



US 84 WIDENING AND RECONSTRUCTION
EDS-84(26) AND EDS-84(27)
Project No.: EDS-84(26), Ware, P.I. No.: 522770
Ware County, Georgia

Value Engineering Study Report
Preliminary Design Phase

December 2007

Designer
EMC Engineering Services

Value Engineering Consultant



Lewis & Zimmerman Associates, Inc.



Lewis & Zimmerman Associates, Inc.

Taking the Chance out of Change

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December 28, 2007

Ms. Lisa L. Myers
Design Review Engineer Manager
Georgia Department of Transportation
No. 2 Capitol Square, Room 265
Atlanta, Georgia 30334

re: Project No.: EDS-84(26), Ware, P.I. No.: 522770
Value Engineering Study Report

Dear Ms Myers:

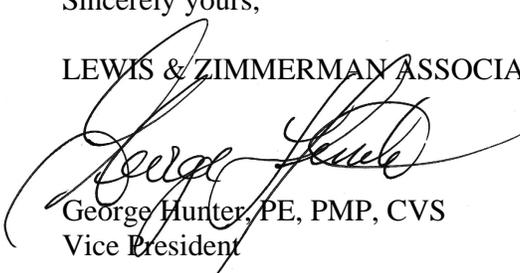
Lewis & Zimmerman Associates, Inc. (LZA) is pleased to submit four hard copies and one CD-ROM of the referenced value engineering study report, which documents the results of the VE study conducted December 11 - 14, 2007. The goal of the VE effort was to identify opportunities to enhance the value and constructibility of the project and reduce costs.

This report highlights 19 alternatives and 18 design suggestions that recommend improvements to the typical section, alignment, intersections and contract management categories.

We thank you, the other GDOT participants and the design team for assisting the VE team in completing this assignment. Please do not hesitate to call upon LZA as you review this report and determine implementation.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.



George Hunter, PE, PMP, CVS
Vice President

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EXECUTIVE SUMMARY

INTRODUCTION

This report summarizes the events and results of the value engineering (VE) study conducted by Lewis & Zimmerman Associates (LZA) for the Georgia Department of Transportation (GDOT). The subject of the study was the widening and reconstruction of US 84, EDS-84(26), BHN-007-3(28), and EDS-84(27), P.I. Nos. 522770, 522775 and 522780, which is being designed by EMC Engineering Services, Inc. The plans were at the preliminary plan development stage at the time of the VE study.

The VE workshop was conducted December 11 – 14, 2007 in GDOT's offices using a multi-disciplinary team of highway design, structures and construction professionals. The team followed the six-phase VE Job Plan to guide its deliberations:

- Information Gathering
- Function Identification and Analysis
- Creative Idea Generation
- Evaluation of Creative Ideas
- Development of Alternatives
- Presentation of Results

PROJECT DESCRIPTION

This project involves the multi-laning of US 84/SR 38, a primary east-west corridor in south Georgia within a 24-mile-long corridor environmental assessment (FONSI) that includes projects EDS-84(23) and BHN-007-3(25) to the west. The subject projects are part of the Governor's Road Improvement Program.

EDS-84(26) and BHN-007-3(28) begin at the end terminus of EDS-84(23), approximately 900 ft. west of Greasy Branch, with widening on the south side and the addition of a 32-ft. depressed grassed median and two 12-ft. lanes of pavement while using the existing right-of-way on the north side of US 84/SR 38. It continues approximately seven miles east to its ending terminus with HPPN-EDS-84(27), approximately 3,600 ft. west of CR 88/Ruskin Road. Five residential and one commercial displacement will be required.

The estimated cost of construction at the time of the VE study was \$29,638,261 with a right-of-way cost of \$2,262,000.

BHN-007-3(28) proposes to reconstruct the US 84/SR 38 bridges over Greasy Branch, and Little and Big Alligator Creeks. The project will involve replacing the existing structures and addressing new hydraulic requirements. The three bridges are within the project limits of EDS-84(26). The proposed bridges consist of multiple 40-ft. spans using Type I-Modified PSC beam, concrete decks and pile intermediate bents.

The bridges lengths are as follows:

<u>Bridge</u>	<u>Existing</u>	<u>Proposed</u>
Greasy Branch	96 ft.	240 ft.
Little Alligator Creek	72 ft.	400 ft.
Big Alligator Creek	144 ft.	1,120 ft.

The construction cost estimate for the replacement of the existing bridges with parallel, longer bridges is \$10,067,548.

HPPN-EDS-84(27) will commence from the ending terminus of EDS-84(26) at a location 3,600 ft. west of CR 88/Ruskin Road to approximately 125 ft. east of the Wadley Glenmore/SR 53 connector intersection, a distance of approximately 5.3 miles. The proposed alignment will follow the existing highway for approximately 200 ft. from the beginning terminus with a 32-ft. median and two 12-ft. lanes, before turning south on a new location to avoid several eligible historic sites in Wahoma. The new location section would then proceed southeasterly for approximately 2,500 ft., then turn eastward with its southern right-of-way bordering the CSX Railroad right-of-way. The new roadway would transition to a 44-ft. depressed median typical section approximately 500 ft. west of CR 411/Griffin Road, while continuing to hold the CSX Railroad right-of-way until the project crosses CR 611/13th Street.

The project continues to parallel the railroad east of 5th Street, where the alignment bears northeast, until a connection with the existing US 84 where the roadway transitions to an urban four-lane 14-ft. flush median typical section. The flush median typical section continues along existing US 84 from approximately 1,500 ft. west of CR 527/Popham Road to approximately CR 290/Oregon Avenue, where the alignment turns southeast onto a new location. The median typical section continues on a new location to approximately CR 112/New Mexico Avenue, where the project transitions to a rural four-lane 14-ft. flush median section. The flush median typical section continues on a new location south of the existing US 84 to approximately 200 ft. north of Idaho Avenue where the alignment turns north. As the alignment turns northward, the typical section transitions to a 14-ft. flush median urban section, which continues to the end of the project. Throughout this portion of the project, the existing CR 286 right-of-way located approximately 300 ft. south of US 84/SR 38 would be used. Project HPPN-EDS-84(27) ends approximately 550 ft. west of CR 287 at the intersection of Wadley Glenmore and the SR 53 Connector. The total length of the concept is 5.3 miles.

Fourteen residential displacements, two commercial displacements, and 31 mobile homes will be required. The estimated cost of construction at the time of the VE study was \$18,131,287 with a right-of-way cost of \$10,281,980.

The projects are expected to be let as two separate contracts: EDS-84(26)/BHN-007-3(28) and HPPN-EDS-84(27).

ISSUES AND OBJECTIVES

The following key issues were identified by the VE team based on the designer's briefing and the review of the project plans:

- The plans are at the preliminary stage of project development and the environmental document is due for a reevaluation.
- The project is a part of an overall corridor improvement along US 84. The portion of US 84 east of the project (27) has been completed and built to realign US 84 opposite the easterly terminus of the subject project's proposed terminus, on a new location.
- Project (28) to the east of project (26) is being designed and includes a four-lane widening on parallel alignment through the town of Manor.

The following identifies the project issues related to Project (26) and the three bridges:

- The existing 96-ft.-long Greasy Branch Creek Bridge is being replaced with 240-ft.-long bridge (6-40 spans).
- The existing 72-ft.-long Little Alligator Creek Bridge is being replaced with 400-ft.-long bridge (6-40 spans).
- The existing 144-ft.-long Big Alligator Creek Bridge is being replaced with 1,120-ft.-long bridge.
- The proposed design speed is 65 mph, whereas the signed speed is to be 55 mph, west of the flush median. The new GDOT guidelines specify that the design and signed speeds should match.
- The new location alignment bypasses three historic properties in the town of Wahoma. The VE team questioned whether these properties had been recently surveyed.
- The bypass alignment hugs the railroad corridor, and three crossings of the railroad are being tied to existing crossings of the railroad.
- The railroad coordination has not begun. It is not clear if one or more of the railroad crossings will be gated.
- The depressed, divided median is being built, for the most part, with a 32-ft. width. The width in the corridor was reduced from a 44-ft. (per standards) to 32-ft. median to reduce impacts to wetlands. One small section is being retained at a width of 44 ft.
- All of the project's medians are 32-ft. depressed medians.
- The (27) project's median begins as a 32-ft. depressed median and transitions to a 44-ft. depressed median. The 44-ft. depressed median transitions to a 14-ft. flush median (Station 217+14 to Station 307+50) that operates as a two-way left-turn lane and is designed with a 45 mph design speed.
- The flush median section from Station 254+50 to Station 296+50 is on a new location alignment that is near the CSX Railroad yard. Most of this section is rural shoulders.
- The 14-ft. flush median is accompanied with a 12-ft. urban (outside) shoulder that includes curb and gutter, a 2.5-ft. green space and a 5-ft.-wide concrete sidewalk.
- The easterly project limits Station 304+00 to Station 307+50 transition the aforementioned
- The concept report calls for a bike lane in the urban shoulder sections that is not incorporated into the plans.

The VE team was charged with reviewing the current design and identifying potential cost savings. The right-of-way and railroad coordination have not begun, so the project can entertain a variety of modifications at this stage of development.

RESULTS

Nineteen alternatives and 18 design suggestions were developed by the VE team to address the issues and objectives described above. Descriptions of some of the key alternatives and design suggestions follow.

Typical Section (TS)

Ten alternatives and one design suggestion were developed for the project's typical sections.

Alternative Numbers (Alt. Nos.) TS-2, TS-3, TS-13, TS-14, TS-15 and TS-16 provide alternatives that would modify the 14-ft. flush median section at the easternmost portion of EDS-84-(27), in the town of Emerson Park. The following modifications are suggested:

- Alt. No. T-2 identifies a \$200,000 cost to include the 4-ft.-wide bike lanes in accordance with the Revised Concept Report in EDS-84-(27), whereas Alt. No. TS-3 suggests that the Concept Report be modified to exclude the bike lanes, in consultation with the town of Emerson Park. Alt. No. TS-16 replaces the bike lanes in the urban section in the town of Emerson Park with a multi-use path.
- Alt. No. TS-13 uses a narrower, 10-ft. flush median in lieu of the 14-ft. median to reduce property impacts and eliminates the two-way left-turn operations.
- Alt. No. TS-15 uses a 10-ft. depressed median in lieu of the 14-ft. flush median and eliminates the two-way left-turn operations.
- Alt. No. TS-14 eliminates the graded aggregate base under the curb and gutter, and Alt. No. TS-17 suggests using an 18-in. curb and gutter in lieu of a 30-in. curb and gutter.

Alt. No. TS-5 eliminates the sole portion of the 44-ft. median, three miles that transition between the 32-ft. depressed median section to the 14-ft. flush median between the towns of Wahoma and Emerson Park.

Alt. No. T-10 suggests a major scope change by widening the roadbed to a three-lane section from Firewater Road to the ending terminus of EDS-84-(26).

Alignment (A)

Three alternatives and nine design suggestions were developed in this category:

- Alt. Nos. A-2 and A-3 modify the proposed new Wahoma Bypass transitions from the existing alignment to Wahoma Bypass based on a more detailed review of the wetlands impacts.
- Alt. No. A-5 suggests that a new location alignment along the utility corridor be considered.
- Alt. No. A-6 recommends that the historical resources and the Wahoma Bypass new location alignment be reviewed again as part of the required environmental reevaluation.
- Alt. No. A-7 recommends that the new location alignment in the town of Emerson Park be shifted closer to the railroad.
- Alt. No. A-8 suggests one-way pairs for the eastern half of EDS-84-(27) - one pair would entail converting existing US 84 to a one-way traffic pattern while the other pair would be constructed on new location alignment.
- Alt. No. A-9 provides a series of traffic calming measures for the transition between rural and urban sections, where the posted speed limit reduces from 55 mph to 45 mph.
- Alt. No. A-10 shifts the new Wahoma Bypass alignment closer to the railroad right-of-way between 16th Street and Station 162+50.
- Alt. No. A-11 shifts the new Wahoma Bypass alignment closer to the railroad right-of-way between 16th Street to Montana Street, incorporating Alt. No. A-10's modifications.

Intersections (INT)

Five alternatives and three design suggestions were developed in this category:

- Alt. No. INT-1 provides the desired 90-degree skew at Ammons Road but with less realignment.
- Alt. No. INT-2 eliminates the connection at Ruskin Road.
- Alt. Nos. INT-3, INT-4 and INT-6 review the crossings of the CSX Railroad.
- Alt. No. INT-8 recommends that the designers review the connections from the old and new US 84.
- Alt. No. INT-7 suggests that side road connections be designed with 11-ft. widths.
- Alt. No. INT-9 recommends that the connector at the eastern end of EDS-84-(27) be moved from Idaho Avenue to Wyoming Avenue.

Bridges (B)

One alternative and two design suggestion were developed in this category. Alt. No. B-1/B-4 suggests further review of the unusually large increase in the waterway openings/bridge lengths. Of particular concern is whether the current design's waterway openings have considered downstream impacts. Alt. No. B-2 modifies the bridge span lengths from 40 ft. to 50 ft. and reduces the number of intermediate bents.

Construction Management (CM)

Two design suggestions were developed in this category. Alt. No. CM-2 suggests that GDOT expedite the coordination with the CSX Railroad, especially at the three proposed crossings in HPPN-EDS-84-(27) Alt. No. CM-2 recommends that alternative bid packages be considered for the EDS-84(26)/BHN-007-3(28) and EDS-84(27) contracts to allow bidders to bid on one or both packages.



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT:		US 84 WIDENING AND RECONSTRUCTION – EDS-8426 AND EDS-8427 <i>Ware County, Georgia</i>				
		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
TYPICAL SECTION (TS)						
TS-1	Use 11-ft. travel lanes for typical section in Projects 26 and 27	\$ 9,364,414	\$ 6,761,727	\$ 2,602,687		\$ 2,602,687
TS-2	Add bike lanes in the urban sections in Project 27	\$ -	\$ 201,675	\$ (201,675)		\$ (201,675)
TS-3	Remove the bike lanes from Project 27				Design Suggestion	
TS-5	Reduce 44-ft. median width to 32-ft. median width in Project 27	\$ 1,406,160	\$ 263,804	\$ 1,142,356		\$ 1,142,356
TS-7	Use soil cement base to eliminate graded aggregate base	\$ 4,563,966	\$ 3,902,751	\$ 661,215		\$ 661,215
TS-10	Provide a 3-lane section between Firetower Road (STA 80+00) to STA 365+00 in Project 26	\$ 1,607,436	\$ -	\$ 1,607,436		\$ 1,607,436
TS-13	Install a 10-ft. raised median in lieu of a 14-ft. flush median from STA 262+00 to STA 295+00	\$ 237,565	\$ 197,749	\$ 39,816		\$ 39,816
TS-14	Use 18-in. curb and gutter in lieu of 30-in. curb and gutter in Project 27	\$ 393,165	\$ 260,318	\$ 132,847		\$ 132,847
TS-15	Provide a minimum width depressed median from STA 262+00 to 295+00 in Project 27	\$ 205,954	\$ -	\$ 205,954		\$ 205,954
TS-16	Provide one multi-use trail on one side of the roadway in lieu of two bike lanes and two sidewalks in the urban section in Project 27	\$ 438,552	\$ 101,242	\$ 337,310		\$ 337,310
TS-17	Eliminate graded aggregate base under curb and gutter in Project 27	\$ 39,204	\$ 8,712	\$ 30,492		\$ 30,492
ALIGNMENT (A)						
A-2	Adjust new location alignment to reduce wetland impacts between STA 20+00 and 50+00 in Project 27				Design Suggestion	
A-3	Adjust new location alignment to reduce wetland impacts between STA 155+00 and 210+00 in Project 27				Design Suggestion	
A-5	Shift roadway alignment adjacent to utility corridor in Projects 26 and 27				Design Suggestion	
A-6	Revisit historical value of resources in the community of Ruskin Road in Project 27				Design Suggestion	
A-7	Place new location alignment adjacent to railroad from New Mexico Avenue to Idaho Avenue (STA 262+00 to 290+00) in Project 27	\$ 258,795	\$ -	\$ 258,795		\$ 258,795
A-8	Use one-way pairs with independent alignments in Project 27	\$ -	\$ 6,436,078	\$ (6,436,078)		\$ (6,436,078)
A-9	Provide traffic calming measures west of the urban section in Project 27				Design Suggestion	
A-10	Move new location alignment closer to the railroad right-of-way from 16th Street to STA 162+50 in Project 27	\$ 179,305	\$ -	\$ 179,305		\$ 179,305



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT:		US 84 WIDENING AND RECONSTRUCTION – EDS-8426 AND EDS-8427 Ware County, Georgia				
		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
ALIGNMENT (A) (continued)						
A-11	Parallel the railroad right-of-way with a new location alignment from 16th Street to Montana Avenue in Project 27	\$ 3,241,901	\$ 335,367	\$ 2,906,534		\$ 2,906,534
A-12	Add a median opening at STA 345+00 in Project 27				Design Suggestion	
A-13	Increase posted speed limit to design speed limit of 65 mph				Design Suggestion	
A-14	Reduce design speed to 55 mph to match posted speed limit				Design Suggestion	
INTERSECTIONS (INT)						
INT-1	Reduce realignment of Ammons Road in Project 26	\$ 96,786	\$ -	\$ 96,786		\$ 96,786
INT-2	Eliminate intersection and connection of Ruskin Road to new US-84 in Project 27	\$ 246,261	\$ -	\$ 246,261		\$ 246,261
INT-3	Eliminate Griffin Road addition and upgraded railroad crossing in Project 27	\$ 186,808	\$ -	\$ 186,808		\$ 186,808
INT-4	Eliminate Needham Road addition and upgrade railroad crossing in Project 27	\$ 123,475	\$ -	\$ 123,475		\$ 123,475
INT-6	Verify need for railroad gates at 3 proposed railroad crossings in Project 27				Design Suggestion	
INT-7	Use 11-ft. lanes for side road connections in Projects 26 and 27	\$ 32,632	\$ -	\$ 32,632		\$ 32,632
INT-8	Identify the new and old US-84 connections (3 locations) in Project 27				Design Suggestion	
INT-9	Relocate connector from Idaho Avenue to Wyoming Avenue in Project 27				Design Suggestion	
BRIDGES (B)						
B-1	Shorten bridges in Projects 26 and 28				Design Suggestion	
B-2	Lengthen bridges from 50-ft. spans in lieu of the proposed 40-ft. spans in Projects 26 and 28	\$ 1,178,530	\$ 943,841	\$ 234,689		\$ 234,689
B-4	Review hydrology of bridges in Projects 26 and 28				Design Suggestion	
CONSTRUCTION MANAGEMENT (CM)						
CM-2	Advance railroad reviews and coordination				Design Suggestion	
CM-3	Alternative bid packaging of Projects 26 and 27				Design Suggestion	

STUDY RESULTS

INTRODUCTION

The results of the VE study portray economic, operational and delivery benefits that can be realized by GDOT and the design team as described in the attached alternatives. Some of the alternatives will directly affect the project's design and require coordination between GDOT and the design team to determine the disposition of each alternative.

During the VE study, many ideas for potential value enhancement were conceived and evaluated by the team for technical merit, applicability to the project, implementability considering the project's status, and the ability to meet the owner's project value objectives. Research performed on those ideas considered to have the potential to enhance the value of the project resulted in the development of individual alternatives identifying specific changes to the project as a whole, or individual elements that comprise the project. These are in the form of VE alternatives (accompanied by cost estimates) or design suggestions (typically without cost estimates). 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 databases, such as the one produced by the RS Means Company, or team member or owner databases were consulted. A composite markup of 10%, as described in the Value Analysis and Conclusions section of the report, was used to generate an all-inclusive project cost for the construction items being compared.

Each design suggestion contains the same information as the VE alternatives, except that no cost information is usually included. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed for reasons other than cost. Examples of these reasons include improved facility operation, ease of maintenance, ease of construction, safer working conditions, reduction in project risk, etc. In addition, some ideas cannot be quantified in terms of cost with the design information provided; these are also presented as design suggestions and are intended to improve the quality of the project.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) to track through the value analysis process and thus facilitate referencing among the Creative Idea

Listing and Evaluation worksheets, the alternatives, and the Summary of VE Alternatives. The Alt. No. includes a prefix that refers to a major project design category listed below:

PROJECT ELEMENT	PREFIX	NO. OF IDEAS	DEVELOPED ALTERNATIVES	
			ALTS	DS
Typical Section	TS	16	10	1
Alignment	A	14	3	9
Intersection	INT	9	5	3
Bridges	B	4	1	2
Construction Management	CM	3	0	2
TOTAL		47	19	18

Summaries of the alternatives and design suggestions are provided on the Summary of VE Alternatives tables, which are divided into project design categories and used to divide the results section. The complete documentation of the developed alternatives and design suggestions follows each of the Summary of VE Alternatives tables.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 19 alternatives and 18 design suggestions for consideration by GDOT and the designer.

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 VALUE ENGINEERING ALTERNATIVES

PROJECT:		US 84 WIDENING AND RECONSTRUCTION - EDS-8426 AND EDS-8427 Ware County, Georgia				
		PRESENT WORTH OF COST SAVINGS				
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TS-3	Remove the bike lanes from Project 27				Design Suggestion	
TS-5	Reduce 44-ft. median width to 32-ft. median width in Project 27	\$ 1,406,160	\$ 263,804	\$ 1,142,356		\$ 1,142,356
TS-7	Use soil cement base to eliminate graded aggregate base	\$ 4,563,966	\$ 3,902,751	\$ 661,215		\$ 661,215
TS-10	Provide a 3-lane section between Firetower Road (STA 80+00) to STA 365+00 in Project 26	\$ 1,607,436	\$ -	\$ 1,607,436		\$ 1,607,436
TS-13	Install a 10-ft. raised median in lieu of a 14-ft. flush median from STA 262+00 to STA 295+00	\$ 237,565	\$ 197,749	\$ 39,816		\$ 39,816
TS-14	Use 18-in. curb and gutter in lieu of 30-in. curb and gutter in Project 27	\$ 393,165	\$ 260,318	\$ 132,847		\$ 132,847
TS-15	Provide a minimum width depressed median from STA 262+00 to 295+00 in Project 27	\$ 205,954	\$ -	\$ 205,954		\$ 205,954
TS-16	Provide one multi-use trail on one side of the roadway in lieu of two bike lanes and two sidewalks in the urban section in Project 27	\$ 438,552	\$ 101,242	\$ 337,310		\$ 337,310
TS-17	Eliminate graded aggregate base under curb and gutter in Project 27	\$ 39,204	\$ 8,712	\$ 30,492		\$ 30,492
ALIGNMENT (A)						
A-2	Adjust new location alignment to reduce wetland impacts between STA 20+00 and 50+00 in Project 27				Design Suggestion	
A-3	Adjust new location alignment to reduce wetland impacts between STA 155+00 and 210+00 in Project 27				Design Suggestion	
A-5	Shift roadway alignment adjacent to utility corridor in Projects 26 and 27				Design Suggestion	
A-6	Revisit historical value of resources in the community of Ruskin Road in Project 27				Design Suggestion	
A-7	Place new location alignment adjacent to railroad from New Mexico Avenue to Idaho Avenue (STA 262+00 to 290+00) in Project 27	\$ 258,795	\$ -	\$ 258,795		\$ 258,795
A-8	Use one-way pairs with independent alignments in Project 27	\$ -	\$ 6,436,078	\$ (6,436,078)		\$ (6,436,078)
A-9	Provide traffic calming measures west of the urban section in Project 27				Design Suggestion	
A-10	Move new location alignment closer to the railroad right-of-way from 16th Street to STA 162+50 in Project 27	\$ 179,305	\$ -	\$ 179,305		\$ 179,305

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-1**
Ware County, Georgia

DESCRIPTION: **USE 11-FT. TRAVEL LANES FOR TYPICAL SECTION IN PROJECTS EDS-84(26) AND EDS-84(27)** SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The conceptual design typical section recommends 12-ft. travel lanes for EDS-84(26) and EDS-84(27).

ALTERNATIVE:

Reduce the travel lanes to 11 ft. on both projects.

ADVANTAGES:

- Reduces cost
- Accelerates construction
- Reduces right-of-way cost

DISADVANTAGES:

- Reduces distance between adjacent vehicles

DISCUSSION:

Using 11-ft. lanes would reduce construction and right-of-way costs, shorten the schedule duration, and reduce impacts to wetlands and the right-of-way.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 9,364,414	—	\$ 9,364,414
ALTERNATIVE	\$ 6,761,727	—	\$ 6,761,727
SAVINGS (Original minus Alternative)	\$ 2,602,687	—	\$ 2,602,687

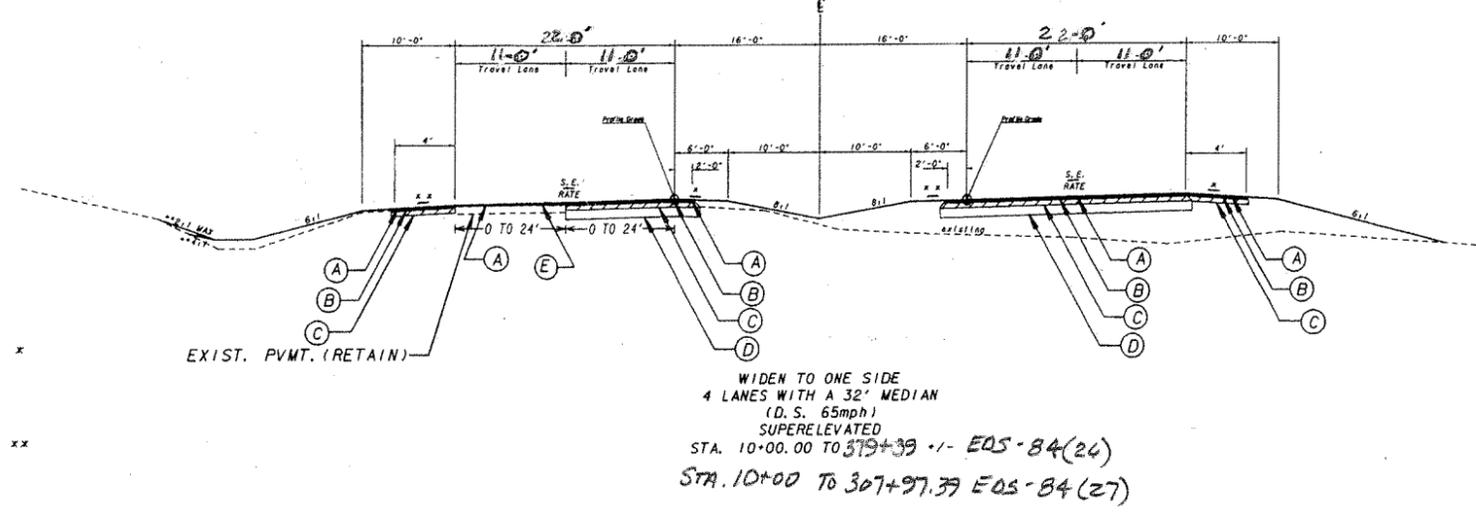
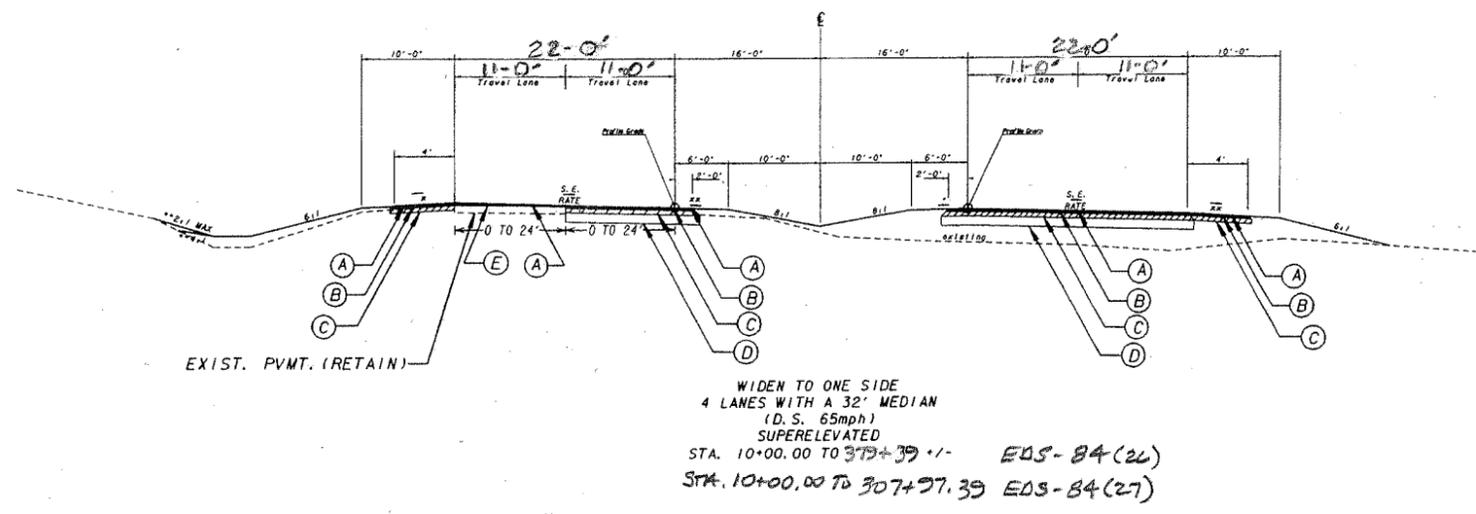
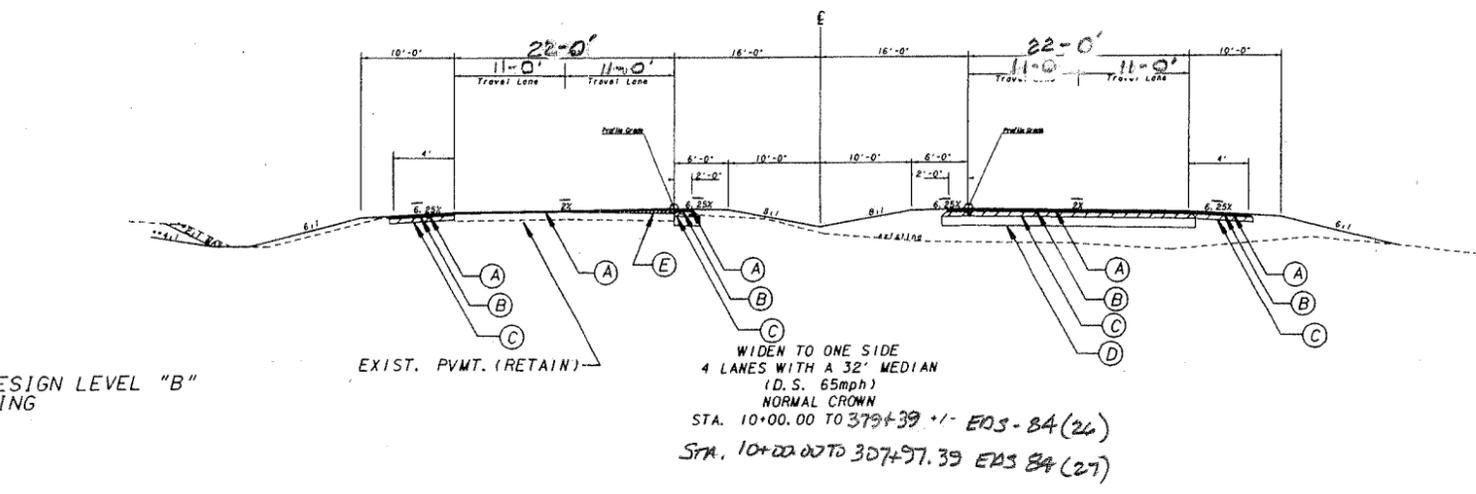
EDS-84(27)
TS-1
ALTERNATIVE DESIGN

- REQUIRED PAVEMENT**
- (A) 135 LB/YD² 9.5 mm SUPERPAVE
 - (B) 220 LB/YD² 19 mm SUPERPAVE
 - (C) 330 LB/YD² 25 mm SUPERPAVE
 - (D) 10" GRADED AGGREGATE BASE
 - (E) ASPHALTIC CONCRETE LEVELING

NOTE: 1. ALL SUPERPAVE SHALL BE MIX DESIGN LEVEL "B"
2. REMOVE EXISTING SHOULDER PAVING

• IN CUT SECTIONS USE 4:1 BACKSLOPES IN EXISTING YARDS OR AREAS WHERE MOWING IS REQUIRED

**SLOPE CONTROLS	
SLOPE	FILL
4:1	3-10'
2:1	OVER 10'



* SHOULDER TO SLOPE AT NORMAL RATE, HOWEVER, THE ALGEBRAIC DIFFERENCE IN PAVING SLOPE AND SHOULDER SLOPE SHALL NOT EXCEED 8%. MINIMUM SHOULDER SLOPE TO BE 6.25%.

