End the tie-in for Relocated New Buckeye Road at Sta. 507+00.

ADVANTAGES:

- Less pavement quantities
- Less right-of-way required
- Less clearing and grubbing and earthwork required

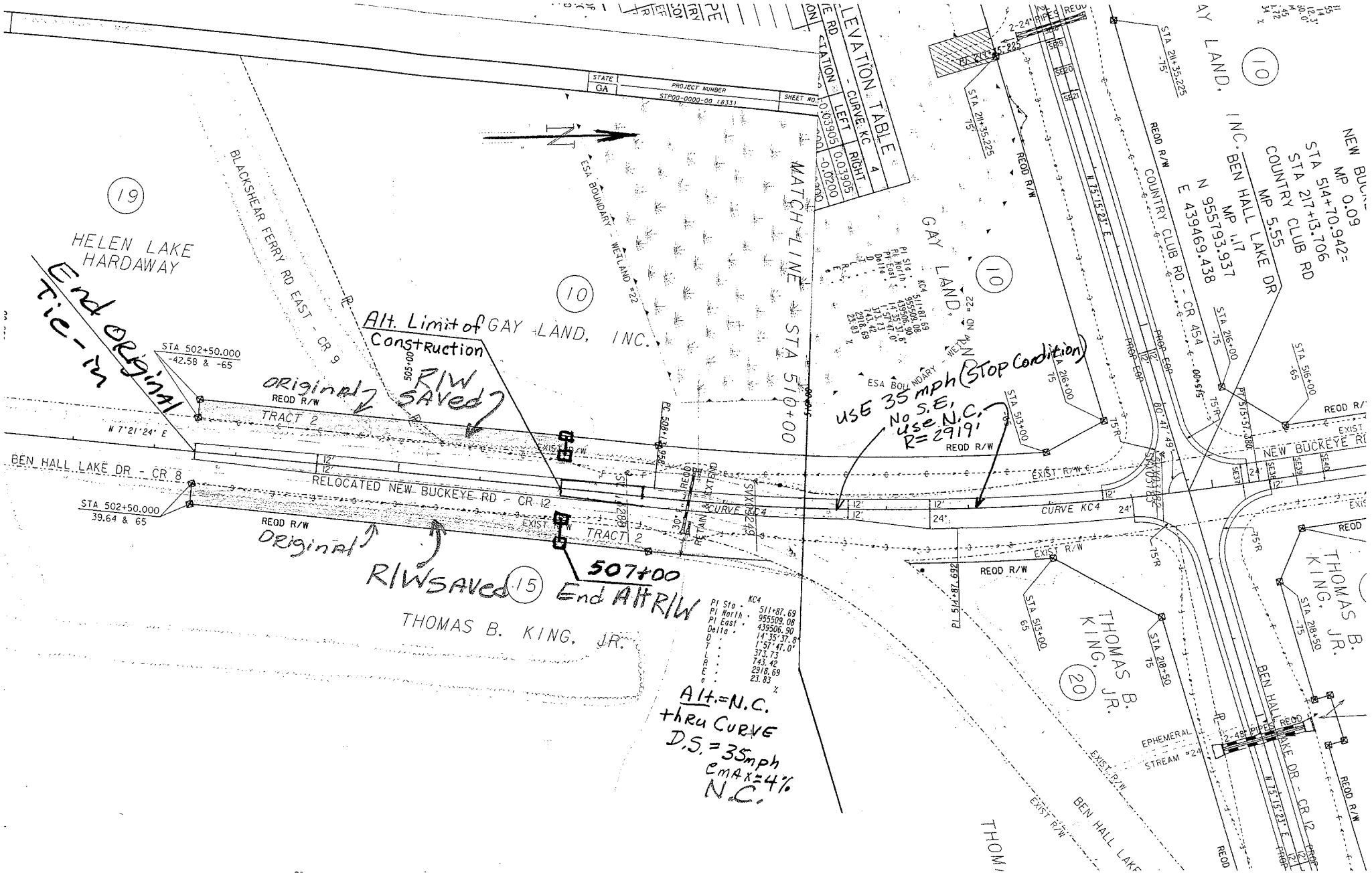
DISADVANTAGES:

- None apparent

DISCUSSION:

The current design has a superelevation on the relocated New Buckeye Road for Curve KC4 (R = 2,919 ft.); however the curve would not require superelevation for a 45 mph design speed with Emax = 4%. Therefore, the roadway could be tied-in sooner at Sta. 507+00 by using a normal crown and eliminating the need for transitioning superelevation. Since Curve KC4 is approaching a stop condition, it can be designed for 10 mph below the posted/design speed as per AASHTO 2004 Geometric Design, and GDOT Design Policy Manual.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 40,000	—	$ 40,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 40,000	—	$ 40,000

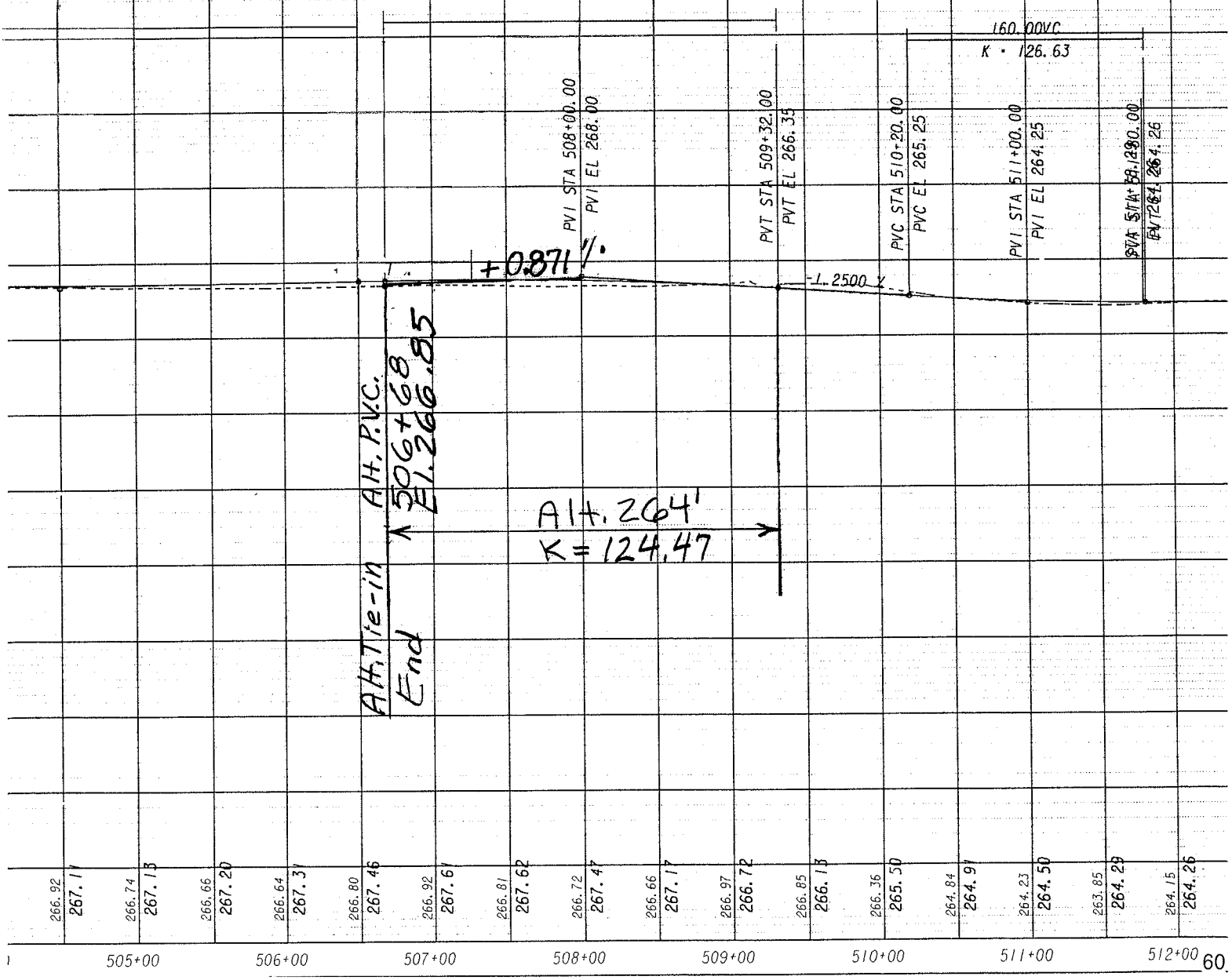


New Buckeye Rd. Sketch Alt. R-6 2/5

Sketch Alt. R-6 3/5

Alt. Design Profile grade

Relocated New Buckeye Rd.



PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)
Laurens County, GA

ALTERNATIVE NO.: **R-6**

SHEET NO.: **4 of 5**

Pavement section saved with shorter tie-in length at Sta. 507+00

Pavement area saved = [(450' x (24' + 2' + 2')]/9sf/sy = 1,400 sy

Mainline CR & Side Roads (from GaDOT Plans) Full-Depth Pavement Unit Cost ($/SY):

9.5mm: 165#/SY x Ton/2,000# x $78.06/Ton = $ 6.45/SY

19mm: 220#/SY x Ton/2,000# x $64.91/Ton = $ 7.14/SY

10" GAB: .833ft x 147#/CF x Ton/2,000# x 9SF/SY x $16.71/Ton = $ 9.21/SY

Total Full-Depth Pavement Unit Cost = $ 22.80/SY

R/W saved = [Parcel 19 & 10 (450' x 23') + Parcel 15(450' x 25')]/43,560sf/ac = 0.50 ac

COST WORKSHEET

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE**
STP00-0000-00(833)

ALTERNATIVE NO.: **R-6**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Original costs saved							
Pavement section	SY	1,400	22.80	31,920			
Clearing & grubbing	AC	2,500	0.50	1,250			
Misc items, marking, grass. Etc.	LS	1	3,000.00	3,000			
R/W saved	AC	0.50	2,800.00	1,400			
R/W markup (148%) #	%	1,400	1.48	2,072			
# from GaDOT R/W estimate							
Subtotal				39,642			
Markup (%) at							
TOTAL				39,642			
TOTAL (ROUNDED)				40,000			

SECTION THREE – PROJECT DESCRIPTION

NEED AND PURPOSE

Currently there is only one Oconee River crossing in Dublin, Georgia, US 80, which exists along a 32-mile stretch from I-16 in Laurens County north to SR 57 in Wilkinson County. The US 80 river crossing serves traffic crossing the Oconee River from several major roadways converging in Dublin: State Routes (SR) 29, 86, 199 and 257 and US Routes (US) 80, 319 and 441. A new river crossing is necessary to improve regional traffic flow between Dublin and East Dublin and provide an alternative river crossing in the event of flooding. It would also help reduce congestion while improving traffic circulation, flow and operations on arterial and collector streets within downtown Dublin, East Dublin and Laurens County. The new river crossing would also provide better north/south and east/west access within and near the City of Dublin and in Laurens County.

The next Oconee River crossing to the north is located approximately 25 to 28 miles from the US 80 crossing along SR 57 in Wilkinson County. Presently, the routes converging on downtown Dublin act as a "funnel" sending traffic across the US 80 bridge, which is often congested. It also may be closed because of flooding. The location of the new river crossing is about five miles north of the US 80 bridge and downtown Dublin/East Dublin, which should be close enough to attract traffic away from the US 80 bridge yet far enough to serve as a "bypass" route relieving US 80/SR 26 and US 319/SR 31 traffic.

The alternative river crossing would also help lessen congestion on other arterial routes and provide better inter-regional accessibility from/to Dublin and East Dublin. Within the Dublin area, there are several businesses that would benefit from increased regional access and improved connectivity. Most of these are located north of the I-16 interchange near Dublin.

When there is flooding on US 80, traffic is routed out of downtown Dublin due to the inaccessibility of the US 80 river crossing. The nearest and only other Oconee River crossing in the Dublin area is on I-16 about 5 miles to the south.

DESCRIPTION OF THE PROJECT

This project, STP00-0000-00(833) New Oconee River Crossing From Country Club Road to Ben Hall Lake Drive includes 2.6 miles of new two-lane roadway with a new Oconee River crossing north of Dublin in Laurens County. The project begins by tying into the existing pavement of CR 454/Country Club Drive, approximately 1,000 feet south of the existing CR 455/Blackshear Ferry Road intersection. The project continues north along CR 454/Country Club Drive as a symmetrical widening to create a two-lane typical section with open ditch drainage to just southeast of the Oconee River and then proceed onto a new bridge structure to cross the river.

Once across the river on a sweeping curve, the project proceeds northeast onto a new location and intersects CR 520/Buckeye Road approximately 200 feet south of CR 9/Blackshear Ferry Road approximately 550 feet north of CR 8/Ben Hall Lake Drive. It continues east on new location and

ends by tying into the existing pavement of CR 8/Ben Hall Lake Drive, approximately 1,200 feet east of CR 12/New Buckeye Road.

A new intersection will be created with Buckeye Road/CR 520, which will eventually be designated a State Route. Right turn lanes will be provided on Buckeye Road/CR 520. A new intersection with New Buckeye Road/CR 12 will be created with right turn lanes on New Buckeye Road. The curved section connecting New Buckeye Road/CR 12 with Ben Hall Lake Drive will be abandoned and the connection of New Buckeye Road/CR 12 with Buckeye Road/CR 520 will be terminated with a cul-de-sac. Both cross roads will be modified to accommodate the new right turn lanes.

