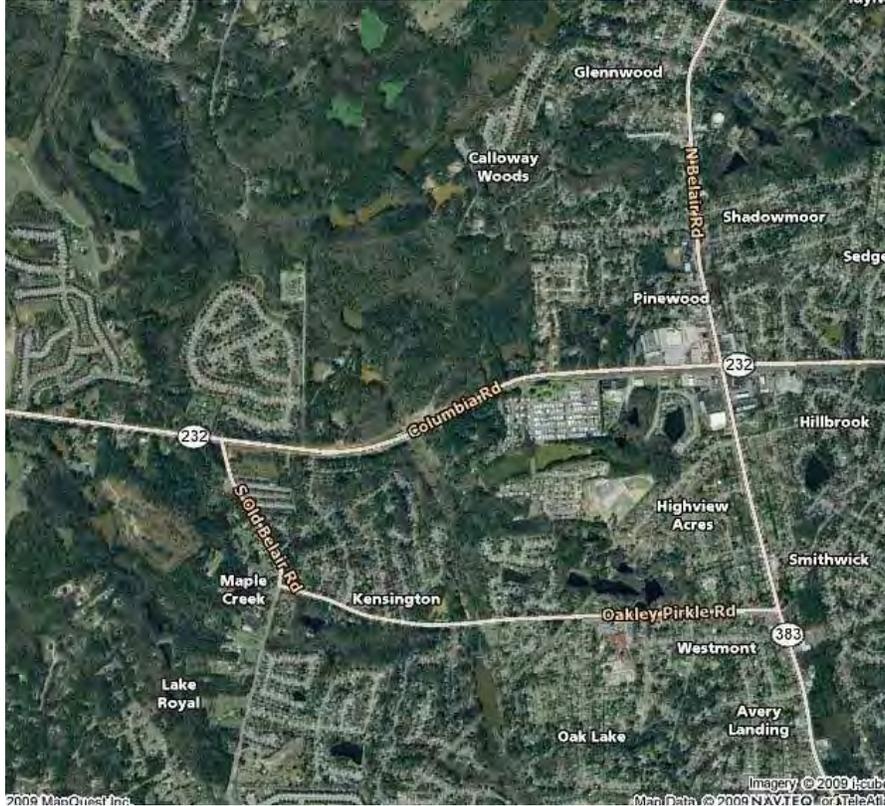


# Value Engineering Study Report

**Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
State Road 232 Reconstruction  
Columbia County**



Value Engineering Team

Design Team



May 8, 2009





May 8, 2009

Ms. Lisa Myers  
Design Review Engineer Manager/VE Coordinator  
Georgia Department of Transportation-Engineering Services  
One Georgia Center  
600 W. Peachtree Street NW  
Atlanta, GA 30308

RE: Submittal of the final Value Engineering Report  
Project No.: STP00-0174-01(007) – P.I. No. 231440  
State Road 232 Reconstruction  
Columbia County

Dear Ms. Myers:

Please find enclosed two (2) hard copies and one (1) CD of our final Value Engineering Report for the Reconstruction of State Route 232 from Old Belair Rd. / C.R. 221 to Belair Rd. /State Route 383

This Value Engineering Study, which was performed during the period April 21 through April 24, 2009, identified **26 Alternative Ideas** of which **8 Alternative Ideas are recommended for implementation**. We believe that the **Alternative Ideas** recommended may have a significant positive affect on the project.

We trust that you will find this report to be in proper order. It should be noted that the results of this workshop are volatile in that they can be overcome by the events that accompany the expeditious continuance of the design process. Accordingly, we encourage an equally expeditious implementation meeting to design the disposition of the contents of this report.

On behalf of our VE Team, we thank you very much for this opportunity to work with you and the hard working staff of the Georgia Department of Transportation.

Yours truly,

**PBS&J**

A handwritten signature in black ink that reads 'Les M. Thomas'.

Les M. Thomas, P.E., CVS-Life  
VE Team Leader

A handwritten signature in black ink that reads 'Randy S. Thomas'.

Randy S. Thomas, CVS  
Assistant Team Leader

# **Value Engineering Study Report**

**Project No. STP00-0174-01(007)**

**P.I. No. 231440**

**Widening and Reconstruction State Route 232  
Columbia County**

## ***Table of Contents***

### **Executive Summary**

Introduction  
Project Description  
Value Engineering Process  
The Study Results  
Summary of Alternatives and Design Suggestions

### **Study Results**

Introduction  
Summary of Alternatives and Design Suggestions  
Documentation of Alternatives and Design Suggestions

### **Project Description**

Introduction of the Project  
Representative Documents

### **Value Engineering Process**

Introduction and Job Plan  
Agenda  
Function Analysis and Cost–Worth Worksheets  
Pareto Cost Model and Graph  
Attendance Sheet for Designers and VE Team Presentations  
Creative Idea Listing and Evaluation Worksheet

# **EXECUTIVE SUMMARY**

## **INTRODUCTION**

This report summarizes the analysis and conclusions by the PBS&J Value Engineering workshop team as they performed a Value Engineering study during the period of April 21 through April 24, 2009 in Atlanta, at the office of the Georgia Department of Transportation. The subject of the Value Engineering study was Project STP00-0174-01(007) – P.I. No. 231440 reconstruction and widening of State Route 232 in Columbia County.

