Georgia Department of Transportation

Relocation of SR 113 From CR 31 To Richland Creek @ Old Alabama Road Relocation – Phase II

P.I. Nos. 621440 and 621445

STP00-0179-01(010) and BHF00-0179-01(011)

Widening and Reconstruction of SR 113 From CR 23/Lucas Road to Richland Creek

P.I. No. 621760, BFR00-0179-01(012); and

SR 113 From Old Alabama Road Relocation to SR 61 @ New Alignment – Phase I

P.I. No. 0008382, CSSTP-0008-00(382)

Value Engineering Study Report

July 2010

Designer

AEI

AMERICAN ENGINEERS, INC.

Value Engineering Consultant

Lewis & Zimmerman Associates an ARCADIS company

an ARCADIS company

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Mr. Matt Sanders
Value Engineering Coordinator
GA DOT - Engineering Services
One Georgia Center – 5th Floor
Atlanta, Georgia 30308

Re: Four SR 113 Projects including:
Relocation of SR 113 From CR 31 To Richland Creek @ Old Alabama Road Relocation – Phase II, P.I. No. 621440 and P.I. No. 621445, STP00-0179-01(010) and BHF00-0179-01(011); Widening and Reconstruction of SR 113 From C.R. 23/Lucas Road to Richland Creek, P.I. No. 621760, BFR00-0179-01(012); and SR 113 From Old Alabama Road Relocation to SR 61 @ New Alignment – Phase I, P.I. No. 0008382, CSSTP-0008-00(382)
Value Engineering Study Report

Date:
July 27, 2010

Contact:
Howard Greenfield

Phone:
301.984.9590 x 20

Email:
hgreenfield@lza.com

Our ref:
LZ083358.0000

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 July 12-15, 2010. 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 to GDOT. Of particular interest are alternatives to reduce pavement, reduce right-of-way impacts, especially acquisitions, and reduce earthwork requirements to save significant project costs.

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 any questions regarding the information presented in this report.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.
an ARCADIS company

Howard B. Greenfield, PE, CVS
Vice President

Attachment

TABLE OF CONTENTS

SECTION ONE - EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report summarizes the events and results of the VE study conducted by Lewis & Zimmerman Associates, Inc. (LZA) for the Georgia Department of Transportation (GDOT). The subject of the study was four SR 113 projects including: the relocation of SR 113 From CR 31 To Richland Creek @ Old Alabama Road – Phase II, P.I. No. 621440 and P.I. No. 621445, STP00-0179-01(010) and BHF00-0179-01(011); Widening and Reconstruction of SR 113 From C.R. 23/Lucas Road to Richland Creek, P.I. No. 621760, BFR00-0179-01(012); and SR 113 From Old Alabama Road Relocation to SR 61 @ New Alignment – Phase I, P.I. No. 0008382CSSTP-0008-00(382). The four projects are being designed for GDOT by American Engineers Inc. The study was performed July 12-15, 2010 in the GDOT Central Office, Atlanta, GA using the approximately 95% design complete documents as the basis of the study.

Comprising the VE team were a highway design engineer, a bridge/structural engineer, a cost/construction specialist and a Certified Value Specialist team leader from LZA. The team used the following six-phase VE Job Plan to guide its deliberations.

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

PROJECT DESCRIPTION

These projects are being developed to increase capacity along the stretch of SR 113 from Taft Road/CR 26 and Old Stilesboro Road/CR 31 to Friction Road, approximately 4.5 miles. For bidding, the Widening and Reconstruction of SR 113 From CR 23/Lucas Road to Richland Creek and SR 113 From Old Alabama Road Relocation to SR 61 @ New Alignment – Phase I projects are to be combined with another project that sits between them. This project realigns Old Alabama Road to tie directly to the east-west portion of SR 113 and tie the northwest segment of SR 113 into this roadway as a signalized tee intersection.

The expansion of SR 113 comprises expanding the two-lane roadway to a four-lane divided highway with a 6.5-ft. full-depth paved shoulders including rumble strips. The outside portion of the pavement will be used as a bicycle lane. The inside shoulder will be 2-ft.-wide full pavement with a rumble strip. At the intersections with CR 20, CR 25, CR 533/Brown Farm Road and Friction Drive the roadway will be expanded to include right turn lanes and a Type B median crossing.

Storm water drainage will consist of grass swales, concrete lined swales and underground piping as necessary. There will be three concrete box culverts to convey streams under the roadway.

As part of the project, the existing Richland Creek Bridge will be demolished and a new 115-ft.-wide x 130-ft.-long bridge constructed to support the four-lane highway and left turn lanes. At Raccoon Creek the existing bridge will be demolished and two 43-ft. 3-in.-wide by 200-ft.-long parallel bridges will be constructed for each two-lane roadway section. The bridges will be constructed using cast-in-place concrete decks and parapets supported on precast, prestressed concrete girders that sit on concrete abutments or piers supported on piles. Storm water runoff will be collected in bio-retention ponds off the bridge before discharging into the creeks.

The estimated total project cost for all four projects is $27.5 million of which $5.2 million is for right-of-way acquisitions. At the start of the VE study, the target bid date for the three combined projects was January 2011 if funding is available. The remaining SR 113 project designs will be "put on the shelf" until funding is available.

CONCERNS AND OBJECTIVES

The designs for all four projects are almost complete and a substantial portion of the right-of-way has been obtained. Yet GDOT still desires to develop the projects so that they meet the purpose and need in a cost-effective manner. To assist with this goal, GDOT convened this VE study. The objective of the study was to identify opportunities to modify the current concept and reduce its cost without negatively impacting need and purpose. Thus the VE team was tasked with generating specific changes to the current design and discussing how the project will benefit from their implementation.

RESULTS OF THE STUDY

The VE team generated 15 alternatives that will maintain the functionality of the project and will reduce the costs of construction and/or right-of-way. All of the alternatives, identified with an alternative number (Alt. No.) assigned to it during the creative idea generation phase for tracking purposes, are summarized on the following Summary of Potential Cost Savings table and detailed in Section Two of the report. Note that the table is divided according to each of the four projects and some of the alternatives are interrelated or mutually exclusive so that the total potential cost savings is dependent upon the combination of alternatives selected for implementation. The following highlights those alternatives with the greatest potential to impact the project.

The three highest cost elements of this project are the pavement, right-of-way and excavation which represent 60% of the projects' costs. To address these elements, the VE team first looked at the intersections. In each of the four intersections, a Type B median crossing was used. In this configuration, the left turn lane is widened so that the right edge is 16 ft. from the edge of the travel lane. However, all of these intersections have combined peak hourly left turn movements of 50 or less in the design year. Therefore, it is proposed to use a Type A median crossing which just provides a 12-ft.-wide left turn lane as shown in Alt. Nos. R-7A, R-7B, R-7C and R-7D to save significant pavement costs. In all instances, there is good visibility on SR 113 and the crossroads rendering this concept as feasible.

In Alt. No. R-10/R-11, the VE team addresses the right-of-way and earthwork costs. On the south side of SR 113 at the intersection of CR 25, parts of four parcels must be acquired, including two properties, a residence and a commercial establishment. To avoid acquiring these parcels, it is

proposed to move the horizontal alignment of SR 113 to the north and to modify the grade. In addition, some retaining walls would be required to further reduce the impacts to the two properties. The net result is that only some minor land requirements will be necessary to construct the new roadway, saving substantial costs and avoiding displacements.

The 6.5-ft.-wide paved shoulder is designed as a full-depth pavement. Since it is mainly going to be used as a bicycle lane, a partial depth shoulder section as illustrated in Alt. Nos. R-7A and R-7B should be used to reduce the pavement cost.

In the segment from the relocated Old Alabama Road intersection northwest, the vertical alignment of SR 113 should be adjusted to reduce the earthwork cost as presented in Alt. No. R-6.

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION - PHASE II**

P.I. No. 621440 & P.I. No. 621445; STP00-0179-01(010) & BHF00-0179-01(011)

Bartow County, Georgia

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
ROADWAY						
R-1	Retain CR 20 in its current location	$137,000	$0	$137,000		$137,000
R-5A	Use 11-ft.-wide inside lanes in lieu of 12-ft.-wide lanes	$115,000	$0	$115,000		$115,000
R-7A	At the CR 20 intersection with SR 113, change from a Type B median crossing to a Type A median crossing	$209,000	$72,000	$137,000		$137,000
R-7B	At the CR 25 intersection with SR 113, change from a Type B median crossing to a Type A median Crossing	$209,000	$72,000	$137,000		$137,000
R-9A	Use a 2-ft.-wide full depth shoulder and a 4.5-ft.-wide reduced depth shoulder for total width of 6.5 ft.	$744,000	$442,000	$302,000		$302,000
R-10/R-11	Move the horizontal alignment of SR 113 north, raise the vertical alignment and use a retaining wall along SR 113 at the CR 25 intersection to reduce right-of-way impacts to the properties south of SR 113	$819,000	$496,000	$323,000		$323,000
DRAINAGE						
D-1A	Replace the 8 ft. x 6 ft. concrete box culvert with 72-in.-diameter reinforced concrete pipe	$92,000	$65,000	$27,000		$27,000

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM C.R. 23/LUCAS RD TO RICHLAND CREEK**

P.I. No. 621760; BRF00-0179-01(012)

Bartow County, Georgia

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
		PRESENT WORTH OF COST SAVINGS				
ROADWAY						
R-5B	Use 11-ft.-wide inside lanes in lieu of 12-ft.-wide lanes	$33,000	$0	$33,000		$33,000
R-7C	At the CR 23 intersection with SR 113, change from a Type B median crossing to a Type A median crossing	$209,000	$72,000	$137,000		$137,000
R-9B	Use a 2-ft.-wide full depth shoulder and a 4.5-ft.-wide reduced depth shoulder for a total width of 6.5 ft.	$214,000	$127,000	$87,000		$87,000

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT - PHASE I**

P.I. No. 0008382; CSSTP-0008-00(382)

Bartow County, Georgia

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
			PRESENT WORTH OF COST SAVINGS			
ROADWAY						
R-6	Adust the vertical profile to reduce the amount of earthwork borrow material	$268,000	$0	$268,000		$268,000
R-7D	At the CR 533 intersection with SR 113 change from a Type B median crossing to a Type A median crossing	$209,000	$72,000	$137,000		$137,000
R-7E	At the Friction Drive intersection with SR 113 change from a Type B median crossing to a Type A median crossing	$209,000	$72,000	$137,000		$137,000
R-8	Use a 4-ft.-wide shoulder pavement in lieu of a 6.5-ft.-wide shoulder pavement	$167,000	$0	$167,000		$167,000
DRAINAGE						
D-1B	Replace the two concrete box culverts with reinforced concrete pipes	$183,000	$114,000	$69,000		$69,000

SECTION TWO - STUDY RESULTS

GENERAL

The results of this value engineering study conducted on the four SR 113 projects portray the benefits that can be realized by GDOT, the owner, Bartow County, the users and American Engineers, the designer. The results will directly affect the project's design and will require coordination between GDOT and the design team to determine the disposition of each alternative.

During the conduct of the study, many ideas for potential value enhance 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 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 the designers, 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 developed is identified with an alternative number (Alt. No.) to track it through the value analysis process and facilitate 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
Roadway	R
Bridge	B
Drainage	D

Summaries of the alternatives are provided on the Summary of Potential Cost Savings tables. The tables are divided by project 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

These projects are being developed to reduce congestion on SR 113 and route truck traffic to I-75 away from downtown Cartersville. The designs for all four projects are almost complete and a substantial portion of the right-of-way has been acquired. Yet GDOT still desires to develop the projects so that they meet the purpose and need in a cost-effective manner.

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 15 alternatives for consideration by the owner and designer. These alternatives 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 the project are highlighted below.

The three highest cost elements of this project are the pavement, right-of-way and excavation which represent 60% of the projects' costs. To address these elements, the VE team first looked at the intersections. In each of the four intersections, a Type B median crossing was used. In this configuration, the left turn lane is widened so that the right edge is 16 ft. from the edge of the travel lane. However, all of these intersections have combined peak hourly left turn movements of 50 or less in the design year. Therefore, it is proposed to use a Type A median crossing which just provides a 12-ft.-wide left turn lane as shown in Alt. Nos. R-7A, R-7B, R-7C and R-7D to save significant pavement costs. In all instances, there is good visibility on SR 113 and the crossroads rendering this concept as feasible.

In Alt. No. R-10/R-11, the VE team addresses the right-of-way and earthwork costs. On the south side of SR 113 at the intersection of CR 25, parts of four parcels must be acquired, including two properties, a residence and a commercial establishment. To avoid acquiring these parcels, it is proposed to move the horizontal alignment of SR 113 to the north and to modify the grade. In addition, some retaining walls would be required to further reduce the impacts to the two properties. The net result is that only some minor land requirements will be necessary to construct the new roadway, saving substantial costs and avoiding displacements.

The 6.5-ft.-wide paved shoulder is designed as a full-depth pavement. Since it is mainly going to be used as a bicycle lane, a partial depth shoulder section as illustrated in Alt. Nos. R-7A and R-7B should be used to reduce the pavement cost.

In the segment from the relocated Old Alabama Road intersection northwest, the vertical alignment of SR 113 should be adjusted to reduce the earthwork cost as presented in 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: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION - PHASE II**

P.I. No. 621440 & P.I. No. 621445; STP00-0179-01(010) & BHF00-0179-01(011)

Bartow County, Georgia

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
ROADWAY						
R-1	Retain CR 20 in its current location	$137,000	$0	$137,000		$137,000
R-5A	Use 11-ft.-wide inside lanes in lieu of 12-ft.-wide lanes	$115,000	$0	$115,000		$115,000
R-7A	At the CR 20 intersection with SR 113, change from a Type B median crossing to a Type A median crossing	$209,000	$72,000	$137,000		$137,000
R-7B	At the CR 25 intersection with SR 113, change from a Type B median crossing to a Type A median Crossing	$209,000	$72,000	$137,000		$137,000
R-9A	Use a 2-ft.-wide full depth shoulder and a 4.5-ft.-wide reduced depth shoulder for total width of 6.5 ft.	$744,000	$442,000	$302,000		$302,000
R-10/R-11	Move the horizontal alignment of SR 113 north, raise the vertical alignment and use a retaining wall along SR 113 at the CR 25 intersection to reduce right-of-way impacts to the properties south of SR 113	$819,000	$496,000	$323,000		$323,000
DRAINAGE						
D-1A	Replace the 8 ft. x 6 ft. concrete box culvert with 72-in.-diameter reinforced concrete pipe	$92,000	$65,000	$27,000		$27,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-1**

DESCRIPTION: **RETAIN CR 20 IN ITS CURRENT LOCATION**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

Realign CR 20 to intersect SR 113 at approximately 80 degrees. Acquire the necessary right-of-way on CR 20 to accommodate the relocation.

ALTERNATIVE: (sketch attached)

Retain CR 20 in its current location. Do not acquire any additional right-of-way on CR 20.

ADVANTAGES:

- Saves construction time and material
- Avoids having to purchase property

DISADVANTAGES:

- Skewed intersection will lead to sharper right turning movement for vehicles from SR 113 to CR 20 and sharper left turning movement for vehicles from CR20 to SR113

DISCUSSION:

The existing skew is approximately 62 degrees. The skew affects vehicles turning right from SR 113 to CR 20 and vehicles turning left from CR 20 to SR 113. The average daily design traffic for design year 2031 shows that only 50 vehicles will be making such turns. For this negligible traffic, it is reasonable to leave the skew as it is. The GDOT Design Policy Manual (page 4-3) states that a minimum 60-degree intersecting angle is permissible by AASHTO standards.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 137,000	—	$ 137,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 137,000	—	$ 137,000

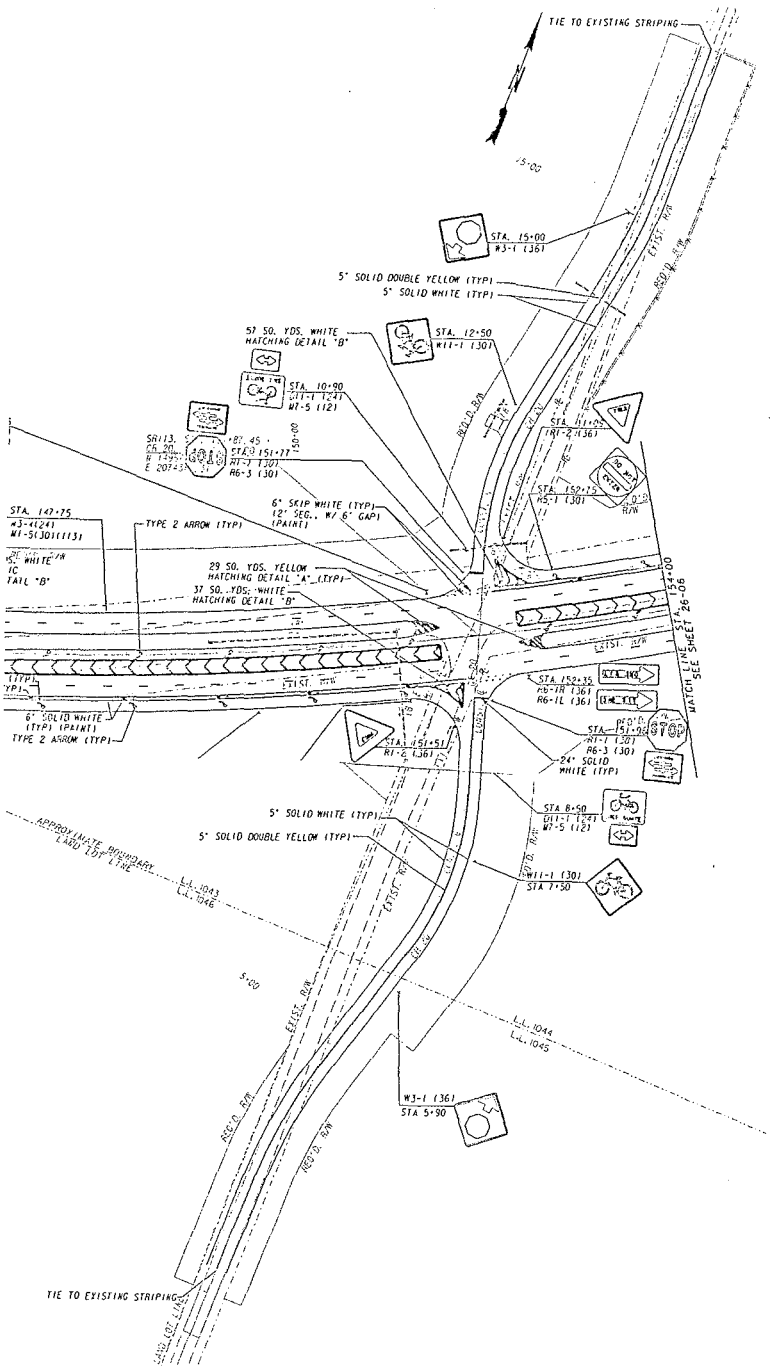
SKETCHES

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-1**

☑ AS DESIGNED ☐ ALTERNATIVE

SHEET NO.: 2 of 5



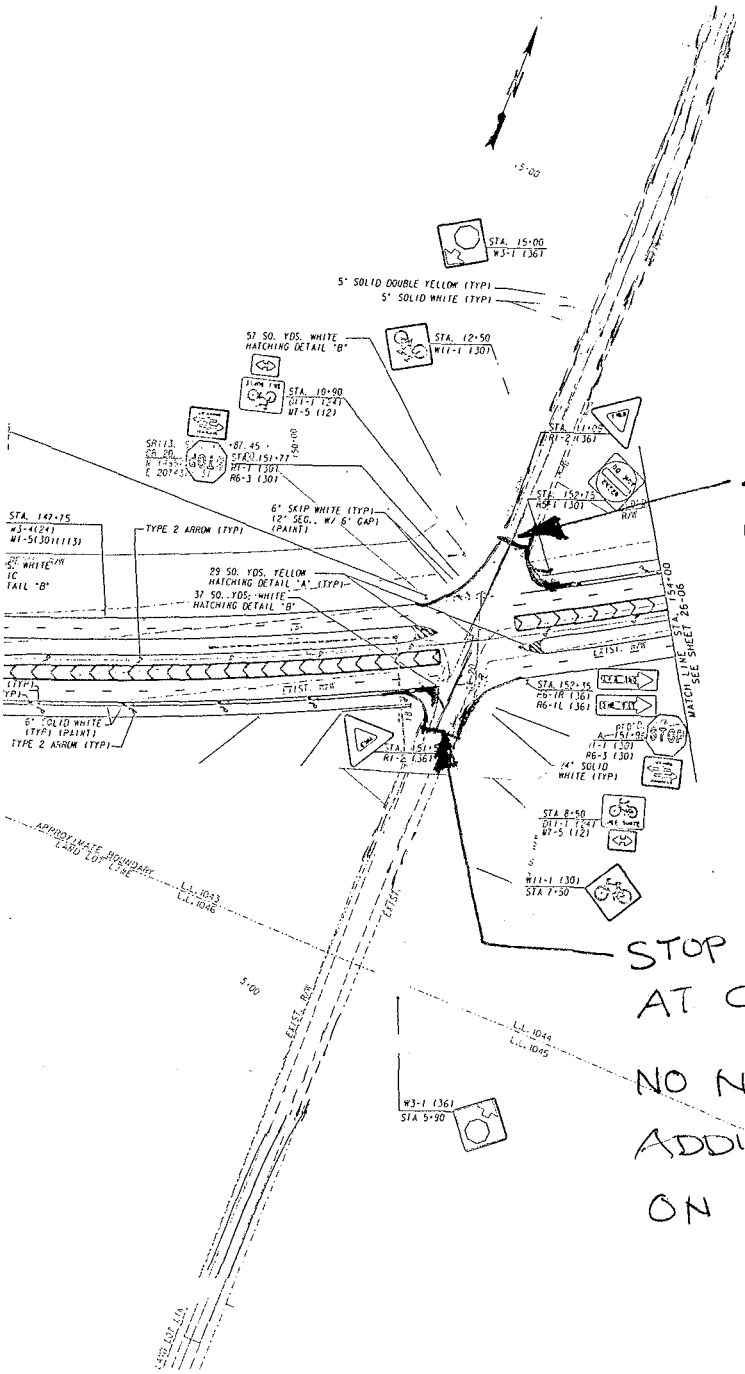
SKETCHES

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-1**

☐ AS DESIGNED ☑ ALTERNATIVE

SHEET NO.: 3 of 5



PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-1**

SHEET NO.: **4 of 5**

Full Depth Pavement Unit Cost ($/SY):

12.5mm:	165#/SY x Ton/2,000# x $72.34/Ton	=	$5.97/SY
19.0mm:	220#/SY x Ton/2,000# x $72.81/Ton	=	$8.01/SY
25.0mm:	550#/SY x Ton/2,000# x $69.38/Ton	=	$19.08/SY
12" GAB:	1ft x 147#/CF x Ton/2,000# x 9SF/SY x $21.16/Ton	=	$14.00/SY
		Total Pavement Unit Cost =	**$48.06/SY**

Length:
(STA. 13+75 – STA. 4+77) – Stations in SR113 (STA. 10+50 – STA. 9+40) = 788 feet
Area before STA. 4+77 and after STA. 13+75 is not includes in the calculations since it is small and will be offset by additional pavement from SR113 to the curb return of CR20.

Pavement area saved: 788 x 1/9 = 87.55 sy

Earthwork saved: [½ (STA. 7+50 – STA. 5+00) x 8 + (STA. 9+50 – STA. 7+50) x 8 + 100]/27 = 100 cy

Rights-of-Way saved:
(17+00 – 14+34)x35 + (14+34 – 11+25)x70 + (17+00 – 14+94)x40 + ½(14+94 – 12+94)x40 +
(8+50 – 5+50)x100 + [(30+20)/2 x(5+50 – 3+33)] + ½(4+68 – 3+33)x20 + (3+33 – 2+00)x20x2 = 85,275 sf

85,275/43,560 = 1.958 acres, say 2 acres of residential area.

COST WORKSHEET

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION - PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

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
A.C. Pavement	SY	2,251	48.06	108,183			
Earthwork	CY	100	8.39	839			
Right-of-way	AC	2	8,000.00	16,000			
Markup 73% on Right of Way				11,680			
Subtotal				136,702			
Markup (%) at 0%							
TOTAL				136,702			
TOTAL (ROUNDED)				137,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-5A**

DESCRIPTION: **CONSTRUCT 11-FT.-WIDE INSIDE LANES IN LIEU OF 12-FT.-WIDE LANES**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

Construct 12-ft.-wide lanes throughout the project.

ALTERNATIVE: (sketch attached)

Construct inside lanes 11 ft. wide. Keep outside lanes and turn lanes 12 ft. wide.

ADVANTAGES:

- Saves construction time and material
- Less impervious area; less storm water; lesser need for drainage infrastructure

DISADVANTAGES:

- None apparent

DISCUSSION:

With 55 mph speed limit, 11-ft.-wide lanes have existed on I-75 and I-85 in Metro Atlanta since 1996. A foot of reduction on each side will decrease impervious area. This will reduce storm water runoff. As a result, the amount of drainage infrastructure will also decrease, although no savings in drainage items are included below. Also, no savings in right-of-way is calculated because Bartow County is already in the process of acquiring right-of-way.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 115,000	—	$ 115,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 115,000	—	$ 115,000

SKETCHES

PROJECT:

Bartow County, GA

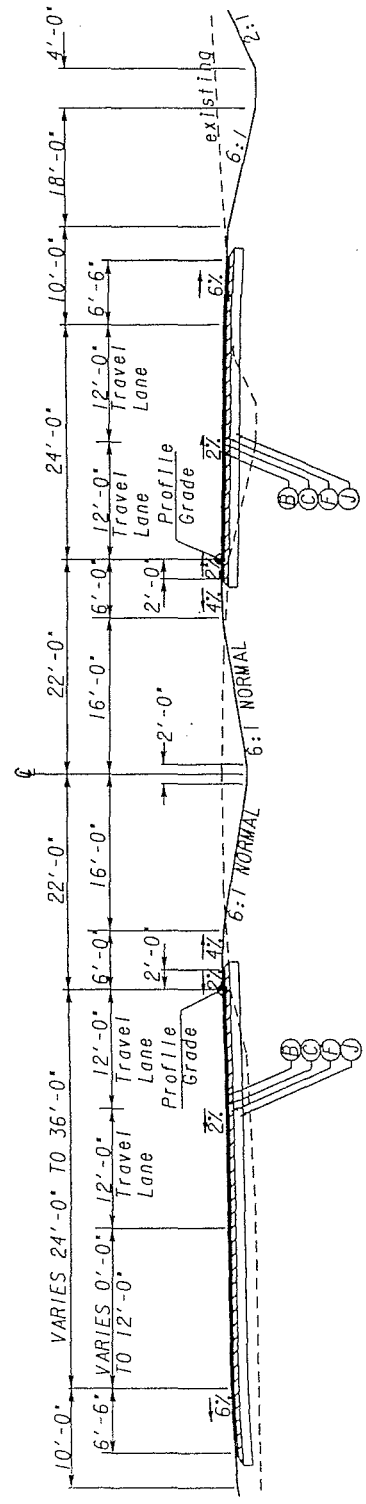
☑ AS DESIGNED ☑ ALTERNATIVE

ALTERNATIVE NO.:

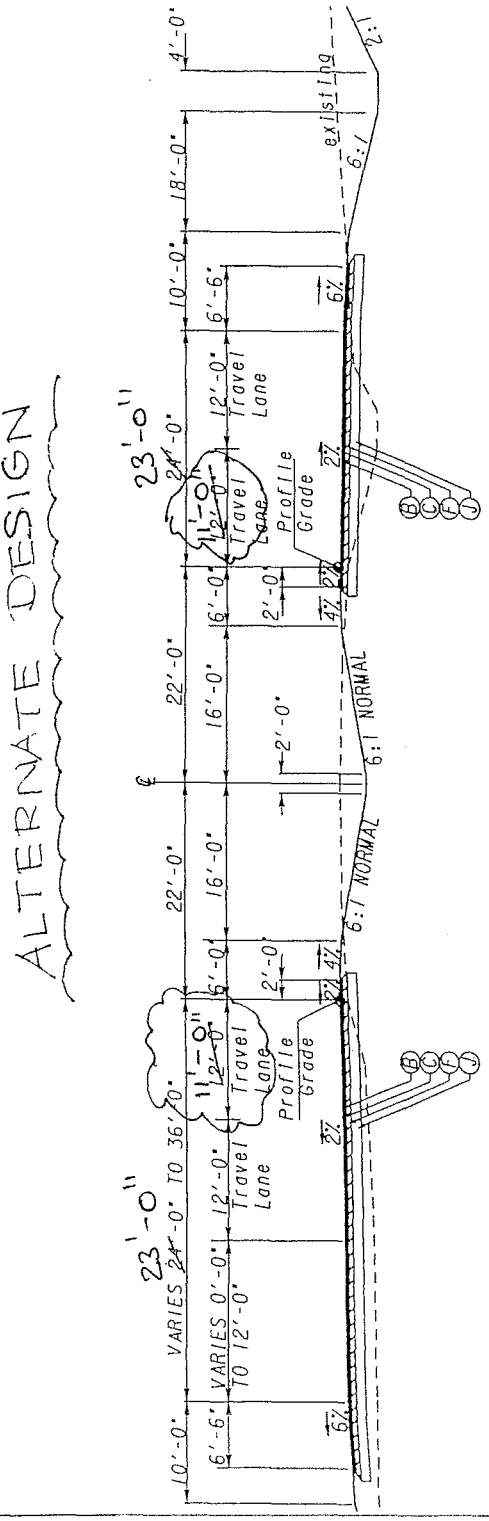
R-5A

SHEET NO.: 2 of 4

ORIGINAL DESIGN



ALTERNATE DESIGN



PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-5A**

SHEET NO.: **3 of 4**

Full Depth Pavement Unit Cost ($/SY):

12.5mm:	165#/SY x Ton/2,000# x $72.34/Ton	=	$5.97/SY
19.0mm:	220#/SY x Ton/2,000# x $72.81/Ton	=	$8.01/SY
25.0mm:	660#/SY x Ton/2,000# x $69.38/Ton	=	$22.90/SY
12" GAB:	1ft x 147#/CF x Ton/2,000# x 9SF/SY x $21.16/Ton	=	$14.00/SY
		Total Pavement Unit Cost =	**$50.88/SY**

Inside Lane Length:
P.I. # 621440: (STA. 204+48 – STA. 100+58) – Bridge (STA, 191+35 – STA. 188+75) = 10,130 feet

Total One-way Length: 10,130 feet
Both ways: 10,130 x 2 = 20,260 feet
Lane Width Reduction: 12' – 11' = 1 foot

Area: 20,260 x 1/9 = 2,251 sy

COST WORKSHEET

PROJECT:	**SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION - PHASE II** *P.I. No. 621440 & P.I. No. 624445* *Bartow County, GA*	ALTERNATIVE NO.:	**R-5A** SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
A.C. Pavement	SY	2,251	50.88	114,531			
Subtotal				114,531			
Markup (%) at 0%							
TOTAL				114,531			
TOTAL (ROUNDED)				115,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-7A**

DESCRIPTION: **AT THE CR 20 INTERSECTION WITH SR 113 CHANGE FROM A TYPE B MEDIAN CROSSING TO A TYPE A MEDIAN CROSSING**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

A Type B median crossing is designed for SR 113 at the intersection with CR 20/Brandon Farm Road and Beazley Road.

