



**SR 10/US 78 Widening and Reconstruction  
From CR 166/Whit Davis Road  
to CR 26/Smokey Road  
STP00-0014-01(069), P.I. No. 132660  
Clarke and Oglethorpe Counties**

**US 78 Bridge Over Moss Creek  
BR000-0001-00(221), P.I. No. 0001221, Oglethorpe County**

**SR 10/US 78 Crawford/Lexington Bypass  
STP00-0014-01(067), P.I. No. 231910  
Oglethorpe County**

**Value Engineering Study Report**

**March 2010**

***Designer***



Kimley-Horn and Associates, Inc.

***Value Engineering Consultant***





Lewis & Zimmerman Associates  
9861 Broken Land Parkway  
Suite 254  
Columbia, Maryland 21046  
Tel: 301.984.9590  
Fax: 410.381.0109  
email: info@lza.com  
www.lza.com

Mr. Matthew J. Sanders, AVS  
Value Engineering Specialist  
Georgia Department of Transportation - Engineering Services  
One Georgia Center – 5<sup>th</sup> Floor  
600 West Peachtree Street  
Atlanta, Georgia 30308

Re: Widening & Reconstruction of SR 10/US 78 from CR 166/Whit Davis Road to CR 26/Smokey Road, Clarke/Oglethorpe Counties, STP00-0014-01(069), P.I. No. 132660; US 78 Bridge Over Moss Creek, BR000-0001-00(221), P.I. No. 0001221, Oglethorpe County; and SR 10/US 78 Crawford/Lexington Bypass, STP00-0014-01(067), P.I. No. 231910, Oglethorpe County  
Value Engineering Study Report

Date:  
March 15, 2010

Contact:  
Howard Greenfield

Phone:  
301.984.9590 x 20

Email:  
hgreenfield@lza.com

Our ref:  
LZ083354.0000

Dear Mr. Sanders:

Lewis & Zimmerman Associates, Inc. is pleased to submit two hard copies and one electronic copy of the referenced value engineering (VE) study report, documenting the study that took place March 1-4, 2010. The objective of the VE effort was to identify opportunities to enhance the value of the project and save costs.

The VE team developed 13 alternatives with identifiable cost saving potential. Most address the two elements that are driving the projects' total cost, pavement and earthwork, illustrating ways each can be reduced.

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

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.  
an ARCADIS company

Howard B. Greenfield, PE, AVS  
Vice President

Attachment

---

---

## TABLE OF CONTENTS

---

---

### SECTION ONE - EXECUTIVE SUMMARY

Introduction	1
Project Description	1
Concerns and Objectives	2
Results of the Study	2
Summary of Potential Cost Savings	4

### SECTION TWO - STUDY RESULTS

General	6
Key Issues	7
Study Objectives	7
Results of the Study	7
Evaluation of Alternatives	8
Potential Cost Savings	9

### SECTION THREE - PROJECT DESCRIPTION 81

### SECTION FOUR - VALUE ANALYSIS AND CONCLUSIONS

General	88
Preparation Effort	88
Value Engineering Workshop Effort	90
Post-Workshop Effort	94
Value Engineering Workshop Participants	95
Economic Data	97
Cost Model	98
Function Analysis	101
Creative Idea Listing and Evaluation of Ideas	103

---

## EXECUTIVE SUMMARY

---

### INTRODUCTION

This value engineering (VE) study report documents the events and results of the VE study conducted by Lewis & Zimmerman Associates, Inc. (LZA) for the Georgia Department of Transportation (GDOT). The subjects of the study were:

- SR 10/US 78 Widening and Reconstruction From CR 166/Whit Davis Road to CR 26/Smokey Road, STP00-0014-01(069), P.I. # 132660, Clarke and Oglethorpe Counties;
- US 78 Bridge Over Moss Creek, BR000-0001-00(221), P.I. # 0001221, Oglethorpe County; and
- SR 10/US 78 Crawford/Lexington Bypass, STP00-0014-01(067), P.I. # 231910, Oglethorpe County

being designed for GDOT by Kimley-Horn and Associates, Inc. The projects were at the Preliminary Stage of development at the time of the VE study, March 1-4, 2010.

Participating on the VE team were a highway engineer, a construction specialist, and a Certified Value Specialist (CVS) team leader. The team used the six-phase VE Job Plan to guide its deliberations.

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

### PROJECT DESCRIPTION

The two projects that were actually reviewed in the VE workshop, SR 10/US 78 Widening and Reconstruction From CR 166/Whit Davis Road to CR 26/Smokey Road and the SR 10/US 78 Crawford/Lexington Bypass, were the revised versions of the three projects referenced above that had concept development reports first approved in July 2000. The US 78 Bridge Over Moss Creek project was eliminated from consideration because the revised concept report for the widening project dated October 26, 2009, rerouted SR 10/US 78 around the existing bridge alignment, thus negating the need for the additional bridge.

The SR 10/US 78 Widening and Reconstruction From CR 166/Whit Davis Road to CR 26/Smokey Road project starts out in Clarke County just east of Whit Davis Road by creating a five-lane urban section consisting of two, 12-ft.-wide through lanes in each direction and one, 14-ft.-wide common left-turn lane. There will be 16-ft.-wide urban shoulders on each side, with curb and gutter, and a 5-ft.-wide sidewalk. A 100-ft.-wide right-of-way will be maintained and the speed limit in this section will be 45 miles per hour (mph).

The five-lane section continues to approximately ½-mile west of Robert Hardeman Road. It then transitions to a four-lane divided highway with a typical section consisting of two 12-ft.-wide lanes in each direction, and 10-ft.-wide rural shoulders with 6.5 ft. of paving on the outside shoulder and 2 ft. of paving on the inside shoulder. A 160-ft. minimum right-of-way with a 44-ft.-wide depressed grass median will be maintained. The speed limit in this section will be 55 mph. Initially, the divided roadway will follow the alignment of the existing roadway. Starting about ¼-mile west of Walter Sams Road/ Double Bridges Road it will follow a new parallel alignment to the north of the existing road. The roadway will rejoin the original SR 10/US 78 alignment where Arnoldsville Road intersects the existing road. Widening of the existing road to four lanes will continue until just past the intersection with Smokey Road. There will be four signalized intersections at CR 166/Whit Davis Road, Robert Hardeman Road, Walter Sams Road, and Arnoldsville Road. The total length of the widening project is 7.9 miles.

The SR 10/US 78 Crawford/Lexington Bypass Project begins where the widening project terminates east of Smokey Road. The Bypass alignment runs south of the existing road alignment for 7.4 miles before tying back into the mainline just west of the SR 22/SR 10/US 78 intersection. The typical section will be the same as the typical section for the realigned portion of the widening project with left and right turn lanes at the four at-grade intersections. The design speed will be 55 mph and signalized intersections will be provided at SR 22 and SR 77.

The estimated costs of the projects are:

- SR 10/US 78 Widening and Reconstruction      \$31.8 m Construction      \$16.9 m ROW
- SR 10/US 78 Crawford/Lexington Bypass      \$30.0 m Construction      \$12.9 m ROW

**CONCERNS AND OBJECTIVES**

This project is being developed to promote economic development in Oglethorpe County, and the four-lane divided highway is a commitment to the community. In developing the project it is necessary to avoid impacting several historical sites and archeologically sensitive areas. Therefore, the alignment has been selected to achieve these goals.

Within these constraints, GDOT requires development of a project that is cost-effective to construct and maintain. To assist GDOT in achieving this goal, the VE team was tasked with identifying specific changes to the current design that would enhance functionality and/or save costs within the constraints noted.

**RESULTS OF THE STUDY**

The two construction elements that dominate the cost of both projects are the pavement and earthwork. The VE team generated 13 cost saving alternatives that address these project elements, 1 that addresses the traffic signals, and 1 design suggestion to improve the operation of the completed project. All of the alternatives and the design suggestion are listed on the following Summary of Potential Cost Savings table and detailed in Section Two of the report. Note that each alternative was developed independently, making some mutually exclusive or interrelated, and the total potential cost savings will be dependent upon the combination selected for implementation. Highlights of the alternatives follow.

Since pavement costs are driving this project, the team suggests using either 11-ft.-wide inside lanes or all 11-ft.-wide lanes in lieu of 12-ft.-wide lanes specified for both projects. There are also suggestions to reduce the outside paved shoulder width from 6.5 ft. to 4 ft. in both projects to further reduce pavement quantities. Considering the low traffic volumes, all of these alternatives appear feasible. Reducing the amount of pavement also saves future maintenance costs and reduces the amount of storm water runoff.

With respect to the earthwork quantity, there are several opportunities to lower the vertical profile of the road to avoid some of the earthwork. In doing so, some of the grades will be lowered to provide a better ride for the users. There is also the potential to narrow the depressed grass median from 44 ft. to 32 ft. to both reduce earthwork quantities and narrow the right-of-way requirement, which is also significant.

Two of the alternatives, labeled Alt. No. B-1 and B-17, realign the roadway to shorten it, thus reducing earthwork, pavement and right-of-way costs. An added benefit is that roadway grades are also reduced because the new alignments are in areas where the existing ground elevations do not vary dramatically. Again rideability is improved when the grades are lowered.





---

---

## STUDY RESULTS

---

---

### INTRODUCTION

The results of the SR 10/US 78 Widening and Reconstruction From CR 166/Whit Davis Road to CR 26/Smokey Road, STP0014-01(069), P.I. # 132660, Clarke and Oglethorpe Counties and SR 10/US 78 Crawford/Lexington Bypass, STP0014-01(067), P.I. # 231910, Oglethorpe County projects value engineering study portray the benefits that can be realized by GDOT, the designer team from Kimley-Horn and Associates, Inc. and the ultimate users of the roadway. The results will directly affect the project's final design, and GDOT staff, with the aid of the design team will be tasked with determining the disposition of each alternative.

During the VE workshop, 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 GDOT's project value objectives including:

- Save construction costs
- Simplify construction
- Avoid historical and archeological areas
- Reduce accidents occurring in the completed roadway

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 individual elements that comprise the project. These may be in the form of VE alternatives (accompanied by cost estimates) or design suggestions (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),
- An evaluation of the advantages and disadvantages of 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 prices were not available, cost databases from GDOT and team members were consulted. Each design suggestion contains the same information as the VE alternatives, except that no cost information is 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 may be to improve traffic operations, reduce maintenance, improve constructability, reduce accidents, and reduce project risk.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) that can be tracked through the value engineering process, thus facilitating referencing between the Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of Potential Cost Savings tables. The Alt. No. contains one of the following letter prefixes indicating the project being addressed:

<b>PROJECT</b>	<b>PREFIX</b>
Widening	W
Bypass	B

Summaries of the alternatives and design suggestions are provided on the Summary of Potential Cost Savings table. The table is divided into projects for the reviewer’s convenience and is used to divide the alternatives portion of the report. The complete documentation of the developed alternatives and design suggestions follows the Summary of Potential Cost Savings tables.

**KEY ISSUES**

This project is being developed to promote economic development in Oglethorpe County, and thus, the four-lane divided highway is a commitment to the community. In developing the project it is necessary to avoid impacting several historical sites and archeologically sensitive areas. Therefore, the alignment has been selected to achieve these goals.

**STUDY OBJECTIVES**

Within these constraints, GDOT desires to develop a project that is cost-effective to construct and maintain. To assist GDOT in achieving this, the VE team was tasked with identifying specific changes to the current design that would enhance functionality and/or save costs within the constraints noted.

**RESULTS OF THE STUDY**

The two construction elements, that dominate the cost of both projects, are the pavement and earthwork. The VE team generated 13 cost saving alternatives that address these project elements, 1 that addresses the traffic signals, and 1 design suggestion to improve the operation of the completed project. The following highlights the alternatives detailed in the remainder of the section.

Since pavement costs are driving this project, the team suggests using either 11-ft.-wide inside lanes or all 11-ft.-wide lanes in lieu of the 12-ft.-wide lanes specified for both projects. There are also suggestions to reduce the outside paved shoulder width from 6.5 ft. to 4 ft. in both projects to further reduce pavement quantities. Considering the low traffic volumes, all of these alternatives appear feasible. Reducing the amount of pavement also saves future maintenance costs and reduces the amount of storm water runoff.

With respect to the earthwork quantity, there are several opportunities to lower the vertical profile of the road to avoid some of the earthwork. In doing so, some of the grades will be lowered to provide a better ride for the users. There is also the potential to narrow the depressed grass median from 44 ft. to 32 ft. to both reduce earthwork quantities and narrow the right-of-way requirement, which is also significant.

Two of the alternatives, labeled Alt. No. B-1 and B-17, realign the roadway to shorten it, thus reducing earthwork, pavement and right-of-way costs. An added benefit is that roadway grades are also reduced because the new alignments are in areas where the existing ground elevations do not vary dramatically. Again rideability is improved when the grades are lowered.

## **EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS**

When reviewing the study results, each part of an alternative or design suggestion should be considered 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 design team and GDOT 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 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.

All alternatives should be carefully reviewed 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.



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** SR 10/US 78 WIDENING & RECONSTRUCTION FROM  
CR 166/WHIT DAVIS ROAD TO CR 26/SMOKEY ROAD  
STP00-0014-01(069)  
Clarke/Oglethorpe Counties, GA

**ALTERNATIVE NO.:**  
**W-3**

**DESCRIPTION:** USE 11-FEET-WIDE INSIDE LANES IN LIEU OF 12-FEET-  
WIDE LANES

**SHEET NO.:** 1 of 4

**ORIGINAL DESIGN:** (sketch attached)

All travel lanes will be 12 feet wide.

**ALTERNATIVE:** (sketch attached)

Make the inside travel lane 11 feet wide. Retain the width of the outside travel lane and the turning lane at 12 feet wide.

**ADVANTAGES:**

- Saves money
- Reduces quantity of pavement area to maintain
- Reduces storm water runoff

**DISADVANTAGES:**

- Perceived sense of constricted space

**DISCUSSION:**

In downtown Atlanta, I-75 and I-85 have 11-ft.-wide lanes. Traffic count is more than 200,000 vehicles per day. With 55 mph design speed and vehicles often traveling at 70 mph, there have not been any major problems. On SR 10/US 78, the maximum average daily traffic (ADT) for design year 2034 is only 9,740. Since the majority of the trucks will be traveling on the outside lane, a considerable amount of money can be saved by narrowing the inside lane from 12 feet to 11 feet. The inside lane also has 2 feet of full depth paved shoulder. Travelers on the inside lane will therefore have 13 feet of width to maneuver their vehicles.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 881,000	—	\$ 881,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 881,000	—	\$ 881,000

PROJECT: **SR 10/US 78 WIDENING AND RECONSTRUCTION FROM  
CR 166/WHIT DAVES ROAD TO CR 26/SMOKEY ROAD**  
*Clarke/Oglethorpe Counties*

ALTERNATIVE NO.:

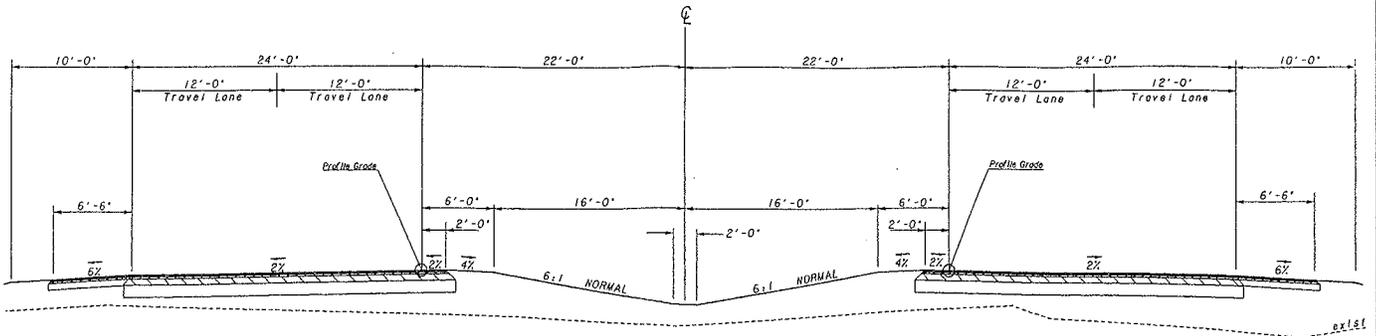
**W-3**

ORIGINAL DESIGN

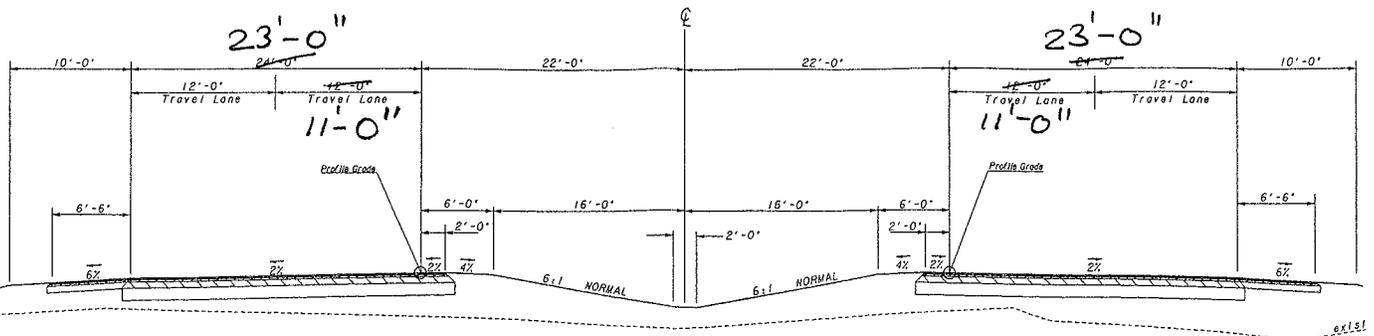
ALTERNATIVE DESIGN

BOTH

SHEET NO.: **2 of 4**



ORIGINAL DESIGN



ALTERNATE DESIGN

# CALCULATIONS



PROJECT: **SR 10/US 78 WIDENING & RECONSTRUCTION FROM CR**  
**166/WHIT DAVIS ROAD TO CR 26/SMOKEY ROAD**  
*STP00-0014-01(069)*  
*Clarke/Oglethorpe Counties, GA*

ALT. NO.:

**W-3**

SHEET NO.: **3 of 4**

Length of the Road: 7.9 miles =>  $7.9 \times 5,280' = 41,712$  feet or 4,634.67 square yards  
One foot of pavement width will be saved in each direction.

12.5 mm recycled asphalt – 165 lbs/sy	Total Weight:	$(1'+1')(165 \text{ lbs}/2000) \times 4,634.67 \text{ sy} = 1,529.44$ tons
19.0 mm recycled asphalt – 220 lbs/sy	Total Weight:	$(1'+1')(220 \text{ lbs}/2000) \times 4,634.67 \text{ sy} = 2,039.25$ tons
25.0 mm recycled asphalt – 440 lbs/sy	Total Weight:	$(1'+1')(440 \text{ lbs}/2000) \times 4,634.67 \text{ sy} = 4,078.50$ tons
12" graded aggregate base – 150 lbs/cf	Total Weight:	$12''(1'+1') \times 41,712' \times 150 \text{ lbs}/2000 = 12,513.60$ tons

For 2 lanes, fuel saving:  $4,634.67 \text{ yards} \times (1'+1') = 9,269.34 \text{ sy}$

It is assumed that the R/W width will not be reduced by two feet. Therefore, no savings are calculated.



# VALUE ENGINEERING ALTERNATIVE



PROJECT: <b>SR 10/US 78 WIDENING &amp; RECONSTRUCTION FROM CR 166/WHIT DAVIS ROAD TO CR 26/SMOKEY ROAD</b> <i>STP00-0014-01(069)</i> <i>Clarke/Oglethorpe Counties, GA</i>	ALTERNATIVE NO.: <b>W-4</b>
DESCRIPTION: <b>CONSTRUCT ALL LANES 11 FEET WIDE IN LIEU OF 12 FEET WIDE</b>	SHEET NO.: <b>1 of 4</b>

**ORIGINAL DESIGN:** (sketch attached)

All travel lanes will be 12 feet wide.

**ALTERNATIVE:** (sketch attached)

Construct through lanes 11 feet wide. Retain the turning lanes at 12 feet wide.

**ADVANTAGES:**

- Saves money
- Reduces amount of pavement to maintain
- Reduces storm water runoff

**DISADVANTAGES:**

- Perceived sense of constricted space

**DISCUSSION:**

In downtown Atlanta, I-75 and I-85 have 11-foot-wide lanes. Traffic count is more than 200,000 vehicles per day. With 55 mph design speed and vehicles often traveling at 70 mph, there have not been any major problems. On SR10/US78, the maximum average daily traffic (ADT) for design year 2034 is only 9,740. A considerable amount of money can be saved by narrowing the through lanes from 12 feet to 11 feet. Since the inside lane has 2 feet of full-depth paved shoulders, travelers on the inside lane will have 13 feet of width to maneuver their vehicles. The outside lane has 6.5 feet of paved shoulder. With 44 feet of median opening, traffic hazards will be minimal.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,762,000	—	\$ 1,762,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 1,762,000	—	\$ 1,762,000

PROJECT: **SR 10/US 78 WIDENING AND RECONSTRUCTION FROM CR 166/WHIT DAVES ROAD TO CR 26/SMOKEY ROAD**  
*Clarke/Oglethorpe Counties*

ALTERNATIVE NO.:

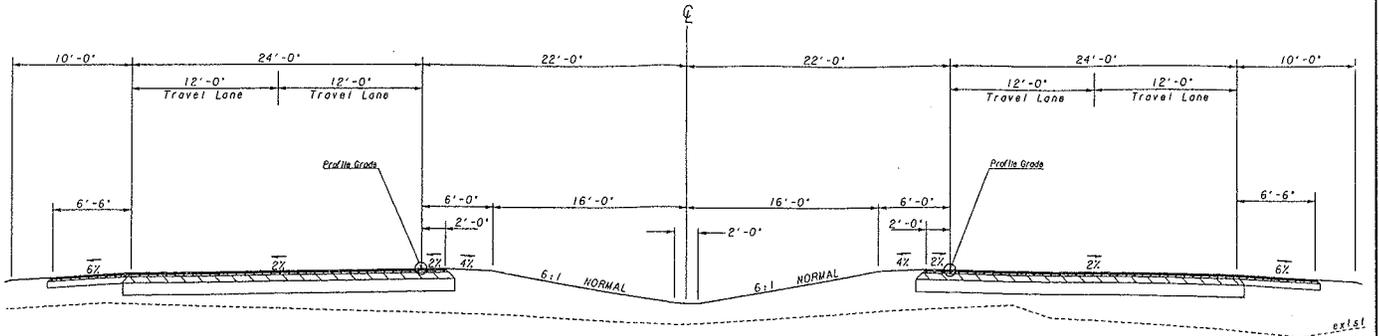
W-4

ORIGINAL DESIGN

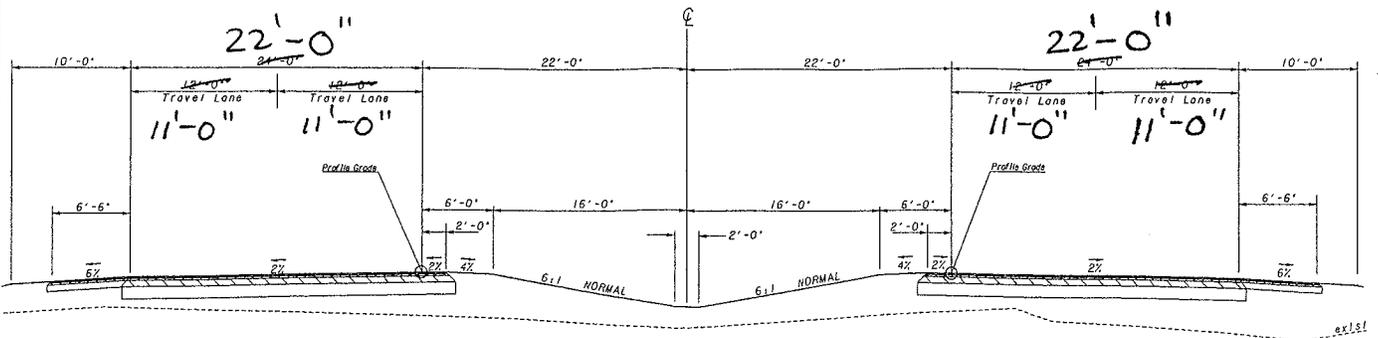
ALTERNATIVE DESIGN

BOTH

SHEET NO.: 2 of 4



ORIGINAL DESIGN



ALTERNATE DESIGN

# CALCULATIONS



PROJECT: **SR 10/US 78 WIDENING & RECONSTRUCTION FROM CR**  
**166/WHIT DAVIS ROAD TO CR 26/SMOKEY ROAD**  
*STP00-0014-01(069)*  
*Clarke/Oglethorpe Counties, GA*

ALT. NO.:

**W-4**

SHEET NO.: **3 of 4**

Length of the Road: 7.9 miles =>  $7.9 \times 5,280' = 41,712$  feet or 4,634.67 square yards  
Two feet of pavement width will be saved in each direction.