** SHOULDER TO SLOPE AT NORMAL RATE OR SUPERELEVATION RATE, WHICHEVER IS GREATER (BUT NOT LESS THAN 6.25%).

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

A. NORMAL CROWN	
SECTION WITH GRADES 0.5% OR GREATER	SECTION WITH GRADES LESS THAN 0.5%
0.0150 FT/FT - MINIMUM	0.0155 FT/FT - MINIMUM
0.0208 FT/FT - DESIRABLE	0.0208 FT/FT - DESIRABLE
0.0250 FT/FT - MAXIMUM	0.0300 FT/FT - MAXIMUM

B. SUPERELEVATION RATE
S.E. RATE SHOWN ON PLANS OR SE RATE EXISTING IN FIELD, WHICHEVER IS GREATER.

C. SUPERELEVATION TRANSITION LENGTH (LENGTH FROM FLAT POINT TO FULL RATE OF CHANGE)
CORRESPONDING DIFFERENCE IN GRADE BETWEEN PIVOT POINT AND EDGE OF PAVEMENT

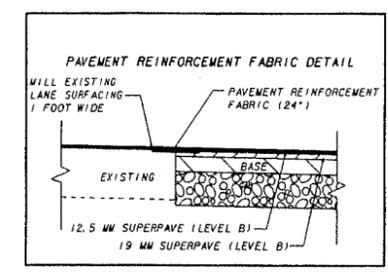
RATE OF CHANGE	MINIMUM	DESIRABLE	MAXIMUM
1:150	0.67%	0.50%	0.33%
1:200			
1:300			

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

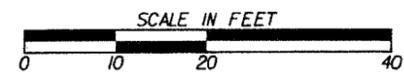
D. POSITIONING OF SUPERELEVATION TRANSITION LENGTH ON SIMPLE CURVES
50% OF TRANSITION INSIDE CURVE - MAXIMUM
33% OF TRANSITION INSIDE CURVE - DESIRABLE
20% OF TRANSITION INSIDE CURVE - MINIMUM

NOTE: CROWN WIPE-OUT SHALL BE AT THE SAME RATE AS THE SE TRANSITION

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



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REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE: DISTRICT 5
TYPICAL SECTIONS

CALCULATIONS



PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

ALTERNATIVE NO.: T3-1

UTILIZE 11' TRAVEL LANES FOR THE REVISED TYPICAL SECTION

SHEET NO.: 3 of 4

PROJECT LENGTH (COMBINED)

$$12.64 \text{ MILES} / 5280 = 66,736.765 \text{ FT.}$$

$$\begin{aligned} \text{ASPHALT (REDUCTION)} &= 66,736.765' \times 4' \\ &= 266,947.06 \text{ SF/9} \\ &= \underline{29,660.78 \text{ SY}} \end{aligned}$$

$$\begin{aligned} 12.5 \text{ mm} &= 29,660.78 \text{ SY} (135 \text{ lbs} / \text{YD}^2 \cdot \text{in}) \div 2000 = 2,002.10 \text{ TONS} \times \$85.00 = \underline{\$170,178.72} \\ 19.0 \text{ mm} &= 29,660.78 \text{ SY} (220 \text{ lbs} / \text{YD}^2 \cdot \text{in}) \div 2000 = 3,262.48 \text{ TONS} \times \$85.00 = \underline{\$277,327.80} \\ 25 \text{ P mm} &= 29,660.78 \text{ SY} (330 \text{ lbs} / \text{YD}^2 \cdot \text{in}) \div 2000 = 4,894.02 \text{ TONS} \times \$85.00 = \underline{\$415,992.43} \\ \text{LEVELING} &= 29,660.78 \text{ SY} (200 \text{ lbs} / \text{YD}^2 \cdot \text{in}^2) \div 2000 = 2,966.08 \text{ TONS} \times \$85.00 = \underline{\$252,116.80} \\ \text{TACK COAT} &= 29,660.78 \text{ SY} (0.035 \text{ GAL} / \text{YD}^2) \times 3 \text{ LIFTS} = 3,114.38 \text{ GALS} \times \$1.20 = \underline{\$3,737.26} \\ \text{C.I.A.B, 10"} &= 29,660.78 (9) \times .83 \\ &= 221,546.06 \text{ FT}^3 \cdot 125 \text{ lbs} / \text{FT}^3 \div 2000 \\ &= 13,847.88 \text{ TONS} \times \$20.00 = \underline{\$276,957.58} \end{aligned}$$

TOTAL PAVEMENT DEPTH REDUCTION
\$1,396,310.59

SHOULDER REDUCTION

$$\text{AREA } 29,660.78 \text{ SY} (29.11 / \text{YD}^2) = \underline{\$863,425.31}$$

TOTAL SHOULDER WIDTH REDUCTION
\$863,425.31

RIGHT-OF-WAY REDUCTION UNIT 26 - 6.9961 MILES

AVG. COST PER ACRE \$4,950.00

$$\begin{aligned} L &= 36,939.37 \text{ FT} \times 4 \text{ FT} / 43,560 \\ &= 3.392 \text{ ACRES REDUCED (5,400/AC)} \\ &= \underline{\$18,316.80} \text{ REDUCED R.O.W. COST} \end{aligned}$$

TOTAL R.O.W REDUCED COST
UNITS 26 & 27
\$30,628.80 / 3.472

UNIT 27 - 5.6434 MILES

$$\begin{aligned} L &= 29,797.39 \times 4 \text{ FT} / 43,560 \text{ ACRES/FT} \\ &= 2.736 \text{ ACRES REDUCED } (\$4,500.00) \\ &= \underline{\$12,312.00} \end{aligned}$$

= 106,343.19

COST WORKSHEET



PROJECT: **EDS-84-(26) & EDS-84-(27)**
 Georgia Department of Transportation

ALTERNATIVE NO.: TS-1

UTILIZE 11' TRAVEL LANES FOR THE REVISED TYPICAL SECTION

SHEET NO.: 4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
12.5mm "E" ASPH.	TLS	15,074	85. ⁰⁰	1,281,290.00	2,447.01	85. ⁰⁰	-\$170,178.92
19.0mm "B" ASPH	TLS	26,887	85. ⁰⁰	2,285,395.00	3,262.68	85. ⁰⁰	-\$277,327.80
25.0mm A BASE	TLS	31,974	85. ⁰⁰	2,717,790.00	6,525.37	85. ⁰⁰	-\$415,992.43
LEVELING	TLS	15,000	85. ⁰⁰	1,275,000.00	2,966.08	85. ⁰⁰	-\$252,116.80
TACK COAT	GAL	19,666	1.20	23,599.20	3,114.38	1.20	-\$3,737.26
Gr. A. B, 10"	TLS	89,067	20. ⁰⁰	1,781,340.00	13,847.88	20. ⁰⁰	-\$276,957.58
GRASS SHO.	SY				29,660.78	29.11	863,425.31
ROW REDUCTION UNIT 26							- 118,316.80
ROW REDUCTION UNIT 27							- 12,312.00
						3.472x	30,628.80
						=	- 106,343.19
Subtotal							
				2,364,414.20			- 2,366,079.09
Markup (%) at				10			- 236,607.91
TOTAL							- 2,602,686.99
				6,447,920.95			

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-2**
Ware County, Georgia

DESCRIPTION: **ADD BIKE LANES IN URBAN DESIGN SECTION TO PROJECT EDS-84(27)** SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The current plan set does not indicate bike lanes in the urban section located in Waycross.

ALTERNATIVE:

Add bike lanes to the urban section of EDS-84(27).

ADVANTAGES:

- Promotes an alternative mode of transportation

DISADVANTAGES:

- Increases cost

DISCUSSION:

Installing bike lanes promotes an alternative means of transportation.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 201,675	—	\$ 201,675
SAVINGS (Original minus Alternative)	\$ (201,675)	—	\$ (201,675)

CALCULATIONS



PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

ALTERNATIVE NO.: TS-2

SHEET NO.: 2 of 3

DS

BIKE LANE ADDITION IN URBAN SECTION

INSTALL BIKE LANE FROM STA. 217+24 - 307+97

L = 5,656.39'
W = 8.00'

45,251.12 SF/9 = 5,027.90 SY

G.A.B = 45,251.12 SF x 0.83 = 37,558.42 FT² (125 lbs/FT²) ÷ 2000
= 2,347.40 TONS x 20.00 = \$46,948.00

12.50 mm SUPERPAVE	5027.90 SY (135 lb/40 ²) ÷ 2000	= 339.38 TONS x \$85	= \$28,847.30
19.00 mm "	5027.90 SY (220 lb/40 ²) ÷ 2000	= 553.06 TONS x \$85	= \$47,010.10
25.00 mm "	5027.90 SY (330 lb/40 ²) ÷ 2000	= 829.40 TONS x \$85	= \$70,516.00
LEVELING	5027.90 SY (100 lb/40 ²) ÷ 2000	= 251.39 TONS x \$85	= \$21,368.57
TACK COAT	5027.90 SY (0.035 GAL/SY) · 4 LIFTS	= 703.91 TONS x \$1.20	= \$844.68

R.O.W.

Avg Cost: \$4,500.00 ACRE

A = 5,656.39 x 8' / 43,540 1.03 Acre

ADDITIONAL COST FOR R.O.W.

\$: 4,500 x 1.03 = 4,674.70 x 3.472 = \$16,230.56

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-3**
Ware County, Georgia

DESCRIPTION: **REMOVE BIKE LANES FROM PROJECT EDS-84(27)** SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

The original concept document describes having bike lanes in the project.

ALTERNATIVE:

Remove the bike lanes from the concept report.

ADVANTAGES:

- Reduces cost

DISADVANTAGES:

- Eliminates alternative mode of transportation

DISCUSSION:

By removing the bike lanes from the concept report, the project impact and cost will be reduced. The original costs will not be affected because the current typical design does not indicate bike lanes for construction.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-5**
Ware County, Georgia

DESCRIPTION: **REDUCE 44-FT. MEDIAN TO 32-FT. MEDIAN IN PROJECT EDS-84(27)** SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The original typical section for both projects includes a 32-ft. median that increases to a 44-ft. median in EDS-84(27). The length of the 44-ft. median is 14,200 linear ft. (lf).

ALTERNATIVE:

Reduce the 44-ft. median to 32 ft. for the distance of 14,200 lf.

ADVANTAGES:

- Reduces costs
- Accelerates construction
- Reduces materials
- Transitions to a 14-ft. flush median

DISADVANTAGES:

- None apparent

DISCUSSION:

Eliminating approximately three miles of the 44-ft. median appears to be a reasonable modification in light of the preponderance of a 32-ft.-wide depressed median in the corridor, and especially as the 44-ft. wide median section is adjacent to the 14-ft. flush median section.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,406,160	—	\$ 1,406,160
ALTERNATIVE	\$ 263,804	—	\$ 263,804
SAVINGS (Original minus Alternative)	\$ 1,142,356	—	\$ 1,142,356

CALCULATIONS



PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

ALTERNATIVE NO.: **TS-5**

REDUCE 44' MEDIAN AND USE 32' MEDIAN THROUGHOUT

SHEET NO.: **2** of **3**

REDUCED MEDIAN LENGTH FROM 44' TO 32'

STA. 75+00 TO STA. 217+00

OUTSIDE SHOULDER 14,200 LF x 12' x 2'/27 = 12,622.22 CY REDUCED EMBANKMENT

INSIDE SHOULDER 14,200 LF x 12' x 2'/27 = 12,622.22 CY REDUCED EMBANKMENT

ESTIMATED

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-7**
Ware County, Georgia

DESCRIPTION: **INCORPROATE SOIL CEMENT BASE TO ELIMINATE GRADED AGGREGATE BASE** SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The preliminary plans call for a 10-in. graded aggregate base (GAB) construction.

ALTERNATIVE:

Use soil cement base construction, 8 in. to eliminate the 10-in. grade aggregate base material for construction. Soil cement base construction is commonly practiced in southeast Georgia.

ADVANTAGES:

- Reduces costs
- Eliminates GAB

DISADVANTAGES:

- None apparent

DISCUSSION:

Eliminating GAB material for construction reduces costs of trucking in rock material.

The current unit cost shown for GAB in the construction cost estimate is not representative of the unit costs for this item in this region (too low). The VE team has reason to believe that this cost estimate will be a larger savings if correct costs are used.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,563,966	—	\$ 4,563,966
ALTERNATIVE	\$ 3,902,751	—	\$ 3,902,751
SAVINGS (Original minus Alternative)	\$ 661,215	—	\$ 661,215

CALCULATIONS



PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

ALTERNATIVE NO.: **T5-7**

INCORPORATE SOIL CEMENT BASE TO ELIMINATE G.A.B

SHEET NO.: **2 of 3**

CORRIDOR LENGTH 12.7 MILES \times 5280' = 67,056.00 LF

PRE-MIXED SOIL CEMENT STABILIZER BASE CRS, 8 IN, INCL MAT'L AND HAUL

UNIT 26 PROJECT LENGTH 36,939.37 LF \times 60.00 FT/19 = 246,262.47 SY

UNIT 26 LENGTH 6.996 MIL = 246,262.47 SY \times \$7.85 = 1,933,160.13 ADDING VALUE

UNIT 27 LENGTH 5.643 MIL

UNIT 27 PROJECT LENGTH 20,724.00 LF \times 60'/19 = 138,160.00 SY

9,073.395 LF \times 67'/19 = 67,546.38 SY

205,706.38 SY \times 7.85

= \$1,614,795.08 REDUCING VALUE

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-10**
Ware County, Georgia

DESCRIPTION: **PROVIDE A 3-LANE SECTION BETWEEN FIRETOWER ROAD (STATION 80+00) TO STATION 365+00 IN PROJECT EDS-84(26)** SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The proposed design specifies a 32-ft. grassed median between Firetower Road, Station (STA) 81+20 to STA 365+00 main line.

ALTERNATIVE:

Reduce the median with a 12-ft. lane that will transition as a passing lane at various intervals. The right-of-way will be purchased to accommodate future widening.

ADVANTAGES:

- Accommodates current and projected ADT in Manor, GA

DISADVANTAGES:

- Increases construction costs

DISCUSSION:

A review of using a three-lane section has merit due to ADT in Manor, Georgia.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,607,436	—	\$ 1,607,436
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 1,607,436	—	\$ 1,607,436

CALCULATIONS



PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.: 75-10

3-LANE SECTION BETWEEN FIRETOWER RD TO STA. 305+00

SHEET NO.: 2 of 3

LENGTH $28,380.00 \times 12'19" = 37,840 \text{ SY}$

9.50 mm $37,840 \text{ SY} (135 \text{ lbs}/10^2) / 2000 = 2554.2 \text{ TRIS} \times \$85.00 = 217,107$

19 mm $37,840 \text{ SY} (220 \text{ lbs}/10^2) / 2000 = 4162.4 \text{ TRIS} \times \$85.00 = 353,804$

25 mm $37,840 \text{ SY} (330 \text{ lbs}/10^2) / 2000 = 6243.6 \text{ TRIS} \times \$85.00 = 530,706$

GAB = $12' \times 83 \times 28,380$
 $= 282,664.8 \text{ FF}^3 (125 \text{ lbs}/\text{FT}^3) / 2000$
 $= 17,666.55 \text{ TRIS} \times \20.00
 $= \underline{\underline{\$353,331.00}}$

TACK COAT $37,840 \text{ SY} (0.035 \text{ GAL}/\text{SY}) \times 4 = 5297.60 \text{ GAL} \times \$1.20 = 6357$

TOTAL COST \$ 1,461,305

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-13**
Ware County, Georgia

DESCRIPTION: **INSTALL A 10-FT. RAISED MEDIAN IN LIEU OF A 14-FT. FLUSH MEDIAN FROM STA 262+00 TO STA 295+00 IN PROJECT EDS-84(27)** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design calls for a 14-ft. flush paved median on Project EDS-84(27) between STA 262+00 and STA 295+00.

ALTERNATIVE: (Sketch attached)

Install a 10-ft. raised median between STA 262+00 and STA 295+00 to reduce impacts on both sides of the proposed highway.

ADVANTAGES:

- Reduces costs
- Reduces adjacent impacts
- Provides safer turning movements

DISADVANTAGES:

- Reduces access (no two-way left-turn lane operations in median)

DISCUSSION:

The alternative is a method to reduce impact to adjacent properties, while increasing safety along US 84 at the expense of access in the Project EDS-84(27) section.

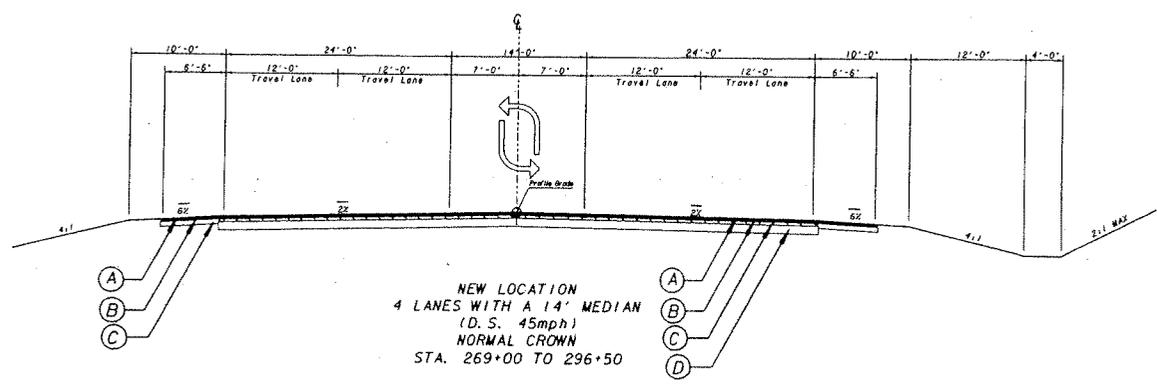
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 237,565	—	\$ 237,565
ALTERNATIVE	\$ 197,749	—	\$ 197,749
SAVINGS (Original minus Alternative)	\$ 39,816	—	\$ 39,816

PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

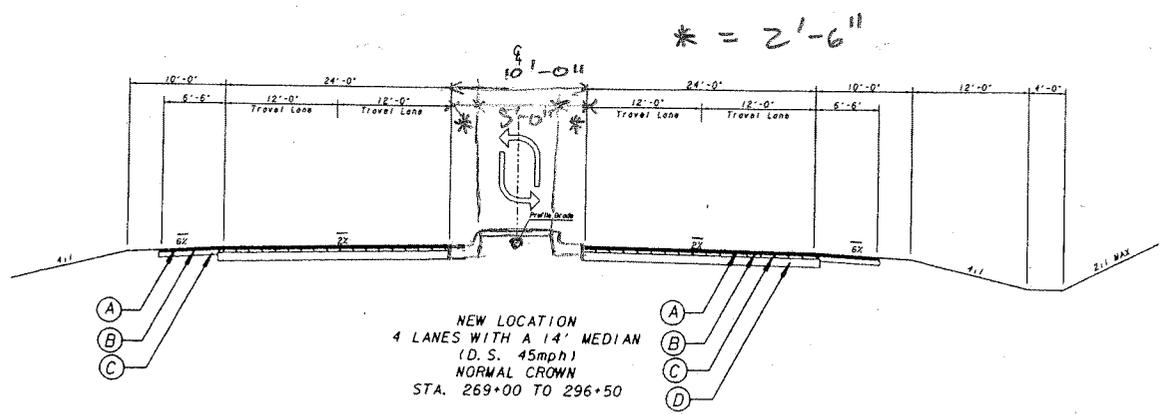
ALTERNATIVE NO.: *TS-13*

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: *2 of 4*



ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH



CALCULATIONS



PROJECT: ~~EDS-84(26)~~ & EDS-84(27) ✓
Georgia Department of Transportation

ALTERNATIVE NO.: TS-13

INSTALL A 10' RAISED MEDIAN FROM STA. 262+00 TO STA. 295+00

SHEET NO.: 3 of 4

PROPOSED MEDIAN LENGTH
 $3,300 \text{ LF} \times 5' = 16,500 \text{ SF} / 9 = \underline{1833.33 \text{ SY}} \times 45.52 = \underline{\$83,453.33}$

TP. 7 30" x 6" C/G 6600 LF x \$12.00 = \$79,200

G.A.B 6600 LF x 2.50' x 0.83 = 13,695.00 FT³ x 125 ^{lbs}/FT³ + 2000
 = 855 TUS x \$20
 = \$17,118.75

OUTSIDE SHOULDER REDUCTION

$4' \times 3300 \times 2.00' / 27 = \underline{977.78 \text{ CY}} \times \9.00 EMBANKMENT
 = \$8,800.00

PAVEMENT FOR 14' FLUSH MEDIAN

$3300 (14) / 9 = 5133 \text{ SY}$
 (COST INCLUDES ALL A.C. AND G.A.B.)

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-14**
Ware County, Georgia

DESCRIPTION: **USE AN 18-IN. CURB AND GUTTER IN LIEU OF 30-IN. CURB AND GUTTER IN PROJECT EDS-84(27)** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The original design shows a 6-in. x 30-in. curb and gutter on GA STD. 9032-B.

ALTERNATIVE: (Sketch attached)

Use a 6-in. x 18-in. curb and gutter as shown on GA. STD. 9032-B.

ADVANTAGES:

- More economical

DISADVANTAGES:

- Reduces room for gutter spread
- Moves curb closer to travelway

DISCUSSION:

A reduction in the gutter width will reduce cost due to the reduction in concrete volume.

Due to the flat terrain on this project, it will be necessary to ensure that the gutter spread is acceptable.

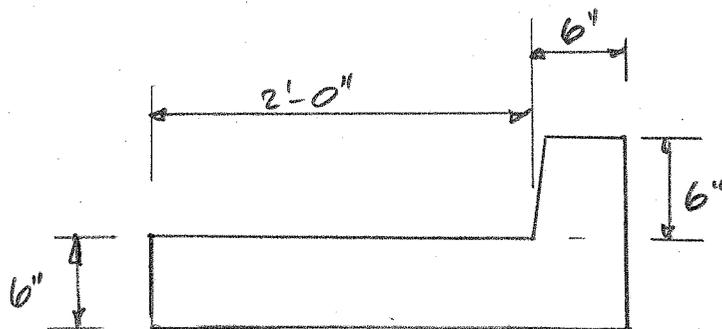
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 393,165	—	\$ 393,165
ALTERNATIVE	\$ 260,318	—	\$ 260,318
SAVINGS (Original minus Alternative)	\$ 132,847	—	\$ 132,847

PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

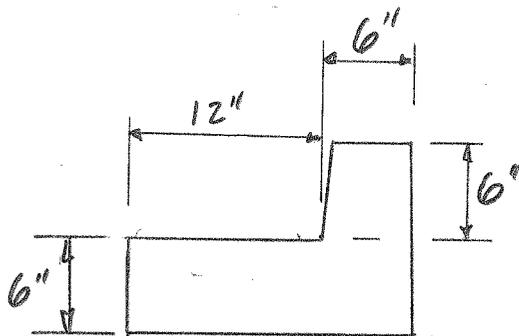
ALTERNATIVE NO.: **TS-14**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2 of 4**



ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH



CALCULATIONS



PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

ALTERNATIVE NO.:

TS-14

SHEET NO.: 3 of 4

CONCRETE PER FOOT:

$$6" \times 30" \quad .5(2.5) + .5(.5) - .5(.5)(.12) \\ = 1.48 \text{ CF/FT}$$

$$6" \times 18" \quad .5(1.5) + .5(.5) - .5(.5)(.12) \\ = 0.98 \text{ CF/FT}$$

BEGIN CURB & GUTTER		217+25
END	"	263+00
BEGIN	"	297+00
END	"	307+97

$$\Sigma = 5672$$

ORIGINAL VOLUME

$$2(5672)(1.48)/27 = 621.8 \text{ CY}$$

ALTERNATIVE VOLUME

$$2(5672)(0.98)/27 = 411.7 \text{ CY}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-15**
Ware County, Georgia

DESCRIPTION: **USE A MINIMUM WIDTH DEPRESSED MEDIAN FROM STA 262+00 TO STA 295+00 IN PROJECT EDS-84(27)** SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The original design calls for a paved flush median beginning at STA 262+00 through STA 295+00.

ALTERNATIVE:

Use a minimum width depressed median between STA 202+00 to 295+00.

ADVANTAGES:

- Reduces pavement cost
- Reduces project schedule

DISADVANTAGES:

- Requires continuous maintenance
- Reduces storage at median openings

DISCUSSION:

This alternative would reduce the flush median from 14 ft. to 10 ft.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 205,954	—	\$ 205,954
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 205,954	—	\$ 205,954

CALCULATIONS



PROJECT: **EDS-84(26) & EDS-84(27)** ✓
 Georgia Department of Transportation

ALTERNATIVE NO.: **TS-15**

MINIMUM WIDTH DEPRESSION MEDIAN STA 242+00 - STA 295+00

SHEET NO.: **2 of 3**

$$\text{LENGTH} = 3300' \times 10' \times 1' \div 27$$

$$= \underline{1222.22 \text{ CY}}$$

$$\text{BORROW Haul} = 1222.22 \text{ CY} \times 9.00 = 11,000.00$$

$$14 \times 3300 \div 5 = \underline{5,133.33 \text{ SY}}$$

$$9.50 \text{ mm} \quad 5,133.33 \left(\frac{135 \text{ lbs}}{402} \right) / 2000 = 346.50 \text{ TONS} \times 85 = \$ 29,452$$

$$19 \text{ mm} \quad 5,133.33 \left(\frac{220 \text{ lbs}}{402} \right) / 2000 = 564.63 \text{ TONS} \times 85 = \$ 47,993.55$$

$$25 \text{ mm} \quad 5,133.33 \left(\frac{330 \text{ lbs}}{402} \right) / 2000 = 846.95 \text{ TONS} \times 85 = \$ 71,990.75$$

$$\text{TRUCK CONT} \quad 5,133.33 \left(\frac{0.035 \text{ GALS}}{402} \right) \cdot 4 = 718.62 \text{ GALS} \times 1.20 = \$ 862.344$$

$$\text{G.A.B} \quad 3300(0.035)(4) = 38,340 \text{ FT}^3 \left(\frac{125 \text{ lbs}}{\text{FT}^3} \right) / 2000 = 2,396.25 \text{ TONS} \times 20$$

$$= 47,925.00$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-16**
Ware County, Georgia

DESCRIPTION: **PROVIDE A SINGLE MULTI-USE TRAIL IN LIEU OF A COVERT URBAN SECTION WITH NO BIKE LANE AND ONE MULTI-USE TRAIL** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The current design calls for an urban section with 4-ft. bike lanes on each side of the roadway with a 5-ft. concrete sidewalk.

ALTERNATIVE: (Sketch attached)

Remove two 4-ft. bike lanes and sidewalks and create a multi-use trail on one preferred side of the road.

ADVANTAGES:

- Reduces cost
- Protect bikes from vehicles
- Reduces grassed width and drainage volumes

DISADVANTAGES:

- No change in right-of-way
- Difference in bike/pedestrian speeds

DISCUSSION:

Multi-use trails are a common practice in a rural setting such as this. This system also concentrates pedestrians in one location.

Costs shown reflect a bike lane added to roadway.

A savings of approximately \$200,000 can still be generated by converting both sides of the roadway with a multi-use trail.

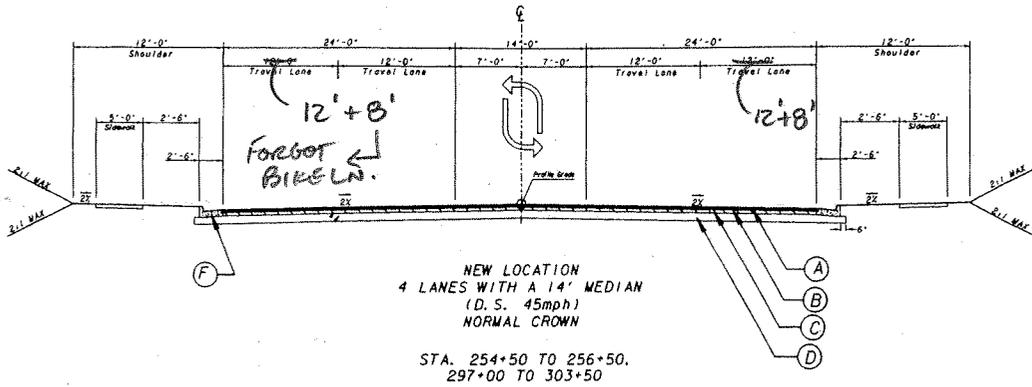
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 438,552	—	\$ 438,552
ALTERNATIVE	\$ 101,242	—	\$ 101,242
SAVINGS (Original minus Alternative)	\$ 337,310	—	\$ 337,310

PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

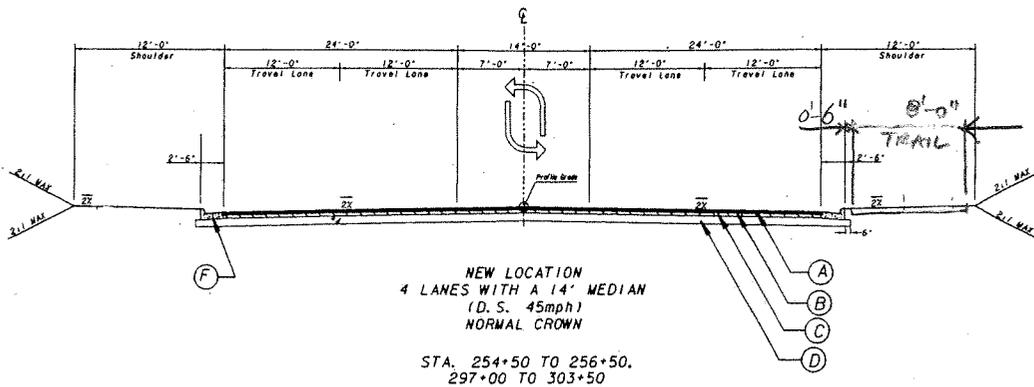
ALTERNATIVE NO.: *TS-16*

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: *2* of *4*



ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH



CALCULATIONS



PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.: TS-16

SHEET NO.: 3 of 4

ASSUMED MULTI-USE PATH SECTIONS: 4" AC (19mm Recy. w/SIT)
4" ACS

$$\text{COST AC} = \$65 \frac{49}{\text{TON}} \quad \text{ACS} = \$18 \frac{82}{\text{TON}}$$

$$\begin{aligned} \text{STATION } 217+00 \text{ TO } 263+00 &= 4600' \\ \{ \text{ } 297+00 \text{ TO } 307+00 &= 1000' \\ \hline &5600' \end{aligned}$$

$$\text{LANE PAVEMENT} = \frac{(2 \times 4') (5600')}{9} \approx 4975 \text{ SY}$$

$$\text{SIDEWALK} = \frac{(2 \times 5') (5600')}{9} \approx 6229 \text{ SY}$$

$$\text{MULTI-USE PATH} = \frac{(8') (5600')}{9} \approx 4975 \text{ SY}$$

$$\left(9 \text{ SF} \right) \left(\frac{4''}{12''} \right) \left(\frac{145 \frac{10}{\text{CF}}}{2000 \frac{10}{\text{TON}}} \right) \left(\$65 \frac{49}{\text{TON}} \right) + \left(9 \text{ SF} \right) \left(\frac{4''}{12''} \right) \left(\frac{150}{2000} \right) \left(\$18 \frac{82}{\text{TON}} \right)$$

$$\approx \$18 \frac{50}{\text{SY}}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **TS-17**
Ware County, Georgia

DESCRIPTION: **ELIMINATE GRADED AGGREGATE BASE UNDER CURB AND GUTTER FROM STA 217+00 TO STA 263+00 AND FROM STA 297+00 TO STA 308+00** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The current design shows 10 in. of GAB beneath the curb and gutter.