The typical section for the new roadway is two, 12-ft.-wide lanes with 10-ft.-wide graded shoulders including 4-ft.-wide asphalt paved sections and open ditch drainage. The roadway is designed for a 55 mile per hour design speed. High embankments at the ends of the bridge and deep cuts in the middle section of the road result in a 200- to 250-ft.-wide right-of-way.

Six pipe culverts will be used to convey streams or storm water drainage under the roadways.

The bridge will be 43-ft., 3-in. wide and will have nine, 140-ft.-long spans of 72-in.-deep bulb tee, precast, prestressed concrete girders with a cast-in-place concrete deck and cast-in-place concrete pier bents supported on deep footings. Abutments will be pile supported cast-on-place concrete pier caps. Rip rap resting on plastic filter fabric slope protection will be provided on the 2 horizontal to 1 vertical earth slope in front of the abutments.

COST

The estimated construction cost is $12.6 million. About 73% of the right of way has been acquired through non-solicited donations.

DRAWINGS

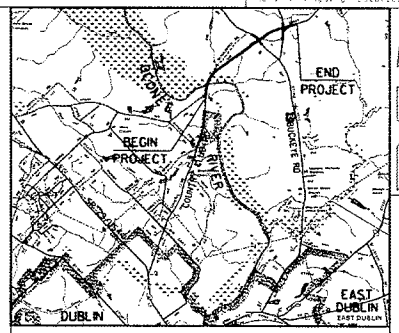
Selected project drawings follow.

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0000-00 (833)		

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

PLAN AND PROFILE OF PROPOSED

NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB ROAD TO BEN HALL LAKE DRIVE



LOCATION SKETCH

FEDERAL AID PROJECT

STP00-0000-00 (833)

FEDERAL ROUTE • N/A

STATE ROUTE • N/A

P.I.NO. 0000833

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,AND SHALL BE DEEMED TO MEAN THE DEPARTMENT OF TRANSPORTATION.

DESIGN DATA:
TRAFFIC A.D.T.: (2009) 1600
TRAFFIC A.D.T.: (2029) 3000
TRAFFIC D.H.V.:
DIRECTIONAL DIST:
% TRUCKS: 10
24 HR.TRUCKS %: 12
SPEED DESIGN: 55 MPH

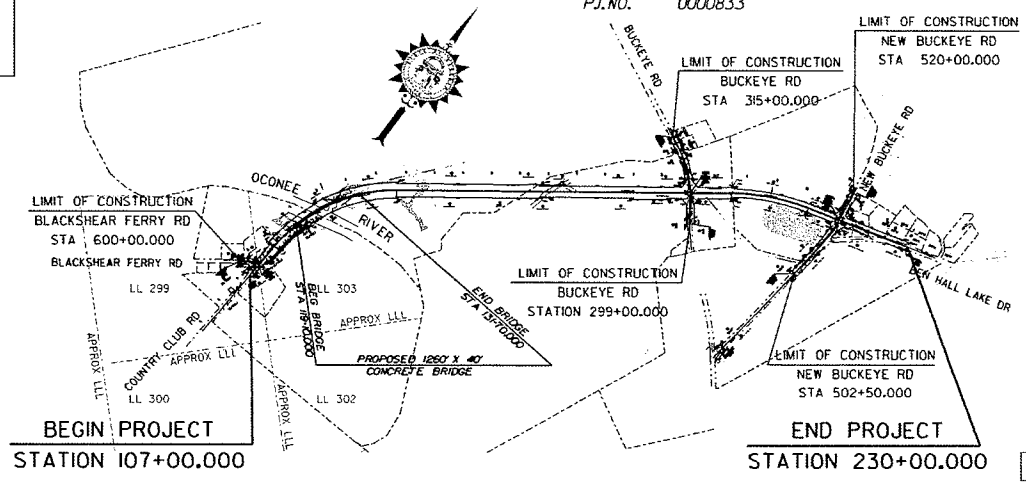
LOCATION & DESIGN APPROVAL DATE:

FUNCTIONAL CLASS:
MAJOR COLLECTOR

THIS PROJECT IS 100% IN LAURENS COUNTY AND IS 100% IN CONG.DIST.NO. .

PROJECT DESIGNATION: EXEMPT
DESIGNED IN ENGLISH UNITS.

THIS PROJECT HAS BEEN PREPARED USING THE HORIZONTAL GEORGIA COORDINATE SYSTEM OF 1984 (NAD 1983)/94 EAST ZONE.AND THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.



PREPARED BY: Sean Bush
DISTRICT DESIGN SQUAD LEADER

RECOMMENDED FOR SUBMISSION BY: Douglas Alan Smith
DISTRICT DESIGN ENGINEER

SUBMITTED BY: George Brewer
DISTRICT PRECONSTRUCTION ENGINEER

SUBMITTED FOR APPROVAL BY: James H. Smith, P.E.
DISTRICT ENGINEER

DATE CHIEF ENGINEER

GMD: 86, 342 LD: 1ST LL: 299, 303

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.

LENGTH OF PROJECT	COUNTY No. / Project No.
	MILES
NET LENGTH OF ROADWAY	2.091
NET LENGTH OF BRIDGES	0.239
NET LENGTH OF PROJECT	2.330
NET LENGTH OF EXCEPTIONS	0.000
GROSS LENGTH OF PROJECT	2.330

SCALE IN FEET
0 1000 2000 4000

PLANS COMPLETED	
REVISIONS	

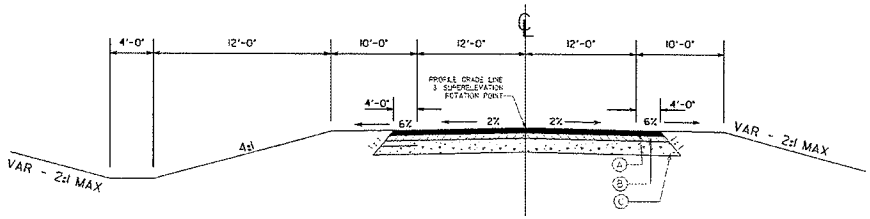
STP00-0000-00 (833) LAURENS

01-01

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0006-00 (833)		

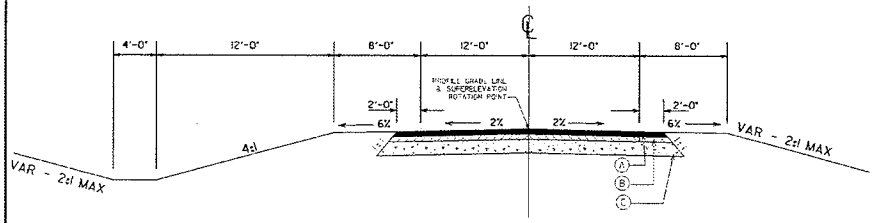
TYPICAL SECTION

COUNTRY CLUB RD / BEN HALL LAKE DR / BUCKEYE RD



TYPICAL SECTION

BLACKSHEAR FERRY RD / NEW BUCKEYE RD



REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

OFFICE:

TYPICAL SECTIONS

DRAWING NO. 5-01

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0000-00 (833)		

*** STANDARD CROSS - SLOPE MAY BE VARIED - AS DIRECTED BY THE ENGINEER - TO BEST FIT THE EXISTING ROADWAY AS PER SECTION 149 OF THE STANDARD SPECIFICATIONS. SEE "ALLOWABLE RANGES TABLE" BELOW.

ALLOWABLE RANGES TABLE

FOR THIS PROJECT, CROSS SLOPES THAT ARE ADJUSTED TO "BEST FIT" EXISTING PAVEMENT SLOPES ARE SUBJECT TO THE FOLLOWING LIMITS:

A: NORMAL CROWN

SECTION WITH GRADES 0.5% OR GREATER	SECTION WITH GRADES 0.5% OR LESS
0.0150 FT/FT - MINIMUM	0.0156 FT/FT - MINIMUM
0.0208 FT/FT - DESIRABLE	0.0208 FT/FT - DESIRABLE
0.0250 FT/FT - MAXIMUM	0.0300 FT/FT - MAXIMUM

B: SUPERELEVATION RATE

S.E. RATE SHOWN ON PLANS OR S.E. RATE EXISTING IN FIELD (WHICHEVER IS GREATER)

C: SUPERELEVATION TRANSITION LENGTH (LENGTH FROM FLAT TO FULL S.E.)

	RATE OF CHANGE	CORRESPONDING DIFFERENCE IN GRADE BETWEEN PIVOT POINT AND EDGE OF PAVEMENT
MINIMUM	1:150	0.67%
DESIRABLE	1:200	0.50%
MAXIMUM	1:300	0.33%

*LENGTH SHALL BE SET TO AVOID CREATING A FLAT GUTTER GRADE ON LOW SIDE AND TO AVOID FLAT CROSS - SLOPES AT OR NEAR THE LOW POINT OF VERTICAL CURVES.

D: POSITIONING OF SUPERELEVATION TRANSITION LENGTH ON SIMPLE CURVES

50% OF TRANSITION INSIDE CURVE - MAXIMUM
33% OF TRANSITION INSIDE CURVE - DESIRABLE
20% OF TRANSITION INSIDE CURVE - MINIMUM

NOTE: CROWN WIPE OUT SHALL BE AT THE SAME RATE AS THE S.E. TRANSITION.

E: SMOOTHING OF BREAKS IN EDGE PROFILE AT BEGIN AND END OF TRANSITION SHALL BE ACCOMPLISHED BY VERTICAL CURVE WITH A MINIMUM LENGTH (IN FEET) EQUAL TO THE SPEED DESIGN (IN MPH).

SLOPE CONTROLS		
SLOPE	CUT	FILL
4:1	0-6'	0-10'
2:1	OVER 6'	OVER 10'

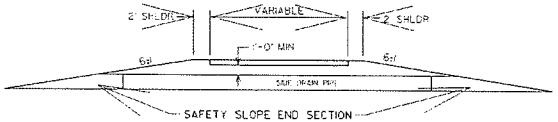
* GUARDRAIL REQUIRED ON FILL SLOPES STEEPER THAN 4:1

SEE PLAN SHEETS FOR SUPERELEVATION LIMITS

▲ RATE OF SE OR NORMAL SHOULDER SLOPE WHICHEVER IS GREATER (BUT NOT LESS THAN ¾" PER FT FOR UNPAVED SHOULDERS

■ ALGEBRAIC DIFFERENCE IN PAVING SLOPE AND SHOULDER SLOPE NOT TO EXCEED 0.08'/FT

DRIVEWAY TYPICAL SECTION



NOTE: SEE DRIVEWAY PROFILES FOR PAVING LIMITS.

RESIDENTIAL DRIVEWAYS

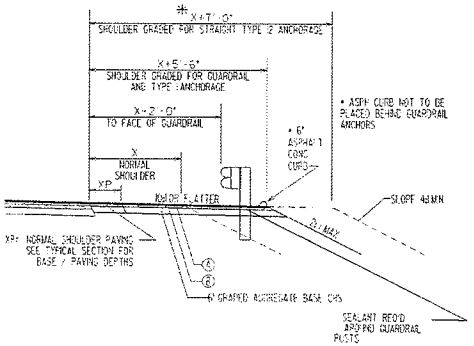
ASPHALT DRIVES WILL BE PAVED WITH THE FOLLOWING:
135 LBS/SQ YD ASPH CONC 9.5mm SUPERPAVE
220 LBS/SQ YD ASPH CONC 19mm SUPERPAVE

COMMERCIAL DRIVEWAYS

ASPHALT DRIVES WILL BE PAVED WITH THE FOLLOWING:
135 LBS/SQ YD ASPH CONC 9.5mm SUPERPAVE
440 LBS/SQ YD ASPH CONC 19mm SUPERPAVE

CONCRETE DRIVEWAYS

RESIDENTIAL DRIVES - 6" CONCRETE
COMMERCIAL DRIVES - 8" CONCRETE



SHOULDER DETAIL FOR GUARDRAIL

SEE PLAN FOR LOCATION

(A) SAME AS TYPICAL SECTION
(B) SAME AS TYPICAL SECTION

REVISION DATES	

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
TYPICAL SECTIONS

SHEET NO. 5-02

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0006-00 (833)		