12.5 mm recycled asphalt – 165 lbs/sy	Total Weight:	$(2'+2')(165 \text{ lbs}/2000) \times 4,634.67 \text{ sy} = 3,058.88$ tons
19.0 mm recycled asphalt – 220 lbs/sy	Total Weight:	$(2'+2')(220 \text{ lbs}/2000) \times 4,634.67 \text{ sy} = 4,078.50$ tons
25.0 mm recycled asphalt – 440 lbs/sy	Total Weight:	$(2'+2')(440 \text{ lbs}/2000) \times 4,634.67 \text{ sy} = 8,157.00$ tons
12" graded aggregate base – 150 lbs/cf	Total Weight:	$12''(2'+2') \times 41,712' \times 150 \text{ lbs}/2000 = 25,027.20$ tons

For 2 lanes, fuel saving:  $4,634.67$  square yards  $\times (2'+2') = 18,538.68$  sy

It is assumed that the R/W width will not be reduced by four feet. Therefore, no savings are calculated.



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** SR 10/US 78 WIDENING & RECONSTRUCTION FROM  
CR 166/WHIT DAVIS ROAD TO CR 26/SMOKEY ROAD  
STP00-0014-01(069)  
Clarke/Oglethorpe Counties, GA

**ALTERNATIVE NO.:**  
**W-5**

**DESCRIPTION:** USE A 32-FEET-WIDE MEDIAN IN LIEU OF A 44-FEET-  
WIDE MEDIAN

**SHEET NO.:** 1 of 4

**ORIGINAL DESIGN:** (sketch attached)

The median is 44 feet wide.

**ALTERNATIVE:** (sketch attached)

Construct the median at 32 ft. wide in lieu of the 44 ft. width.

**ADVANTAGES:**

- Saves money
- Saves construction time
- Reduces extent of right-of-way

**DISADVANTAGES:**

- None apparent

**DISCUSSION:**

On a four-lane divided highway, it is common to have a median that is 32 feet in width. Eliminating 12 feet of median will not affect the function of this project but will result in a narrowing of the right-of-way.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,106,000	—	\$ 1,106,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 1,106,000	—	\$ 1,106,000



PROJECT: **SR 10/US 78 WIDENING AND RECONSTRUCTION FROM  
CR 166/WHIT DAVES ROAD TO CR 26/SMOKEY ROAD**  
*Clarke/Oglethorpe Counties*

ALTERNATIVE NO.:

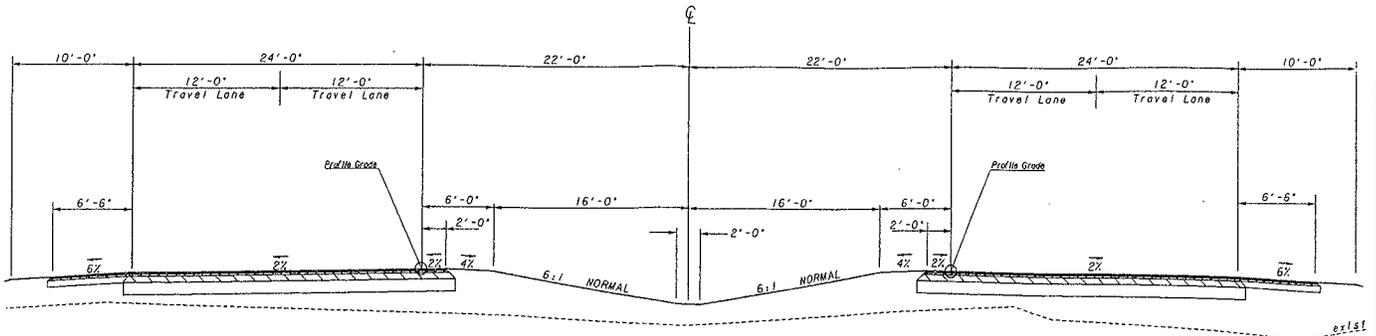
W-5

ORIGINAL DESIGN

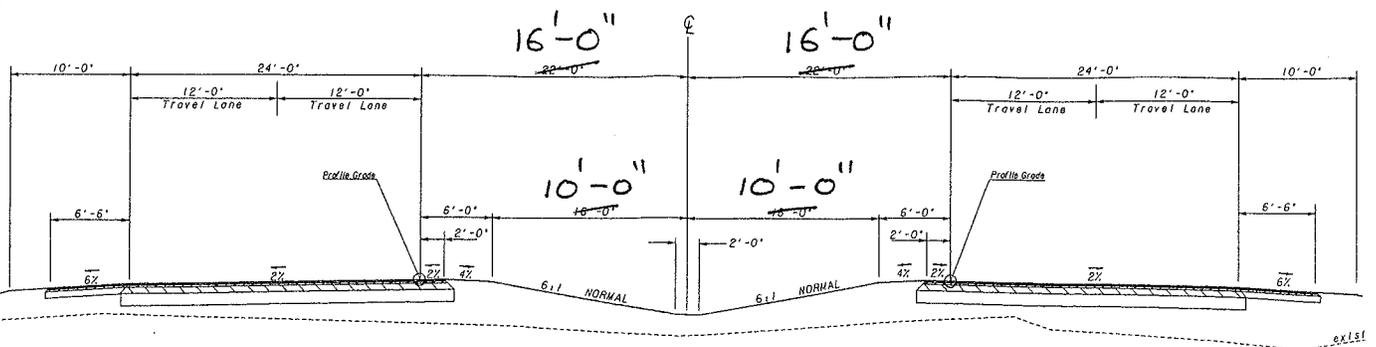
ALTERNATIVE DESIGN

BOTH

SHEET NO.: 2 of 4



ORIGINAL DESIGN



ALTERNATE DESIGN

# CALCULATIONS



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALT. NO.:

**W-5**

SHEET NO.: **3 of 4**

Length of the Road: 7.9 miles =>  $7.9 \times 5,280' = 41,712$  feet    Width of Median saved = 12'    1 acre = 43,560 sf  
Total acreage of R/W saved"  $41,712' \times 12' / 43,560 \text{sf} = 11.491$  acres

Due to reduction in twelve feet of median width, the earthwork is expected to decrease by 10%.

$0.10 \times 800,000 \text{ cy} = 80,000 \text{ cy}$



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** SR 10/US 78 WIDENING & RECONSTRUCTION FROM  
CR 166/WHIT DAVIS ROAD TO CR 26/SMOKEY ROAD  
STP00-0014-01(069)  
Clarke/Oglethorpe Counties, GA

ALTERNATIVE NO.:  
**W-6**

**DESCRIPTION:** TIE LEXINGTON ROAD TO THE ARNOLDSVILLE ROAD  
INTERSECTION ON RELOCATED SR 10/US 78

SHEET NO.: 1 of 2

**ORIGINAL DESIGN:** (sketch attached)

On relocated SR 10/US 78, Lexington Road intersects 1,000 feet away from where Arnoldsville Road intersects it.

**ALTERNATIVE:** (sketch attached)

Construct a common intersection of Lexington Road to Arnoldsville Road on the relocated SR 10/US 78.

**ADVANTAGES:**

- Reduces potential for accidents
- One traffic signal will serve traffic in all four directions

**DISADVANTAGES:**

- Cost increases due to additional pavement and right-of-way

**DISCUSSION:**

In the original design, a traffic signal at a cost of \$100,000 is proposed at the intersection of Arnoldsville Road and relocated SR 10/US 78. To take advantage of this investment, tie Lexington Road to this intersection which has the potential to reduce accidents by providing only one controlled intersection in lieu of two with one having a stop sign only.

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

ALT.  
W-6

ARNOLDSVILLE RD

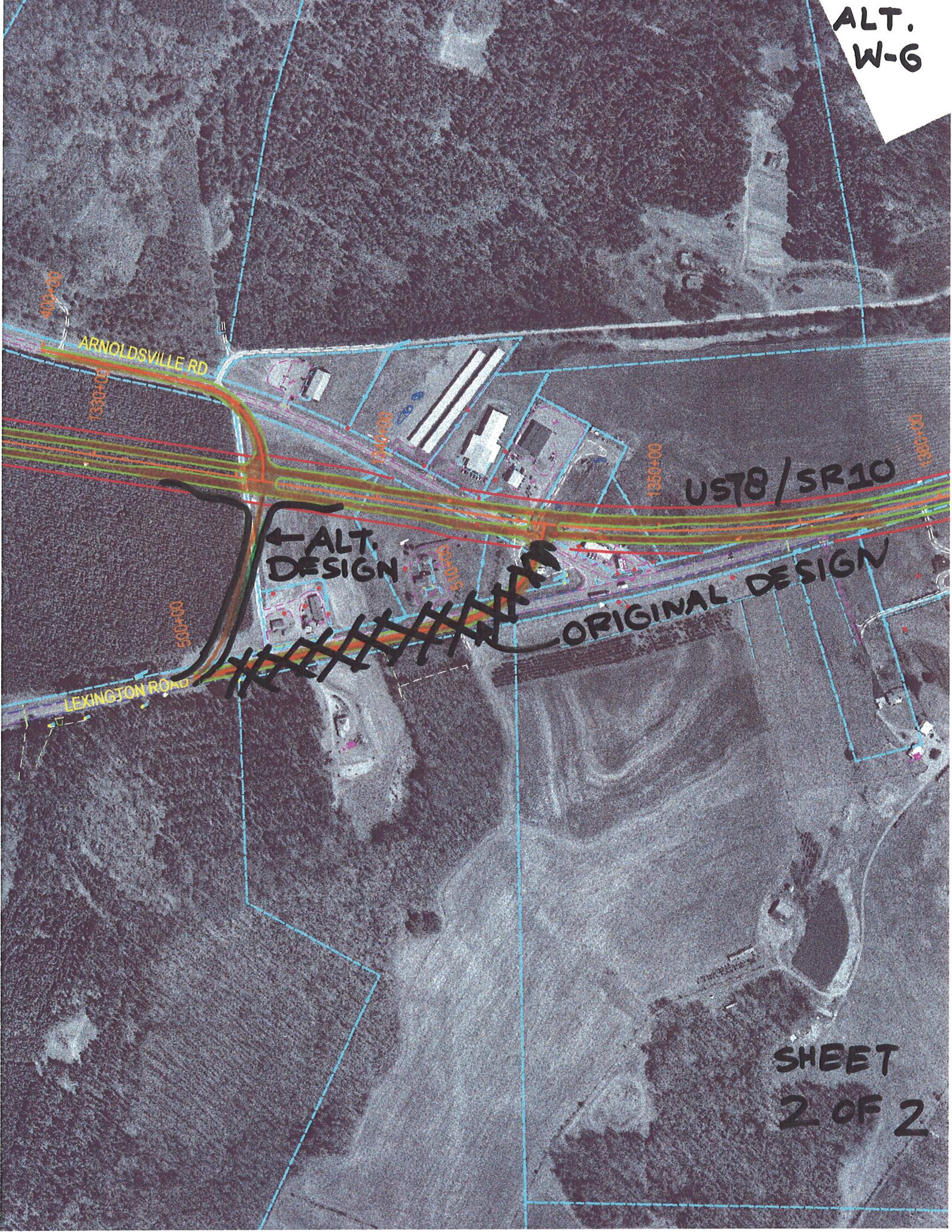
US 8 / SR 10

← ALT.  
DESIGN

ORIGINAL DESIGN

LEXINGTON ROAD

SHEET  
2 OF 2



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** SR 10/US 78 WIDENING & RECONSTRUCTION FROM  
CR 166/WHIT DAVIS ROAD TO CR 26/SMOKEY ROAD  
STP00-0014-01(069)  
Clarke/Oglethorpe Counties, GA

**ALTERNATIVE NO.:**  
**W-10**

**DESCRIPTION:** USE A 4-FEET-WIDE PAVED SHOULDER IN LIEU OF A  
6.5-FEET-WIDE PAVED OUTSIDE SHOULDER

**SHEET NO.:** 1 of 4

**ORIGINAL DESIGN:** (sketch attached)

The outside lanes have 6.5-ft.-wide paved shoulder.

**ALTERNATIVE:** (sketch attached)

Construct a 4-ft.-wide paved shoulder in lieu of a 6.5-ft.-wide shoulder at the outside lanes.

**ADVANTAGES:**

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

**DISADVANTAGES:**

- None apparent

**DISCUSSION:**

On a four-lane divided highway, it is common to have paved shoulders that are 4 feet in width. Eliminating 2.5 feet of paved shoulder will not affect the function of this project.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 3,227,000	—	\$ 3,227,000
ALTERNATIVE	\$ 1,986,000	—	\$ 1,986,000
SAVINGS (Original minus Alternative)	\$ 1,241,000	—	\$ 1,241,000

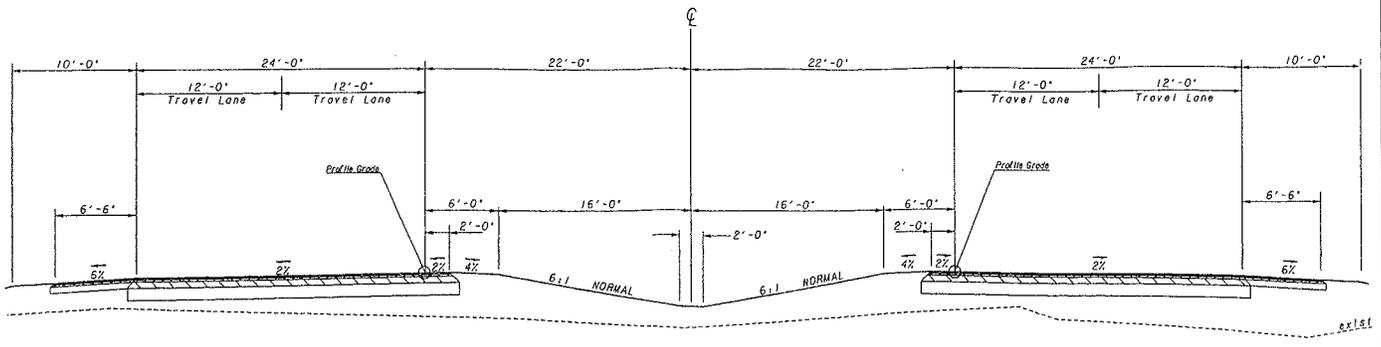
PROJECT: **SR 10/US 78 WIDENING AND RECONSTRUCTION FROM  
CR 166/WHIT DAVES ROAD TO CR 26/SMOKEY ROAD**  
Clarke/Oglethorpe Counties

ALTERNATIVE NO.:

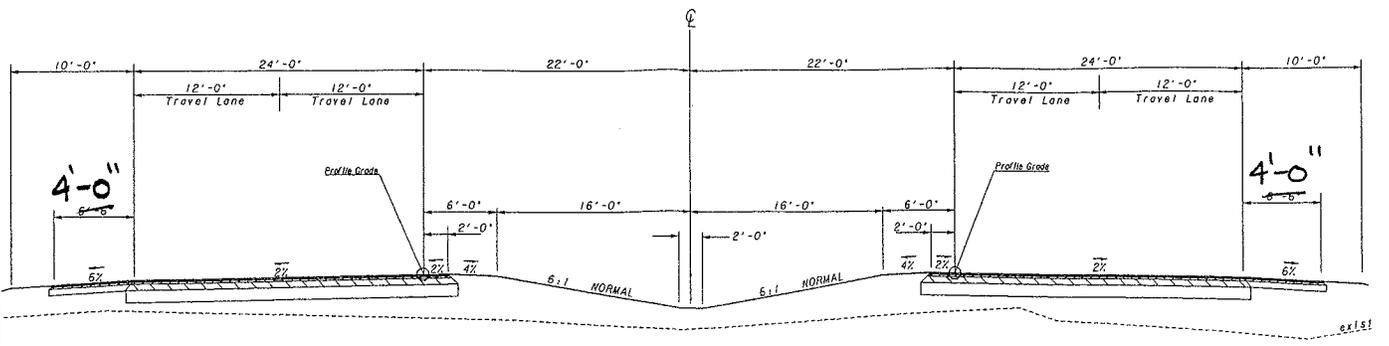
**W-10**

ORIGINAL DESIGN  ALTERNATIVE DESIGN  BOTH

SHEET NO.: **2 of 4**



ORIGINAL DESIGN



ALTERNATE DESIGN

# CALCULATIONS



PROJECT: **SR 10/US 78 WIDENING & RECONSTRUCTION FROM CR**  
**166/WHIT DAVIS ROAD TO CR 26/SMOKEY ROAD**  
*STP00-0014-01(069)*  
*Clarke/Oglethorpe Counties, GA*

ALT. NO.:

**W-10**

SHEET NO.: **3 of 4**

Length of the Road: 7.9 miles =>  $7.9 \times 5,280' = 41,712$  feet or 4,634.67 yards

As-designed: 6.5' feet of shoulder width next to outside lane in each direction.

For 2 shoulders, area = 4,634.67 yards x (6.5'+6.5') = 60,250.67 sy

12.5 mm recycled asphalt – 165 lbs/sy Total Weight: (165 lbs/2000) x 60,250.67 y = 9,941 tons

19.0 mm recycled asphalt – 220 lbs/sy Total Weight: (220 lbs/2000) x 60,250.67 y = 13,255 tons

6" graded aggregate base – 150 lbs/cf Total Weight:  $2[0.5' \times 6.5' \times 41,712'] \times 150 \text{ lbs}/2000 = 40,669$  tons

Alternate design: 4.0' feet of shoulder width next to outside lane in each direction.

For 2 shoulders, area = 4,634.67 yards x (4'+4') = 37,077.33 sy

12.5 mm recycled asphalt – 165 lbs/sy Total Weight: (165 lbs/2000) x 37,077.33 = 6,118 tons

19.0 mm recycled asphalt – 220 lbs/sy Total Weight: (220 lbs/2000) x 37,077.33 = 8,157 tons

6" graded aggregate base – 150 lbs/cf Total Weight:  $2[0.5' \times 4' \times 41,712'] \times 150 \text{ lbs}/2000 = 25,027$  tons

Since 4" of 25 mm Superpave is not part of the paved shoulder, the fuel cost adjustment will be half of the full depth pavement i.e., instead of \$12 per square yard it will be \$6 per square yard.

R/W width can be reduced on each side by 2.5' (6.5' – 4.0') for a total of five feet. However, it is assumed that in reality this will not happen. Therefore, no R/W savings are calculated.





# VALUE ENGINEERING ALTERNATIVE



PROJECT: <b>SR 10/US 78 CRAWFORD/LEXINGTON BYPASS</b> <i>STP00-0014-01(067)</i> <i>Oglethorpe County, GA</i>	ALTERNATIVE NO.: <b>B-1</b>
DESCRIPTION: <b>SKEW THE ALIGNMENT THROUGH THE INTERSECTION WITH SR 77 AND SHORTEN THE BYPASS</b>	SHEET NO.: <b>1 of 7</b>

**ORIGINAL DESIGN:** (sketch attached)

The alignment for the SR 10/US 78 Bypass is 90 degrees to SR 77 requiring a significant “S” curve on SR 10/US 78.

**ALTERNATIVE:** (sketch attached)

Use an approximate 71 degree skew angle for the Bypass intersection with SR 77 and shorten the alignment.

**ADVANTAGES:**

- Shortens the roadway by about 300 ft.
- Reduces the amount of horizontal curvature
- Reduces the amount of cut and the area of disturbance
- Reduces the amount of pavement to maintain
- Reduces the amount of storm water runoff
- Reduces the roadway grades

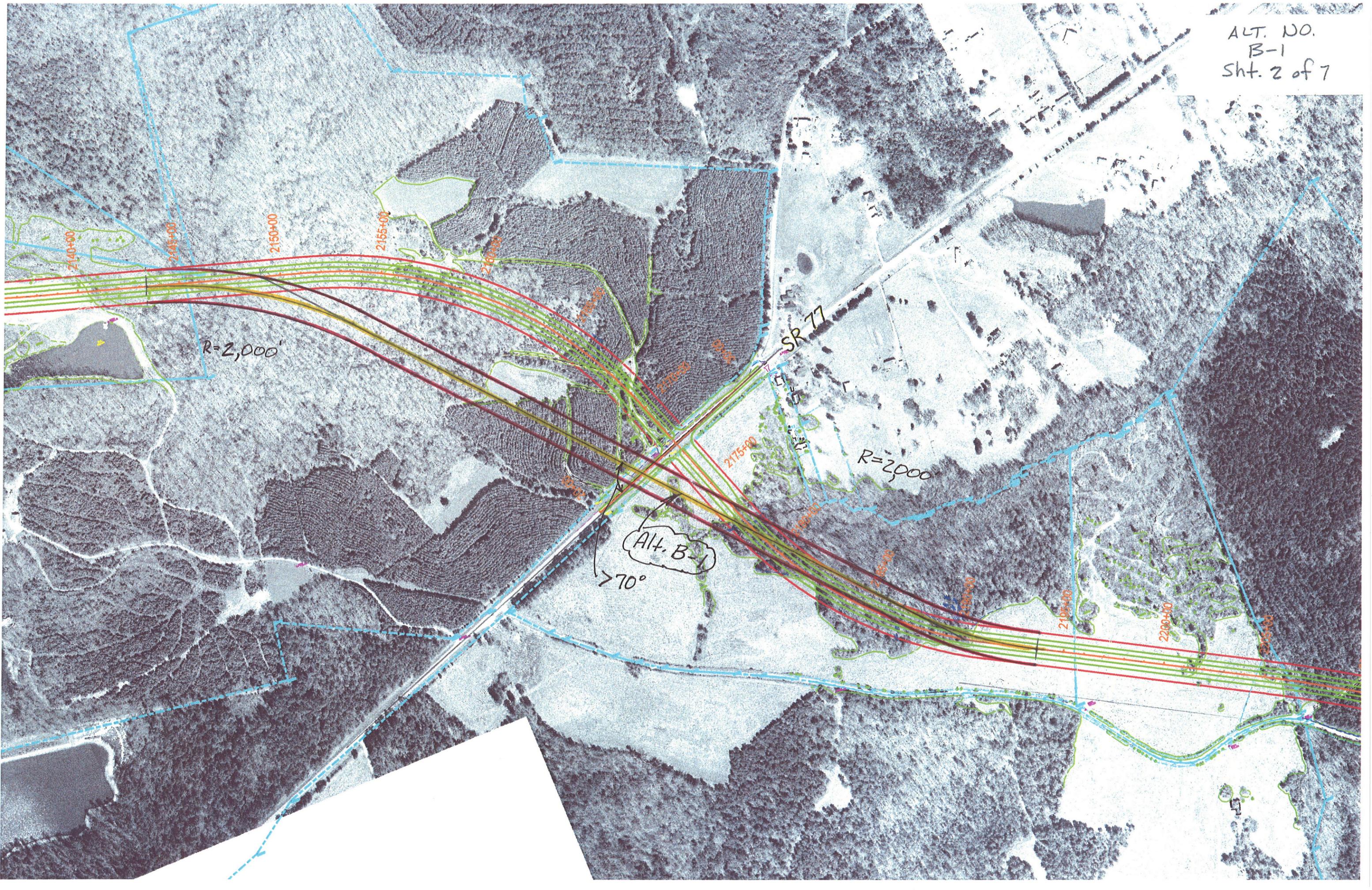
**DISADVANTAGES:**

- Changes the intersection from a 90 degree angle to approximately a 71 degree skew angle

**DISCUSSION:**

This alternative shortens the roadway by about 300 ft. and minimizes the curves in the roadway alignment. A signalized intersection with a 70+ degree skew is an acceptable design. Because the realigned section of roadway is an area where the ground elevations do not undulate as much as on the original alignment, the roadway grades can be reduced, thus enhancing rideability.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 304,000	—	\$ 304,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 304,000	—	\$ 304,000



2140+00

2145+00

2150+00

2155+00

2160+00

SR 77

R=2,000'

R=2,000'

Alt. B-1

>70°

2175+00

2180+00

2185+00

2190+00

2195+00

2200+00

2205+00

2210+00

2215+00

2220+00

2225+00

2230+00

2235+00

2240+00

2245+00

2250+00

2255+00



MATCH LINE A

MATCH LINE B

500' VC  
K = 161.4 Alt.