ALTERNATIVE: (sketch attached)

Use a Type A median crossing at this intersection.

ADVANTAGES:

- Reduces the amount of pavement to install and maintain
- Reduces the amount of impervious area and storm water runoff

DISADVANTAGES:

- Left turning movements on SR 113 at this intersection are slightly more than the preferred minimum

DISCUSSION:

The number of combined left turn movements from SR 113 to CR 20 are 20 vehicles per hour (vph) in the peak AM hour and 40 vph in the peak PM hour in the design year. Although this exceeds the recommended 20 vph in the GDOT standard, this intersection has good visibility from both directions on SR 113 and the intersecting roads are minor roads. Therefore, it is suggested that the Type A median crossing will be adequate in this location and substantial construction and maintenance costs can be saved.

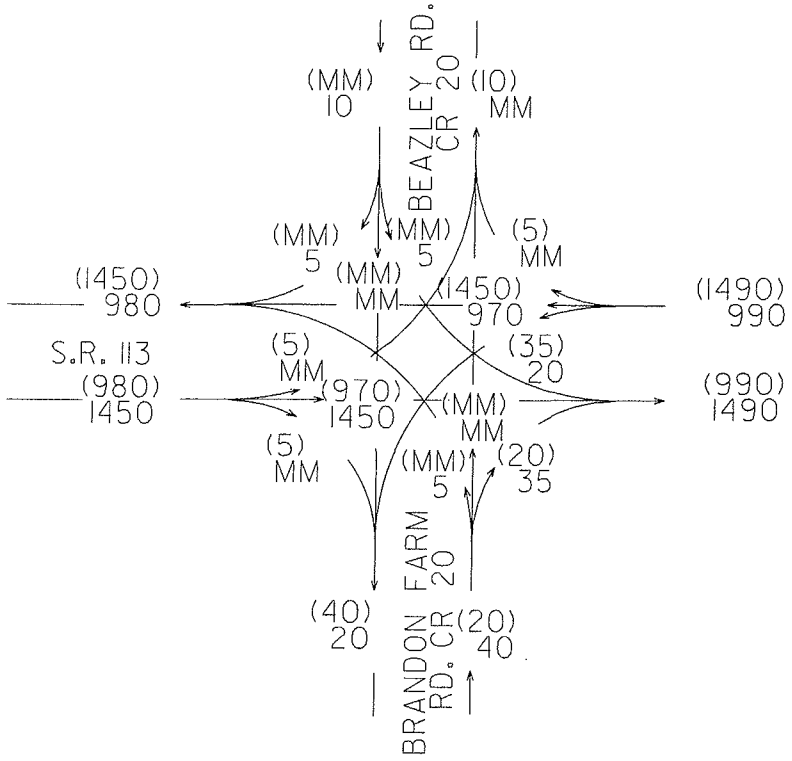
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 209,000	—	$ 209,000
ALTERNATIVE	$ 72,000	—	$ 72,000
SAVINGS (Original minus Alternative)	$ 137,000	—	$ 137,000

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-7A**

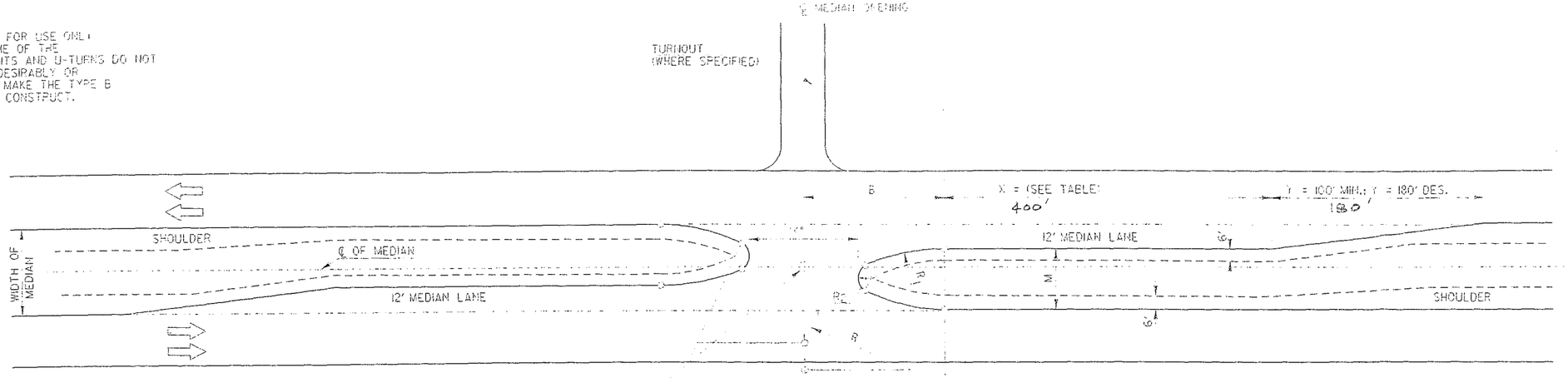
☒ AS DESIGNED ☐ ALTERNATIVE

SHEET NO.: 2 of 5



DHV TRAFFIC

NOTE:
TYPE A MEDIAN CROSSOVERS ARE FOR USE ONLY WHERE THE FUTURE TOTAL VOLUME OF THE COMBINED LEFT TURNING MOVEMENTS AND U-TURNS DO NOT EXCEED 20 VEHICLES PER HOUR, DESIRABLY OR WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE B MEDIAN CROSSOVER DIFFICULT TO CONSTRUCT.



STATION WHERE MED. OPEN REQ'D. CONSTR. SYMMETRICAL ABOUT THIS POINT.

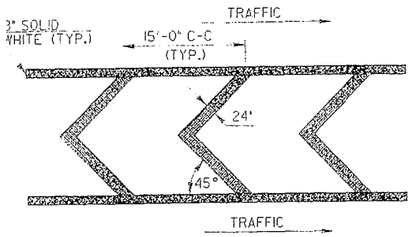
30 20 10 0 30FT.
GRAPHIC SCALE

TYPE A MEDIAN CROSSOVER

NOTE:
TYPE B MEDIAN CROSSOVERS ARE THE PREFERRED TYPE OF MEDIAN CROSSOVER. TYPE A MEDIAN CROSSOVER CAN BE USED IN LOW VOLUME SITUATIONS WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE A MEDIAN CROSSOVER A MORE DESIRABLE OPTION.

NOTE FOR TYPE 'A' AND TYPE 'B':
- THE EMBANKMENT GRADED UP TO THE MEDIAN CROSSOVERS SHALL BE SLOPED AT 20:1 DESIRABLE, 10:1 MIN. NORMALLY, WITH A 6:1 ACCEPTABLE FOR SPEEDS UNDER FORTY-FIVE MILES PER HOUR.

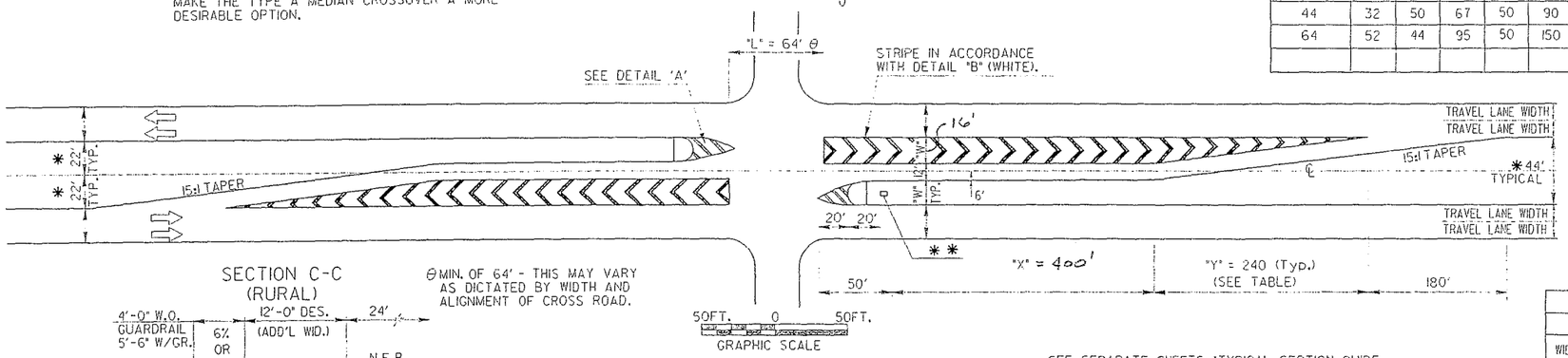
DETAIL "B" (WHITE)



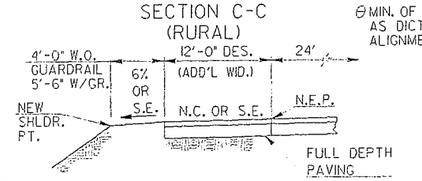
NOTE:
SQUARE YARDS OF STRIPING SHOWN ON PLAN AND SUMMARY SHEETS INCLUDES THE AREA WITHIN THE BORDERS, AS WELL AS THE 8" SOLID WHITE BORDER.

TYPE A MEDIAN CROSSOVERS ●										
							DECELERATION LENGTH = X Δ (FT)			
							DESIGN SPEED			
WIDTH OF MEDIAN	M	L NORM	B NORM	R	R_1	R_2	45 MPH	55 MPH	65 MPH	Y (DES)
40	28	50	67	50	90	6	400(250) MIN	525(400) MIN	700(525) MIN	180
44	32	50	67	50	90	8	400(250) MIN	525(400) MIN	700(525) MIN	180
64	52	44	95	50	150	10	400(250) MIN	525(400) MIN	700(525) MIN	180

Δ "X" DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED. MIN. VALUES FOR "X" ARE ONLY TO BE USED WHERE SPACING BETWEEN MEDIAN OPENINGS DOES NOT ALLOW FOR THE MORE DESIRABLE LENGTH.



SECTION C-C (RURAL)



NOTE: SEE GA. STD. 4280 FOR GRADING WITH GUARDRAIL.

θ MIN. OF 64' - THIS MAY VARY AS DICTATED BY WIDTH AND ALIGNMENT OF CROSS ROAD.

TYPE B MEDIAN CROSSOVER

* DIMENSION MAY VARY WHERE SPECIFIED IN THE PLANS. ADJUSTMENTS TO BE SHOWN FOR ANY WIDTH OTHER THAN 44 FT.

● DIMENSIONS IN FEET (TYP)

SEE SEPARATE SHEETS: "TYPICAL SECTION GUIDE FOR TYPE 'B' MEDIAN CROSSOVER."

NOTE:
PAVEMENT OF MEDIAN CROSSOVERS (ALL TYPES) SHALL BE SLOPED FOR SURFACE DRAINAGE AS SPECIFIED.

** MEDIAN DROP INLET (903IS) CANNOT BE PLACED CLOSER THAN 20 FEET BACK FROM END OF NOSE OF THE MEDIAN.

MEDIAN DROP INLET (903IS) IS NOT RECOMMENDED FOR TYPE B MEDIAN CROSSOVERS WHERE GRADES ARE GREATER THAN 3%.

TYPE B MEDIAN CROSSOVERS ●					
	DECELERATION LENGTH = Δ (FT.)				
WIDTH OF MEDIAN	DESIGN SPEED			Y	W
	45 MPH	55 MPH	65 MPH		
44	150(150 MIN)	300(150 MIN)	450(300 MIN)	240	16
64	N/A	150(150 MIN)	300(150 MIN)	390	26

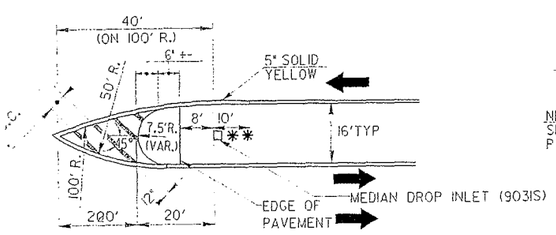
$W = \frac{44-12}{2} = 16'$

DECELERATION LANE

$\frac{450 \times 28 + \frac{1}{2}(28 \times 420)}{9} = 2053$ SY

ONE SIDE

DETAIL "A" (YELLOW)



20FT. 0 20FT.
GRAPHIC SCALE

TYPE C MEDIAN CROSSOVERS ●	
DECELERATION LENGTH = X ■	
DESIGN SPEED	X (FT)
35 MPH	300(200 MIN.)
45 MPH	400(250 MIN.)

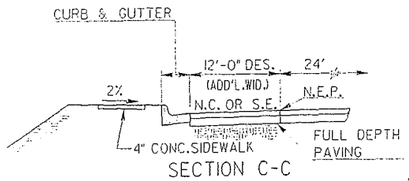
'X' DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED.

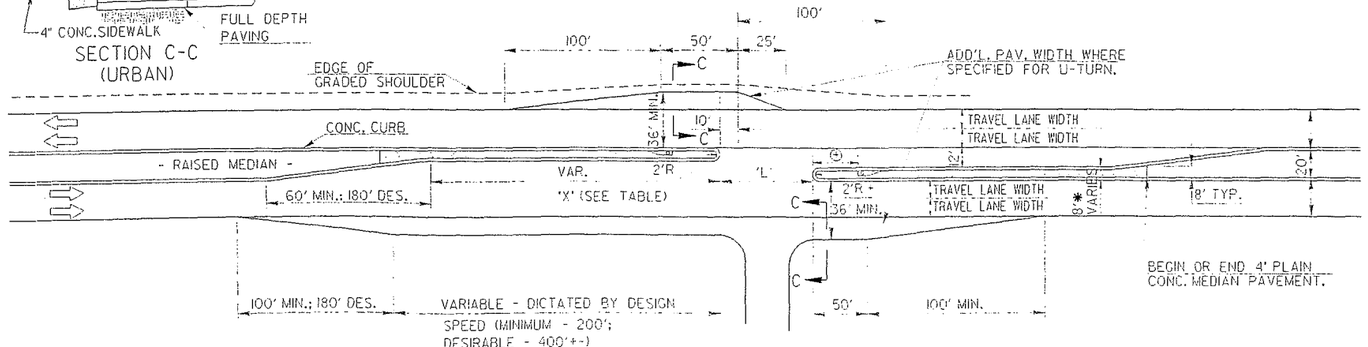
TE:
'HE TYPE C MEDIAN CROSSOVER SHOWN IS TYPICAL FOR ONE SIDE ROAD CONNECTION. (T-INTERSECTION)

'HE BOTTOM PORTION OF TYPE C IS APPLICABLE ON EACH SIDE OF THE CROSSOVER FOR A CROSS ROAD INTERSECTION OR SIDE ROAD CONNECTION ON EACH SIDE. (X-INTERSECTION)

'HE TOP PORTION OF TYPE C DETAIL IS APPLICABLE ON EACH

SECTION C-C (URBAN)





"L" - 84' MIN. (FOR TYP. C)

TYPE C MEDIAN CROSSOVER

SPECIAL NOTE:
THE "L" DIMENSIONS SHOWN FOR TYPE A, TYPE B, AND TYPE C CROSSOVERS ARE BASED UPON 50FT. CONTROL RADII FOR LEFT TURNS AND INTERSECTING CROSSROADS OF TWO 12 FT. LANES PERPENDICULAR TO THE MAINLINE. DIFFERENT "L" DIMENSIONS MAY BE SPECIFIED AT LOCATIONS WHERE WARRANTED BY OTHER CONDITIONS.

GA. | PROJ. | SHEET #

ALT. NO.
R-7A
Sht. 3 of 5

DECELERATION LANE AREA

$\frac{12 \times 440 + \frac{1}{2}(180 \times 12)}{9} = 707$ SY

ONE SIDE

DATE

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

CONSTRUCTION DETAILS
MEDIAN CROSSOVERS

REVISION

SCALE AS SHOWN

APRIL, 2022

NUMBER

CALCULATIONS

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-7**

SHEET NO.: 4 of 5

Pavement Costs:

12" GAB	(147 #/ft^3 x 9 ft^3 / sy) / 2000 #/ton x $21.16/ ton	= $14.00/sy
6 in. Recyl AC 25 mm	(660 #/sy) / 2000 #/ton x $69.38/ ton	= 22.90/sy
2 in. Recyl AC 19 mm	(220 #/sy) / 2000 #/ton x $72.81/ ton	= 8.01/sy
1-1/2 in. Recyl AC 12.5 mm	(165 #/sy) / 2000 #/ton x $72.34/ ton	= 5.97/sy
Total		= $50.88/sy

COST WORKSHEET

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION - PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-7A**

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
Asphalt Pavement	SY	4,106	50.88	208,913	1,414	50.88	71,944
Subtotal				208,913			71,944
Markup (%) at							
TOTAL				208,913			71,944
TOTAL (ROUNDED)				209,000			72,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-7B**

DESCRIPTION: **AT THE CR 25 INTERSECTION WITH SR 113 CHANGE FROM A TYPE B MEDIAN CROSSING TO A TYPE A MEDIAN CROSSING**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

A Type B median crossing is designed for SR 113 at the intersection with CR 25/Picklesimer Road and Kincannon Road.

ALTERNATIVE: (sketch attached)

Use a Type A median crossing at this intersection.

ADVANTAGES:

- Reduces the amount of pavement to install and maintain
- Reduces the amount of impervious area and storm water runoff

DISADVANTAGES:

- Left turning movements on SR 113 at this intersection are slightly more than the preferred minimum

DISCUSSION:

The number of combined left turn movements from SR 113 to CR 25 is 25 vehicles per hour (vph) in the peak AM hour and 50 vph in the peak PM hour in the design year. Although this exceeds the recommended 20 vph in the GDOT standard, this intersection has good visibility from both directions on SR 113 and the intersecting roads are minor roads. Therefore, it is suggested that the Type A median crossing will be adequate in this location and substantial construction and maintenance costs can be saved.

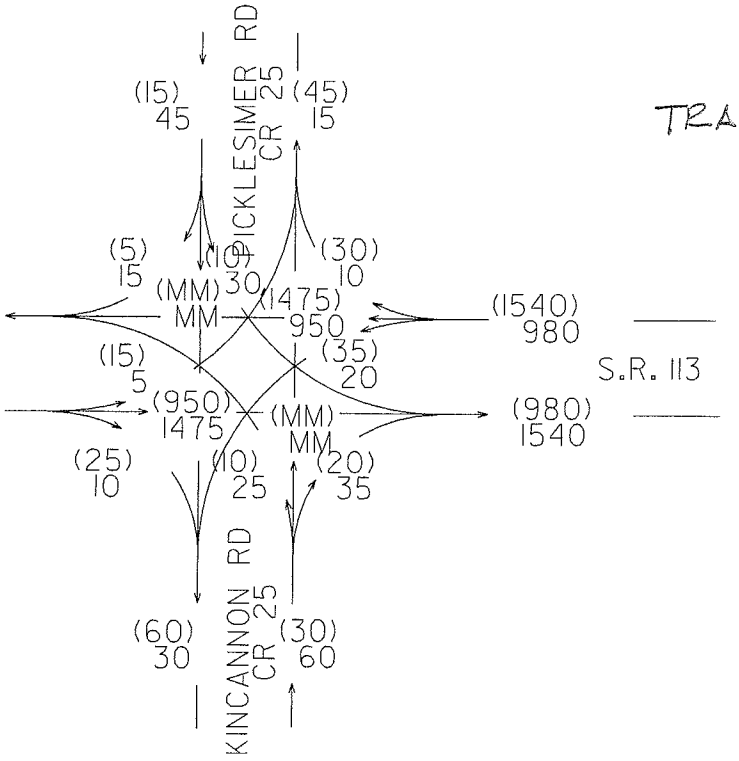
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 209,000	—	$ 209,000
ALTERNATIVE	$ 72,000	—	$ 72,000
SAVINGS (Original minus Alternative)	$ 137,000	—	$ 137,000

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-7B**

☒ AS DESIGNED ☐ ALTERNATIVE

SHEET NO.: 2 of 4



DHV TRAFFIC

NOTE:
TYPE A MEDIAN CROSSOVERS ARE FOR USE ONLY WHERE THE FUTURE TOTAL VOLUME OF THE COMBINED LEFT TURNING MOVEMENTS AND U-TURNS DO NOT EXCEED 20 VEHICLES PER HOUR, DESIRABLY OR WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE B MEDIAN CROSSOVER DIFFICULT TO CONSTRUCT.

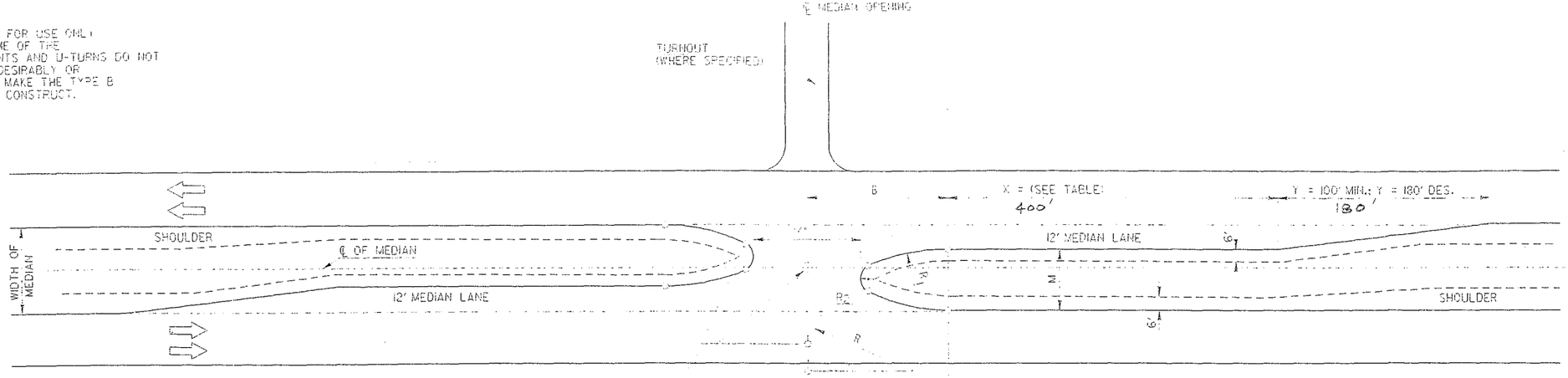
GA. | REV. | SHEET #

ALT. NO.
R-7B
Sht 3 of 4

DECELERATION LANE AREA

$\frac{12 \times 440 + \frac{1}{2}(180 \times 12)}{9} = 707$ SY

ONE SIDE



30 20 10 0 30FT.
GRAPHIC SCALE

TYPE A MEDIAN CROSSOVER

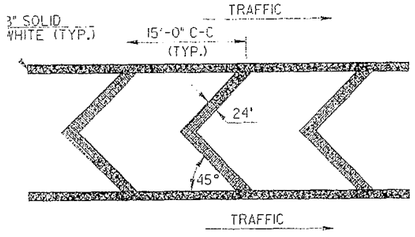
NOTE:
TYPE B MEDIAN CROSSOVERS ARE THE PREFERRED TYPE OF MEDIAN CROSSOVER. TYPE A MEDIAN CROSSOVER CAN BE USED IN LOW VOLUME SITUATIONS WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE A MEDIAN CROSSOVER A MORE DESIRABLE OPTION.

NOTE FOR TYPE 'A' AND TYPE 'B':
- THE EMBANKMENT GRADED UP TO THE MEDIAN CROSSOVERS SHALL BE SLOPED AT 20:1 DESIRABLE, 10:1 MIN. NORMALLY, WITH A 6:1 ACCEPTABLE FOR SPEEDS UNDER FORTY-FIVE MILES PER HOUR.

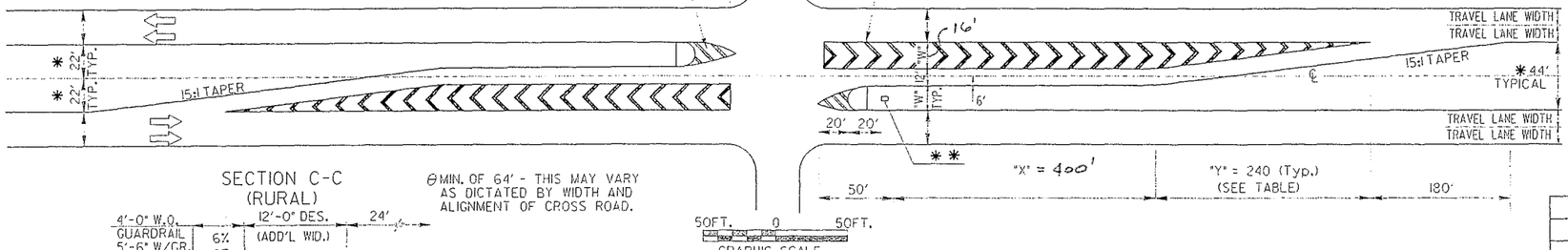
TYPE A MEDIAN CROSSOVERS ●										
							DECELERATION LENGTH = X Δ (FT)			
							DESIGN SPEED			
WIDTH OF MEDIAN	M	L NORM	B NORM	R	R_1	R_2	45 MPH	55 MPH	65 MPH	Y (DES)
40	28	50	67	50	90	6	400(250) MIN	525(400) MIN	700(525) MIN	180
44	32	50	67	50	90	8	400(250) MIN	525(400) MIN	700(525) MIN	180
64	52	44	95	50	150	10	400(250) MIN	525(400) MIN	700(525) MIN	180

Δ "X" DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED. MIN. VALUES FOR "X" ARE ONLY TO BE USED WHERE SPACING BETWEEN MEDIAN OPENINGS DOES NOT ALLOW FOR THE MORE DESIRABLE LENGTH.

DETAIL "B" (WHITE)



NOTE:
SQUARE YARDS OF STRIPING SHOWN ON PLAN AND SUMMARY SHEETS INCLUDES THE AREA WITHIN THE BORDERS, AS WELL AS THE 8" SOLID WHITE BORDER.



TYPE B MEDIAN CROSSOVER

SEE SEPARATE SHEETS: "TYPICAL SECTION GUIDE FOR TYPE "B" MEDIAN CROSSOVER."

NOTE:
PAVEMENT OF MEDIAN CROSSOVERS (ALL TYPES) SHALL BE SLOPED FOR SURFACE DRAINAGE AS SPECIFIED.

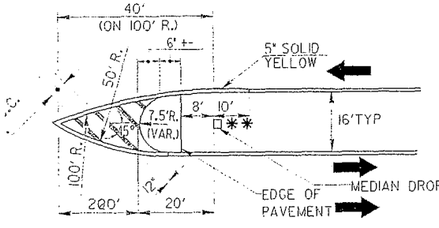
TYPE B MEDIAN CROSSOVERS ●					
	DECELERATION LENGTH = Δ (FT.)				
WIDTH OF MEDIAN	DESIGN SPEED			Y	W
	45 MPH	55 MPH	65 MPH		
44	150(150 MIN)	300(150 MIN)	450(300 MIN)	240	16
64	N/A	150(150 MIN)	300(150 MIN)	390	26

$W = \frac{44 - 12}{2} = 16'$

DECELERATION LANE

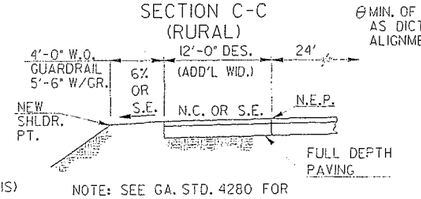
$\frac{450 \times 28 + \frac{1}{2}(28 \times 420)}{9} = 2053$ SY

ONE SIDE



DETAIL "A" (YELLOW)

20FT. 0 20FT.
GRAPHIC SCALE



SECTION C-C (RURAL)

NOTE: SEE GA. STD. 4280 FOR GRADING WITH GUARDRAIL.

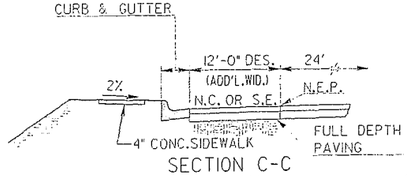
θ MIN. OF 64' - THIS MAY VARY AS DICTATED BY WIDTH AND ALIGNMENT OF CROSS ROAD.

* DIMENSION MAY VARY WHERE SPECIFIED IN THE PLANS. ADJUSTMENTS TO BE SHOWN FOR ANY WIDTH OTHER THAN 44 FT.

● DIMENSIONS IN FEET (TYP)

** MEDIAN DROP INLET (9031S) CANNOT BE PLACED CLOSER THAN 20 FEET BACK FROM END OF NOSE OF THE MEDIAN.

MEDIAN DROP INLET (9031S) IS NOT RECOMMENDED FOR TYPE B MEDIAN CROSSOVERS WHERE GRADES ARE GREATER THAN 3%.



SECTION C-C (URBAN)

TYPE C MEDIAN CROSSOVERS ●	
DECELERATION LENGTH = X ■	
DESIGN SPEED	X (FT)
35 MPH	300(200 MIN.)
45 MPH	400(250 MIN.)

'X' DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED.

TE:
THE TYPE C MEDIAN CROSSOVER SHOWN IS TYPICAL FOR ONE SIDE ROAD CONNECTION. (T-INTERSECTION)

THE BOTTOM PORTION OF TYPE C IS APPLICABLE ON EACH SIDE OF THE CROSSOVER FOR A CROSS ROAD INTERSECTION OR SIDE ROAD CONNECTION ON EACH SIDE. (X-INTERSECTION)

THE TOP PORTION OF TYPE C DETAIL IS APPLICABLE ON EACH

"L" - 84' MIN. (FOR TYP. C)

TYPE C MEDIAN CROSSOVER

SPECIAL NOTE: ONE SIDE
THE "L" DIMENSIONS SHOWN FOR TYPE A, TYPE B, AND TYPE C CROSSOVERS ARE BASED UPON 50FT. CONTROL RADII FOR LEFT TURNS AND INTERSECTING CROSSROADS OF TWO 12 FT. LANES PERPENDICULAR TO THE MAINLINE. DIFFERENT "L" DIMENSIONS MAY BE SPECIFIED AT LOCATIONS WHERE WARRANTED BY OTHER CONDITIONS.