ALTERNATIVE: (Sketch attached)

Omit the GAB beneath curb and gutter.

ADVANTAGES:

- Reduces cost
- Eases construction
- Reduces grassed width and drainage volumes

DISADVANTAGES:

- None apparent

DISCUSSION:

GAB is typically not used beneath curb and gutter in the southern portions of Districts 4 and 5.

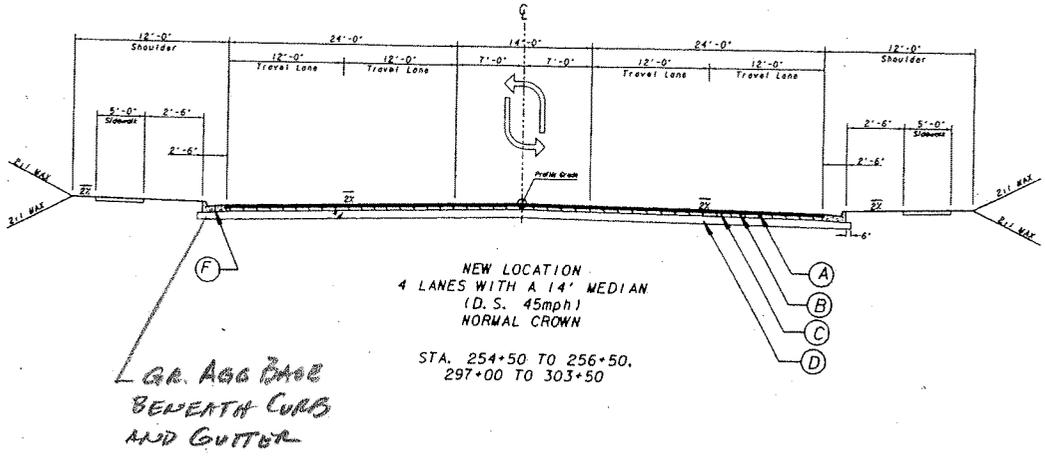
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 39,204	—	\$ 39,204
ALTERNATIVE	\$ 8,712	—	\$ 8,712
SAVINGS (Original minus Alternative)	\$ 30,492	—	\$ 30,492

PROJECT: **EDS-84-(26) & EDS-84-(27)**
 Georgia Department of Transportation

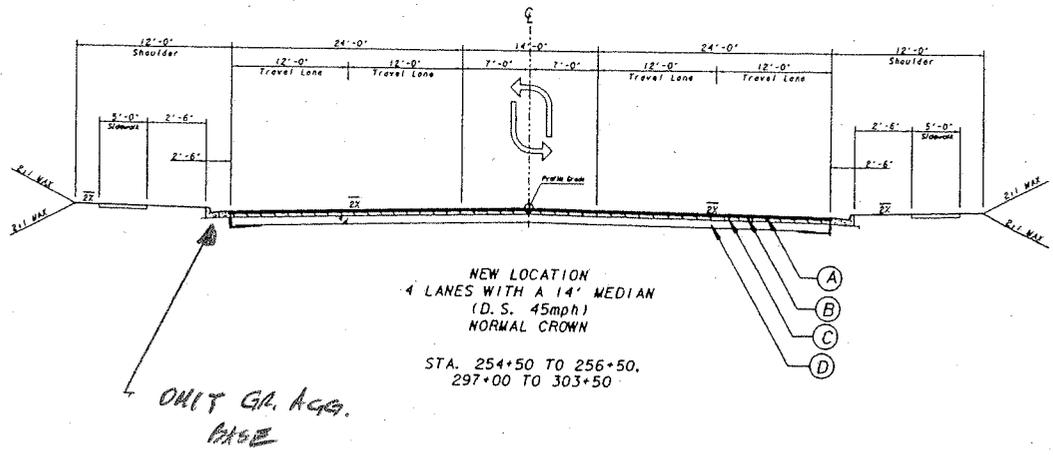
ALTERNATIVE NO.:
TS-17

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2** of **4**



ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH



CALCULATIONS



PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.:

TS-17

SHEET NO.:

3 of 4

$$\begin{aligned} \text{LENGTH} &= 2(26300 - 21700 + 30800 - 29700) \\ &= 11400 \end{aligned}$$

$$\text{VOLUME} = 11400 (10/12)(2.5)/27 = 880 \text{ CY}$$

VOLUME IS REDUCTION IN G.A.B.,

ADDITIONAL EMBANKMENT

$$\begin{aligned} \text{WEIGHT OF G.A.B.} &= 880 (27)(150)/2000 \\ &= 1782 \text{ TN} \end{aligned}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-2**
Ware County, Georgia

DESCRIPTION: **ADJUST NEW LOCATION ALIGNMENT TO REDUCE WETLAND IMPACTS BETWEEN STA 20+00 TO STA 50+00 IN PROJECT EDS-84(27)** SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (Sketch attached)

The new alignment bisects a wetland from approximately STA 20+00 to STA 48+00. The alignment also crosses a wetland from around STA 374+00 [EDS84(26)] to STA 19+00 [EDS-84(27)].

ALTERNATIVE: (Sketch attached)

Move the new alignment west to avoid most of the wetlands.

ADVANTAGES:

- Reduces wetlands impacts
- Reduces wetland mitigation

DISADVANTAGES:

- Requires additional right-of-way
- Leaves exiting alignment sooner so requires additional construction on new location

DISCUSSION:

In order to avoid historic resources along SR38, approximately 3,200 ft. east of the beginning of EDS-84(27), the road is placed on a new alignment south, beginning at STA 15+00.

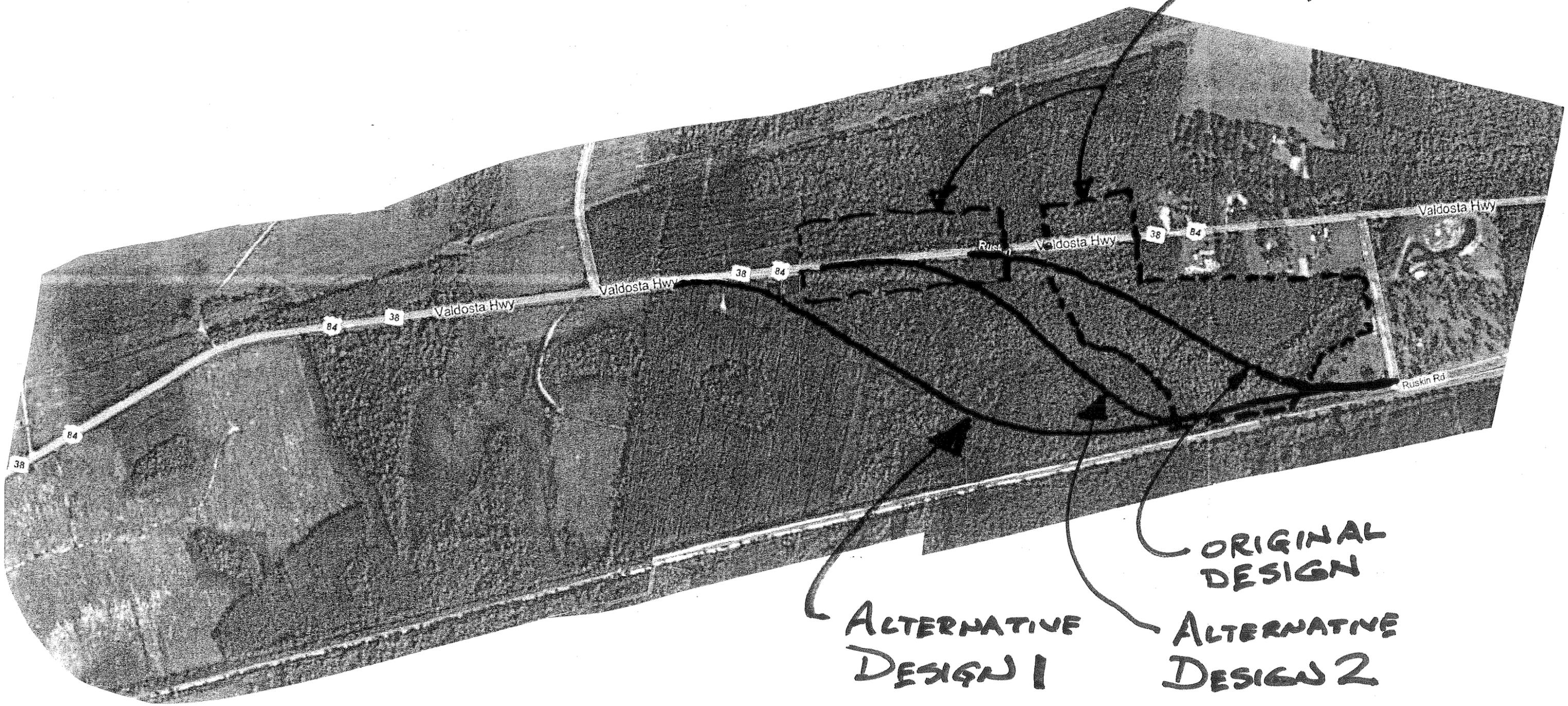
In the original design, the relocated alignment passes through the center of a large wetland from STA 20+00 to STA 48+00. If the relocation begins further west, much of this wetland can be avoided. This is shown as alternative design 2. There is also a wetland along the original alignment from STA 374+00 in EDS-84(26) to STA 19+00 EDS-84(27). By shifting the beginning of the new alignment even further west (shown as alternative design 1), this wetland can be avoided.

Both of these conclusions are based on the assumption that the wetlands limits shown on the aerial photos provided by the consultant are accurate. It is possible that the wetland limits were shown at the limit of the wetland survey. If that is the case, the wetlands could extend further than shown and these alternatives may not be valid.

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

ALTERNATIVE
A-2

WETLAND LIMITS
AS SHOWN ON
PLANS



ALTERNATIVE
DESIGN 1

ORIGINAL
DESIGN

ALTERNATIVE
DESIGN 2

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-3**
Ware County, Georgia

DESCRIPTION: **ADJUST NEW LOCATION ALIGNMENT TO REDUCE WETLAND IMPACTS BETWEEN STA 155+00 TO STA 210+00 IN PROJECT EDS-84(27)** SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (Sketch attached)

The new location alignment bisects a wetland from approximately STA 173+00 to STA 192+00.

ALTERNATIVE: (Sketch attached)

Move the new alignment east, closer to CSX Railroad, to avoid most of the wetlands.

ADVANTAGES:

- Reduces wetlands impacts
- Reduces wetland mitigation

DISADVANTAGES:

- Requires additional right-of-way
- Ties to existing alignment later so requires additional construction on new location

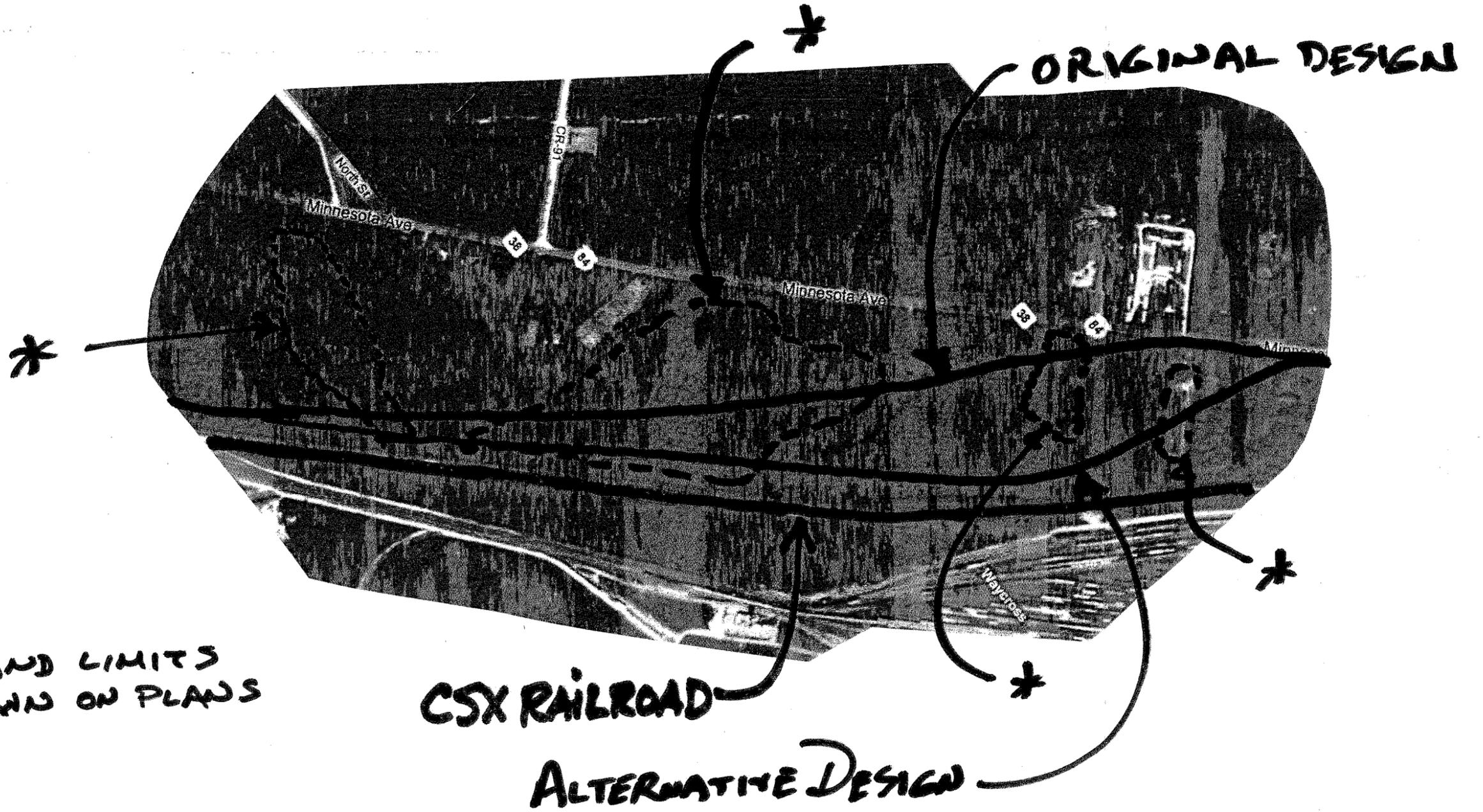
DISCUSSION:

In order to avoid historic resources along SR38, approximately 3,200 ft. east of the beginning of EDS-84(27), the road is placed on a new alignment south of the existing, beginning at STA 15+00 and ending at STA 213+00.

In the original design, the relocated alignment passes through the center of a large wetland from STA 155+00 to STA 210+00. If the relocation is extended further to the east, a smaller portion of the wetland can be crossed. This alternative is based on the assumption that the wetland limits shown on the aerial photos provided by the consultant are accurate. It is possible that the wetland limits were shown at the limit of the wetland survey. If that is the case, the wetlands could extend further than shown and these alternatives may not be valid.

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

ALTERNATIVE
A-3



* WETLAND LIMITS
AS SHOWN ON PLANS

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-5**
Ware County, Georgia

DESCRIPTION: **SHIFT ROADWAY ALIGNMENT ADJACENT TO UTILITY CORRIDOR IN PROJECTS EDS-84(26) AND (27)** SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (Sketch attached)

The design follows the existing alignment \approx 50% of the length in question before deviating to the south on a new alignment adjacent to the railroad right-of-way.

ALTERNATIVE: (Sketch attached)

Deviate from the original alignment at STA 335+00. Shift north to the north side of the existing utility corridor. Shift back to existing SR 38/US 84 at Smith Road. Remaining alignment is unchanged.

ADVANTAGES:

- Reduces impact to railroad
- Provides straighter alignment
- Reduces displacements
- Bypasses WAHOMA
- Less history to contend with

DISADVANTAGES:

- Crosses a minimum of two times under utility corridor
- Wetlands impacts unknown
- Cost implications unknown
- Increases right-of-way

DISCUSSION:

Design would provide for a new alignment (as is currently proposed) yet with less displacements.

Since this alternative deviates from the original study, area impacts are unknown.

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

DESIGN SUGGESTION

SKETCH

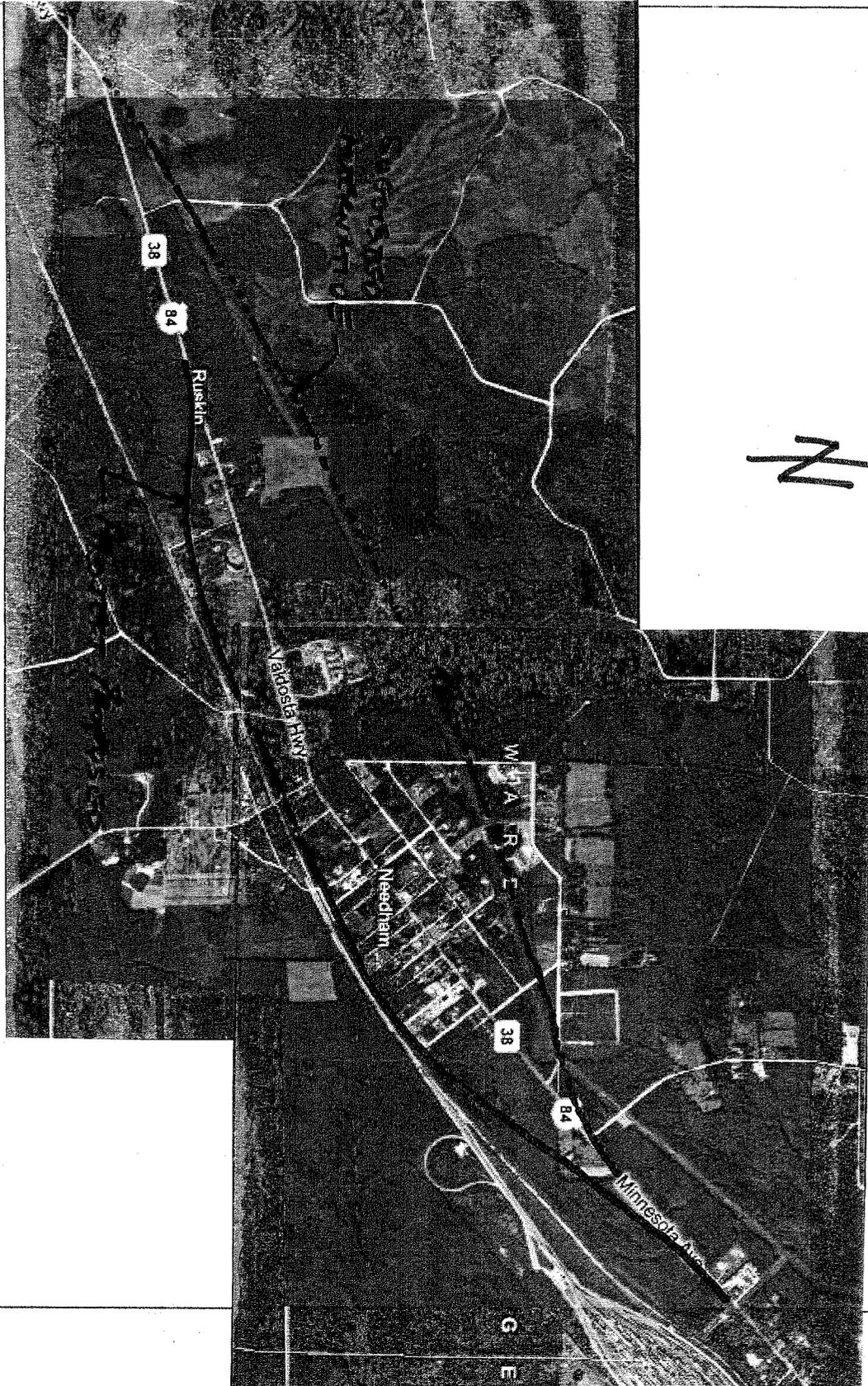


PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

ALTERNATIVE NO.: **A-5**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2** of **2**



G
E

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-6**
Ware County, Georgia

DESCRIPTION: **REVISIT HISTORICAL VALUE OF RESOURCES IN THE COMMUNITY OF RUSHKIN IN PROJECT EDS-84(27)** SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (Sketch attached)

The original design relocates the road on an independent alignment to the south of Ruskin to avoid three historic resources along the existing road.

ALTERNATIVE: (Sketch attached)

It is recommended that these sites be revisited to make sure that no changes have been made that affect the historic value.

Since the publishing of the environmental document, Site #5 located opposite Griffin Road, owned by Edwin Ivey Pittman, identified as eligible for the National Register of Historical properties, has recently been reanalyzed and removed from the eligible list.

If the historical site #4 and the unidentified property are not eligible, then the new location alignment could be reduced by approximately 3,000 ft. with a reduction based on \$1,325 per lf. This would save approximately \$6.6 million in pavement and 26.4 acres of right-of-way acquisition.

DISCUSSION:

The aerial photographs provided by the consultant show three historic resources along the existing and just east of Ruskin. According to the environmental document, site #4, on the south side of the road at Ruskin Road, has experienced few changes over the years and retains many historic features. Site #5, on the north side of the road opposite Griffin Road, according to the environmental document, has had few changes and retains significant features. An area shown as historic on the aerial view on the north side of the road, approximately 500 ft. west of Rushkin Road, is not mentioned in the document.

Due to adverse affects on the view from site #4, it is unlikely that retaining the existing alignment is feasible.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-7**
Ware County, Georgia

DESCRIPTION: **PLACE NEW LOCATION ALIGNMENT ADJACENT TO RAILROAD FROM NEW MEXICO AVENUE TO IDAHO AVENUE (STA 262+000 STA 290+00) IN PROJECT EDS-84(27)** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The new alignment from STA 262+00 to STA 290+00 is adjacent to Missouri Avenue and the right-of-way line is approximately 200 ft. from the railroad right-of-way.

ALTERNATIVE: (Sketch attached)

Shift the new alignment to the south so the right-of-way line is along the railroad right-of-way.

ADVANTAGES:

- Reduces land-locked area
- Moves road further from residents
- Leaves more developable property for the region

DISADVANTAGES:

- Increases length of alignment
- May require increased coverage environmental technical studies

DISCUSSION:

The original design proposes to construct a new road just south of Missouri Avenue from STA 262+00 to STA 290+00. This results in a strip of land approximately 200 ft. wide between the railroad right-of-way and the road that will have no access.

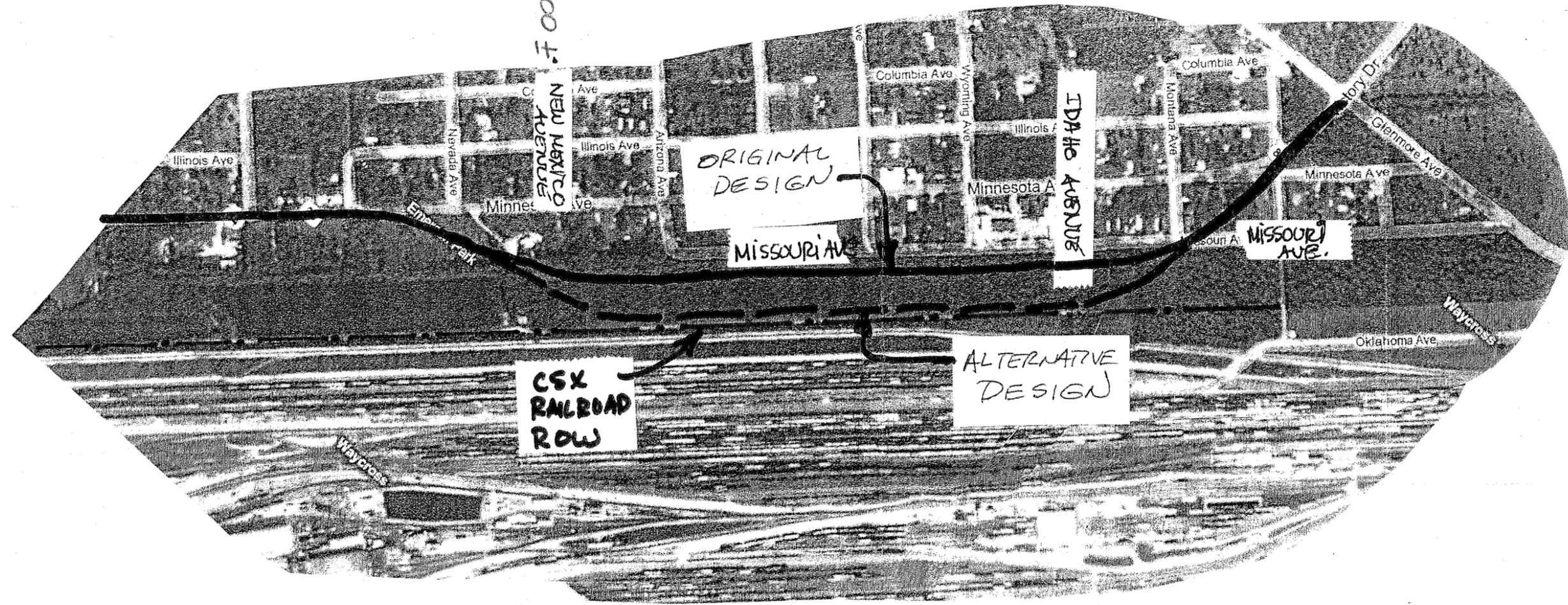
Moving the alignment adjacent to the railroad will leave property between Missouri Avenue and the new road that can be developed. The cost savings shown assumes that the property between the original design and the railroad would have to be purchased since it will have no access.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 258,795	—	\$ 258,795
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 258,795	—	\$ 258,795

ALTERNATIVE
A-7
SHEET No.
2 OF 4

STA
290+00

STA
262+00 F.



ORIGINAL
DESIGN

MISSOURI AVE

IDAHO AVENUE

MISSOURI
AVE.

CSX
RAILROAD
ROW

ALTERNATIVE
DESIGN

CALCULATIONS



PROJECT: EDS-84(26) & EDS-84(27)
Georgia Department of Transportation

ALTERNATIVE NO.:

A-7

SHEET NO.: 3 of 4

ADDITIONAL RIGHT-OF-WAY:

$$L = 29000 - 26200 = 2800$$

$$W = 200'$$

$$\begin{aligned} \text{AREA} &= 2800(200) / 43560 \\ &= 12.86 \text{ AC} \end{aligned}$$

ROADWAY COSTS: No change

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-8**
Ware County, Georgia

DESCRIPTION: **USE ONE-WAY PAIRS WITH INDEPENDENT ALIGNMENTS IN PROJECT EDS-84(27)** SHEET NO.: **1 of 3**

ORIGINAL DESIGN: (Sketch attached)

The original design and concept does not address consideration for one-way pairs.

ALTERNATIVE: (Sketch attached)

The alternative offers two routes for one-way pair travel lanes.

ADVANTAGES:

- Provides safer movement for traffic

DISADVANTAGES:

- Increases costs to design and construct
- May require increased coverage environmental technical studies

DISCUSSION:

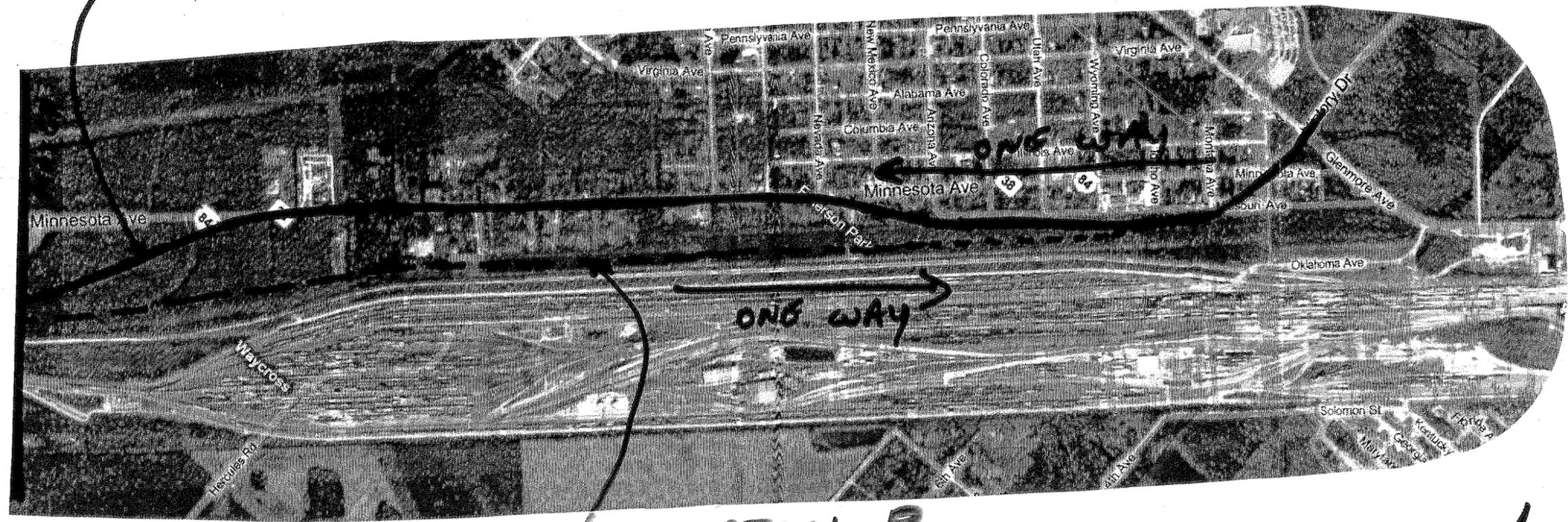
This proposed option will add cost for roadway construction coupled with right-of-way costs.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 6,436,078	—	\$ 6,436,078
SAVINGS (Original minus Alternative)	\$ (6,436,078)	—	\$ (6,436,078)



Proposed Design.

OPTION A



OPTION B

SUGGESTED ALTERNATE ROUTE

ALTERNATIVE DESIGN

CALCULATIONS



PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.:
A-8

SHEET NO.: 3 of 3

ONE-WAY PAIRS WITH INDEPENDENT ALIGNMENTS

BEG. STA. 140+00 TO STA. 295+00

LENGTH = $\frac{\$15,500.00}{5200}$

= 2.93 (2,192,418.67) = \$6,436,077.52

USE MINIMUM TRAVELWAY AVG. PER MILE
\$2,192,418.67 PER MILE

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-9**
Ware County, Georgia

DESCRIPTION: **PROVIDE TRAFFIC CALMING WEST OF THE URBAN SECTION IN PROJECT EDS-84(27)** SHEET NO.: **1 of 2**

ORIGINAL DESIGN:

The posted speed limit will be reduced from 55 mph to 45 mph west of the urban section of parallel widening section that passes through the town of Waycross. The rural section to urban section transition takes place through a pair of reversing curves that also provide a transition in median from 44 ft. depressed to a 14-ft. flush median (operating as a two-way left-turn lane). Limited or no traffic calming measures are incorporated in the current plans.

ALTERNATIVE:

Provide traffic calming measures for the above-referenced rural section to urban section transition to manage speed and increase safety. Some common traffic calming measures that may be considered include the following:

At Transition Zone (beginning)

Install “reduced speed ahead” (R2-12) signs approximately 500 ft. in advance of the initial sign indicating the reduced speed limit.

Install a “speed limit 45” (R2-1E), largest panel size, at or as near as practical to the beginning of the reduced speed zone on both sides of the roadway.