500.00VC  
K = 129.29

PVC STA 2165+35.00  
PVC EL 738.16

PVI STA 2167+85.00  
PVI EL 748.15

PVI EL 748.15  
PVI STA 2168+00  
PVI EL 741.45

PVT STA 2170+35.00  
PVT EL 748.48

AS DESIGNED GRADE LINE

ORIGINAL PROFILE  
+3.9979%

+3.458% Alt. PROFILE

ALTERNATIVE GRADE LINE

+0.36%

+3.9979%

740

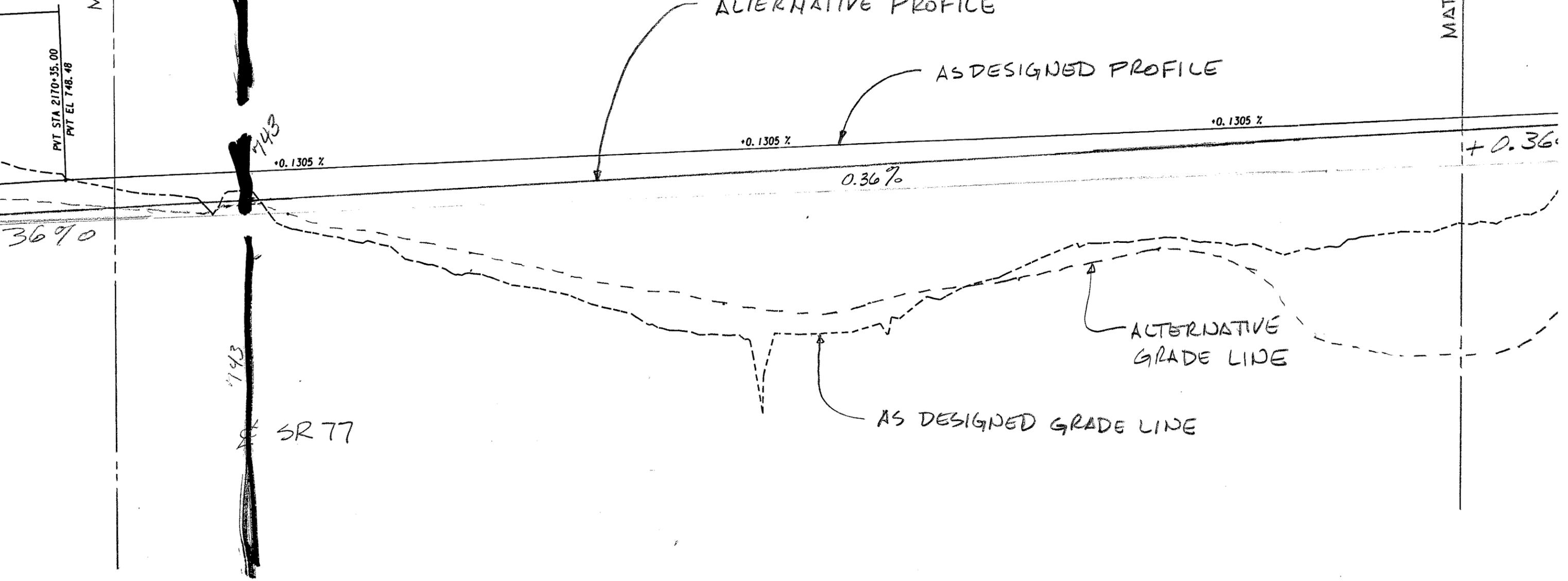
740

MATCH LINE B

MATCH LINE C

2172+30  
74300  
Along new  
Profile

PVT STA 2170+35.00  
PVT EL 748.48



36'9"

743

SR 77

743

0.1305 %

ALTERNATIVE PROFILE

AS DESIGNED PROFILE

0.1305 %

0.36 %

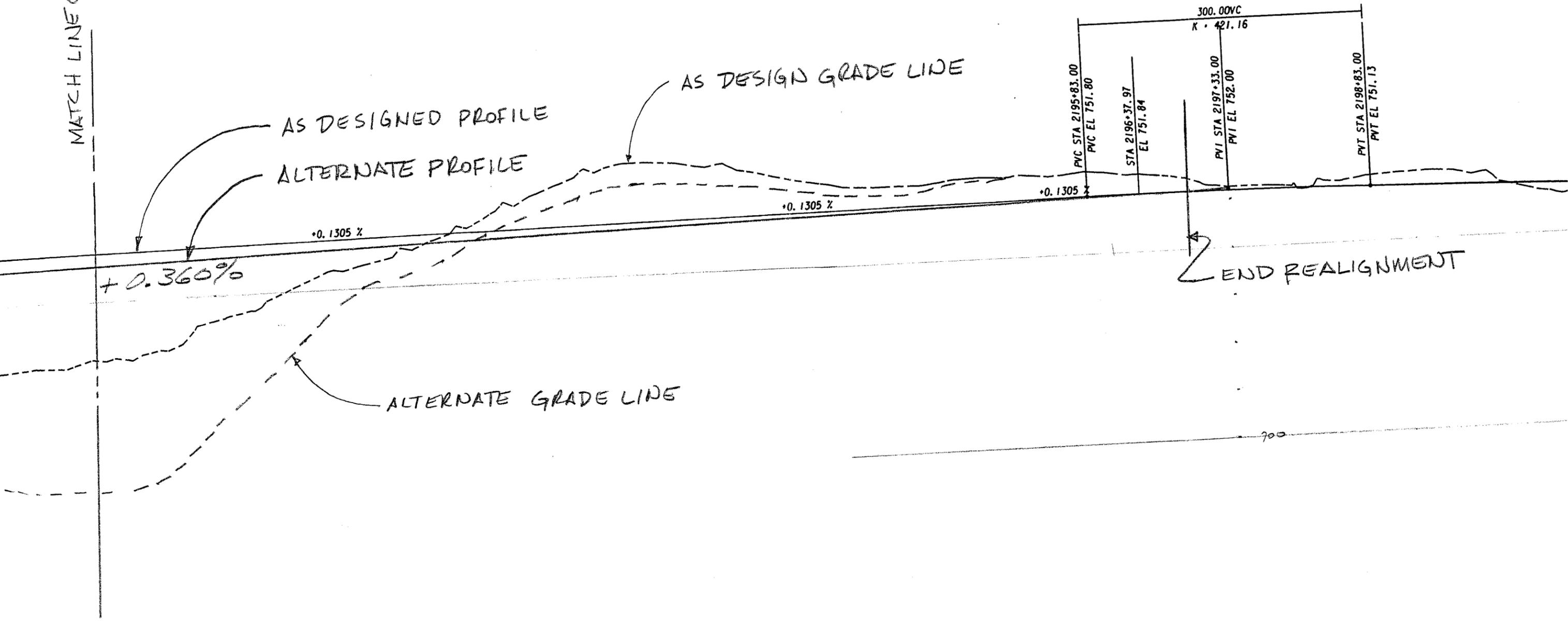
0.1305 %

+ 0.36 %

ALTERNATIVE  
GRADE LINE

AS DESIGNED GRADE LINE

MATCH LINE C





# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:  
**B-4**

DESCRIPTION: **LOWER THE ROADWAY PROFILE TO REDUCE  
 EARTHWORK EMBANKMENT FROM STA 2214+00 TO  
 STA 2233+00**

SHEET NO.: **1 of 5**

**ORIGINAL DESIGN:** (sketch attached)

The current design's profile grade has an earthwork requirement of 160,000 cy of borrow material.

**ALTERNATIVE:** (sketch attached)

Lower the profile grade from approximately Sta 2214+00 to Sta 2233+00 to reduce the earthwork embankment requirement.

**ADVANTAGES:**

- Reduces construction time
- Reduce the quantity of borrow material required
- Reduces project cost
- Reduces area of disturbance

**DISADVANTAGES:**

- Slightly steeper grade required

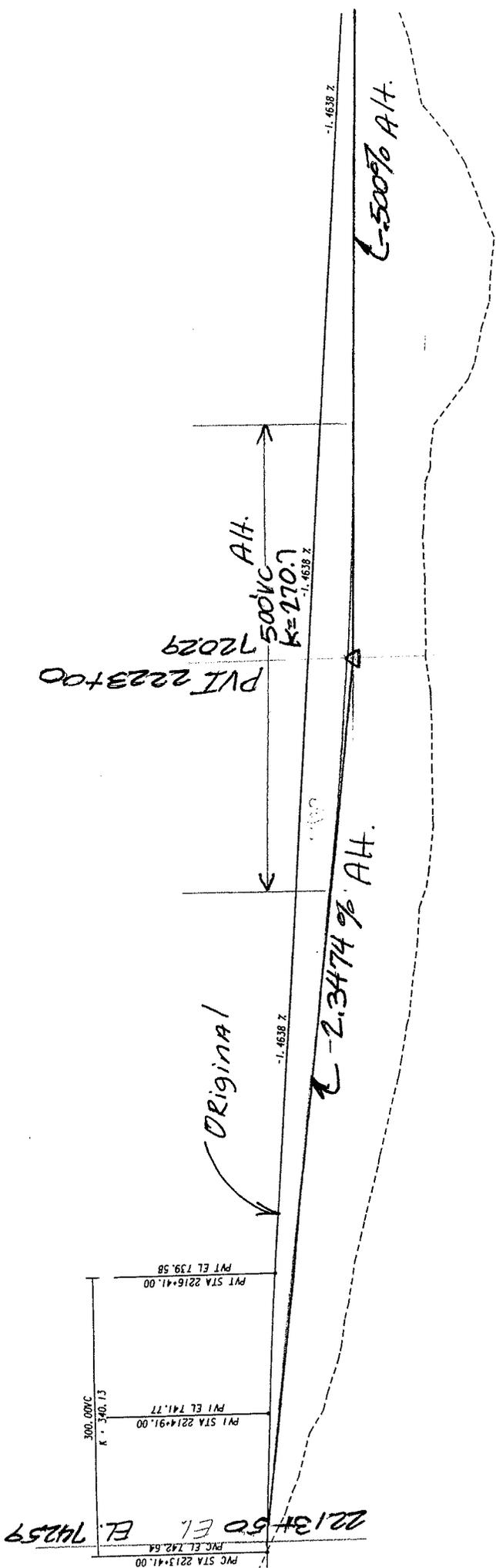
**DISCUSSION:**

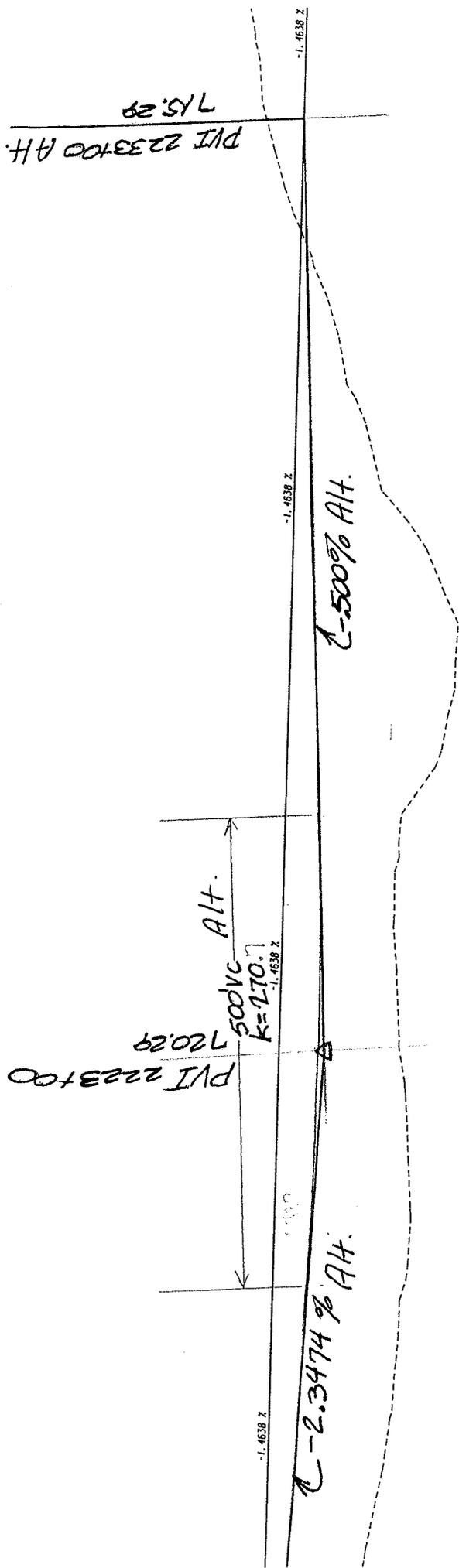
After adjusting the unclassified excavation earthwork by a 20% shrinkage factor (source: GDOT Recommended Shrinkage Factors by county), the net result is 160,000 cy of borrow material required for this project. By adjusting the roadway profile between these stations, some of this cut can be eliminated. It is important to mention that this alternate profile does not require any additional roadway "cut", unclassified excavation. Also the steepest grade with the alternate profile would be 2.3%.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 405,000	—	\$ 405,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 405,000	—	\$ 405,000

ALT. NO.  
B-4  
Sht 2 of 5

STA 2213+50 to STA 2233+00





ALT. NO.  
 B-4  
 SH. 3 of 5

STA 2213+50 to Sta 2233+00

# CALCULATIONS



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:  
**B-4**

SHEET NO.: **4 of 5**

Earthwork computations:

Fill embankment = 1,917,312 CY ; Unclass Excavation = 2,195,901 CY; Shrinkage = 20%

Adjusted Excavation = 2,195,901CY x (1-.2) = 1,756,721 CY

Fill embankment = 1,917,312 CY

-Adjusted Excavation = 1,756,721 CY

Borrow = 160,591 CY ( for Project only for information purposes)

Alternate Design earthwork Computations (estimate):

Fill Embankment saved =  $[(9'/2) \text{ avg. ht.} \times (1900') \times \text{avg. width (240')}] / 27\text{cf/cy} = 76,000 \text{ CY}$



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:  
**B-5**

DESCRIPTION: **LOWER THE ROADWAY PROFILE TO REDUCE  
 EARTHWORK EMBANKMENT FROM STA 2261+00 TO  
 STA 2276+50**

SHEET NO.: **1 of 5**

**ORIGINAL DESIGN:** (sketch attached)

The current design's profile grade has an earthwork requirement of approximately 160,000 cy of borrow material.

**ALTERNATIVE:** (sketch attached)

Lower the profile grade from approximately Sta 2261+00 to Sta 2276+50 to reduce the earthwork embankment requirement.

**ADVANTAGES:**

- Reduces construction time
- Reduce the quantity of borrow material required
- Reduces project cost
- Reduces area of disturbance

**DISADVANTAGES:**

- Slightly steeper grade required

**DISCUSSION:**

After adjusting the unclassified excavation earthwork by a 20% shrinkage factor (source: GDOT Recommended Shrinkage Factors by county), the net result is 160,000 cy of borrow material required for this project. By adjusting the roadway profile between these stations, some of this cut can be eliminated. It is important to mention that this alternate profile does not require any additional roadway "cut," unclassified excavation. Also the steepest grade for the alternate profile would be -4.7% in lieu of -3.5% (-5% is allowable).

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 155,000	—	\$ 155,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 155,000	—	\$ 155,000

ALT. No.  
B-5  
Sht. 2 of 5

PVI 2270+00  
E.L. 631.58

ALT. 400' VC A  
K = 155.8

Original

-4.7467% Alt.

600' Alt.  
K = 182.8

PVI 2261+00  
E.L. 674.30

PVI STA 2262+00.00  
PVT EL. 667.80

PVI STA 2259+50.00  
PVI EL. 676.50

PVC STA 2257+00.00  
PVC EL. 680.16

500.00' VC  
K = 248.23

-1.4638%

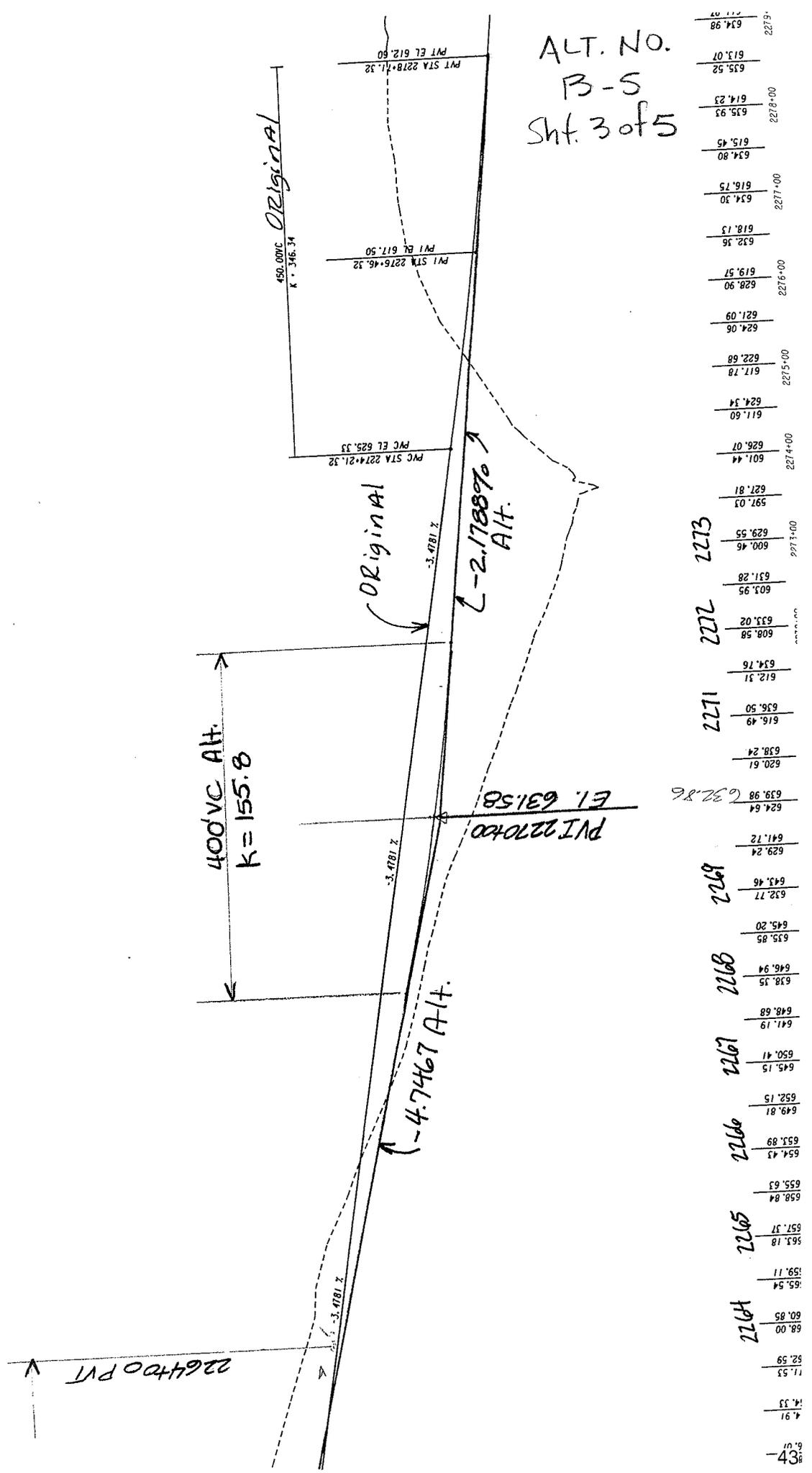
740'

54' Alt.

STA 2261+00 to STA 2276+00

(TSJ Needs 650' (S.L.)  
to get to median for Lx)  
Driver can see 740' Turn.

ALT. NO.  
B-5  
Sht. 3 of 5



Station	Original Elevation	ALT. Elevation
2264+00	60.00	60.00
2264+10	60.50	60.50
2264+20	61.00	61.00
2264+30	61.50	61.50
2264+40	62.00	62.00
2264+50	62.50	62.50
2264+60	63.00	63.00
2264+70	63.50	63.50
2264+80	64.00	64.00
2264+90	64.50	64.50
2265+00	65.00	65.00
2265+10	65.50	65.50
2265+20	66.00	66.00
2265+30	66.50	66.50
2265+40	67.00	67.00
2265+50	67.50	67.50
2265+60	68.00	68.00
2265+70	68.50	68.50
2265+80	69.00	69.00
2265+90	69.50	69.50
2266+00	70.00	70.00
2266+10	70.50	70.50
2266+20	71.00	71.00
2266+30	71.50	71.50
2266+40	72.00	72.00
2266+50	72.50	72.50
2266+60	73.00	73.00
2266+70	73.50	73.50
2266+80	74.00	74.00
2266+90	74.50	74.50
2267+00	75.00	75.00
2267+10	75.50	75.50
2267+20	76.00	76.00
2267+30	76.50	76.50
2267+40	77.00	77.00
2267+50	77.50	77.50
2267+60	78.00	78.00
2267+70	78.50	78.50
2267+80	79.00	79.00
2267+90	79.50	79.50
2268+00	80.00	80.00
2268+10	80.50	80.50
2268+20	81.00	81.00
2268+30	81.50	81.50
2268+40	82.00	82.00
2268+50	82.50	82.50
2268+60	83.00	83.00
2268+70	83.50	83.50
2268+80	84.00	84.00
2268+90	84.50	84.50
2269+00	85.00	85.00
2269+10	85.50	85.50
2269+20	86.00	86.00
2269+30	86.50	86.50
2269+40	87.00	87.00
2269+50	87.50	87.50
2269+60	88.00	88.00
2269+70	88.50	88.50
2269+80	89.00	89.00
2269+90	89.50	89.50
2270+00	90.00	90.00
2270+10	90.50	90.50
2270+20	91.00	91.00
2270+30	91.50	91.50
2270+40	92.00	92.00
2270+50	92.50	92.50
2270+60	93.00	93.00
2270+70	93.50	93.50
2270+80	94.00	94.00
2270+90	94.50	94.50
2271+00	95.00	95.00
2271+10	95.50	95.50
2271+20	96.00	96.00
2271+30	96.50	96.50
2271+40	97.00	97.00
2271+50	97.50	97.50
2271+60	98.00	98.00
2271+70	98.50	98.50
2271+80	99.00	99.00
2271+90	99.50	99.50
2272+00	100.00	100.00
2272+10	100.50	100.50
2272+20	101.00	101.00
2272+30	101.50	101.50
2272+40	102.00	102.00
2272+50	102.50	102.50
2272+60	103.00	103.00
2272+70	103.50	103.50
2272+80	104.00	104.00
2272+90	104.50	104.50
2273+00	105.00	105.00
2273+10	105.50	105.50
2273+20	106.00	106.00
2273+30	106.50	106.50
2273+40	107.00	107.00
2273+50	107.50	107.50
2273+60	108.00	108.00
2273+70	108.50	108.50
2273+80	109.00	109.00
2273+90	109.50	109.50
2274+00	110.00	110.00
2274+10	110.50	110.50
2274+20	111.00	111.00
2274+30	111.50	111.50
2274+40	112.00	112.00
2274+50	112.50	112.50
2274+60	113.00	113.00
2274+70	113.50	113.50
2274+80	114.00	114.00
2274+90	114.50	114.50
2275+00	115.00	115.00
2275+10	115.50	115.50
2275+20	116.00	116.00
2275+30	116.50	116.50
2275+40	117.00	117.00
2275+50	117.50	117.50
2275+60	118.00	118.00
2275+70	118.50	118.50
2275+80	119.00	119.00
2275+90	119.50	119.50
2276+00	120.00	120.00

# CALCULATIONS



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:

**B-5**

SHEET NO.: **4 of 5**

Earthwork computations:

Fill embankment = 1,917,312 CY ; Unclass Excavation = 2,195,901 CY; Shrinkage = 20%

Adjusted Excavation = 2,195,901CY x (1-.2) = 1,756,721 CY

Fill embankment = 1,917,312 CY

-Adjusted Excavation = 1,756,721 CY

Borrow = 160,591 CY ( Total Project, only for information purposes)

Alternate Design earthwork Computations (estimate):

Fill Embankment saved =  $[(7.3'/2) \text{ avg. ht.} \times (1200') \times \text{avg. width} (180')] / 27\text{cf/cy} = 29,000 \text{ CY}$



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:  
**B-6**

DESCRIPTION: **LOWER THE ROADWAY PROFILE TO REDUCE  
 EARTHWORK EMBANKMENT FROM STA 2313+50 TO  
 STA 2362+00**

SHEET NO.: 1 of 7

**ORIGINAL DESIGN:** (sketch attached)

The current design's profile grade has an earthwork requirement of approximately 160,000 cy of borrow material.