SUPERELEVATION TABLE

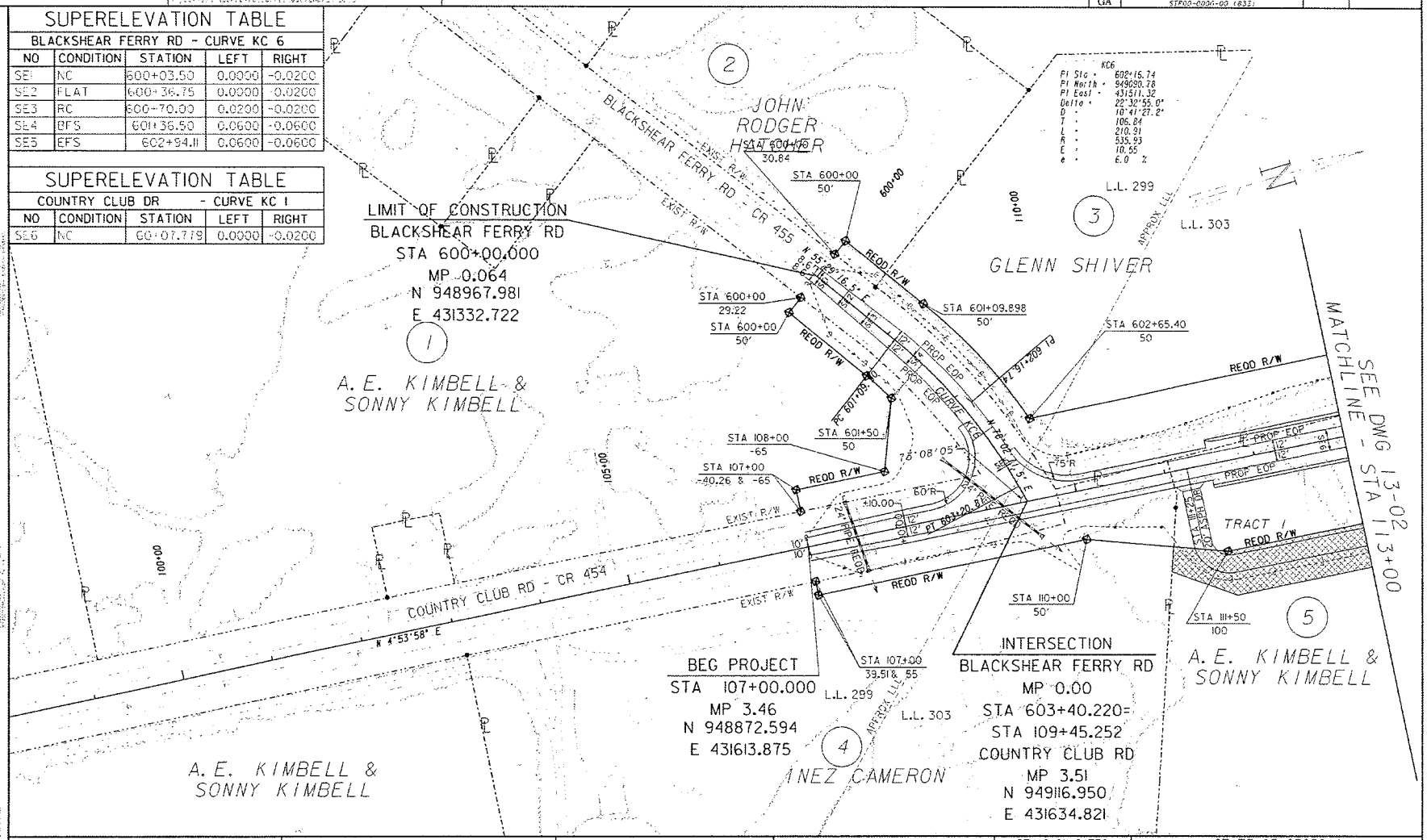
BLACKSHEAR FERRY RD - CURVE KC 6

NO	CONDITION	STATION	LEFT	RIGHT
SE1	NC	600+03.50	0.0000	-0.0200
SE2	FLAT	600+36.75	0.0000	0.0200
SE3	RC	600+70.00	0.0200	-0.0200
SE4	BFS	601+36.50	0.0600	-0.0600
SE5	EFS	602+94.11	0.0600	-0.0600

SUPERELEVATION TABLE

COUNTRY CLUB DR - CURVE KC 1

NO	CONDITION	STATION	LEFT	RIGHT
SE6	NC	60+07.779	0.0000	-0.0200



PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

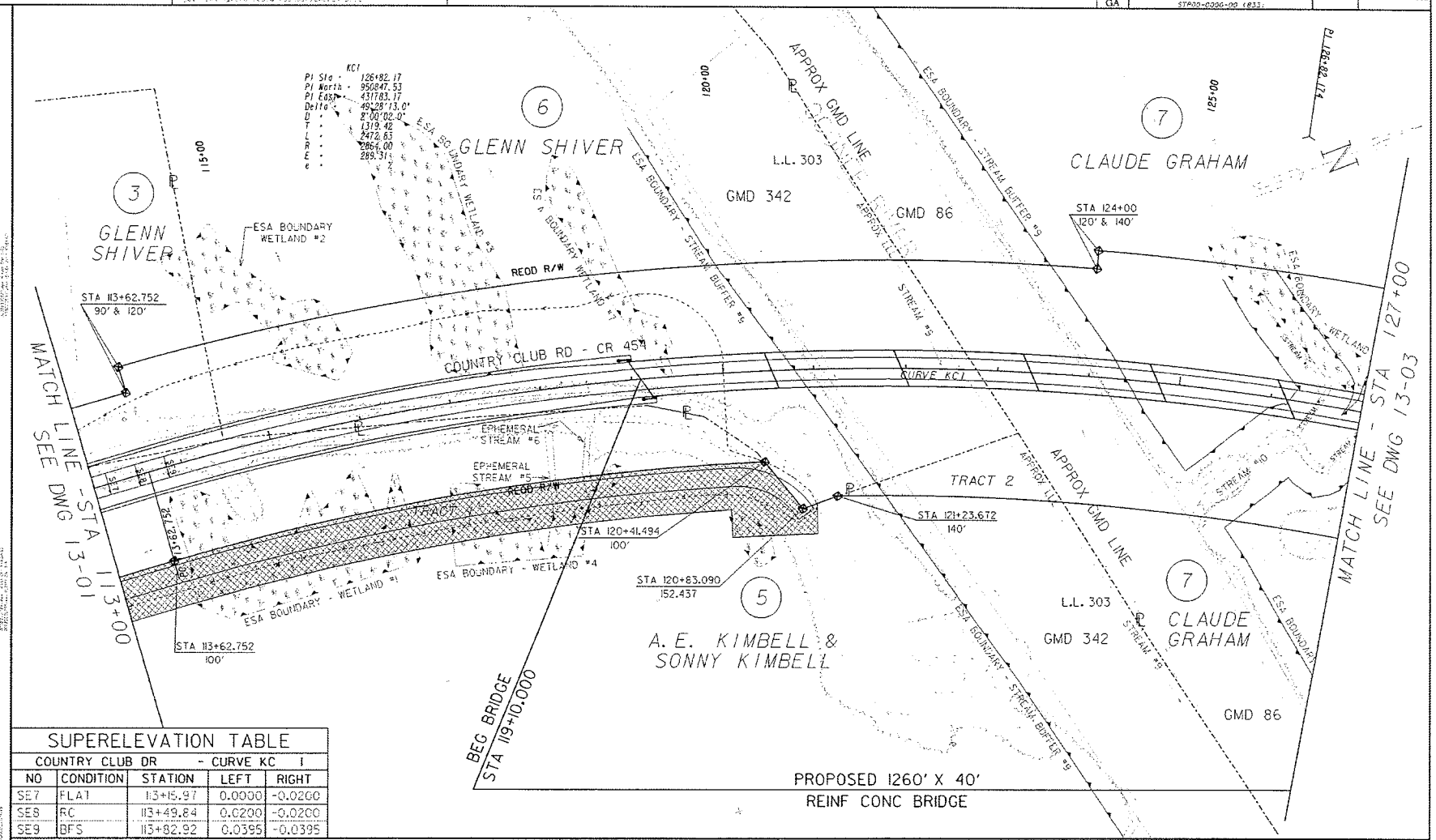
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

MAINLINE PLAN
COUNTRY CLUB RD @ BLACKSHEAR FERRY RD
BEGIN TO STA 113+00
LAURENS COUNTY

DRAWING NO. 13-01

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0300-00 (833)		



SUPERELEVATION TABLE

COUNTRY CLUB DR - CURVE KC 1

NO	CONDITION	STATION	LEFT	RIGHT
SE7	FLAT	113+15.97	0.0000	-0.0200
SE8	RC	113+49.84	0.0200	-0.0200
SE9	BFS	113+82.92	0.0395	-0.0395

PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

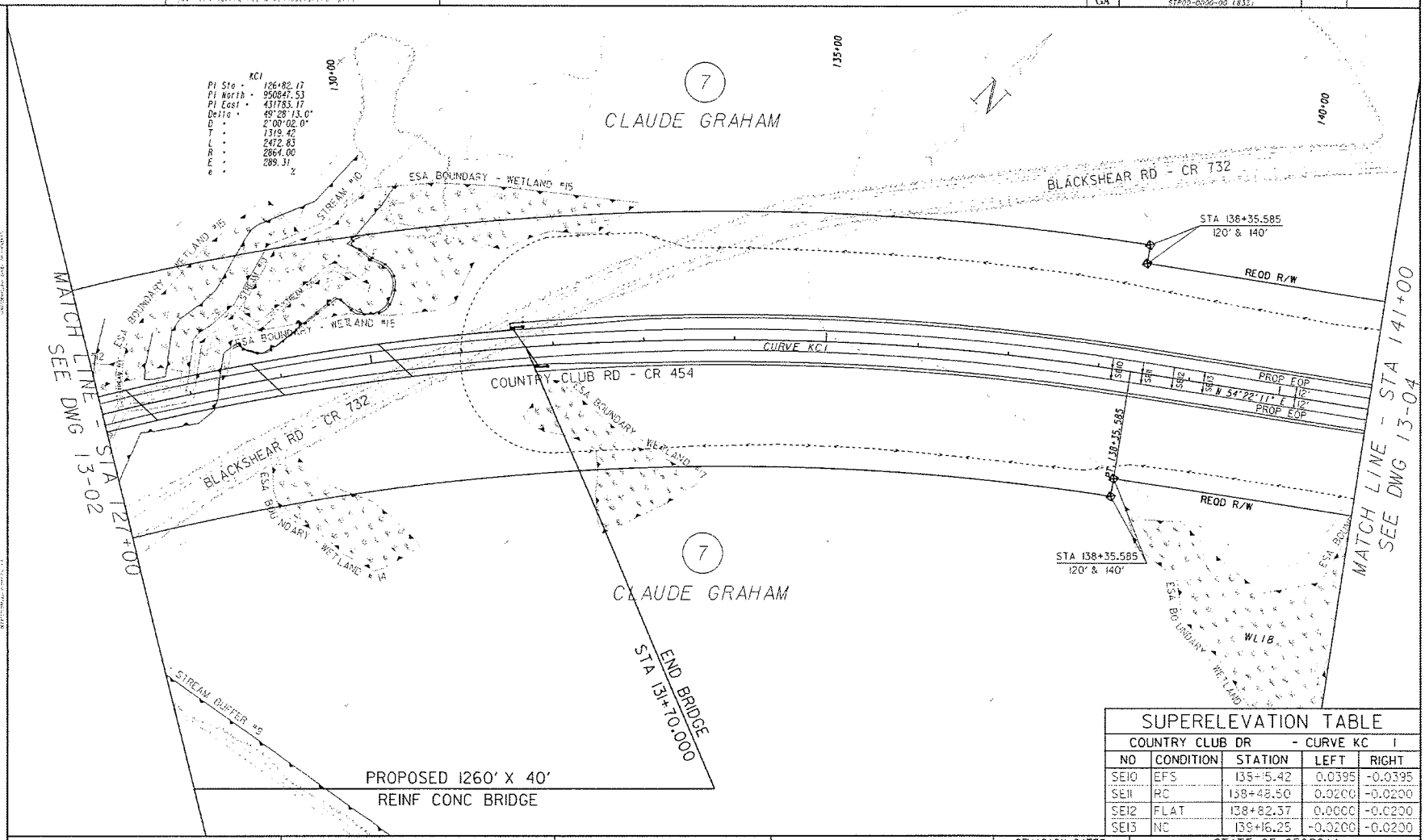
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

MAINLINE PLAN
COUNTRY CLUB RD
STA 113+00 TO STA 127+00
LAURENS COUNTY

DRAWING NO. 13-02

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0006-00 (833)		



SUPERELEVATION TABLE

COUNTRY CLUB DR - CURVE KC 1

NO	CONDITION	STATION	LEFT	RIGHT
SE10	EFS	135+15.42	0.0395	-0.0395
SE11	RC	138+48.50	0.0200	-0.0200
SE12	FLAT	138+82.37	0.0000	-0.0200
SE13	NC	139+16.25	-0.0200	-0.0200

PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

REVISION DATES

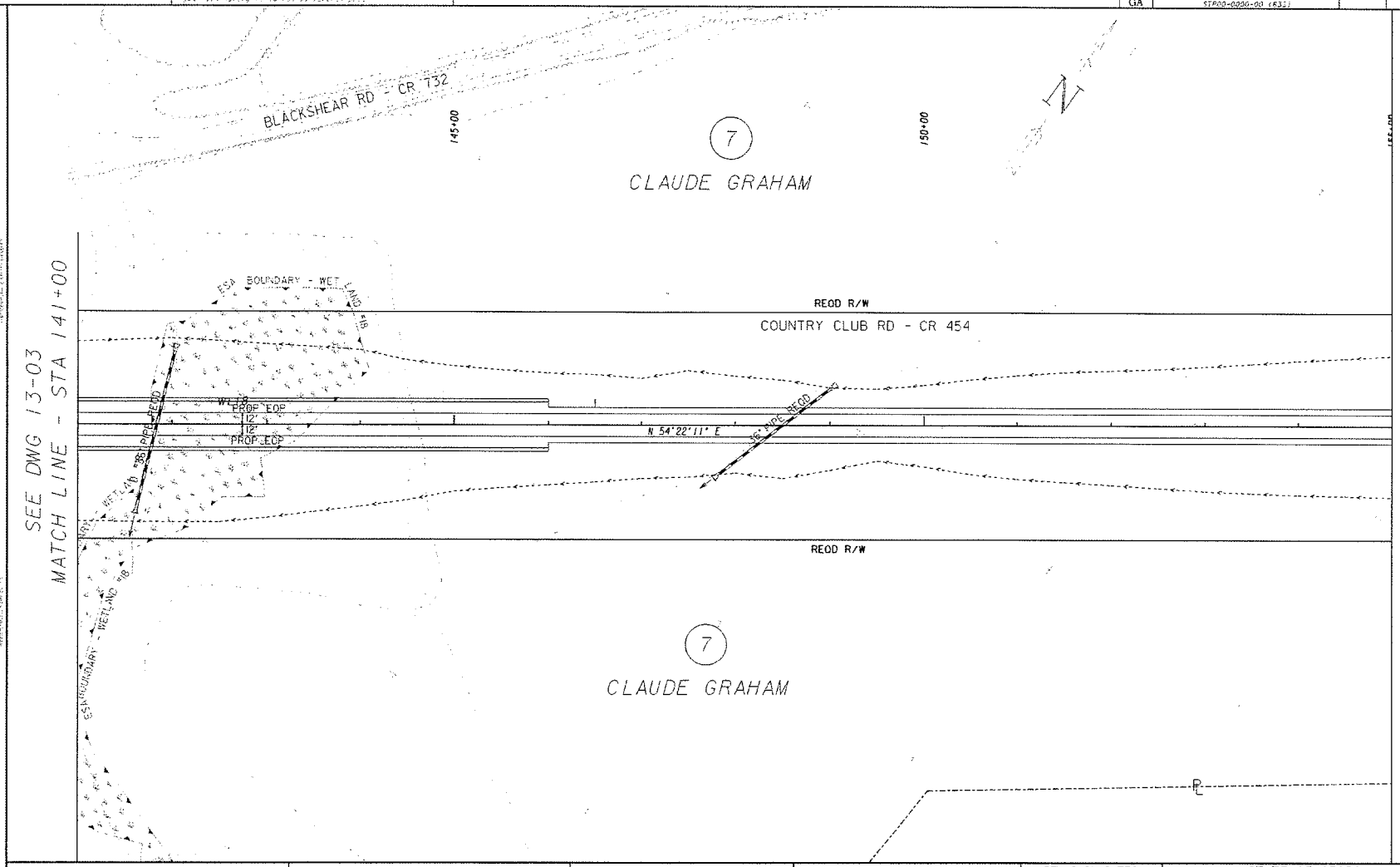
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

MAINLINE PLAN

COUNTRY CLUB RD
STA 127+00 TO 141+00
LAURENS COUNTY

DRAWING NO. 13-03

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0000-00 (833)		



PROPERTY AND EXISTING R/W LINE	BEGIN LIMIT OF ACCESS.....	BLA
REQUIRED R/W LINE	END LIMIT OF ACCESS.....	ELA
CONSTRUCTION LIMITS	LIMIT OF ACCESS	
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES	REQ'D R/W & LIMIT OF ACCESS	
EASEMENT FOR CONSTR OF SLOPES		
EASEMENT FOR CONSTR OF DRIVES		

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

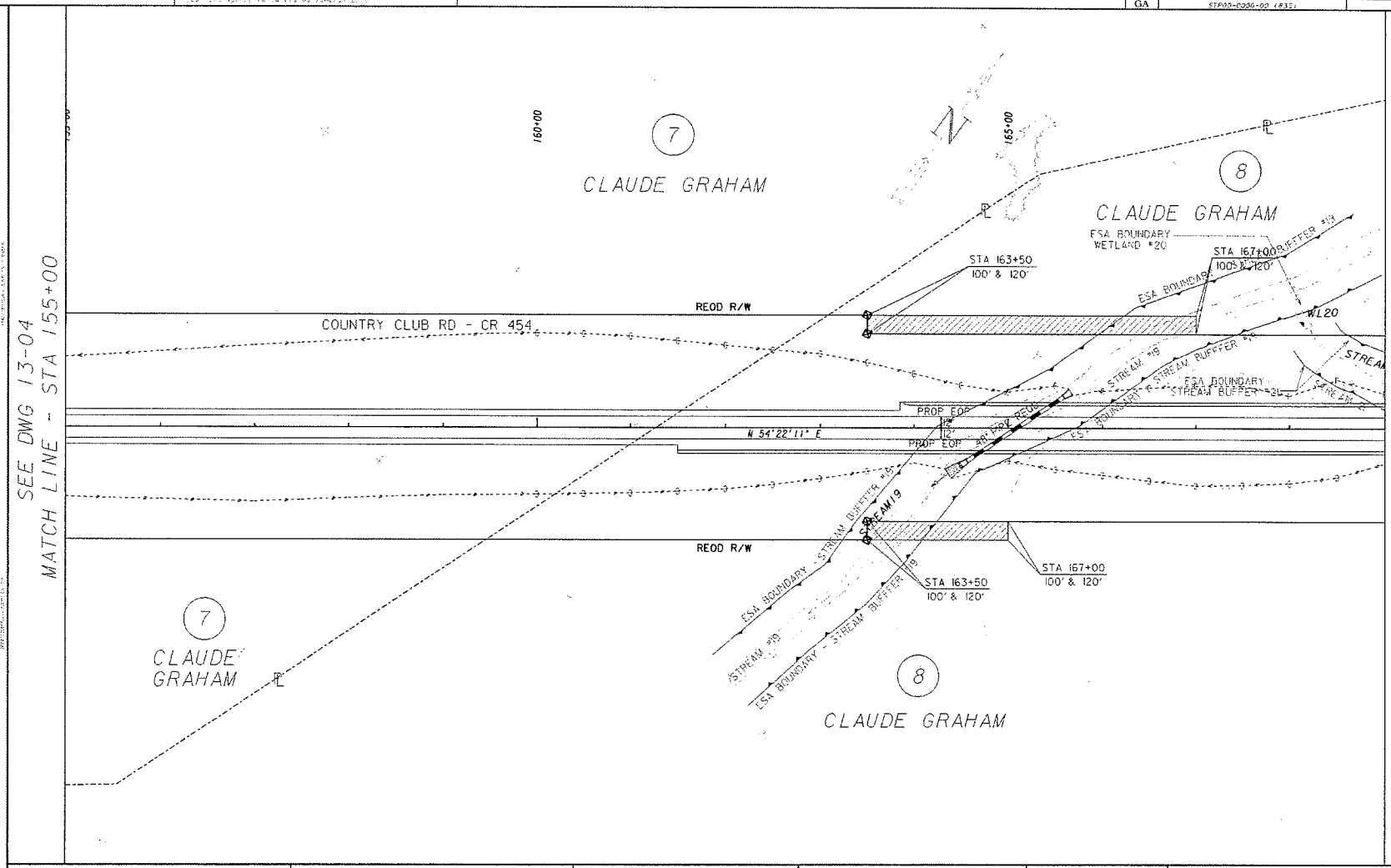
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

MAINLINE PLAN
COUNTRY CLUB RD
STA 141+00 TO STA 155+00
LAURENS COUNTY

DRAWING NO. 13-04

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0006-00 (833)		



PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REO'D R/W & LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

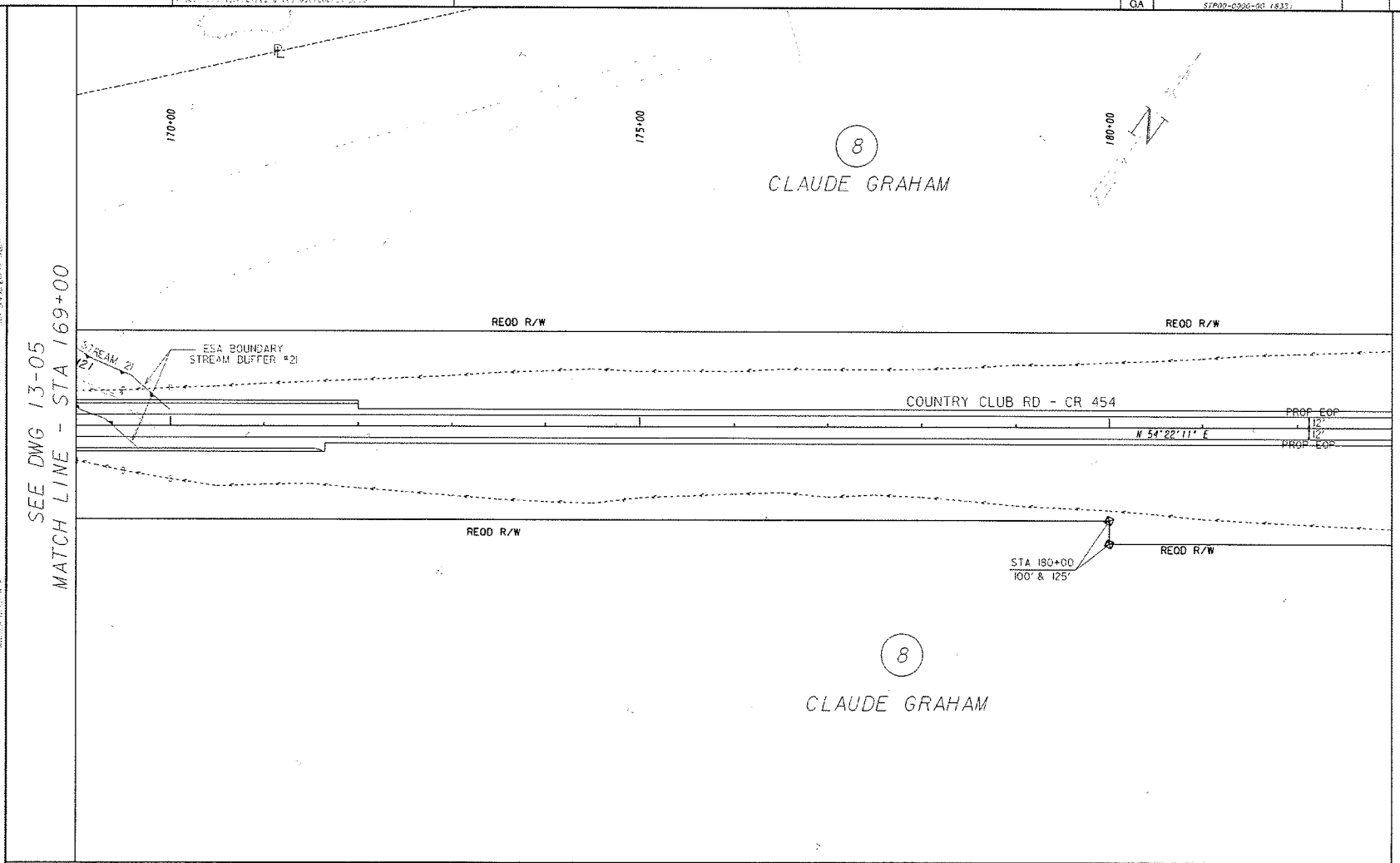
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

MAINLINE PLAN
COUNTRY CLUB RD
STA 155+00 TO STA 169+00
LAURENS COUNTY

SHEET NO. 13-05

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP03-0000-00 (833)		



PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

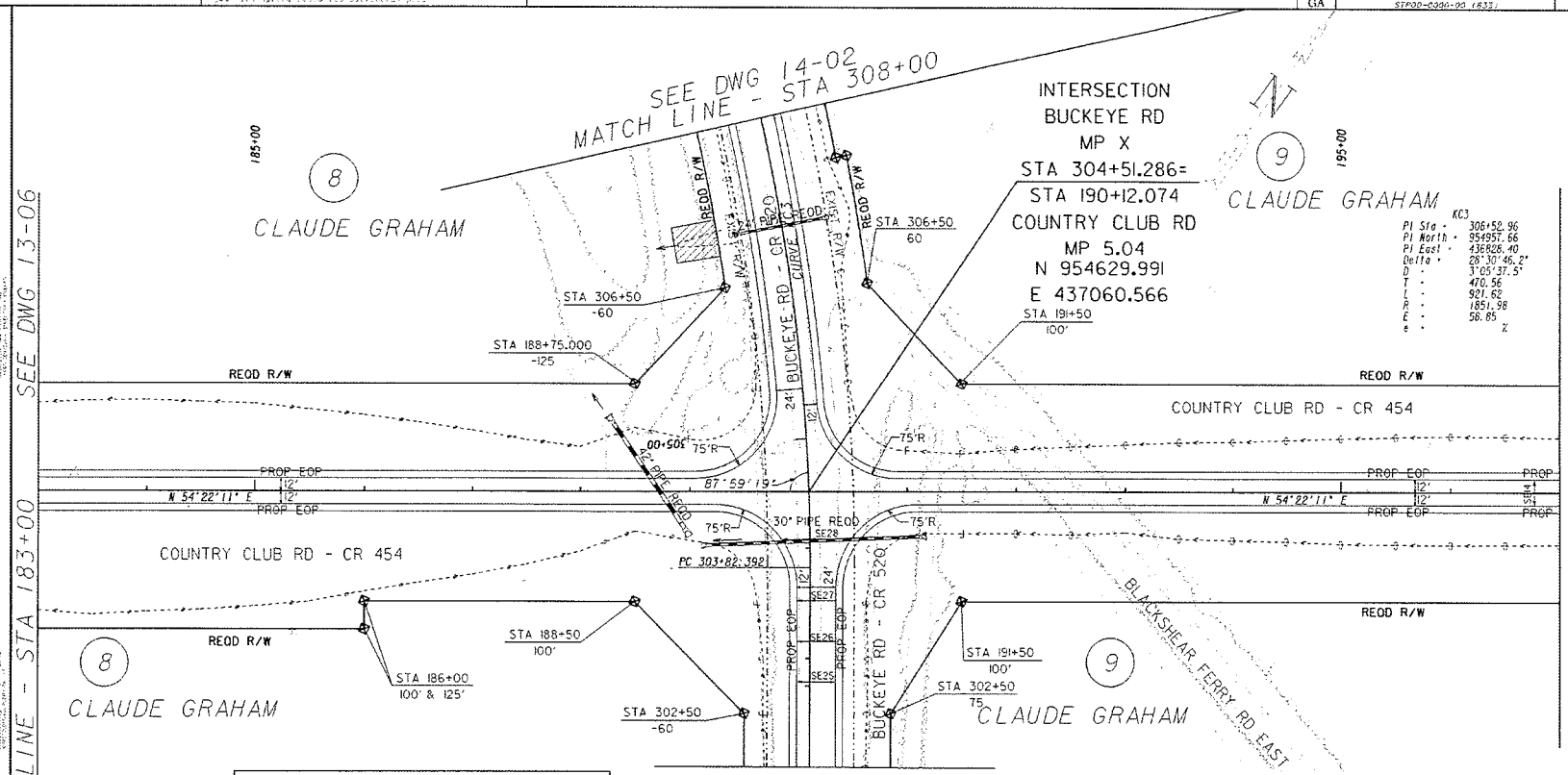
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