Instead of orange flagging on these signs, install flashing yellow warning lights to supplement these traffic signs. Lights should be positioned above and below, on each side of the sign (R2-1E).

Install radar detection with a VMS board indicating vehicle speed approximately one kilometer after entering the reduced speed zone.

Within Reduced Speed Zone

Install initial “speed limit” 45 (R2-1) sign at 1,000 ft. into the reduced speed zone.

Subsequent intermediate speed limit signs to be installed at approximately half mile intervals throughout the length of the zone.

Increase enforcement within zone with increased patrols. Supplement with signing indicating speed limit actively enforced, and post signs indicating fines for speeding.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-9**
Ware County, Georgia

DESCRIPTION: **PROVIDE TRAFFIC CALMING WEST OF THE URBAN SECTION IN PROJECT EDS-84(27)** SHEET NO.: **2 of 2**

ALTERNATIVE: (continued)

At Transition Zone (end)

At end of speed zone, the speed limit 55 (R2-1) sign for the speed limit which follows shall be installed.

If the above measures prove to be insufficient, the following measures could be installed:

At Transition Zone (Beginning)

Install a series of rumble strips across the travel lanes. "Rumble Strip" (W4-17) signs to be installed approximately 500 ft. before the section of roadway where the rumble strips are installed.

Install pavement marking in the travel lanes indicating 55 mph speed limit.

Provide special edge line treatment such as change in color.

Provide screening along the sides of the road preceding sharp curves to produce a lateral confinement effect which will cause motorists to instinctively slow down.

Horizontal Alignment

Sharpen the curve radius that approaches the parallel widening section and the beginning of the urban section (45 mph) portion of the design, to slow down the drivers approaching the urban section.

Legend is already in current design

ADVANTAGES:

- Alerts motorists of on-coming reduced speed zone
- Assists in maintaining speed limit within reduced speed zone

DISADVANTAGES:

- Increases operation and maintenance costs associated with flashing beacons and electronic apparatus (radar and speed display)
- Increases construction/signage cost

DISCUSSION:

The above measures are relatively low cost items that can be easily installed to better alert and warn motorists, particularly those from outside the area that are not familiar with the roadway or the need to reduce and maintain speed at 45 mph through this section of the highway.

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-10**
Ware County, Georgia

DESCRIPTION: **MOVE NEW LOCATION ALIGNMENT CLOSER TO RAILROAD FROM 16TH STREET TO STA 162+50 IN PROJECT EDS-84(27)** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

The realignment pulls away from the railroad beginning at approximately 16th Street (STA 114+00±) to approximately STA 162+50.

ALTERNATIVE: (Sketch attached)

Keep the new alignment adjacent to the railroad.

ADVANTAGES:

- Reduces land-locked property
- Locates road further from residents

DISADVANTAGES:

- Increases length of alignment

DISCUSSION:

For approximately 4,800 ft., the new alignment moves away from the railroad. At the maximum point, the proposed right-of-way is approximately 150 ft. from the railroad right-of-way. This results in a strip of land with little or no access. The cost savings shown assumes that this property would have to be purchased.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 179,305	—	\$ 179,305
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 179,305	—	\$ 179,305

CALCULATIONS



PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.:

A-10

SHEET NO.: 3 of 4

RIGHT-OF-WAY AREA

$$L = 16250 - 11400 \\ = 4850'$$

$$\text{AVG } W = 80'$$

$$\text{AREA} = 4850(80) / 43560 \\ = 8.91 \text{ AC}$$



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

PROJECT: US 84 WIDENING AND RECONSTRUCTION – EDS-8426 AND EDS-8427 Ware County, Georgia		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
ALIGNMENT (A) (continued)						
A-11	Parallel the railroad right-of-way with a new location alignment from 16th Street to Montana Avenue in Project 27	\$ 3,241,901	\$ 335,367	\$ 2,906,534		\$ 2,906,534
A-12	Add a median opening at STA 345+00 in Project 27				Design Suggestion	
A-13	Increase posted speed limit to design speed limit of 65 mph				Design Suggestion	
A-14	Reduce design speed to 55 mph to match posted speed limit				Design Suggestion	
INTERSECTIONS (INT)						
INT-1	Reduce realignment of Ammons Road in Project 26	\$ 96,786	\$ -	\$ 96,786		\$ 96,786
INT-2	Eliminate intersection and connection of Ruskin Road to new US-84 in Project 27	\$ 246,261	\$ -	\$ 246,261		\$ 246,261
INT-3	Eliminate Griffin Road addition and upgraded railroad crossing in Project 27	\$ 186,808	\$ -	\$ 186,808		\$ 186,808
INT-4	Eliminate Needham Road addition and upgrade railroad crossing in Project 27	\$ 123,475	\$ -	\$ 123,475		\$ 123,475
INT-6	Verify need for railroad gates at 3 proposed railroad crossings in Project 27				Design Suggestion	
INT-7	Use 11-ft. lanes for side road connections in Projects 26 and 27	\$ 32,632	\$ -	\$ 32,632		\$ 32,632
INT-8	Identify the new and old US-84 connections (3 locations) in Project 27				Design Suggestion	
INT-9	Relocate connector from Idaho Avenue to Wyoming Avenue in Project 27				Design Suggestion	
BRIDGES (B)						
B-1	Shorten bridges in Projects 26 and 28				Design Suggestion	
B-2	Lengthen bridges from 50-ft. spans in lieu of the proposed 40-ft. spans in Projects 26 and 28	\$ 1,178,530	\$ 943,841	\$ 234,689		\$ 234,689
B-4	Review hydrology of bridges in Projects 26 and 28				Design Suggestion	
CONSTRUCTION MANAGEMENT (CM)						
CM-2	Advance railroad reviews and coordination				Design Suggestion	
CM-3	Alternative bid packaging of Projects 26 and 27				Design Suggestion	

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-11**
Ware County, Georgia

DESCRIPTION: **PARALLEL RAILROAD RIGHT-OF-WAY WITH NEW LOCATION ALIGNMENT FROM 16TH STREET TO MONTANA AVENUE IN PROJECT EDS-84(27)** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

At the east end of Project EDS-84(27), a 4,000-ft.-long parallel widening to the existing alignment is called for before returning to new location alignment to the west of Waycross (270 ft. away from railroad right-of-way).

ALTERNATIVE: (Sketch attached)

Run the entire new location alignment along the edge of the railroad right-of-way until right before the tie-in at the end of the project.

ADVANTAGES:

- Reduces cost
- Minimizes displacements
- Provides better land use (developable land)
- Provides rural section for entire project
- Provides constant design speed for entire project
- Increases safety

DISADVANTAGES:

- May be unknown hidden costs
- Increases right-of-way
- Wetlands impacts unknown (there appears to be ponds on the route)
- Parallels railroad right-of-way
- Possible additional environmental technical studies

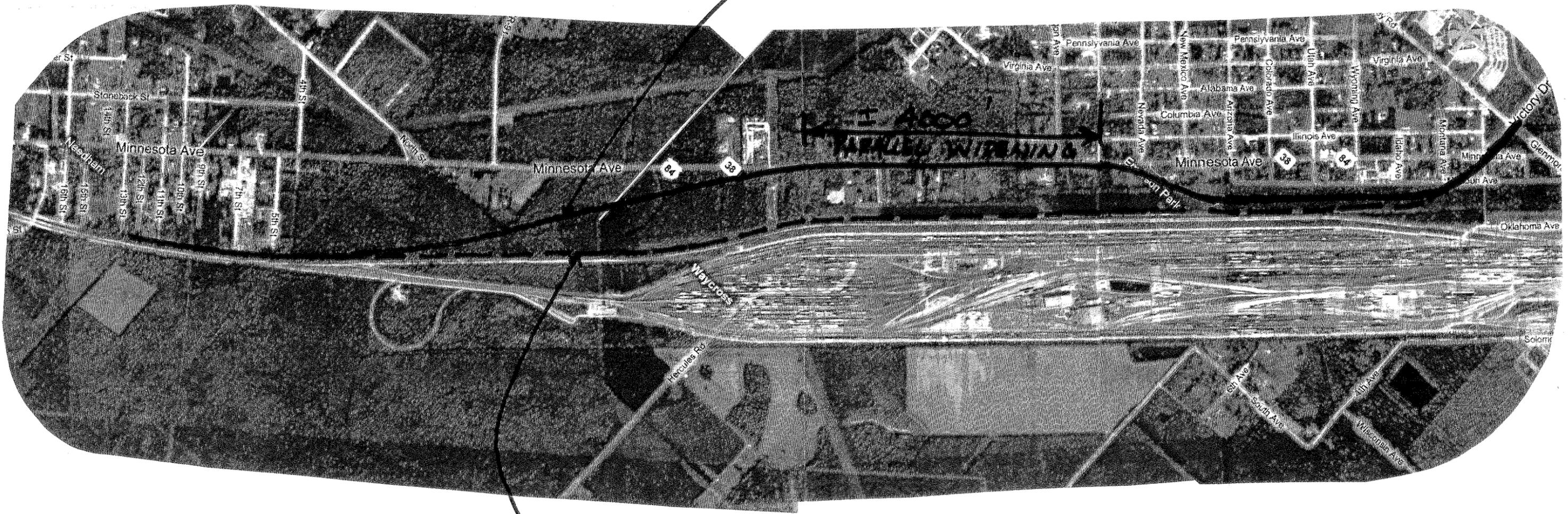
DISCUSSION:

Sixty percent of this stretch of roadway is already new location; placing the whole stretch is another reasonable alternative.

The proposed change, besides generating cost savings, may provide a safer and more compatible solution for the community.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 3,241,901	—	\$ 3,241,901
ALTERNATIVE	\$ 335,367	—	\$ 335,367
SAVINGS (Original minus Alternative)	\$ 2,906,534	—	\$ 2,906,534

CURRENT DESIGN.



SUGGESTED ALTERNATE

CALCULATIONS



PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

ALTERNATIVE NO.: A-11

SHEET NO.: 3 of 4

⇒ WETLANDS AFFECTS UNKNOWN! COST NOT KNOWN.

ROW CHANGES FOR 4600' ONLY (IN URBAN TO RURAL SECTION).

$$\text{NEW ROW} = (4600') \times (250') = 1,150,000 \text{ SF} = 26.40 \text{ ACRES.}$$

STA 217+00 TO STA 263+00 Δ = 223

$$\text{SAVED ROW (DESIGNABLE)} = (3900') \times (270') = 1,053,000 \text{ SF} = 24.17 \text{ ACRES.}$$

STA 257+00 TO STA 296+00

$$\text{OLD ROW TAKE} = (4600') \times (75') = 345,000 \text{ SF} = 7.92 \text{ ACRES}$$

→ TWO SIDES @ \$4500/ACRE

ASSUME CURB INLETS @ 500' } ONLY CHANGING 4600' LENGTH
ASSUME MEDIAN INLETS @ 1000'

PAVEMENT CHANGE: LANES = $\frac{1}{2} (1)$ (FILLED MEDIAN) @ 14'

At @ 4600' SHOULDER = $2 (2' + 6.5') = 17'$

C & GUTTER = 2

SIDEWALK = 10'

GRADING CAN NOT BE DETERMINED W/O FURTHER DESIGN

* AVERAGE COST = $\frac{4500 + 1000}{2} = \$3150/\text{ACRE}$

COST WORKSHEET



PROJECT: **EDS-84-(26) & EDS-84-(27)**
 Georgia Department of Transportation

ALTERNATIVE NO.: **A-11**

SHEET NO.: **46** of **46**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
LANE PAVEMENT	SY	3575	\$ 40 ³⁶	\$144,287	∅	\$ 40 ³⁶	∅
SHLD PAVEMENT	SY	∅	\$ 29 ¹¹	∅	8685	\$ 29 ¹¹	\$252,820
C & G	LF	9200	\$ 18 ⁴³	\$169,556	∅	\$ 18 ⁴³	∅
SIDEWALK	SY	5110	\$ 31 ⁷⁹	\$162,447	∅	\$ 31 ⁷⁹	∅
CURB INLETS w/ DRAINS	EA	20	\$ 4500	\$ 90,000	∅	\$ 2000	∅
MEDIAN INLETS w/ PIPES	EA.	∅	\$ 4700	∅	5	\$ 4700	\$23,500
TOTALS				\$566,290			\$276,320
10%				\$56,629			\$27,632
ROW	ACRE	7.92	\$4500	\$35,640	2.23	\$ 3150	\$7025
DISPLACEMENTS.	EA	5	\$110,000	\$550,000	∅	∅	∅
MARK-UP 3.472				\$2,033,342			\$24,390
Subtotal				\$ 3,241,901			\$335,367
Markup (%) at				N/A			N/A
TOTAL				\$ 3,241,901			\$335,367

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-12**
Ware County, Georgia

DESCRIPTION: **ADD A MEDIAN OPENING AT STA 345+00 IN PROJECT EDS-84(27)** SHEET NO.: **1 of 1**

ORIGINAL DESIGN: (Sketch attached)

There is no median opening from Gooding Bay Road [STA 270+40, EDS-84(26)] to Rushkin Street [STA 50+30, EDS-84(27)], a distance of 14,930 ft.

ALTERNATIVE: (Sketch attached)

Add a median opening at approximately STA 345+00, halfway between the existing openings.

ADVANTAGES:

- Facilitates access to other side of road
- Reduces distance to travel to turn around

DISADVANTAGES:

- Increase pavement cost
- Increases conflict points

DISCUSSION:

There are three miles between median openings. Adding an opening will make it easier to turn around when necessary.

The classification of roadway, rural principal arterial is two miles (GDOT Policy Manual 7.3).

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-13**
Ware County, Georgia

DESCRIPTION: **INCREASE POSTED SPEED LIMIT TO DESIGN SPEED LIMIT OF 65 MPH** SHEET NO.: **1 of 1**

ORIGINAL DESIGN: (Sketch attached)

The project is designed for 65 mph with a posted speed limit of 55 mph.

ALTERNATIVE: (Sketch attached)

Post speed limit of 65 mph to match design speed.

ADVANTAGES:

- Additional design for 65 mph is not wasted

DISADVANTAGES:

- Cars have legal right to drive faster

DISCUSSION:

This design was likely performed when department policy was to design ≈ 10 mph higher than the posted speed limit. Current department policy is to design for the posted speed limit.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **A-14**
Ware County, Georgia

DESCRIPTION: **REDUCE DESIGN SPEED TO 55 MPH TO MATCH POSTED SPEED LIMIT** SHEET NO.: **1 of 1**

ORIGINAL DESIGN: (Sketch attached)

The design speed is 65 mph, posted speed is 55 mph.

ALTERNATIVE: (Sketch attached)

Match posted and design speed to 55 mph.

Revisit curve corrections proposed for the parallel widening portions of the design.

ADVANTAGES:

- Reduces cost
- Reduces curve corrections required
- Reduces legal driving speed (safety)

DISADVANTAGES:

- May not match other locations along the corridor

DISCUSSION:

Current department policy is to match posted and design speed limits.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **INT-1**
Ware County, Georgia

DESCRIPTION: **REDUCE REALIGNMENT OF AMMONS ROAD IN PROJECT EDS-84(26)** SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (Sketch attached)

Ammons Road is realigned for an approximate length of 500 ft. Existing conditions already show the existing intersection meeting SR 38/US 84 at $\pm 90^\circ$.

ALTERNATIVE: (Sketch attached)

Simply improve the existing intersection without a 50-ft.-long realignment of Ammons Road, as shown on the attached sketch. Retain a 90° skew.

ADVANTAGES:

- Reduces right-of-way
- Reduces cost
- Reduces traffic disruption
- No apparent need for all the work proposed

DISADVANTAGES:

- Curve is immediately adjacent to the intersection. Most cars will appear to be at an angle to the mainline. Sight distance reduction

DISCUSSION:

There does not appear to be any reason for the realignment. The existing intersection is already at roughly $\pm 90^\circ$. Additional work proposed seems unnecessary.

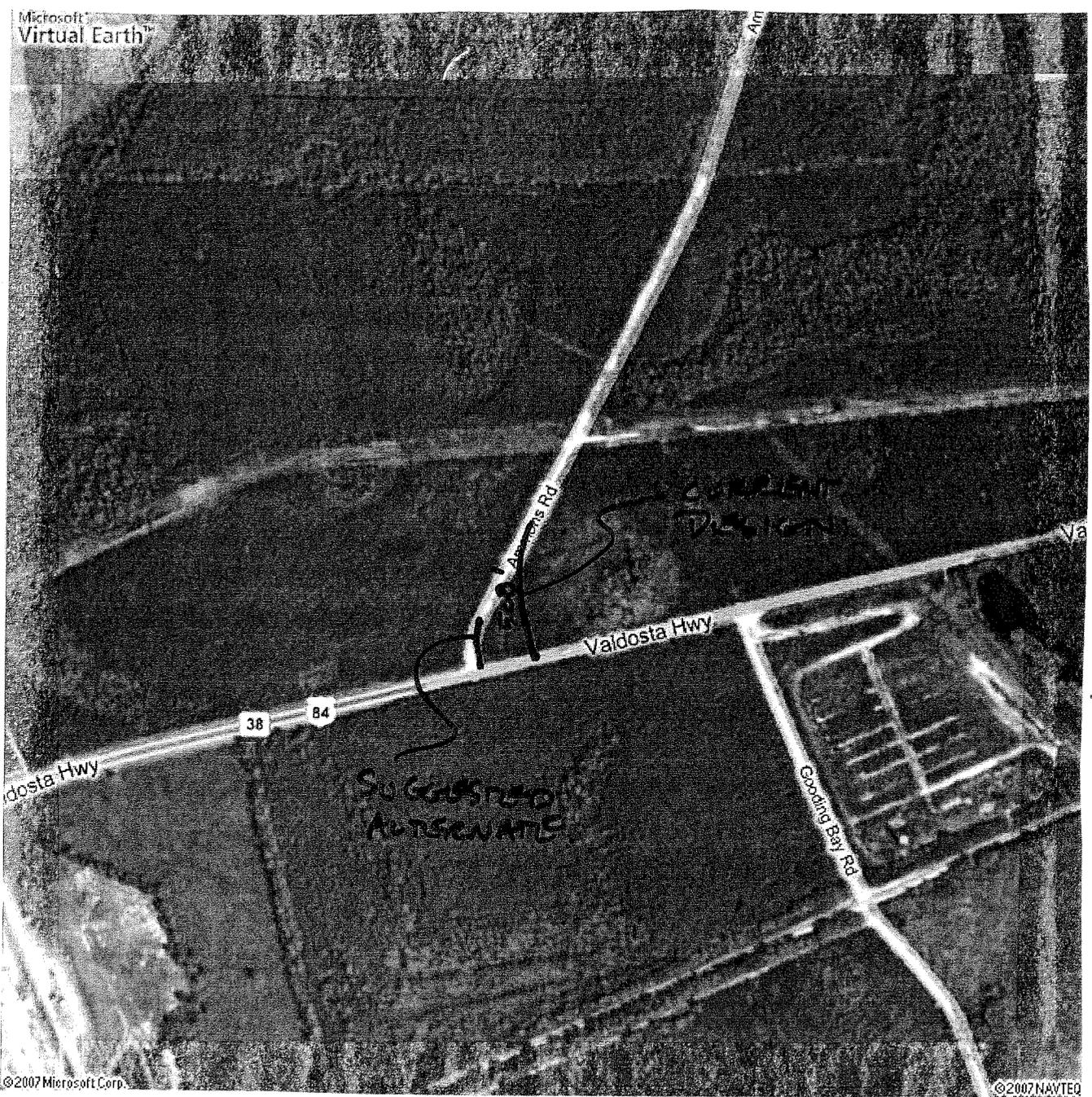
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 96,786	—	\$ 96,786
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 96,786	—	\$ 96,786

PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

ALTERNATIVE NO.: **ENT-1**

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: **2** of **4**



CALCULATIONS



PROJECT: **EDS-84-(26) & EDS-84-(27)**
 Georgia Department of Transportation

ALTERNATIVE NO.: INT-1

SHEET NO.: 3 of 4

- NO CHANGE IN INTERSECTION IMPROVEMENT QUANTITIES.

QUANTITIES SAVED → ROAD IMPROVEMENT ALONG
 AMMONG RD.

R/W → NO CHANGE APPARENT.

ROADBED ≈ 450' LENGTH @ 24' WIDTH LANE
 @ 10' WIDTH SHOULDER.

$$\begin{aligned} \text{LANE} &= \frac{(450')(24')}{9} (\$40.36) = \underline{\underline{\$48,432}} \\ &= \frac{(450')(10')}{9} (\$29.11) = \underline{\underline{\$14,555}} \end{aligned}$$

$$\begin{aligned} \text{REMOVE OLD ROADBED} &= \frac{(450')(30')}{9} (\$50/4') \left(\frac{12''}{36''} \right) \\ &= \underline{\underline{25,000}} \end{aligned}$$

ASSUMED PAVEMENT
THICKNESS. ↙

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **INT-2**
Ware County, Georgia

DESCRIPTION: **ELIMINATE INTERSECTION AND CONNECTION OF RUSHKIN ROAD TO NEW US 84 IN PROJECT EDS-84(27)** SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (Sketch attached)

The design provides an intersection at Ruskin Road to allow the small road to access the new location alignment at SR 38/US 84.

ALTERNATIVE: (Sketch attached)

Remove intersection and close small frontage road between new SR 38/US 84 alignment and existing railroad track. Access can be provided via old US 84.

ADVANTAGES:

- Reduces cost
- Increases safety along US 84 by removing excess access points/median

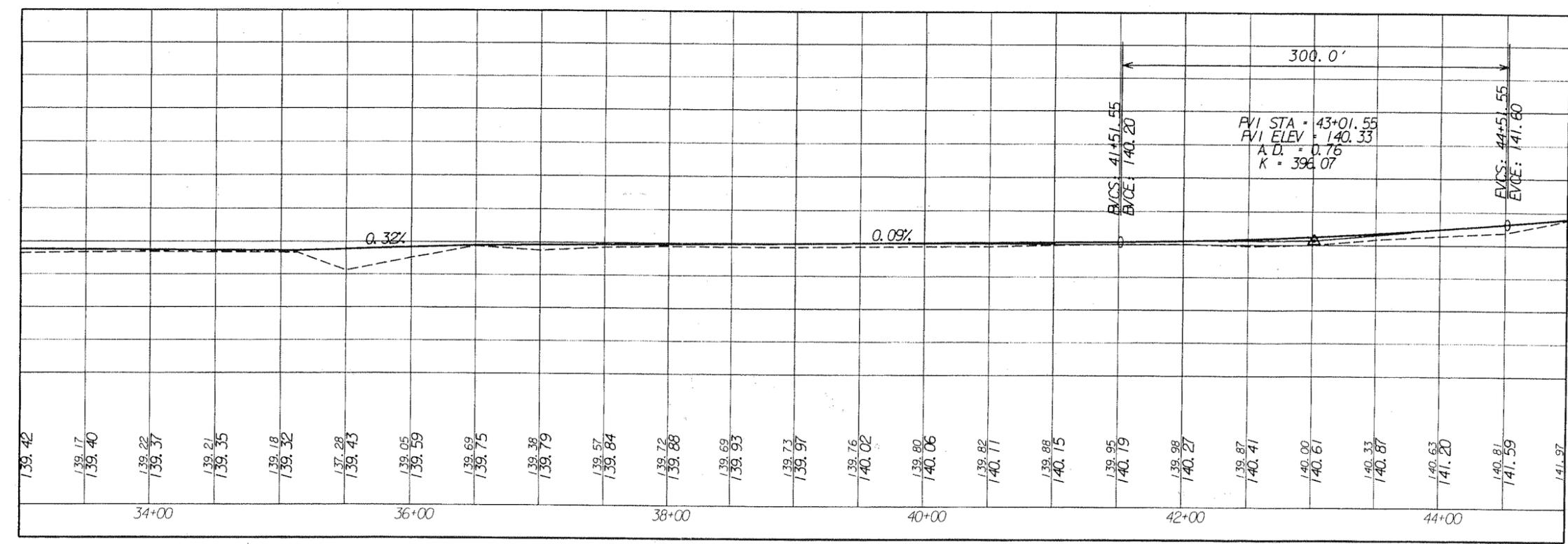
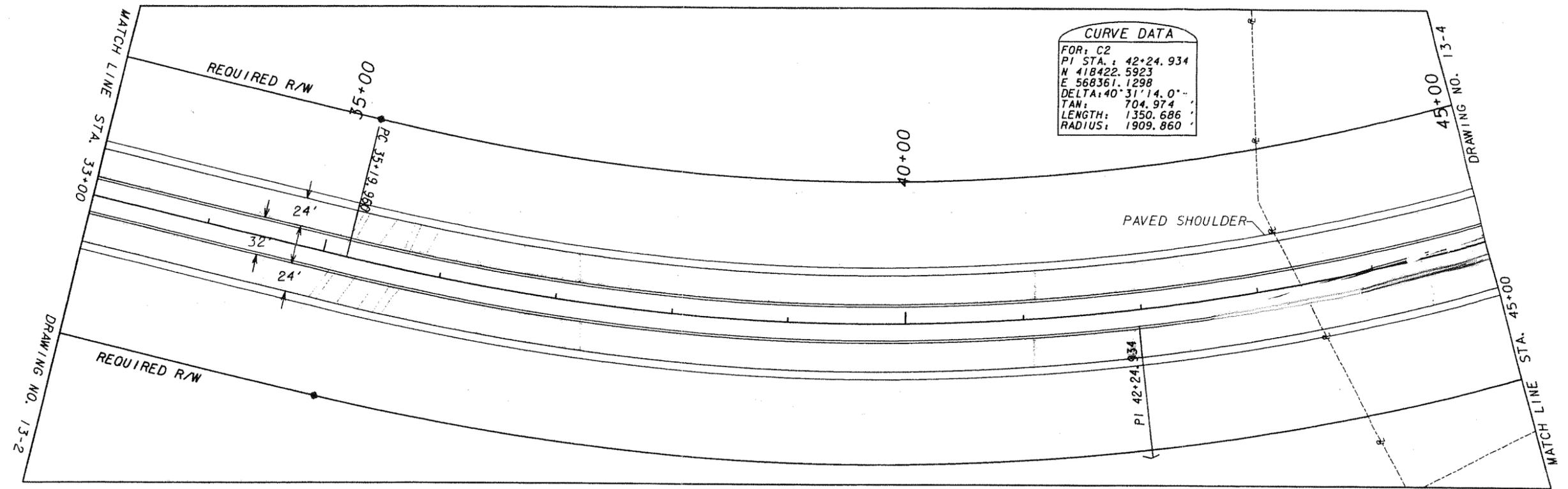
DISADVANTAGES:

- Reduces access points

DISCUSSION:

Eliminating the intersection and connection has been created to allow access from Ruskin Road (small) between old and new US 84.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 246,261	—	\$ 246,261
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 246,261	—	\$ 246,261



AMERICAN
INSTITUTION
REGISTERED

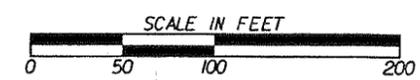
AMERICAN
INSTITUTION
REGISTERED

PROPERTY AND EXISTING R/W LINE -----E-----
 REQUIRED R/W LINE -----F-----
 CONSTRUCTION LIMITS -----G-----
 EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES [Hatched Box]
 EASEMENT FOR CONSTR OF SLOPES [Cross-hatched Box]
 EASEMENT FOR CONSTR OF DRIVES [X-hatched Box]

BEGIN LIMIT OF ACCESS.....BLA
 END LIMIT OF ACCESS.....ELA
 LIMIT OF ACCESS [Dashed Line]
 REQ'D R/W & LIMIT OF ACCESS [Double Line]



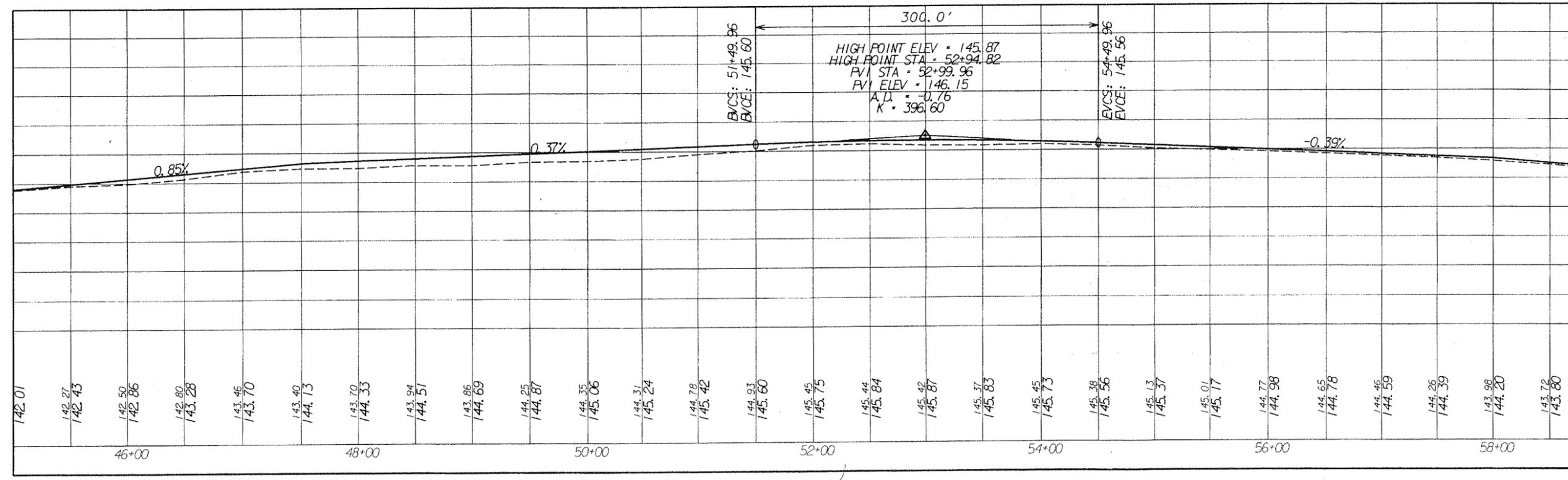
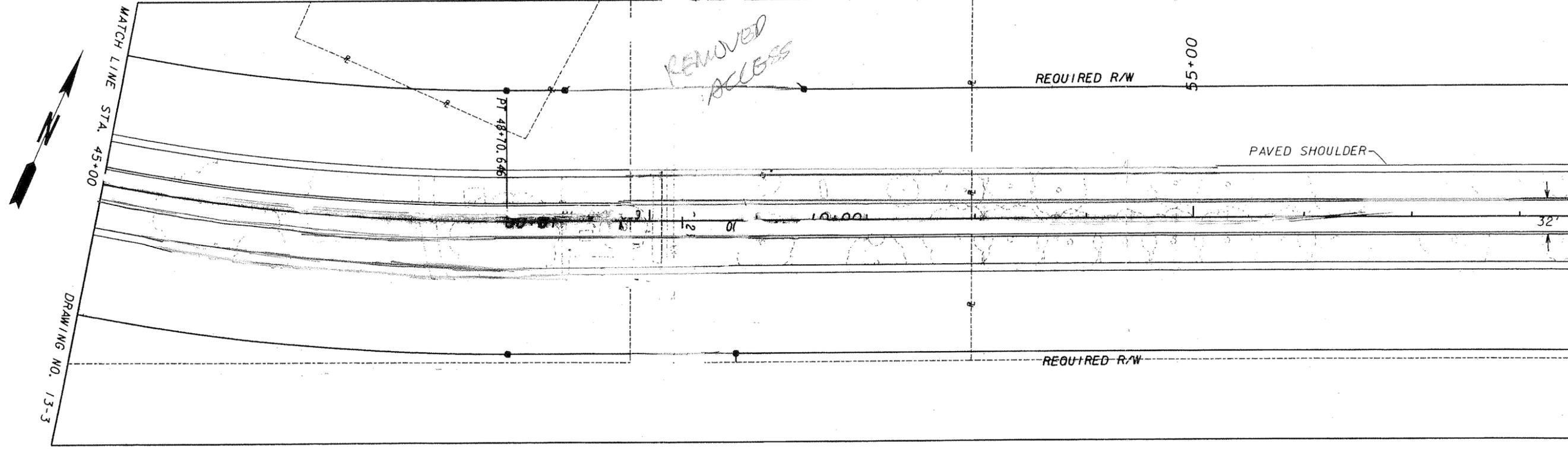
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 Savannah, Georgia 31412
 Phone: (912) 232-6533