DATE | REVISION

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

CONSTRUCTION DETAILS
MEDIAN CROSSOVERS

SCALE AS SHOWN APRIL, 2027

MCR

COST WORKSHEET

PROJECT:	**SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION - PHASE II** *P.I. No. 621440 & P.I. No. 621445* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**R-7B** **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Asphalt Pavement	SY	4,106	50.88	208,913	1,414	50.88	71,944
Subtotal				208,913			71,944
Markup (%) at							
TOTAL				208,913			71,944
TOTAL (ROUNDED)				209,000			72,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-9A**

DESCRIPTION: **USE 2-FT.-WIDE FULL DEPTH PAVED SHOULDERS AND 4.5-FT.-WIDE REDUCED DEPTH SHOULDER IN LIEU OF 6.5.-FT.-WIDE FULL DEPTH SHOULDER ON P.I. NO. 621440**

SHEET NO.: 1 of 4

ORIGINAL DESIGN: (sketch attached)

The current design proposes 6.5-ft.-wide paved shoulders with full-depth pavement.

ALTERNATIVE: (sketch attached)

Use 2-ft.-wide paved shoulders with full-depth pavement and 4.5-ft.-wide shoulders with reduced depth of pavement.

ADVANTAGES:

- Reduces construction labor and material requirements

DISADVANTAGES:

- Under heavy truck usage, the reduced depth pavement portion of the shoulder is likely to deteriorate more quickly than the full depth pavement portion of the shoulder

DISCUSSION:

The 6.5-ft.-wide shoulder provides extra width to accommodate bicycles. However, bicycles do not need full depth pavement. Since the shoulder is normally used only during the emergencies, a 4.5 ft. paved shoulder with reduced depth is sufficient for an arterial type highway as long as the graded shoulder width is 10 ft.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 744,000	—	$ 744,000
ALTERNATIVE	$ 442,000	—	$ 442,000
SAVINGS (Original minus Alternative)	$ 302,000	—	$ 302,000

SKETCHES

PROJECT:

Bartow County, GA

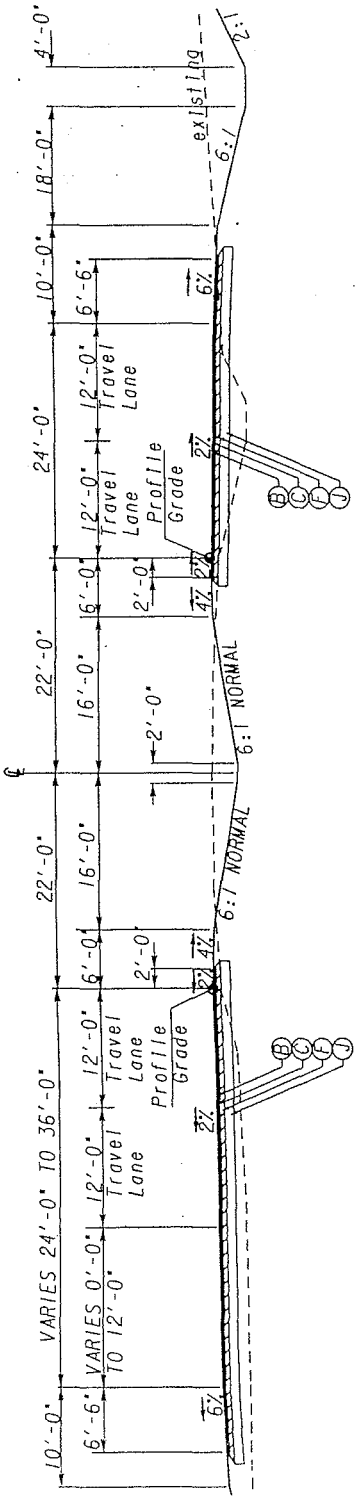
☑ AS DESIGNED ☑ ALTERNATIVE

ALTERNATIVE NO.:

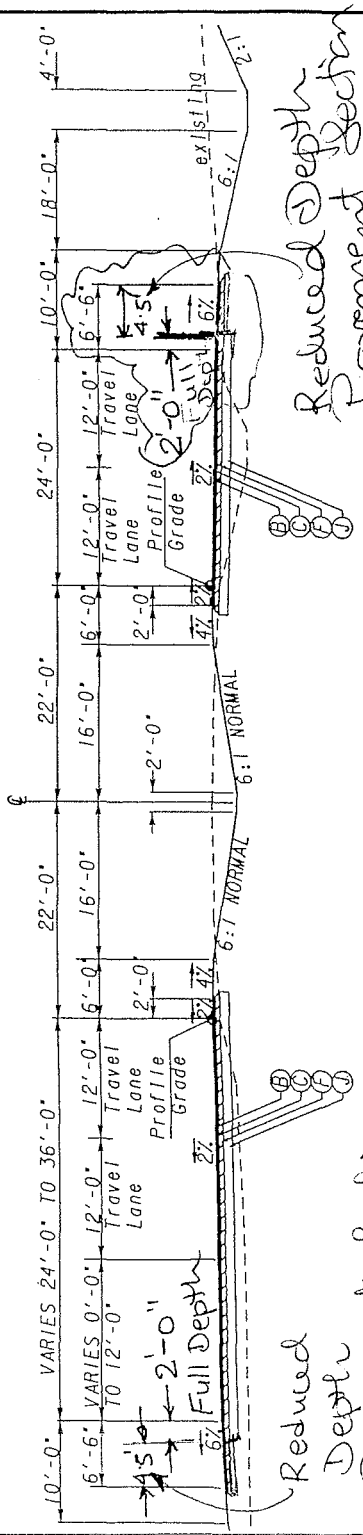
R-9A

SHEET NO.: 2 of 4

ORIGINAL DESIGN



ALTERNATE DESIGN



PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-9A**

SHEET NO.: **3 of 4**

P.I. # 621440: (STA. 204+48 – STA. 100+58) – Bridge (STA. 191+35 – STA. 188+75) = 10,130 feet

Total One-way Length: 10,130 feet
Both ways: 10,130 x 2 = 20,260 feet

Area of 6.5' wide full depth paved shoulder: 20,260 x 6.5/9 = 14,632 sy

Area of 2.0' wide full depth paved shoulder: 20,260 x 2.0/9 = 4,502 sy

Area of 4.5' wide reduced depth paved shoulder: 20,260 x 4.5/9 = 10,130 sy

Full Depth Pavement Section Unit Cost = $50.88/sy (see Alternate R-5A)

Reduced Depth Pavement Section Unit Cost:

12.5mm:	165#/SY x Ton/2,000# x $72.34/Ton	=	$5.97/SY
19.0mm:	220#/SY x Ton/2,000# x $72.81/Ton	=	$8.01/SY
6" GAB:	0.5ft x 147#/CF x Ton/2,000# x 9SF/SY x $21.16/Ton	=	$7.00/SY
	Total Pavement Unit Cost =		**$20.98/SY**

COST WORKSHEET

PROJECT:	**SR 113 FROM CR 31 TO RICHLAND CREEK@ OLD ALABAMA ROAD RELOCATION - PHASE II** *P.I. No. 621440 & P.I. No. 621445* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**R-9A** **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
6.5' full depth shoulder section	SY	14,632	$50.88	$744,476			
2.0' full depth shoulder section	SY				4,502	50.98	229,512
4.5' reduced depth shoulder section	SY				10,130	20.98	212,527
Subtotal				$744,476			442,039
Markup (%) at							
TOTAL				$744,476			442,039
TOTAL (ROUNDED)				$744,000			442,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-10/R-11**

DESCRIPTION: **MOVE THE HORTIZONTAL ALIGNMENT OF SR 113 NORTH (LEFT), RAISE THE VERTICLA ALIGNMENT (PROFILE) AND USE A RETAINING WALL ALONG SR 113 AT THE CR 25 INTERSECTION TO REDUCE R/W IMPACTS TO THE PROPERTIES SOUTH (RIGHT) OF SR 113**

SHEET NO.: **1 of 14**

ORIGINAL DESIGN: (sketch attached)

The current design's horizontal and vertical alignments for Sta. 200+50 to Sta. 229+00 have major right of way impacts to parcels 25, 26, 28, and 30 on the left side of SR 113.

ALTERNATIVE: (sketch attached)

Shift the horizontal alignment to the left and raise the vertical profile alignment to reduce the major right of way impacts to parcels 25, 26, 28, and 30.

ADVANTAGES:

- Reduces right of way impacts
- Reduces right of way requirements
- Reduces unclassified excavation requirements

DISADVANTAGES:

- Increases retaining wall, guardrail, and drainage construction requirements

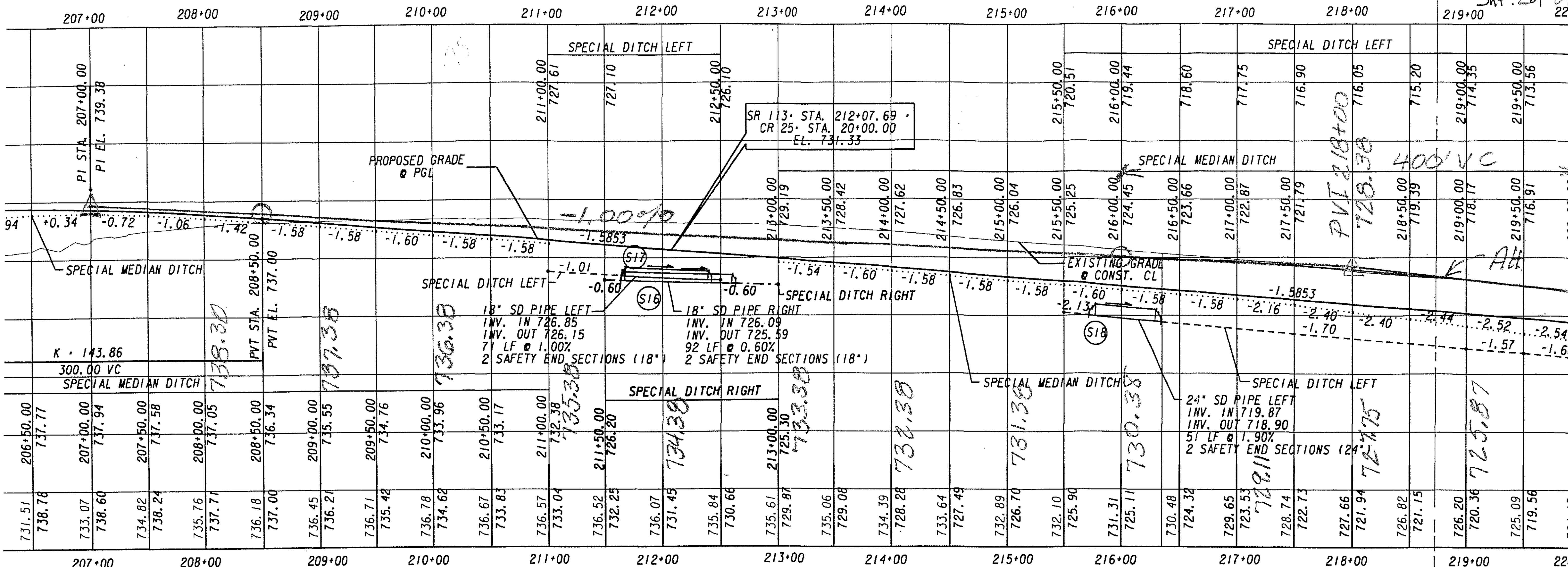
DISCUSSION:

The current design causes major right of way impacts to parcels 25, 26, 28, and 30 because of the horizontal alignment and the depth of earthwork "cut" (vertical profile) along this section of the SR 113 widening and reconstruction project. The alternate design uses guardrail from approximate Sta. 203+50 to Sta. 208+00 left and right to reduce the amount of required right of way (refer to attached x-sections). A retaining wall from Sta. 218+00 to Sta. 226+00 will be required to save the parking and staging area lot on parcel 28, and impacts to parcel 30. After the pavement costs, right of way is the next highest item for the total project cost.

It is possible to use other types of retaining walls to save construction costs, such as a pile and concrete lagging type wall, which would be cheaper than the reinforced steel concrete type (cast-in-place) Type 6A, 6B, and 6C walls.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 819,000	—	$ 819,000
ALTERNATIVE	$ 496,000	—	$ 496,000
SAVINGS (Original minus Alternative)	$ 323,000	—	$ 323,000

ALT. No.
R-10/R-11
Sht. 2 of 14



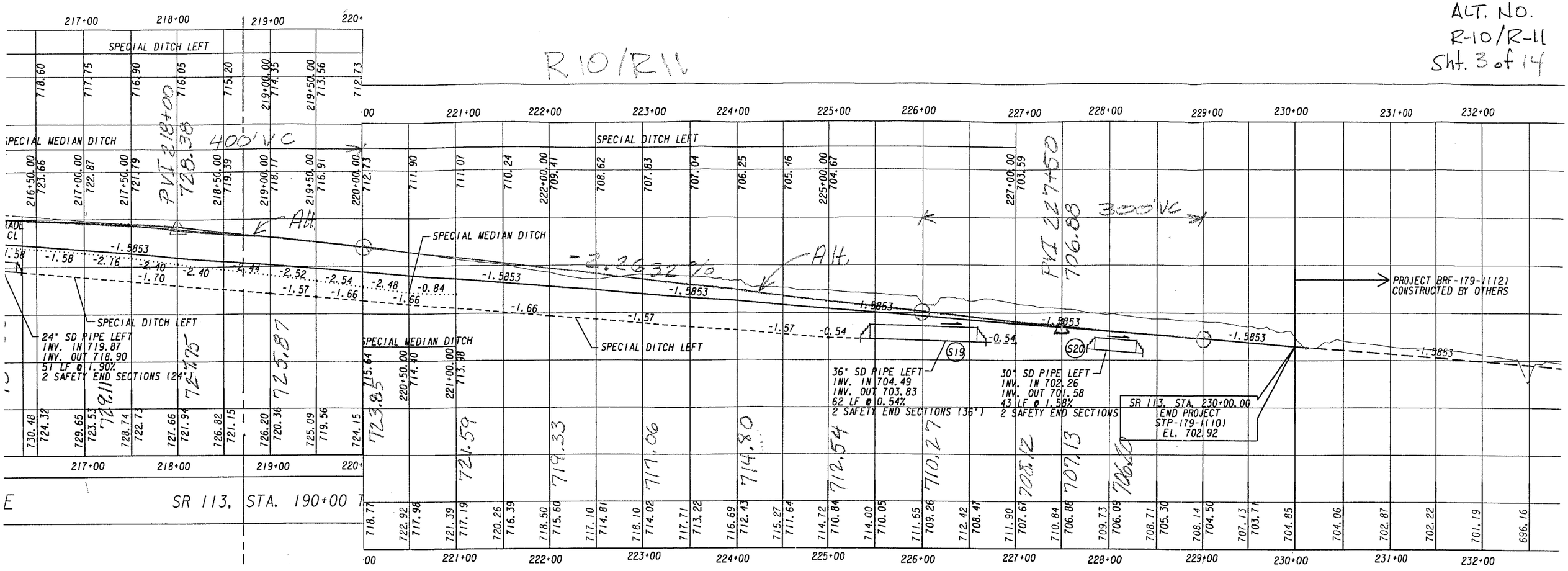
1:10 VERT. 1:50 HORZ.	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE OF CONSULTANT DESIGN	MAINLINE PROFILE SR 113, STA. 190+00 T

N 6/22/2010 10:10:10 PM

MATCH LINE

ALT. NO.
R-10/R-11
Sht. 3 of 14

R10/R11



R10/R11

PRF	DGN	COUNTY	PROJECT
$$PENTABLE$$		BARTOW	STP00-017

19
MAX D. KALEY, TRUSTEE of LOU ERNICE HEARD MORRISON INTER VIVOS TRUST

APPROXIMATE BOUNDARY LAND LOT LINE

L.L. 938
L.L. 939

200'00

23
RACOON CREEK CHURCH

NOTE: DO NOT DISTURB WROUGHT IRON GATES

NOTE: DO NOT DISTURB PARKING LOT

202+20.00
89.48' LT
105.00' LT

STA. 198+50.00
END GR
TYPE 2 ANCHOR

STA. 200+00.00
BEGIN SPEC. DITCH LT

200+50.00
90.00' LT
110.00' LT

199+24.41
110.00' LT

STA. 201+00.00
END SPEC. DITCH LT

APPROX. REQ'D. R/W LT

202+94.82
REV. CROWN

202+70.00
89.27' LT
105.00' LT

203+65.76
130.00' LT

203+59.46
88.52' LT

WROUGHT IRON GATES

TEMP. ESMT FOR CONST. OF SLOPES

203+75.00
100.00' LT
130.00' LT
140.00' LT

205'00

BEGIN 6' CHAIN LINK FENCE WITH 3 STRANDS BARBED WIRE

204+39.04
130.00' LT

ESMT FOR CONST. OF FENCE

6' CHAIN LINK FENCE WITH 3 STRANDS BARBED WIRE

REQ'D. R/W

EXIST. R/W

207+50.00
100.00' LT
130.00' LT

207+60.00
100.00' LT
140.00' LT

END 6' CHAIN LINK FENCE WITH 3 STRANDS BARBED WIRE

REQ'D. R/W

SVX0841

STA. 203+71.42
ZERO SE

28'

24.00'

CURVE = 29

SR 113

CONST. ℄

N 84°22'37" E

W17

W18

SVX0844

STA. 202+64.19
EFSE

514

18'

+72.55
24.00'

+92.13
46.00' RT.

EXIST. R/W

+92.54
6.00' LT.

+72.65
68.00'

Curve = 21

STA. 204+48.02
BNC

STA. 205+50.00
BEGIN "V" GUTTER
MEDIAN DITCH PAVING

208+53.18
120.00' RT

Alt. R/W 2

30600SF

105'

110'

REQ'D. R/W

204+39.04
120.00' RT

BEGIN 4' WOVEN WIRE FIELD FENCE WITH 2 STRANDS BARBED WIRE

208+53.31
130.00' RT

ESMT. FOR CONST. OF FENCE

N 1497861.28
E 2078532.69

198+82.92
120.00' RT

200+97.24
120.00' RT

201+80.00
120.00' RT
135.00' RT

201+40.00
120.00' RT
135.00' RT

STA. 203+00.00
BEGIN SPEC. MEDIAN DITCH

PT 202+99.93

202+99.93
120.00' RT

PC 204+39.04
N 1497930.12
E 2079067.12

21
WALTER T. LOCHRIDGE

25 FOOT ROADWAY EASEMENT

24
CHARLES T. & GENEVIA L. DOVER

22
WALTER T. & BRENDA SUE DOVER LOCHRIDGE

L.L. 1007
L.L. 1006

STATE OF
MENT OF T
NSULTANT
MAINLIN
1+00 TO ST

19
MAX D. KALEY, TRUSTEE of LOU ERNICE HEARD MORRISON INTER VIVOS TRUST

24+45.00
19.74' LT
70.00' LT

END 4' WOVEN WIRE FENCE WITH 1 STARND BARBED WIRE

24+30.00
19.74' LT
55.00' LT

+25.00
10.56' LT.

STA. 24+21.20
END SPEC. DITCH LEFT

+00.00
24.00'

PT 23+55.00

23+55.00
55.00' LT
70.00' LT

STA. 23+50.00
BEG. SPEC. DITCH LEFT

4' WOVEN WIRE FIELD FENCE WITH 2 STRANDS BARBED WIRE

TEMP. ESMT FOR CONST., MAINT. & REMOVAL OF TEMP. DETOUR

22+00.00
55.00' LT

22+00.00
70.00' LT

21+85.11
70.00' LT

ESMT. FOR CONST. OF FENCE

SR 113 STA. 212+07.69
CR 25 STA. 20+00.00
N 1497975.13
E 2079834.25
BEGIN 4' WOVEN WIRE FENCE WITH STRAN OF BARBED WIRE

210+50.00
100.00' LT

210+40.00
100.00' LT

REQ'D. R/W

STA. 210+50.00
BEGIN SPEC. DITCH

EXIST. R/W

+43.47
46.00' LT.

W19

24.00'

W19B

+15.07
14.21' LT.

STA. 211+00.00
END SPEC. MEDIAN DITCH
END "V" GUTTER
MEDIAN DITCH PAVING

+42.79
62.00' RT.

EXIST. R/W

ESMT. FOR CONST. OF FENCE

209+73.43
120.00' RT

STA. 18+24.32
ZERO SE

211+00.00
120.00' RT

STA. 211+50.00
BEGIN SPEC. DITCH RIGHT

209+73.12
130.00' RT

END 4' WOVEN WIRE FIELD FENCE WITH 2 STRANDS BARBED WIRE

26
DONALD H. & ELLEN NELSON

18+50.00
50.00' LT

18+05.00
50.00' LT
65.00' LT

17+65.00
50.00' LT
65.00' LT

STA. 17+50.00
END SPEC. DITCH LEFT

17+45.94
50.00' LT

25
DONALD H. & ELLEN NELSON

STA. 17+00.00
BEG SPEC. DITCH LEFT

17+35.00
50.00' LT
65.00' LT

17+00.00
50.00' LT

27
DONALD H. & ELLEN NELSON

16+90.00
65.00' LT

16+90.00
18.15' LT
50.00' LT

+00.00
12.00' LT.

L.L. 1006
L.L. 1005

EXIST. R/W

CONST. ℄ EXIST. R/W

KINCANNON ROAD/CR 25

N 0°03'57.8" E

+45.

LIMIT OF CONSTRUCTION
CR 25, STA. 24+55.00

L.L. 939
L.L. 940

+25.00
10.41' RT.

STA. 24+21.20
END SPEC. DITCH RIGHT

STA. 23+50.00
BEG SPEC. DITCH RIGHT

23+55.00
75.00' RT

23+10.00
75.00' RT

23+10.00
55.00' RT
65.00' RT

BEG. FIELD FENCE

22+00.00
55.00' RT

22+05.00
65.00' RT

ESMT. FU
OF FENCE

STA. 20+81.68
ZERO SE

STA. 212+50.00
END SPEC. DITCH L

213+53.50
135.00' LT

66SQ. YDS
TYPE 3 RIP RAP

125.0

PC 20+68.97
R=50'

+65.87
62.00' LT.

STA.
BEG

SVX0204

STA. 213+00.00
BEGIN SPEC. MEDIAN DI
BEGIN "V" GUTTER
MEDIAN DITCH PAVING

91°42'58.3"

88°55'31.1"

+92.95
14.32' RT.

CBO. 44
46.00' RT.

STA. 213+00.00
END SPEC. DITCH RIGHT

32 SQ. YDS
TYPE 3 RIP RAP

213+00.00
110.00' R

4 SQ. YDS
TYPE 3 RIP RAP

80.

STA. 18+85.61
ENC

18+60.00
60.00' RT

18+

60.

STA. 17+50.00
END SPEC. DITCH RIGHT

STA. 17+00.00
BEG SPEC. DITCH RIGHT

16+90.00
31.68' RT
60.00' RT

+00.00
19.45' RT.

LIMIT OF CONSTRUCTION
CR 25, STA. 16+00.00

GL

CONTROL POINTS	
POINT	COORDINATES
SVX0205	N 1497965.24 E 2078826.39

PLANS PREPARED AND SUBMITTED BY:

65 Aberdeen Drive
Georgia, KY 42141
(270) 656-1220

1534 White Circle, Suite D
Marietta, GA 30066
(770) 421-8422

1500 Nelson Miller Parkway
Louisville, KY 40223
(502) 245-3813

REVISION DATES

OFFICE:

PERTY AND EXISTING R/W LINE
UIRED R/W LINE
STRUCTION LIMITS
EMENT FOR CONSTR. & MAINT.
SLOPE
EMENT FOR CONSTR. & MAINT.
EDIMENT BASINS
EMENT FOR CONSTR OF DRIVES

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Alt. No. R-10/R-11
5 of 14

COUNTY	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
BARTOW	STP00-0179-01(010)		

R/W Saved under R10/11

R10/R11

ALL EXISTING RIGHT OF WAY BETWEEN STA. 212+08 AND 239+00, RT. AND BETWEEN 223+01 AND 239+00, LT. AND ALL EXISTING EOP AND DRAINAGE FEATURES, BETWEEN STA. 216+35 AND STA. 239+00 ARE PROPOSED PER PROJECT. BRF-179-1(121), GDOT PI NO. 621760. TO BE CONSTRUCTED BY OTHERS.

24+30.00
20 19.76 RT
55.00' RT

RTGHT

Curve # 8
PI STA. : 22+12.04
PI X : 2079823.85
PI Y : 1498186.91
Δ : 3°50'49.1" (CW)
R : 4260.00'
e : N.C.
T : 143.07'
L : 286.03'
E : 2.40'

29
RICHARD COLE

31
RICHARD COLE

31
RICHARD COLE

32
ROBERT H. & DEBRA TATUM

GRAVEL PARKING LOT

ASPH. PARKING LOT

STA. 219+63.68
END 4' WOVEN WIRE FIELD FENCE WITH 2 STRANDS BARBED WIRE
BEG. 4' CHAIN LINK FENCE

ESMT. FOR CONST., MAINT. & REMOVAL OF SEDIMENT BASIN AND CONST. OF PERM. FENCE ALONG R/W AFTER STAGED CONST.

4' WOVEN WIRE FIELD FENCE WITH 2 STRANDS BARBED WIRE

L.L. 940
L.L. 941

ESMT. FOR CONST. OF FENCE

ESMT FOR DEMOLITION OF IMPROVEMENTS

ESMT. FOR CONST. OF FENCE

ESMT. FOR CONST. OF FENCE

ESMT. FOR CONST. OF FENCE

ESMT. FOR CONST. OF FENCE

Alt. R/W

Alt. R/W

215+00

220+00

225+00

230+00

216+20.00
125.00' LT
140.00' LT

215+80.00
125.00' LT
140.00' LT

2-12' GALV. METAL FIELD GATE

16' GALV. METAL FIELD GATE

217+28.00
183.00' LT

217+08.50
180.00' LT

218+53.48
135.00' LT

218+57.00
125.00' LT

217+36.00
135.00' LT

217+16.00
135.00' LT

219+37.00
192.00' LT

219+33.94
202.00' LT

220+06.60
125.00' LT

220+75.72
187.00' LT

220+68.00
178.00' LT

220+92.44
135.00' LT

223+00.48
135.00' LT

220+85.00
125.00' LT

223+00.72
125.00' LT

225+32.00
125.00' LT
180.00' LT

225+95.00
125.00' LT
140.00' LT

PT 226+08.82
N 1497938.77
E 2081234.56

225+12.00
125.00' LT
135.00' LT

226+21.00
180.00' LT

226+28.00
140.00' LT

226+50.00
125.00' LT
135.00' LT
140.00' LT

227+85.28
145.00' LT

227+83.86
135.00' LT

228+25.00
135.00' LT
145.00' LT

229+93.28
135.00' LT

226+60.67
135.00' LT

226+60.60
125.00' LT

229+91.6
125.00'

227+82.47
125.00' LT

226+08.82
125.00' LT

213+50.00
125.00' LT

REQ'D. R/W

GALV. WIRE GATE

24'

12' GATE

STA. 215+50.00
BEGIN SPEC. DITCH LEFT

32 SQ. YDS TYPE 3 RIP RAP

EXIST. R/W

BEG. 4' CHAIN LINK FENCE

END FIELD FENCE

IRON METAL GATE

14'

36'

14'

EXIST. R/W

28 SQ. YDS TYPE 3 RIP RAP

0.00
MEDIAN DITCH
GUTTER
CH PAVING SR 113 | Curve # 21

C21

60.57'
68.00'

+14.81
6.00' RT.

+00.53
16.00' LT.

SR. 113

STA. 219+00.00
END "V" GUTTER
MEDIAN DITCH PAVING

+36.16
24.00'

APPROXIMATE BOUNDARY LAND LOT LINE

Curve # 22

Curve # 22

24.00'

24.00'

EXIST. R/W

6' CHAIN LINK FENCE WITH 3 STRAND BARBED WIRE

Ret. Wall

Drop Inlet

18"

Alt. R/W

Drop Inlet

Wall

Drop Inlet

24"

60"

SR 113

CONST. ℄

STA. 227+00.00
END SPEC. DITCH LEFT
25 SQ. YDS TYPE 3 RIP RAP

GRADE MEDIAN TO DRAIN TO EXISTING INLET CONSTRUCTED BY PROJECT BRF-179-1(112)

BEG. FENCE
STA. 221+00.00
END SPEC. MEDIAN DITCH

Exist. & Alt. R/W

6' CHAIN LINK FENCE WITH 3 STRAND BARBED WIRE

1.00
DITCH RIGHT

32 SQ. YDS TYPE 3 RIP RAP

213+00.00
110.00' RT

REQ'D. R/W

216+00.00
110.00' RT
125.00' RT

ESMT. FOR CONST. & MAINT. OF SLOPES

220+06.60
110.00' RT
125.00' RT

220+65.70
110.00' RT

220+66.42
125.00' RT

ESMT. FOR CONST. & MAINT. OF SLOPES

222+00.00
110.00' RT
120.00' RT
125.00' RT

ESMT. FOR CONST. OF FENCE

224+40.00
110.00' RT
120.00' RT

226+08.82
110.00' RT

224+30.00
120.00' RT
130.00' RT

16' GALV. METAL FIELD GATE

226+20.00
149.00' RT
220.00' RT

226+30.00
140.00' RT
210.00' RT

228+66.77
120.00' RT

226+60.00
110.00' RT

228+20.00
210.00' RT

228+26.77
220.00' RT

ESMT. FOR CONST., MAINT. & REMOVAL OF SEDIMENT BASIN AND CONST. OF PERM. FENCE ALONG RW AFTER STAGED CONST.