**ALTERNATIVE:** (sketch attached)

Lower the profile grade from approximately Sta 2313+50 to Sta 2362+00 to reduce the earthwork embankment requirement.

**ADVANTAGES:**

- Reduces construction time
- Reduce the quantity of borrow material required
- Reduces project cost
- Reduces area of disturbance

**DISADVANTAGES:**

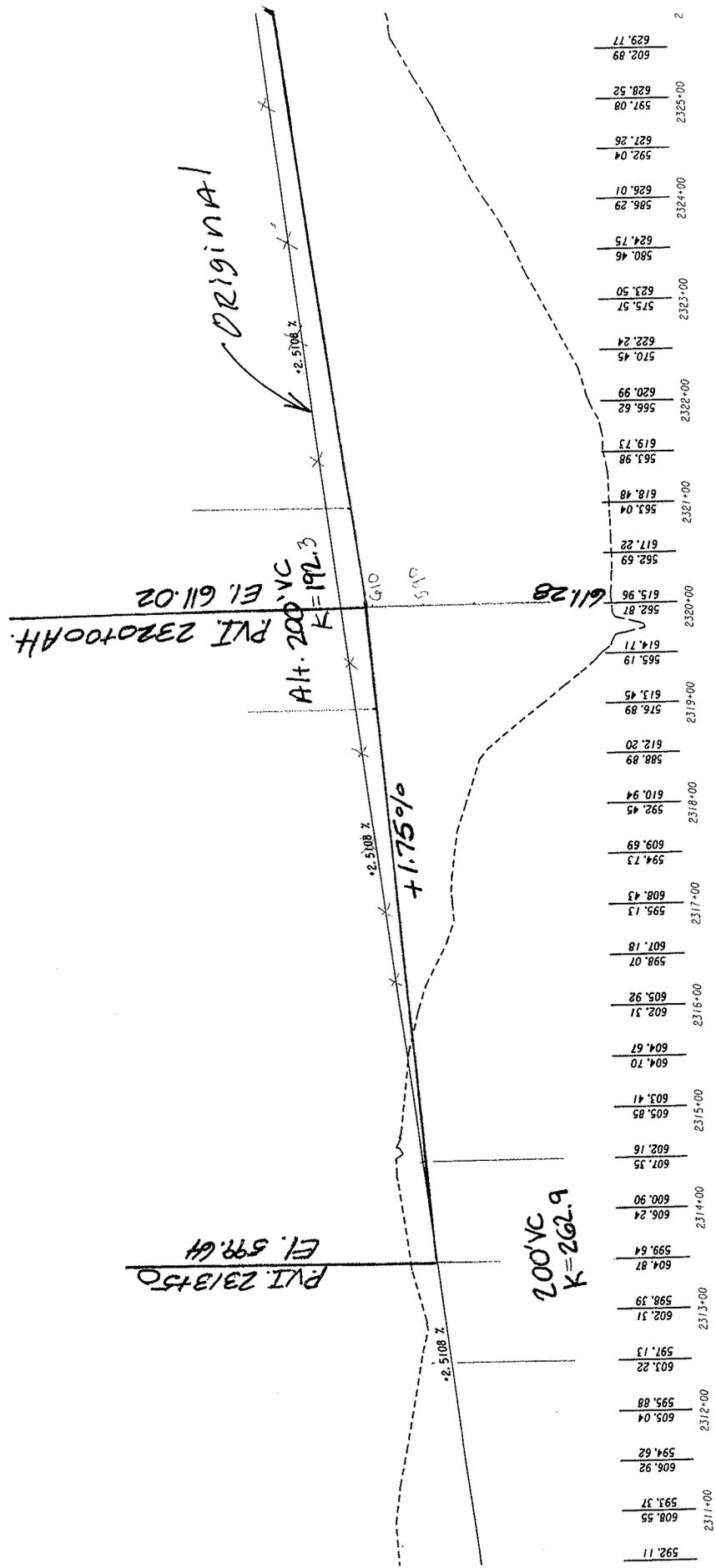
- Slightly steeper grade required

**DISCUSSION:**

After adjusting the unclassified excavation earthwork by a 20% shrinkage factor (source: GaDOT Recommended Shrinkage Factors by county), the net result is 160,000 cy of borrow material required for this project. By adjusting the roadway profile between these stations, some of this cut can be eliminated. It is important to mention that this alternate profile does not require any additional roadway "cut," unclassified excavation. Also the steepest grade for the alternate profile would be +2.8% in lieu of +2.5% (+5% is allowable).

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 341,000	—	\$ 341,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 341,000	—	\$ 341,000

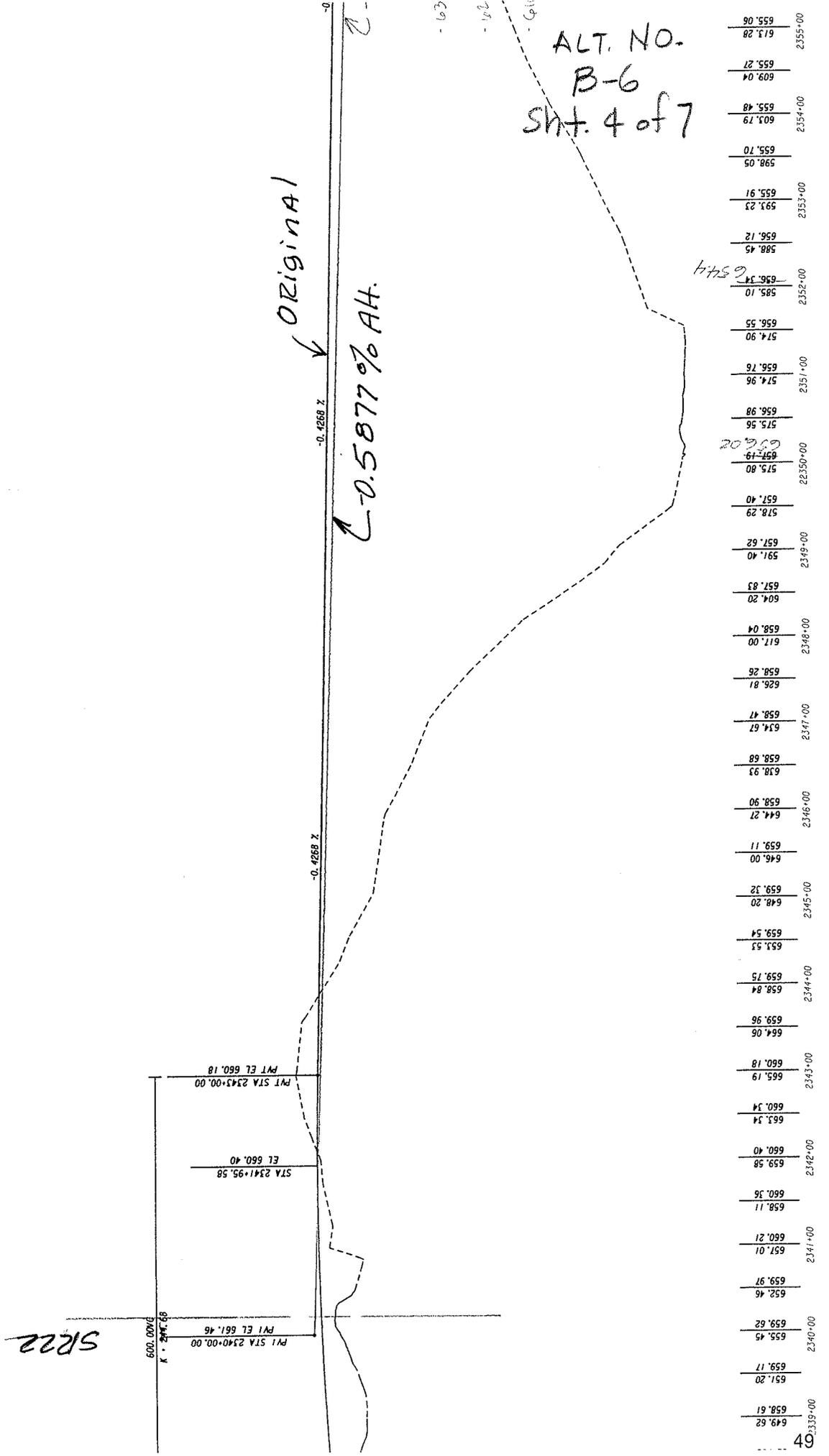
ACT. NO.  
 B-6  
 Sht. 2 of 7





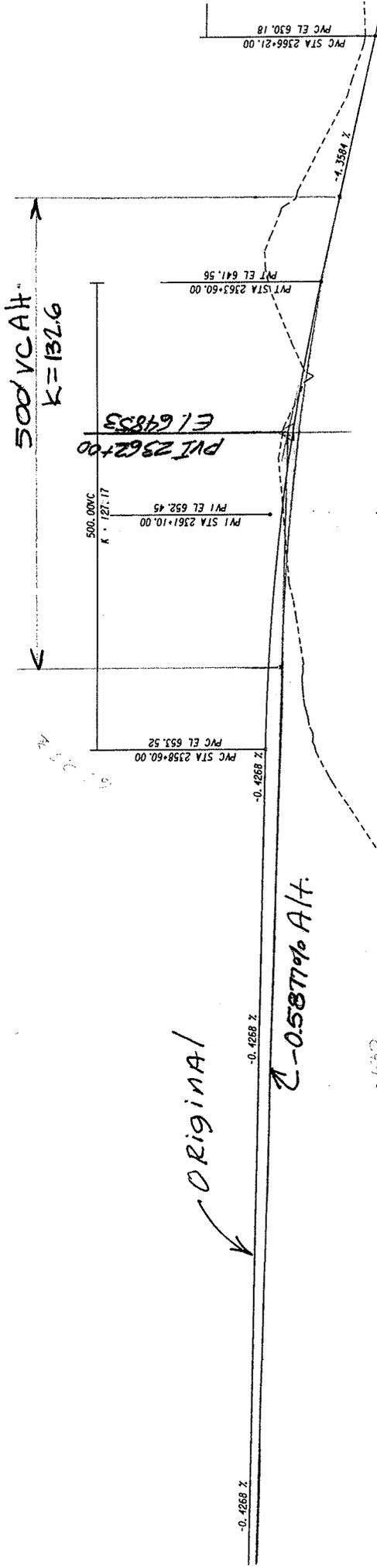
ALT. NO.  
B-6  
SHT. 4 of 7

Original  
-0.5877% AH.



SR22

ALT. NO.  
B-6  
Sht. 5 of 7



2352+00	572.00
2353+00	575.19
2354+00	574.96
2355+00	574.76
2356+00	574.90
2357+00	574.96
2358+00	574.96
2359+00	574.96
2360+00	574.96
2361+00	574.96
2362+00	574.96
2363+00	574.96
2364+00	574.96
2365+00	574.96
2366+00	574.96
2367+00	574.96
2368+00	574.96
2369+00	574.96
2370+00	574.96
2371+00	574.96
2372+00	574.96
2373+00	574.96
2374+00	574.96
2375+00	574.96
2376+00	574.96
2377+00	574.96
2378+00	574.96
2379+00	574.96
2380+00	574.96
2381+00	574.96
2382+00	574.96
2383+00	574.96
2384+00	574.96
2385+00	574.96
2386+00	574.96
2387+00	574.96
2388+00	574.96
2389+00	574.96
2390+00	574.96
2391+00	574.96
2392+00	574.96
2393+00	574.96
2394+00	574.96
2395+00	574.96
2396+00	574.96
2397+00	574.96
2398+00	574.96
2399+00	574.96
2400+00	574.96

246.17 ALT.

254.9

# CALCULATIONS



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:

**B-6**

SHEET NO.: **6 of 7**

Earthwork computations:

Fill embankment = 1,917,312 CY ; Unclass Excavation = 2,195,901 CY; Shrinkage = 20%

Adjusted Excavation = 2,195,901CY x (1-.2) = 1,756,721 CY

Fill embankment = 1,917,312 CY

-Adjusted Excavation = 1,756,721 CY

Borrow = 160,591 CY ( Total Project, only for information purposes)

Alternate Design earthwork Computations (estimated):

Fill Embankment saved = [(5'/2) avg. ht. x (1950') x avg. width (210')] / 27cf/cy = 38,000 CY

Fill Embankment saved = [(3'/2) avg. ht. x (1700') x avg. width (280')] / 27cf/cy = 26,000 CY

Total Borrow saved = 64,000 CY



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:  
**B-12**

DESCRIPTION: **USE 11-FOOT-WIDE INSIDE LANES IN LIEU OF 12-FOOT-WIDE LANES**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:** (sketch attached)

All travel lanes will be 12 feet wide.

**ALTERNATIVE:** (sketch attached)

Make the inside travel lane 11 feet wide. Retain the outside travel lane and the turning lanes at 12 feet wide.

**ADVANTAGES:**

- Saves money
- Reduces pavement area to maintain
- Reduces storm water runoff

**DISADVANTAGES:**

- Perceived sense of constricted space

**DISCUSSION:**

In downtown Atlanta, I-75 and I-85 have 11-ft.-wide lanes. Traffic count is more than 200,000 vehicles per day. With 55 mph design speed and vehicles often traveling at 70 mph, there has not been any major problems. On SR10/US78, the maximum ADT for design year 2034 is only 9,740. Since majority of the trucks will be traveling on the outside lane, considerable amount of money can be saved by narrowing the inside lane from 12 feet to 11 feet. The inside lane also has 2 feet of full depth paved shoulder. Travelers on the inside lane will therefore have 13 feet of width to maneuver their vehicles.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 705,000	—	\$ 705,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 705,000	—	\$ 705,000

# SKETCH



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
**STPOO-0014-01 (067)**  
*Clarke/Oglethorpe Counties*

ALTERNATIVE NO.:

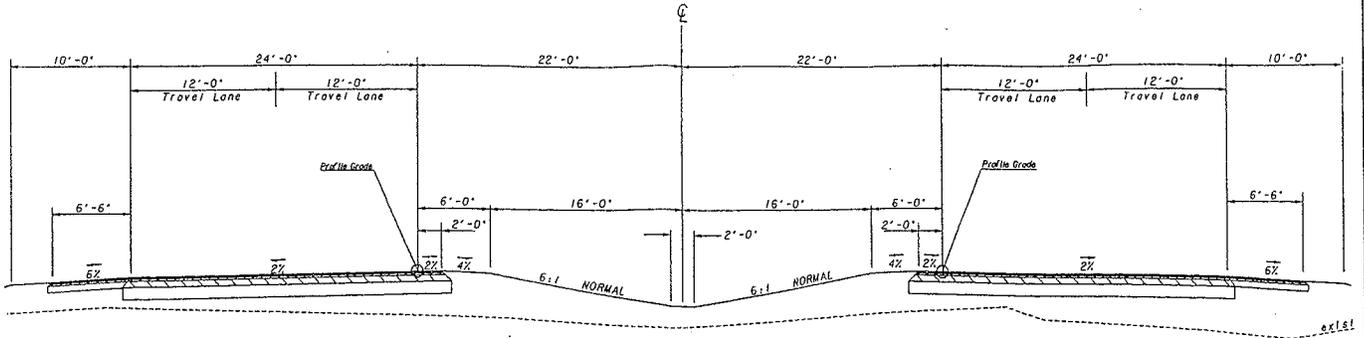
**B-12**

ORIGINAL DESIGN

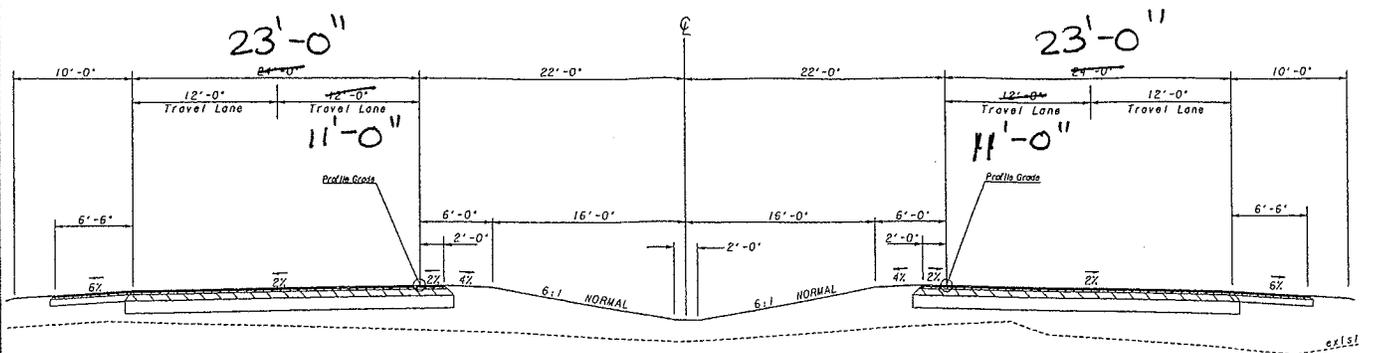
ALTERNATIVE DESIGN

BOTH

SHEET NO.: **2 of 4**



ORIGINAL DESIGN



ALTERNATE DESIGN

# CALCULATIONS



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALT. NO.:

**B-12**

SHEET NO.: **3 of 4**

Length of the Road: 7.4 miles =>  $7.4 \times 5,280' = 39,072$  feet or 4,341.33 square yards  
One foot of pavement width will be saved in each direction.

12.5 mm recycled asphalt – 165 lbs/sy	Total Weight:	$(1'+1')(165 \text{ lbs}/2000) \times 4,341.33 \text{ sy} = 1,432$ tons
19.0 mm recycled asphalt – 220 lbs/sy	Total Weight:	$(1'+1')(220 \text{ lbs}/2000) \times 4,341.33 \text{ sy} = 1,910$ tons
25.0 mm recycled asphalt – 440 lbs/sy	Total Weight:	$(1'+1')(440 \text{ lbs}/2000) \times 4,341.33 \text{ sy} = 3,820$ tons
12" graded aggregate base – 150 lbs/cf	Total Weight:	$12''(1'+1') \times 39,072' \times 150 \text{ lbs}/2000 = 11,722$ tons

For 2 lanes, fuel saving:  $4,341.333 \text{ yards} \times (1'+1') = 8,683 \text{ sy}$

It is assumed that the R/W width will not be reduced by two feet. Therefore, no savings are calculated.



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:  
**B-13**

DESCRIPTION: **USE 11-FEET-WIDE LANES IN LIEU OF 12-FEET-WIDE LANES**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:** (sketch attached)

All travel lanes will be 12 feet wide.

**ALTERNATIVE:** (sketch attached)

Make the through lanes 11 feet wide. Retain the turning lanes at 12 feet wide.

**ADVANTAGES:**

- Saves money
- Reduces pavement area to maintain
- Reduces storm water runoff

**DISADVANTAGES:**

- Perceived sense of constricted space

**DISCUSSION:**

In downtown Atlanta, I-75 and I-85 have 11-ft.-wide lanes. Traffic count is more than 200,000 vehicles per day. With 55 mph design speed and vehicles often traveling at 70 mph, there have not been any major problems. On SR10/US78, the maximum average daily traffic (ADT) for design year 2034 is only 9,740. Considerable amount of money can be saved by narrowing the through lanes from 12 feet to 11 feet. Travelers on the inside lane will therefore have 13 feet of width to maneuver their vehicles. The outside lane has 6.5 feet of paved shoulder while the inside lane has 2 feet of full depth paved shoulder. With 44 feet of median opening, traffic hazards will be minimal.

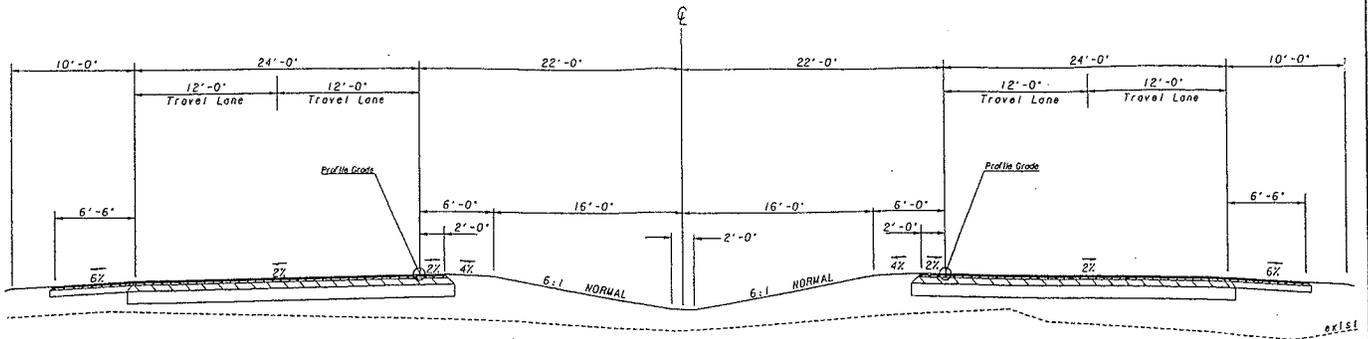
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,409,000	—	\$ 1,409,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 1,409,000	—	\$ 1,409,000

PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
**STP00-0014-01(067)**  
*Clarke/Oglethorpe Counties*

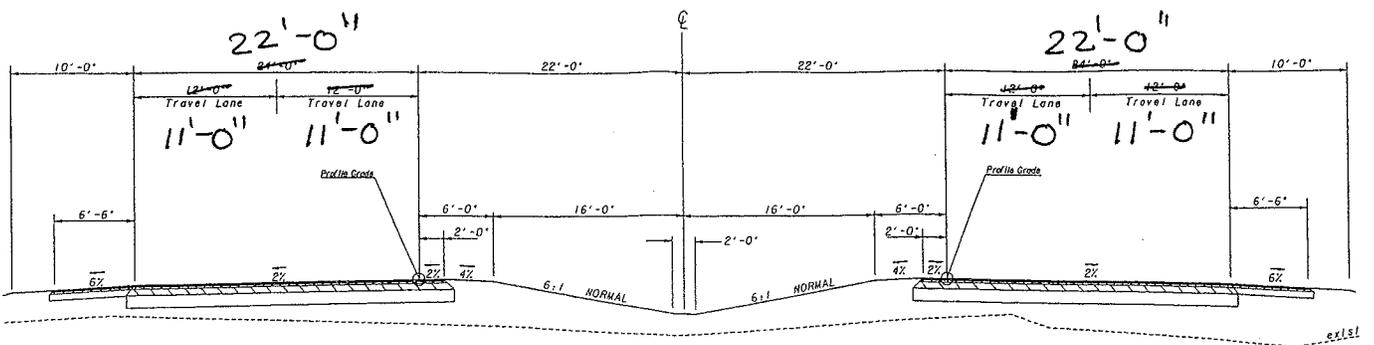
ALTERNATIVE NO.:  
**B-13**

ORIGINAL DESIGN  ALTERNATIVE DESIGN  BOTH

SHEET NO.: **2 of 4**



ORIGINAL DESIGN



ALTERNATE DESIGN

# CALCULATIONS



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALT. NO.:

**B-13**

SHEET NO.: **3 of 4**

Length of the Road: 7.4 miles  $\Rightarrow 7.4 \times 5,280' = 39,072$  feet or 4,341.33 square yards  
Two feet of pavement width will be saved in each direction.