REVISION DATES	

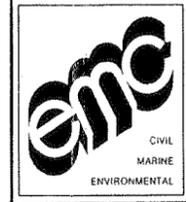
INT - 2
 2 of 6

DRAWING NO. 13-3 MATCH LINE STA. 45+00

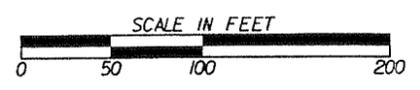


PROPERTY AND EXISTING R/W LINE -----E-----
 REQUIRED R/W LINE -----F-----
 CONSTRUCTION LIMITS -----C-----
 EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES [Hatched Box]
 EASEMENT FOR CONSTR OF SLOPES [Diagonal Lines Box]
 EASEMENT FOR CONSTR OF DRIVES [Cross-hatched Box]

BEGIN LIMIT OF ACCESS.....BLA
 END LIMIT OF ACCESS.....ELA
 LIMIT OF ACCESS [Dashed Line]
 REQ'D R/W & LIMIT OF ACCESS [Double Line]



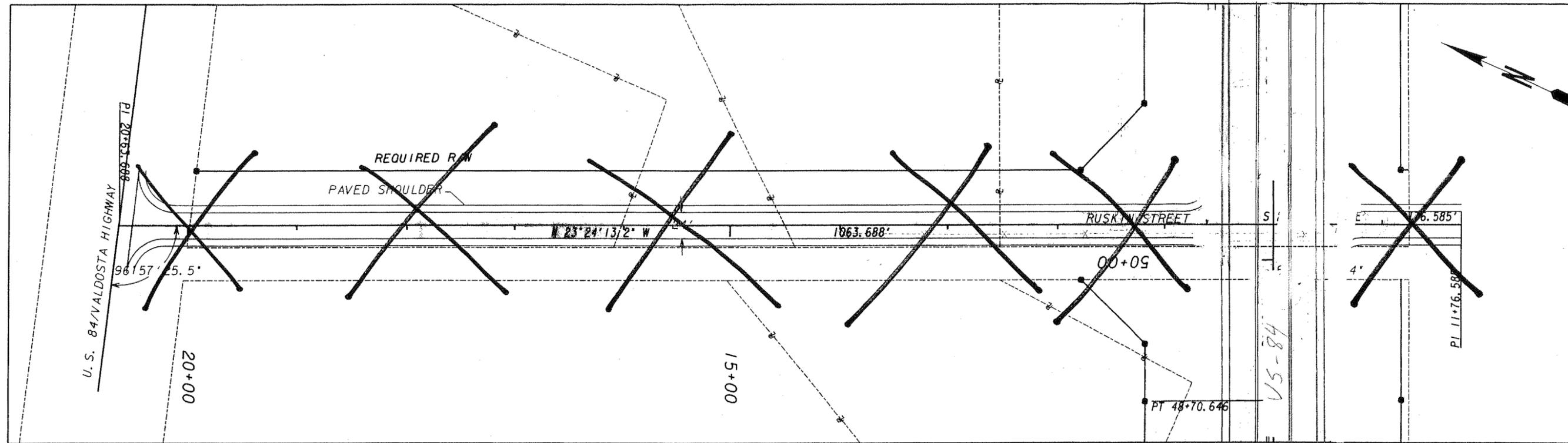
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 Phone: (912) 232-6533



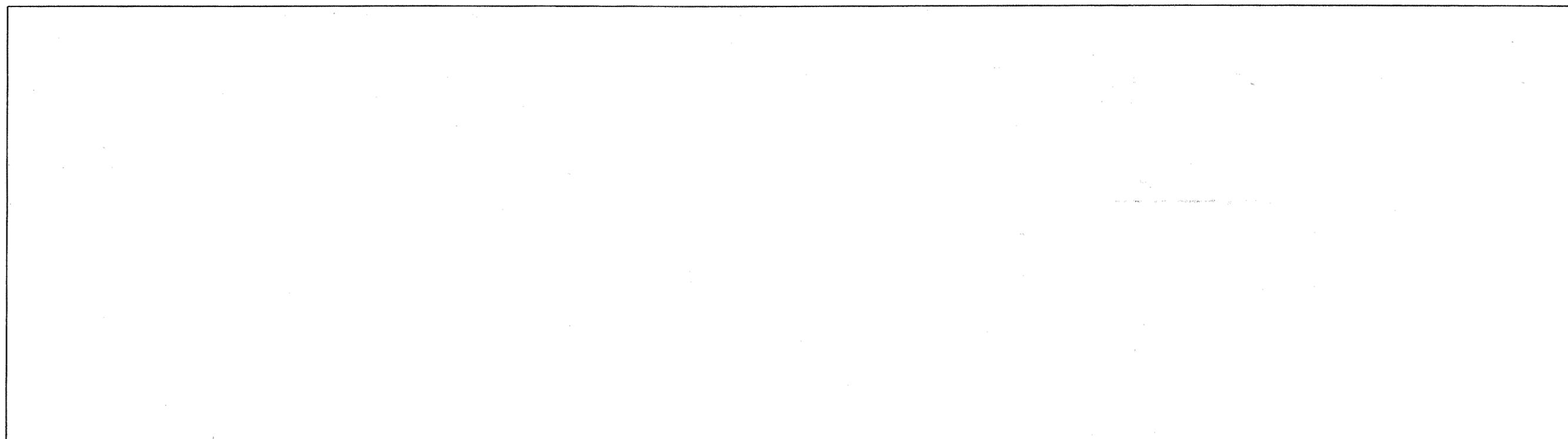
REVISION DATES	

INT - 2
 3 of 6

SEE DRAWING NO. 13-4



SEE DRAWING NO. 13-4

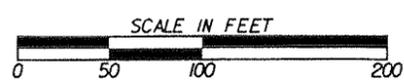


PROPERTY AND EXISTING R/W LINE -----E-----
 REQUIRED R/W LINE -----
 CONSTRUCTION LIMITS -----C-----F-----
 EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES [Hatched Box]
 EASEMENT FOR CONSTR OF SLOPES [Hatched Box]
 EASEMENT FOR CONSTR OF DRIVES [Cross-hatched Box]

BEGIN LIMIT OF ACCESS.....BLA
 END LIMIT OF ACCESS.....ELA
 LIMIT OF ACCESS -----O-----O-----
 REQ'D R/W & LIMIT OF ACCESS [Line with Ticks]



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REVISION DATES	

INT-2
 4 OF 6

CALCULATIONS



PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.: INT-2

SHEET NO.: 5 of 6

TURN LANES (RIGHT) = $2 \frac{(12')(400')}{9} = 1060 \text{ SY}$
 (NO R/W SAVINGS)

(LEFT) = NO PAVEMENT SAVINGS.

REMOVED ROADWAY = $\frac{(24')(1000')}{9} \approx 2665 \text{ SY}$

SHED = $\frac{(13')(1000')}{9} \approx 1445 \text{ SY}$

R/W SAVINGS = $(50')(50')(2) + (70')(1000') = 75,000 \text{ SF}$
 $= 1.72 \text{ ACRES}$

COST WORKSHEET



PROJECT: **EDS-84(26) & EDS-84(27)**
 Georgia Department of Transportation

ALTERNATIVE NO.: **INT-2**

SHEET NO.: **6** of **6**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
MAINLINE PAVING	SY	1060	\$40 ³⁶	\$42,782	∅	∅	∅
SHOULDER PAVING	SY	2665	\$40 ³⁶	\$107,560	∅	∅	∅
SHLD	SY	1445	\$29 ⁴⁴	\$42,064	∅	∅	∅
TOTAL				\$192,406			
10%				\$19,240			
R/W	ACRE	1.72	\$4500	\$7740	∅	∅	∅
MARK-UP		3.472		\$26,875			
Subtotal				\$246,261			∅
Markup (%) at				N/A			∅
TOTAL				\$246,261			∅

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **INT-3**
Ware County, Georgia

DESCRIPTION: **ELIMINATE GRIFFIN ROAD RAILROAD CROSSING IN PROJECT EDS-84(27)** SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (Sketch attached)

The current design extends Griffin Road from old alignment (old US 84) to new location alignment (new US 84). Railroad crossing remains as before.

ALTERNATIVE: (Sketch attached)

Eliminate proposed extension of Griffin Road. Use as negotiation tactic during railroad coordination with CSX Railroad.

ADVANTAGES:

- Reduces cost
- Reduces access points/median openings
- Reduces railroad crossings
- Improves safety
- Good railroad negotiating item (GDOT favor)

DISADVANTAGES:

- Reduces access points

DISCUSSION:

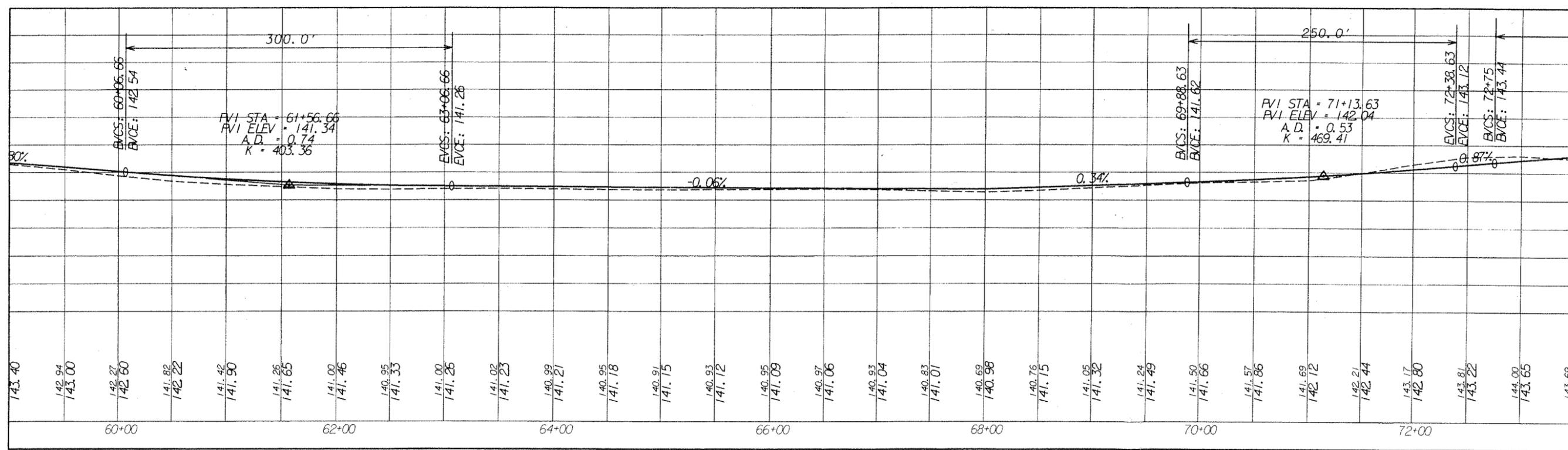
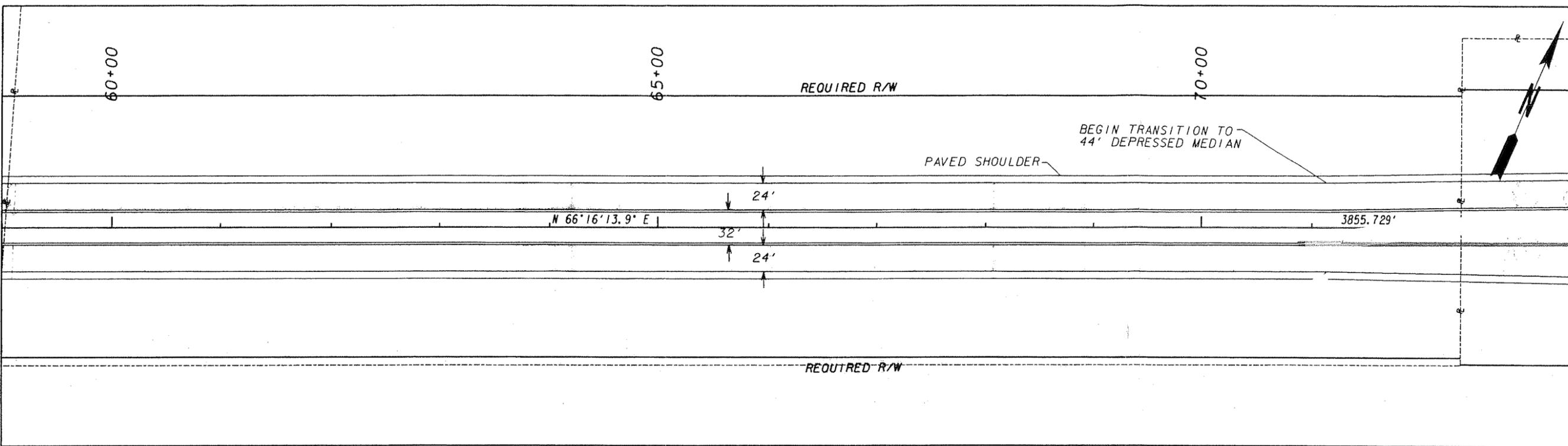
There are three intersections and railroad crossings in the area of Griffin Road. Reducing several will not affect the roadway network performance within the town, but would enhance safety along the US 84 corridor.

The VE team felt that the 17th Street access across the railroad was the most significant as it feeds the frontage road running along south side of the railroad.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 186,808	—	\$ 186,808
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 186,808	—	\$ 186,808

MATCH LINE STA. 59+00

DRAWING NO. 13-4



PROPERTY AND EXISTING R/W LINE 

REQUIRED R/W LINE 

CONSTRUCTION LIMITS 

EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES 

EASEMENT FOR CONSTR OF SLOPES 

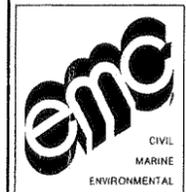
EASEMENT FOR CONSTR OF DRIVES 

BEGIN LIMIT OF ACCESS.....BLA

END LIMIT OF ACCESS.....ELA

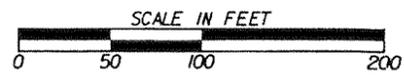
LIMIT OF ACCESS 

REQ'D R/W & LIMIT OF ACCESS 



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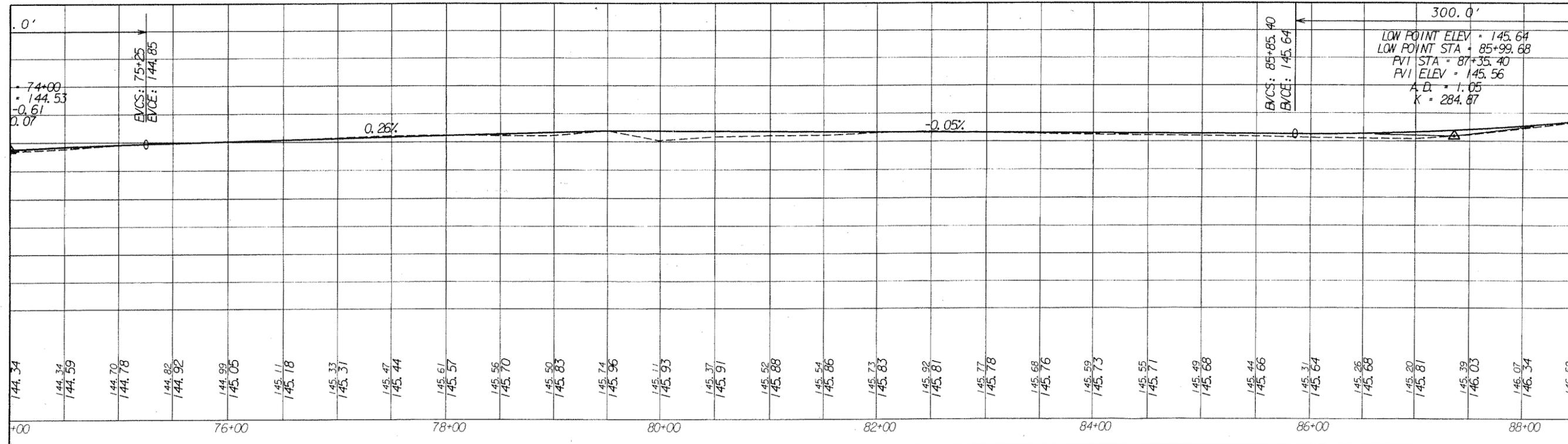
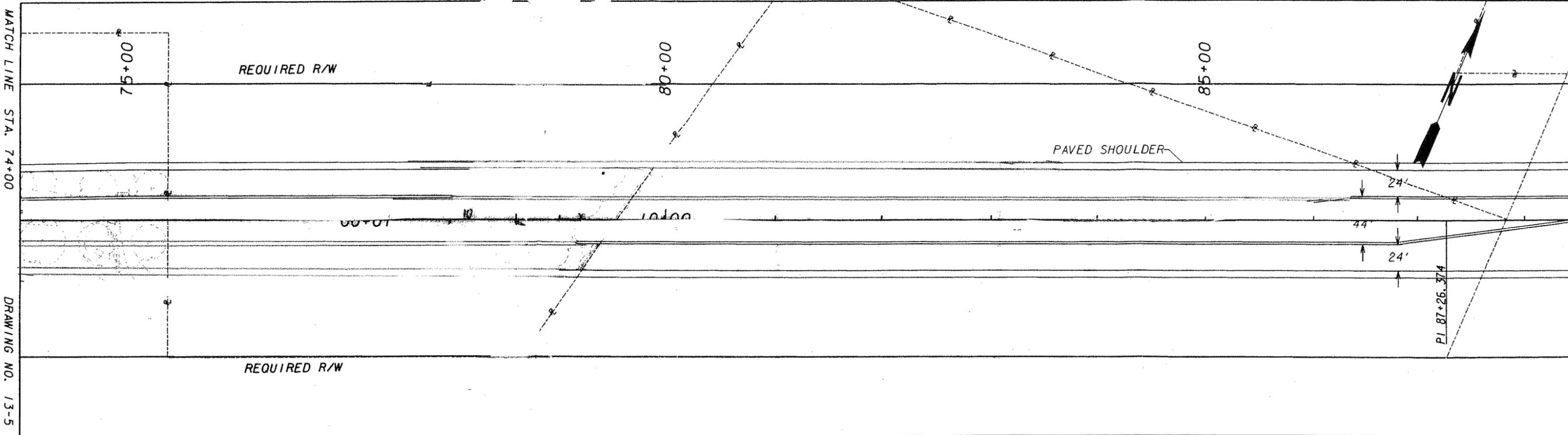


REVISION DATES	

INT-3

2 OF 6

MATCH LINE STA. 74+00 DRAWING NO. 13-5

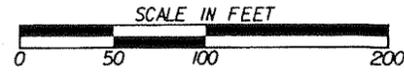


PROPERTY AND EXISTING R/W LINE
 REQUIRED R/W LINE
 CONSTRUCTION LIMITS
 EASEMENT FOR CONSTR
 & MAINTENANCE OF SLOPES
 EASEMENT FOR CONSTR OF SLOPES
 EASEMENT FOR CONSTR OF DRIVES

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

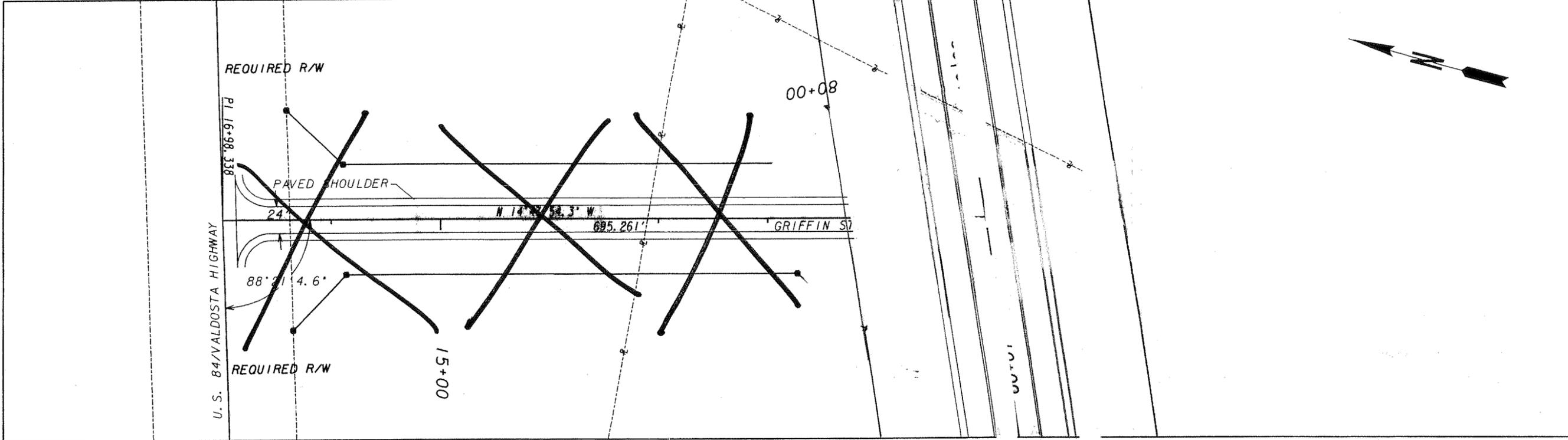


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REVISION DATES

INT-3
 307 6



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PROPERTY AND EXISTING R/W LINE -----E-----

REQUIRED R/W LINE -----

CONSTRUCTION LIMITS -----G-----F-----

EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES [diagonal hatching]

EASEMENT FOR CONSTR OF SLOPES [diagonal hatching]

EASEMENT FOR CONSTR OF DRIVES [cross-hatching]

BEGIN LIMIT OF ACCESS.....BLA

END LIMIT OF ACCESS.....ELA

LIMIT OF ACCESS -----O-----O-----

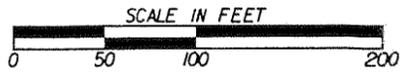
REQ'D R/W & LIMIT OF ACCESS [thick lines]



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CIVIL
MARINE
ENVIRONMENTAL

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REVISION DATES

INT-3

4 of 6

CALCULATIONS



PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.: INT-3

SHEET NO.: 5 of 6

TURN LANES (RIGHT) = $2 \frac{(12')(400')}{9} = 1060 \text{ SY}$
 (NO R/W SAVINGS)

(LEFT) = NO PAVEMENT SAVINGS.

REMOVES PAVEMENT = $\frac{(24')(650')}{9} \approx 1740 \text{ SY}$

SHLD = $\frac{(13')(650')}{9} \approx 940 \text{ SY}$

R/W SAVINGS = $(50')(50')(2) + (100')(650') = 70,000 \text{ SF}$
 $= 1.61 \text{ Acres}$

COST WORKSHEET

PROJECT: **EDS-84-(26) & EDS-84-(27)**
 Georgia Department of Transportation

ALTERNATIVE NO.: **INT-3**

SHEET NO.: **6** of **6**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
MAINLINE PAVING	SY	1060	\$40 ³⁶	\$42,782	∅	∅	∅
SURROAD PAVING	SY	1740	\$40 ³⁶	\$70,226	∅	∅	∅
SHLD	SY	940	\$29 ¹¹	\$27,363	∅	∅	∅
TOTAL				\$140,371			
10%				14,037			
R/W	ACRE	1.61	\$4500	\$7245	∅	∅	∅
MARK-UP 3.472				\$25,155			
Subtotal				\$186,808			∅
Markup (%) at				N/A			∅
TOTAL				\$186,808			∅

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **INT-4**
Ware County, Georgia

DESCRIPTION: **ELIMINATE NEEDHAM ROAD RAILROAD CROSSING IN PROJECT EDS-84(27)** SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (Sketch attached)

The current design extends Needham Road from old alignment (old US 84) through the new location alignment (new US 84). Railroad crossing remains as before.

ALTERNATIVE: (Sketch attached)

Eliminate proposed extension of Needham Road. Use as negotiation tactic during railroad coordination with CSX Railroad.

ADVANTAGES:

- Reduces cost
- Reduces access points/median openings
- Reduces railroad crossings
- Improves safety
- Good railroad negotiating item (GDOT favor)

DISADVANTAGES:

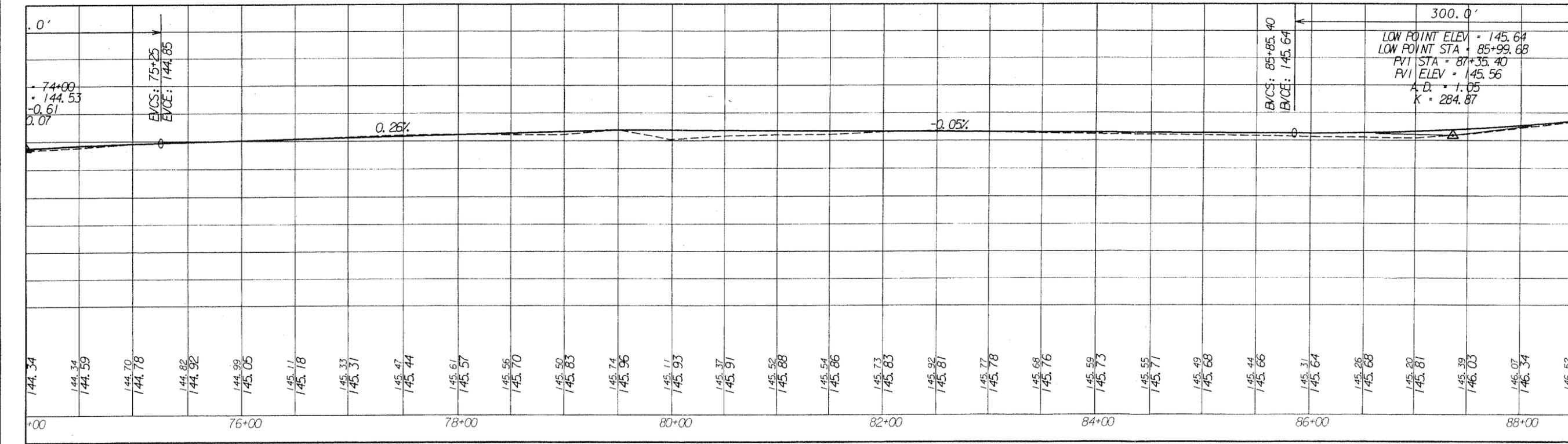
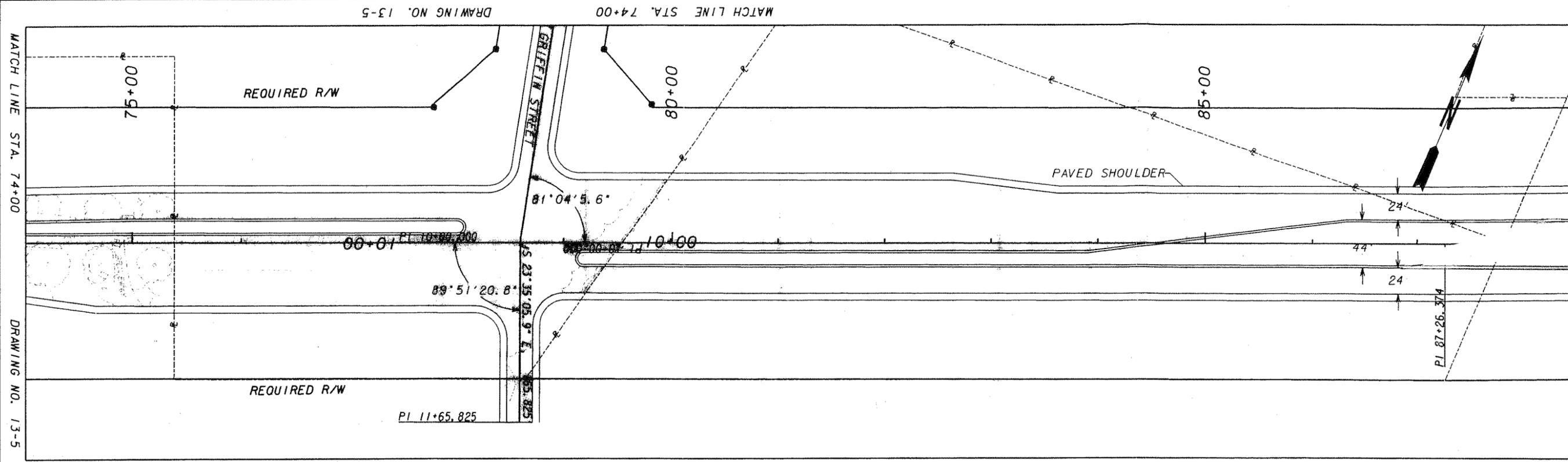
- Reduces access points

DISCUSSION:

There are three intersections and railroad crossings in the area of Griffin Road. Reducing several will not affect the roadway network performance within the town, but would enhance safety along the US 84 corridor.