MAINLINE PLAN
COUNTRY CLUB RD
STA 169+00 TO STA 183+00
LAURENS COUNTY

SHEET NO. 13-06

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0300-00 (633)		



SUPERELEVATION TABLE

BUCKEYE RD - CURVE KC 3

NO	CONDITION	STATION	LEFT	RIGHT
SE25	NC	302+78.91	0.0000	-0.0200
SE26	FLAT	303+15.58	0.0000	-0.0200
SE27	RC	303+52.26	0.0200	-0.0200
SE28	BFS	304+08.26	-0.0505	0.0505

SUPERELEVATION TABLE

COUNTRY CLUB DR - CURVE KC 2

NO	CONDITION	STATION	LEFT	RIGHT
SE24	NC	196+76.64	0.0000	-0.0200

PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

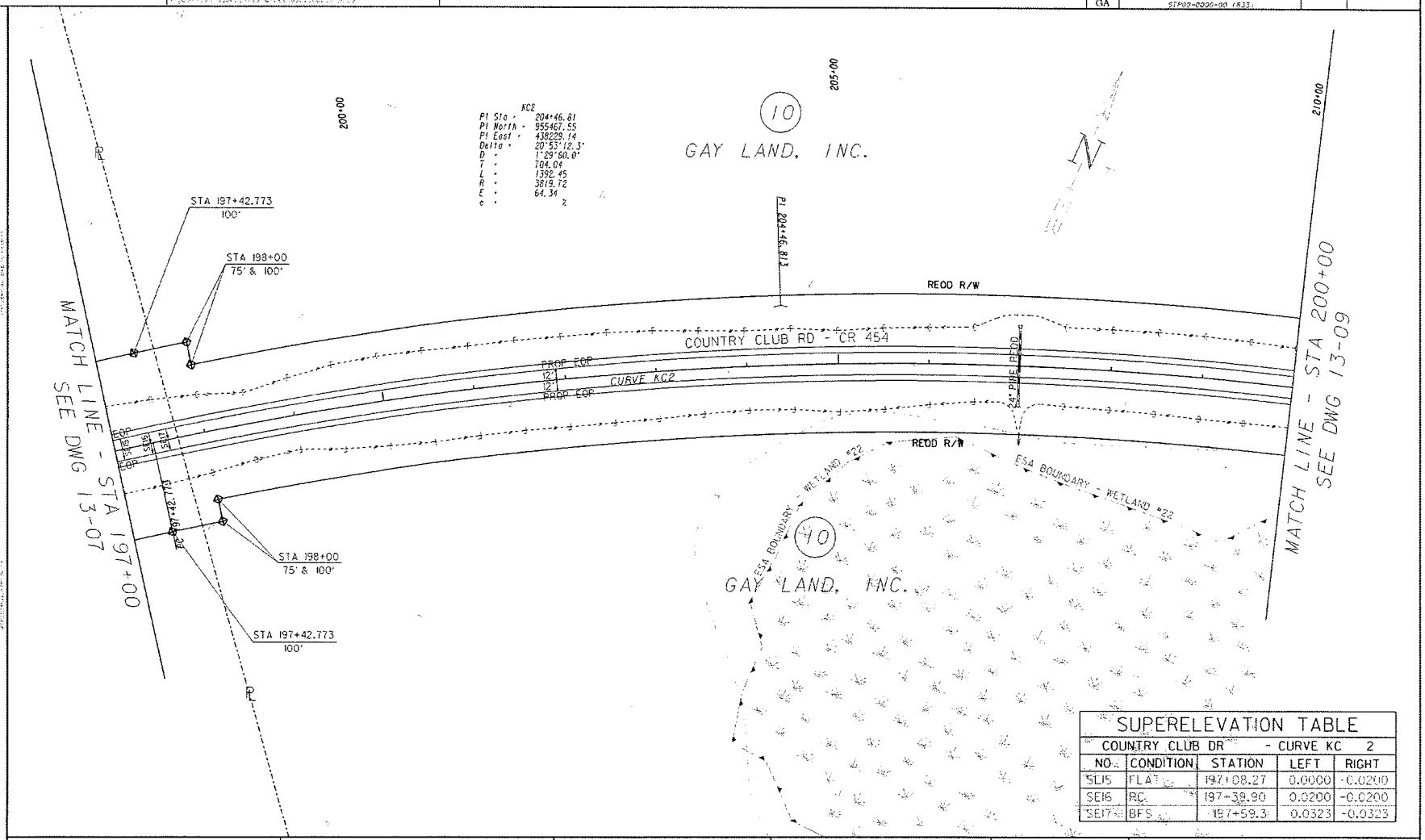
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

MAINLINE PLAN
COUNTRY CLUB RD @ BUCKEYE RD
STA 183+00 TO STA 197+00
LAURENS COUNTY

SHEET NO. 13-07

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0000-00 (633)		



SUPERELEVATION TABLE

COUNTRY CLUB DR - CURVE KC 2

NO.	CONDITION	STATION	LEFT	RIGHT
SLI5	FLAT	197+08.27	0.0000	-0.0200
SEI6	RC	197+38.90	0.0200	-0.0200
SEI7	BFS	197+59.3	0.0323	-0.0323

PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS..... BLA
END LIMIT OF ACCESS..... ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

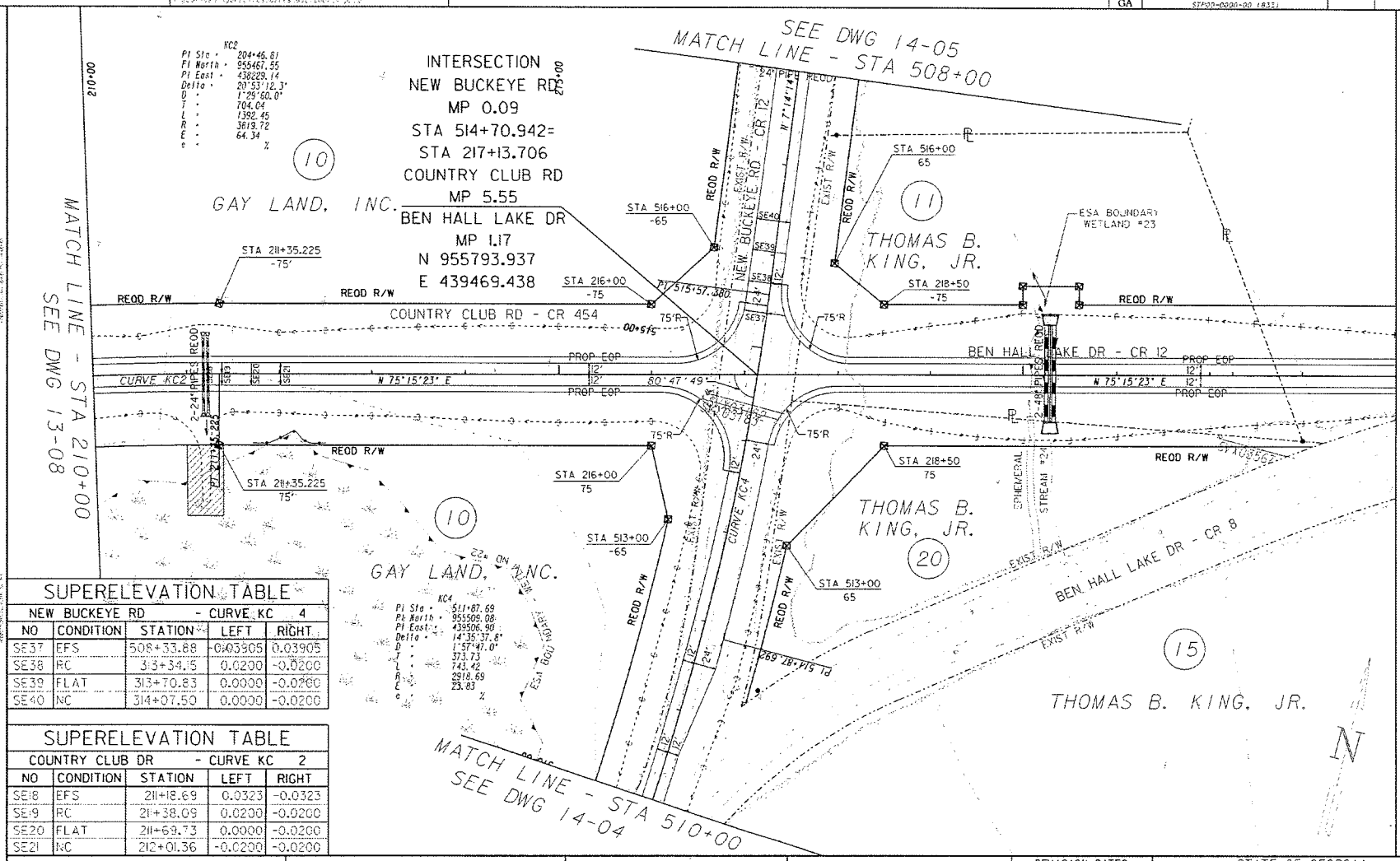
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

MAINLINE PLAN
COUNTRY CLUB RD
STA 197+00 TO STA 200+00
LAURENS COUNTY

DRAWING NO. 13-08

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0000-00 (833)		



SUPERELEVATION TABLE

NEW BUCKEYE RD - CURVE KC 4

NO	CONDITION	STATION	LEFT	RIGHT
SE37	EFS	508+33.88	0.03905	0.03905
SE38	RC	513+34.15	0.0200	-0.0200
SE39	FLAT	513+70.83	0.0000	-0.0200
SE40	NC	514+07.50	0.0000	-0.0200

SUPERELEVATION TABLE

COUNTRY CLUB DR - CURVE KC 2

NO	CONDITION	STATION	LEFT	RIGHT
SE18	EFS	211+18.69	0.0323	-0.0323
SE19	RC	211+38.09	0.0200	-0.0200
SE20	FLAT	211+69.73	0.0000	-0.0200
SE21	NC	212+01.36	-0.0200	-0.0200

PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

SCALE IN FEET
0 50 100 200

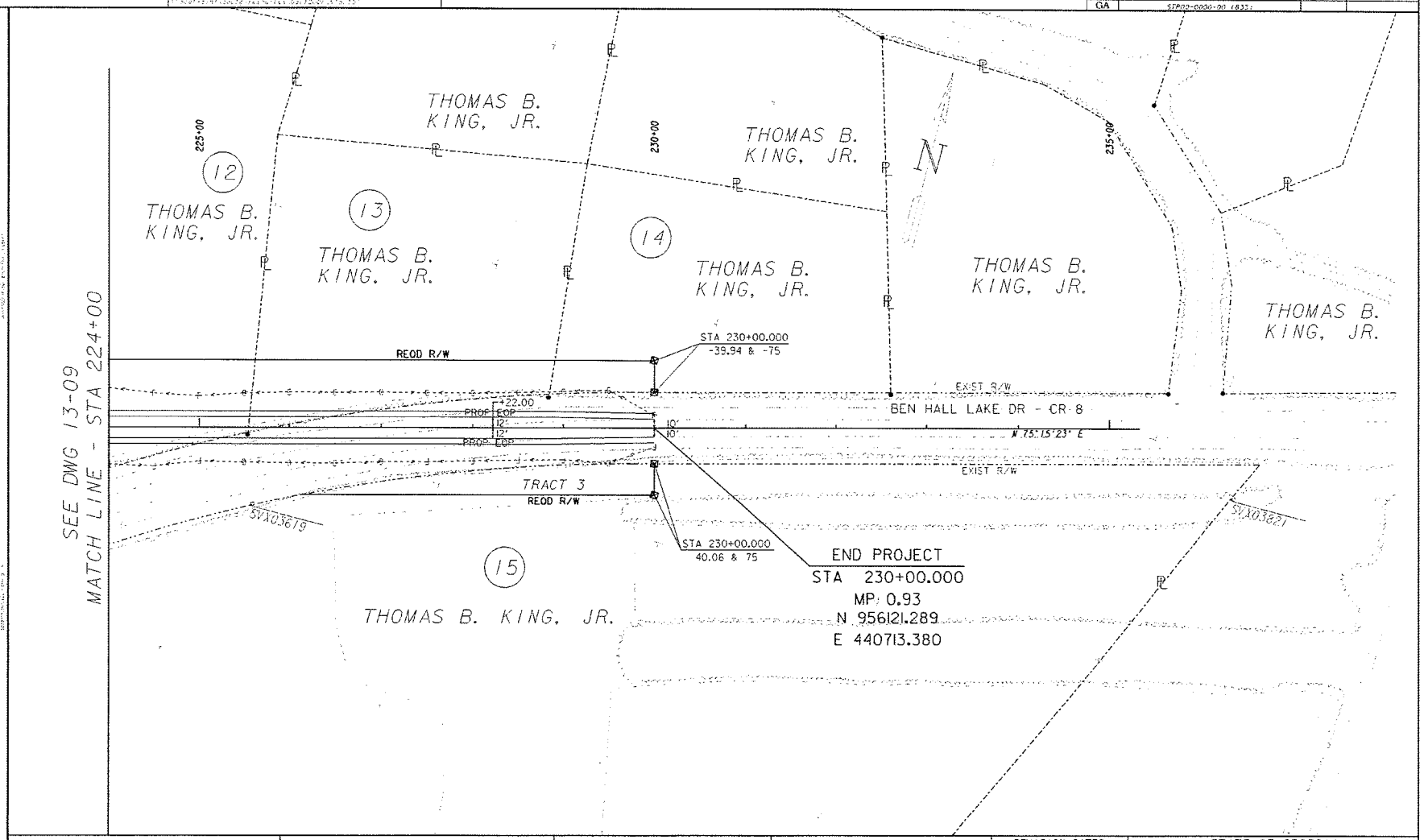
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

MAINLINE PLAN
COUNTRY CLUB RD @ NEW BUCKEYE RD
STA 210+00 TO STA 224+00
LAURENS COUNTY

PLAN SHEET NO. 13-09

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	STP00-0000-00 (833)		



PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
EASEMENT FOR CONSTR OF SLOPES
EASEMENT FOR CONSTR OF DRIVES

BEGIN LIMIT OF ACCESS.....BLA
END LIMIT OF ACCESS.....ELA
LIMIT OF ACCESS
REQ'D R/W & LIMIT OF ACCESS

GEORGIA
DEPARTMENT OF TRANSPORTATION

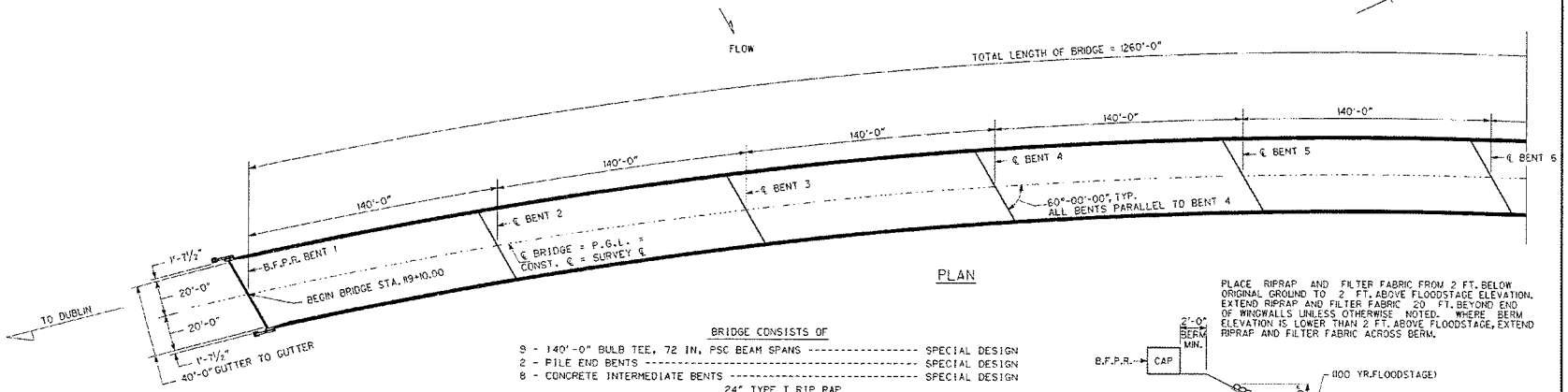
SCALE IN FEET
0 50 100 200

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: TENNILLE DESIGN

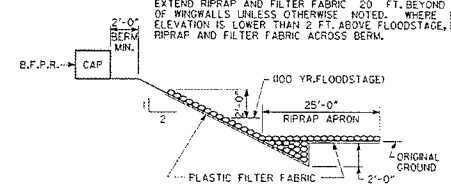
MAINLINE PLAN
COUNTRY CLUB RD
STA 224+00 TO END
LAURENS COUNTY

SHEET NO. 13-10



PLAN

PLACE RIPRAP AND FILTER FABRIC FROM 2 FT. BELOW ORIGINAL GROUND TO 2 FT. ABOVE FLOODSTAGE ELEVATION. EXTEND RIPRAP AND FILTER FABRIC 20 FT. BEYOND END OF WINGWALLS UNLESS OTHERWISE NOTED. WHERE BERM ELEVATION IS LOWER THAN 2 FT. ABOVE FLOODSTAGE, EXTEND RIPRAP AND FILTER FABRIC ACROSS BERM.



RIPRAP DETAIL
NO SCALE

BRIDGE CONSISTS OF

9 - 140'-0" BULB TEE, 72 IN. PSC BEAM SPANS ---------- SPECIAL DESIGN
2 - PILE END BENTS ---------- SPECIAL DESIGN
8 - CONCRETE INTERMEDIATE BENTS ---------- SPECIAL DESIGN
24" TYPE I RIP RAP

TRAFFIC DATA

TRAFFIC ---------- ADT = 1,600 (2009)
ADT = 3,000 (2029)
DESIGN SPEED ---------- 55 MPH
TRUCKS ---------- 10 %
24 HR TRUCKS ---------- 12 %

NOTES

CROSS-SLOPE - PROPOSED BRIDGE SHALL HAVE A CONSTANT CROSS SLOPE OF 3.95% SLOPING DOWN TO THE RIGHT.

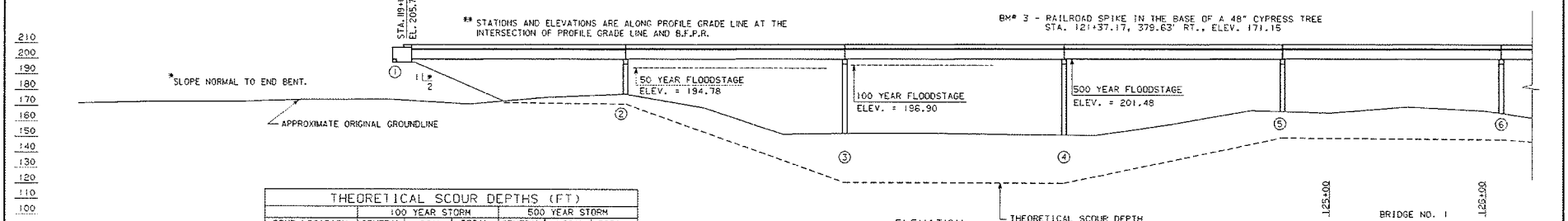
BENT LAYOUT - BENT 4 TO BE 60 DEGREES TO TANGENT OF CENTERLINE. ALL BENTS ARE PARALLEL TO ℄ BENT 4.

BEAM ELEVATION - MINIMUM BOTTOM OF BEAM ELEVATION FOR PROPOSED BRIDGE SHALL BE NO LOWER THAN ELEVATION 197.90.

DESIGN DATA

SPECIFICATIONS ---------- AASHTO 17TH EDITION, 2002
TYPICAL HS20-44 AND/OR MILITARY LOADING ---------- IMPACT ALLOWED
FUTURE PAVING ALLOWANCE ---------- 30 LBS PER SQ FT

UTILITIES
NONE



ELEVATION

THEORETICAL SCOUR DEPTHS (FT)						
	100 YEAR STORM			500 YEAR STORM		
BENT LOCATION	GENERAL	LOCAL	TOTAL	GENERAL	LOCAL	TOTAL
BENT 2	0.0	4.7	4.7	1.1	5.3	6.4
BENTS 3-4	17.0	9.7	26.7	21.1	10.3	31.4
BENTS 5-9	1.1	6.1	7.2	11.0	6.5	17.5

117+00 118+00 119+00 120+00 121+00 122+00 123+00 124+00 125+00 126+00

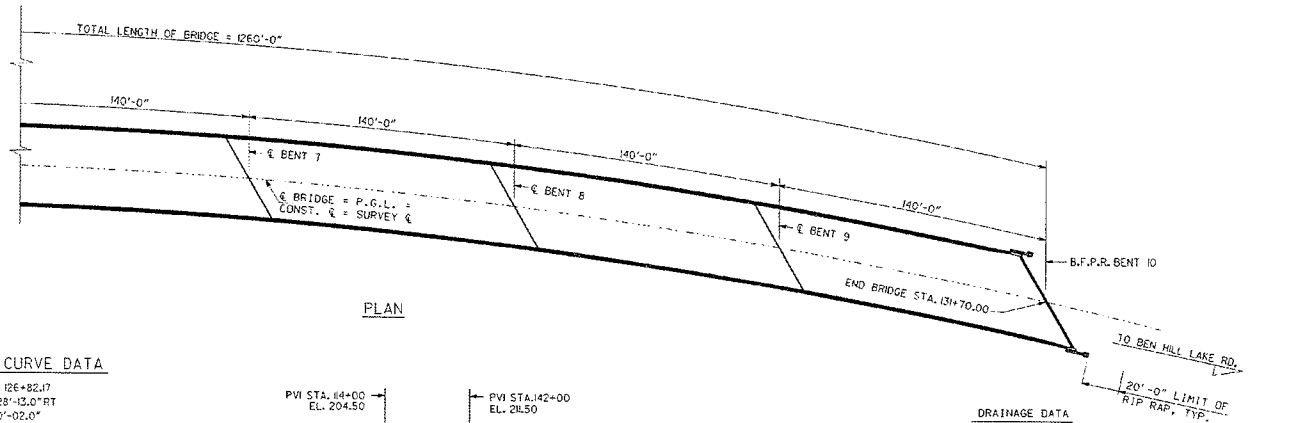
BRIDGE NO. 1

EXISTING BRIDGE SERIAL NO. N/A
EXISTING BRIDGE I.D. NO. N/A
P.I. NO. 0000833

PRELIMINARY LAYOUT
PROJECT : STP00-0000-00(833)
NAME: C.R. 454 (COUNTRY CLUB RD.)
OVER OCONEE RIVER
LAURENS CO.
DRAWN BY : ELS
DATE : MAY 17, 2010
SCALE : 1" = 30'-0"
PREPARED BY : JAB

1 OF 2

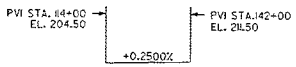
B00000833A.DGN



PLAN

HORIZONTAL CURVE DATA

P.I. STA. = 126+82.17
Δ = 49°-28'-13.0" RT
D = 2°-00'-02.0"
T = 1319.42 FT
L = 2472.83 FT.
R = 2864.00 FT.
S.E. = 0.0395%

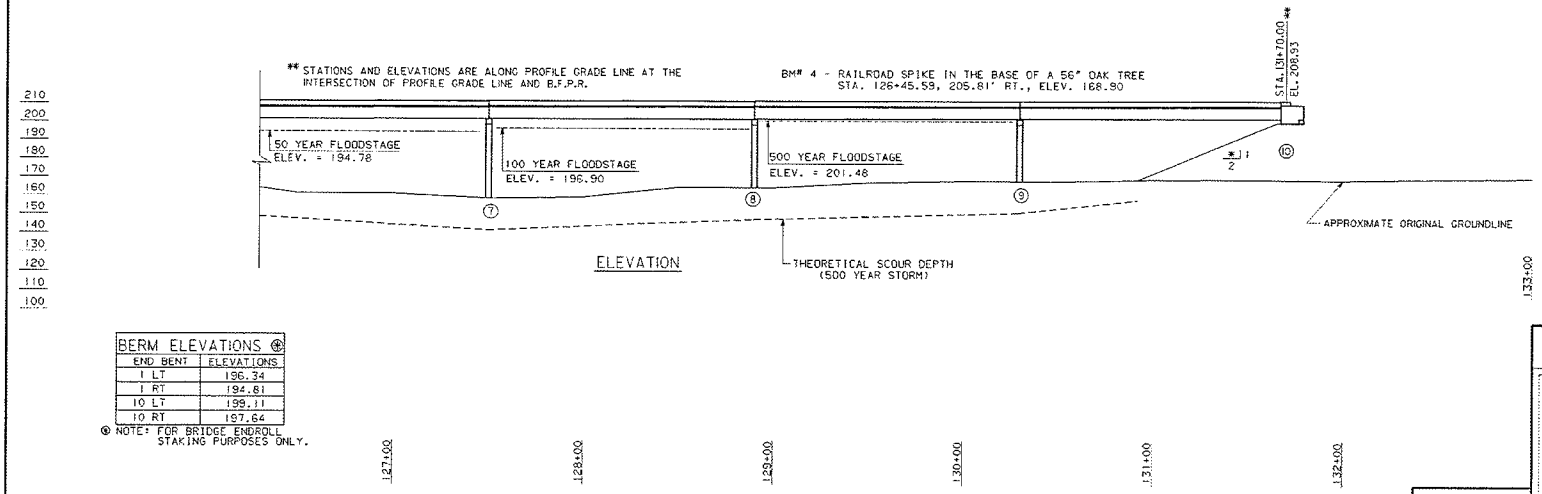


PROPOSED VERTICAL CURVE

DRAINAGE DATA

DRAINAGE AREA ---------- 4284 SQ MILES

FLOOD FREQUENCY	TOTAL DISCHARGE	MEAN VELOCITY	AREA OF OPENING UNDER FLOODSTAGE	BACKWATER
50 YEAR	94,100 CFS	2.73 FPS	34,513 SQ FT	0.18 FT
100 YEAR	107,000 CFS	2.88 FPS	37,133 SQ FT	0.20 FT
500 YEAR	139,000 CFS	3.43 FPS	40,520 SQ FT	0.39 FT



ELEVATION

BERM ELEVATIONS ⊛	
END BENT	ELEVATIONS
1 LT	196.34
1 RT	194.81
10 LT	199.11
10 RT	197.64

⊛ NOTE: FOR BRIDGE ENDROLL STAKING PURPOSES ONLY.