ESMT. FOR CONST. OF FENCE

PC/PT 220+06.60
N 1497957.53
E 2080632.74

Alt. Curve C21
R = 4584' (1°15')
S.E. = 3%

Alt. Curve 22
R = 4584'
(1°15')

18°18.78'
ANGLES FABRICATION BLDG A (FOR LEASE)

18+85.61
EMC

18+60.00
60.00' RT

18+15.00
60.00' RT
80.00' RT

RIGHT

Curve # 21
PI STA. : 212+22.82
PI X : 2079848.82
PI Y : 1498007.09
Δ : 9°14'25.8" (CW)
R : 9719.68'
e : N.C.
T : 785.48'
L : 1567.56'
E : 31.69'

Curve # 22
PI STA. : 223+07.71
PI X : 2080933.35
PI Y : 1497938.52
Δ : 3°32'59.5" (CCW)
R : 9720.00'
e : N.C.
T : 301.21'
L : 602.22'
E : 4.67'

28
GLENN E. TAYLOR

30
GLENN E. TAYLOR

30
GLENN E. TAYLOR

CONTROL POINTS	
POINT	COORDINATES
SVX0204	N 1498020.12 E 2079851.74

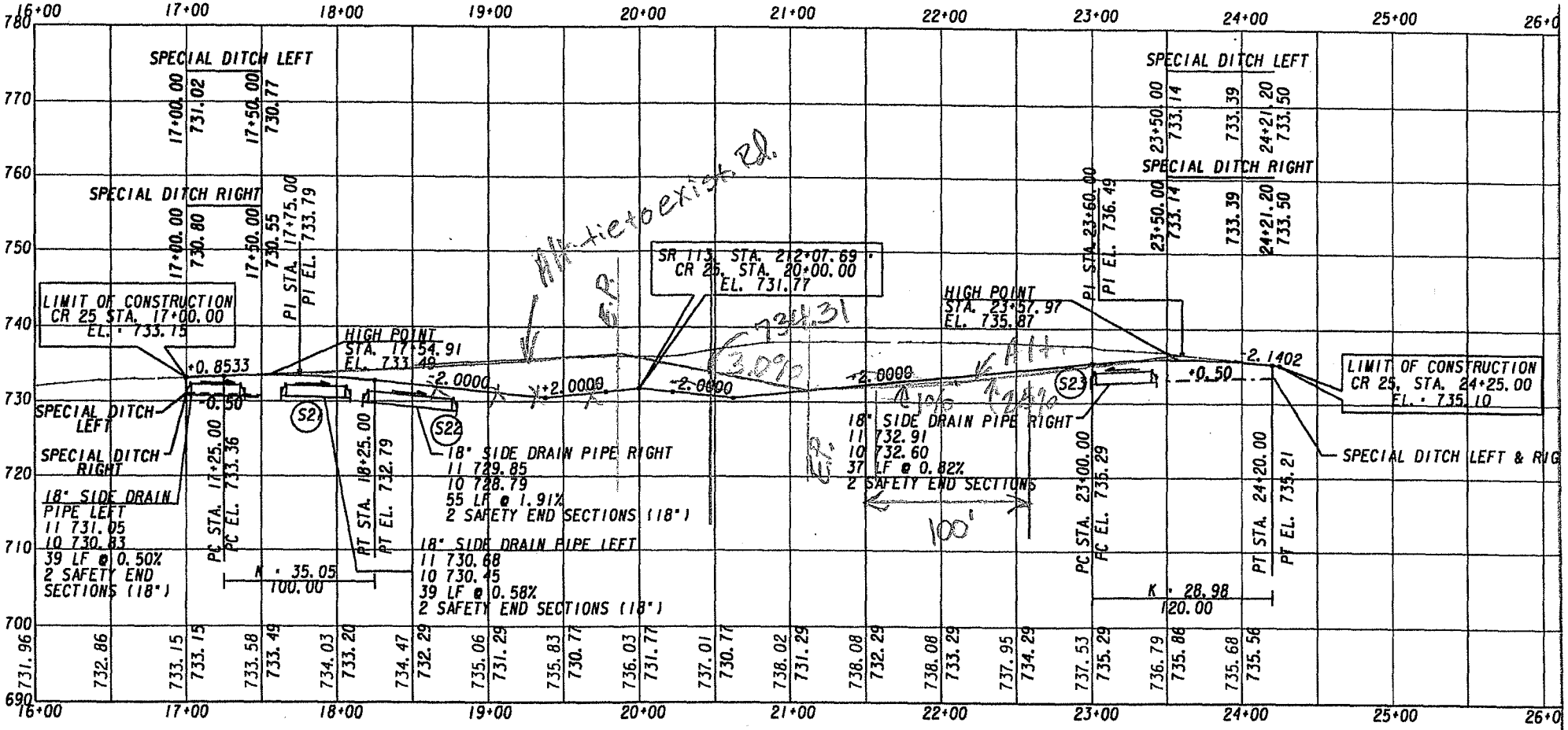
L.L. 1005 APPROXIMATE BOUNDARY
L.L. 1004 LAND LOT LINE

PROPERTY AND EXISTING R/W LINE

PLANS PREPARED AND SUBMITTED BY:

REVISION DATES

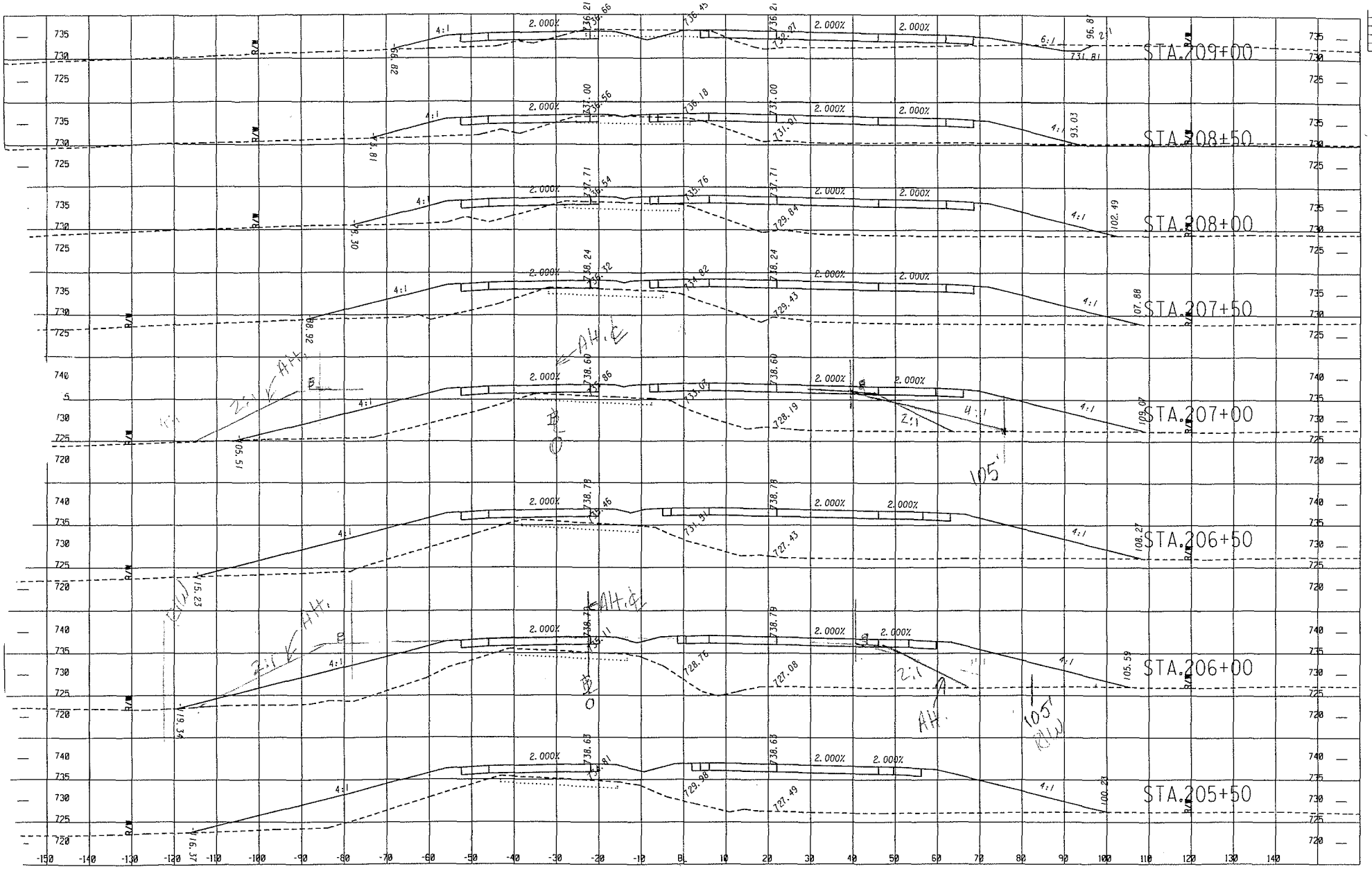
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: CONSULTANT DESIGN
MAINLINE PLAN



1:50 HOR 1:10 VER	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE OF CONSULTANT DESIGN	CROSSRO

621440\DGN\621440XP01.DGN 6/22/2010 10:11:11 PM

CROSSROAD PROFILE



1:10 HOR
1:10 VER

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

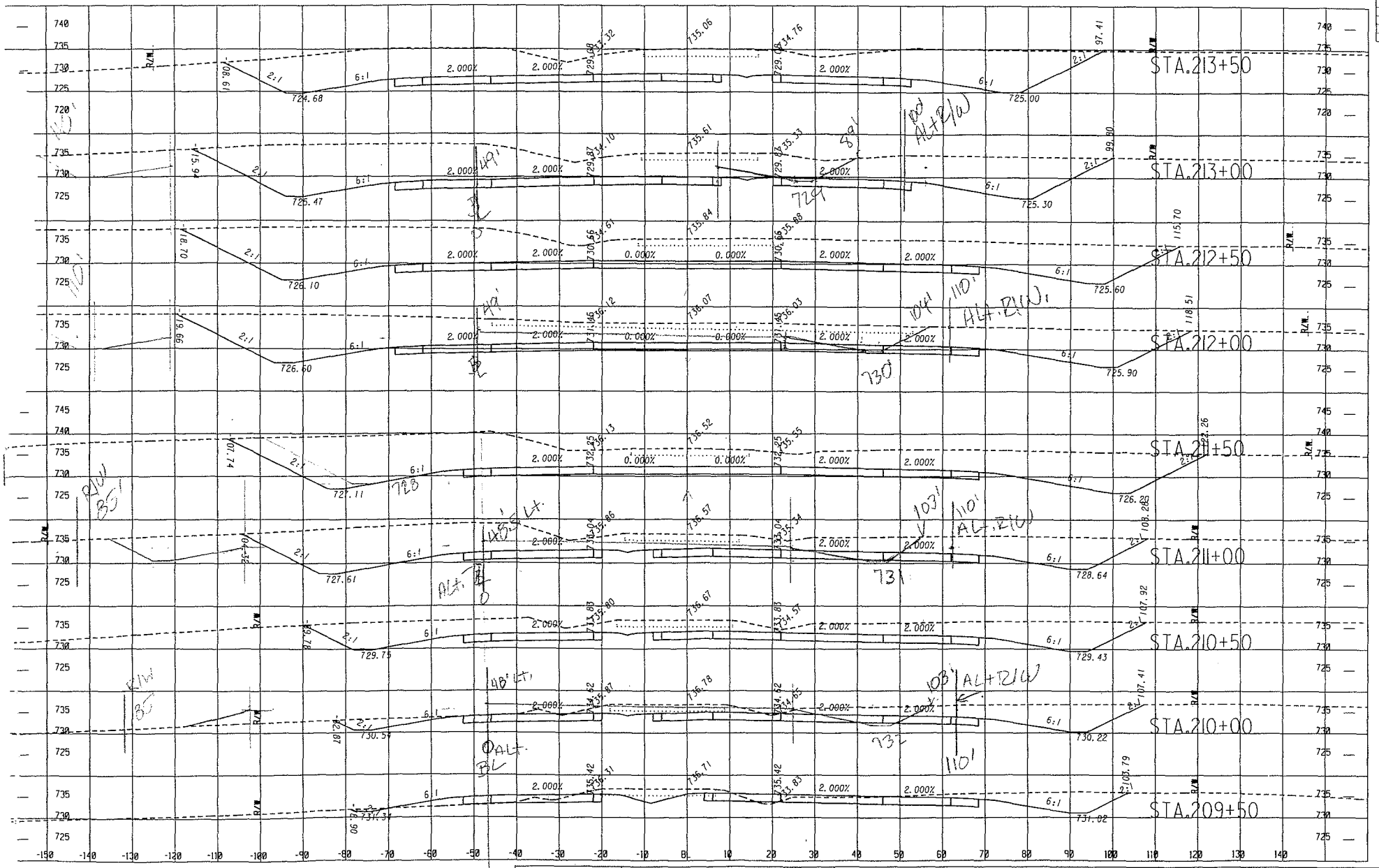
EARTHWORK CROSS SECTIONS

SR 113, STA. 205+50
TO STA. 209+00

DRAW 23

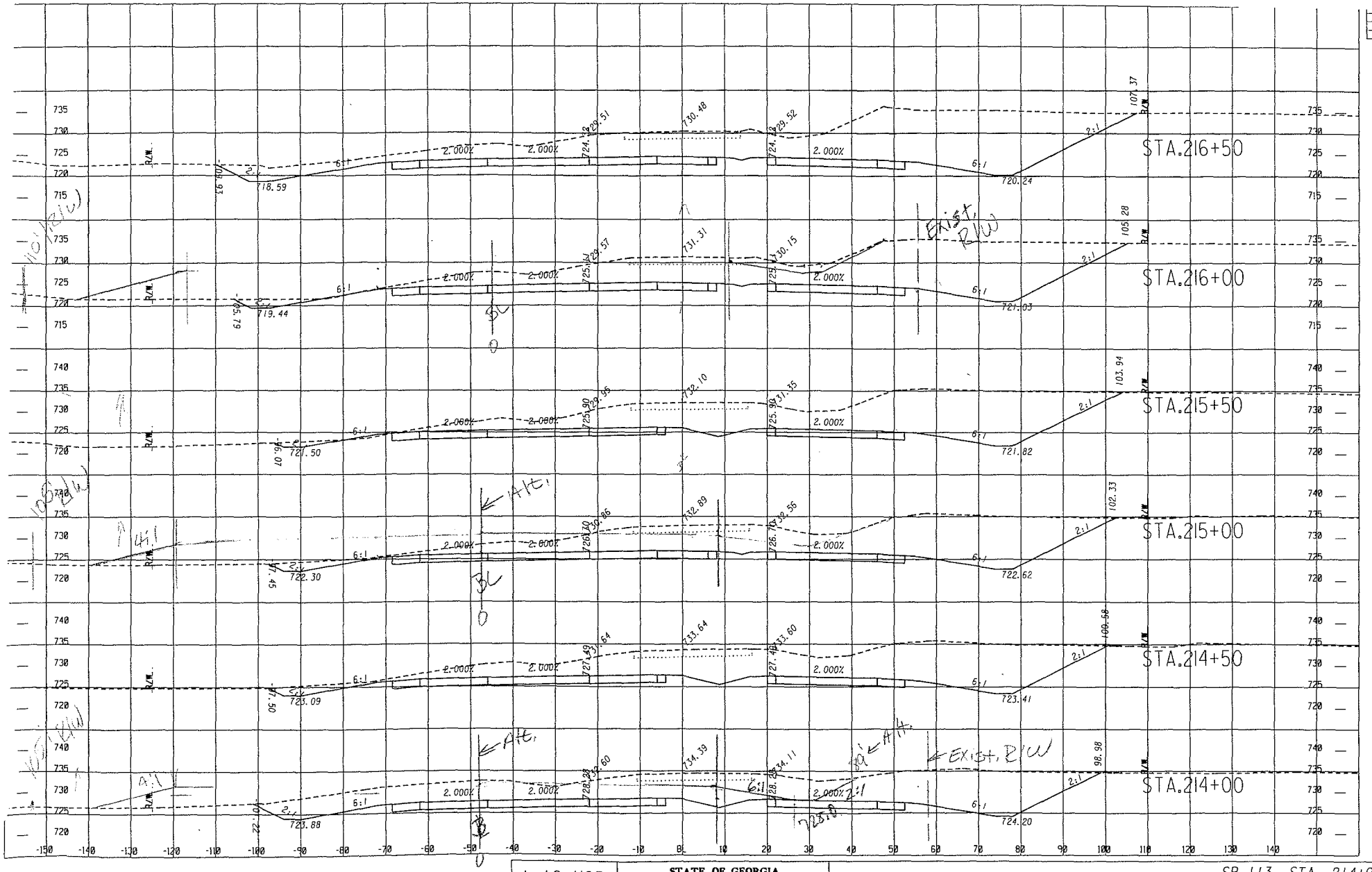
ALT. NO. R-10/R-11
Sht. 7 of 14

REVISION DATE



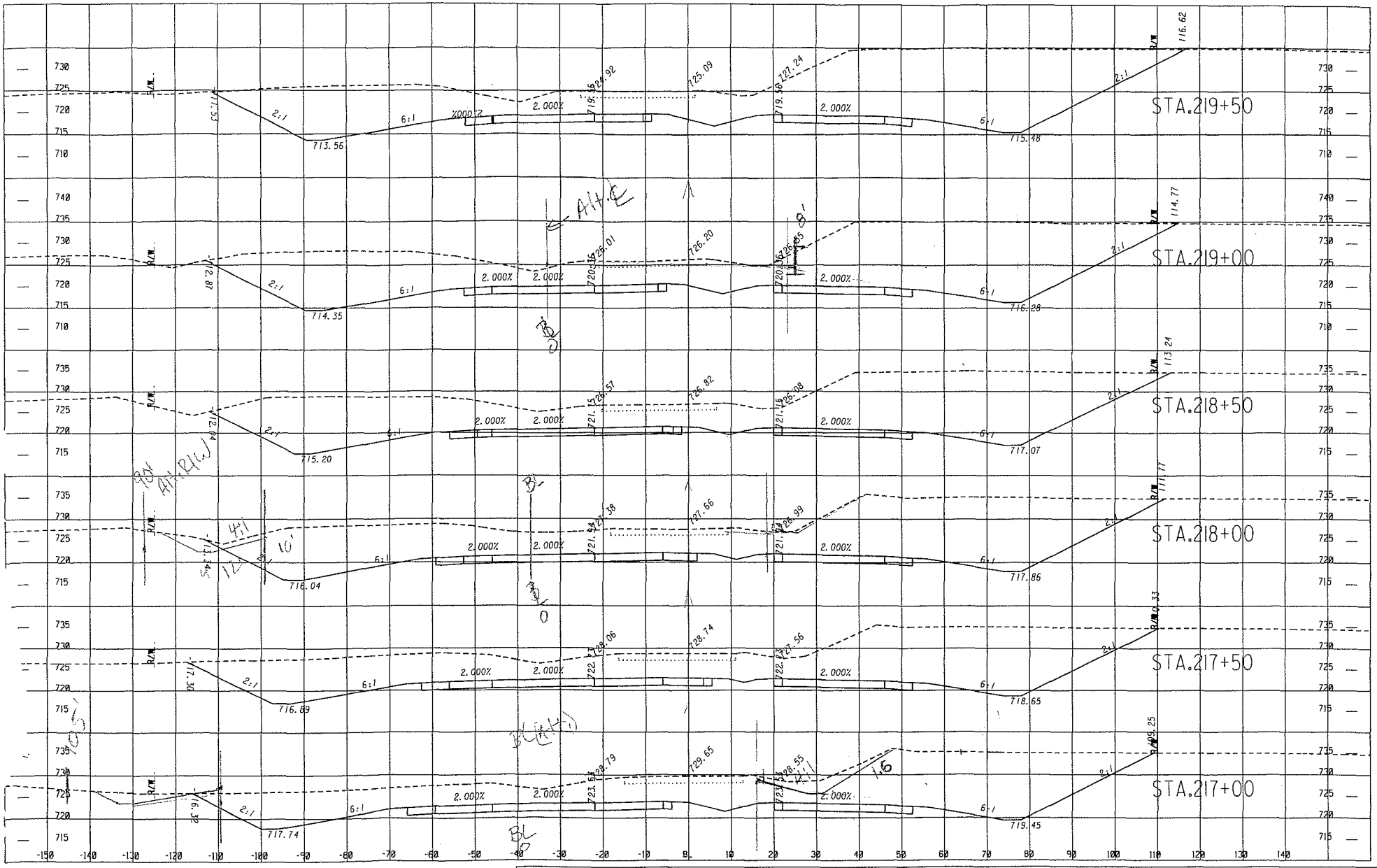
1:10 HOR | STATE OF GEORGIA | EARTHWORK CROSS SECTIONS | SR 113, STA. 209+50 | DRAWN

ALT. NO. R-10/R-11 Sht. 8 of 11



1:10 HOR 1:10 VER	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE OF CONSULTANT DESIGN	EARTHWORK CROSS SECTIONS	SR 113, STA. 214+00 TO STA. 216+50	DRAWING 23-

ALT. NO. R-10/R-11 Sht. 8 of 15



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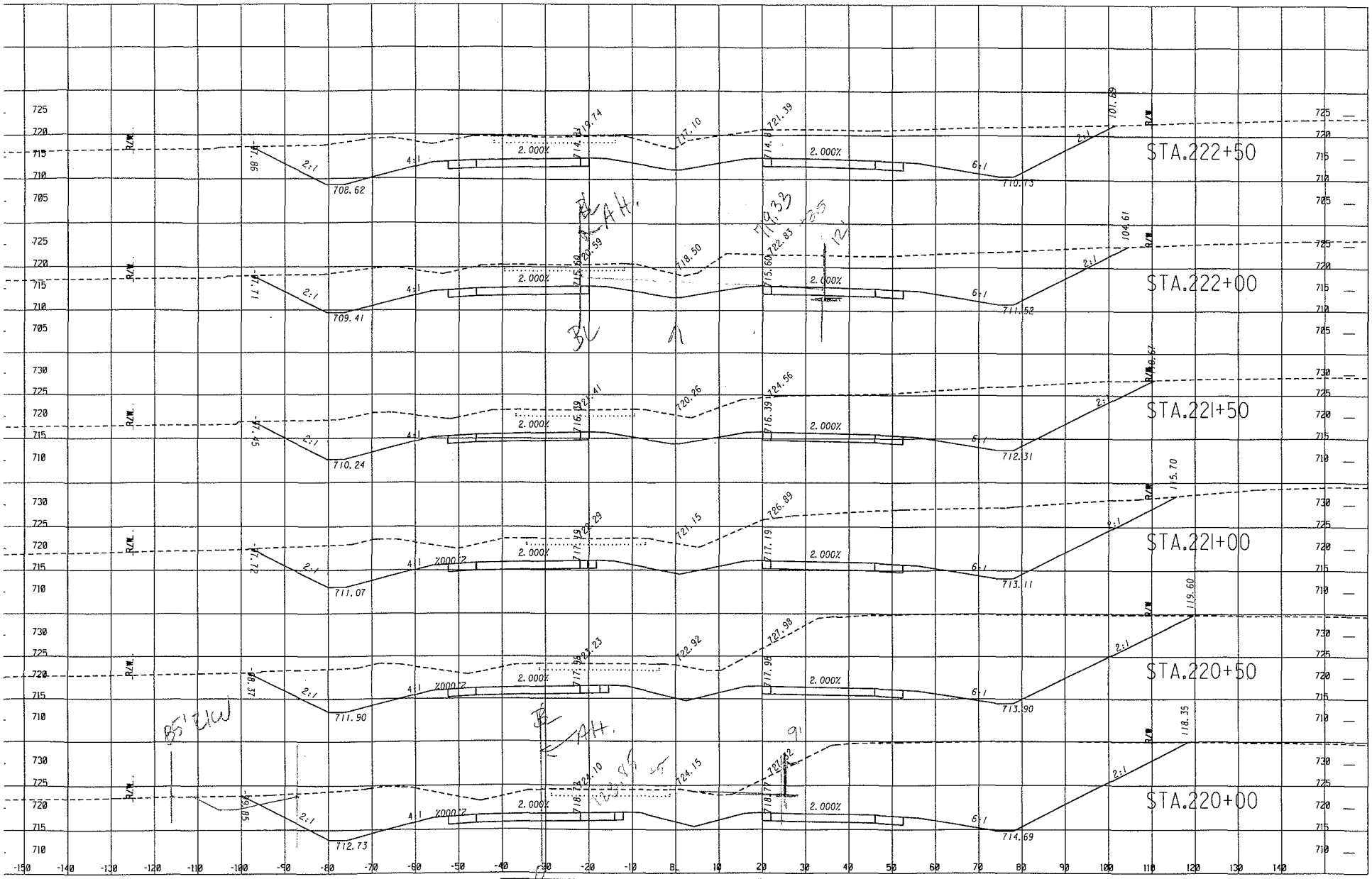
ALT. NO.
R-10/12-11
Sht. 10 of 14



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1:10 VER

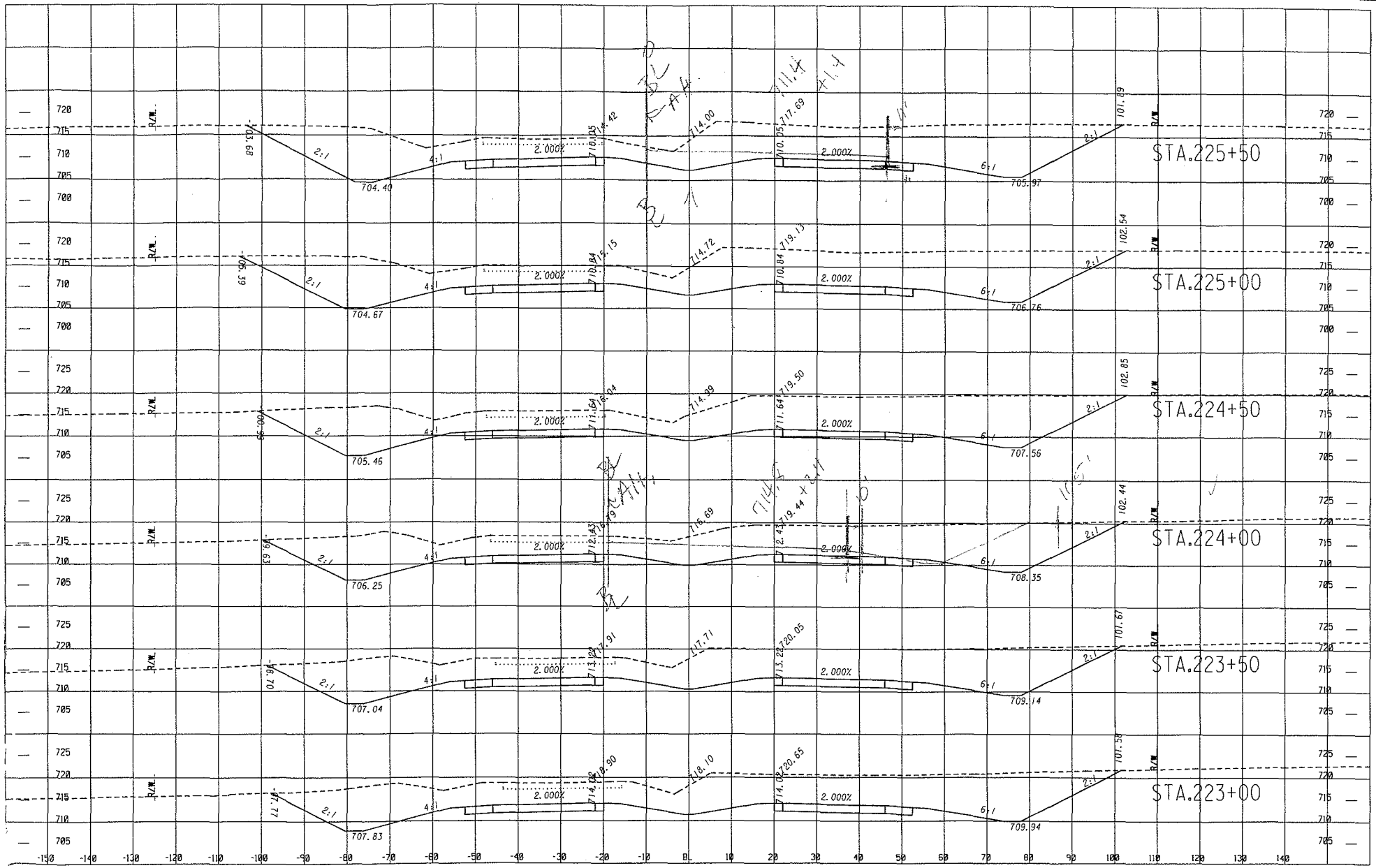
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

EARTHWORK CROSS SECTIONS

SR 113, STA. 220+00 TO STA. 222+50

DRAWING No. 23-36

ALT. No. R-10/R-11
Sht. 11 of 14



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STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION

EARTHWORK CROSS SECTIONS

SR 113, STA. 223+00

ALT. NO. R-10/R-11
Sht. 13 of 14

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **R-10/R-11**

SHEET NO.: **13 of 14**

Original costs saved:

Unclassified Excavation saved: (1600' x 6'/2 x 120')/ 27 cf/cy = 20,000 cy

R/W saved: Parcel 24 = 21,250sf = 0.49 ac (res)

R/W saved: Parcel 25 = 6,000 sf = 0.14 (res)

R/W saved: Parcel 26 = 9,900 sf = 0.23 ac (res)

R/W saved: Parcel 28 = 47,400 sf = 1.1 ac (comm.)

Parcel 28 Parking and asphalt pavement staging area saved 40,000 sf at $6/sf = $240,000

R/W saved: Parcel 30 = 36,750 sf = 0.85 ac (industrial)

Additional Alternate costs:

Type 6A retaining wall (240 lf) with barrier face = $375/lf

Type 6B retaining wall (200 lf) with barrier face = $500/lf

Type 6C retaining wall (400 lf) with barrier face = $630/lf

Guardrail = 800 lf of "W" beam

Type 1 anchorage = 2 ea

Type 9 anchorage = 2 ea

Additional drainage items: Drop inlets = 3 each

18 inch storm drain pipe = 400 lf

24 inch storm drain pipe = 40 lf

Additional R/W required: Parcel 19 = 9,450 sf = 0.217 ac (res)

Parcel 29 = 12,330 sf = 0.283 ac (res)

COST WORKSHEET

PROJECT:	**SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION - PHASE II** *P.I. No. 621440 & P.I. No. 621445* *Bartow County, GA*	ALTERNATIVE NO.:	**R-10/R-11**
		SHEET NO.:	**14 of 14**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
unclass excav saved	cy	16,600	8.39	139,274			
R/W saved							
Residential	ac	0.86	15,000.00	12,900			
Commerial	ac	1.10	100,000.00	110,000			
Parking asphalt lot	sf	40,000.00	6.00	240,000			
Industrial	ac	0.85	35,000.00	29,750			
R/W markup 73% (GaDOT)		73.00%		286,635			
Alternate additional costs:							
Type 6A Retain. Wall	lf				240	375.00	90,000
Type 6B Retain. Wall	lf				200	495.00	99,000
Type 6C Retain. Wall	lf				400	630.00	252,000
G'rail W-beam	lf				800	15.50	12,400
Type 1 anchorage	ea				2	653.00	1,306
Type 12 anchorage	ea				2	1,898.00	3,796
Drop inlets	ea				3	2,619.00	7,857
18 inch storm drainage pipe	lf				400	36.18	14,472
24 inch storm drainage pipe	lf				40	58.25	2,330
Add'l R/W residential	ac				0.50	15,000.00	7,500
R/W markup 73% (GaDOT)					73.00%		5,475
Subtotal				818,559			496,136
Markup (%) at							
TOTAL				818,559			496,136
TOTAL (ROUNDED)				819,000			496,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **D-1A**

DESCRIPTION: **REPLACE THE 8 FT. X 6 FT. CONCRETE BOX CULVERT WITH 72-IN.-DIAMETER REINFORCED CONCRETE PIPE**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

A 8 ft. x 6 ft. x 150 ft. long concrete box culvert is used at Station 134+50.

ALTERNATIVE: (sketch attached - beam chart and deck thickness chart)

Replace the concrete box culvert with dual 72-in.-diameter reinforced concrete pipes.