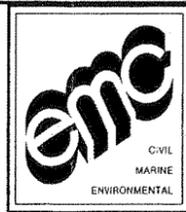
The VE team felt that the 17th Street access across the railroad was the most significant as it feeds the frontage road running along south side of the railroad.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 123,475	—	\$ 123,475
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 123,475	—	\$ 123,475

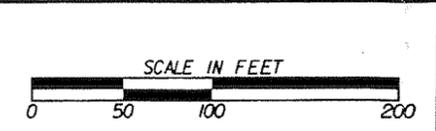


PROPERTY AND EXISTING R/W LINE E
 REQUIRED R/W LINE
 CONSTRUCTION LIMITS C F
 EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES
 EASEMENT FOR CONSTR OF SLOPES
 EASEMENT FOR CONSTR OF DRIVES

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

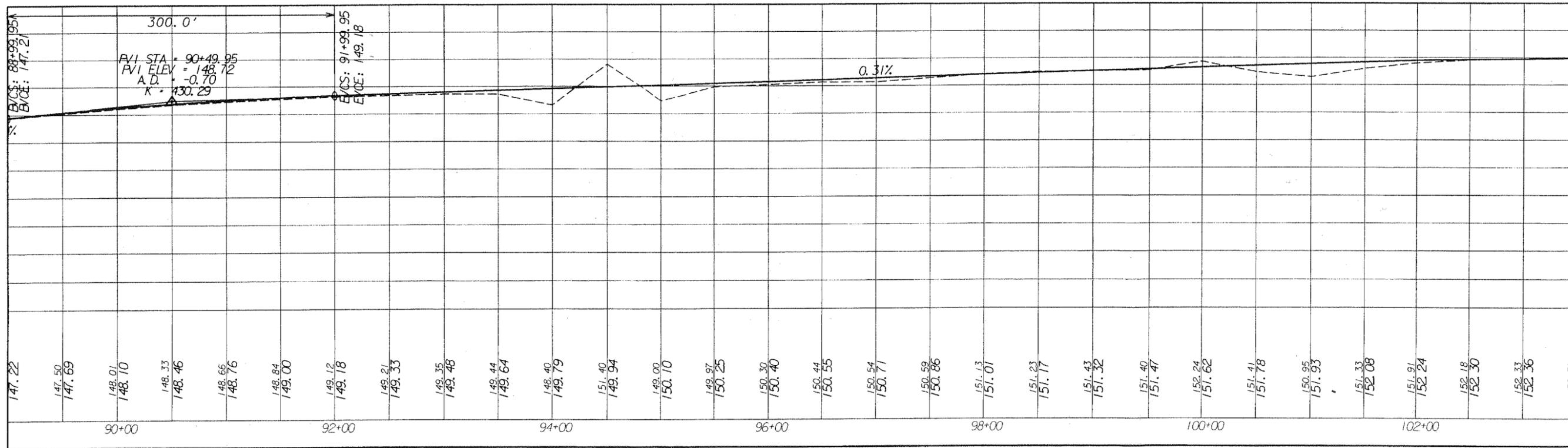
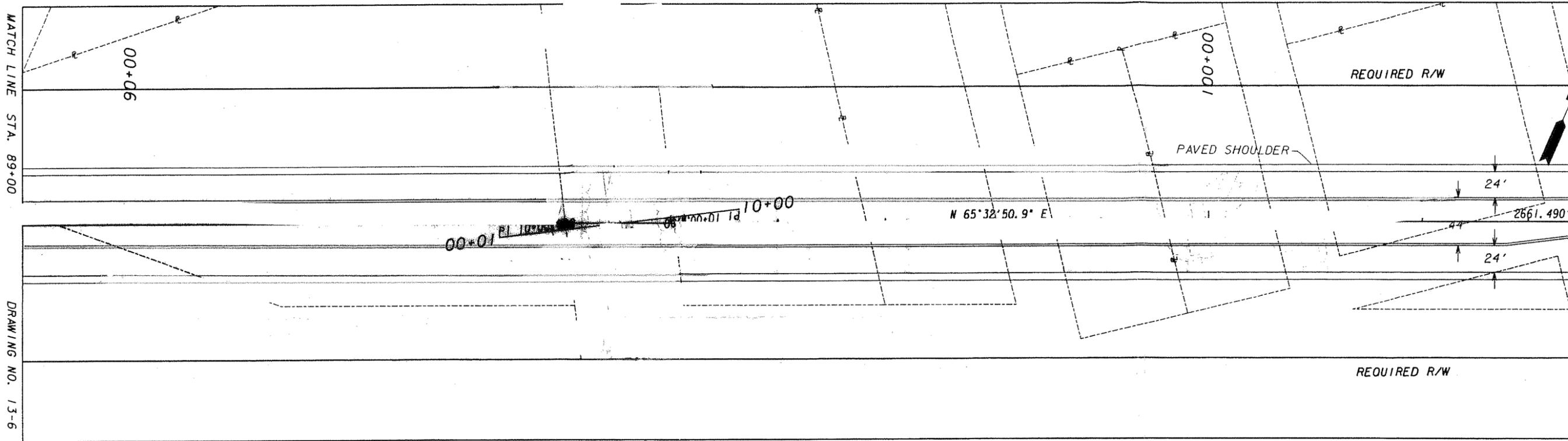


EMC ENGINEERING SERVICES, INC.
 Post Office Box 8101
 23 East Chariton Street
 Savannah, Georgia 31412
 Phone: (912) 232-6533



REVISION	DATE	DESCRIPTION

STATE OF GEORGIA
 INT-4
 2 OF 6



PROPERTY AND EXISTING R/W LINE -----e-----
 REQUIRED R/W LINE -----f-----
 CONSTRUCTION LIMITS -----c-----f-----
 EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES [diagonal hatching]
 EASEMENT FOR CONSTR OF SLOPES [cross-hatching]
 EASEMENT FOR CONSTR OF DRIVES [diagonal cross-hatching]

BEGIN LIMIT OF ACCESS.....BLA
 END LIMIT OF ACCESS.....ELA
 LIMIT OF ACCESS -----o-----o-----
 REQ'D R/W & LIMIT OF ACCESS [double line]



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 23 East Charlton Street
 Savannah, Georgia 31412
 Phone: (912) 232-6533



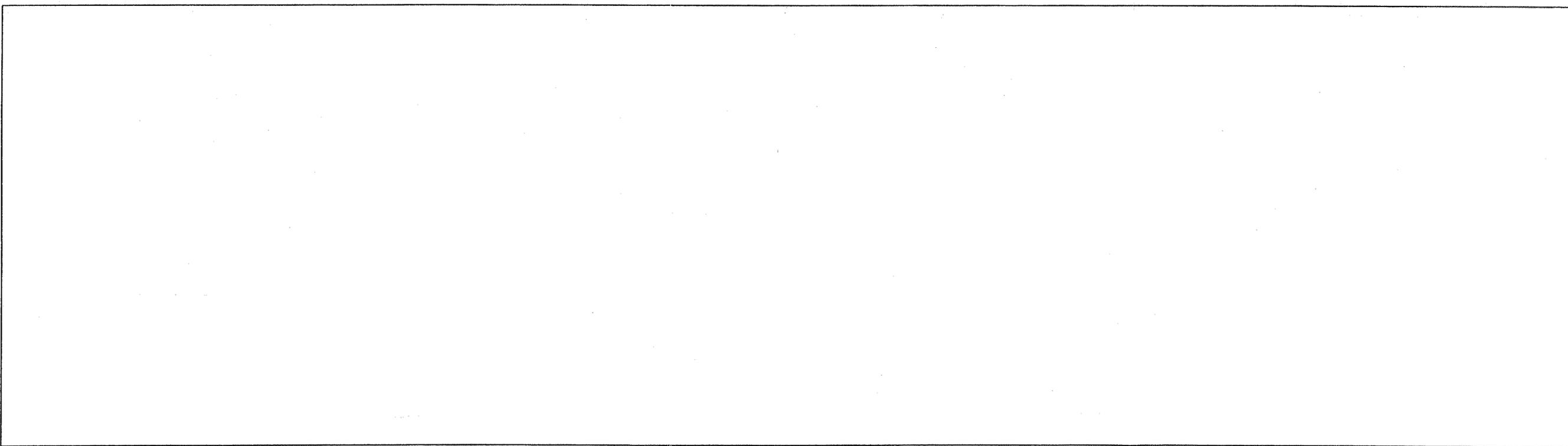
REVISION DATES	

OF INT-4
 3 of 6
 A RT.
 N

SEE DRAWING NO. 13-7



SEE DRAWING NO. 13-7



PROPERTY AND EXISTING R/W LINE -----E-----

REQUIRED R/W LINE -----R-----

CONSTRUCTION LIMITS -----C-----F-----

EASEMENT FOR CONSTR & MAINTENANCE OF SLOPES [Hatched Box]

EASEMENT FOR CONSTR OF SLOPES [Hatched Box]

EASEMENT FOR CONSTR OF DRIVES [Hatched Box]

BEGIN LIMIT OF ACCESS.....BLA

END LIMIT OF ACCESS.....ELA

LIMIT OF ACCESS -----O-----O-----

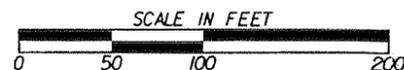
REQ'D R/W & LIMIT OF ACCESS [Hatched Box]

emc

CIVIL MARINE ENVIRONMENTAL

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Savannah, Georgia 31412
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REVISION DATES	

INT-4

4 OF 6

0'

N

CALCULATIONS



PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.: INT-4

SHEET NO.: 5 of 6

TURN LANES (RIGHT) = $2 \frac{(12')(400')}{9} = 1060 \text{ SY}$
 (NO R/W SAVINGS)

(LEFT) = NO PAVEMENT SAVINGS.

REMOVES ROADWAY = $\frac{(24')(450')}{9} = 1200 \text{ SY}$

SHED = $\frac{(13')(450')}{9} = 650 \text{ SY}$

R/W SAVINGS = $(50')(50')(2) = 5000 \text{ SF}$

= 0.115 ACRES

COST WORKSHEET



PROJECT: **EDS-84-(26) & EDS-84-(27)**
 Georgia Department of Transportation

ALTERNATIVE NO.: **INT-4**

SHEET NO.: **6** of **6**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
MAINLINE PAVING	SY	1060	\$40 ³⁶	\$42,782	∅	∅	∅
SURROAD PAVING	SY	1200	\$40 ³⁶	\$48,432	∅	∅	∅
SHLD	SY	650	\$29 ¹¹	\$18,925	∅	∅	∅
TOTAL				\$110,140			
10%				\$11,015			
R/W	ACRE	0.115	\$4500	\$518 ⁰⁰	∅	∅	∅
MARK-UP		3.472		\$1797 ⁰⁰			
Subtotal				\$123,475			∅
Markup (%) at				N/A			∅
TOTAL				\$123,475			∅

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **INT-6**
Ware County, Georgia

DESCRIPTION: **VERIFY THE NEED FOR RAILROAD GATES AT THREE PROPOSED RAILROAD CROSSINGS IN PROJECT EDS-84(27)** SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

No gates are indicated on current plans at this time.

ALTERNATIVE:

Gates may be needed once railroad coordination is underway.

ADVANTAGES:

- Provides early identification of railroad requirements to expedite project schedule and identify project costs

DISADVANTAGES:

- None apparent

DISCUSSION:

Coordination with the railroad has not begun. It is unknown if crossing gates will be required. This information is best known early in the project development process.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **INT-7**
Ware County, Georgia

DESCRIPTION: **USE 11-FT. LANES FOR SIDE ROAD CONNECTIONS IN PROJECTS EDS-84(26) & EDS-84(27)** SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

All side roads use 12-ft. lane widths.

ALTERNATIVE:

Use 11-ft. lane widths for side roads. Existing side roads may already be less than 12 ft.

ADVANTAGES:

- Reduces cost and construction schedule
- Conforms with the existing side roads (may be more compatible)

DISADVANTAGES:

- None apparent

DISCUSSION:

Road speeds on the side roads may not require 12-ft.-wide lanes and existing widths may already be less than 12 ft.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 32,632	—	\$ 32,632
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 32,632	—	\$ 32,632

CALCULATIONS

PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.: INT-7

SHEET NO.: 2 of 3

RUSKIN ST = 950'

GRIFFIN RD = 600'

NESBHAM ST = 400'

17TH ST. = 750'

NEW MEXICO = 300'

IPATO = 300'

$$3300' \times \frac{2'}{9} \approx 735 \text{ SF}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **INT-8**
Ware County, Georgia

DESCRIPTION: **IDENTIFY OLD AND NEW US 84 CONNECTIONS (THREE LOCATIONS) IN PROJECT EDS-84(27)** SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

The current design does not indicate the tie-in where the old US 84 and new location alignment US 84 diverge.

ALTERNATIVE:

The plans should indicate the proposed connections between old and new US 84.

Traffic volumes and design speed may warrant signals. Suggest using 90° intersections by realigning the old alignment to tie in to the new alignment as a “T” intersection at STA 30+00 and STA 195+00.

ADVANTAGES:

- Improves safety
- Provides traffic calming when approaching populated areas
- Provides better access to new alignment for local residents

DISADVANTAGES:

- Increases cost
- Requires maintenance
- Decreases smooth traffic flow on mainline

DISCUSSION:

With the design speed set at 65 mph and the possibility of traffic volumes along the old alignment, there could be safety issues with traffic trying to merge into SR 38/US 84. The proposed 90° geometry is a standard way to tie these connections.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **INT-9**
Ware County, Georgia

DESCRIPTION: **RELOCATE CONNECTOR FROM IDAHO AVENUE TO WYOMING AVENUE IN PROJECT EDS-84(27)** SHEET NO.: **1 of 2**

ORIGINAL DESIGN: (Sketch attached)

The original design provides improvement to Idaho Avenue (STA 290+00) to act as a connector between the existing road and the new road.

ALTERNATIVE: (Sketch attached)

Relocate the connector to Wyoming Avenue (STA 284+20, labeled “Oregon Avenue” in the plans).

ADVANTAGES:

- Evenly spaces access between new and existing roads
- Wyoming Avenue provides greater connectivity

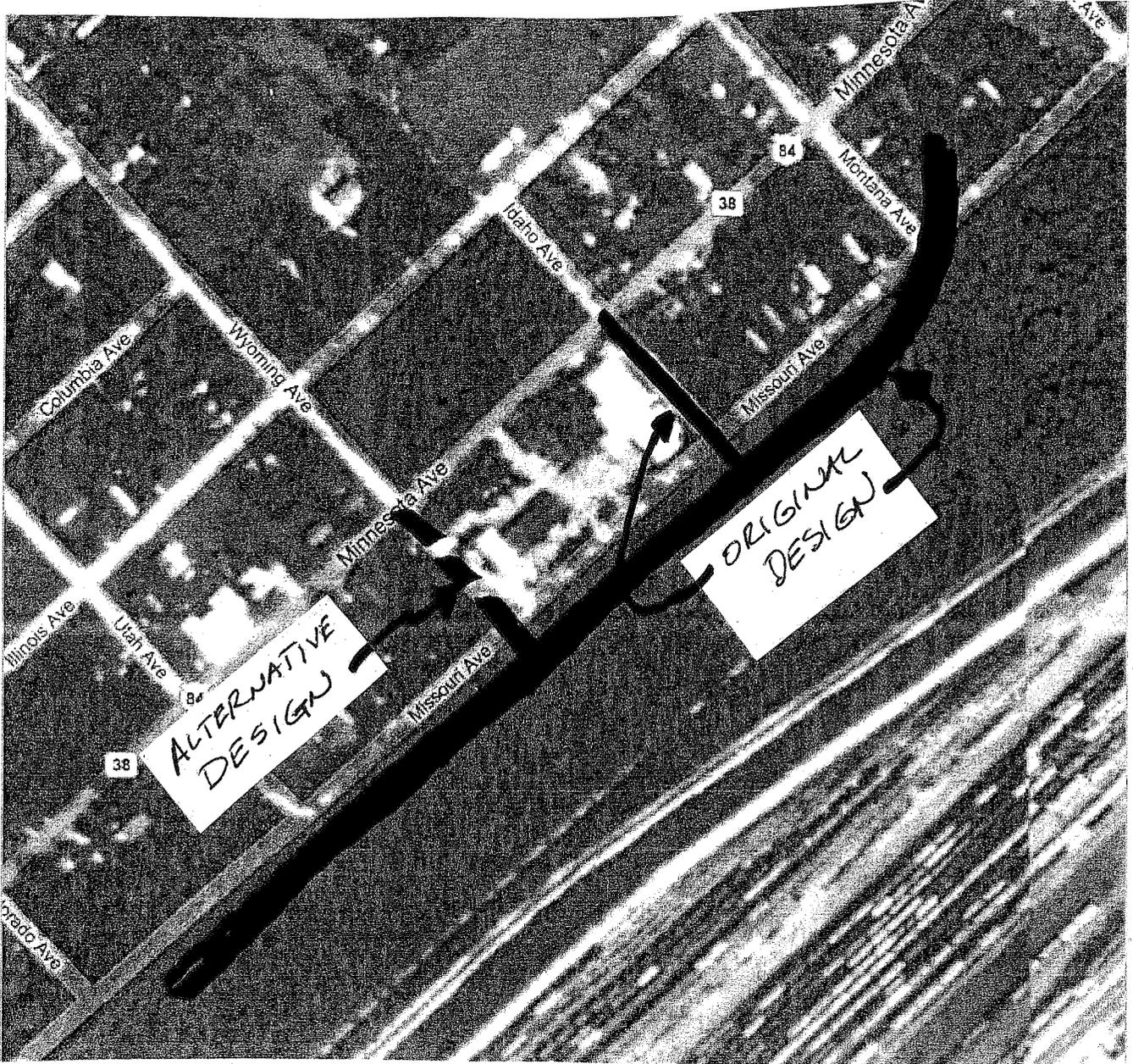
DISADVANTAGES:

- None apparent

DISCUSSION:

Idaho Avenue extends from the new alignment for only two blocks before ending at Illinois Avenue. Wyoming Avenue extends eight blocks to Wadley Road, providing superior connectivity. Also, Wyoming Avenue appears to be a bigger street, so it is possible less construction will be required.

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



VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **B-1**
Ware County, Georgia

DESCRIPTION: **SHORTEN BRIDGES IN PROJECT EDS-84(26)** SHEET NO.: **1 of 1**

ORIGINAL DESIGN: (Sketch attached)

Bridge lengths in the original design are:

- Greasy Branch 240 ft.
- Little Alligator Creek 400 ft.
- Big Alligator Creek 1,200 ft.

ALTERNATIVE: (Sketch attached)

Re-evaluate hydraulics and shorten bridges where possible.

ADVANTAGES:

- Reduces costs
- Shortens construction schedule
- Reduces flow to railroad drainage structures

DISADVANTAGES:

- Potential hydraulic effects

DISCUSSION:

The existing proposed bridge lengths are:

<u>Bridge</u>	<u>Existing</u>	<u>Proposed</u>
• Greasy Branch	96 ft.	240 ft.
• Little Alligator Creek	72 ft.	400 ft.
• Big Alligator Creek	144 ft.	1,120 ft.

The bridge lengths are being increased by factors of 2.5 (Greasy Branch), 5.56 (Little Alligator Creek) and 8.33 (Big Alligator Creek). As no hydraulic data was made available to the VE team, it is impossible to know if shortening the bridges is hydraulically feasible. However, since in all cases the proposed bridges are several times the length of the existing bridges, it appears that the bridges could be shorter. Also, with bridges this long, substantially larger flows will reach the railroad drainage structures, possibly overtopping and/or damaging them.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **B-2**
Ware County, Georgia

DESCRIPTION: **LENGTHEN BRIDGE SPANS FROM 40 FT. TO 50 FT. IN PROJECT EDS-84(26)** SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

Each of the bridges is made up of multiple 40-ft. spans using Type I-modified PSC beams, a concrete deck and pile intermediate bents.

ALTERNATIVE:

Use 50-ft. spans in lieu of 40-ft. spans.

ADVANTAGES:

- Reduces cost
- Reduces spans
- Reduces intermediate bents
- Accelerates construction

DISADVANTAGES:

- Requires the Greasy Branch Bridge to be 10 ft. longer than in the original design

DISCUSSION:

As designed, there are five intermediate bents at Greasy Branch, nine at Little Alligator Creek, and 29 at Big Alligator Creek, for a total of 43 bents. Increasing the span length reduces these numbers to 4, 7 and 23, respectively, for a total of 34 bents. The bridge length at Greasy Creek would be increased by 10 ft. to allow for 50-ft. spans. This alternative would save money by reducing the number of and quantities for intermediate bents. Construction time would be lessened because fewer spans and intermediate bents would be required. Type I-modified PSC beams would be used for the 50-ft. spans as for the 40-ft. spans. The increased span length would marginally increase the number of strands in the beams. It is assumed that the cost for this would be negligible.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,178,530	—	\$ 1,178,530
ALTERNATIVE	\$ 943,841	—	\$ 943,841
SAVINGS (Original minus Alternative)	\$ 234,689	—	\$ 234,689

CALCULATIONS



PROJECT: EDS-84-(26) & EDS-84-(27)
Georgia Department of Transportation

ALTERNATIVE NO.:

B-2

SHEET NO.: 2 of 4

THE CAP QUANTITY WILL BE THE SAME FOR THE ORIGINAL DESIGN AND THE ALTERNATIVE.

$$\text{VOLUME} = 2(3)(39)/27 = 8.67 \text{ CY/CAP}$$

$$\text{REINF @ } 110 \#/\text{CY} = 953 \#/\text{CAP}$$

ASSUME PILE LENGTHS OF 50',
10' ABOVE GROUND, 40' IN GROUND.

PSC PILES

USE 14" PILES FOR 40' SPANS,

16" PILES FOR 50' SPANS

$$\text{PILING} = 5(50) = 250 \text{ LF/CAP}$$

ADDITIONAL BRIDGE AREA @

$$\text{GREASY BRANCH} = 41.25(10)$$

$$= 413 \text{ SF}$$

GREASY BRANCH INT. BENT QUANTITIES

$$\text{CLA CONC } 5(8.67) = 43.3 \text{ ORIGINAL}$$

$$4(8.67) = 34.7 \text{ ALTERNATIVE}$$

$$\text{REINF } 5(953) = 4765 \text{ ORIGINAL}$$

$$4(953) = 3812 \text{ ALTERNATIVE}$$

CALCULATIONS



PROJECT: **EDS-84-(26) & EDS-84-(27)**
Georgia Department of Transportation

ALTERNATIVE NO.: **B-2**

SHEET NO.: **3** of **4**

PILING	14"	5(250) = 1250	ORIGINAL
	16"	4(250) = 1000	ALTERNATIVE

LITTLE ALLIGATOR CREEK

CL A CONC	9(8.67) = 78.0	ORIG.
	7(8.67) = 60.7	ALT.

REINF	9(953) = 8577	ORIG.
	7(953) = 6671	ALT.

14" PILING	9(250) = 2250	ORIG.
16" PILING	7(250) = 1750	ALT.

BIG ALLIGATOR CREEK

CL A CONC	29(8.67) = 251.4	ORIG.
	23(8.67) = 199.6	ALT.

REINF	29(953) = 27637	ORIG.
	23(953) = 21919	ALT.

14" PILING	29(250) = 7250	ORIG.
	23(250) = 5750	ALT.

PARALLEL BRIDGES SO DOUBLE ALL
QUANTITIES

COST WORKSHEET



PROJECT: **EDS-84-(26) & EDS-84-(27)**
 Georgia Department of Transportation

ALTERNATIVE NO.:

SHEET NO.:

B-2
4 of 4

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
GREAT BRANCH							
PIERCE AREA	SF	0	-	0	826	60	49,560
CL A CONC	CY	86.6	574.82	49,779	69.4	574.82	39,893
REINF STEEL	LB	9530	0.94	8958	7624	0.94	7167
14" PILING	LF	1250	52.64	65,800	0	-	0
16" PILING	LF	0	-	0	1000	48.59	48,590
GREAT BRANCH SUBTOTAL				124,537			145,210
LITTLE ALLIGATOR CR							
CL A CONC	CY	156	574.82	89,672	121.4	574.82	69,783
REINF STEEL	LB	17154	0.94	16,125	13342	0.94	12,541
14" PILING	LF	2250	52.64	118,440	0	-	0
16" PILING	LF	0	-	0	1750	48.59	85,032
L. ALLIGATOR CR SUBTOTAL				224,237			167,356
BIG ALLIGATOR CR							
CL A CONC	CY	502.8	574.82	289,019	391.2	574.82	224,870
REINF STEEL	LB	55274	0.94	51,958	43838	0.94	41,208
14" PILING	LF	7250	52.64	381,640	0	-	0
16" PILING	LF	0	-	0	5750	48.59	279,993
BIG ALLIGATOR CR SUBTOTAL				722,617			545,471
Subtotal				1,071,391			858,037
Markup (%) at 10				107,139			85,804
TOTAL				1,178,530			943,841

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **B-4**
Ware County, Georgia

DESCRIPTION: **REVIEW HYDROLOGY OF BRIDGES IN PROJECT EDS-84(26)** SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

Bridges many times longer than the existing bridges are proposed. (See Alt. No. B-1.)

ALTERNATIVE:

Consider effects of longer bridges on hydraulics, wetlands, and downstream railroad structures.

ADVANTAGES:

- Right-sizes the bridges to eliminate negative effects, such as floods passing more quickly

DISADVANTAGES:

- None apparent

DISCUSSION:

Increasing the bridge lengths from the existing lengths will pass flood flows much more quickly. Water that currently backs up at the existing structures providing moisture for wetlands will not be retained, possibly decreasing wetland area. Because the downstream railroad drainage structures are likely similar to or smaller than the existing highway structures, they may impede the flow and cause backwater issues and/or cause overtopping of the railroad or damage to the railroad drainage structures.

Furthermore, water backing up at the railroad structures could convert areas to wetlands. This could be detrimental to the current land use. These issues should be investigated in relation to the longer proposed bridge lengths.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **CM-2**
Ware County, Georgia

DESCRIPTION: **ADVANCE RAILROAD REVIEWS AND COORDINATION TIME FRAME** SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

The design team has not commenced coordination with the CSX Railroad.

ALTERNATIVE:

Coordinate early and often with the railroad to determine constraints early in project development.

ADVANTAGES:

- Provides early understanding of constraints
- Reduces project delays
- Determines safety measures required
- Determines possible construction constraints

DISADVANTAGES:

- Railroad review and coordination time frames are lengthy

DISCUSSION:

Delays due to railroad coordination issues can be lengthy and should be started at the beginning of the project. Certain issues may require major design changes to the project, also best completed early in the project. Understanding of additional costs associated with any changes.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27)** ALTERNATIVE NO.: **CM-3**
Ware County, Georgia

DESCRIPTION: **ALTERNATIVE BID PACKAGING OF PROJECTS EDS-84(26) AND EDS-84(27)** SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

Two separate contracts with separate let dates appear to be proposed at this time.

ALTERNATIVE:

Advertise both construction contracts simultaneously to allow bidders to bid on one of the contracts or both.

ADVANTAGES:

- Reduces construction costs
- Allows both small and large firms to bid competitively
- Contract site decision is left to the industry

DISADVANTAGES:

- Requires both packages be completed simultaneously

DISCUSSION:

Contract plans, specifications and estimates can be organized so that the two contracts can be advertised and awarded as one or two separate contract bid documents.

This approach will allow the marketplace to dictate what the best contract packaging is.

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

PROJECT DESCRIPTION

OVERVIEW

EDS-84(26) & BHN-007-3(28) & HPPN-EDS-84(27) (P.I. No. 522770, 522775, & 522780) Ware County

The projects were the subject of the VE study carried out December 11 – 14, 2007 at GDOT's offices in Atlanta. These projects, part of the Governor's Road Improvement Program (GRIP), involve the multi-laning of US 84/SR 38, a primary east-west corridor in South Georgia, and are addressed within a 24-mile-long corridor environmental assessment (FONSI) that includes projects EDS-84(23) and BHN-007-3(25) to the west.

EDS-84(26) and BHN-007-3(28) begin at the end terminus of EDS-84(23), approximately 900 ft. west of Greasy Branch with widening on the south side, adding a 32-ft. depressed grassed with two 12-ft. lanes of pavement, while using the existing right-of-way on the north side of US 84/SR 38. It would continue to approximately seven miles east to its ending terminus with HPPN-EDS-84(27), approximately 3,600 ft. west of CR 88/Ruskin Road. Five residential displacements and one commercial displacement will be required. The construction cost estimate is \$29,638, 261 with right-of-way costs of \$2,262,000.

BHN-007-3(28) proposes to reconstruct the US 84/SR 38 bridges over Greasy Branch, Little and Big Alligator Creeks. The project will involve replacing the existing structures while addressing new hydraulic requirements. The three bridges are within the project limits of EDS-84(26). The proposed bridges consist of multiple 40-ft. spans using Type I- Modified PSC beam, concrete decks and pile intermediate bents.

The bridge lengths are as follows:

<u>Bridge</u>	<u>Existing</u>	<u>Proposed</u>
• Greasy Branch	96 ft.	240 ft.
• Little Alligator Creek	72 ft.	400 ft.
• Big Alligator Creek	144 ft.	1,120 ft.

The construction cost estimate for the replacement of existing bridges with parallel, longer bridges is \$10,067,548.

HPPN-EDS-84(27) will commence from the ending terminus of EDS-84(26) at a location 3,600 ft. west of CR 88/Ruskin Road to approximately 125 ft. east of the Wadley Glenmore/SR 53 connector intersection, a distance of approximately 5.3 miles. The proposed alignment will follow the existing highway for approximately 200 ft. from the beginning terminus with a 32-ft. median and two 12-ft. lanes, before turning south on new location to avoid several eligible historical sites in Wahoma. The new location section would then proceed on a southeastern heading for approximately 2,500 ft. then turn eastward, with its southern right-of-way bordering the CSX Railroad right-of-way. The new

roadway would transition to a 44-ft. depressed median typical section approximately 500 ft. west of CR 411/Griffin Road, while continuing to hold the CSX Railroad right-of-way until the project crosses CR 611/13th Street. The project continues to parallel the railroad to east of 5th Street, where the alignment bears northeast until connection with the existing US 84, the roadway transitions to an urban four-lane 14-ft. flush median typical section. The urban 14-ft. flush median typical section continues along existing US 84 from approximately 1,500 ft. west of CR 527/Popham Road to approximately CR 290/Oregon Avenue, where the alignment turns southeast on to new location. The urban median typical section continues on new location to approximately CR 112/New Mexico Avenue, where the project transitions to a rural four-lane 14-ft. flush median section. The rural 14-ft. flush median typical section continues on new location south of the existing US 84 to approximately 200 ft. north of Idaho Avenue., where the alignment turns north. As the alignment turns northward, the typical section transitions to a 14-ft flush median urban section, which continues to the end of the project. Throughout this portion of the project, the existing CR 286 right-of-way located approximately 300 ft. south of US 84/SR 38 would be used. Project HPPN-EDS-84(27) ends approximately 550 ft. west of CR 287 at the intersection of Wadley Glenmore and the SR 53 Connector. The total length of the concept is 5.3 miles.

Fourteen residential displacements, two commercial displacements, and 31 mobile homes will be required. The construction cost estimate is \$18, 131, 287 with a right-of-way cost of \$10,281,980.

The projects are expected to be let as two separate contracts: EDS-84(26)/BHN-007-3(28) and HPPN-EDS-84(27).

ENVIRONMENTAL DOCUMENT

**EDS-84(23), BHN-007-3(25), EDS-84(26), BHN-007-3(28), & HPPN-EDS-84(27)
(P.I. No. 422120, 422125, 522770, 522775, and 522780) Clin. and Ware Counties**

Project Need and Purpose

The US 84/SR 38 improvements will serve as a catalyst for the development of this region. The improvements will aid in the economic development of sparsely populated rural areas and small towns along this route. Traffic carrying capacity will be increased, and safety and operational characteristics along this segment will be improved.

Environmental Document Project Description

The preferred alternative will widen and reconstruct US 84/SR 38 from east of the Homerville city limits in Clin County and will continue northeastward to the intersection with SR 53 Connector in Waycross in Ware County. The existing two-lane highway will be widened and reconstructed to a four-lane, divided facility with a center median. At several different locations, a flush median typical section is used to reduce impacts. The city of Argyle Bypass and the Wahoma Bypass are also being proposed.

Beginning east of the bridge over Peters Branch, the alignment will shift onto a new location around the City of Argyle, north of the existing highway, to avoid impacts to historical structures situated along the north and south side of US 84 within the city limits of Argyle. At the beginning terminus of

EDS-84(27), the roadway shifts south of Wahoma to avoid historical structures located on the north and the south sides of the existing road. After connecting again with US 84/SR 38, the proposed roadway shifts south again onto new location, at CR 290/Oregon Avenue in the town of Emerson Par., and continues on a new location until the project reaches the end terminus.

Project BHN-0007-3(25), Ware County, is the proposed replacement of the US 84/SR 38 bridge over Suwannee Creek.

Project BHN-007-3(28), Ware County, is proposed to reconstruct the US 84/SR 38 bridges over Greasy Branch, Little and Big Alligator Creeks. The project will involve replacing the existing structures while addressing new hydraulic requirements.

The total length of the proposed project corridor is approximately 24 miles. The existing right-of-way width varies from 60 to 100 ft. but is typically 80 ft. wide. The proposed right-of-way widths will vary from a total of 100 to 250 ft., but are typically from 170 to 200 ft. wide.

The No-Build Alternative will not fulfill the purpose and need for the project and will result in a failure to provide adequate transportation support for the existing and future economic growth of this area, nor does it address the travel safety needs of the present roadway network. It will not be consistent with the regional land use planning recommendations and guidelines, including the GRIP and the Clin. County and Ware County Comprehensive Plans.

Environmental Document Impacts

The following information gives a summary of the corridor environmental assessment, leading to a FONSI, prepared by Georgia Department of Transportation in 1986, in compliance with the 1969 National Environmental Policy Act. It includes an assessment of the social, economic and environmental effects for the proposed widening and reconstruction of US 84/SR 38 from east of Homerville in Clin. County, to the SR 53 Connector intersection in Waycross in Ware County.

Approximately 63 residential units and 13 businesses will be displaced by the proposed project. The roadway will be placed closer to remaining residences, and loss of yard area will occur. The proposed project will result in the loss of both residential and business frontage as well as some business parking.

In accordance with Executive Order 11990, the project was surveyed for wetland and stream involvement and was found to have 147.81 acres of wetlands and 0.37 acre of jurisdictional pond habitat that will be impacted by the proposed project. The Georgia Department of Transportation will be mitigating the impacts to the wetland mitigation for this project. The Department is searching for land for wetland mitigation, in the form of degraded wetlands with the following criteria:

1. must be relatively near the project (no greater than ten miles),
2. must not be existing wetlands or swamp (potential restoration areas should show signs of being previously ditched or drained or converted to non-wetland use such as agriculture or silviculture), and
3. must be easily accessible by local or state roads.