BRIDGE NO. 1
EXISTING BRIDGE SERIAL NO. N/A
EXISTING BRIDGE I.D. NO. N/A
F.I. NO. 0000833

PRELIMINARY LAYOUT
PROJECT : STP00-0000-00(833)
NAME: C.R. 454 (COUNTRY CLUB RD.)
OVER OCONEE RIVER
LAURENS CO.
DRAWN BY : ELS
DATE : MAY 17, 2010
PREPARED BY : JAB
SCALE : 1" = 30'-0"

2 OF 2

B0000833A.DGN

SECTION FOUR - VALUE ANALYSIS AND CONCLUSIONS

GENERAL

This section describes the value methodology followed during the value engineering study on the New Oconee River Crossing From Country Club Drive to Ben Hall Lake Dive, STP00-0000-00(833), Laurens County, P.I. No. 0000833, project for the GDOT. The workshop was performed at the conceptual design completion stage. GDOT District #2 has provided information for the VE team to use as the basis of the study.

A systematic approach was used in the VE study, which was divided into three parts: (1) Preparation Effort, (2) Workshop Effort, and (3) Post-Workshop Effort. A task flow diagram outlining each of the procedures included in the VE study is attached for reference.

Following this description of the VA procedure, separate narratives and supporting documentation identify the following:

- VE workshop participants
- Economic data
- Cost model
- Function analysis
- Creative ideas and evaluations

PREPARATION EFFORT

Preparation for the workshop consisted of scheduling workshop participants and tasks and gathering necessary project documents for team members to review before attending the workshop. Documents such as those listed below were used as the basis for generating VE alternatives and for determining the cost implications of the selected VE alternatives:

- State Highway Agency Job Detail Estimate New Oconee RVR Xing Frm Country Club Rd to Ben Hall Lake Rd, dated 02/08/2011, prepared by GDOT
- Preliminary Right of Way Cost Estimate, STP-0000-00(833) Lauren, dated July 08, 2009, prepared by GDOT
- VE Study Constraints prepared by Sean Bush of GDOT
- Approved Project Concept Report, P.I. No. 0000833, Laurens County, STP-0000-00(833), New Oconee River Crossing, dated March 30, 2006, prepared by GDOT

Information relating to the project's purpose and need, owner concerns, project stakeholder concerns, design criteria, project constraints, funding sources and availability, regulatory agency approval requirements, and the project's schedule and costs is very important as it provides the VE team with insight about how the project has progressed to its current state.

Value Engineering Study Task Flow Diagram

Preparation Effort

Coordination Project
- Verify Schedule
- Suggest Format for Designer Presentation
- Outline Project Responsibilities
- Outline Needed Background Data
- Define *Project Value Objectives*
- Identify Project Constraints

→

Prepare for Workshop
- Collect Project Data
- Distribute Data to Team Members
- Team Members Become Familiar with Project

→

Construct Cost Models
- Construct Cost Models
- Construct Graphic Function Analysis
- Outline High Cost Areas

→

LCC Model
- Roadway
- Bridges
- MOT
- Energy
- User Impact

Workshop Effort

Information Phase
- Introduction by VETL
- Project Description and Presentation by Designer
- Outline Owner Requirements
- Review Project Data
- Visit Project Site (Alt.)

→

Function Identification and Analysis Phase
- Analyze Project Costs and Energy Usage
- Perform Function Analysis and FAST Diagram
- Identify High Cost and Energy Areas
- Calculate Cost/Worth Ratios
- Identify Paradigms

List Ideas Generated During Function Analysis

→

Speculation Phase
- Introduction by VETL
- Creative Idea Listing:
  - Quantity of ideas
  - Association of Ideas
- Brainstorm
- Do Creative Thinking
  - Group Thinking
  - Individual Thinking
- Use Checklist for Ideas

→

Evaluation Phase
- Eliminate Impractical Ideas
- Rank Ideas with Advantages/ Disadvantages
- Evaluate Alternatives (Include Non-Economic considerations: Safety, Reliability, Environment, Aesthetics, O&M, etc.)
- Select Best Ideas for Implementation

→

Development Phase
- Develop Proposed Alternatives
- Prepare Alternative Design Sketches
- Estimate Costs
- Perform Life Cycle Comparison
  - Initial Cost
  - Redesign Cost
  - O&M Cost
  - LCC Cost

→

Presentation Phase
- Summarize Findings
- Present VE Ideas to Owner/ User/Designer
- Oral Presentation

Post-Workshop Effort

VE Study Report
- Develop Implementation VE Report
- Designer Prepares Responses to VE Report
- Owner Evaluates Recommendations

→

Implementation Phase
- Participate in Implementation Meeting with Owner/User/ Designer/ VE Team, as needed
- Prepare Final VE Report

→

Final Acceptance
- Redesign by Designer

Project cost information provided by the designers is used by the VE team as the basis for a comparative analysis with similar projects. To prepare for this exercise, the VE team leader used the cost estimate prepared by GDOT to develop a cost model for the project. The model was used to distribute the total project cost among the various elements of the project. The VE team used this model to identify the high-cost elements that drive the project and the element providing little or no value so that the team could focus on reducing or eliminating their impact.

VALUE ENGINEERING WORKSHOP EFFORT

The VE workshop was a three and one-half-day effort beginning with an orientation/kickoff meeting on Monday, March 14, 2011, and concluding with the final VE Presentation on Thursday, March 17, 2011. During the workshop, the VE Job Plan was followed in compliance with the U.S. Federal Highway Administration guidelines for conducting a VE study. The Job Plan guided the search for alternatives to mitigate or eliminate high-cost drivers, secondary functions providing little or no value, and potential project risks. Alternatives to specifically address the owner's project concerns and enhance value by improving operations, reducing maintenance requirements, enhancing constructability, and providing missing functions were also considered. The Job Plan includes six phases:

- Information Phase
- Function Identification and Analysis Phase
- Creative/Speculation Phase
- Evaluation of Creative Ideas Phase
- Alternative Development Phase
- Presentation Phase

Information Phase

At the beginning of the study, the decisions that have influenced the project's design and proposed construction methods have to be reviewed and understood. For this reason, the workshop began with a presentation of the project by GDOT to the team. The presentation highlighted the information provided in the documentation reviewed by the VE team before the workshop and expanded on it to include a history of the project's development and any underlying influences that caused the design to develop to its current state. During this presentation, VE team members were given the opportunity to ask questions and obtain clarification about the information provided.

Function Identification and Analysis Phase

Having gained some information on the project, the VE team proceeded to define the functions provided by the project, identifying the costs to provide these functions, and determining whether the value provided by the functions has been optimized. Function analysis is a means of evaluating a project to see if the expenditures actually perform the requirements of the project or if there are disproportionate amounts of money spent on support functions. Elements performing support functions add cost to the project but have a relatively low worth to the basic function.

Function is defined as the intended use of a physical or process element. The team attempted to identify functions in the simplest manner using measurable noun/verb word combinations. To accomplish this,

the team first looked at the project in its entirety and randomly listed its functions, which were recorded on Random Function Analysis Worksheets (provided in the Function Identification and Analysis section). Then the individual function(s) of the major components of the project depicted on the cost models were identified.

After identifying the functions, the team classified the functions according to the following:

Abbreviation	Type of Function	Definition
HO	Higher Order	The primary reason the project is being considered or project goal.
B	Basic	A function that must occur for the project to meet its higher order functions.
S	Secondary	A function that occurs because of the concept or process selected and may or may not be necessary.
R/S	Required Secondary	A secondary function that may not be necessary to perform the basic function but must be included to satisfy other requirements or the project cannot proceed.
G	Goal	Secondary goal of the project.
O	Objective	Criteria to be met
LO	Lower Order	A function that serves as a project input.

Higher order and basic functions provide value, while secondary functions tend to reduce value. The goal of the next job phase is to reduce the impact of secondary functions and thereby enhance project value.

To further clarify the impact of the various functions, the team assigned costs to provide the functions or group of functions indicated by a specific project element using the cost estimate and cost models. Where possible, they seek to find the lowest cost, or worth, to perform the function. This is accomplished using published data from other sources or team knowledge obtained from working on other similar projects to establish cost goals and then comparing them to the current costs. By identifying the cost and worth of a function or group of functions, cost/worth ratios were calculated. Cost/worth ratios greater than one indicated that less than optimum value was being provided. Those project functions or elements with high cost/worth ratios became prime targets for value improvement.

As well as looking at areas with high cost/worth ratios, the team used the cost models previously prepared to seek out the areas where most of the project funds are being applied. Because of the absolute magnitude of these high-cost elements or functions, they also became initial targets for value enhancement.

Overall, these exercises stimulated the VE team members to focus on apparently low value areas and initially channel their creative idea development in these places.

Creative/Speculation Phase

This VE study phase involved the creation and listing of ideas. Starting with the functions or project elements with high cost/worth ratios, a high absolute cost compared to other elements in the project, and secondary functions providing little or no value and using the classic brainstorming technique, the

VE team began to generate as many ideas as possible to provide the necessary functions at a lower total life cycle cost, or to improve the quality of the project. Ideas for improving operation and maintenance, reducing project risk, and simplifying constructability were also encouraged. At this stage of the process, the VE team was looking for a large quantity of ideas and free association of ideas. A Creative Idea Listing worksheet was generated and organized by the function or project element being addressed.

GDOT may wish to review these creative lists since they may contain ideas that were not pursued by the VE team but can be further evaluated for potential use in the design.

Evaluation Phase

Since the goal of the Creative/Speculation Phase was to conceive as many ideas as possible without regard for technical merit or applicability to the project goals, the Evaluation Phase focused on identifying those ideas that do respond to the project value objectives and are worthy of additional research and development before being presented to the owner. The selection process consisted of the VE team evaluating the ideas originated during the Creative/Speculation Phase based on GDOT's value objectives identified through conversations during the opening presentation. Based on the team's understanding of the owner's value objectives, each idea was compared with the present design concept, and the advantages and disadvantages of each idea were discussed. How well an idea met the design criteria was also reviewed.

Based on the results of these reviews, the VE team rated the idea by consensus using a scale of 1 to 5, with 5 or 4 indicating an idea with the greatest potential to be technically sound and provide cost savings or improvements in other areas of the project, 3 indicating an idea that provides marginal value but could be used if the project was having budget problems, 2 indicating an idea with a major technical flaw, and 1 indicating an idea that does not respond to project requirements. Generally, ideas rated 4 and 5 are pursued in the next phase and presented to the owner during the Presentation Phase.

The team also used the designation "DS" to indicate a design suggestion, which is an idea that may not have specific quantifiable cost savings but may reduce project risk, improve constructability, help to minimize claims, enhance operability, ease maintenance, reduce schedule time, or enhance project value in other ways. Design suggestions could also increase a project's cost but provide value in areas not currently addressed. These are also developed in the next phase of the VE process.

Development Phase

In this phase, each highly rated idea was expanded into a workable solution designated as a VE alternative. The development consisted of describing the current design and the alternative solution, preparing a life cycle cost comparison where applicable, describing the advantages and disadvantages of the proposed alternative solution, and writing a brief narrative to compare the original design to the proposed change and provide a rationale for implementing the idea into the design. Sketches and design calculations, where appropriate, were also prepared in this part of the study. The VE alternatives are included in the Section Two of this report.

Design suggestions include the same information as the alternatives except that no cost analysis is performed. They too are included in Section Two.