ADVANTAGES:

- Reduces labor and material requirements
- Decreases construction time

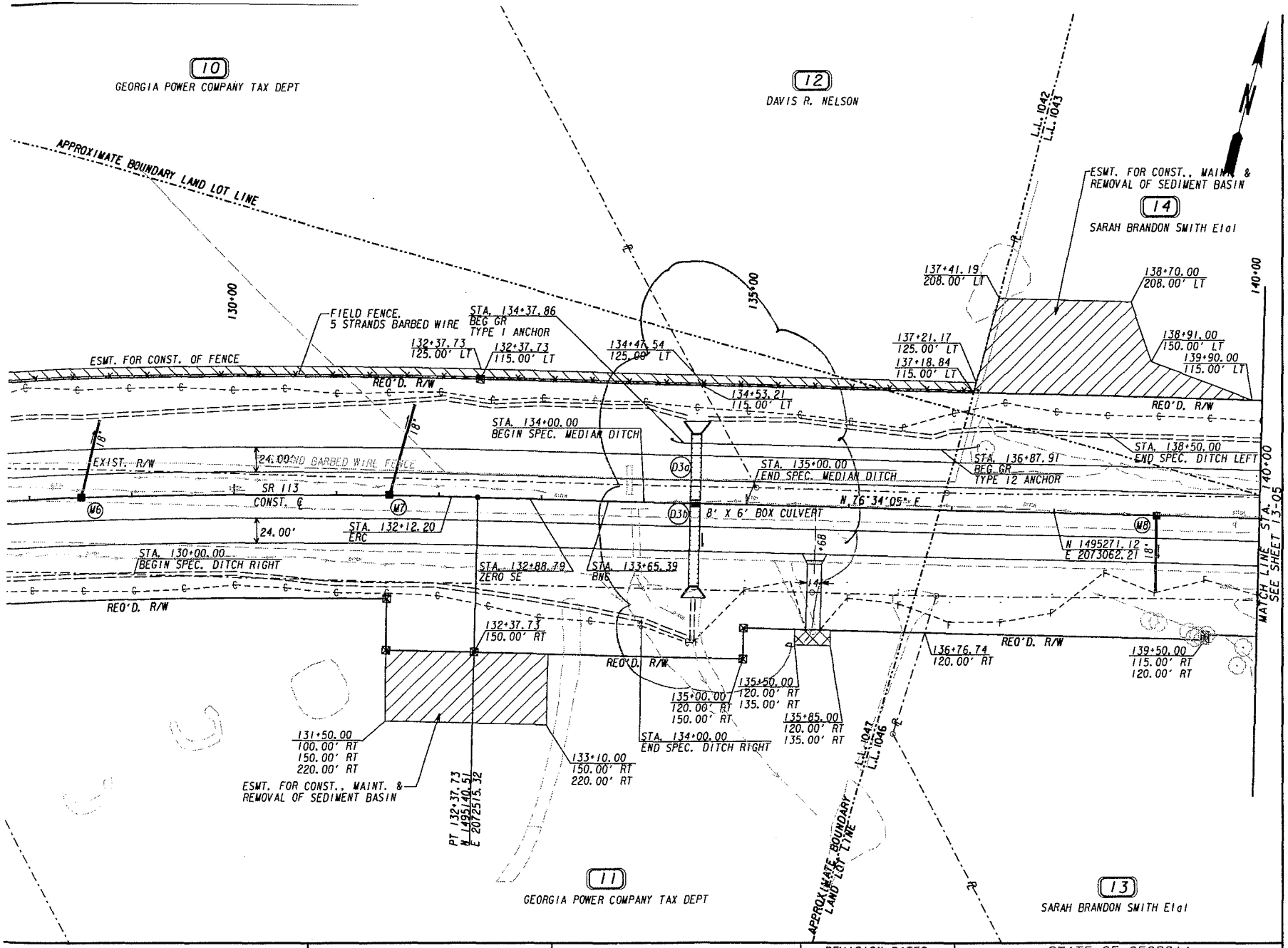
DISADVANTAGES:

- Redesign is required

DISCUSSION:

There will be a cost savings of around $27,000 as well as a decrease in construction time if this alternative is implemented.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 92,000	—	$ 92,000
ALTERNATIVE	$ 65,000	—	$ 65,000
SAVINGS (Original minus Alternative)	$ 27,000	—	$ 27,000



PLANS PREPARED AND SUBMITTED BY:

AMERICAN ENGINEERS, INC.

SCALE IN FEET
0 50 100 200

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: CONSULTANT DESIGN

MAINLINE PLAN

STA. 125+00 TO STA. 140+00

DRAWING No. 13-04

ALT. NO. 1
D-1A
Sht. 2 of 4

PROJECT: **SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION – PHASE II**
P.I. No. 621440 & P.I. No. 621445
Bartow County, GA

ALTERNATIVE NO.: **D-1A**

SHEET NO.: **3 of 4**

Concrete Culvert 8 x 6 x 150 (See GDOT Standard 2323)

Culvert Concrete Volume = (0.976 CY/ft)(150') = 146.4 CY

+ wingwalls = 18.38 CY

Concrete Total = 164.78 CY

Culvert Reinforcing = (118.1 lbs/ft)(150')= 17,715 lbs

+ wingwalls = 770 lbs

Reinforcing Total = 18, 485 lbs

Alternate: Double 72" dia. RCP (See GDOT Standard 1125 for Headwall Quantity)

Headwalls (Use same quantity for inlet and outlet) = 9.48 CY + 9.48 CY + 6.46 CY + 6.46 CY = 31.88 CY

COST WORKSHEET

PROJECT:	**SR 113 FROM CR 31 TO RICHLAND CREEK @ OLD ALABAMA ROAD RELOCATION - PHASE II** *P.I. No. 621440 & P.I. No. 621445* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**D-1A** **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Concrete Box Culvert 8 x 6 x 150							
Class A Concrete	CY	164.78	455.00	$74,974.90			
Bar Reinf Steel	LB	18,485	0.92	$17,006.20			
Double 72" dia. RCP							
72" dia. RCP	LF				300	165.25	$49,575.00
Conc. Headwalls with Rebar	CY				31.88	498.70	$15,899.00
Subtotal				91,981			65,474
Markup (%) at							
TOTAL				91,981			65,474
TOTAL (ROUNDED)				92,000			65,000

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM C.R. 23/LUCAS RD TO RICHLAND CREEK**

P.I. No. 621760; BRF00-0179-01(012)

Bartow County, Georgia

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
ROADWAY						
R-5B	Use 11-ft.-wide inside lanes in lieu of 12-ft.-wide lanes	$33,000	$0	$33,000		$33,000
R-7C	At the CR 23 intersection with SR 113, change from a Type B median crossing to a Type A median crossing	$209,000	$72,000	$137,000		$137,000
R-9B	Use a 2-ft.-wide full depth shoulder and a 4.5-ft.-wide reduced depth shoulder for a total width of 6.5 ft.	$214,000	$127,000	$87,000		$87,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM C.R. 23/LUCAS ROAD TO RICHLAND CREEK**
P.I. No. 621760
Bartow County, GA

ALTERNATIVE NO.: **R-5B**

DESCRIPTION: **CONSTRUCT 11-FT.-WIDE INSIDE LANES IN LIEU OF 12-FT.-WIDE LANES**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

Construct 12-ft.-wide lanes throughout the project.

ALTERNATIVE: (sketch attached)

Construct inside lanes 11 ft. wide. Keep outside lanes and turn lanes 12 ft. wide.

ADVANTAGES:

- Saves construction time and material
- Less impervious area; less storm water; lesser need for drainage infrastructure

DISADVANTAGES:

- None apparent

DISCUSSION:

With 55 mph speed limit, 11-ft.-wide lanes have existed on I-75 and I-85 in Metro Atlanta since 1996. A foot of reduction on each side will decrease impervious area. This will reduce storm water. As a result, the amount of drainage infrastructure will also decrease, although no savings in drainage items are included below. Also, no savings in right-of-way is calculated because Bartow County is already in the process of acquiring right-of-way.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 33,000	—	$ 33,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 33,000	—	$ 33,000

SKETCHES

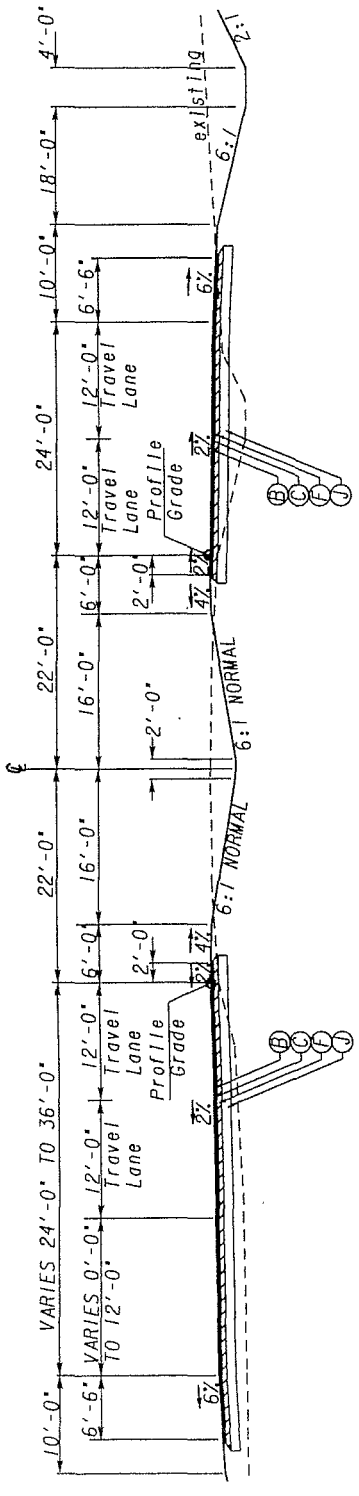
PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM CR 23/LUCAS ROAD TO RICHLAND CREEK**
P.I. No. 621760
Bartow County, GA

ALTERNATIVE NO.: R-5B

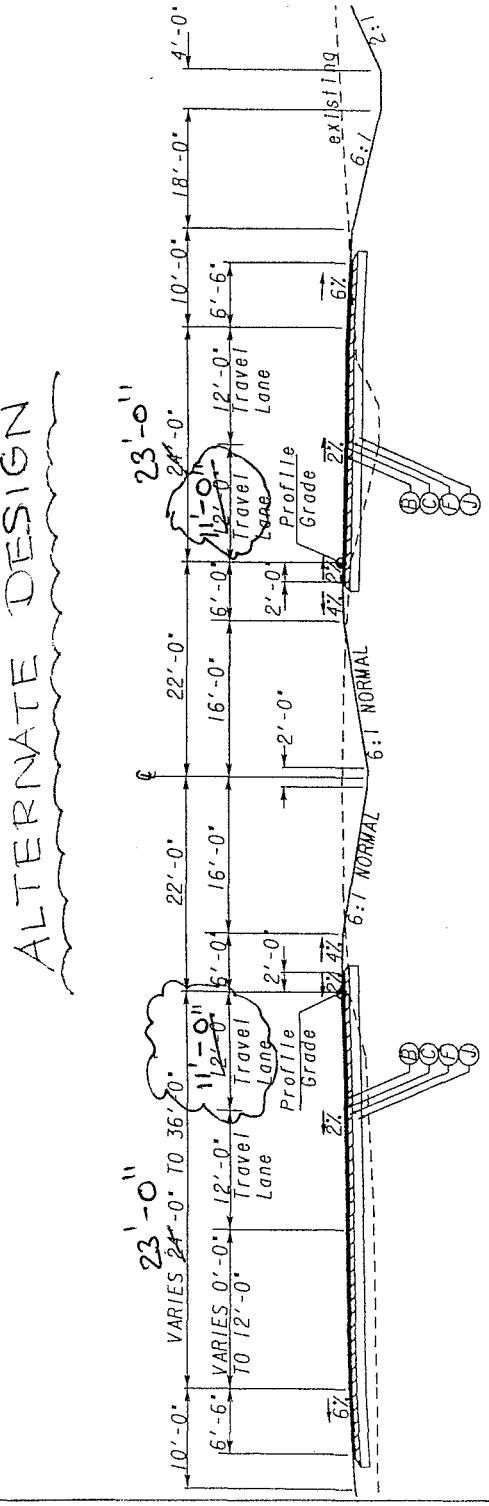
☑ AS DESIGNED ☑ ALTERNATIVE

SHEET NO.: 2 of 4

ORIGINAL DESIGN



ALTERNATE DESIGN



PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM CR 23/LUCAS ROAD TO RICHLAND CREEK**
P.I. No. 621760
Bartow County, GA

ALTERNATIVE NO.: **R-5B**

SHEET NO.: **3 of 4**

Full Depth Pavement Unit Cost ($/SY):

12.5mm:	165#/SY x Ton/2,000# x $72.34/Ton	=	$5.97/SY
19.0mm:	220#/SY x Ton/2,000# x $72.81/Ton	=	$8.01/SY
25.0mm:	660#/SY x Ton/2,000# x $69.38/Ton	=	$22.90/SY
12" GAB:	1ft x 147#/CF x Ton/2,000# x 9SF/SY x $21.16/Ton	=	$14.00/SY
	Total Pavement Unit Cost =		**$50.88/SY**

Inside Lane Length:
P.I. # 621760: (STA. 245+44 – STA. 216+35) = 2,909 feet

Total One-way Length: 2,909 feet
Both ways: 2,909 x 2 = 4,818 feet
Lane Width Reduction: 12' – 11' = 1 foot

Area: 5,818 x 1/9 = 646.44 sy

COST WORKSHEET

PROJECT:	**WIDENING AND RECONSTRUCTION OF SR 113 FROM CR 23/LUCAS ROAD TO RICHLAND CREEK** *P.I. No. 621760* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**R-5B** **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
A.C. Pavement	SY	646.44	50.88	32,891			
Subtotal				32,891			
Markup (%) at 0%							
TOTAL				32,891			
TOTAL (ROUNDED)				33,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM CR 23/LUCAS ROAD TO RICHLAND CREEK**
P.I. No. 621760
Bartow County, GA

ALTERNATIVE NO.: **R-7C**

DESCRIPTION: **AT THE CR 23 INTERSECTION WITH SR 113, CHANGE FROM A TYPE B MEDIAN CROSSING TO A TYPE A MEDIAN CROSSING**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

A Type B median crossing is designed for SR 113 at the intersection with CR 23/Richland Drive and Lucas Road.

ALTERNATIVE: (sketch attached)

Use a Type A median crossing at this intersection.

ADVANTAGES:

- Reduces the amount of pavement to install and maintain
- Reduces the amount of impervious area and storm water runoff

DISADVANTAGES:

- None apparent

DISCUSSION:

The number of combined left turn movements from SR 113 to CR 20 is 15 vehicles per hour (vph) in the peak AM hour and 40 vph in the peak PM hour in the design year. This intersection meets the recommended 20 vph turning movements in the GDOT standard for a Type A median crossing. The intersection has good visibility from both directions on SR 113 and the intersecting roads are minor roads. Therefore, it is suggested that the Type A median crossing will be adequate in this location and substantial construction and maintenance costs can be saved.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 209,000	—	$ 209,000
ALTERNATIVE	$ 72,000	—	$ 72,000
SAVINGS (Original minus Alternative)	$ 137,000	—	$ 137,000

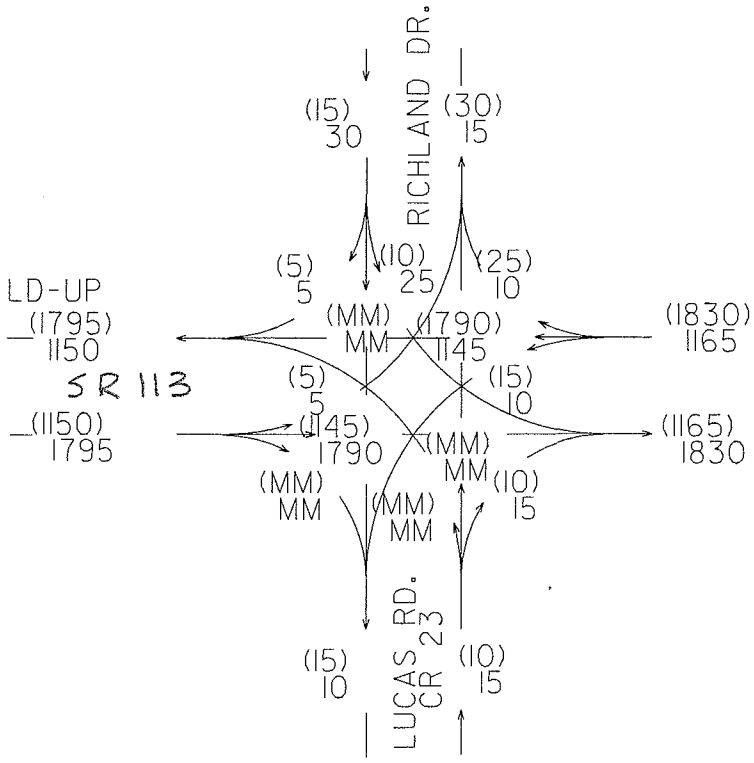
PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM C.R. 23/LUCAS ROAD TO RICHLAND CREEK**
P.I. No. 621760
Bartow County, GA

ALTERNATIVE NO.: **R-7C**

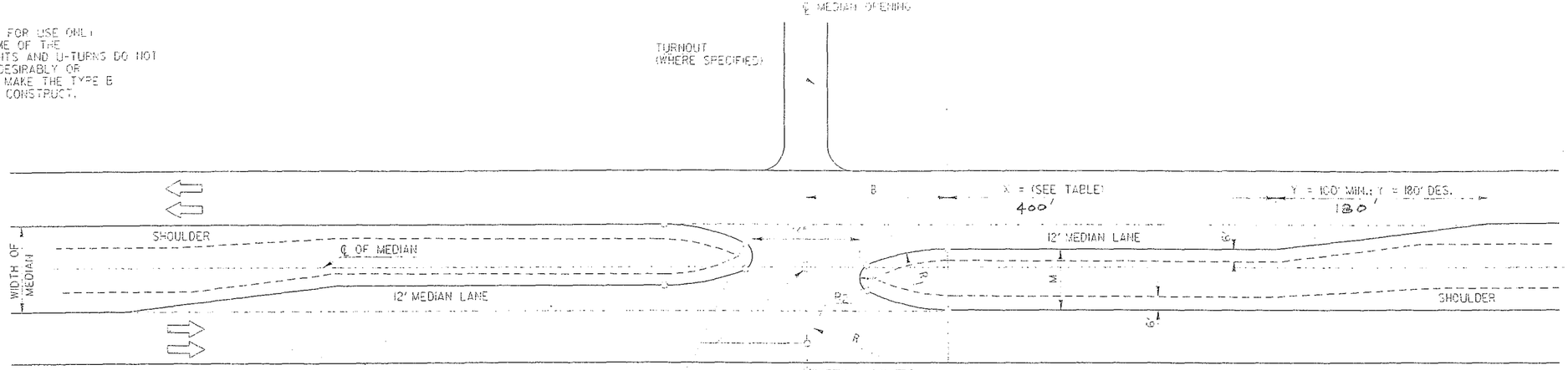
☒ AS DESIGNED ☐ ALTERNATIVE

SHEET NO.: 2 of 4

DHV TRAFFIC



NOTE:
TYPE A MEDIAN CROSSOVERS ARE FOR USE ONLY WHERE THE FUTURE TOTAL VOLUME OF THE COMBINED LEFT TURNING MOVEMENTS AND U-TURNS DO NOT EXCEED 20 VEHICLES PER HOUR, DESIRABLY OR WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE B MEDIAN CROSSOVER DIFFICULT TO CONSTRUCT.



STATION WHERE MED. OPEN REQ'D. CONSTR. SYMMETRICAL ABOUT THIS POINT.

NOTE:
TYPE B MEDIAN CROSSOVERS ARE THE PREFERRED TYPE OF MEDIAN CROSSOVER. TYPE A MEDIAN CROSSOVER CAN BE USED IN LOW VOLUME SITUATIONS WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE A MEDIAN CROSSOVER A MORE DESIRABLE OPTION.

30 20 10 0 30FT.
GRAPHIC SCALE

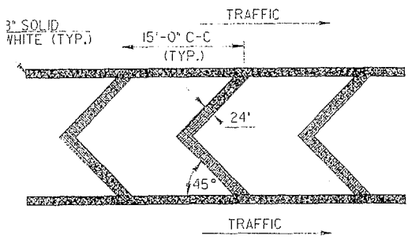
TYPE A MEDIAN CROSSOVER

NOTE FOR TYPE 'A' AND TYPE 'B':
- THE EMBANKMENT GRADED UP TO THE MEDIAN CROSSOVERS SHALL BE SLOPED AT 20:1 DESIRABLE, 10:1 MIN. NORMALLY, WITH A 6:1 ACCEPTABLE FOR SPEEDS UNDER FORTY-FIVE MILES PER HOUR.

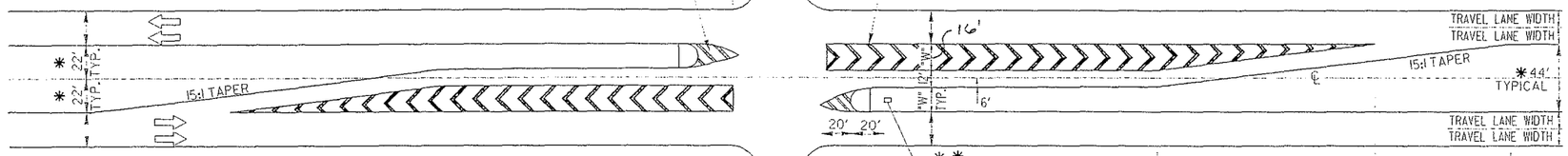
TYPE A MEDIAN CROSSOVERS ●										
							DECELERATION LENGTH = X Δ (FT)			
							DESIGN SPEED			
WIDTH OF MEDIAN	M	L NORM	B NORM	R	R_1	R_2	45 MPH	55 MPH	65 MPH	Y (DES)
40	28	50	67	50	90	6	400(250) MIN	525(400) MIN	700(525) MIN	180
44	32	50	67	50	90	8	400(250) MIN	525(400) MIN	700(525) MIN	180
64	52	44	95	50	150	10	400(250) MIN	525(400) MIN	700(525) MIN	180

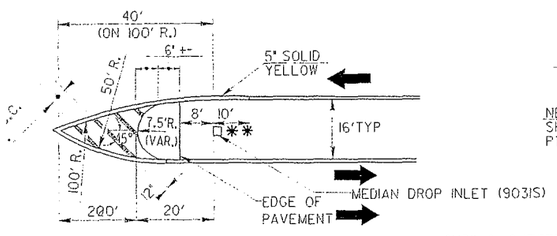
Δ "X" DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED. MIN. VALUES FOR "X" ARE ONLY TO BE USED WHERE SPACING BETWEEN MEDIAN OPENINGS DOES NOT ALLOW FOR THE MORE DESIRABLE LENGTH.

DETAIL "B" (WHITE)



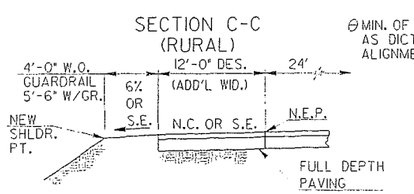
NOTE:
SQUARE YARDS OF STRIPING SHOWN ON PLAN AND SUMMARY SHEETS INCLUDES THE AREA WITHIN THE BORDERS, AS WELL AS THE 8" SOLID WHITE BORDER.





DETAIL "A" (YELLOW)

20FT. 0 20FT.
GRAPHIC SCALE



SECTION C-C (RURAL)

NOTE: SEE GA. STD. 4280 FOR GRADING WITH GUARDRAIL.

θ MIN. OF 64' - THIS MAY VARY AS DICTATED BY WIDTH AND ALIGNMENT OF CROSS ROAD.

50FT. 0 50FT.
GRAPHIC SCALE

TYPE B MEDIAN CROSSOVER

SEE SEPARATE SHEETS: 'TYPICAL SECTION GUIDE FOR TYPE 'B' MEDIAN CROSSOVER."

NOTE:
PAVEMENT OF MEDIAN CROSSOVERS (ALL TYPES) SHALL BE SLOPED FOR SURFACE DRAINAGE AS SPECIFIED.

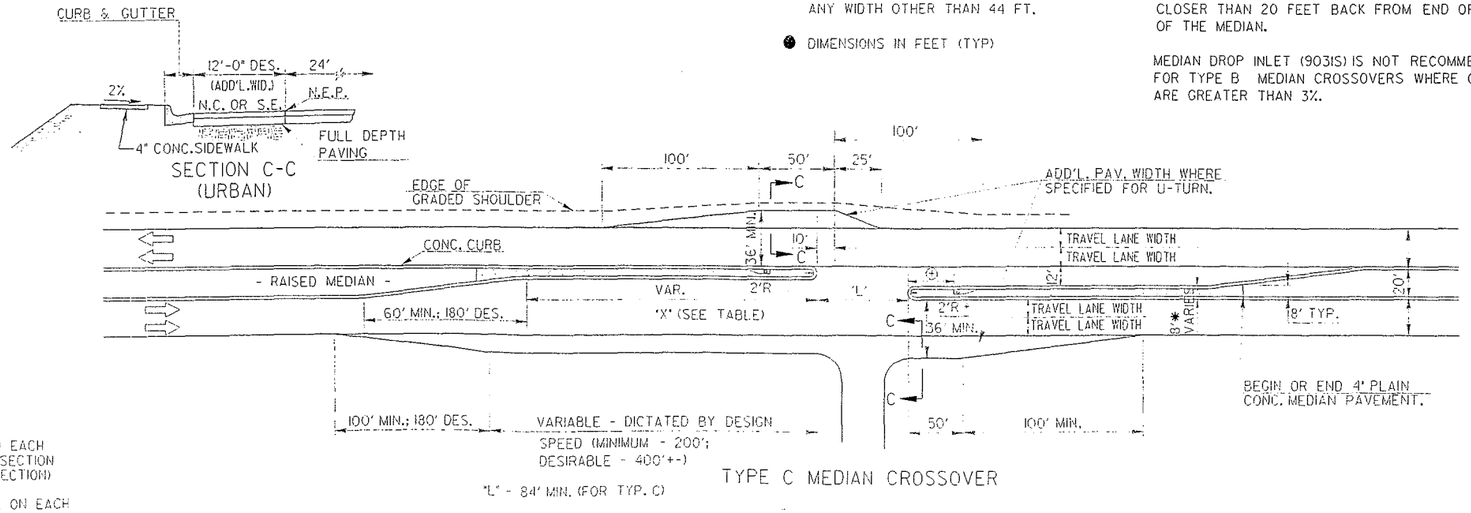
* DIMENSION MAY VARY WHERE SPECIFIED IN THE PLANS. ADJUSTMENTS TO BE SHOWN FOR ANY WIDTH OTHER THAN 44 FT.

● DIMENSIONS IN FEET (TYP)

** MEDIAN DROP INLET (903IS) CANNOT BE PLACED CLOSER THAN 20 FEET BACK FROM END OF NOSE OF THE MEDIAN.

MEDIAN DROP INLET (903IS) IS NOT RECOMMENDED FOR TYPE B MEDIAN CROSSOVERS WHERE GRADES ARE GREATER THAN 3%.

TYPE B MEDIAN CROSSOVERS ●					
	DECELERATION LENGTH = Δ (FT.)				
WIDTH OF MEDIAN	DESIGN SPEED			Y	W
	45 MPH	55 MPH	65 MPH		
44	150(50MIN)	300(150MIN)	450(300MIN)	240	16
64	N/A	150(50MIN)	300(150MIN)	390	26



'L' - 84' MIN. (FOR TYP. C)

TYPE C MEDIAN CROSSOVER

TYPE C MEDIAN CROSSOVERS ●	
DECELERATION LENGTH = X ■	
DESIGN SPEED	X (FT)
35 MPH	300(200MIN.)
45 MPH	400(250MIN.)

'X' DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED.

NOTE:
THE TYPE C MEDIAN CROSSOVER SHOWN IS TYPICAL FOR ONE SIDE ROAD CONNECTION. (T-INTERSECTION)

THE BOTTOM PORTION OF TYPE C IS APPLICABLE ON EACH SIDE OF THE CROSSOVER FOR A CROSS ROAD INTERSECTION OR SIDE ROAD CONNECTION ON EACH SIDE. (Y-INTERSECTION)

THE TOP PORTION OF TYPE C DETAIL IS APPLICABLE ON EACH

SPECIAL NOTE:
THE "L" DIMENSIONS SHOWN FOR TYPE A, TYPE B, AND TYPE C CROSSOVERS ARE BASED UPON 50FT. CONTROL RADII FOR LEFT TURNS AND INTERSECTING CROSSROADS OF TWO 12 FT. LANES PERPENDICULAR TO THE MAINLINE. DIFFERENT "L" DIMENSIONS MAY BE SPECIFIED AT LOCATIONS WHERE WARRANTED BY OTHER CONDITIONS.

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

DATE
REVISION

CONSTRUCTION DETAILS
MEDIAN CROSSOVERS

SCALE AS SHOWN APRIL, 2016

NUMBER

GA. PROJ. SHEET #

ALT. NO.
R-7C
Sht. 3 of 4

DECELERATION LANE AREA

$\frac{12 \times 440 + \frac{1}{2}(180 \times 12)}{9} = 707$ SY

ONE SIDE

$W = \frac{44 - 12}{2} = 16'$

DECELERATION LANE

$\frac{450 \times 28 + \frac{1}{2}(28 \times 420)}{9} = 2053$ SY

ONE SIDE

COST WORKSHEET

PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM C.R. 23/LUCAS ROAD TO RICHLAND CK**
P.I. No. 621760
Bartow County, GA

ALTERNATIVE NO.: **R-7C**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Asphalt Pavement	SY	4,106	50.88	208,913	1,414	50.88	71,944
Subtotal				208,913			71,944
Markup (%) at							
TOTAL				208,913			71,944
TOTAL (ROUNDED)				209,000			72,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM CR 23/LUCAS ROAD TO RICHLAND CREEK**
P.I. No. 621760
Bartow County, GA

ALTERNATIVE NO.: **R-9B**

DESCRIPTION: **USE A 2-FT.- WIDE FULL-DEPTH PAVED SHOULDER AND A 4.5-FT.-WIDE REDUCED DEPTH SHOULDER FOR A TOTAL WIDTH OF 6.5 FT. WIDTH**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

The current design proposes 6.5-ft.-wide paved shoulders with full-depth pavement.

ALTERNATIVE: (sketch attached)

Use 2-ft.-wide paved shoulders with full-depth pavement and 4.5-ft.-wide shoulder with reduced depth of pavement.