In accordance with Executive Order 11988, the proposed project was surveyed for floodplain involvement. The proposed project passes through a 100-year flood plain in the vicinity of Woodyard

Creek, Woodyard Creek Overflow, Cane Creek, Peters Branch, Polly Branch, Box Creek, Little Suwanee Creek, Suwanee Creek, Greasy Branch Creek, Little Alligator Creek and Alligator Creek. The project will not have an adverse effect on water quality within the project corridor. A U.S. Army Corps of Engineers Section 404 permit will be required for this project.

The proposed project will not exceed state and federal air quality standards, and it is consistent with the State Implementation Plan for the attainment of clean air quality in the state.

The construction of this project will result in a 1.0 to 8.0 decibel increase in traffic generated noise by the design year 2027, and five houses will approach or exceed the noise abatement criteria. No feasible noise abatement measures were identified for the houses.

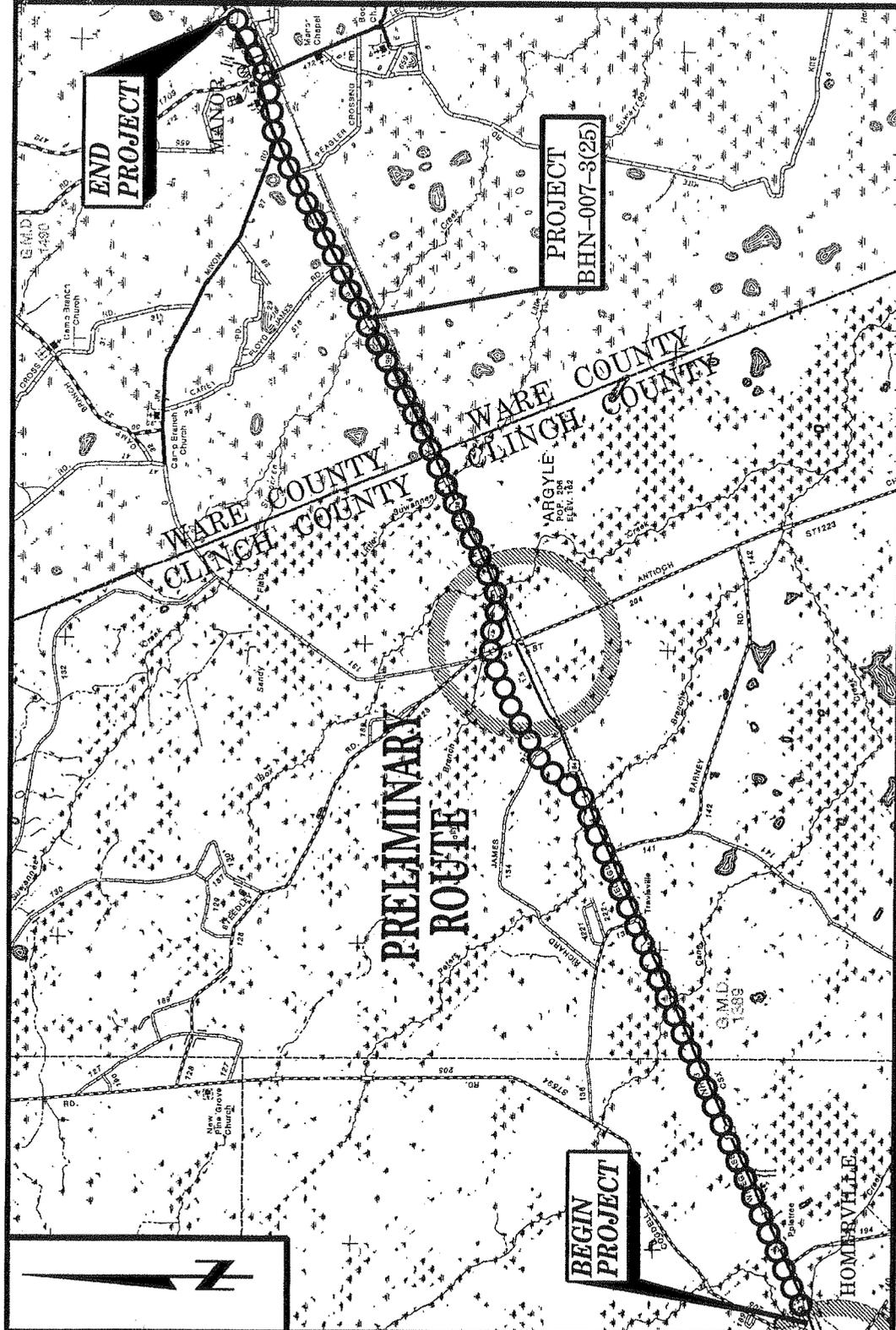
In compliance with Section 106 of the National Historic Preservation Act of 1966, the project has been surveyed for existing and eligible National Register properties. No existing or eligible historic or archaeological resources were found to be located within the project's area of potential environmental effect.

The proposed project will not affect any threatened or endangered plant or wildlife species, as none are located in or frequent the project area. The project will not involve any farmland as defined in the Farmland Protection Policy Act, 7 CFR Part 658, due to the land in this corridor being in or committed to urban development.

In accordance with the Farmland Protection Policy Act, the criteria of 7 CFR, Part 658 have been applied to determine project effects on farmland. Based on the assessment of these effects, no additional alternates need to be examined.

The proposed project has been surveyed for potential sites where contaminated soil and/or water from leaking underground storage tanks may exist. The two potential sites that were identified are being further investigated. If contaminants are found, avoidance alternates may be considered, or applicable laws and regulations concerning the removal of toxic or hazardous material will be coordinated with the Environmental Protection Division.

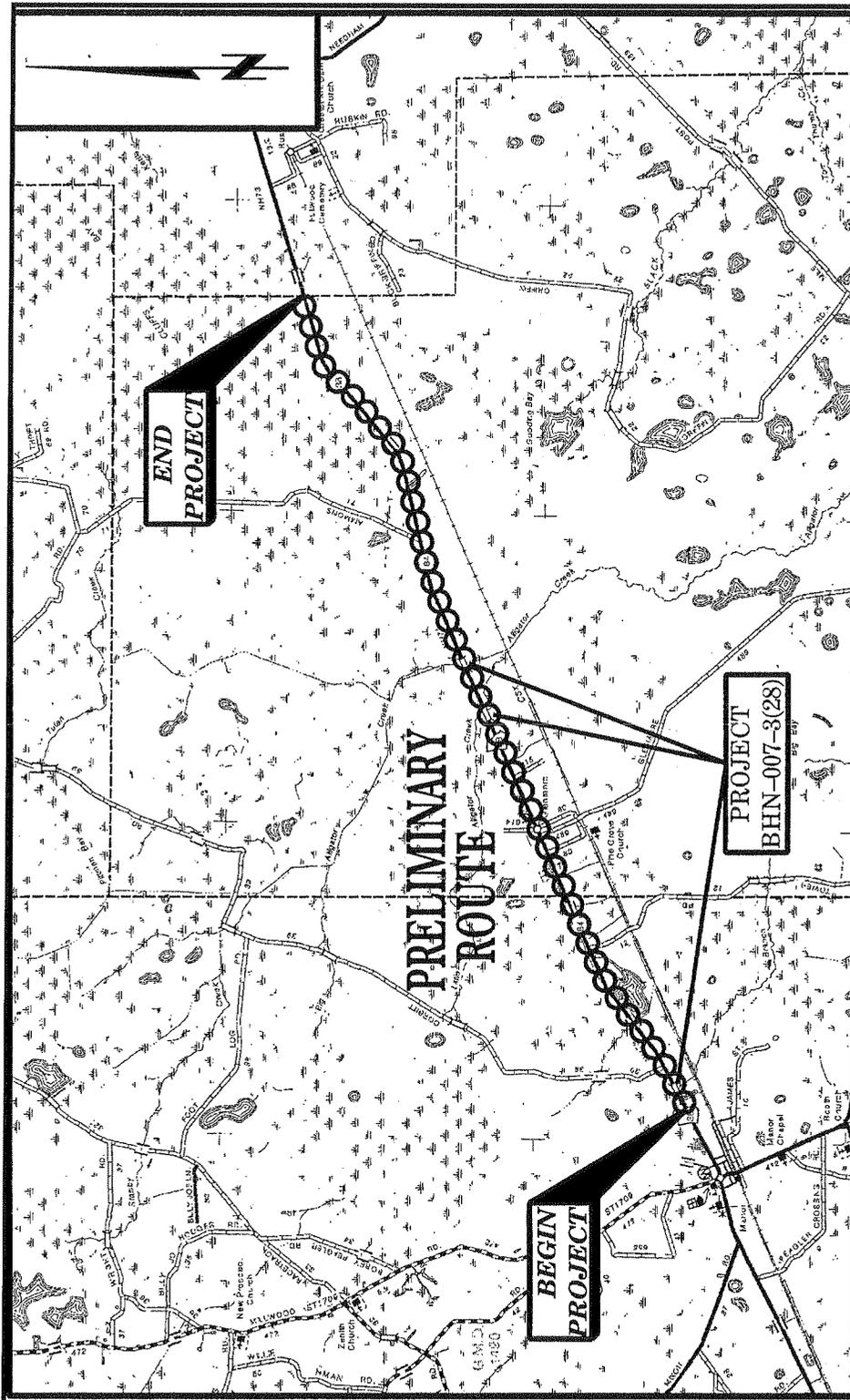
The following three pages show the strip map of the 24 miles of the corridor improvements.



STRIP MAP
EDS-84(23) & BHN-007-3(25)
US 84 / SR 38 IMPROVEMENTS
CLINCH/WARE COUNTIES
P.I.# 422120 & 422125

06/24/2004

 **LOCATION**



STRIPMAP

EDS-84(26) & BHN-007-3(28)
 US 84SR 38 IMPROVEMENTS
 WARE COUNTY
 P.I.# 522770 & 522775

June 29, 2004

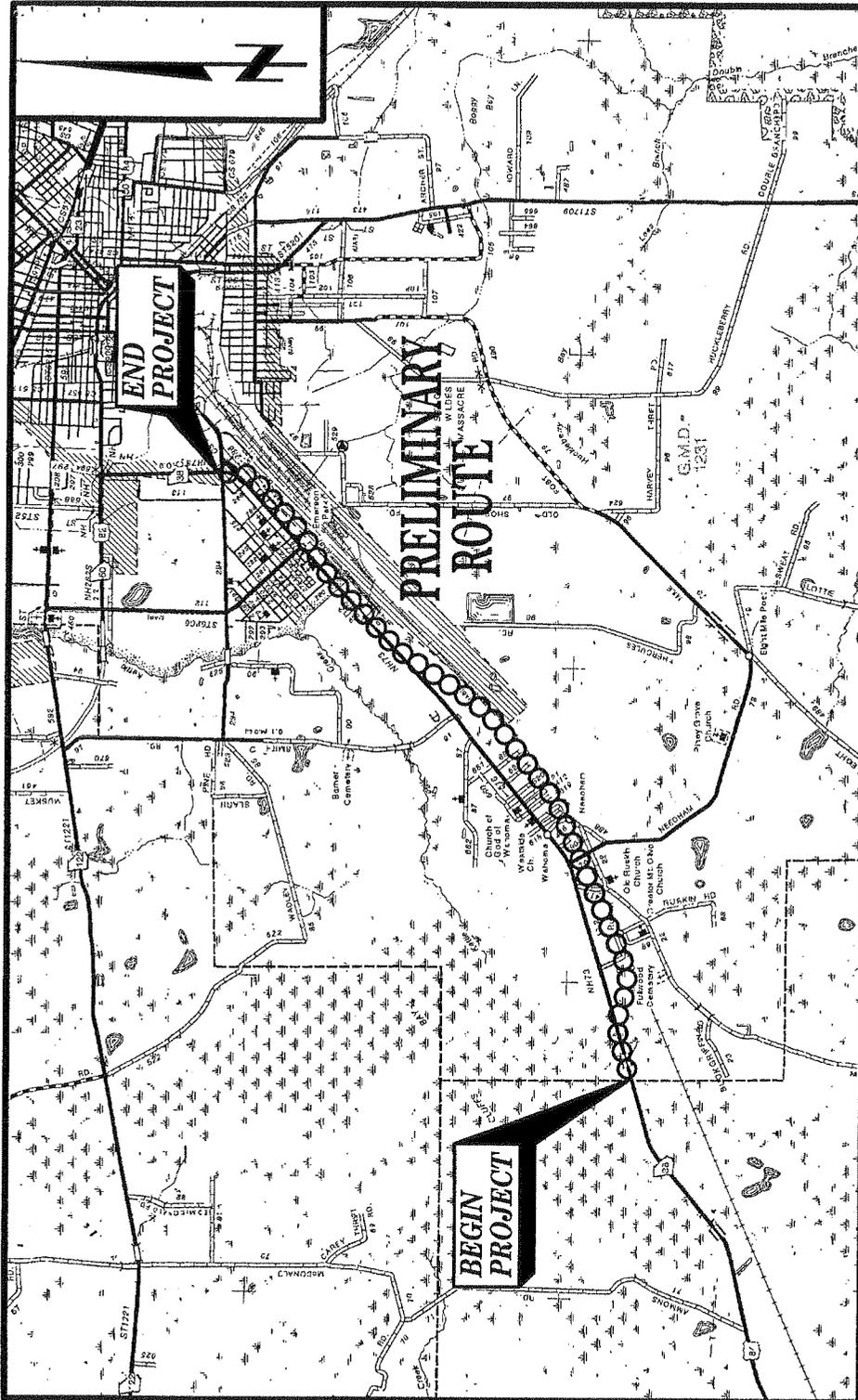


LOCATION

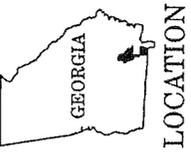


SCALE IN MILES

SOURCE: GENERAL HIGHWAY MAP WARE CO. GEORGIA
 PREPARED BY THE GEORGIA DEPARTMENT OF TRANSPORTATION, 1988



STRIP MAP
 HPPN-EDS-84(27)
 US 84/SR 38 IMPROVEMENTS
 WARE COUNTY
 P.I.# 522780



SOURCE: GENERAL HIGHWAY MAP, WARE COUNTY, GEORGIA
 PREPARED BY THE GEORGIA DEPARTMENT OF TRANSPORTATION, 1999

06242204

PROJECT DESCRIPTION EDS-84(26)

Project Location

The proposed concept would be located along US 84/SR 38 in Ware County beginning approximately at mile post 3.9 and ending around mile post 12.6. The total length of the project is expected to be 8.7 miles. This project ties into EDS-84(23) at the beginning terminus and EDS-84(27) at the ending terminus.

Description of the approved concept

The project would begin approximately 900 ft. west of Greasy Branch and would widen US 84/SR 38 on the south side, adding a 44-ft. depressed grass median with two 12-ft. lanes of pavement, while the existing right-of-way on the north side of US 84/SR38. It would continue to approximately 1,850 ft. east of CR 615/Sutton Lane. At that point, the median narrows to a 32-ft. depressed grass median and would continue eastward to about 2,300 ft. west of CR 71/Ammons Road. The 32-ft. depressed grass median complies with the agreement between the Department and coordinating federal resource agencies to reduce impacts to wetlands. From there, the median widens to 44 ft. and continues to approximately 2,600 ft. east of CR 71/Ammons Road. At that point, the median narrows to 32 ft. and continues eastward 3,700 ft. The alignment would then shift to the north side while holding the existing right-of-way on the south side of US 84/SR 38 and would continue for about 1,000 ft. east of CR 88/Ruskin Road. There, the median widens to 44 ft. and the alignment would shift to the south side of US 84/SR 38 and continue to the end of the project at CR 79/Needham Road. Through this section, it is proposed to construct four new 12-ft. lanes, while holding the existing right-of-way on the north side. This concept would avoid a historical site along the north side of US 84/SR 38. The existing bridges at Greasy Branch Creek, Little Alligator Creek and Big Alligator Creek would be widened and new ones built parallel to the existing bridges. Additional required right-of-way would vary from 70 ft. to 118 ft. The speed design is 65 mph.

PROJECT INFORMATION SHEET

Project Name:	S.R. 38/U.S. 84 Improvments from west of Greasy Branch Creek to west of CR 88/Ruskin Road
Project No.:	EDS-84(26) Ware
P.I. No.:	522770
Speed Design:	65 mph (depressed median)
Typical Section(s):	4 lanes w/32 ft. depressed median - Rural
Existing R/W:	100 Feet
Proposed R/W:	Varies from 190 to 250 Feet
Access Control:	By Permit
Current Traffic:	7200 ADT (2007)
Design Year Traffic:	11,500 ADT (2027)
Length:	7.0 miles
Displacements:	5 Residential and 1 Commercial
Construction Cost Estimate:	\$24,572,000
Right-of-Way Estimate:	\$1,605,000
Utilities Cost Estimate:	N/A
R/W Acquisition Date:	2008
Construction Date:	2010

PD Classification: Major/Construction on existing roadway and new construction

Federal Oversight: Full Oversight (), Exempt (X), State Funded (), or Other ()

Functional Classification:

U.S. Route Number(s): 84 State Route Number(s): 38

PROJECT DESCRIPTION HPPN-EDS-84(27)**Project Location**

Project HPPN-EDS-84(27) in Ware County, would widen and reconstruct US 84/SR 38 from approximately 3,600 ft. west of CR 88/Ruskin Road on US 84/SR 38 to approximately 5.6 miles. This project ties into the EDS-84(26) at the beginning terminus.

Description of Approved Concept (Includes 2004 Revision)

HPPN-EDS-84(27) will commence from the ending terminus of EDS-84(26) at a location 3600 ft. west of CR 88/Ruskin Road to approximately 125 ft. east of the Wadley Glenmore/SR 53 connector intersection, a distance of approximately 5.3 miles. The proposed alignment begins will follow the existing highway for approximately 200 ft. from the beginning terminus with a 32-ft. median and two 12-ft. lanes, before turning south on new location to avoid several eligible historical sites in Wahoma. The new location section would then proceed on a southeastern heading for approximately 2500 ft. then turn eastward, with it's southern right-of-way bordering the CSX Railroad right-of-way. The new roadway would transition to a 44-ft. depressed median typical section approximately 500 ft. west of CR 411/Griffin Road, while continuing to hold the CSX Railroad right-of-way until the project crosses CR 611/13th Street. The project continues to parallel the railroad to approximately ft.

east of 5th Street, where the alignment bears northeast until connection with the existing US 84, the roadway transitions to an urban four lane 14-ft. flush median typical section. The urban 14-ft. flush median typical section continues along existing US 84 from approximately 1500 ft. west of CR 527/Popham Road to approximately CR 290/Oregon Avenue, where the alignment turns southeast on to new location. The urban 14-ft. median typical section continues on new location to approximately CR 112/New Mexico Avenue, where the project transitions to a rural four lane 14-ft. flush median section. The rural 14-ft. flush median typical section continues on new location south of the existing US 84 to approximately 200 ft. north of Idaho Avenue., where the alignment turns north. As he alignment turns northward, the typical section transitions to a 14-ft flush median urban section, which continues to the end of the project. Throughout this portion of the project, the existing CR 286 right-of-way located approximately 300 ft. south of US 84/SR 38 would be utilized. Project HPPN-EDS-84(27) ends approximately 550 ft. west of CR 287 at the intersection of Wadley Glenmore and the SR 53 Connector. The total length of the concept is 5.3 miles.

Fourteen residential displacements, two commercial displacement and thirty-one mobile homes will be required. Construction Cost Estimate \$18, 131, 287/Right-of-way Cost Estimate \$10,281,980.

PD Classification: Major/Construction on existing location

Federal Oversight: Full Oversight (), Exempt (X), SF (), Other ()

Functional Classification: Rural Principal Arterial

U.S. Route Number(s): 84

State Route Number(s): 38

Traffic (AADT) as shown in the approved concept:			
Current Traffic		Design Traffic	
Year: 2005	AADT: 12,500	Year: 2025	AADT: 19,750
Proposed Features to be Revised:			
• Typical Section:			
○ The urban 14-foot flush median typical sections are recommended to be revised due to the addition of bike lanes and to meet current GDOT and ADA policies regarding shoulder widths. This section of US 84 has been designated as a bike corridor by the Southeast Regional Development Center.			
• Right-of-Way:			
○ Additional right-of-way is required in order to add the required bike lanes and shoulders along the proposed urban 14-foot flush median typical section portions of the project.			
Describe Revisions to be Approved:			
• Typical Section:			
○ The urban 14-foot flush median typical section is recommended to be revised for an acceptable width according to Department guidelines. This would make the proposed shoulder width 16 feet where applicable. Four feet of additional pavement along the outside edges of the travelway would be added for bicycle accommodations (eight feet total additional pavement).			
• Right-of-Way:			
○ The additional shoulder width and bike lanes require that the proposed right-of-way be widened to approximately 120 feet along the proposed urban 14-foot flush median typical section portions of the project.			
Updated Traffic Data (AADT):			
Current Traffic		Design Traffic	
Year: 2012	AADT: 9,100	Year: 2032	AADT: 14,000

PROJECT DESCRIPTION BHN-007-3(28)

BHN-007-3(28) proposes to reconstruct the US 84/SR 38 bridges over Greasy Branch, Little and Big Alligator Creeks. The project will involve replacing the existing structures while addressing new hydraulic requirements. The three bridges are within the project limits of EDS-84(26). The proposed bridges consist of multiple 40- ft. spans using Type I- Modified PSC beam, concrete decks and pile intermediate bents.

The bridges lengths for the bridges as follows:

<u>Bridge</u>	<u>Existing</u>	<u>Proposed</u>
• Greasy Branch	96 ft.	240 ft.
• Little Alligator Creek	72 ft.	400 ft.
• Big Alligator Creek	144 ft.	1,120 ft.

PROJECT INFORMATION SHEET

Project Name:	S.R. 38/U.S. 84 Improvements from west of CR 88/Ruskin Road to east of SR 38 Connector
Project No.:	EDS-84(27) Ware
P.I. No.:	522780
Speed Design:	65 mph (depressed median) 45 mph (flush median)
Typical Section(s):	4 lanes w/32 ft. depressed median - Rural 4 lanes w/14 ft. flush median - Urban
Existing R/W:	Varies from 65 to 100 feet
Proposed R/W:	Varies from 100 to 250 feet
Access Control:	By Permit (Existing) Partial Limited (New Location)
Current Traffic:	12,500 ADT (2005)
Design Year Traffic:	19,750 ADT (2025)
Length:	5.6 miles
Displacements:	14 Res, 2 Comm., 31 Mobile Homes
Construction Cost Estimate:	\$18,131,000
Right-of-Way Estimate:	\$7,545,000
Utilities Cost Estimate:	N/A
R/W Acquisition Date:	2008
Construction Date:	2010

PROJECT INFORMATION SHEET

Project Name:	Bridge Replacements at SR 38/US 84 over Greasy Branch - Little and Big Alligator Creek
Project No.:	BHN-007-3(28) Ware
P.I. No.:	522775
Speed Design:	65 mph (depressed median)
Typical Section(s):	4 lanes w/32 ft. depressed median - Rural
Existing R/W:	100 Feet
Proposed R/W:	Varies from 190 to 220 Feet
Access Control:	By Permit
Current Traffic:	7200 ADT (2007)
Design Year Traffic:	11,500 ADT (2027)
Length:	7.0 miles
Displacements:	5 Residential and 1 Commercial
Construction Cost Estimate:	\$5,067,000
Right-of-Way Estimate:	Incl. in Unit 26
Utilities Cost Estimate:	N/A
R/W Acquisition Date:	2008
Construction Date:	2010

GREASY BRANCH

Proposed bridge	
Minimum Hydraulic Design	
Bridge length (ft)	240
LCEL (ft)	154.9
PGL (ft)	158.83
Begin Station	12+76.7
End Station	15+16.7
Pier 1 Station	13+16.7
Pier 2 Station	13+56.7
Pier 3 Station	13+96.7
Pier 4 Station	14+36.7
Pier 5 Station	14+76.7
Downstream	
Contracted Section	
WSEL (ft) 50-yr	152.87
Approach subgrade elevation (ft)	153.9

Existing Bridge	
Bridge length (ft)	96
LCEL (ft)	152.9
PGL (ft)	156.9
Begin Station	13+53
End Station	14+49
Pier 1 Station	13+77.6
Pier 2 Station	14+1.6
Pier 3 Station	14+25.6
Downstream	
Contracted Section	
WSEL (ft) 50-yr	152.99

Table 1. WSEL at Approach Section (Cross Section 4561)				
	WSEL	Rise With Respect to		
		Natural	Existing	Proposed
Natural Conditions 50-year	152.87	N/A	-0.74	-0.37
Natural Conditions 100-year	153.4	N/A	-0.47	-0.42
Existing Conditions 50-year	153.61	0.74	N/A	0.37
Existing Conditions 100-year	153.87	0.05	N/A	0.05
Proposed Conditions 50-year	153.24	0.37	-0.37	N/A
Proposed Conditions 100-year	153.82	0.42	-0.05	N/A

Table 2. WSEL at Upstream Contracted Section (Cross Section 4154)				
	WSEL	Rise With Respect to		
		Natural	Existing	Proposed
Natural Conditions 50-year	152.82	N/A	-0.64	-0.25
Natural Conditions 100-year	153.37	N/A	-0.33	-0.26
Existing Conditions 50-year	153.46	0.64	N/A	0.39
Existing Conditions 100-year	153.7	0.07	N/A	0.07

Proposed Conditions 50-year	153.07	0.25	-0.39	N/A
Proposed Conditions 100-year	153.63	0.26	-0.07	N/A

LITTLE ALLIGATOR CREEK

Proposed bridge	
Little Alligator Creek	
Minimum Hydraulic Design	
Bridge length (ft)	400
LCEL (ft)-NAVD	150.03
PGL (ft)-NAVD	154.06
Begin Station	182+40
End Station	186+40
Pier 1 Station	182+80
Pier 2 Station	183+20
Pier 3 Station	183+60
Pier 4 Station	184+00
Pier 5 Station	184+40
Pier 6 Station	184+80
Pier 7 Station	185+20
Pier 8 Station	185+60
Pier 9 Station	186+00
Downstream Contracted Section	
WSEL (ft) 50-yr	148.03
Approach subgrade elevation (ft)	149.1

Existing Bridge	
Little Alligator Creek	
Bridge length (ft)	72
LCEL (ft)-NAVD	146.4
PGL (ft)-NAVD	152.2
Begin Station	184+27
End Station	184+99
Pier 1 Station	184+51
Pier 2 Station	184+75
Downstream Contracted Section	
WSEL (ft) 50-yr	148.03

Table 1. WSEL at Approach Section (Cross Section 6235)				
	WSEL	Rise With Respect to		
		Natural	Existing	Proposed
Natural Conditions 50-year	148.04	N/A	-0.64	-0.08
Natural Conditions 100-year	148.27	N/A	-0.09	-0.12
Existing Conditions 50-year	148.68	0.64	N/A	0.56
Existing Conditions 100-year	148.36	0.09	N/A	-0.03
Proposed Conditions 50-year	148.12	0.08	-0.56	N/A
Proposed Conditions 100-year	148.39	0.12	0.03	N/A

Table 2. WSEL at Upstream Contracted Section (Cross Section 5893)				
	WSEL	Rise With Respect to		
		Natural	Existing	Proposed
Natural Conditions 50-year	148.02	N/A	-0.65	-0.05
Natural Conditions 100-year	148.25	N/A	-0.11	-0.09
Existing Conditions 50-year	148.67	0.65	N/A	0.6
Existing Conditions 100-year	148.36	0.11	N/A	0.02
Proposed Conditions 50-year	148.07	0.05	-0.6	N/A
Proposed Conditions 100-year	148.34	0.09	-0.02	N/A

BIG ALLIGATOR CREEK

Proposed bridge	
Big Alligator Creek	
Minimum Hydraulic Design	
Bridge length (ft)	1120
LCEL (ft)-NAVD	150
PGL (ft)-NAVD	154.03
Begin Station	199+25.4
End Station	210+45.4
Pier 1 Station	199+25.4
Pier 2 Station	200+05.4
Pier 3 Station	200+45.4
Pier 4 Station	200+85.4
Pier 5 Station	201+25.4
Pier 6 Station	201+65.4
Pier 7 Station	202+05.4
Pier 8 Station	202+45.4
Pier 9 Station	202+85.4
Pier 10 Station	203+25.4
Pier 11 Station	203+65.4
Pier 12 Station	204+05.4
Pier 13 Station	204+45.4
Pier 14 Station	204+85.4
Pier 15 Station	205+25.4
Pier 16 Station	205+65.4
Pier 17 Station	206+05.4
Pier 18 Station	206+45.4
Pier 19 Station	206+85.4
Pier 20 Station	207+25.4
Pier 21 Station	207+65.4
Pier 22 Station	208+05.4
Pier 23 Station	208+45.4
Pier 24 Station	208+85.4
Pier 25 Station	209+25.4
Pier 26 Station	209+65.4
Pier 27 Station	210+05.4
Downstream Contracted Section WSEL (ft) 50-yr	148.0
Approach subgrade elevation (ft) based on upstream contracted section	149.1

Existing Bridge	
Big Alligator Creek	
Bridge length (ft)	144
LCEL (ft)-NAVD	147.2
PGL (ft)-NAVD	153.2
Begin Station	204+18.4
End Station	205+62.4
Pier 1 Station	204+42.4
Pier 2 Station	204+66.4
Pier 3 Station	204+90.4
Pier 4 Station	205+14.4
Pier 5 Station	205+38.4
Downstream Contracted Section WSEL (ft) 50-yr	147.92

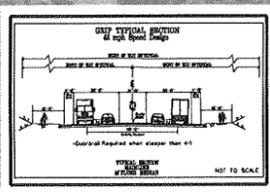
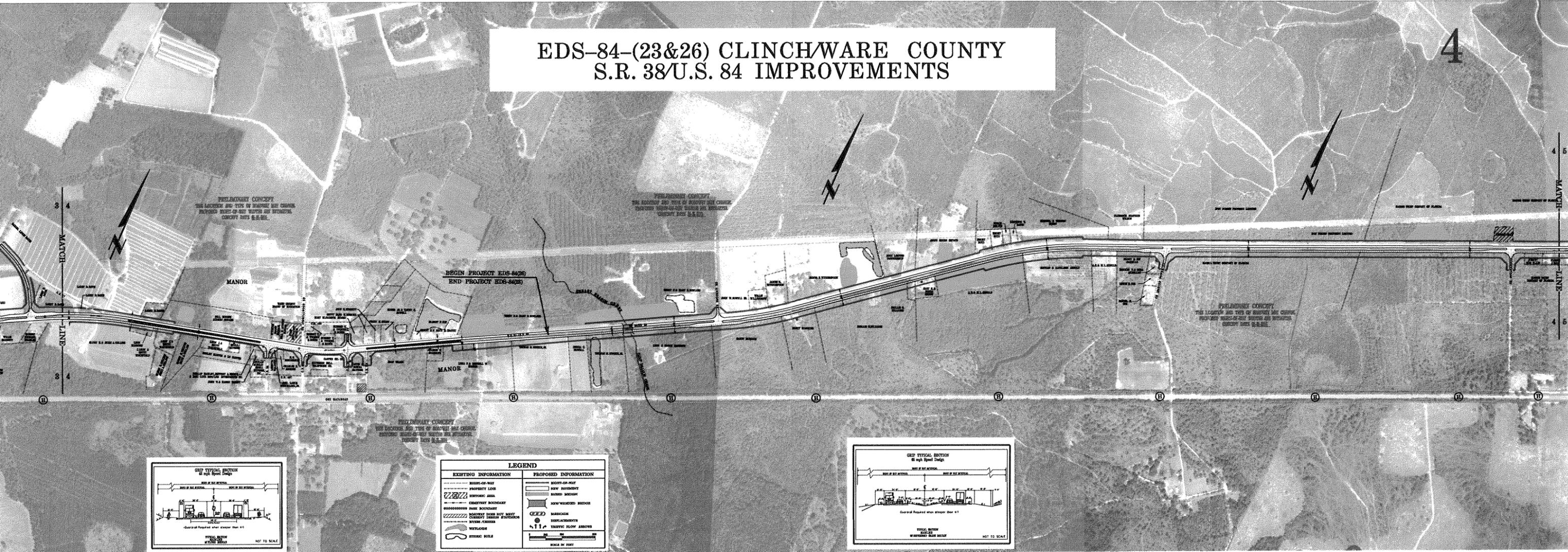
Table 1. WSEL at Approach Section (Cross Section 6232)				
	WSEL	Rise With Respect to		
		Natural	Existing	Proposed
Natural Conditions 50-year	148.1	N/A	-0.39	-0.26
Natural Conditions 100-year	148.38	N/A	-0.56	-0.3
Existing Conditions 50-year	148.49	0.39	N/A	0.13
Existing Conditions 100-year	148.94	0.56	N/A	0.26
Proposed Conditions 50-year	148.36	0.26	-0.13	N/A