12.5 mm recycled asphalt – 165 lbs/sy	Total Weight:	$(2'+2')(165 \text{ lbs}/2000) \times 4,341.33 \text{ sy} = 2,864$ tons
19.0 mm recycled asphalt – 220 lbs/sy	Total Weight:	$(2'+2')(220 \text{ lbs}/2000) \times 4,341.33 \text{ sy} = 3,820$ tons
25.0 mm recycled asphalt – 440 lbs/sy	Total Weight:	$(2'+2')(440 \text{ lbs}/2000) \times 4,341.33 \text{ sy} = 7,640$ tons
12" graded aggregate base – 150 lbs/cf	Total Weight:	$12''(2'+2') \times 39,072' \times 150 \text{ lbs}/2000 = 23,443$ tons

For 4 lanes, fuel saving:  $4,341.33 \text{ yards} \times (2'+2') = 17,365 \text{ sy}$

It is assumed that the R/W width will not be reduced by four feet. Therefore, no savings are calculated.



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:  
**B-14**

DESCRIPTION: **USE A 4-FEET-WIDE PAVED OUTSIDE SHOULDER IN LIEU OF A 6.5-FEET-WIDE PAVED OUTSIDE SHOULDER**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:** (sketch attached)

The outside lanes have 6.5-ft.-wide paved shoulders.

**ALTERNATIVE:** (sketch attached)

Construct a 4-ft.-wide paved shoulder in lieu of a 6.5 ft. width for the outside lanes.

**ADVANTAGES:**

- Saves money
- Reduces pavement area to maintain
- Reduces amount of impervious area and storm water runoff

**DISADVANTAGES:**

- None apparent

**DISCUSSION:**

On a four lane divided highway, it is common to have paved shoulders that are 4 feet in width. Eliminating 2.5 feet of paved shoulder will not affect the function of this project.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,620,000	—	\$ 2,620,000
ALTERNATIVE	\$ 1,613,000	—	\$ 1,613,000
SAVINGS (Original minus Alternative)	\$ 1,007,000	—	\$ 1,007,000

PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
**STPOO-0014-01 (067)**  
*Clarke/Oglethorpe Counties*

ALTERNATIVE NO.:

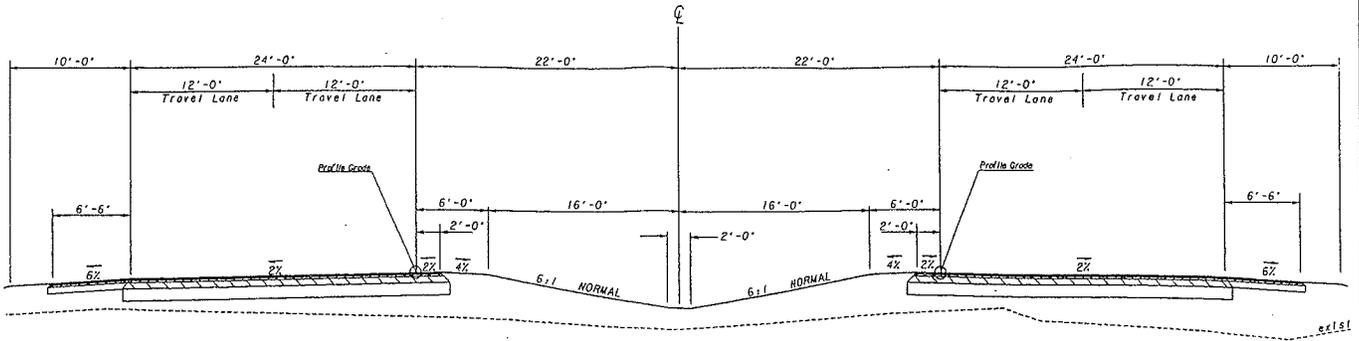
**B-14**

ORIGINAL DESIGN

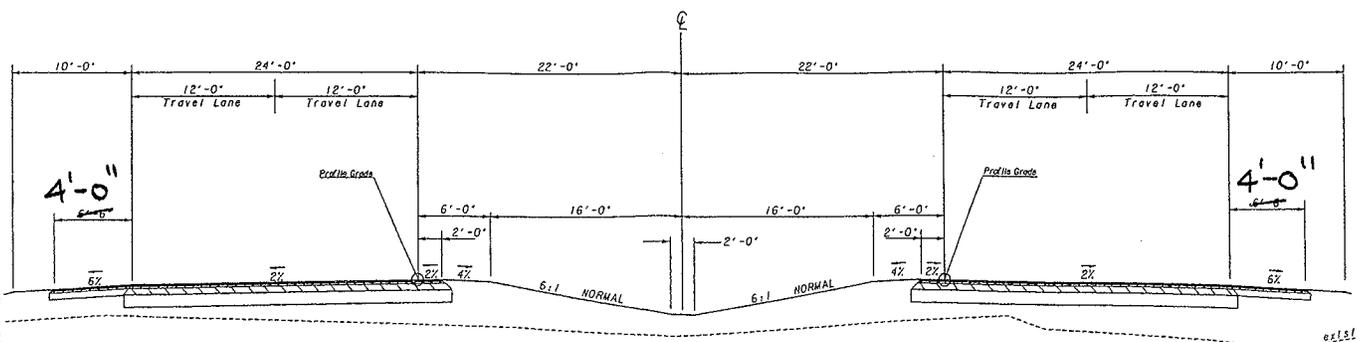
ALTERNATIVE DESIGN

BOTH

SHEET NO.: **2 of 4**



ORIGINAL DESIGN



ALTERNATE DESIGN

# CALCULATIONS



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALT. NO.:

**B-14**

SHEET NO.: **3 of 4**

Length of the Road: 7.4 miles =>  $7.4 \times 5,280' = 39,072$  feet or 4,341.33 square yards

As-designed: 6.5' feet of shoulder width next to outside lane in each direction.

For 2 shoulders, area =  $4,341.33 \text{ yards} \times (6.5' + 6.5') = 56,437.33 \text{ sy}$

12.5 mm recycled asphalt – 165 lbs/sy    Total Weight:  $(165 \text{ lbs}/2000) \times 56,437.33 \text{ sy} = 9,312 \text{ tons}$

19.0 mm recycled asphalt – 220 lbs/sy    Total Weight:  $(220 \text{ lbs}/2000) \times 56,437.33 \text{ sy} = 12,416 \text{ tons}$

6" graded aggregate base – 150 lbs/cf    Total Weight:  $2[0.5' \times 6.5' \times 39,072'] \times 150 \text{ lbs}/2000 = 38,095 \text{ tons}$

Alternate design: 4.0' feet of shoulder width next to outside lane in each direction.

For 2 shoulders, area =  $4,341.33 \text{ yards} \times (4' + 4') = 34,730.67 \text{ sy}$

12.5 mm recycled asphalt – 165 lbs/sy    Total Weight:  $(165 \text{ lbs}/2000) \times 34,730.67 \text{ sy} = 5,731 \text{ tons}$

19.0 mm recycled asphalt – 220 lbs/sy    Total Weight:  $(220 \text{ lbs}/2000) \times 34,730.67 \text{ sy} = 7,641 \text{ tons}$

6" graded aggregate base – 150 lbs/cf    Total Weight:  $2[0.5' \times 4' \times 39,072'] \times 150 \text{ lbs}/2000 = 23,443 \text{ tons}$

Since 4" of 25 mm Superpave is not part of the paved shoulder, the fuel cost adjustment will be half of the full depth pavement i.e., instead of \$12 per square yard it will be \$6 per square yard.

R/W width can be reduced on each side by 2.5' ( $6.5' - 4.0'$ ) for a total of five feet. However, it is assumed that in reality this will not happen. Therefore, no R/W savings are calculated.



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:  
**B-15**

DESCRIPTION: **USE A 32-FEET-WIDE MEDIAN IN LIEU OF A 44-FEET-WIDE MEDIAN**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:** (sketch attached)

The median is 44 feet wide.

**ALTERNATIVE:** (sketch attached)

Construct a 32-ft.-wide median in lieu of the 44 ft. width.

**ADVANTAGES:**

- Saves money
- Saves construction time
- Reduces right-of-way
- Reduces area of disturbance

**DISADVANTAGES:**

- Narrower clear zone

**DISCUSSION:**

On a four lane divided highway, it is common to have median that is 32 feet in width. Eliminating 12 feet of median will not affect the function of this project but will result in a narrowing of the right-of-way requirement as well as some reduction in earthwork.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 881,000	—	\$ 881,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 881,000	—	\$ 881,000



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
**STPOO-0014-01 (067)**  
*Clarke/Oglethorpe Counties*

ALTERNATIVE NO.:

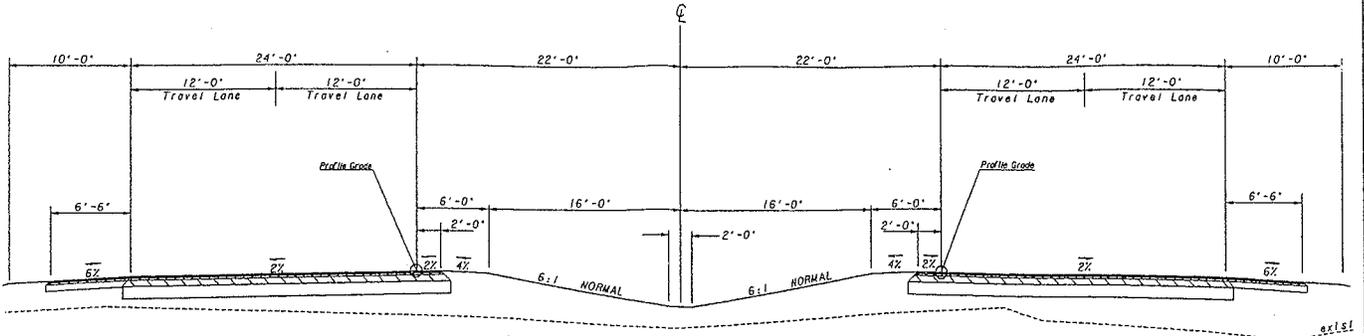
**B-15**

ORIGINAL DESIGN

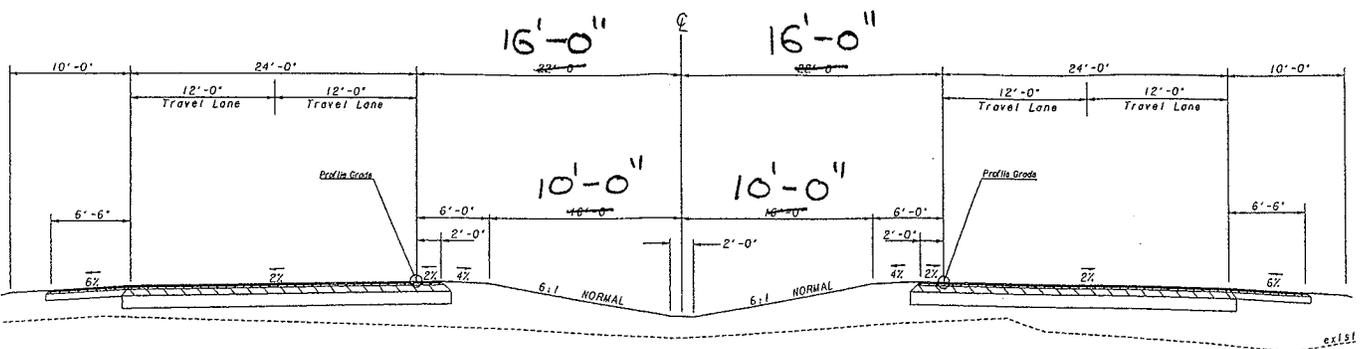
ALTERNATIVE DESIGN

BOTH

SHEET NO.: 2 of 4



ORIGINAL DESIGN



ALTERNATE DESIGN

# CALCULATIONS



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALT. NO.:

**B-15**

SHEET NO.: **3 of 4**

Length of the Road: 7.4 miles =>  $7.4 \times 5,280' = 39,072$  feet    Width of Median saved = 12'    1 acre = 43,560 sf  
Total acreage of R/W saved"  $39,072' \times 12' / 43,560 \text{sf} = 10.764$  acres

Due to reduction in twelve feet of median width, the earthwork is expected to decrease by 10%.

$0.10 \times 1,000,000 \text{ cy} = 100,000 \text{ cy}$



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:

**B-16**

DESCRIPTION: **DELAY INSTALLATION OF TRAFFIC SIGNALS AT THE  
 INTERSECTION OF SR 10/US 78 AND SR 22 AND SR 77**

SHEET NO.: **1 of 5**

**ORIGINAL DESIGN:** (sketch attached)

Traffic signals are to be installed at the new intersections of the SR 10/US 78 Bypass and SR 22 and SR 77.

**ALTERNATIVE:** (sketch attached)

Delay the installation of the traffic signals until traffic volumes increase to warrant the signals.

**ADVANTAGES:**

- Provides uninterrupted flow on SR 10/US 78

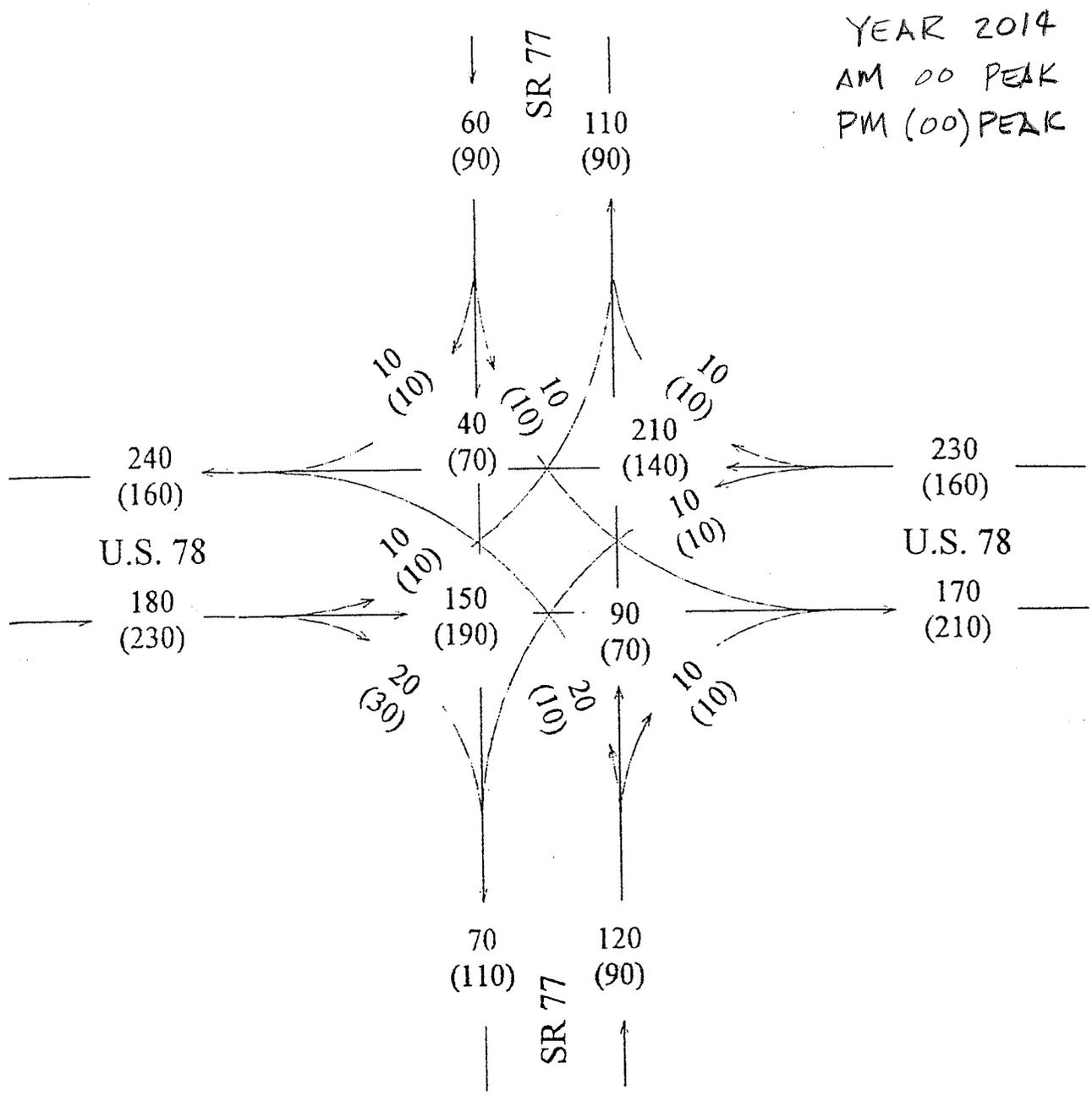
**DISADVANTAGES:**

- Requires all vehicles on SR 22 and SR 77 to stop at the SR 10/US 78 intersection before proceeding to cross it or make a turn

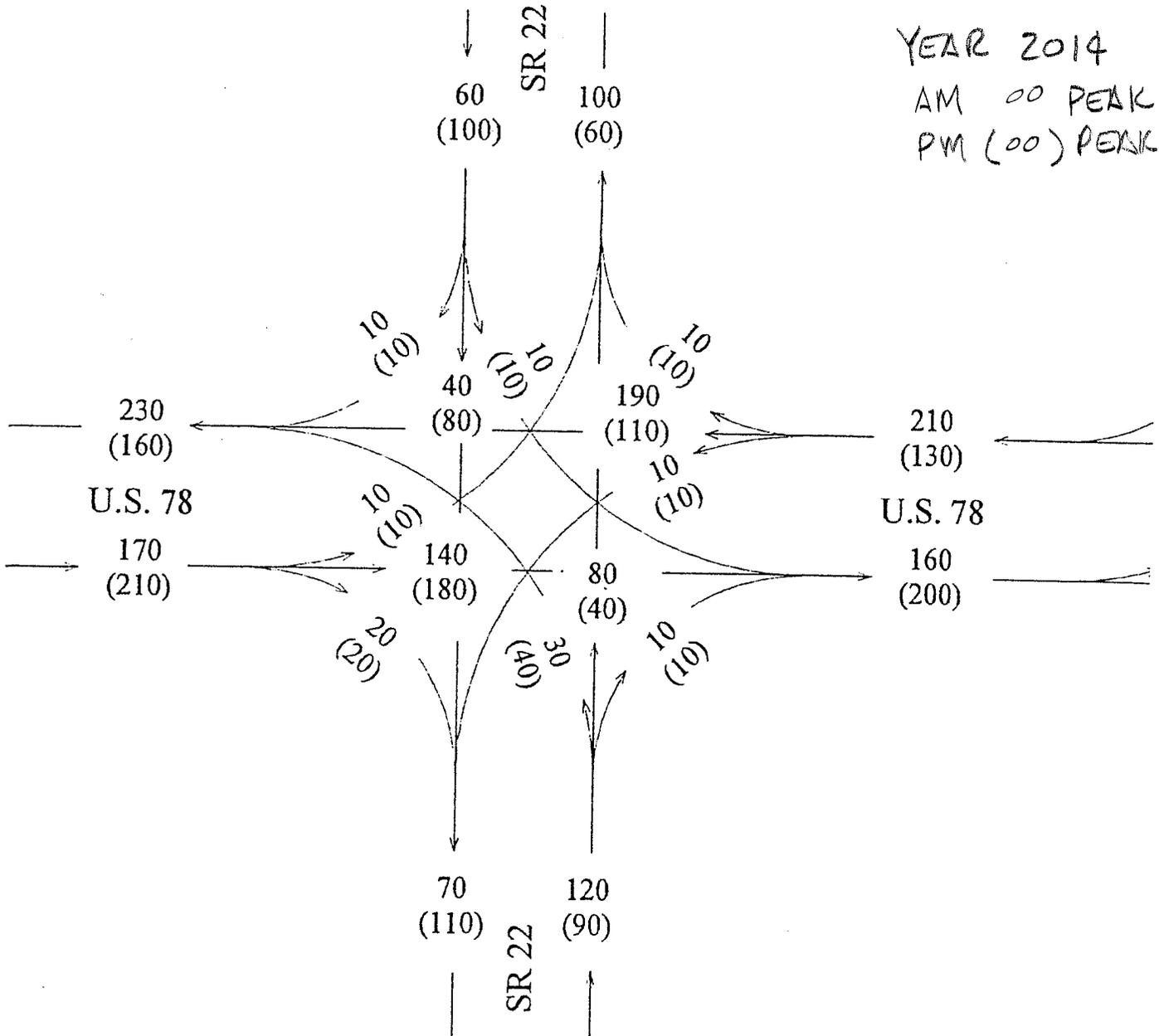
**DISCUSSION:**

When the Bypass opens, traffic at these intersections will be very light and thus signals are not required to maintain an adequate level of service, which is calculated at B. Install the signals when traffic volumes increase to warrant them, thus saving costs initially.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 118,000	—	\$ 118,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 118,000	—	\$ 118,000



YEAR 2014  
 AM 00 PEAK  
 PM (00) PEAK



YEAR 2014  
 AM 00 PEAK  
 PM (00) PEAK

ALT. NO.  
B-6  
Sht. 4 of 5

**2014 Signal Warrants Evaluation**  
For GADOT VE Study

**Warrant 3 Peak Hour Evaluations**

Intersection	No. of Lanes per Approach		Highest Peak Hour Volume		Required Hourly Volume		Stopped Time Delay on Minor St (Veh-Hrs)	LOS on Minor St STOP Controlled	Warrant Meet?
	Major	Minor	Major (VPH)	Minor (VPH)	Major (VPH)	Minor (VPH)			
U.S. 78 @ SR 22	1	1	380	110	800	100	0.4		NO
U.S. 78 @ SR 77	1	1	410	110	800	100	0.4		NO
U.S. 78 @ Arnoldsville Rd	2	1	1255	170	800	100	15.2		YES
U.S. 78 @ Walter Sams Rd	2	1	1100	115	800	100	5.1		YES

- The intersections of U.S. 78 at SR 22 and SR 77 does not meet the peak hour warrants for 2014 peak hour volumes to install a traffic signal. The minor street approaches at these two intersections operate at LOS B under stop control during the peak hours in the year 2014.
- The intersections of U.S. 78 at Arnoldsville Road and Walter Sams Road meet the peak hour warrants for 2014 peak hour volumes to install a traffic signal. The minor street approaches at these two intersections operate at LOS F under stop control during the peak hours in the year 2014.



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)*  
*Oglethorpe County, GA*

ALTERNATIVE NO.:  
**B-17**

DESCRIPTION: **REALIGN THE ROADWAY TO THE NORTH FROM  
 APPROXIMATE STATION 2040+00 AND STATION 2095+00**

SHEET NO.: 1 of 7

**ORIGINAL DESIGN:** (sketch attached)

The alignment for the Bypass goes southeast from the eastern connection to existing SR 10/US 78 and then curves back to the northeast and then back to the east starting at Station 2095+00.

**ALTERNATIVE:** (sketch attached)

Start the alignment for the Bypass as in the current design and then curve it to the east to line up with the section east of Station 2095+00. Eliminate the reverse curve in the roadway.