ADVANTAGES:

- Reduces construction labor and material requirements

DISADVANTAGES:

- Under heavy truck usage, the reduced depth pavement portion of the shoulder is likely to deteriorate more quickly than the full depth pavement portion of the shoulder

DISCUSSION:

The 6.5 ft wide shoulder provides extra width for to accommodate bicycles. However, bicycles do not need full depth pavement. Since the shoulder is normally used only during the emergencies, a 4.5 ft. paved shoulder with reduced depth is sufficient for an arterial type highway as long as the graded shoulder width is 10 ft.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 214,000	—	$ 214,000
ALTERNATIVE	$ 127,000	—	$ 127,000
SAVINGS (Original minus Alternative)	$ 87,000	—	$ 87,000

SKETCHES

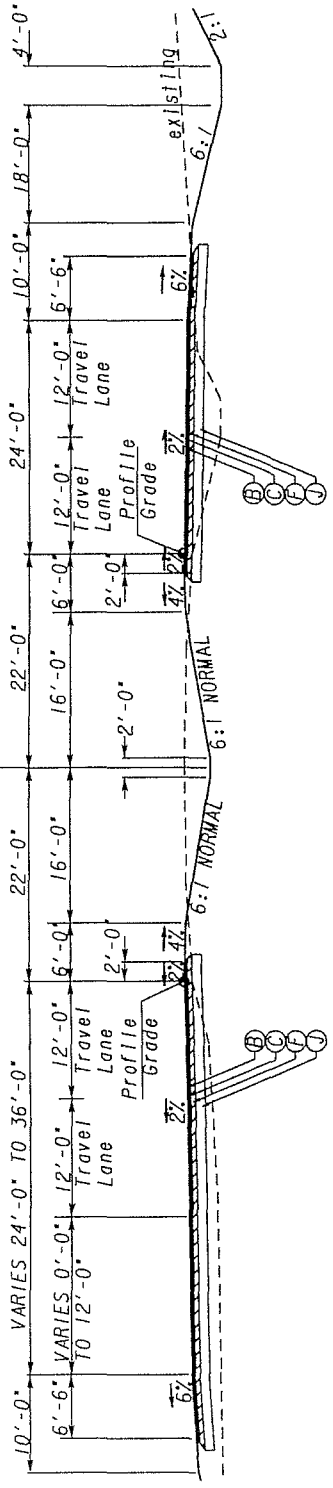
PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM CR 23/LUCAS ROAD TO RICHLAND CREEK**
P.I. No. 621760
Bartow County, GA

ALTERNATIVE NO.: R-9B

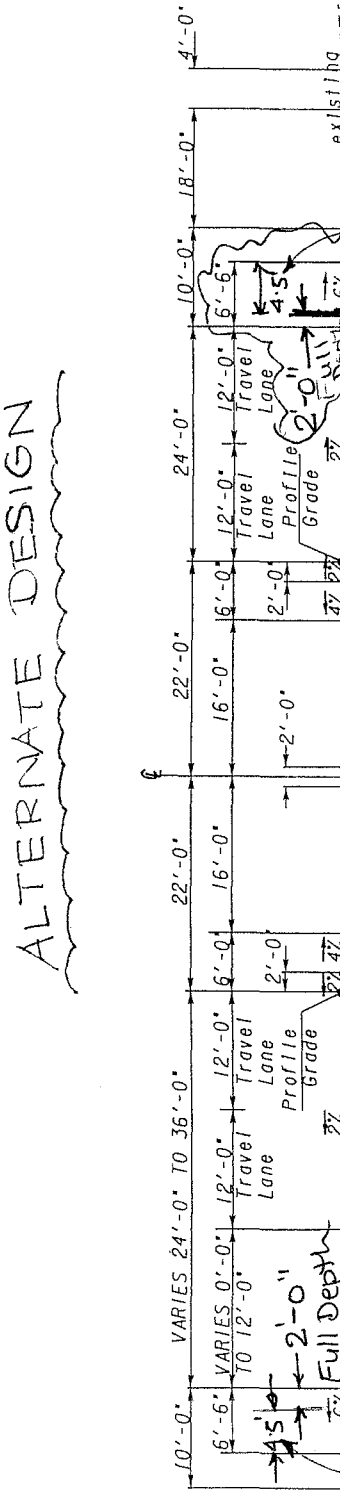
☑ AS DESIGNED ☑ ALTERNATIVE

SHEET NO.: 2 of 4

ORIGINAL DESIGN



ALTERNATE DESIGN



PROJECT: **WIDENING AND RECONSTRUCTION OF SR 113 FROM CR 23/LUCAS ROAD TO RICHLAND CREEK**
P.I. No. 621760
Bartow County, GA

ALTERNATIVE NO.: **R-9B**

SHEET NO.: **3 of 4**

P.I. # 621760: (STA. 245+44 – STA. 216+35) = 2,909 feet

Total One-way Length: 2,909 feet
Both ways: 2,909 x 2 = 5,818 feet

Area of 6.5' wide full depth paved shoulder: 5,818 x 6.5/9 = 4,202 sy

Area of 2.0' wide full depth paved shoulder: 5,818 x 2.0/9 = 1,293 sy

Area of 4.5' wide reduced depth paved shoulder: 5,818 x 4.5/9 = 2,909 sy

Full Depth Pavement Section Unit Cost = $50.88/sy (see Alternate R-5A)

Reduced Depth Pavement Section Unit Cost:

12.5mm:	165#/SY x Ton/2,000# x $72.34/Ton	=	$5.97/SY
19.0mm:	220#/SY x Ton/2,000# x $72.81/Ton	=	$8.01/SY
6" GAB:	0.5ft x 147#/CF x Ton/2,000# x 9SF/SY x $21.16/Ton	=	$7.00/SY
	Total Pavement Unit Cost =		**$20.98/SY**

COST WORKSHEET

PROJECT:	**WIDENING AND RECONSTRUCTION OF SR 113 FROM CR 23/LUCAS ROAD TO RICHLAND CREEK** *P.I. No. 621760* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**R-9B** **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
6.5' full depth shoulder section	SY	4,202	$50.88	$213,798			
2.0' full depth shoulder section	SY				1,293	50.98	65,917
4.5' reduced depth shoulder section	SY				2,909	20.98	61,031
Subtotal				$213,798			126,948
Markup (%) at							
TOTAL				$213,798			126,948
TOTAL (ROUNDED)				$214,000			127,000

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT - PHASE I**

P.I. No. 0008382; CSSTP-0008-00(382)

Bartow County, Georgia

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
ROADWAY						
R-6	Adust the vertical profile to reduce the amount of earthwork borrow material	$268,000	$0	$268,000		$268,000
R-7D	At the CR 533 intersection with SR 113 change from a Type B median crossing to a Type A median crossing	$209,000	$72,000	$137,000		$137,000
R-7E	At the Friction Drive intersection with SR 113 change from a Type B median crossing to a Type A median crossing	$209,000	$72,000	$137,000		$137,000
R-8	Use a 4-ft.-wide shoulder pavement in lieu of a 6.5-ft.-wide shoulder pavement	$167,000	$0	$167,000		$167,000
DRAINAGE						
D-1B	Replace the two concrete box culverts with reinforced concrete pipes	$183,000	$114,000	$69,000		$69,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT – PHASE I**
P.I. No. 0008382; CSSTP-0008-00(382)
Bartow County, GA

ALTERNATIVE NO.: **R-6**

DESCRIPTION: **ADUST THE VERTICAL PROFILE TO REDUCE THE AMOUNT OF EARTHWORK BORROW MATERIAL**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

The current vertical alignment/profile design results in 50,000 CY of required borrow material.

ALTERNATIVE: (sketch attached)

Adjust the profile to reduce the amount of earthwork fill embankment and therefore borrow material required.

ADVANTAGES:

- Reduces construction labor and material requirement
- Reduces construction time

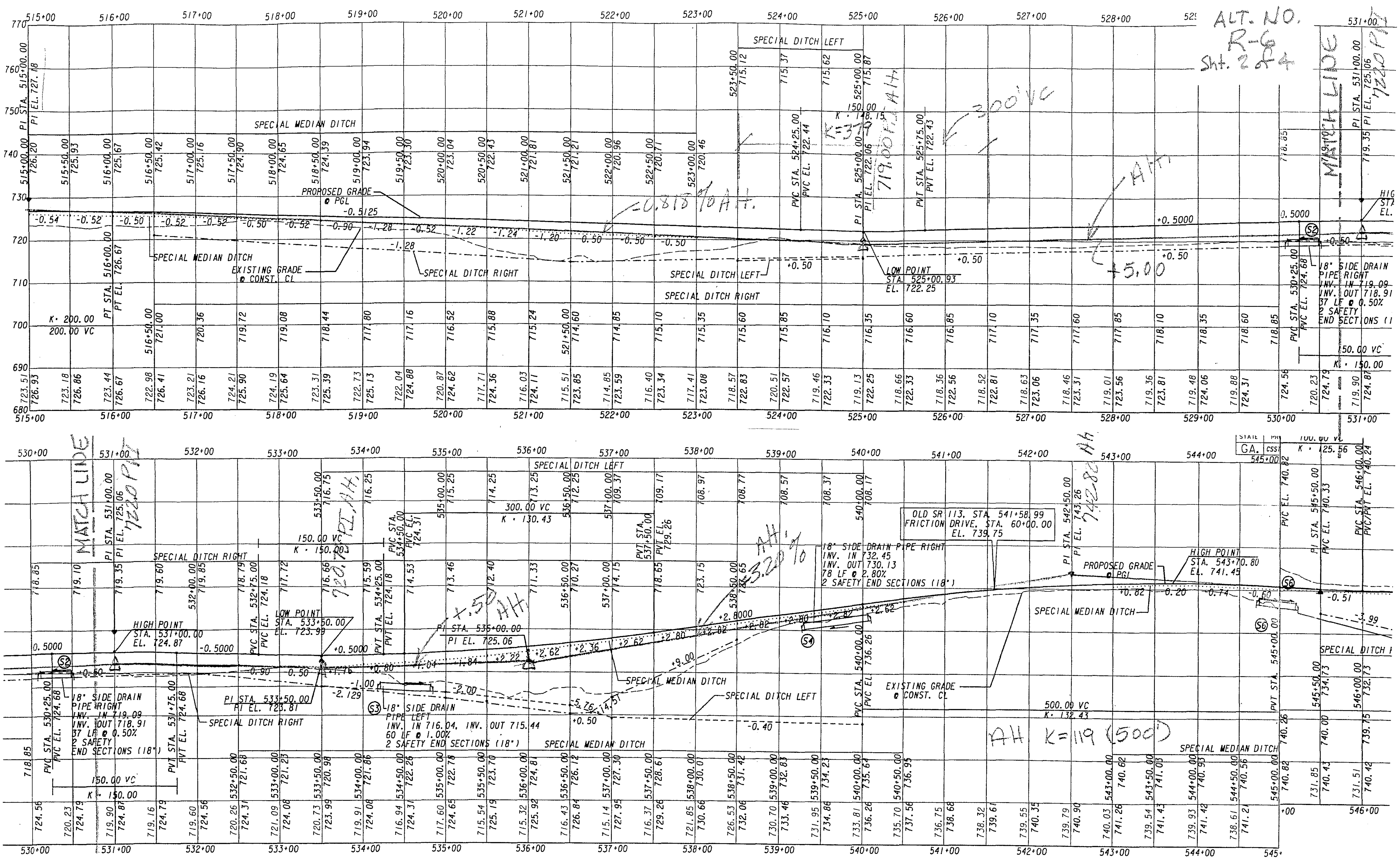
DISADVANTAGES:

- Slightly increases some excavation

DISCUSSION:

The alternative profile was lowered by 3 ft. through a mostly "fill" section of roadway to reduce the amount of required fill embankment.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 268,000	—	$ 268,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 268,000	—	$ 268,000


ALT. NO. R-6 Sht. 2 of 4
MATCH LINE
PI STA. 515+00.00
PI EL. 727.18
SPECIAL MEDIAN DITCH
PROPOSED GRADE @ PGL
EXISTING GRADE @ CONST. CL
SPECIAL DITCH RIGHT
SPECIAL DITCH LEFT
K = 200.00
200.00 VC
PT STA. 516+00.00
PT EL. 726.67
PVC STA. 524+25.00
PVC EL. 722.44
PI STA. 525+00.00
PI EL. 722.06
PVT STA. 525+75.00
PVT EL. 722.43
150.00
K = 148.15
LOW POINT
STA. 525+00.93
EL. 722.25
PVC STA. 530+25.00
PVC EL. 724.68
18" SIDE DRAIN PIPE RIGHT
INV. IN 719.09
INV. OUT 718.91
37 LF @ 0.50%
2 SAFETY END SECTIONS (18")
150.00 VC
K = 150.00
PI STA. 531+00.00
PI EL. 725.06
HIGH POINT
STA. 531+00.00
EL. 724.87
PVT STA. 531+75.00
PVT EL. 724.68
PVC STA. 532+75.00
PVC EL. 724.18
LOW POINT
STA. 533+50.00
EL. 723.99
PI STA. 533+50.00
PI EL. 723.81
PVT STA. 534+25.00
PVT EL. 724.18
18" SIDE DRAIN PIPE LEFT
INV. IN 716.04, INV. OUT 715.44
60 LF @ 1.00%
2 SAFETY END SECTIONS (18")
PVC STA. 534+50.00
PVC EL. 724.31
300.00 VC
K = 130.43
PI STA. 535+00.00
PI EL. 725.06
PVT STA. 537+50.00
PVT EL. 729.26
18" SIDE DRAIN PIPE RIGHT
INV. IN 732.45
INV. OUT 730.13
78 LF @ 2.80%
2 SAFETY END SECTIONS (18")
OLD SR 113, STA. 541+58.99
FRICTION DRIVE, STA. 60+00.00
EL. 739.75
PVC STA. 540+00.00
PVC EL. 736.26
500.00 VC
K = 132.43
PI STA. 542+50.00
PI EL. 743.26
HIGH POINT
STA. 543+70.80
EL. 741.45
PVT STA. 545+00.00
PVC EL. 740.82
PI STA. 545+50.00
PVC EL. 740.33
PVC STA. 546+00.00
PVC/PVT EL. 740.24
100.00 VC
K = 125.56
GA.
722.0 PI
720.70 PI, AH.
+.50 AH.
AH. 3.20%
742.80 AH
AH K=119 (500')
-0.818% AH.
K=37.5
719.00 PI AH
300' VC
AH
+5.00

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT – PHASE I**
P.I. No. 0008382; CSSTP-0008-00(382)
Bartow County, GA

ALTERNATIVE NO.: **R-6**

SHEET NO.: **3 of 4**

Original designed fill embankment saved

Fill embankment = [(3'/2 x 900' x 135') + (3' x 1100' x 135') + (3'/2 x 650' x 135')]/27 cf/cy = 28,125 CY

Borrow material required = 28,12cy / (1-.2) = 35,000 cy (shrinkage factor = 20%)

COST WORKSHEET

PROJECT:	**SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT** *P.I. No. 0008382; CSSTP-0008-00(382)* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**R-6** **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow Material	CY	35,150	7.63	268,195			
Subtotal				268,195			
Markup (%) at							
TOTAL				268,195			
TOTAL (ROUNDED)				268,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT – PHASE I**
P.I. No. 0008382; CSSTP-0008-00(382)
Bartow County, GA

ALTERNATIVE NO.: **R-7D**

DESCRIPTION: **AT THE CR 533 INTERSECTION WITH SR 113, CHANGE FROM A TYPE B MEDIAN CROSSING TO A TYPE A MEDIAN CROSSING**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN: (sketch attached)

A Type B median crossing is designed for SR 113 at the intersection with CR 533/Brown Farm Road.

ALTERNATIVE: (sketch attached)

Use a Type A median crossing at this intersection.

ADVANTAGES:

- Reduces the amount of pavement to install and maintain
- Reduces the amount of impervious area and storm water runoff
- Vehicles traveling southwest on SR 113 will have more room to make a U-turn

DISADVANTAGES:

- None apparent

DISCUSSION:

There are no traffic counts for this intersection. Because CR 533 is believed to be a minor road with very little traffic, the recommended 20 vehicle per hour (vph) combined left turning movements maximum for a Type A median crossing in the GDOT standard will probably be met. Thus it is suggested that the Type A median crossing will be adequate in this location and substantial construction and maintenance costs can be saved.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 209,000	—	$ 209,000
ALTERNATIVE	$ 72,000	—	$ 72,000
SAVINGS (Original minus Alternative)	$ 137,000	—	$ 137,000

GA. | NO. | SHEET #

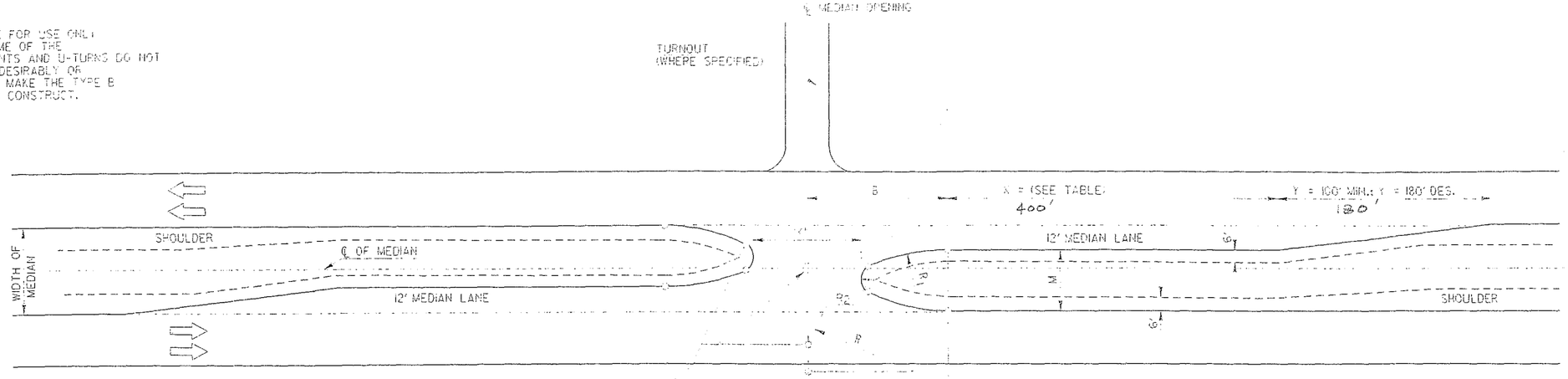
ALT. NO.
R-7D
Sht. 2 of 3

DECELERATION LANE AREA

$\frac{12 \times 440 + \frac{1}{2}(180 \times 12)}{9} = 707$ SY

ONE SIDE

NOTE:
TYPE A MEDIAN CROSSOVERS ARE FOR USE ONLY WHERE THE FUTURE TOTAL VOLUME OF THE COMBINED LEFT TURNING MOVEMENTS AND U-TURNS DO NOT EXCEED 20 VEHICLES PER HOUR, DESIRABLY OR WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE B MEDIAN CROSSOVER DIFFICULT TO CONSTRUCT.



STATION WHERE MED. OPEN REQ'D. CONSTR. SYMMETRICAL ABOUT THIS POINT.

30 20 10 0 30FT.
GRAPHIC SCALE

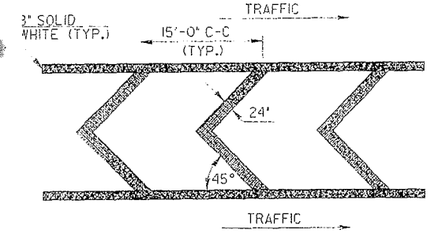
TYPE A MEDIAN CROSSOVER

NOTE FOR TYPE 'A' AND TYPE 'B':
- THE EMBANKMENT GRADED UP TO THE MEDIAN CROSSOVERS SHALL BE SLOPED AT 20:1 DESIRABLE, 10:1 MIN. NORMALLY, WITH A 6:1 ACCEPTABLE FOR SPEEDS UNDER FORTY-FIVE MILES PER HOUR.

TYPE A MEDIAN CROSSOVERS ●										
WIDTH OF MEDIAN	M	L NORM	B NORM	R	R_1	R_2	DECELERATION LENGTH = X Δ (FT) DESIGN SPEED 45 MPH	55 MPH	65 MPH	Y (DES)
40	28	50	67	50	90	6	400(250) MIN	525(400) MIN	700(525) MIN	180
44	32	50	67	50	90	8	400(250) MIN	525(400) MIN	700(525) MIN	180
64	52	44	95	50	150	10	400(250) MIN	525(400) MIN	700(525) MIN	180

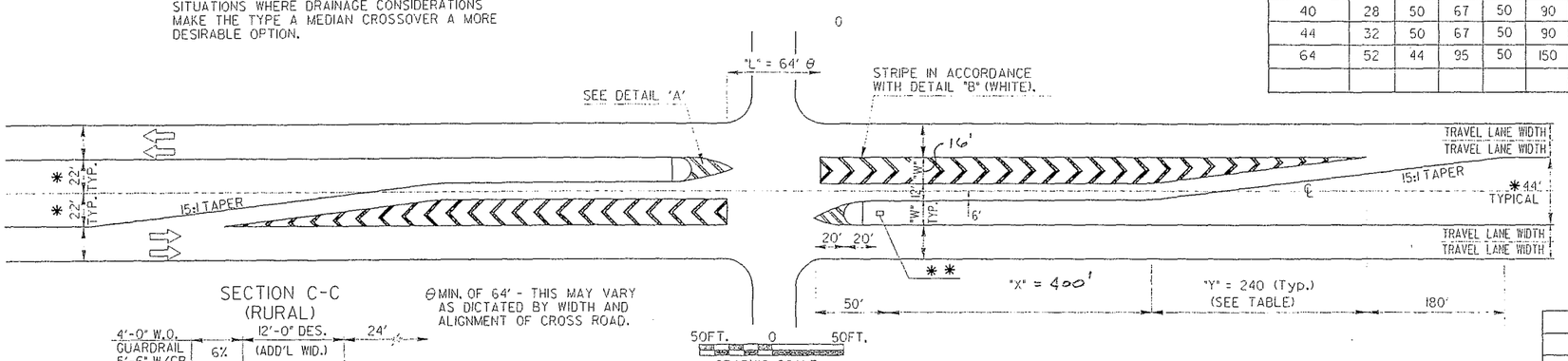
Δ "X" DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED. MIN. VALUES FOR "X" ARE ONLY TO BE USED WHERE SPACING BETWEEN MEDIAN OPENINGS DOES NOT ALLOW FOR THE MORE DESIRABLE LENGTH.

DETAIL "B" (WHITE)

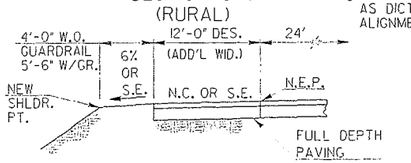


NOTE:
SQUARE YARDS OF STRIPING SHOWN ON PLAN AND SUMMARY SHEETS INCLUDES THE AREA WITHIN THE BORDERS, AS WELL AS THE 8" SOLID WHITE BORDER.

NOTE:
TYPE B MEDIAN CROSSOVERS ARE THE PREFERRED TYPE OF MEDIAN CROSSOVER. TYPE A MEDIAN CROSSOVER CAN BE USED IN LOW VOLUME SITUATIONS WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE A MEDIAN CROSSOVER A MORE DESIRABLE OPTION.



SECTION C-C (RURAL)



NOTE: SEE GA. STD. 4280 FOR GRADING WITH GUARDRAIL.

θ MIN. OF 64' - THIS MAY VARY AS DICTATED BY WIDTH AND ALIGNMENT OF CROSS ROAD.

50FT. 0 50FT.
GRAPHIC SCALE

TYPE B MEDIAN CROSSOVER

SEE SEPARATE SHEETS: "TYPICAL SECTION GUIDE FOR TYPE "B" MEDIAN CROSSOVER."

NOTE:
PAVEMENT OF MEDIAN CROSSOVERS (ALL TYPES) SHALL BE SLOPED FOR SURFACE DRAINAGE AS SPECIFIED.

TYPE B MEDIAN CROSSOVERS ●					
WIDTH OF MEDIAN	DECELERATION LENGTH = Δ(FT.) DESIGN SPEED 45 MPH	55 MPH	65 MPH	Y	W
44	150(50MIN)	300(150MIN)	450(300MIN)	240	16
64	N/A	150(50MIN)	300(150MIN)	390	26

$W = \frac{44 - 12}{2} = 16'$

DECELERATION LANE

$\frac{450 \times 28 + \frac{1}{2}(28 \times 420)}{9} = 2053$ SY

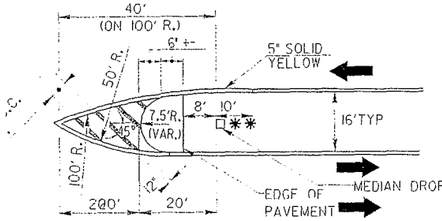
ONE SIDE

* DIMENSION MAY VARY WHERE SPECIFIED IN THE PLANS. ADJUSTMENTS TO BE SHOWN FOR ANY WIDTH OTHER THAN 44 FT.

** MEDIAN DROP INLET (903IS) CANNOT BE PLACED CLOSER THAN 20 FEET BACK FROM END OF NOSE OF THE MEDIAN.

● DIMENSIONS IN FEET (TYP)

MEDIAN DROP INLET (903IS) IS NOT RECOMMENDED FOR TYPE B MEDIAN CROSSOVERS WHERE GRADES ARE GREATER THAN 3%.



DETAIL "A" (YELLOW)

20FT. 0 20FT.
GRAPHIC SCALE

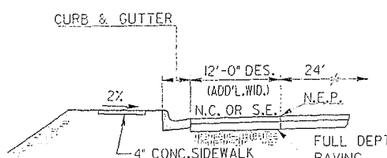
TYPE C MEDIAN CROSSOVERS ●	
DECELERATION LENGTH = X ■	
DESIGN SPEED	X (FT)
35 MPH	300(200MIN.)
45 MPH	400(250MIN.)

'X' DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED.

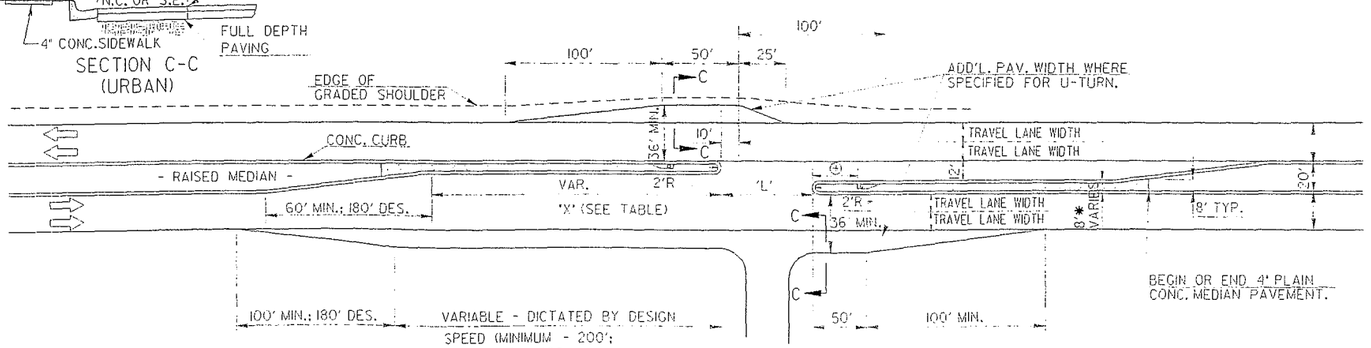
TE:
'HE TYPE C MEDIAN CROSSOVER SHOWN IS TYPICAL FOR ONE SIDE ROAD CONNECTION. (T-INTERSECTION)

'HE BOTTOM PORTION OF TYPE C IS APPLICABLE ON EACH SIDE OF THE CROSSOVER FOR A CROSS ROAD INTERSECTION OR SIDE ROAD CONNECTION ON EACH SIDE. (X-INTERSECTION)

'HE TOP PORTION OF TYPE C DETAIL IS APPLICABLE ON EACH



SECTION C-C (URBAN)



"L" - 84' MIN. (FOR TYP. C)

TYPE C MEDIAN CROSSOVER

SPECIAL NOTE: ONE SIDE
THE "L" DIMENSIONS SHOWN FOR TYPE A, TYPE B, AND TYPE C CROSSOVERS ARE BASED UPON 50FT. CONTROL RADII FOR LEFT TURNS AND INTERSECTING CROSSROADS OF TWO 12 FT. LANES PERPENDICULAR TO THE MAINLINE. DIFFERENT "L" DIMENSIONS MAY BE SPECIFIED AT LOCATIONS WHERE WARRANTED BY OTHER CONDITIONS.

DATE | REVISION

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

CONSTRUCTION DETAILS
MEDIAN CROSSOVERS

SCALE AS SHOWN APRIL, 2010

COST WORKSHEET

PROJECT:	**WIDENING AND RECONSTRUCTION OF SR 113 FROM C.R. 23/LUCAS ROAD TO RICHLAND CK** *P.I. No. 621760* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**R-7D** **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Asphalt Pavement	SY	4,106	50.88	208,913	1,414	50.88	71,944
Subtotal				208,913			71,944
Markup (%) at							
TOTAL				208,913			71,944
TOTAL (ROUNDED)				209,000			72,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT – PHASE I**
P.I. No. 0008382; CSSTP-0008-00(382)
Bartow County, GA

ALTERNATIVE NO.: **R-7E**

DESCRIPTION: **AT THE FRICTION DRIVE INTERSECTION WITH SR 113, CHANGE FROM A TYPE B MEDIAN CROSSING TO A TYPE A MEDIAN CROSSING**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN: (sketch attached)

A Type B median crossing is designed for SR 113 at the intersection with Friction Drive.

ALTERNATIVE: (sketch attached)

Use a Type A median crossing at this intersection

ADVANTAGES:

- Reduces the amount of pavement to install and maintain
- Reduces the amount of impervious area and storm water runoff
- Vehicles traveling southwest on SR 113 will have more room to make a U-turn

DISADVANTAGES:

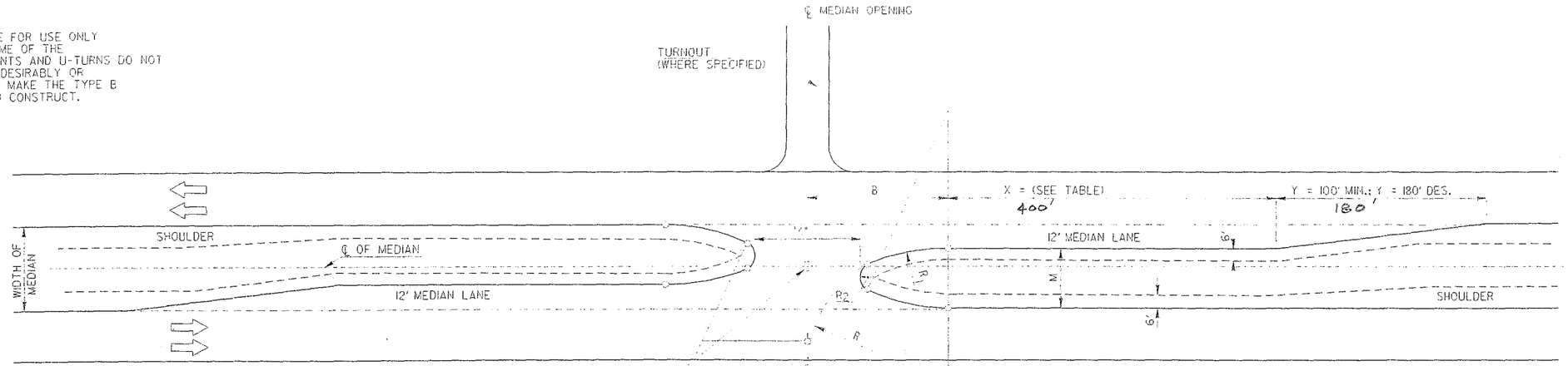
- None apparent

DISCUSSION:

There are no traffic counts for this intersection. Because Friction Drive is believed to be a minor road with very little traffic, the recommended 20 vehicle per hour (vph) combined left turning movements maximum for a Type A median crossing in the GDOT standard will probably be met. Therefore, it is suggested that the Type A median crossing will be adequate in this location and substantial construction and maintenance costs can be saved.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 209,000	—	$ 209,000
ALTERNATIVE	$ 72,000	—	$ 72,000
SAVINGS (Original minus Alternative)	$ 137,000	—	$ 137,000

NOTE:
TYPE A MEDIAN CROSSOVERS ARE FOR USE ONLY WHERE THE FUTURE TOTAL VOLUME OF THE COMBINED LEFT TURNING MOVEMENTS AND U-TURNS DO NOT EXCEED 20 VEHICLES PER HOUR, DESIRABLY OR WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE B MEDIAN CROSSOVER DIFFICULT TO CONSTRUCT.