Presentation Phase

The goals of the last phase of the workshop were to summarize the results of the study, to prepare draft Summary of Potential Cost Savings worksheets to hand out at the presentation, and to present the key VE alternatives and design suggestions to GDOT design team. The presentation was held on Thursday, March 17, 2011, at the GDOT Headquarters office in Atlanta, Georgia. The purpose of the meeting was to provide the attendees with an overview of the suggestions for value enhancement resulting from the VE study and afford them the opportunity to ask questions to clarify specific aspects of the alternatives presented. Procedures for implementing the results of the study were discussed, and arrangements were made for the reviewers of the VE report to contact the VE team in order to obtain further clarifications, if necessary. Draft copies of the Summary of Potential Cost Savings worksheets were given to the owner and design team to facilitate a timely review and speedy implementation of the selected ideas.

POST-WORKSHOP EFFORT

The post-workshop portion of the VE study consisted of the preparation of this VE Study Report. Personnel from GDOT design team will analyze each alternative and prepare a short response, recommending incorporation of the alternative into the project, offering modifications before implementation, or presenting reasons for rejection. LZA is available at your convenience as you review the alternatives. Please do not hesitate to call on us for clarification or further information as you consider an implementation approach.

Upon completing the design team review, GDOT will decide which alternatives to implement.

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise in the unique project elements involved with the New Oconee Bridge Crossing From Country Club Road to Ben Hall Lake Drive project. The multidisciplinary team comprised professionals with highway design and construction experience and a working knowledge of VE procedures. The following lists the VE team members:

Participant	Specialization	Affiliation
Joe Leoni, PE	Highway Design	ARCADIS U.S., Inc.
Jim Aitken, PE	Bridge/Structural Engineering	ARCADIS U.S., Inc.
Harley Griffin	Constructability	Delon Hampton Associates
Howard B. Greenfield, PE, CVS	VE Team Leader	Lewis & Zimmerman Associates

DESIGNER'S PRESENTATION

An overview of the project was presented on Monday, March 14, 2011, by representatives from the GDOT District #2 design team. The purpose of this meeting, in addition to being an integral part of the Information Phase of the VE study, was to bring the VE team up-to-speed regarding the overall project specifics. Additionally, the meeting afforded the owner and design team the opportunity to highlight in greater detail those areas of the project requiring additional or special attention. An attendance list for the meeting is attached.

VALUE ENGINEERING TEAM'S PRESENTATION

A VE presentation was conducted by the VE team on Thursday, March 17, 2011, at the GDOT Headquarters office in Atlanta, Georgia to review VE alternatives with GDOT. Copies of the Draft Summary of Potential Cost Savings worksheet were provided to the attendees. Attendees checked off their names on the attendance list from the opening presentation.

GDOT VE STUDY SIGN-IN SHEET

Meeting Days | Project No.: STP00-0000-00(833) P.I. No. 0000833 | County: Laurens | Date: Mar. 14-17, 2011

IN-BRIEF	OUT-BRIEF	NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	✓	Lisa L. Myers		Engineering Services	404-631-1770	lmyers@dot.ga.gov
✓	✓	Matt Sanders		Engineering Services	404-631-1752	msanders@dot.ga.gov
✓	✓	James K. Magnus		Construction	404-631-1971	jmagnus@dot.ga.gov
✓	✓	Bill DuVall		GDOT Bridge Design	404-631-1883	bduvall@dot.ga.gov
✓		Ken Werho		Traffic Operations	404-635-8144	kwerho@dot.ga.gov
✓	✓	Ron Wishon		Engineering Services	404-631-1753	rwishon@dot.ga.gov
✓		Howard Greenfield		Lewis & Zimmerman Assoc.	410-381-1990x20	hgreenfield@lza.com
✓	✓	Joe Leoni		ARCADIS	770-384-8666	joe.leoni@arcadis-us.com
✓	✓	Jim Aitken		ARCADIS	770-431-8666	michael.moilanen@arcadis-us.com
✓	✓	Harley Griffin		Delon Hampton & Assoc.	404-524-8030	hgriffin@delonhampton.com
✓		Douglas Smith		GDOT	478-552-4642	asmith@dot.ga.gov
✓		Sean Bush		GDOT	478-552-4641	sbush@dot.ga.gov
✓	✓	Jason Brown		GDOT	478-552-4645	jasbrown@dot.ga.gov
✓		George Brewer		GDOT	478-552-4629	gbrewer@dot.ga.gov
✓	✓	Marc Jordan		GDOT	478-552-4658	mjordan@dot.ga.gov

Check all that attend

10 Attended Project Overview (Day 1)
5 via video District #2

9 Attended Project Presentation (Day 4)
2 via video District #2

ECONOMIC DATA

The comparisons of life cycle costs between the VE alternatives and the current design solutions were performed on the basis of discounted present worth. To accomplish this, the VE team developed economic criteria to use in its calculations based on information gathered from GDOT and the design team. The following parameters were used when calculating discounted present worth:

Year of Analysis:	2011
Construction Start Date:	Unknown
Construction Completion Date:	Unknown
Planning Period (n):	20
Discount Rate (i):	3%

COST MODEL

The VE team prepared a Pareto Chart, or Cost Histogram, for the project that follows this page. This Cost Histogram displays the major construction elements identified in the cost estimate prepared by the designer in descending order of magnitude and thus identifies the high cost areas in the project. The high cost elements provide the VE team with one focus for its work during the study.

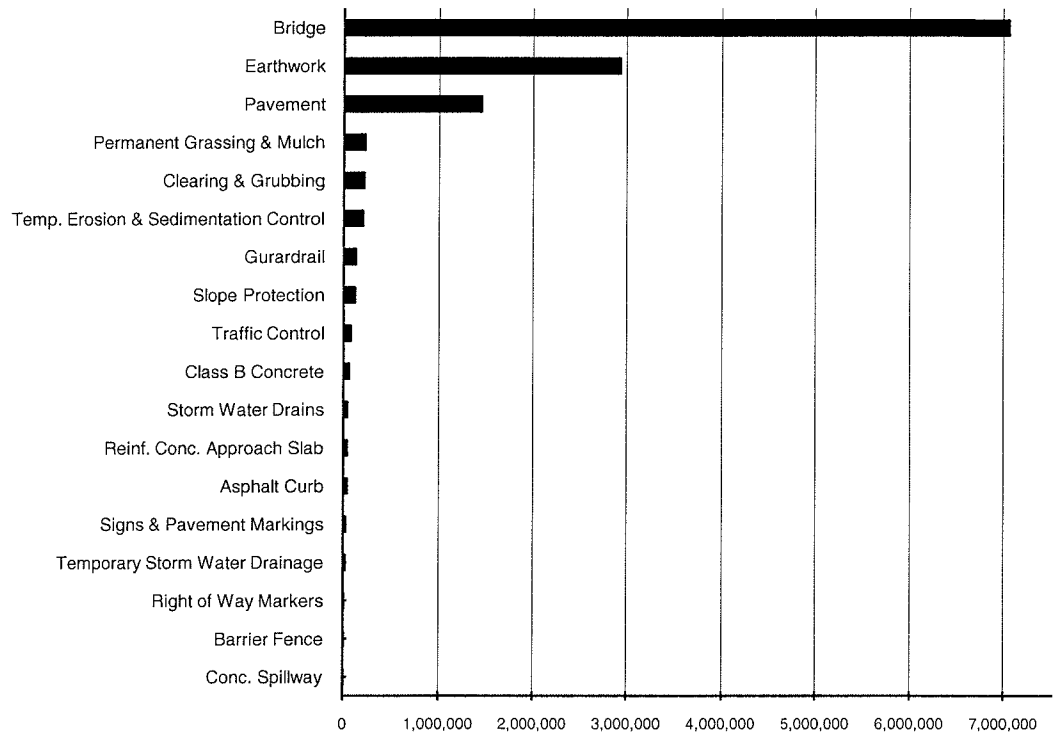
From the Cost Histogram it can be seen that the project elements controlling the project are:

- Bridge
- Earthwork
- Pavement
- Permanent Grass Seeding and Mulch

COST HISTOGRAM

PROJECT: NEW OCONEE BRIDGE CROSSING FROM COUNTRY CLUB RD TO BEN HALL LAKE RD, LAURENS COUNTY

PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Bridge	7,056,000	55.95%	55.95%
Earthwork	2,926,933	23.21%	79.16%
Pavement	1,446,136	11.47%	90.63%
Permanent Grassing & Mulch	219,963	1.74%	92.37%
Clearing & Grubbing	210,000	1.67%	94.04%
Temp. Erosion & Sedimentation Control	199,434	1.58%	95.62%
Gurardrail	127,495	1.01%	96.63%
Slope Protection	118,337	0.94%	97.57%
Traffic Control	75,000	0.59%	98.17%
Class B Concrete	57,860	0.46%	98.62%
Storm Water Drains	40,197	0.32%	98.94%
Reinf. Conc. Approach Slab	37,824	0.30%	99.24%
Asphalt Curb	35,548	0.28%	99.53%
Signs & Pavement Markings	22,769	0.18%	99.71%
Temporary Storm Water Drainage	20,566	0.16%	99.87%
Right of Way Markers	7,243	0.06%	99.93%
Barrier Fence	5,831	0.05%	99.97%
Conc. Spillway	3,463	0.03%	100.00%
TOTAL	$ 12,610,599	100.00%	
	$ -		
	$ -		
TOTAL	$ 12,610,599	Comp Mark-up:	0%



Costs in graph are not marked-up.

FUNCTION ANALYSIS

A function analysis was performed to (1) understand the project purpose and need, (2) define the requirements for each project element, (3) ensure a complete and thorough understanding by the VE team of the basic function(s) needed to attain the given project purpose and need, (4) identify other public goals, and (5) identify secondary functions that should be addressed by the VE team. The Random Function Analysis worksheet completed by the team for the project in its entirety and the various elements follow.

RANDOM FUNCTION ANALYSIS

PROJECT: **NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB DRIVE TO BEN HALL LAKE DRIVE**
Laurens County, Georgia

SHEET NO.: **1 of 1**

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
Project Functions	Increase	Connectivity	HO
	Reduce	Congestion	HO
	Cross	River	B
	Approach	River	B
Bridge $$$	Span	River	B
Earthwork	Establish	Elevation	B
	Support	Pavement	B
Pavement	Distribute	Loads	B
Permanent Grassing and Mulch	Prevent	Erosion	S
	Enhance	Aesthetics	S
Clearing and Grubbing	Prepare	Area	S
Temporary Erosion and Sediment Control	Protect	Environment	S
Slope Protection	Prevent	Erosion	S
Guard Rail	Redirect	Vehicles	B

Function defined as: Action Verb / Measurable Noun

Kind: B = Basic; S = Secondary; RS = Required Secondary; HO = Higher Order; LO = Lower Order; G = Goal

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

During the Creative/Speculation Phase, numerous ideas were generated for the project using conventional brainstorming techniques. These ideas were recorded and are shown with their corresponding ranking on the attached Creative Idea Listing Worksheets. For the convenience of tracking an idea through the VA process, the ideas were grouped into the following project elements and numbered according to the order in which they were conceived. The following letter prefixes were used to identify the project elements.

PROJECT ELEMENT	PREFIX
General	G
Bridge	B
Earthwork	E
Roadway	R

The ideas were ranked on a qualitative scale of 1 to 5 on how well the VE team believed the idea met the project purpose and need criteria. To assist the team in evaluating the creative ideas, the advantages and disadvantages of each new idea compared to the existing design solution were discussed based on the owner's value objectives for the project as discussed during the designer's presentation. The following are the top value objectives for this project:

- Saves Cost
- Reduces Environmental Impacts
- Improves Connectivity
- Reduces Potential For Collisions

After discussing each idea, the team evaluated the ideas by consensus. The evaluation produced 8 ideas rated 4 or 5 to research and develop into formal VE alternatives and 2 design suggestions to be included in Section Two of the report. Highly rated ideas that were not developed further may have been combined with another related idea or discarded as a result of additional research indicating the concept as not being cost effective or technically feasible. The reader is encouraged to review the Creative Idea Listing and Evaluation worksheet since it may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING

PROJECT:	**NEW OCONEE RIVER CROSSING FROM COUNTRY CLUB DRIVE TO BEN HALL LAKE DRIVE** *Laurens County, Georgia*	SHEET NO.: **1 of 1**

NO.	IDEA DESCRIPTION	RATING
	BRIDGE (B)	
B-1	Shorten the bridge length	1
B-2	Narrow the bridge by reducing the shoulder width	2
B-3	Raise the profile of the bridge	2
B-4	Use eight spans in lieu of nine spans for the bridge	4
B-5	Increase (adjust) grade at the east side of the bridge	ABD
B-6	For approaches, use smaller spans on pile bents and longer spans over main channel crossing	2
B-7	Use a deeper beam size and eliminate one row of beams	5
	ROADWAY (R)	
R-1	Narrow graded shoulder from 10 ft. wide to 8 ft. wide	4
R-2	Narrow paved shoulder from 4 ft. wide to 2 ft. wide	4
R-3	Eliminate cul-de-sac on New Buckeye Road	3
R-4	Delete right turn lanes on Buckeye Road	4
R-5	Delete right turn lanes on New Buckeye Road	4
R-6	End New Buckeye Road tie-in to the south sooner, at Sta. 507+00	4
	GENERAL (G)	
G-1	Move the road to Ferry Dock out of the wetlands	4
	EARTHWORK (E)	
E-1	Modify grades east of the bridge	5
E-2	Modify grade at the end of the project, Sta. 214+00 to 229+00	4

Rating: 1→2 = Not to be developed 3→4 = Varying degrees of development potential 5 = Most likely to be developed
DS = Design suggestion ABD = Already being done