**ADVANTAGES:**

- Shortens the roadway by about 600 ft.
- Eliminates a reverse curve in the horizontal road alignment
- Reduces the grades from 5.6438% and 4.7560% to less than 4%
- Reduces the amount of earthwork by reducing the amount of high fills
- Reduces the overall right-of-way requirement

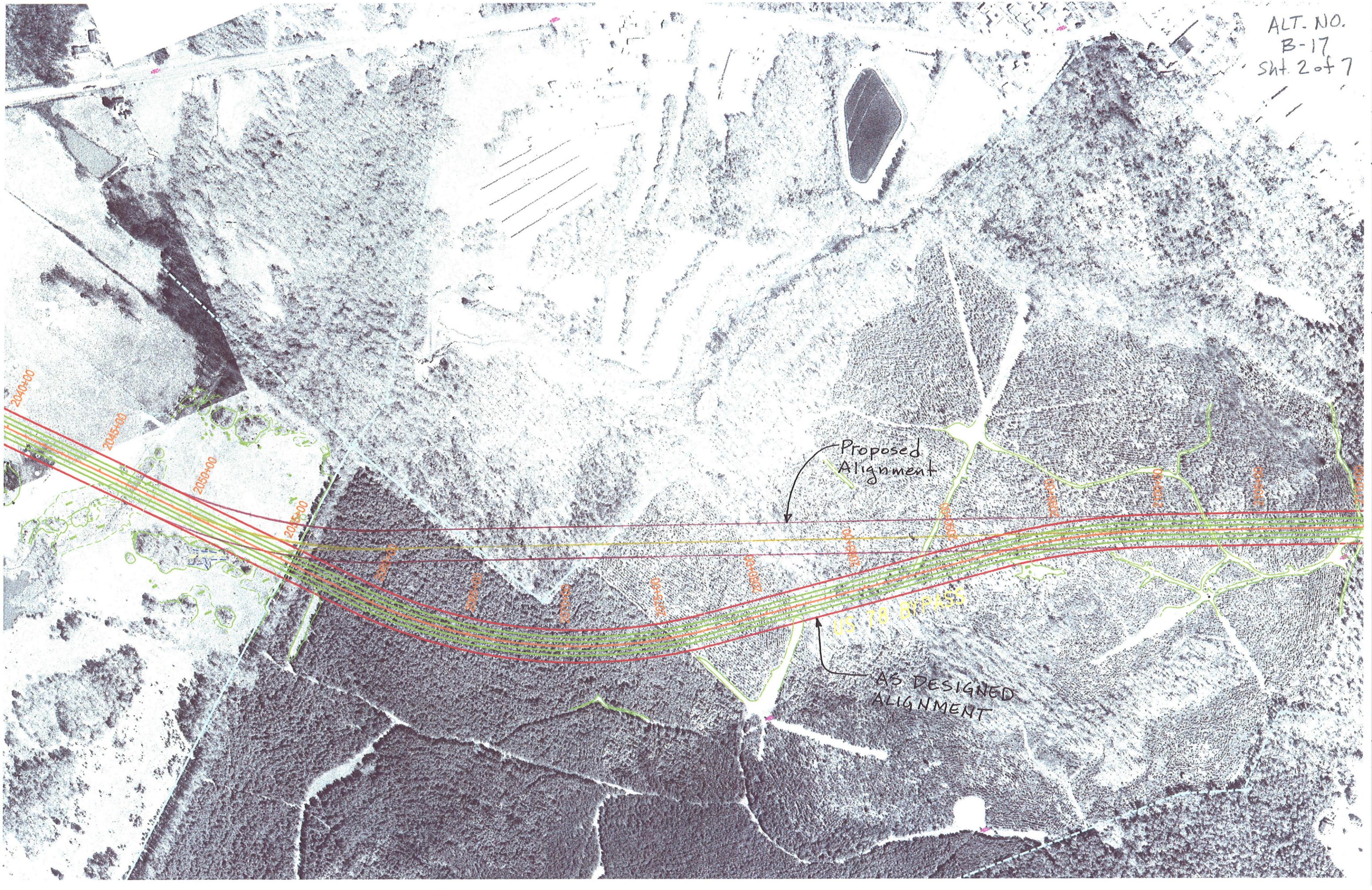
**DISADVANTAGES:**

- Requires right-of-way acquisition from a farm owner

**DISCUSSION:**

This alternative straightens the roadway by eliminating a reverse curve as well as it lowers the vertical differential between high and low points. This shortens the roadway and reduces the earthwork requirements thus saving costs. The roadway grade is also lowered to below 4% which is preferred for a rolling type of highway.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 608,000	—	\$ 608,000
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 608,000	—	\$ 608,000



Proposed Alignment

US 78 BYPASS

AS DESIGNED ALIGNMENT

2040+00

2045+00

2050+00

2055+00

2060+00

2065+00

2070+00

2075+00

2080+00

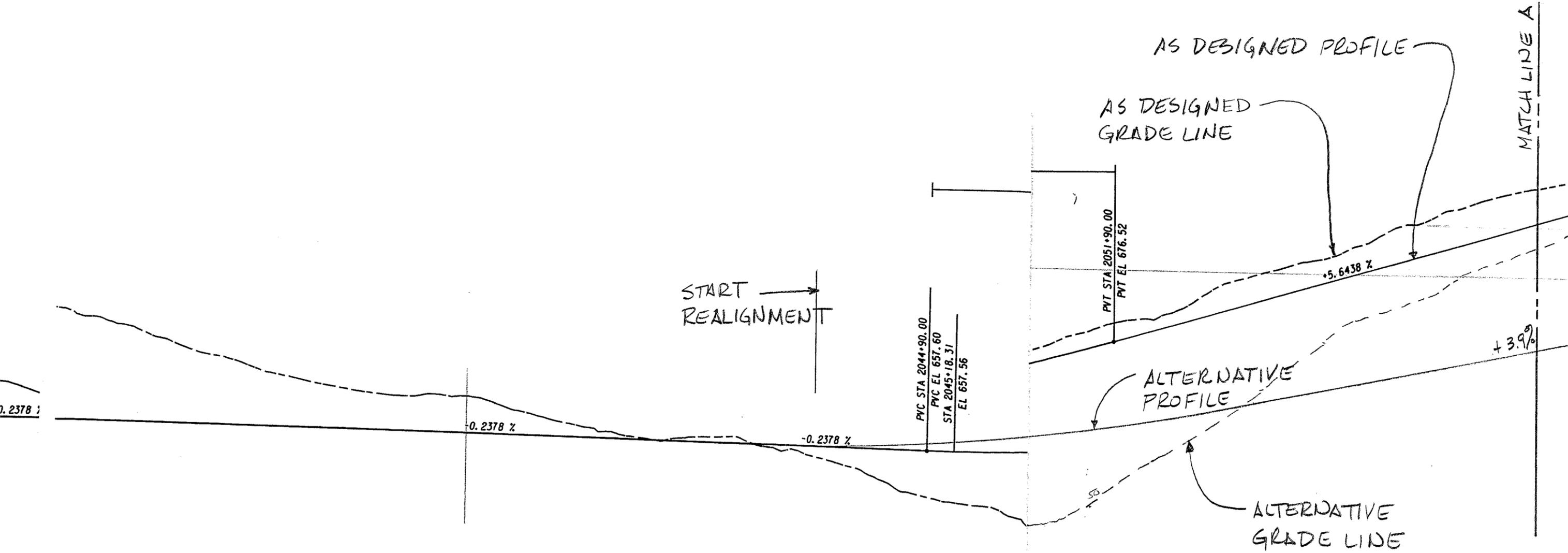
2085+00

2090+00

2095+00

2100+00

2105+00



MATCH LINE A

MATCH LINE B

AS DESIGNED PROFILE

AS DESIGNED GRADE LINE

ALTERNATIVE GRADE LINE

ALTERNATIVE PROFILE

PVC STA 2062+00.00  
PVC EL 733.52

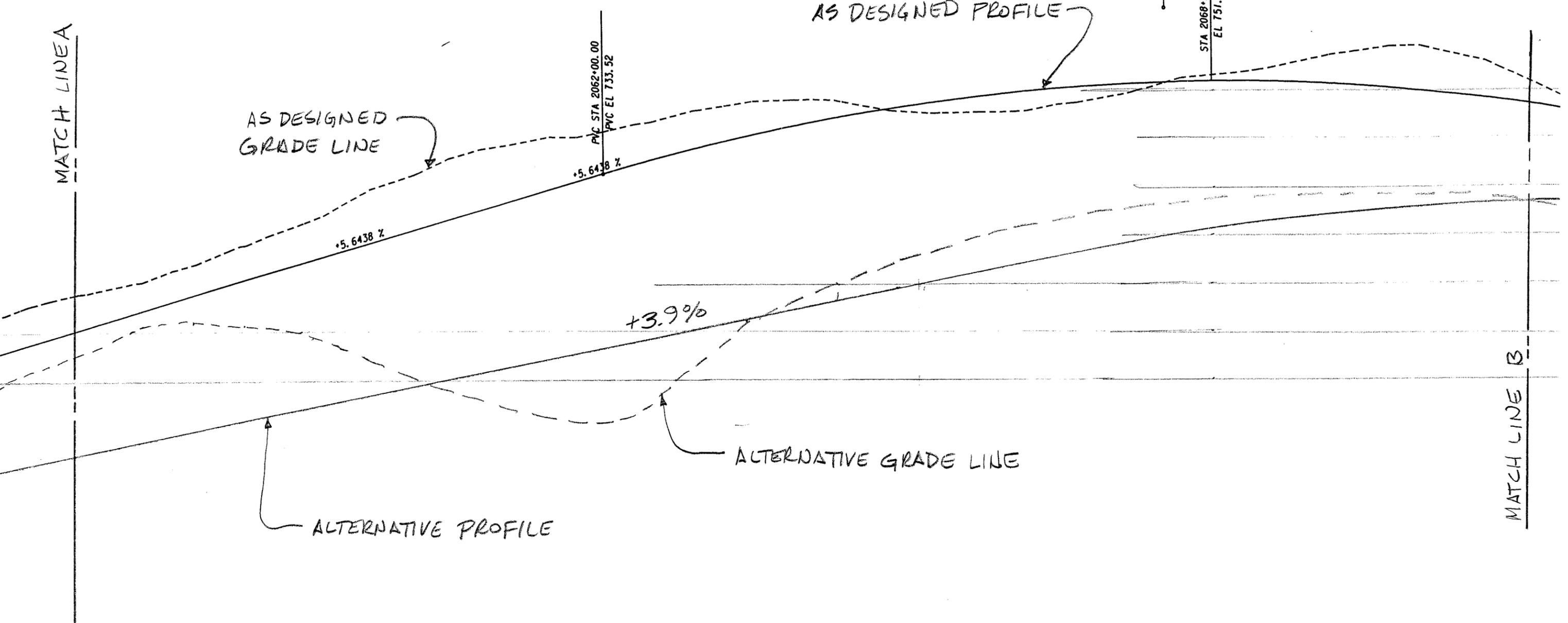
PVI STA 2061  
PVI EL 76

STA 2068+51.22  
EL 751.90

+5.6438 %

+5.6438 %

+3.9%



MATCH LINE B

MATCH LINE C

PVT STA 2074+00.00  
PVT EL 738.85

-4.7560 %

PVC STA 2078+35.00  
PVC EL 718.16

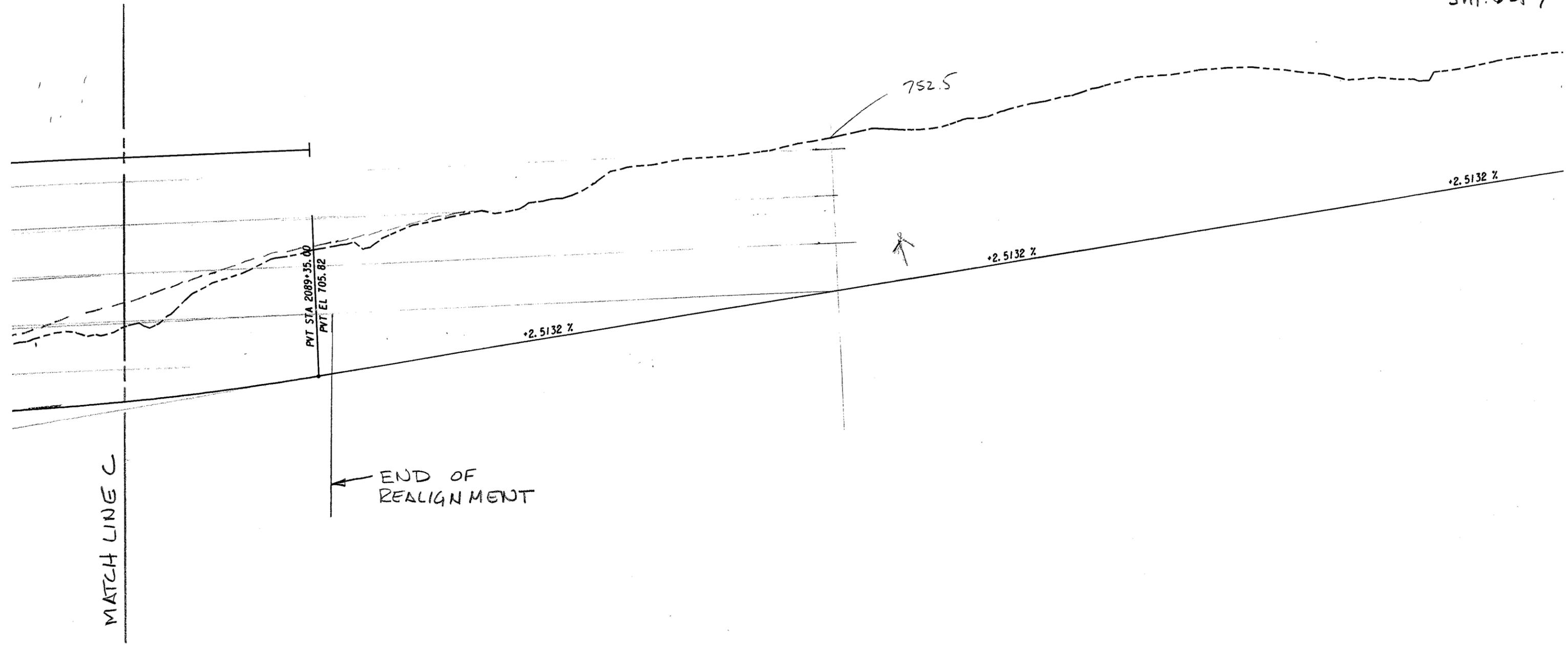
-2.69%

1100.00VC  
K = 151.32

PVI STA 2083+85.00  
PVI EL 692.00

700

STA 2085+54.69  
EL 701.04





---

## PROJECT DESCRIPTION

---

The VE study reviewed three projects:

- SR 10/US 78 Widening and Reconstruction From CR 166/Whit Davis Road to CR 26/Smokey Road, STP00-0014-01(069), P.I. No. 132660, Clarke/Oglethorpe Counties;
- US 78 Bridge Over Moss Creek, BR000-0001-00(221), P.I. No. 0001221, Oglethorpe County; and
- SR 10/US 78 Crawford/Lexington Bypass, STP00-0014-01(067), P.I. No. 231910, Oglethorpe County

These projects were revised versions of the three projects referenced above that had concept development reports first approved in July 2000. The US 78 Bridge Over Moss Creek project was eliminated from consideration because the revised concept report dated October 26, 2009 for the widening project, rerouted SR 10/US 78 around the existing bridge alignment, thus negating the need for the additional bridge. Details of the projects follow.

### **SR 10/US 78 Widening and Reconstruction From CR 166/Whit Davis Road to CR 26/Smokey Road**

This project starts out in Clarke County just east of Whit Davis Road by converting a four-lane divided roadway to a five-lane urban section through a developed section of the roadway and to minimize the impact to historical properties on both sides of the road. The typical section will consist of two, 12-ft.-wide through lanes in each direction and one, 14-ft.-wide common left-turn lane. There will be 16-ft.-wide urban shoulders on each side, with curb and gutter, and a 5-ft.-wide concrete sidewalk. A 100-ft.-wide right-of-way will be maintained and the speed limit in this section will be 45 miles per hour (mph). Piped storm water drainage will be provided in this area.

The five-lane section continues to approximately ½-mile west of Robert Hardeman Road. It then transitions to a four-lane divided highway with the widening occurring mainly to the south of the existing roadway. The typical section will consist of two 12-ft.-wide lanes in each direction and 10-ft.-wide rural shoulders with 6.5 ft. of paving on the outside shoulder and 2 ft. of paving on the inside shoulder in each direction. A 160-ft. minimum right-of-way with a 44-ft.-wide depressed grass median will be maintained. The speed limit in this section will be 55 mph.

Initially, the divided roadway will follow the alignment of the existing roadway. Starting about ¼-mile west of Walter Sams Road/Double Bridges Road it will follow a new parallel alignment with the existing road to the north. The roadway will rejoin the original SR 10/US 78 alignment where Arnoldsville Road intersects the existing road. A new connection for Arnoldsville Road to SR 10/US 78 will be formed. There will also be a connection for the existing SR 10/US 78 (Lexington Road) with the new road. Widening of the existing road to four divided lanes will continue until just past the intersection with Smokey Road. There will be four signalized intersections at CR 166/Whit Davis Road, Robert Hardeman Road, Walter Sams Road, and Arnoldsville Road. The total length of the widening project is 7.9 miles.

As part of the project, several concrete box culverts will be constructed for storm water conveyance.

**SR 10/US 78 Crawford/Lexington Bypass Project**

This project begins where the widening project terminates east of Smokey Road. The Bypass alignment goes south of the existing road alignment for 7.4 miles before tying back into the mainline just west of the SR 22/SR 10/US 78 intersection. The typical section will be the same as the typical section for the realigned portion of the widening project with left and right turn lanes at the four at-grade intersections. However, the minimum right-of-way will be set at 152 ft. The design speed will be 55 mph and signalized intersections will be provided at SR 22 and SR 77.

Several concrete box culverts will be installed along the route to convey storm water under the roadway.

**PROJECT COSTS**

The estimated costs of the projects are:

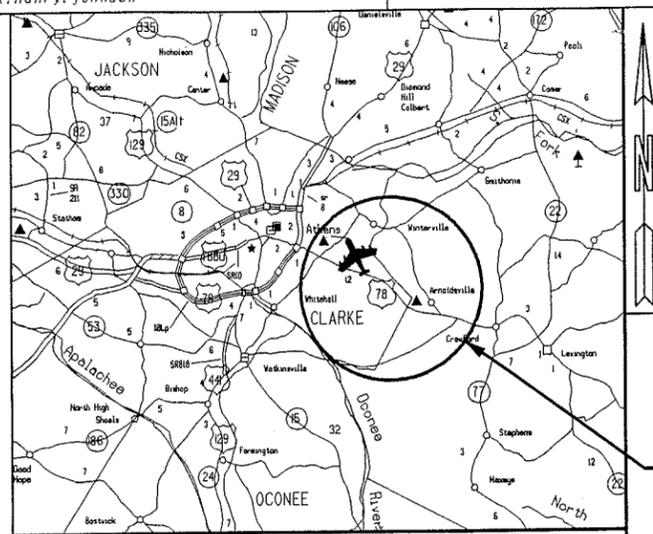
<u>Project</u>	<u>Construction</u>	<u>Contingency</u>	<u>Right-of-Way</u>	<u>Utilities</u>	<u>Engineering</u>	<u>Total</u>
Widening	\$31,877,428	\$714,312	\$16,940,900	\$514,150	\$1,190,519	\$51,237,309
Bypass	\$30,016,477	\$703,401	\$12,889,300	\$263,900	\$1,172,336	\$45,045,414

**DRAWINGS**

Location drawings and typical sections follow.

# DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA

## PLAN AND PROFILE OF PROPOSED SR 10/US 78 WIDENING & RECONSTRUCTION FROM CR 166/WHIT DAVIS ROAD TO CR 26/SMOKEY ROAD



PROJECT LOCATION

LOCATION SKETCH

**DESIGN DATA:**  
 TRAFFIC A.D.T.: 17260 (2014)  
 TRAFFIC A.D.T.: 23210 (2034)  
 TRAFFIC D.H.V.: 1835 (2034)  
 DIRECTIONAL DIST: 50 / 50  
 % TRUCKS: 10%  
 24 HR. TRUCKS %: 14%  
 SPEED DESIGN: 45 / 55 MPH

**LOCATION & DESIGN APPROVAL DATE:**  
 FUNCTIONAL CLASS:  
 URBAN PRINCIPAL ARTERIAL (CLARKE CO.)  
 RURAL PRINCIPAL ARTERIAL (OGLETHORPE CO.)  
 THIS PROJECT IS 55% IN CLARKE COUNTY AND 45% IN OGLETHORPE COUNTY IS 100% IN CONG. DIST. NO. 10.

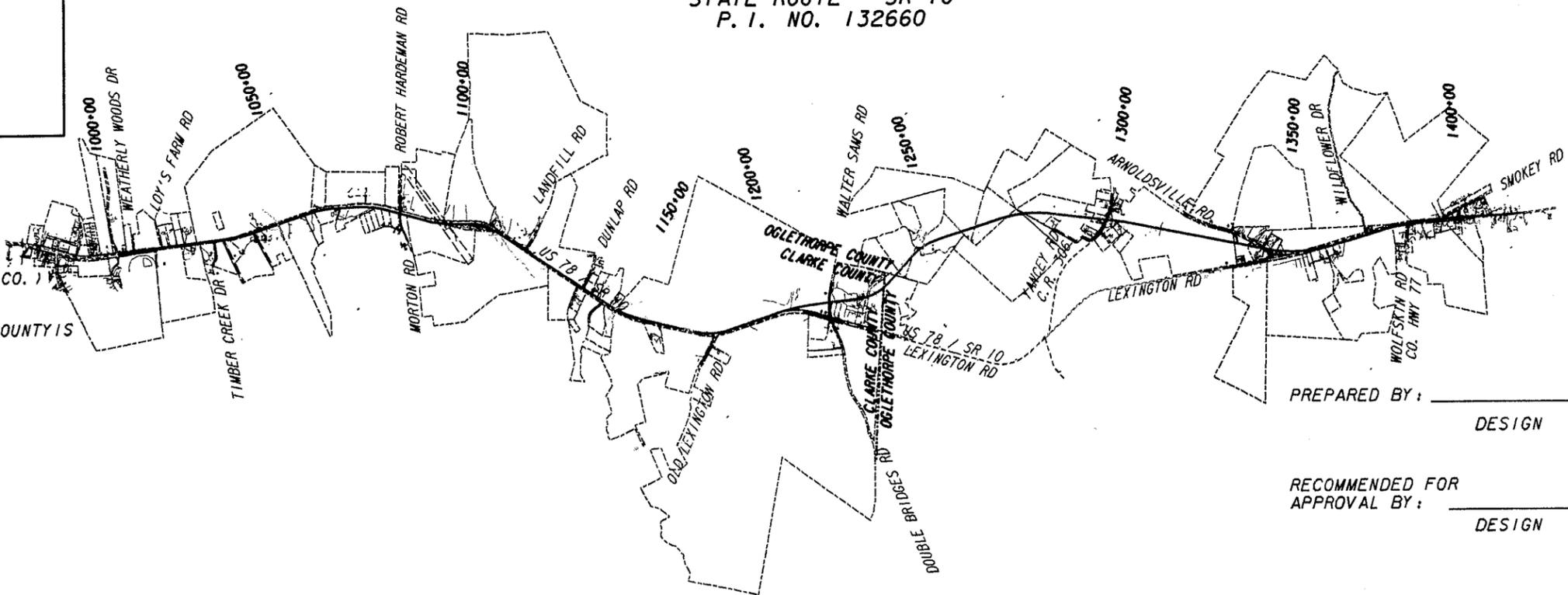
PROJECT DESIGNATION:  
 DESIGNED IN ENGLISH UNITS.