TYPE A MEDIAN CROSSOVER

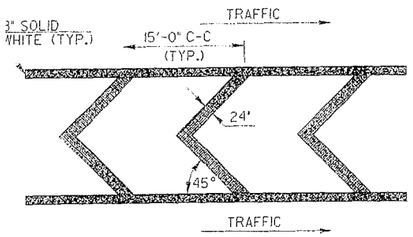
NOTE:
TYPE B MEDIAN CROSSOVERS ARE THE PREFERRED TYPE OF MEDIAN CROSSOVER. TYPE A MEDIAN CROSSOVER CAN BE USED IN LOW VOLUME SITUATIONS WHERE DRAINAGE CONSIDERATIONS MAKE THE TYPE A MEDIAN CROSSOVER A MORE DESIRABLE OPTION.

NOTE FOR TYPE 'A' AND TYPE 'B':
- THE EMBANKMENT GRADED UP TO THE MEDIAN CROSSOVERS SHALL BE SLOPED AT 20:1 DESIRABLE, 10:1 MIN. NORMALLY, WITH A 6:1 ACCEPTABLE FOR SPEEDS UNDER FORTY-FIVE MILES PER HOUR.

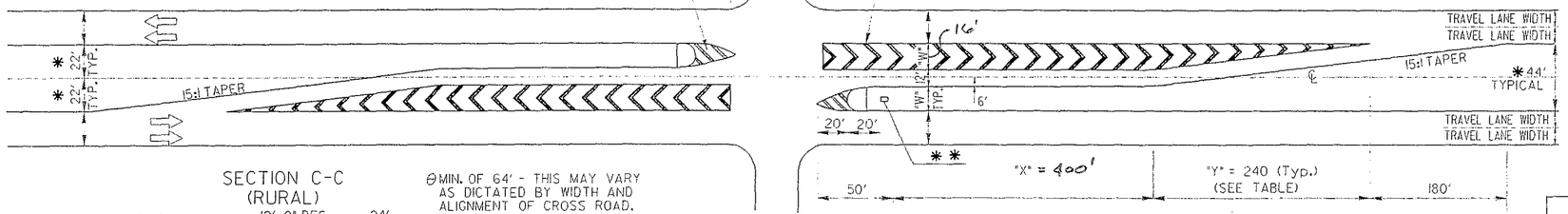
TYPE A MEDIAN CROSSOVERS ●										
WIDTH OF MEDIAN	M	L NORM	B NORM	R	R_1	R_2	DECELERATION LENGTH = X Δ (FT) DESIGN SPEED 45 MPH	55 MPH	65 MPH	Y (DES)
40	28	50	67	50	90	6	400(250) MIN	525(400) MIN	700(525) MIN	180
44	32	50	67	50	90	8	400(250) MIN	525(400) MIN	700(525) MIN	180
64	52	44	95	50	150	10	400(250) MIN	525(400) MIN	700(525) MIN	180

Δ "X" DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED. MIN. VALUES FOR "X" ARE ONLY TO BE USED WHERE SPACING BETWEEN MEDIAN OPENINGS DOES NOT ALLOW FOR THE MORE DESIRABLE LENGTH.

DETAIL "B" (WHITE)



NOTE:
SQUARE YARDS OF STRIPING SHOWN ON PLAN AND SUMMARY SHEETS INCLUDES THE AREA WITHIN THE BORDERS, AS WELL AS THE 8" SOLID WHITE BORDER.



TYPE B MEDIAN CROSSOVER

TYPE B MEDIAN CROSSOVERS ●					
WIDTH OF MEDIAN	DECELERATION LENGTH = Δ (FT.) DESIGN SPEED 45 MPH	55 MPH	65 MPH	Y	W
44	150(50 MIN)	300(150 MIN)	450(300 MIN)	240	16
64	N/A	150(50 MIN)	300(150 MIN)	390	26

SEE SEPARATE SHEETS: 'TYPICAL SECTION GUIDE FOR TYPE 'B' MEDIAN CROSSOVER."

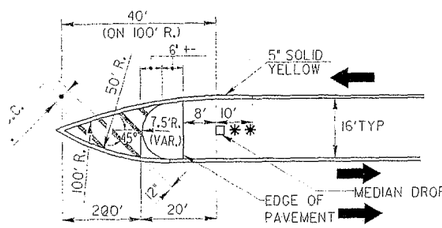
NOTE:
PAVEMENT OF MEDIAN CROSSOVERS (ALL TYPES) SHALL BE SLOPED FOR SURFACE DRAINAGE AS SPECIFIED.

* DIMENSION MAY VARY WHERE SPECIFIED IN THE PLANS. ADJUSTMENTS TO BE SHOWN FOR ANY WIDTH OTHER THAN 44 FT.

● DIMENSIONS IN FEET (TYP)

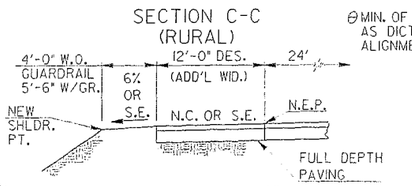
** MEDIAN DROP INLET (903IS) CANNOT BE PLACED CLOSER THAN 20 FEET BACK FROM END OF NOSE OF THE MEDIAN.

MEDIAN DROP INLET (903IS) IS NOT RECOMMENDED FOR TYPE B MEDIAN CROSSOVERS WHERE GRADES ARE GREATER THAN 3%.



DETAIL "A" (YELLOW)

20FT. 0 20FT.
GRAPHIC SCALE



SECTION C-C (RURAL)

NOTE: SEE GA. STD. 4280 FOR GRADING WITH GUARDRAIL.

θ MIN. OF 64' - THIS MAY VARY AS DICTATED BY WIDTH AND ALIGNMENT OF CROSS ROAD.

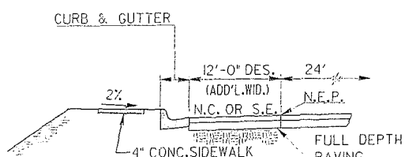
TYPE C MEDIAN CROSSOVERS ●	
DECELERATION LENGTH = X ■	
DESIGN SPEED	X (FT)
35 MPH	300(200 MIN.)
45 MPH	400(250 MIN.)

'X' DIMENSION IS FOR DECELERATION ONLY, DOES NOT ACCOUNT FOR ANY STORAGE NEEDED.

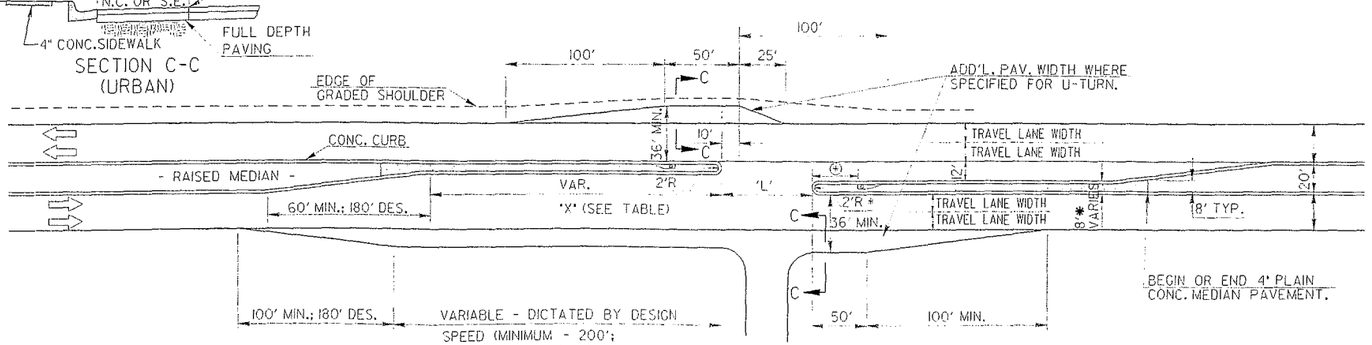
TE:
'HE TYPE C MEDIAN CROSSOVER SHOWN IS TYPICAL FOR ONE SIDE ROAD CONNECTION. (T-INTERSECTION)

'HE BOTTOM PORTION OF TYPE C IS APPLICABLE ON EACH SIDE OF THE CROSSOVER FOR A CROSS ROAD INTERSECTION OR SIDE ROAD CONNECTION ON EACH SIDE. (X-INTERSECTION)

'HE TOP PORTION OF TYPE C DETAIL IS APPLICABLE ON EACH SIDE OF THE MEDIAN OPENING WITHOUT ANY SIDE ROAD. U-TURNS ONLY)



SECTION C-C (URBAN)



'L' - 84' MIN. (FOR TYP. C)

TYPE C MEDIAN CROSSOVER

50FT. 0 50FT.

ONE DRAINAGE STRUCTURE IS REQUIRED IN THE MEDIAN

SPECIAL NOTE: ONE SIDE
THE "L" DIMENSIONS SHOWN FOR TYPE A, TYPE B, AND TYPE C CROSSOVERS ARE BASED UPON 50FT. CONTROL RADII FOR LEFT TURNS AND INTERSECTING CROSSROADS OF TWO 12 FT. LANES PERPENDICULAR TO THE MAINLINE. DIFFERENT "L" DIMENSIONS MAY BE SPECIFIED AT LOCATIONS WHERE WARRANTED BY OTHER CONDITIONS.

GA. | NO. | SHEETS

ALT. NO. R-7E
Sht. 2 of 3

DECELERATION LANE AREA

$\frac{12 \times 440 + \frac{1}{2}(180 \times 12)}{9} = 707$ SY

ONE SIDE

$W = \frac{44 - 12}{2} = 16'$

DECELERATION LANE

$\frac{450 \times 28 + \frac{1}{2}(28 \times 420)}{9} = 2053$ SY

ONE SIDE

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA

DATE | REVISION

CONSTRUCTION DETAILS
MEDIAN CROSSOVERS

SCALE AS SHOWN | APRIL, 2010

DES. | MGR | NUMBER 73

COST WORKSHEET

PROJECT:	**SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT** *P.I. No. 0008382; CSSTP-0008-00(382)* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**R-7E** **3 of 3**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Asphalt Pavement	SY	4,106	50.88	208,913	1,414	50.88	71,944
Subtotal				208,913			71,944
Markup (%) at							
TOTAL				208,913			71,944
TOTAL (ROUNDED)				209,000			72,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT – PHASE I**
P.I. No. 0008382; CSSTP-0008-00(382)
Bartow County, GA

ALTERNATIVE NO.: **R-8**

DESCRIPTION: **USE 4-FT.-WIDE PAVED SHOULDERS IN LIEU OF 6.5-FT.-WIDE PAVED SHOULDERS**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

The current design proposes 6.5-ft.-wide paved shoulders with full-depth pavement.

ALTERNATIVE: (sketch attached)

Use 4-ft.-wide paved shoulders with full-depth pavement.

ADVANTAGES:

- Reduces construction labor and material requirements
- Reduces imperious paved area of runoff

DISADVANTAGES:

- Narrower paved shoulder

DISCUSSION:

The 6.5-ft.-wide shoulder provides extra width to accommodate bicycles. This county road route is not a bicycle route. A 4 ft. paved shoulder is sufficient for an arterial type highway as long as the graded shoulder width is 10 ft.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 167,000	—	$ 167,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS (Original minus Alternative)	$ 167,000	—	$ 167,000

SKETCHES

PROJECT:

Bartow County, GA

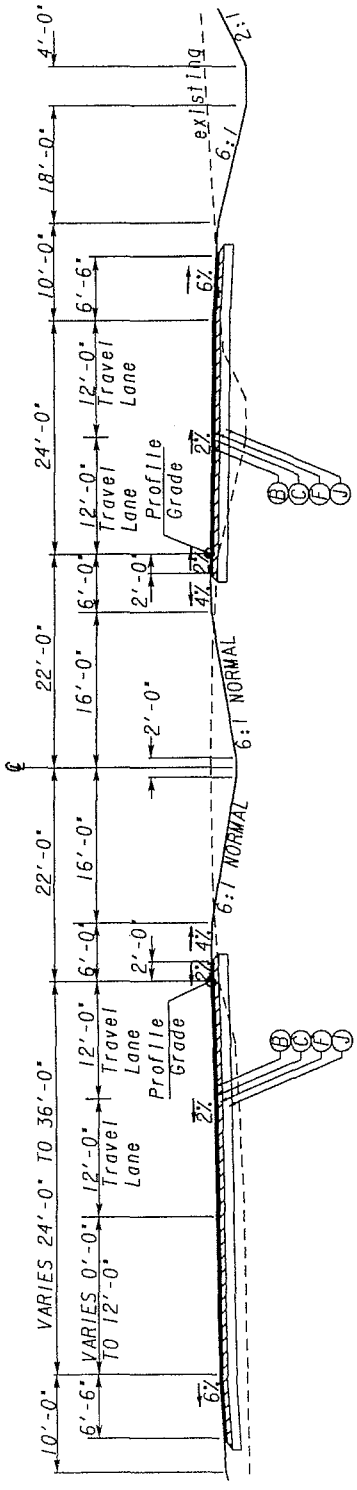
☑ AS DESIGNED ☑ ALTERNATIVE

ALTERNATIVE NO.:

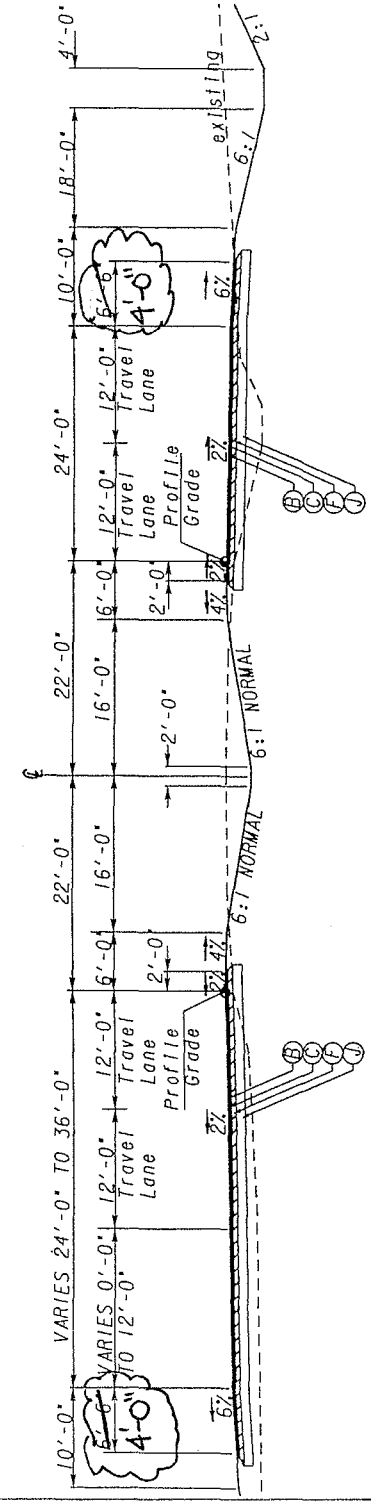
R-8

SHEET NO.: 2 of 4

ORIGINAL DESIGN



ALTERNATE DESIGN



PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT – PHASE I**
P.I. No. 0008382; CSSTP-0008-00(382)
Bartow County, GA

ALTERNATIVE NO.: **R-8**

SHEET NO.: **3 of 4**

P.I. # 008382: (STA. 561+00 – STA. 502+00) = 5,900 feet

Alternate design is to use a 4 ft paved outside shoulder in lieu of a 6.5 ft outside paved shoulder.

Outside Paved shoulder saved: [(6.5' – 4') x 2 shoulders x 5,900']/9sf/sy = 3,278 sy

Pavement Section Unit Cost = $50.88/sy (see Alternate R-5)

COST WORKSHEET

PROJECT:	**SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT** *P.I. No. 0008382; CSSTP-0008-00(382)* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**R-8** **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Shoulder pavement section	SY	3,278.00	$50.88	$166,785			
Subtotal				$166,785			
Markup (%) at							
TOTAL				$166,785			
TOTAL (ROUNDED)				$167,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT – PHASE I**
P.I. No. 0008382; CSSTP-0008-00(382)
Bartow County, GA

ALTERNATIVE NO.: **D-1B**

DESCRIPTION: **REPLACE THE TWO CONCRETE BOX CULVERTS WITH REINFORCED CONCRETE PIPES**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (sketch attached)

A 4-ft. x 3-ft. x 160-ft.-long concrete box culvert is provided at Station 521+75.

A 10-ft. x 6-ft. x 190-ft.-long concrete box culvert is provided at Station 537+00.

ALTERNATIVE: (sketch attached beam chart and deck thickness chart)

Replace the 4-ft. x 3-ft. x 160-ft.-long concrete box culvert with a 48-in.-diameter reinforced concrete pipe (RCP).

Replace the 10-ft. x 6-ft. x 190-ft.-long concrete box culvert with dual 78-in.-diameter RCPs.

ADVANTAGES:

- Reduces construction material and labor requirements
- Decreases construction time

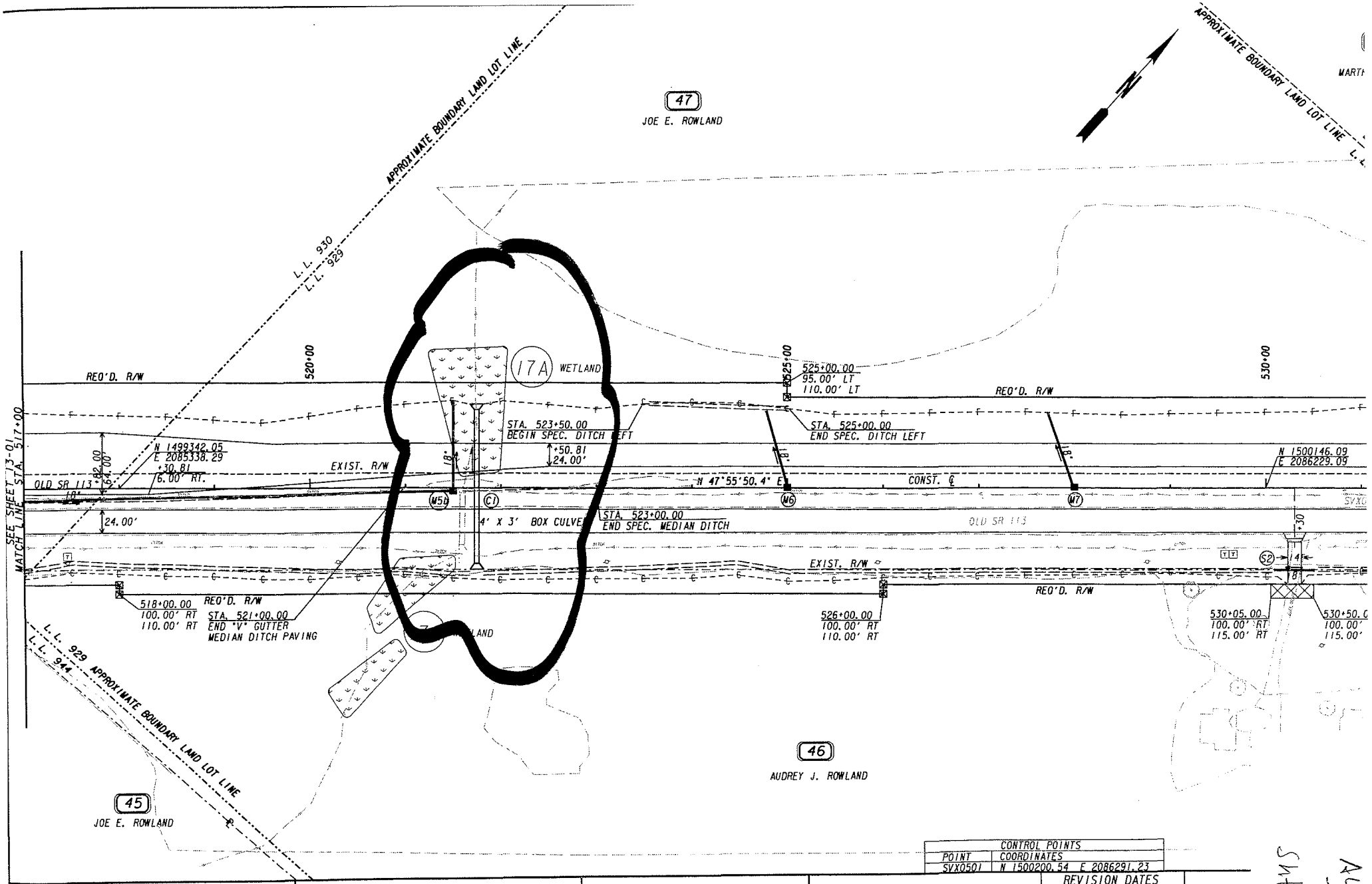
DISADVANTAGES:

- Redesign required

DISCUSSION:

There will be a cost savings of around $69,000 for both box culverts as well as a decrease in construction time. Some redesign will be required.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 183,000	—	$ 183,000
ALTERNATIVE	$ 114,000	—	$ 114,000
SAVINGS (Original minus Alternative)	$ 69,000	—	$ 69,000



CONTROL POINTS	
POINT	COORDINATES
SVX0501	N 1500200.54 E 2086291.23

PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR. & MAINT. OF SLOPE
EASEMENT FOR CONSTR. & MAINT. OF SEDIMENT BASINS
EASEMENT FOR CONSTR OF DRIVES

PLANS PREPARED AND SUBMITTED BY:

AMERICAN ENGINEERS, INC.
PROFESSIONAL ENGINEERING
DESIGN CONSULTANT

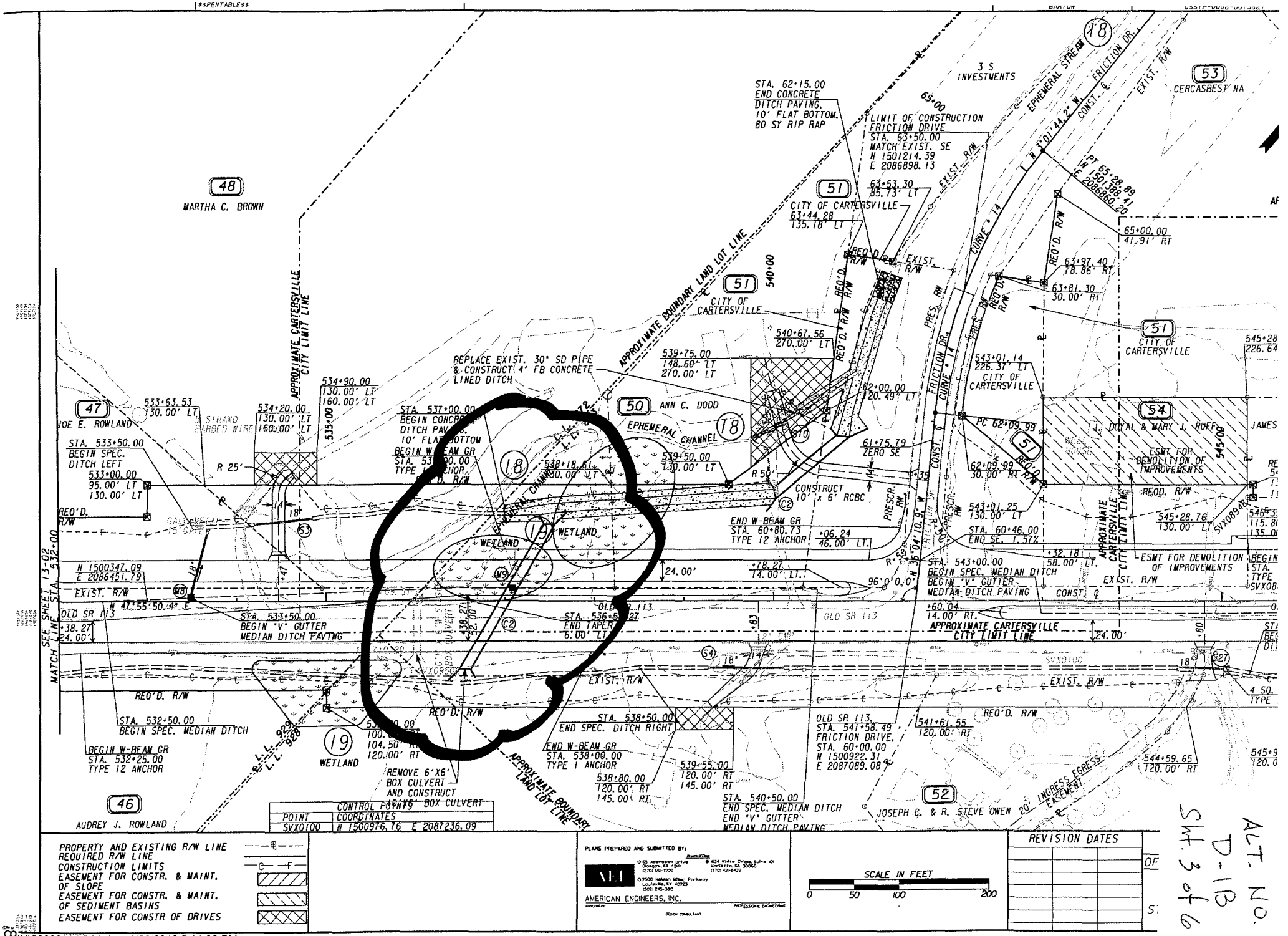
SCALE IN FEET
0 50 100 200

REVISION DATES

DEPA
OFFICE: (

STA. 51

ALT. NO. D-1B
Sht. 2 of 6


48
MARTHA C. BROWN
47
JOE E. ROWLAND
46
AUDREY J. ROWLAND
50
ANN C. DODD
51
CITY OF CARTERSVILLE
53
CERCASBEST NA
54
J. DOYAL & MARY J. RUFF
52
JOSEPH C. & R. STEVE OWEN
3 S INVESTMENTS
EPHEMERAL CHANNEL
EPHEMERAL STREAM
WETLAND
APPROXIMATE CARTERSVILLE CITY LIMIT LINE
APPROXIMATE BOUNDARY LAND LOT LINE
FRICTION DR.
CONST. ℄
EXIST. R/W
REQ'D. R/W
PRES. R/W
OLD SR 113
INGRESS EGRESS EASEMENT 20'
ESMT FOR DEMOLITION OF IMPROVEMENTS
SEE SHEET 13-02 MATCH LINE STA. 532+00
STA. 62+15.00 END CONCRETE DITCH PAVING. 10' FLAT BOTTOM. 80 SY RIP RAP
LIMIT OF CONSTRUCTION FRICTION DRIVE STA. 63+50.00 MATCH EXIST. SE N 1501214.39 E 2086898.13
REPLACE EXIST. 30" SD PIPE & CONSTRUCT 4' FB CONCRETE LINED DITCH
CONSTRUCT 10' x 6' RCBC
REMOVE 6'X6' BOX CULVERT AND CONSTRUCT 10'X6' BOX CULVERT
STA. 533+50.00 BEGIN SPEC. DITCH LEFT
STA. 532+50.00 BEGIN SPEC. MEDIAN DITCH
STA. 533+50.00 BEGIN "V" GUTTER MEDIAN DITCH PAVING
STA. 536+50.27 END TAPER 6.00' LT
STA. 538+50.00 END SPEC. DITCH RIGHT
STA. 540+50.00 END SPEC. MEDIAN DITCH END "V" GUTTER MEDIAN DITCH PAVING
STA. 543+00.00 BEGIN SPEC. MEDIAN DITCH BEGIN "V" GUTTER MEDIAN DITCH PAVING
STA. 541+58.49 FRICTION DRIVE, STA. 60+00.00 N 1500922.31 E 2087089.08
END W-BEAM GR STA. 60+80.73 TYPE 12 ANCHOR
END W-BEAM GR STA. 538+00.00 TYPE I ANCHOR
BEGIN W-BEAM GR STA. 532+25.00 TYPE 12 ANCHOR
CONTROL POINTS
POINT | COORDINATES
SVX0100 | N 1500976.76 E 2087236.09
PROPERTY AND EXISTING R/W LINE
REQUIRED R/W LINE
CONSTRUCTION LIMITS
EASEMENT FOR CONSTR. & MAINT. OF SLOPE
EASEMENT FOR CONSTR. & MAINT. OF SEDIMENT BASINS
EASEMENT FOR CONSTR OF DRIVES
PLANS PREPARED AND SUBMITTED BY:
AMERICAN ENGINEERS, INC.
SCALE IN FEET
0 50 100 200
REVISION DATES
ALT. NO. 1
D-18
Sht. 3 of 6

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT – PHASE I**
P.I. No. 0008382; CSSTP-0008-00(382)
Bartow County, GA

ALTERNATIVE NO.: **D-1B**

SHEET NO.: **4 of 6**

Concrete Culvert 4 x 3 x 160 (See GDOT Standard 2321)

Culvert Concrete Volume = (0.367 CY/ft)(160') = 58.72 CY

+ wingwalls = 7.91 CY

Concrete Total = 66.63 CY

Culvert Reinforcing = (40.9 lbs/ft)(160')= 6,544 lbs

+ wingwalls = 205 lbs

Reinforcing Total = 6,749 lbs

Alternate: Single 48" dia. RCP (See GDOT Standard 1125 for Headwall Quantity)

Headwalls (Use same quantity for inlet and outlet) = 4.8 CY + 4.8 CY = 9.6 CY

PROJECT: **SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT – PHASE I**
P.I. No. 0008382; CSSTP-0008-00(382)
Bartow County, GA

ALTERNATIVE NO.: **D-1B**

SHEET NO.: **5 of 6**

Concrete Culvert 10 x 6 x 190 (See GDOT Standard 2324)

Culvert Concrete Volume = (1.244 CY/ft)(190') = 236.4 CY

+ wingwalls = 21.20 CY

Concrete Total = 257.60 CY

Culvert Reinforcing = (163.3 lbs/ft)(190')= 31,027 lbs

+ wingwalls = 915 lbs

Reinforcing Total = 31, 942.0 lbs

Alternate: Double 78" dia. RCP (See GDOT Standard 1125 for Headwall Quantity)

Average the 72" and 84" RCP cost to get the 78" RCP cost = ($165.25 + $233.74)/2 = $ 200.00

Headwalls (Use same quantity for inlet and outlet)

Average the 72" and 84" headwall quantity = (15.19 CY + 9.48 CY)/2 = 12.4 CY

Average the 72" and 84" additional line = (9.29 CY + 6.46 CY)/2 = 7.9 CY

Headwall Quantity = 12.4 CY + 12.4 CY + 7.9 CY + 7.9 CY = 40.6 CY

COST WORKSHEET

PROJECT:	**SR 113 FROM OLD ALABAMA ROAD RELOCATION TO SR 61 @ NEW ALIGNMENT** *P.I. No. 0008382; CSSTP-0008-00(382)* *Bartow County, GA*	ALTERNATIVE NO.: SHEET NO.:	**D-1B** **6 of 6**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Concrete Box Culvert 4 x 3 x 160							
Class A Concrete	CY	66.63	455.00	$30,316.65			
Bar Reinf Steel	LB	6,749	0.92	$6,209.08			
Single 48" dia. RCP							
48" dia. RCP	LF				160	80.18	$12,829.00
Conc. Headwalls with Rebar	CY				9.60	498.70	$4,788.00
Concrete Box Culvert 10 x 6 x 190							
Class A Concrete	CY	257.60	455.00	$117,208.00			
Bar Reinf Steel	LB	31,942	0.92	$29,386.64			
Double 78" dia. RCP							
78" dia. RCP	LF				380	200.00	$76,000.00
Conc. Headwalls with Rebar	CY				40.60	498.70	$20,247.00
Subtotal				183,120			113,864
Markup (%) at							
TOTAL				183,120			113,864
TOTAL (ROUNDED)				183,000			114,000

SECTION THREE - PROJECT DESCRIPTION

These projects are being developed to increase capacity along the stretch of SR 113 from Taft Road/CR 26 and Old Stilesboro Road/CR 31 to Friction Road, a distance of approximately 4.5 miles. For bidding, the Widening and Reconstruction of SR 113 from CR 23/Lucas Road to Richland Creek and SR 113 From Old Alabama Road Relocation to SR 61 @ New Alignment – Phase I projects are to be combined with another project that sits between them. This project realigns Old Alabama Road to tie directly to the east-west portion of SR 113 and tie the northwest segment of SR 113 into this roadway as a signalized tee intersection.