Proposed Conditions 100-year	148.68	0.3	-0.26	N/A
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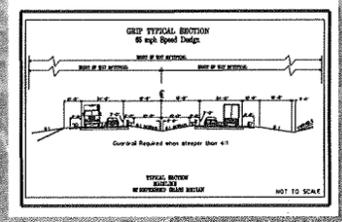
Table 2. WSEL at Upstream Contracted Section (Cross Section 5893)				
	WSEL	Rise With Respect to		
		Natural	Existing	Proposed
Natural Conditions 50-year	148.01	N/A	0.07	-0.08
Natural Conditions 100-year	148.25	N/A	-0.06	-0.1
Existing Conditions 50-year	147.94	-0.07	N/A	-0.15
Existing Conditions 100-year	148.31	0.06	N/A	-0.04
Proposed Conditions 50-year	148.09	0.08	0.15	N/A
Proposed Conditions 100-year	148.35	0.1	0.04	N/A

EDS-84-(23&26) CLINCH/WARE COUNTY S.R. 38/U.S. 84 IMPROVEMENTS

4

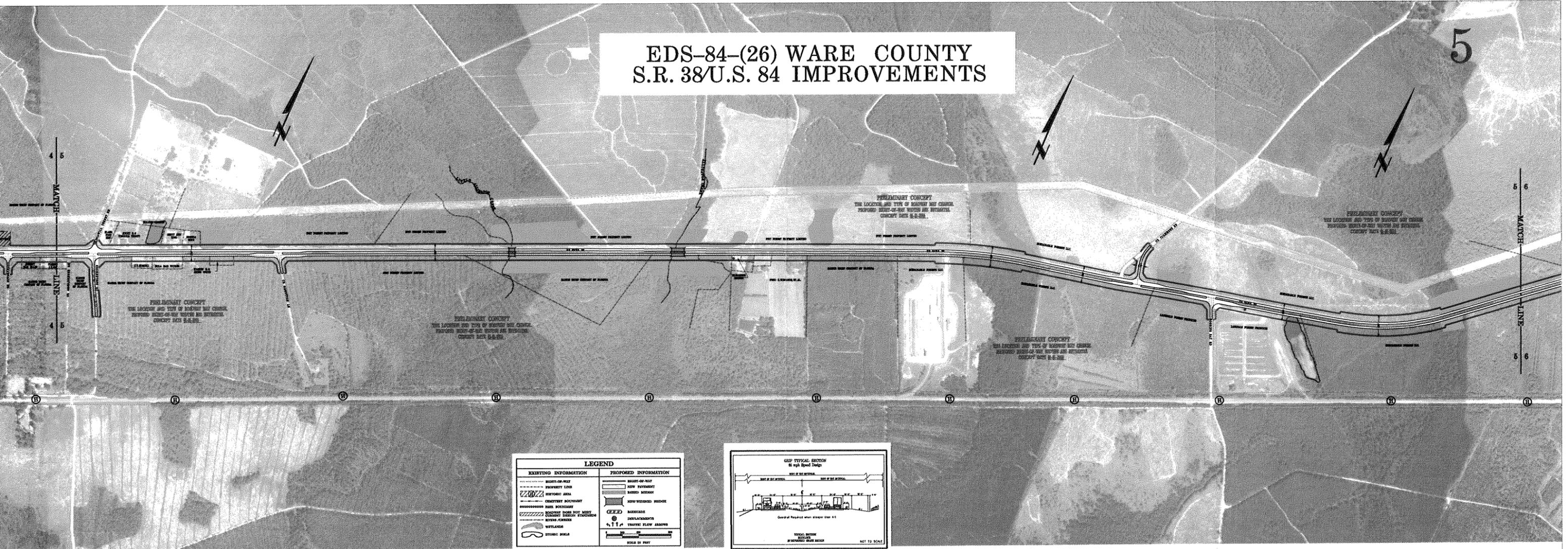


LEGEND	
EXISTING INFORMATION	PROPOSED INFORMATION
RIGHT-OF-WAY	NEW RIGHT-OF-WAY
PROPERTY LINE	EXISTING ROADWAY
WETLAND AREA	NEW WETLAND BRIDGE
COUNTY BOUNDARY	BRIDGE
STATE BOUNDARY	REPLACEMENT
HIGHWAY DOES NOT MEET CRITERIA FOR 4% GRADE	TRAFFIC FLOW ARROW
WETLAND AREA	SCALE IN FEET
WETLAND AREA	



EDS-84-(26) WARE COUNTY S.R. 38/U.S. 84 IMPROVEMENTS

5



VALUE ANALYSIS AND CONCLUSIONS

INTRODUCTION

This section describes the procedures used during the value engineering study on the US 84 Widening and Reconstruction, Projects EDS-84(26) and BHN-007-3(28) and HPPN-EDS-84(27), P.I. No. 522770, 522775, and 522780 conducted by Lewis & Zimmerman Associates for the Georgia Department of Transportation. The workshop was performed December 11 – 14, 2007 at GDOT's headquarters in Atlanta. EMC Engineering Services, Inc. is responsible for the development of the project and provided the information for the VE team to use as the basis of the study.

A systematic approach was used in the VE study and the key steps taken were organized into three distinct parts: 1) pre-study preparation; 2) VE orientation/kickoff meeting and workshop; and 3) post-study reporting and implementation. The attached task flow diagram outlines each of the procedures used in the VE study.

In the sections following the procedures, narratives and supporting documentation identify the following:

- Value Engineering Workshop Agenda
- Value Engineering Workshop Participants
- Economic Data used in the workshop
- Cost Model(s) developed for use in the workshop
- Function Analysis performed by the team
- Creative Ideas and Evaluation of the ideas performed by the team

PREPARATION EFFORT

A workshop format was used to conduct the study. Pre-study preparation for the workshop consisted of scheduling study participants and tasks and gathering necessary project documents to distribute to team members for review prior to attending the workshop. Throughout the study, the following documents were used as the basis for generating alternative approaches for achieving project functions:

A Policy on Geometric Design of Highways and Streets	ASSHTO	2004
Georgia Standard Specifications Construction of Transportation Systems	GDOT	2001
Item Mean Summary	GDOT	8/14/07
GDOT Policy Manual	GDOT	5/21/07
GDOT Bridge and Structures Design Policy Manual	GDOT Office of Bridge Design	4/07
Roadside Design Guide, 3 rd Edition	AASHTO	2006



Value Engineering Study Task Flow Diagram

Preparation Effort

Coordinate 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
- Verify Cost Data
- Team Members Become Familiar with Project

Construct Cost Models

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

LCC Model

- Process Areas
- Staffing
- Chemicals
- 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

Creative Phase

- Introduction by VETL
- Creative Idea Listing:
 - Quantity of Ideas
 - Association of Ideas
- Brainstorming
- Creative Thinking:
 - Group & Individual
- 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

- Prepare Preliminary 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

DESCRIPTION	PREPARED BY	DATE OF DOCUMENT
Project Plans EDS-84(26) Ware	EMC Engineering Services	11/21/07
Project Plans EDS-84(27) Ware	EMC Engineering Services	11/21/07
Corridor Environmental Assessment	GDOT	12/29/86
Preliminary Cost Estimate EDS-84(26)	EMC Engineering Services	12/3/07
Preliminary Cost Estimate EDS-84(27)	EMC Engineering Services	12/3/07
Preliminary Cost Estimate EDS-84(28)	EMC Engineering Services	7/6/06
Approved Revised Concept Report EDS-84(27)	GDOT	1/2/07
Right-of-way Cost Estimate EDS-84(26)	GDOT - Right-of-Way	12/11/07
Bridge Length Summary Sheets Greasy Branch, Little Alligator Creek Big Alligator Creek	J.B. Trimble	12/11/07
Revised Concept Report EDS-84(27)	GDOT	12/15/06
Revised Concept Report Approval EDS-84(276) and EDS-84(28)	GDOT	7/23/04
Preliminary Right-of-way Cost Estimate EDS-84(26) and EDS-84(27)	GDOT	4/25/06
Revised Project Concept Report Approval EDS-84(27)	GDOT	7/23/04
Project Concept Report EDS-84(27)	GDOT – OEL	6/1/99
Project Concept Report EDS-84(26)	GDOT – OEL	6/2/99

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 are very important as they provide the VE team with insight as to how the project has progressed to its current state.

Project cost data provided by the designers was used by the VE team as the basis for a comparative analysis with other similar projects. To prepare for this exercise, the VE team leader used the cost estimate prepared by GDOT to develop a cost model for the project. The model (described in the Cost Model section of this report) was used to distribute the total project cost among the various elements or functions comprising the project. The VE team used this data to identify the high cost elements or functions that drive the project and the elements or functions providing little or no value so that the team could effectively use its time and focus on reducing or eliminating the impact of those elements.

VALUE ENGINEERING WORKSHOP EFFORT

The VE workshop effort consisted of a 4-day workshop beginning with an orientation/kickoff meeting on December 11, 2007 and concluding with the final VE Presentation on December 14, 2007. During the workshop, the VE Job Plan was followed in compliance with FHWA and SAVE International guidelines for VE studies. The job plan guided the search for alternatives to mitigate or eliminate high cost drivers, support functions providing little or no value, and potential project risk elements. Alternatives to specifically address the owner's project concerns and enhance value by improving operations, reducing

maintenance requirements, enhancing constructibility, and providing missing or less than optimum functionality were also entertained. The Job Plan includes six phases:

- Information Gathering Phase (some team member made a prior site visit)
- Function Identification and Analysis Phase
- Creative Idea Generation Phase
- Evaluation of Creative Ideas Phase
- Alternative Development Phase
- Presentation Phase

Information Gathering Phase

At the beginning of the study, the decisions that have influenced the project's design and proposed construction methods had to be reviewed and understood. For this reason, GDOT and its design team sent information (described above) to the VE team prior to the study and, following a short orientation session, the workshop was kicked off with a presentation of the project to the team. The presentation highlighted the information provided in the written documentation and expanded on that information 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 clarifications of the information provided.

Due to the distance required to travel to the site, no site visit was possible for this study.

Function Identification and Analysis Phase

Having gained some information on the project, the VE team proceeded to further enhance its project knowledge by defining the functions provided, 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 determine if the expenditures actually perform the requirements of the project, or if there are disproportionate amounts of money spent on support functions. The elements performing support functions add cost to the final product, but have a relatively low worth to the basic function.

Function is defined as the "intended use" of a physical or process element. In the VE process, the team attempted to identify functions in the simplest manner using active verb/measurable noun word combinations. Sometimes modifying adjectives were used with the noun to clarify the definition. 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) were identified for the major components of the project depicted on the cost model(s).

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

<u>Abbreviation</u>	<u>Type of Function</u>	<u>Definition</u>
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. Thus, the team works in future phases to reduce the impact of secondary functions and enhance project value.

The team used the cost model 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 too 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 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, the VE team generated 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 constructibility 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. Creative Idea Listing worksheets were generated and organized by the function or project element being addressed.

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

Evaluation/Judgment Phase

Since the goal of the Creative Idea Generation phase was to conceive as many creative ideas as possible without regard for technical merit or applicability to respond to the project goals, this phase of the workshop focused on identifying those ideas that 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 evaluating the ideas originated during the Creative Idea Generation phase based on the owner's value objectives identified through conversations and questions during the Designer's Briefing.

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 3, with 3 indicating an idea with the greatest potential to be technically sound and provide cost savings or improvements in other areas of the project, 2 indicating an idea that provides moderate project value improvement and a 1 indicating an idea with a major technical flaw or does not respond to project requirements. Generally, ideas rated 3 and 2 are continued to be pursued in the next phase and presented to GDOT 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 VA process.

Development Phase

In this phase, each highly-rated idea was expanded into a workable solution designated as a Value Engineering Alternative. The development consists 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 a 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 Value Engineering Alternatives are included in the Study Results section of the report.

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

Presentation Phase

The last phase of the workshop was to summarize the results of the study and prepare Draft Summary of Potential Cost Saving worksheets to handout at the presentation and to present the key Value Engineering Alternatives and design suggestions to GDOT. The purpose of the presentation 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.

POST-WORKSHOP EFFORT

The post-study portion of the VE study consisted of the preparation of this Value Engineering Study Report. Personnel from GDOT 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.

VALUE ENGINEERING WORKSHOP AGENDA

Lewis & Zimmerman Associates, Inc. will conduct a four-day value engineering (VE) workshop on the EDS-84(26) & BHN-007-3(28) & EDS-84(27), Ware County, (P.I. No. 522770, 522775, 522780) projects for the Georgia Department of Transportation from December 11- 14, 2007.

The study, including the Designer's Briefing will be conducted at:

Room 264
No. 2 Capitol Square
Atlanta, GA 30334

The Designers will present the design at the beginning of the VE workshop and will be available to answer questions during the study effort. A suggested outline for the Designer's presentation follows the agenda. Georgia Department of Transportation (GDOT) staffs are encouraged to attend.

The VE team is comprised of the following:

George Hunter, PE, CVS	VE Team Leader/Civil	Lewis & Zimmerman Associates
Dom Saulino, PE	Highway Design Engineer	HNTB, Inc.
John Tiernan, PE	Structural/Bridge Engineer	ARCADIS US, Inc.
Harley Griffen, PE	Construction Engineer	Delon Hampton & Associates

Tuesday, December 11, 2007

8:00- 9:00	Convene VE Team	(VE Team)
	VE team gathers to review project documents and prepare for VE study	
9:00- 9:15	Welcome, Introduction and Objectives	(All Participants)
	Welcome; Opening Remarks and Introduction of Participants: Owner, Designer, VE Team members	
	History and Background of the project and available project funds	
	Overview of the VE Process, Workshop Organization and Agenda	
	Review VE Workshop Objectives and Goals	
9:15 am – 10:30 am	Design Team Detailed Presentation	(All Participants)
	Overview, Scope, and Project Requirements	
	Key Design Issues for all Disciplines	
	Construction Phasing and most recent Project Cost Estimate	

Tuesday, December 11, 2007 (continued)

9:15 am – 10:30 am **Design Team Detailed Presentation** **(All Participants)**

Design Team fields VE Team questions

10:30 am – 11:00 pm **Cost Model** **(VE Team)**

VE team develops cost histogram from the project estimate.

12:30 pm - 1:00 pm **Lunch**

1:00 pm – 2:00 pm **Functional Analysis** **(VE Team)**

Identify basic and secondary functions

Analyze cost model(s) and worth assignments

2:00 pm – 3:00 pm **Identification of Major Project Risks, Project Constraints and Key Issues**

3:00 pm – 5:00 pm **Creative Phase** **(VE Team)**

Brainstorm to generate ideas through free association. Defer judgment.

5:00 pm **Daily Wrap-up Session** **(VE Team)**

Wednesday, December 12, 2007

8:00 am – 10:00 am **Creative Phase (cont.)** **(VE Team)**

10:00 am – 11:00 am **Evaluation Phase** **(VE Team)**

Establish the criteria for evaluation and rate each idea on a scale of 1 to 5, identifying the “best” ideas for development.

11:00 am - noon **Development Phase** **(VE Team)**

The VE team develops creative ideas into value engineering alternatives with sketches, calculations and written justifications. Initial and life-cycle cost estimates comparing baseline and proposed designs will be prepared.

1200 pm – 1:00 pm **Lunch**

1:00 pm – 5:00 pm **Development Phase (Cont.)** **(VE Team)**

Thursday, December 13, 2007

8:00 am – 5:00 pm **Development Phase (continued)** **(VE Team)**

Friday, December 14, 2007

8:00 am – 9:00 am **Development Phase (continued)** **(VE Team)**

9:00 am – 10:00 am **Presentation Phase** **(All Participants)**

The VE team presents the value engineering alternatives to the Designers and GDOT representatives. A draft copy of the Summary of Potential Cost Savings will be distributed.

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise in the project elements involved with this project. Team members consisted of a multidisciplinary group with professional planning, design, and construction experience and a working knowledge of VE procedures. The VE team included the following:

<u>Participant</u>	<u>Specialization</u>	<u>Affiliation</u>
John Tiernan, PE	Bridge Design	ARCADIS
Dan Hood, PE,	Roadway Design	HNTB
Harley Griffin, PE	Highway Design/Constructibility	Delon Hampton & Associates
George Hunter, PE, CVS, PMP	VE Team Leader	Lewis & Zimmerman Associates

DESIGNER'S PRESENTATION

An overview of the project was presented on December 11, 2007 by representatives from GDOT and the consultant designers. The purpose of this meeting, in addition to being an integral part of the Information Gathering 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 staff 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.

Site Visit

A site visit was not held.

VALUE ENGINEERING TEAM'S PRESENTATION

A VE presentation was conducted on December 14, 2007 at GDOT Headquarters to review VE alternatives with the owner and representatives from the design team. Copies of the Draft Summary of Potential Cost Savings were provided to the attendees. An attendance list for the meeting is attached.

VE STUDY SIGN-IN SHEET

Project No.: EDS-84(26)

County: Ware

PI Nos.: 522770 522780 Date: 12/11-14/07

HPPN-EDS-84(27) & BHN-007-3(28)

522775

NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
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Harley G. Griffin		DHA	404-524-8030	hgriffin@delanhampton.com
BRIAN SUMMERS		GDOT ENGR SERVICES		
MIKE DAVIS		D.B. TRIMBLE		

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. No economic parameters were used or developed for this study.

When computing capital costs, direct material, labor and equipment costs, no markups were applied. The VE alternatives' cost estimates are based on recent original cost estimates (2007 dollars), provided by the designers, or GDOT cost history based on 2007 bid prices.

COST MODEL

The VE team leader prepared the attached Pareto Chart, or cost histogram, for the project which displays the major construction elements identified in the cost estimate prepared by the designer in descending order of magnitude and thus identifies the high cost areas in the project and provides the VE team with a focus for its work during the study.

EDS-84(26) & BHN-007-3(28) project

For this project, 3 out of 11, or 27%, of the construction items represent about 80% of the project costs:

- Base and paving \$9,858,455
- Major Structures \$8,902,316
- Earthwork \$2,465,019

The summary of this project's costs are summarized below:

Total Construction	\$29,616,261
<u>Right-of-Way Acquisition</u>	<u>2,262,600</u>
Total Project Costs	\$31,878,861

EDS-84(27) project

For this project, 3 out of 11, or 27%, of the construction items represent about 80% of the project costs:

- Base and paving \$9,693,458
- Earthwork \$2,237,427
- Drainage \$1,007,830

The summary of this project's costs are summarized below:

Total Construction	\$18,131,287
<u>Right-of-Way Acquisition</u>	<u>10,281,980</u>
Total Project Costs	\$28,413,267

The combined project costs for (EDS-84(26) and BHN-007-3(28) and EDS-84(27)) is \$60,292,128.

COST HISTOGRAM



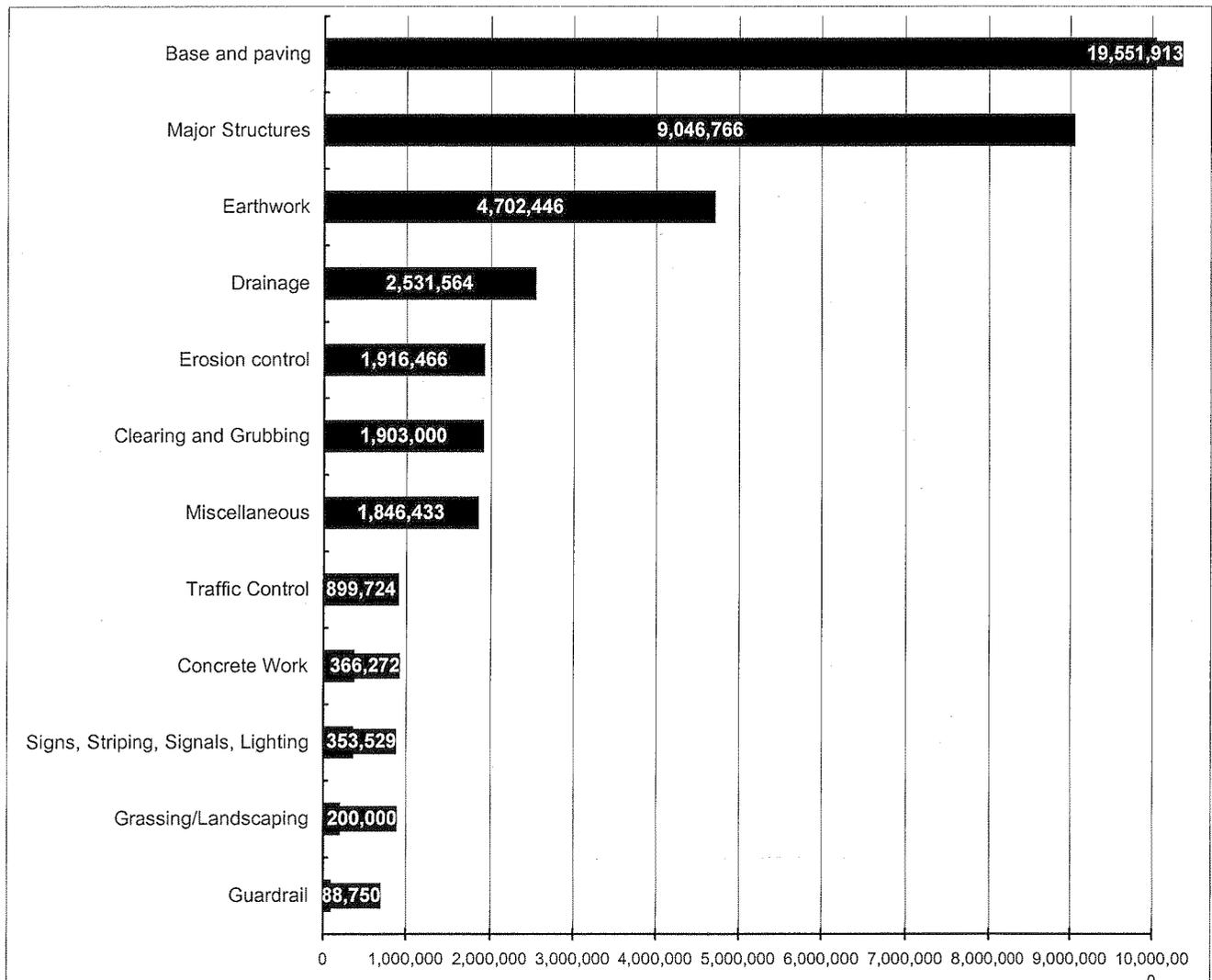
Project No.: EDS-84(26), Ware, P.I. No.: 522770 VE Study
Ware County, Georgia

PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Base and paving	19,551,913	45.04%	45.04%
Major Structures	9,046,766	20.84%	65.89%
Earthwork	4,702,446	10.83%	76.72%
Drainage	2,531,564	5.83%	82.55%
Erosion control	1,916,466	4.42%	86.97%
Clearing and Grubbing	1,903,000	4.38%	91.35%
Miscellaneous	1,846,433	4.25%	95.60%
Traffic Control	899,724	2.07%	97.68%
Concrete Work	366,272	0.84%	98.52%
Signs, Striping, Signals, Lighting	353,529	0.81%	99.33%
Grassing/Landscaping	200,000	0.46%	99.80%
Guardrail	88,750	0.20%	100.00%
Subtotal	\$ 43,406,862	100.00%	
E&C	10.00%	\$ 4,340,686	
	0.00%	\$ -	
	0.00%	\$ -	
	0.00%	\$ -	
	0.00%	\$ -	
TOTAL CONSTRUCTION	\$ 47,747,549		
RIGHT OF WAY ACQUISITION	\$ 2,262,600	Comp Construction Mark-up:	10%
UTILITIES (REIMBURSABLE)	\$ -		
TOTAL	\$ 50,010,149		

COST HISTOGRAM



Project No.: EDS-84(26), Ware, P.I. No.: 522770 VE Study
Ware County, Georgia



Costs in graph are not marked-up.

FUNCTION ANALYSIS

Function Analysis of the project was prepared 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 worksheets completed by the team for the project in its entirety and the various elements follow.

The basic functions of the project are to “Increase Traffic Capacity” and “Continue Multi-Lane. The project’s basic functions support the statewide goals to “Promote Economic Development” and “Relieve Congestion” within the corridor.

RANDOM FUNCTION ANALYSIS



PROJECT: **EDS-84(26), WARE, P.I. NO.: 522770 VE STUDY** SHEET NO.: 1 of 1
Ware County, Georgia

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
Global Project	Promote	Economic Development	HO
	Relieve	Congestion	HO
	Continue	Multi-Lane Corridor	B
	Add	Traffic Capacity	B
Divided Median	Reduce	Head-on Collisions	RS
Intersection Improvements (Turn Lanes)	Reduce	Rear-End Collisions	RS
Intersection Improvements (Skew Angle)	Improve	Intersection Sight Distance	RS
Intersection Improvements (Skew Angle)	Reduce	Side Impact Collisions	RS
Railroad Crossings	Reduce	Storage	Unwanted
	Reduce	Sight Distance	Unwanted
Independent (New Location) Alignment	Avoid	Historic Property	RS
	Bypass	Wahoma	Unwanted
New Bridge	Pass	Floodwaters	RS
	Pass	Critters	RS
	Reduce	Ponded Wetlands	Unwanted
	Reduce	Roadway Overtopping	S
Replace Bridge	Reduce	Maintenance	S
	Increase	Service Life	S
Increase Roadway Footprint	Fill	Wetlands	Unwanted
	Mitigate	Wetlands	RS

Function defined as:	Action Verb	Kind:	B = Basic	HO = Higher Order
	Measurable Noun		S = Secondary	LO = Lower Order
	? VE Team opinion- not sure		RS = Required Secondary	U = Unwanted

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

During the speculation phase, numerous ideas were generated for this project using conventional brainstorming techniques as recorded on the following pages. 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	NO. OF IDEAS	DEVELOPED ALTERNATIVES	
			ALTS	DS
Typical Section	TS	16	10	1
Alignment	A	14	3	9
Intersection	INT	9	5	3
Bridges	B	4	1	2
Construction Management	CM	3	0	2
TOTAL		47	19	18

The ideas were ranked on a qualitative scale of 1 to 3 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 responses of GDOT to questions posed at the Designer's Briefing. GDOT identified the following as its top value objectives:

- Project Capital Costs
- Highway User Safety (Head-on, rear-end, side collisions)
- Satisfaction of Environmental Requirements: Historical, Wetlands and Cemetery
- Railroad (CSX) Coordination
- Utility Coordination

After discussing each idea, the team evaluated the ideas by consensus. This produced various ideas evaluated as 2 or 3 or as Design Suggestion to carry forward and research and develop into formal Value Engineering Alternatives to be included in the Study Results section of the report. When this is not the case, an idea may have been combined with another related idea or discarded, as a result of the additional research that indicated the concept as not being cost-effective or technically feasible. The reader is encouraged to review the Creative Idea Listing and Evaluation worksheets since they may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING



PROJECT: US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27) <i>Ware County, Georgia</i>	SHEET NO.: 1 of 2
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NO.	IDEA DESCRIPTION	RATING
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TYPICAL SECTION (TS)		
TS-1	11-ft. lanes	3
TS-2	Add bike lanes to urban shoulders	DS
TS-3	Remove bike lanes from Concept Report	3
TS-4	Eliminate rural shoulders (New Mexico and Idaho Avenues)	2
TS-5	Build 32-ft. median in lieu of 44-ft. median	3
TS-6	Widen north in lieu of south	1
TS-7	Soil cement base in lieu of GAB	3
TS-8	Lime soil stabilization to reduce GAB	1
TS-9	Fill-depth AC (includes treatment per TS-7 and TS-8)	1
TS-10	3-lane between Firetower Road (STA 81+20) and STA 365+00, and purchase right-of-way for future 4-lane	2
TS-11	Use 12-ft. FWSH median, in lieu of 14-ft.	1
TS-12	STA 210+00 to 295+00 – use minimum width (20 ft. ±) depressed median	1
TS-13	10-ft. raised median between New Mexico Avenue and Montana Avenue (STA 262 to STA 295)	2
TS-14	Use 18-in. curb and gutter (verify gutter spread viability)	3
TS-15	Use a minimum width depressed median between STA 262+00 to STA 295+00	2
TS-16	Build an AC multi-use trail on north side in lieu of sidewalk where urban shoulder is	2
TS-17	Eliminate GAB under curb and gutter on EDS-84(27)	3

ALIGNMENT (A)		
A-1	Increase separation between railroad and new alignment	1
A-2	Reduce impacts to wetlands with new alignment at west end (increase wetlands identification)	DS
A-3	Reduce impacts to wetlands with new alignment at east end (increase wetlands identification)	DS
A-4	Build road in utility corridor	1
A-5	Build road adjacent to utility corridor	DS
A-6	Revisit historicity and do parallel widening	3
A-7	Revisit new location alignment through Emerson Park (4F?) Right-of-way New Mexico Avenue to Idaho Avenue (new alignment along railroad)	2

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
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CREATIVE IDEA LISTING



PROJECT: US 84 WIDENING AND RECONSTRUCTION – EDS-84(26) AND EDS-84(27) <i>Ware County, Georgia</i>	SHEET NO.: 2 of 2
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NO.	IDEA DESCRIPTION	RATING
ALIGNMENT (A) (continued)		
A-8	One-way pairs at both independent alignments – access in town	2
A-9	Use traffic calming before and at urban sections	DS
A-10	Move alignment closer to railroad from STA 163+00 to STA 162+50	2
A-11	New alignment along railroad right-of-way from 16 th Street to New Mexico Avenue	2
A-12	Add additional median opening at STA 345+00	DS
A-13	Change speed limit sign to 65 mph	DS
A-14	Curve correction may be eliminated with a design speed limit of 55 mph	DS
INTERSECTION (INT)		
INT-1	Eliminate realignment at Ammons Road	2
INT-2		2
INT-3		3
INT-4	Eliminate intersection at Ruskin Road	3
INT-5	Eliminate Griffin Road (negotiation point with railroad)	ABD
INT-6	Review railroad gates at crossings (exist conditions??)	DS
INT-7	11-ft. lanes on side roads being reconstructed	3
INT-8	Use signals at intersections where “bypass” and existing road tie-in	DS
INT-9	Relocate connector (roadway extension) from Idaho Avenue to Wyoming Avenue	2
BRIDGES (B)		
B-1	Shorten bridges in Projects EDS-84(26) and EDS-84(28)	3
B-2	Lengthen bridges spans (50 spans)	2
B-3	Single-wide versus parallel structures	1
B-4	Revisit hydrology (wetlands, railroad down stream crossings)	DS
CONSTRUCTION MANAGEMENT (CM)		
CM-1	Single construction contract	1
CM-2	Advance the railroad review timeframe and railroad coordination	DS
CM-3	Alternative bids – single versus dual contracts	DS

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