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

FEDERAL AID PROJECT  
 CLARKE/OGLETHORPE COUNTIES  
 STP00-0014-01(069)

FEDERAL ROUTE • US 78  
 STATE ROUTE • SR 10  
 P. I. NO. 132660

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



PREPARED BY: \_\_\_\_\_  
 DESIGN

RECOMMENDED FOR APPROVAL BY: \_\_\_\_\_  
 DESIGN

**MID-POINT COORDINATES**

STA  
 N  
 E

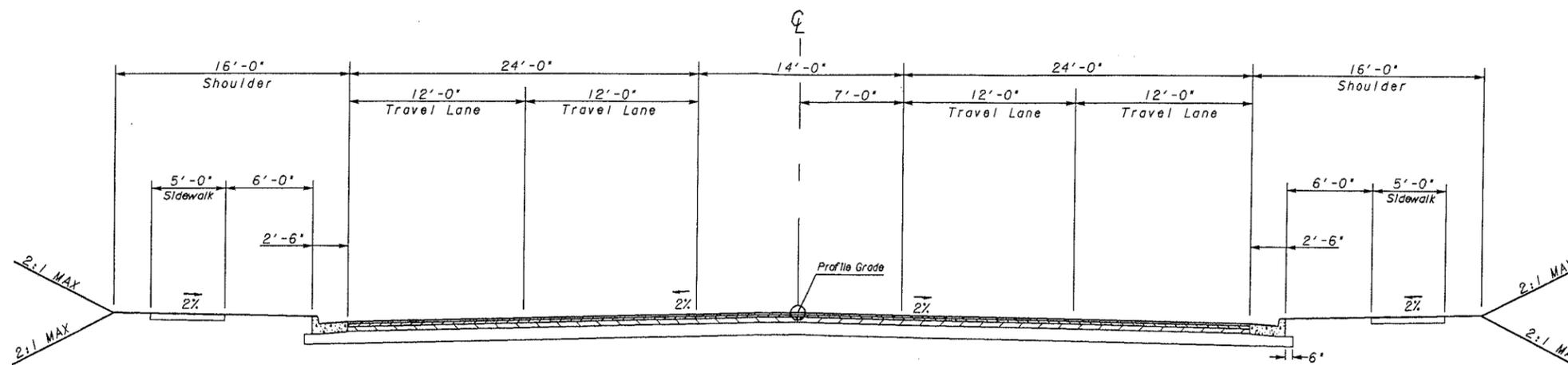
**Kimley-Horn and Associates, Inc.**  
 Engineering, Planning, and Environmental Consultants  
 Suite 600, 3169 Holcomb Bridge Road  
 Norcross, Georgia 30071



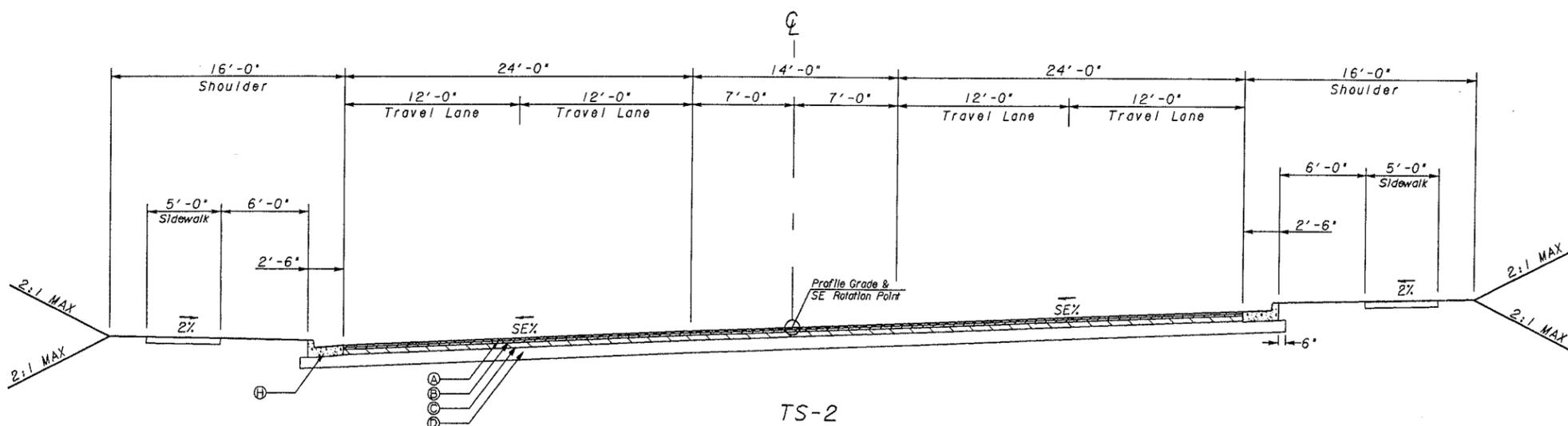
LENGTH OF PROJECT	CLARKE COUNTY No. 059	OGLETHORPE COUNTY No. 221	TOTAL
	MILES	MILES	MILES
NET LENGTH OF ROADWAY			
NET LENGTH OF BRIDGES			
NET LENGTH OF PROJECT			
NET LENGTH OF EXCEPTIONS			

DATE	CHIEF ENGINEER
PLANS COMPLETED	- -
REVISIONS	

THE DATA, TOGETHER WITH ALL OTHER INFORMATION SHOWN ON THESE PLANS OR IN ANYWAY INDICATED THEREBY, WHETHER BY DRAWINGS OR NOTES, OR IN ANY OTHER MANNER, ARE BASED UPON FIELD INVESTIGATIONS AND ARE BELIEVED TO BE INDICATIVE OF ACTUAL CONDITIONS. HOWEVER, THE SAME ARE SHOWN AS INFORMATION ONLY. ARE NOT GUARANTEED, AND DO NOT BIND THE



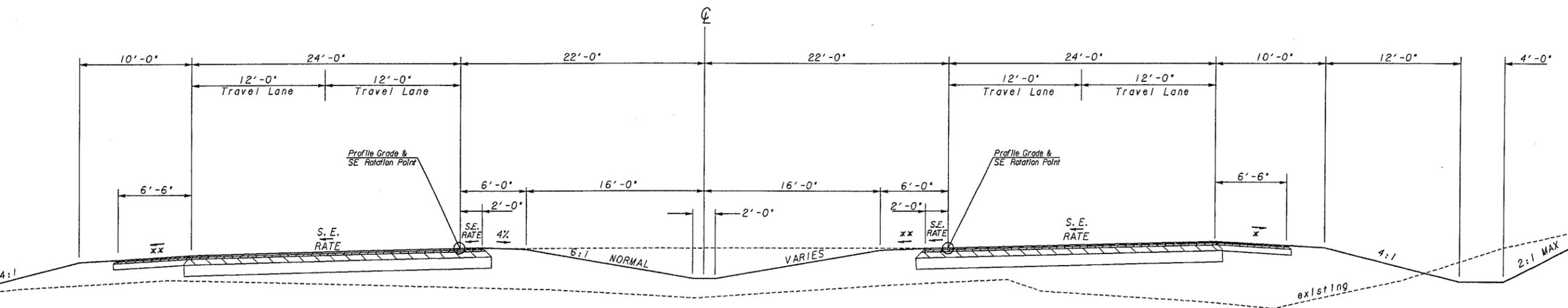
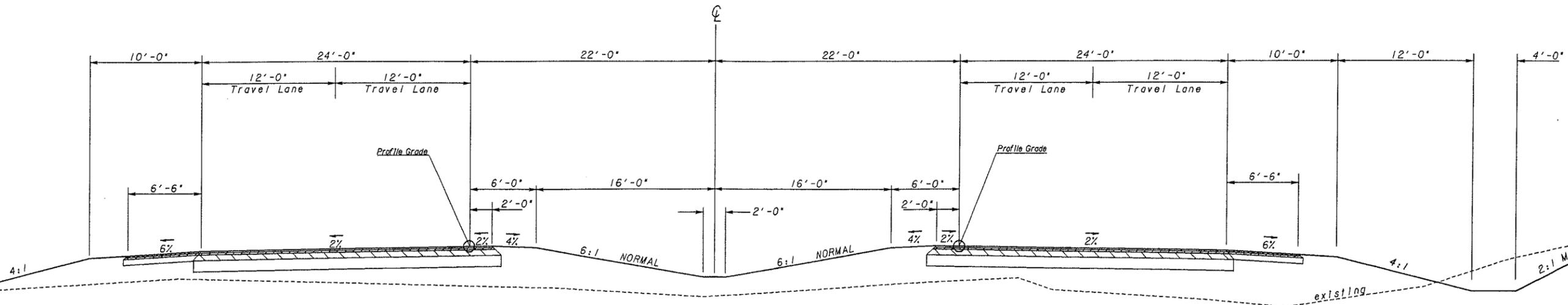
TS-1  
 SR 10 / US78  
 TANGENT SECTION  
 N. T. S.



TS-2  
 SR 10 / US78  
 SUPERELEVATION SECTION  
 N. T. S.

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

REVISION DATES	



**REQUIRED PAVEMENT**

- (A) RECYCLED ASPHALTIC CONCRETE 12.5 mm SUPERPAVE
- (B) RECYCLED ASPHALTIC CONCRETE 19 mm SUPERPAVE
- (C) RECYCLED ASPHALTIC CONCRETE 25 mm SUPERPAVE
- (D) GRADED AGGREGATE BASE
- (E) GRADED AGGREGATE BASE
- (F) ASPHALTIC CONCRETE LEVELING
- (G) EXISTING PAVEMENT
- (H) 8"x30" CONCRETE CURB AND GUTTER, TP 2

\* SHOULDERS TO SLOPE AT NORMAL RATE, HOWEVER, THE ALGEBRAIC DIFFERENCE IN PAVING SLOPE AND SHOULDER SLOPE SHALL NOT EXCEED 8%. MINIMUM SHOULDER SLOPE TO BE 2%.

\*\* SHOULDERS TO SLOPE AT NORMAL RATE OR SUPERELEVATION RATE, WHICHEVER IS GREATER.

**Kimley-Horn and Associates, Inc.**  
Engineering, Planning, and Environmental Consultants  
Suite 600, 3169 Holcomb Bridge Road  
Norcross, Georgia 30071

REVISION DATES	

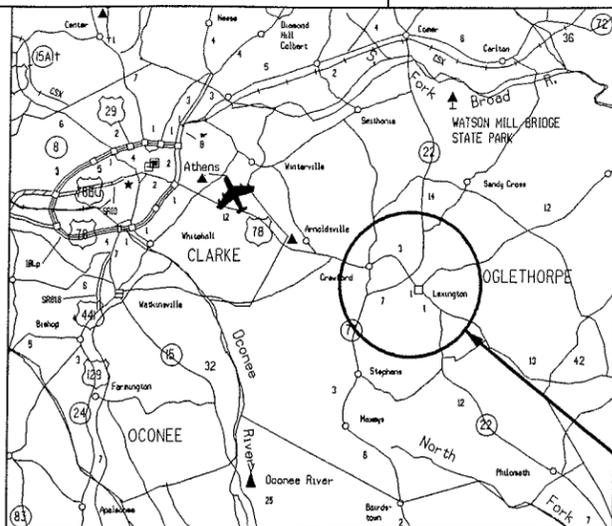
STATE OF GEORGIA  
DEPARTMENT OF TRANSPORTATION

**TYPICAL SECTIONS**

# DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA

## PLAN AND PROFILE OF PROPOSED

### SR 10/US 78 CRAWFORD/LEXINGTON BY-PASS



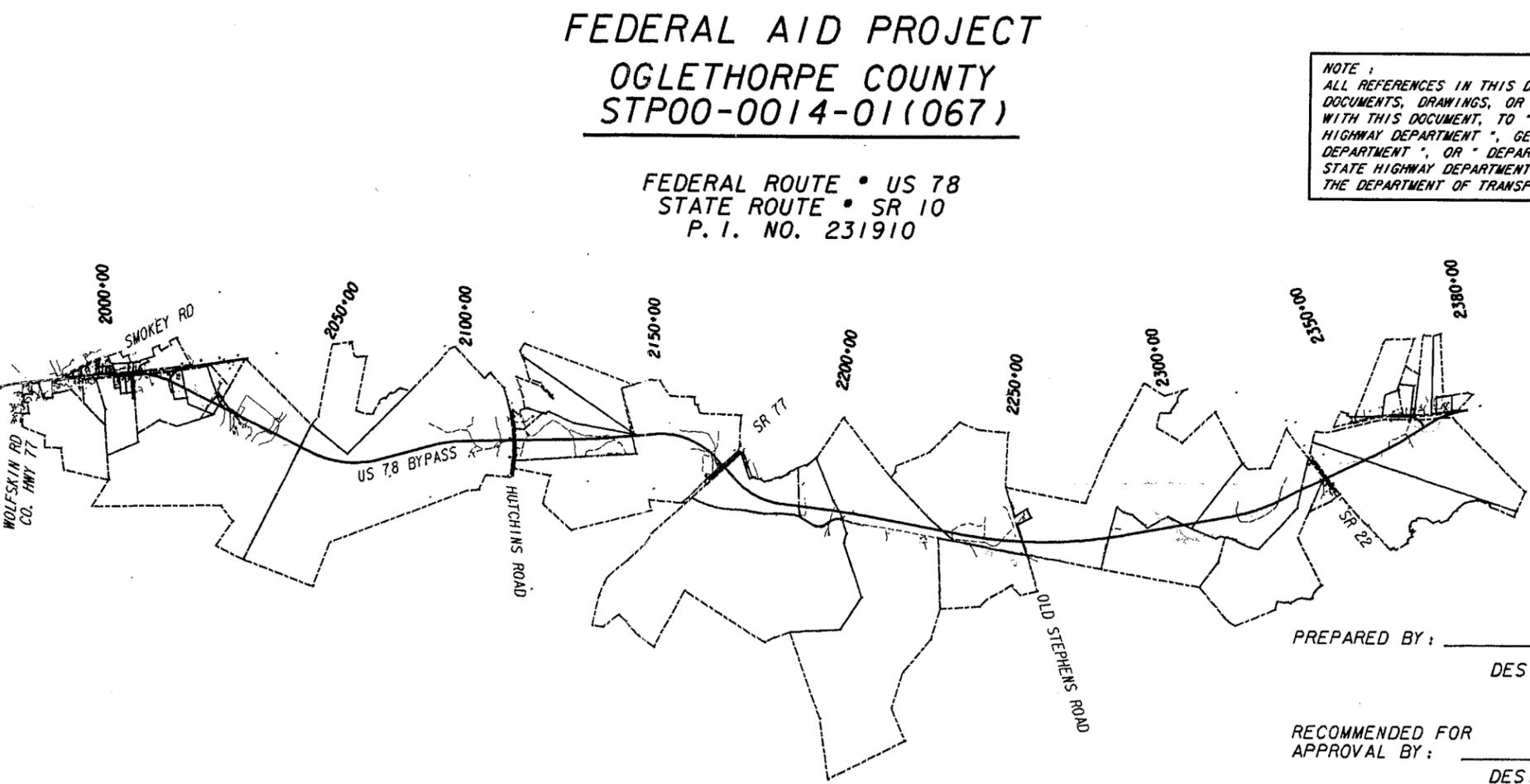
LOCATION SKETCH

**DESIGN DATA:**  
 TRAFFIC A. D. T. : 5760 (2014)  
 TRAFFIC A. D. T. : 7590 (2034)  
 TRAFFIC D. H. V. : 1770 (2034)  
 DIRECTIONAL DIST: 50 / 50  
 % TRUCKS: 17%  
 24 HR. TRUCKS %: 18%  
 SPEED DESIGN: 55 MPH

**LOCATION & DESIGN APPROVAL DATE:**  
**FUNCTIONAL CLASS:**  
 RURAL PRINCIPAL ARTERIAL  
 THIS PROJECT IS 100% IN OGLETHORPE COUNTY AND IS 100% IN CONG. DIST. NO. 10.  
**PROJECT DESIGNATION:**  
 DESIGNED IN ENGLISH UNITS.

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

**MID-POINT COORDINATES**  
 STA  
 N  
 E



FEDERAL AID PROJECT  
 OGLETHORPE COUNTY  
 STP00-0014-01(067)

FEDERAL ROUTE • US 78  
 STATE ROUTE • SR 10  
 P. I. NO. 231910

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

PREPARED BY: \_\_\_\_\_  
 DESIGN  
 RECOMMENDED FOR APPROVAL BY: \_\_\_\_\_  
 DESIGN

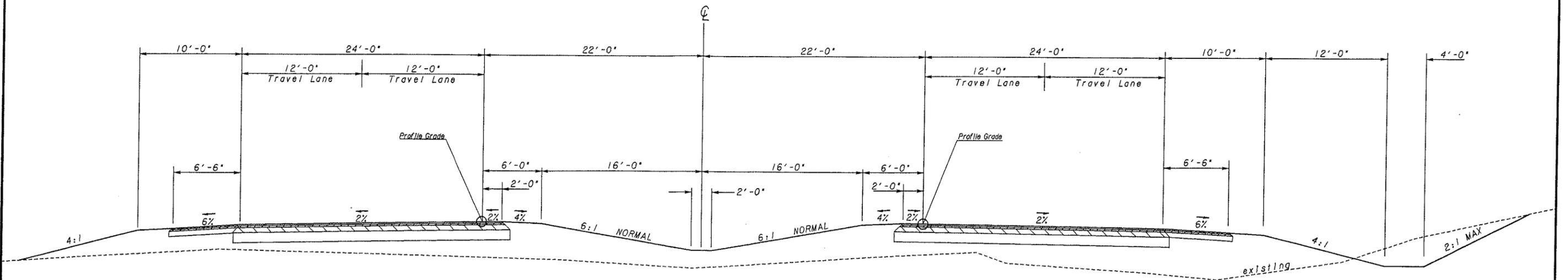
**Kimley-Horn and Associates, Inc.**  
 Engineering, Planning, and Environmental Consultants  
 Suite 600, 3169 Holcomb Bridge Road  
 Norcross, Georgia 30071



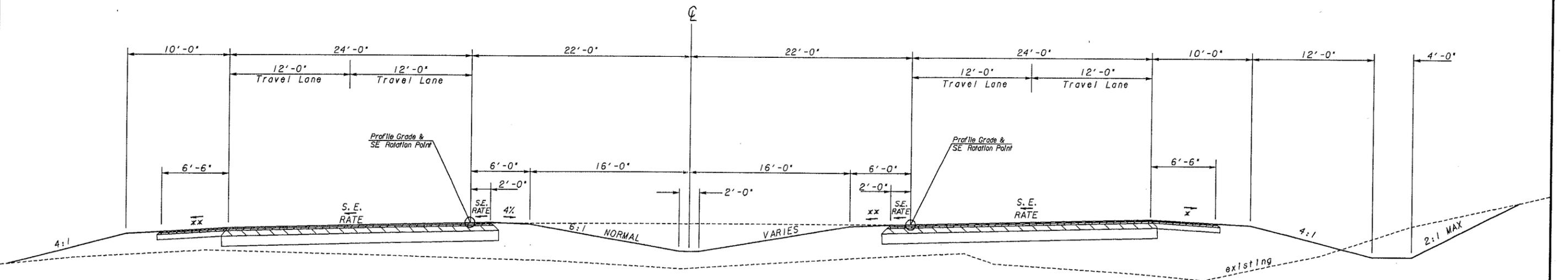
LENGTH OF PROJECT	OGLETHORPE COUNTY No. 221
	MILES
NET LENGTH OF ROADWAY	
NET LENGTH OF BRIDGES	
NET LENGTH OF PROJECT	
NET LENGTH OF EXCEPTIONS	
GROSS LENGTH OF PROJECT	

DATE	CHIEF ENGINEER
PLANS COMPLETED	- -
REVISIONS	

THE DATA, TOGETHER WITH ALL OTHER INFORMATION SHOWN ON THESE PLANS OR IN ANYWAY INDICATED THEREBY, WHETHER BY DRAWINGS OR NOTES, OR IN ANY OTHER MANNER, ARE BASED UPON FIELD INVESTIGATIONS AND ARE BELIEVED TO BE INDICATIVE OF ACTUAL CONDITIONS. HOWEVER, THE SAME ARE SHOWN AS INFORMATION ONLY, ARE NOT GUARANTEED, AND DO NOT BIND THE DEPARTMENT OF TRANSPORTATION IN ANY WAY. THE ATTENTION OF BIDDER IS SPECIFICALLY DIRECTED TO SUBSECTION 100.04 (A) OF THE STANDARD SPECIFICATIONS.



TS-1  
SR 10 / US 79  
TANGENT SECTION  
N. T. S.



TS-2  
SR 10 / US 79  
SUPERELEVATION SECTION  
N. T. S.

**REQUIRED PAVEMENT**

- (A) RECYCLED ASPHALTIC CONCRETE 12.5 mm SUPERPAVE
- (B) RECYCLED ASPHALTIC CONCRETE 19 mm SUPERPAVE
- (C) RECYCLED ASPHALTIC CONCRETE 25 mm SUPERPAVE
- (D) GRADED AGGREGATE BASE
- (E) GRADED AGGREGATE BASE
- (F) ASPHALTIC CONCRETE LEVELING
- (G) EXISTING PAVEMENT
- (H) 8"x30" CONCRETE CURB AND GUTTER, TP 2

\* SHOULDERS TO SLOPE AT NORMAL RATE, HOWEVER, THE ALGEBRAIC DIFFERENCE IN PAVING SLOPE AND SHOULDER SLOPE SHALL NOT EXCEED 8%. MINIMUM SHOULDER SLOPE TO BE 2%.

\*\* SHOULDERS TO SLOPE AT NORMAL RATE OR SUPERELEVATION RATE, WHICHEVER IS GREATER.



REVISION DATES	

STATE OF GEORGIA  
DEPARTMENT OF TRANSPORTATION

**TYPICAL SECTIONS**

---

---

## VALUE ANALYSIS AND CONCLUSIONS

---

---

### GENERAL

This section describes the value methodology followed during the value engineering study on the SR 10/US 78 Widening and Reconstruction From CR 166/Whit Davis Road to CR 26/Smokey Road, STP00-0014-01(069), Clarke and Oglethorpe Counties; US 78 Bridge Over Moss Creek, BR000-0001-00(221), Oglethorpe County; and SR 10/US 78 Crawford/Lexington Bypass, STP00-0014-01(067), Oglethorpe County projects for the GDOT. The workshop was performed at the Preliminary Design completion stage. Kimley-Horn and Associates, Inc. has been selected by GDOT to assist with the development of the project and has provided information for the VE team to use as the basis of the study.

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

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

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

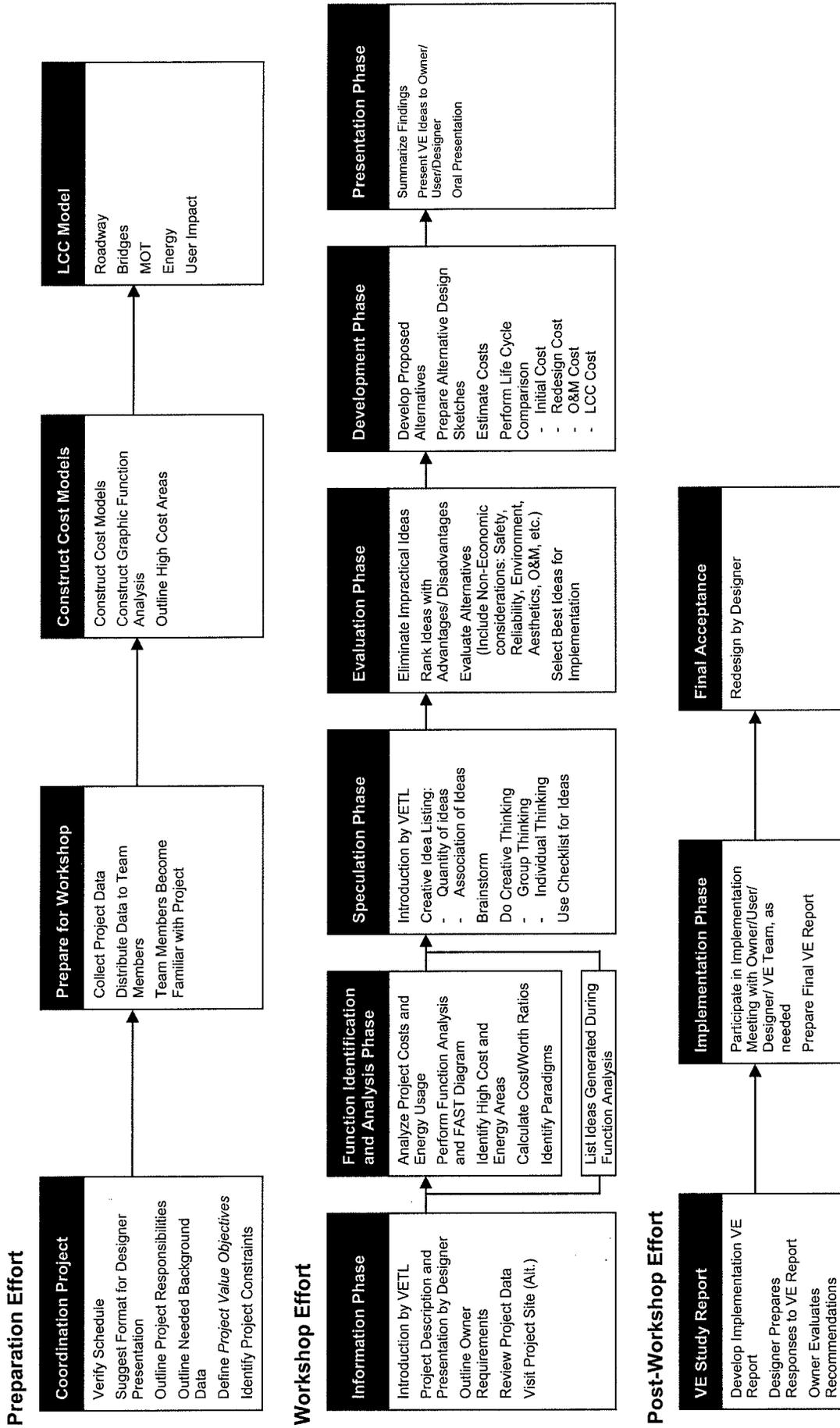
### PREPARATION EFFORT

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

- SR 10/US 78 Widening and Reconstruction From CR 166/Whit Davis Road to CR 26/Smokey Road, STP00-0014-01(069), Clarke and Oglethorpe Counties, Plan and Profile and Earthwork Table, dated February 2010, prepared by Kimley-Horn and Associates, Inc.
- US 78 Bridge Over Moss Creek Widening, BR000-0001-00(221), Oglethorpe County; prepared by Kimley-Horn and Associates, Inc.
- SR 10/US 78 Crawford/Lexington Bypass, STP00-0014-01(067), Oglethorpe County Plan and Profile and Earthwork Table, dated February 2010, prepared by Kimley-Horn and Associates, Inc.