The expansion of SR 113 comprises expanding the two-lane roadway to a four-lane divided highway with 6.5-ft. of full-depth pavement including rumble strips. The outside portion of the pavement will be used as a bicycle lane. The inside shoulder will be 2-ft.-wide full pavement with a rumble strip. At the intersections with CR 20, CR 25, CR 533/Brown Farm Road and Friction Drive the roadway will be expanded to include right turn lanes and a Type B median crossing.

Storm water drainage will consist of grass swales, concrete lined swales and underground piping as necessary. There will be three concrete box culverts to convey streams under the roadway.

As part of the project, the existing Richland Creek Bridge will be demolished and a new 115-ft.-wide x 130-ft.-long bridge constructed to support the four-lane highway and left turn lanes. At Raccoon Creek the existing bridge will be demolished and two 43-ft. 3-in.-wide by 200-ft.-long parallel bridges will be constructed for each two-lane roadway section. The bridges will be constructed using cast-in-place concrete decks and parapets supported on precast, prestressed concrete girders that sit on concrete abutments or piers supported on piles. Storm water runoff will be collected in bio-retention ponds off the bridge before discharging into the creeks.

The estimated total project cost for all four projects is $27.5 million of which $5.2 million is for right-of-way acquisitions. As of the start of the VE study, the bid date for the three combined projects was January 2011 if funding is available. The remaining SR 113 project designs will be "put on the shelf" until funding is available.

SECTION FOUR - VALUE ANALYSIS AND CONCLUSIONS

GENERAL

This section describes the value methodology followed during the value engineering study on the four SR 113 projects for the GDOT. The workshop was performed at the 95% design completion stage. American Engineers, Inc. has been selected by GDOT to assist with the development of the project and 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:

- Project Plans for SR 113 From Cr 31 To Richland Creek @ Old Alabama Road Relocation – Phase II, P.I. No. 621440 and P.I. No. 621445, STP00-0179-01(010) and BHF00-0179-01(011), dated 6/22/2010, prepared by American Engineers, Inc.
- Project Plans for Widening and Reconstruction of SR 113 From C.R. 23/Lucas Road to Richland Creek, P.I. No. 621760, BFR00-0179-01(012), dated 6/22/2010, prepared by American Engineers, Inc.
- Project Plans for SR 113 From Old Alabama Road Relocation to SR 61 @ New Alignment – Phase I, P.I. No. 0008382CSSTP-0008-00(382), dated 6/22/2010, prepared by American Engineers, Inc.
- Approved Revised Project Concept Report, P.I. Nos. 621440-, 621445-, 621760-, Bartow County, STP-179-1(10), BHF-179-1(11), BRF-179-1(12), dated August 16, 2006, prepared by GDOT
- VE Study Constraints prepared by DeWayne Commer & Cherie Marsh of GDOT

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

- Department of Transportation State of Georgia Interdepartment Correspondence, P.I. Nos. 621440, 621445, 621760 & 0008382, STP00-0179-01(010) and BHF00-0179-01(011), P.I. No. 621760, BFR00-0179-01(012), P.I. No. 0008382CSSTP-0008-00(382), Bartow/Polk Counties – The Widening and Reconstruction of SR 113 Environmental Commitments/Requirements, dated June 11, 2009, prepared by Glenn Bowman
- Job Estimate Reports for 621440 CES 6-8-10; 621445 CES 5-26-10; 621760 CES 6-8-10; and 0008382 CES 6-810.
- Department of Transportation State of Georgia Interdepartment Correspondence, P.I. Nos. 621440, 621445, 621760 & 0008382, STP00-0179-01(010) and BHF00-0179-01(011), P.I. No. 621760, BFR00-0179-01(012), P.I. No. 0008382CSSTP-0008-00(382), Bartow County Right of Way Costs, dated February 2, 2010, prepared by GDOT
- Department of Transportation State of Georgia Interdepartment Correspondence, STP00-0179-01(010) and BHF00-0179-01(011), P.I. No. 621760, BFR00-0179-01(012), P.I. No. 0008382CSSTP-0008-00(382), Bartow, P.I. Nos. 621440, 621445, 621760 & 0008382, Pavement Type Selection SR 113 from CR 31 to Richland Creek at Old Ala Rd Relocation – Ph III, dated July 7, 2010, prepared by Georgene M. Geary

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.

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 American Engineers Inc. 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, July 12, 2010, and concluding with the final VE Presentation on Thursday, July 15, 2010. 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 and American Engineers to the VE 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 and the American Engineers Inc. design team 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 Study Results section of this report.

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

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 and the American Engineers Inc. design team. The presentation was held on Thursday, July 15, 2010, 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 and the American Engineers Inc. 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 their reviews, 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 four SR 113 projects. The multidisciplinary team comprised professionals with highway design, structural engineering 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 US, Inc.
Michael Moilanen, PE	Bridge/Structural Engineering	ARCADIS US, Inc.
Paresh J. Parikh	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, July 12, 2010, by representatives from GDOT and the American Engineers Inc. 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, July 15, 2010, at the GDOT Headquarters office in Atlanta, Georgia to review VE alternatives with the owner and representatives from the design team. 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.

VE STUDY SIGN-IN SHEET

Project No.: STP00-0179-01(010), BHF00-0179-01(011) BRF00-0179-01(012), CSSTP-0008-00(382) County: Bartow PI Nos.: 621440, 621445 621760, 0008382 Date: July 12-15, 2010

FIRST	LAST	NAME	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
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✓	✓	Howard Greenfield	Lewis & Zimmerman	301-984-9590	hgreenfield@lza.com
✓	✓	Paresh J. Parikh	Delon Hampton	404-524-3030	pparikh@delonhampton.com
✓	✓	Joe Leoni	ARCADIS	770-431-8666	Joe.leoni@arcadis-us.com
✓	✓	Ron Wishon	Engineering Services	404-631-1753	rwishon@dot.ga.gov
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✓	✓	Cherie Marsh	D6 PreConstruction	770.387.3618	cmarsh@dot.ga.gov
✓	✓	Mark Wilkinson	American Engineers	770-421-8422	mwilkinson@aei.cc
	✓	Bill Duvall	Bridge Design	404-631-1883	bduvall@dot.ga.gov
✓	✓	Mike Moilanen	ARCADIS	770.431.8666	Michael.moilanen@arcadis-us.com
	✓	DeWayne Comer	D6 PreConstruction	770-387-3619	dcomer@dot.ga.gov

✓ Check all that apply 10 Attended Project Overview (First) 11 Attended Project Presentation (Last)

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:	2010
Construction Start Date:	
P.I. Nos. 621760 and 0008382	January 2011
P.I. Nos. 621440 and 621445	Unknown
Construction Completion Date:	2013
Planning Period (n):	20 years
Discount Rate (i):	3%

COST MODEL

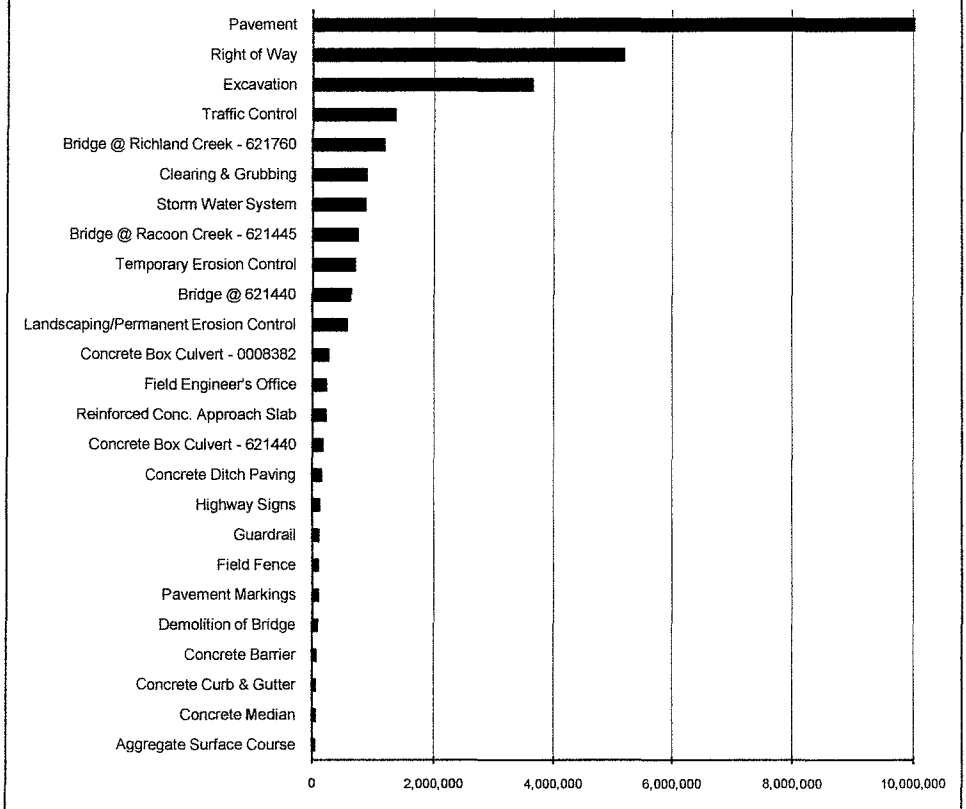
The VE team prepared Pareto Charts, or Cost Histograms, for the each project and for all projects combined that follow this page. The Cost Histograms display the major construction elements identified in the cost estimates prepared by the designer in descending order of magnitude and thus identifies the high cost areas in the project. The high cost elements provide the VE team with one focus for its work during the study.

For the combined projects, 3 of 25 construction items, pavement, right of way, and excavation, comprise 68% of the project costs.

COST HISTOGRAM

PROJECT: P.I. ALL SR 113 FROM OLD ALABAMA ROAD TO SR 61 BYPASS TO SR 101

PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Pavement	10,024,658	36.42%	36.42%
Right of Way	5,190,000	18.85%	55.27%
Excavation	3,636,968	13.21%	68.49%
Traffic Control	1,351,123	4.91%	73.40%
Bridge @ Richland Creek - 621760	1,183,400	4.30%	77.69%
Clearing & Grubbing	890,000	3.23%	80.93%
Storm Water System	868,823	3.16%	84.08%
Bridge @ Racoon Creek - 621445	738,478	2.68%	86.77%
Temporary Erosion Control	692,665	2.52%	89.28%
Bridge @ 621440	630,678	2.29%	91.57%
Landscaping/Permanent Erosion Control	573,006	2.08%	93.66%
Concrete Box Culvert - 0008382	269,087	0.98%	94.63%
Field Engineer's Office	226,683	0.82%	95.46%
Reinforced Conc. Approach Slab	222,452	0.81%	96.27%
Concrete Box Culvert - 621440	170,275	0.62%	96.88%
Concrete Ditch Paving	154,920	0.56%	97.45%
Highway Signs	117,523	0.43%	97.87%
Guardrail	105,501	0.38%	98.26%
Field Fence	93,829	0.34%	98.60%
Pavement Markings	93,498	0.34%	98.94%
Demolition of Bridge	85,526	0.31%	99.25%
Concrete Barrier	62,520	0.23%	99.48%
Concrete Curb & Gutter	53,587	0.19%	99.67%
Concrete Median	49,056	0.18%	99.85%
Aggregate Surface Course	41,741	0.15%	100.00%
TOTAL	**$ 27,525,997**	**100.00%**	

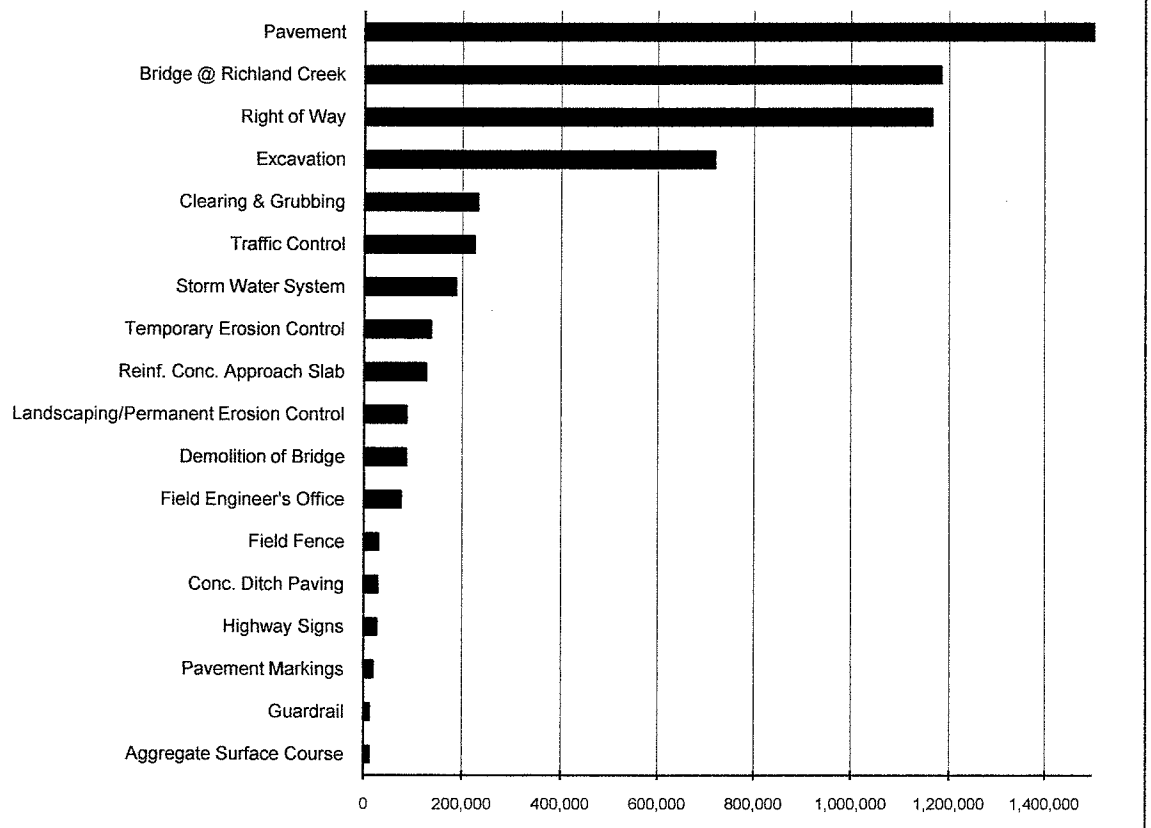


Costs in graph are not marked-up.

COST HISTOGRAM

PROJECT: P.I. 621760 SR 113 AT RICHLAND CREEK

PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Pavement	1,522,742	25.96%	25.96%
Bridge @ Richland Creek	1,183,400	20.18%	46.14%
Right of Way	1,165,000	19.86%	66.00%
Excavation	718,319	12.25%	78.24%
Clearing & Grubbing	230,000	3.92%	82.17%
Traffic Control	223,835	3.82%	85.98%
Storm Water System	186,153	3.17%	89.16%
Temporary Erosion Control	136,080	2.32%	91.48%
Reinf. Conc. Approach Slab	126,669	2.16%	93.64%
Landscaping/Permanent Erosion Control	86,182	1.47%	95.10%
Demolition of Bridge	85,526	1.46%	96.56%
Field Engineer's Office	75,561	1.29%	97.85%
Field Fence	30,028	0.51%	98.36%
Conc. Ditch Paving	28,264	0.48%	98.84%
Highway Signs	26,247	0.45%	99.29%
Pavement Markings	19,145	0.33%	99.62%
Guardrail	11,662	0.20%	99.82%
Aggregate Surface Course	10,697	0.18%	100.00%
TOTAL	**$ 5,865,510**	**100.00%**	

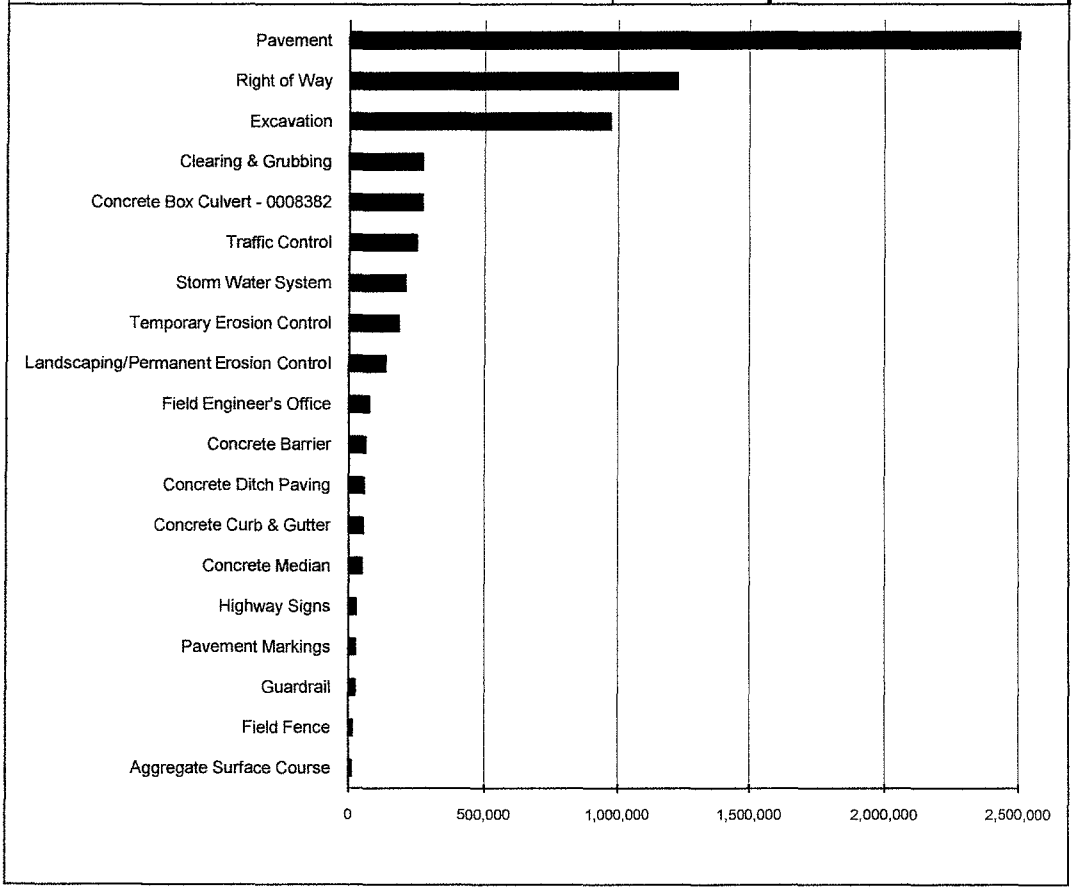


Costs in graph are not marked-up.

COST HISTOGRAM

PROJECT: P.I. 0008382 FROM OLD ALABAMA ROAD TO SR 61 BYPASS TO SR 101

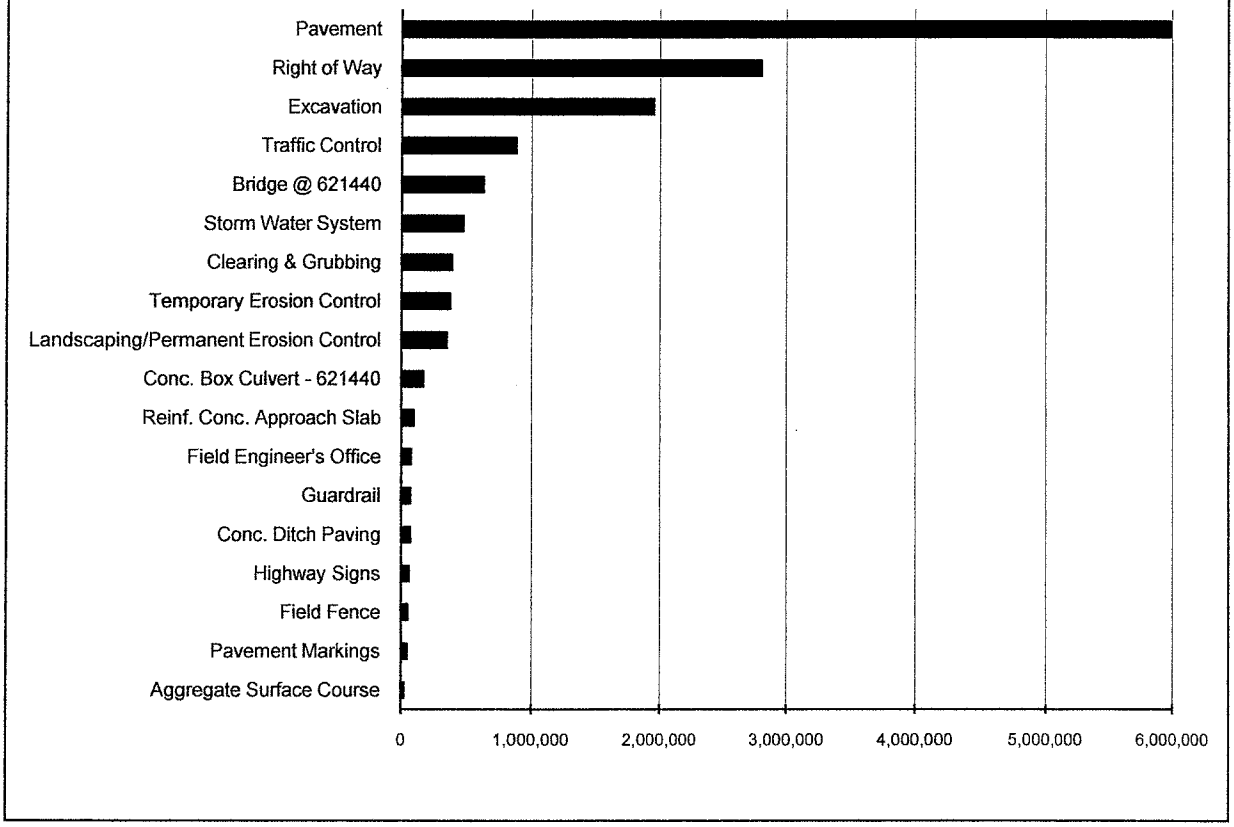
PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Pavement	2,513,286	39.15%	39.15%
Right of Way	1,225,000	19.08%	58.23%
Excavation	969,672	15.10%	73.33%
Clearing & Grubbing	270,000	4.21%	77.54%
Concrete Box Culvert - 0008382	269,087	4.19%	81.73%
Traffic Control	247,385	3.85%	85.58%
Storm Water System	207,321	3.23%	88.81%
Temporary Erosion Control	183,208	2.85%	91.67%
Landscaping/Permanent Erosion Control	135,375	2.11%	93.77%
Field Engineer's Office	75,561	1.18%	94.95%
Concrete Barrier	62,520	0.97%	95.92%
Concrete Ditch Paving	56,747	0.88%	96.81%
Concrete Curb & Gutter	53,587	0.83%	97.64%
Concrete Median	49,056	0.76%	98.41%
Highway Signs	29,062	0.45%	98.86%
Pavement Markings	24,797	0.39%	99.25%
Guardrail	23,742	0.37%	99.62%
Field Fence	13,949	0.22%	99.83%
Aggregate Surface Course	10,697	0.17%	100.00%
TOTAL	**$ 6,420,052**	**100.00%**	



COST HISTOGRAM

PROJECT: P.I. 621440 SR 113 FROM CR 31 TO RICHLAND CREEK AT OLD ALABAMA ROAD

PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Pavement	5,988,630	41.30%	41.30%
Right of Way	2,800,000	19.31%	60.62%
Excavation	1,948,977	13.44%	74.06%
Traffic Control	879,903	6.07%	80.13%
Bridge @ 621440	630,678	4.35%	84.48%
Storm Water System	475,349	3.28%	87.75%
Clearing & Grubbing	390,000	2.69%	90.44%
Temporary Erosion Control	373,377	2.58%	93.02%
Landscaping/Permanent Erosion Control	351,449	2.42%	95.44%
Conc. Box Culvert - 621440	170,275	1.17%	96.62%
Reinf. Conc. Approach Slab	95,783	0.66%	97.28%
Field Engineer's Office	75,561	0.52%	97.80%
Guardrail	70,097	0.48%	98.28%
Conc. Ditch Paving	69,909	0.48%	98.76%
Highway Signs	62,214	0.43%	99.19%
Field Fence	49,852	0.34%	99.54%
Pavement Markings	46,694	0.32%	99.86%
Aggregate Surface Course	20,347	0.14%	100.00%
TOTAL	**$ 14,499,095**	**100.00%**	



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: **SR 113**
P.I. Nos. 621440, 621445, 621760 and 0008382
Bartow County, GA

SHEET NO.: **1 of 2**

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
PROJECT	Increase	Capacity	B
	Reduce	Congestion	HO
	Extend	Useful Life	B
PAVEMENT	Add	Lanes	B
	Support	Vehicles	B
	Guide	Vehicles	B
	Accommodate	Bicycles	B
RUMBLE STRIPS	Alert	Drivers	B
RIGHT-OF-WAY	Create	Space	B
	Adhere	To Environmental Standards	G
EXCAVATION/BACKFILL	Create	Drainage Paths	B
	Establish	Elevations	B
TRAFFIC CONTROL	Maintain	Traffic During Construction	RS
BRIDGE @ RICHLAND CREEK	Expand	Capacity	B
	Extend	Useful Life	B
CLEARING & GRUBBING	Clear	Area	B
STORM WATER SYSTEM	Collect	Storm Water	B
	Convey	Storm Water	B
	Treat	Storm Water	R/S
BRIDGE @ RACCOON CREEK	Add	Capacity	B
TEMPORARY EROSION CONTROL	Prevent	Erosion During Construction	R/S
BRIDGE @ 621440 (RACCOON CREEK)	Extend	Useful Life	B
LANDSCAPING/EROSION CONTROL	Prevent	Soil Erosion	R/S

Function defined as: Action Verb, Measurable Noun

Kind: B = Basic, S = Secondary, RS = Required Secondary, HO = Higher Order, LO = Lower Order

RANDOM FUNCTION ANALYSIS

PROJECT: **SR 113**
P.I. Nos. 621440, 621445, 621760 and 0008382
Bartow County, GA

SHEET NO.: **2 of 2**

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
CONCRETE BOX CULVERT (2)	Convey	Storm Water	B
FIELD ENGINEERS OFFICE	House	Inspection Staff	S
REINFORCED CONCRETE APPROACH SLAB	Support	Vehicles	B
	Increase	Capacity	B
CONCRETE DITCH PAVING	Convey	Storm Water	R/S
	Pavement	Erosion	S
HIGHWAY SIGNS	Inform	Motorists	B

Function defined as: Action Verb, Measurable Noun

Kind: B = Basic, S = Secondary, RS = Required Secondary, HO = Higher Order, LO = Lower Order

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

During the Creative/Speculation Phase, numerous ideas were generated for the four SR 113 projects 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
Roadway	R
Drainage	D
Bridge	B

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/the responses of the owner. The following are the top value objectives for this project:

- Impacts to project's cost
- Functionality
- Impact on schedule
- Impact on right of way
- Impact on construction

After discussing each idea, the team evaluated the ideas by consensus. This exercise produced nine ideas rated 4 or 5 to research and develop into formal VE alternatives 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:	**SR 113** *P.I. Nos. 621440, 621445, 621760 and 0008382* *Bartow County, GA*	SHEET NO.:	**1 of 1**

NO.	IDEA DESCRIPTION	RATING
ROADWAY (R)		
R-1	Retain CR 20 in its current location	4
R-2	Provide a free right turn from existing SR 113 to new, widened SR 113	3
R-3	Use grass ditches in lieu of concrete ditches	2
R-4	Use 32-ft.-wide median in lieu of 44-ft.-wide median	2
R-5	Use 11-ft.-wide inside lanes in lieu of 12-ft.wide inside lanes	4
R-6	Adjust vertical profile to reduce borrow	4
R-7	Use Type A median opening in lieu of Type B	5
R-8	Use 4-ft.-wide shoulder pavement in lieu of 6.5-ft.-wide shoulder for P.I. No. 0008382	4
R-9	Use 2-ft.-wide full-depth shoulder and 4.5-ft.-wide reduced depth shoulder	4
R-10	Move alignment at CR 25 further north to reduce impacts to residential and commercial properties on the south side of SR 113	Combine w/R-11
R-11	Change vertical alignment and use a wall on the south side of SR 113 at CR 25 to reduce impacts to residential and commercial properties	4
DRAINAGE (D)		
D-1	Use reinforced concrete pipes in lieu of concrete box culverts	5
BRIDGES (B)		
B-1	For Raccoon Creek bridges, delete one row of girders and increase concrete deck thickness	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