# Value Engineering Study Task Flow Diagram



- SR 1-/US 78 Widening and Reconstruction From CR 166/Whit Davis Road in Clarke County to CR 26/Smokey Road in Oglethorpe County, STP00-0014-01(069), Revised Project Concept Report dated October 26, 2009, prepared by Kimley-Horn and Associates, Inc.
- US 78 Bridge Over Moss Creek Widening, BR000-0001-00(221), Oglethorpe County; prepared by Kimley-Horn and Associates, Inc.
- SR 10/US 78 Crawford/Lexington Bypass east of CR 26/Smokey Road Southeast to SR 22/US 78/SR 10 Intersection in Oglethorpe County, STP00-0014-01(067), Revised Concept Report, dated October 26, 2009, prepared by Kimley-Horn and Associates, Inc.
- U S 78 Bypass Traffic Study, Oglethorpe County, STP00-0014-01(067), PI# 231910, dated July 2009, prepared by Kimley-Horn and Associates, Inc.
- US 78 Widening Traffic Study, Clarke & Oglethorpe Counties, STP00-0014-01(069), PI# 132660, dated July 2009, prepared by Kimley-Horn and Associates, Inc.
- Ecology Assessment/Description of Jurisdictional Wetlands, Non-Wetland Waters of the U.S., and Protected Species Survey, STP00-0014-01(069), STP00-0014-01(067), Clarke and Oglethorpe Counties, The Proposed SR 10/US 78 Widening and Bypass, P.I. Number: 132660, 231910, dated November 2009, prepared by Kimley-Horn and Associates, Inc.
- Historic Resources Survey Report, GDOT Project STP00-0014-1(67), Oglethorpe County, P.I. No. 231910 and HP No. 02021104-001, Construction of New Location Roadway South of Crawford and Lexington in Oglethorpe County, dated February 11, 2003, prepared by Edwards-Pitman Environmental, Inc.
- Historic Resources Survey Report, GDOT Project STP00-0014-01(69), Clarke and Oglethorpe Counties, P.I. No. 132660 & HP No. 060830-007, Widening and Reconstruction of US 78/SR 10 in Clarke and Oglethorpe Counties, dated December 8, 2006, prepared by Edwards-Pitman Environmental, Inc.
- Management Summary Archeological Survey of the Proposed US 78/SR 10 Widening and the US Crawford/Lexington Bypass Clarke and Oglethorpe Counties, Georgia, GDOT Projects STP00-014-1(69) Clarke and Oglethorpe Counties and STP00-014-1(67) Oglethorpe County P.I. Nos. 132660 and 231910, dated May 2009, prepared by Edwards-Pitman Environmental, Inc.

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

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

## **VALUE ENGINEERING WORKSHOP EFFORT**

The VE workshop was a three and one-half-day effort beginning with an orientation/kickoff meeting on Monday, March 1, 2010, and concluding with the final VE Presentation on Thursday, March 4, 2010.

During the workshop, the VE Job Plan was followed in compliance with the U.S. Federal Highway Administration guidelines for conducting a VE study. The Job Plan guided the search for alternatives to mitigate or eliminate high-cost drivers, secondary functions providing little or no value, and potential project risks. Alternatives to specifically address the owner’s project concerns and enhance value by improving operations, reducing maintenance requirements, enhancing constructability, and providing missing functions were also considered. The Job Plan includes six phases:

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

**Information Phase**

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

**Function Identification and Analysis Phase**

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

Function is defined as the intended use of a physical or process element. The team attempted to identify functions in the simplest manner using measurable noun/verb word combinations. To accomplish this, the team first looked at the project in its entirety and randomly listed its functions, which were recorded on Random Function Analysis Worksheets (provided in the Function Identification and Analysis section). Then the individual function(s) of the major components of the project depicted on the cost models were identified.

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

<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. The goal of the next job phase is to reduce the impact of secondary functions and thereby enhance project value.

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

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

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

### **Creative/Speculation Phase**

This VE study phase involved the creation and listing of ideas. Starting with the functions or project elements with high cost/worth ratios, a high absolute cost compared to other elements in the project, and secondary functions providing little or no value and using the classic brainstorming technique, the VE team began to generate as many ideas as possible to provide the necessary functions at a lower total life cycle cost, or to improve the quality of the project. Ideas for improving operation and maintenance, reducing project risk, and simplifying constructability were also encouraged. At this stage of the process, the VE team was looking for a large quantity of ideas and free association of ideas. A Creative Idea Listing worksheet was generated and organized by the function or project element being addressed.

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

## **Evaluation Phase**

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

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

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

## **Development Phase**

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

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

## **Presentation Phase**

The goals of the last phase of the workshop were to summarize the results of the study, to prepare draft Summary of Potential Cost Savings worksheets to hand out at the presentation, and to present the key VE alternatives and design suggestions to GDOT and the Kimley-Horn design team. The presentation was held on Thursday, March 4, 2010, at the GDOT Headquarters office in Atlanta, Georgia. The purpose of the meeting was to provide the attendees with an overview of the suggestions for value enhancement resulting from the VE study and afford them the opportunity to ask questions to clarify specific aspects of the alternatives presented. Procedures for implementing the results of the study were discussed, and arrangements were made for the reviewers of the VE report to contact the VE team in

order to obtain further clarifications, if necessary. Draft copies of the Summary of Potential Cost Savings worksheets were given to the owner and design team to facilitate a timely review and speedy implementation of the selected ideas.

## **POST-WORKSHOP EFFORT**

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

Upon completing their reviews, GDOT will decide which alternatives to implement.

## VALUE ENGINEERING WORKSHOP PARTICIPANTS

---

The VE team was organized to provide specific expertise in the unique project elements involved with the SR 10/US 78 Widening and Reconstruction From CR 166/Whit Davis Road to CR 26/Smokey Road, STP00-0014-01(069), Clarke and Oglethorpe Counties; US 78 Bridge Over Moss Creek Widening, BR000-0001-00(221), Oglethorpe County; and SR 10/US 78 Crawford/Lexington Bypass, STP00-014-01(067), Oglethorpe County projects. The multidisciplinary team comprised professionals with highway design and construction experience and a working knowledge of VE procedures. The following lists the VE team members:

<b><u>Participant</u></b>	<b><u>Specialization</u></b>	<b><u>Affiliation</u></b>
Joe Leoni, PE	Highway Design	ARCADIS US, Inc.
Paresh J. Parikh	Constructability	Delon Hampton Associates
Howard B. Greenfield, PE, CVS	VE Team Leader	Lewis & Zimmerman Associates

### DESIGNER'S PRESENTATION

An overview of the project was presented on Monday, March 1, 2010, by representatives from GDOT and the Kimley-Horn design team. The purpose of this meeting, in addition to being an integral part of the Information Phase of the VE study, was to bring the VE team up-to-speed regarding the overall project specifics. Additionally, the meeting afforded the owner and design team the opportunity to highlight in greater detail those areas of the project requiring additional or special attention. A list of study participants follows with those attending the meeting checked off.

### VALUE ENGINEERING TEAM'S PRESENTATION

A VE presentation was conducted by the VE team on Thursday, March 4, 2010, at the GDOT Headquarters office in Atlanta, Georgia to review VE alternatives with the owner and representatives from the design team. Copies of the Draft Summary of Potential Cost Savings worksheet were provided to the attendees. Attendees checked off their names on the attendance list from the opening presentation.

# VE STUDY SIGN-IN SHEET

Project No.: STP00-0014-01(067)(069) County: Clark & Oglethorpe PI No.: 231910-, 132660- Date: March 1-4, 2010  
 BR000-0001-00(221) 0001221

Days

1 4	NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	Lisa L. Myers	00244168	Engineering Services	404-631-1770	lmyers@dot.ga.gov
✓	Matt Sanders	00284154	Engineering Services	404-631-1752	msanders@dot.ga.gov
✓	James K. Magnus	00208161	Construction	404-631-1971	jmagnus@dot.ga.gov
✓	Ken Werho	00258268	Traffic Operations	404-635-8144	kwerho@dot.ga.gov
✓	Joe Leoni		ARCADIS	770-384-6564	joe.leoni@arcadis-us.com
✓	Parish J. Parish		Delon Hampton & Associates	404-419-8434	pparikh@delonhampton.com
✓	Howard Greenfield		Lewis & Zimmerman	301-984-9590x20	hgreenfield@lza.com
✓	Sean Johnston		Kimley-Horn	404-419-8716	sean.johnston@kimley-horn.com
✓	Diana Mitonen		Kimley-Horn	678-502-1881	diana.mitonen@kimley-horn.com
✓	Debbie Wilson		Kimley-Horn	678-502-1882	debbie.wilson@kimley-horn.com
✓	BRYAN CUBBS	00293107	GDOT-D2-MADISON	706-343-5836	brcubbs@dot.ga.gov
✓	Peter Emmanuel	00556516	GDOT - OPD	404-631-1158	pemmanuel@dot.ga.gov
✓	Amber Phillips	60850268	GDOT - OES	404-631-1117	aphillips@dot.ga.gov
✓	JERRY BROOKS		KHA	678-502-1864	jerry.brooks@kimley-horn.com

✓ Check all that apply      | 3 | Attended Project Overview (Day 1)      \_\_\_\_\_ Attended Project Presentation (Day 4)

## ECONOMIC DATA

---

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

Year of Analysis:	2010
Construction Start Date:	2012
Construction Completion Date:	2014
Planning Period (n):	20
Discount Rate (i):	3%

When computing capital costs, direct material, labor and equipment costs are marked up using a composite markup of 8% that includes:

Engineering and Inspection	5%
Construction Contingency	3%

## **COST MODEL**

---

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

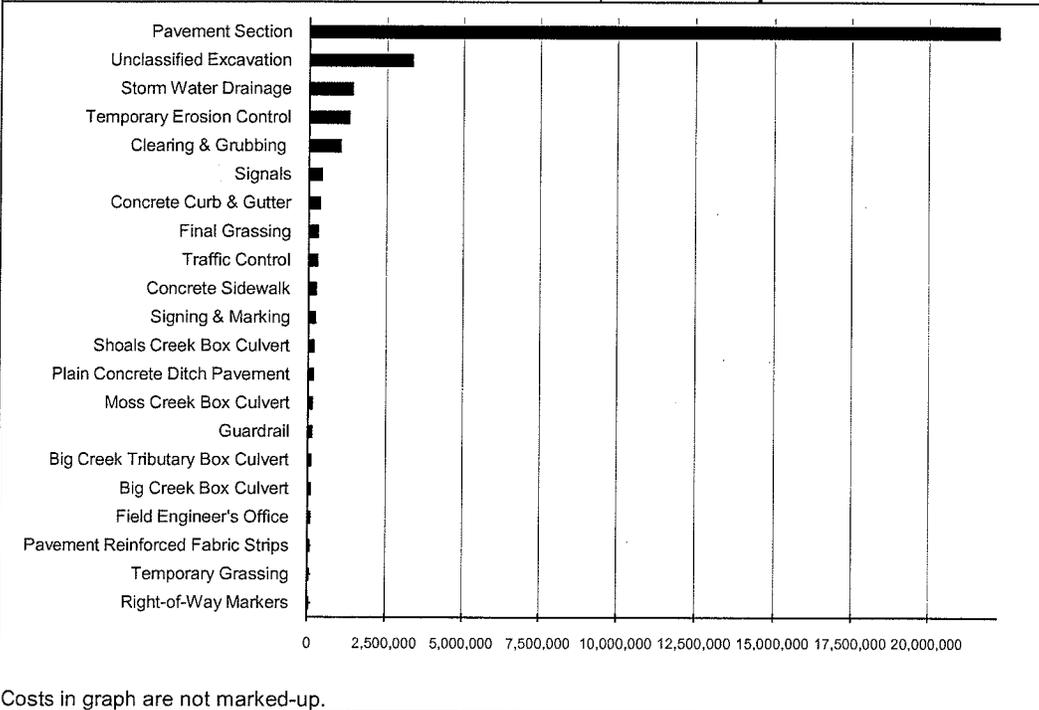
Pavement and excavation are the two major project elements for both parts of the project and thus became the subject of intense review during the course of the VE workshop.

# COST HISTOGRAM



**PROJECT: SR 10/US 78 WIDENING & RECONSTRUCTION FROM CR 166/WHIT DAVIS ROAD TO CR 26/SMOKEY RD**

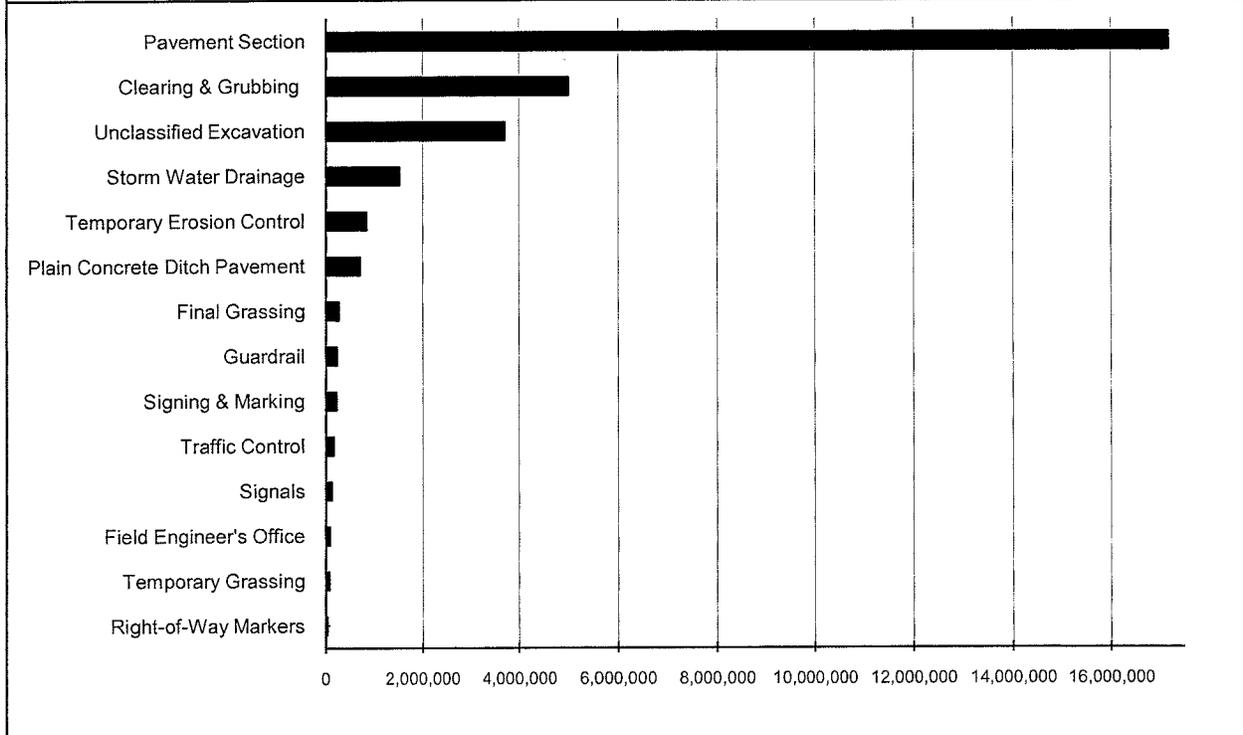
PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Pavement Section	22,301,910	69.96%	69.96%
Unclassified Excavation	3,312,520	10.39%	80.35%
Storm Water Drainage	1,381,881	4.33%	84.69%
Temporary Erosion Control	1,269,303	3.98%	88.67%
Clearing & Grubbing	1,000,000	3.14%	91.81%
Signals	400,000	1.25%	93.06%
Concrete Curb & Gutter	333,368	1.05%	94.11%
Final Grassing	276,622	0.87%	94.98%
Traffic Control	250,000	0.78%	95.76%
Concrete Sidewalk	232,406	0.73%	96.49%
Signing & Marking	208,308	0.65%	97.14%
Shoals Creek Box Culvert	164,374	0.52%	97.66%
Plain Concrete Ditch Pavement	154,370	0.48%	98.14%
Moss Creek Box Culvert	123,640	0.39%	98.53%
Guardrail	114,711	0.36%	98.89%
Big Creek Tributary Box Culvert	87,683	0.28%	99.16%
Big Creek Box Culvert	83,166	0.26%	99.43%
Field Engineer's Office	76,009	0.24%	99.66%
Pavement Reinforced Fabric Strips	48,000	0.15%	99.81%
Temporary Grassing	29,778	0.09%	99.91%
Right-of-Way Markers	29,379	0.09%	100.00%
<b>Subtotal</b>	<b>\$ 31,877,428</b>	<b>100.00%</b>	
<b>Contingency</b>	<b>\$ 714,312</b>		
<b>Utilities w-Contingency</b>	<b>\$ 514,150</b>		
<b>Engineering &amp; Inspection</b>	<b>\$ 1,190,519</b>		
<b>Right-of-Way</b>	<b>\$ 16,940,900</b>		
<b>TOTAL</b>	<b>\$ 51,237,309</b>	<b>Comp Mark-up:</b>	<b>61%</b>



# COST HISTOGRAM



PROJECT: SR 10/US 78 CRAWFORD/LEXINGTON BYPASS			
PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Pavement Section	17,167,112	57.19%	57.19%
Clearing & Grubbing	5,000,000	16.66%	73.85%
Unclassified Excavation	3,700,381	12.33%	86.18%
Storm Water Drainage	1,509,076	5.03%	91.21%
Temporary Erosion Control	826,971	2.76%	93.96%
Plain Concrete Ditch Pavement	703,600	2.34%	96.30%
Final Grassing	253,719	0.85%	97.15%
Guardrail	216,192	0.72%	97.87%
Signing & Marking	207,206	0.69%	98.56%
Traffic Control	150,000	0.50%	99.06%
Signals	109,284	0.36%	99.42%
Field Engineer's Office	73,914	0.25%	99.67%
Temporary Grassing	70,843	0.24%	99.91%
Right-of-Way Markers	28,179	0.09%	100.00%
<b>Subtotal</b>	<b>\$ 30,016,477</b>	<b>100.00%</b>	
<b>Contingency</b>	<b>\$ 703,401</b>		
<b>Utilities w-Contingency</b>	<b>\$ 263,900</b>		
<b>Engineering &amp; Inspection</b>	<b>\$ 1,172,336</b>		
<b>Right-of-Way</b>	<b>\$ 12,889,300</b>		
<b>TOTAL</b>	<b>\$ 45,045,414</b>	<b>Comp Mark-up: 50%</b>	



Costs in graph are not marked-up.

## FUNCTION ANALYSIS

---

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

# RANDOM FUNCTION ANALYSIS



PROJECT: <b>SR 10/US 78 CRAWFORD/LEXINGTON BYPASS</b> STP00-0014-01(067) Oglethorpe County, GA	SHEET NO.: <b>1 of 1</b>		
DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
<b>PROJECT</b>	Spur	Economic Growth	HO
	Reduce	Accidents	HO
	Increase	Capacity	B
	Signalize	Intersections	B
	Reduce	Congestion	HO
<b>PAVEMENT</b>	Define	Travel Way	B
	Support	Vehicles	B
	Accommodate	Break Downs	B
	Separates	Turning Vehicles	B
<b>UNCLASSIFIED EXCAVATION</b>	Establish	Elevation	B
<b>CLEARING AND GRUBBING</b>	Create	Space	B
	Remove	Obstacles	B
<b>STORM WATER DRAINAGE</b>	Collect	Storm Water	B
	Convey	Storm Water	B
<b>CULVERTS</b>	Convey	Storm Water	B
	Support	Vehicles	B
<b>TEMPORARY EROSION CONTROL</b>	Facilitate	Construction	S

Function defined as:    Action Verb Measurable Noun	Kind:    B = Basic S = Secondary RS = Required Secondary	HO = Higher Order LO = Lower Order G = Goal
--	--	---

## CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

---

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

<b>PROJECT</b>	<b>PREFIX</b>
Widening Project	W
Bypass Project	B

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

- Saves costs
- Reduces accidents
- Reduces environmental impacts
- Reduces construction time

After discussing each idea, the team evaluated the ideas by consensus. The evaluation produced 20 ideas rated 4 or 5 or design suggestions to research and develop into formal VE alternatives to be included in the Study Results section of the report. Highly rated ideas that were not developed further may have been combined with another related idea or discarded as a result of additional research, indicating the concept as not being cost effective or technically feasible. The reader is encouraged to review the Creative Idea Listing and Evaluation worksheet since it may suggest additional ideas that can be applied to the design.

# CREATIVE IDEA LISTING



PROJECT: **SR 10/US 78 WIDENING AND RECONSTRUCTION**  
**SR 10/US 78 CRAWFORD/LEXINGTON BYPASS**  
*STP00-0014-01(067)(069)*  
*Clarke/Oglethorpe Counties, GA*

SHEET NO.: **1 of 2**

NO.	IDEA DESCRIPTION	RATING
<b>WIDENING (W)</b>		
W-1	Use a roundabout at the Lexington Road/US 78 intersection on the east side	2
W-2	Use a roundabout at the Lexington Road/US 78 intersection on the west side	2
W-3	Use 11-ft.-wide inside lanes in lieu of 12-ft.-wide inside lanes	4
W-4	Use 11-ft.-wide lanes in lieu of 12-ft.-wide lanes	4
W-5	Use a 32-ft.-wide median in lieu of a 44-ft.-wide median	4
W-6	Tie Lexington Road to the Arnoldsville Road intersection on relocated SR 10/US 78	DS
W-7	Initially remove signals from Arnoldsville Road and Walter Sams Road/Double Bridges Road intersections and add when needed	4
W-8	Revise profile on new location section to balance the cut and fill	2
W-9	Build only two lanes for the relocation and tie in to the bypass	5
W-10	Use 4-ft.-wide paved outside shoulder in lieu of 6.5-ft.-wide paved outside shoulder	
<b>BYPASS (B)</b>		
B-1	Skew intersection at SR 77 and shorten bypass	4
B-2	Build only two lanes now with turn lanes at intersections	5
B-3	Build only two lanes now from Hutchins Road East and add turn lanes at intersections	5
B-4	Lower the roadway profile from Sta 2214+00 to Sta 2233+00	4
B-5	Lower the roadway profile from Sta 2261+00 to Sta 2276+00	4
B-6	Lower the roadway profile from Sta 2314+00 to Sta 2362+00	4
B-7	Move roadway north at Sta 2065+00	4
B-8	Not used	
B-9	Move intersection with Hutchins Road south and delete the reverse curve	3
B-10	Use a roundabout at the intersection of the Bypass and old US 78 on the west side	2
B-11	Use a roundabout at the intersection of the Bypass and old US 78 on the east side	2
B-12	Use 11 ft. wide lanes for the inside lanes	4
B-13	Use all 11 ft. wide lanes	2

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