The design for the project has been prepared by Georgia Department of Transportation-District 2. At the time of the workshop, the plans had advanced to the preliminary design level.

## **PROJECT DESCRIPTION**

The need for the project is to improve safety and reduce the number of accidents which currently is above the statewide average for similar facilities. This project is needed to accommodate existing and future traffic demands

State Route 232 is currently classified as an Urban Minor Arterial and operates on a Level of Service of "E". With no improvements, this segment of State Road 232 will operate at a LOS of "F" in 2025.

Currently State Route 232 consists of one 12-ft travel lane in each direction with 5' rural shoulders from west of Crawford Creek to County Road 79 (Shady Grove Drive) and two twelve foot lanes in each direction with a 14' flush median from County Road 799 to State Route 383 (Belair Road). There is a bridge over Crawford Creek that is to be widened.

The proposed design consists of constructing two 12-ft lanes in each direction with a 14' center turn lane. The plans specify a 16' shoulders to include curb and gutter, sidewalk, and a 4' bicycle lane on each side. The bridge over Crawford Creek will be widened to 86'.

The estimated construction costs are \$8,955,817 with additional Right-of-Way costs of \$1,303,061 and reimbursable utility costs of \$267,500. The projected total project cost is \$10,526,378

This project is more fully described in the documentation that is located in the Tabbed section of this report, entitled ***Project Description***.

## PROJECT CONCERNS AND OBJECTIVES

Some of the information from the concept report and the designer's presentation indicated the following important points about the project:

- Improve safety and reduce accidents on corridor
- Increase capacity
- Improve Level of Service
- Comply with regulations

## VALUE ENGINEERING PROCESS

The Value Engineering team followed the seven step Value Engineering job plan as promulgated by SAVE International. This seven step job plan includes the following:

- Investigative
- Analysis
- Speculation
- Evaluation
- Development
- Recommendation
- Presentation

This report is a component of the Presentation Phase. As part of the VE workshop in Atlanta, the team made an informal presentation of their results on the last morning of the workshop. This report is intended to formalize the workshop results and set the stage for a formal implementation meeting in which alternatives and design suggestions will typically be accepted, accepted with modifications, or rejected for cause. The worksheet that follows, along with the formally developed alternatives and design suggestions can be used as a "score sheet" for the implementation meeting. It is also included in this report to identify, on a summary basis, the results of the workshop. The reader is encouraged to visit the third tabbed section of this report entitled **Study Results** for a review of the details of the developed alternatives. The tabbed section **Project Description** includes information about the project itself and the tabbed section **Value Engineering Process** presents the detailed process of the Value Engineering Study.

## CONCLUSIONS AND RECOMMENDATIONS

During the speculation phase the VE Team identified **26 Alternative Ideas** that appeared to hold potential for reducing the construction cost, improving the end product, and/or reducing the difficulty and time of project construction.

After the evaluation phase was completed, **8 Alternative Ideas** remained for further consideration.. These Alternative Ideas may be found, in their documented form, in the section of this report entitled **Study Results**.

The following **Summary of Alternatives and Design Suggestions** coupled with the documentation of the developed alternatives should provide the reader with the information required to fully evaluate the merits of each of the alternatives.

# Summary of Alternatives & Design Suggestions



PROJECT: **Georgia Department of Transportation**  
**STP00-0174-01(007) – P.I. No. 231440**  
**SR 232 Reconstruction**  
**Columbia County**

SHEET NO.: 1 of 1

ALTERNATIVE NUMBER	DESCRIPTION OF ALTERNATIVE	INITIAL COST SAVINGS
<b>ROADWAY (RD)</b>		
RD-1	Use 11' lanes	\$343,760
RD-2	Use a 10' shoulder throughout the project	\$430,023
RD-6	Eliminate bike lanes and sidewalks from Sta. 260+00 to the end of project	\$182,102
RD-7	Minimize the retaining walls	\$67,219
RD-8	Don't realign Shepherd Road intersection; construct an eastbound acceleration lane for Maple Creek Drive	\$176,142
RD-11	Shorten culvert extension	\$50,000
RD-16	Reconfigure intersection at Old Belair Road	\$28,362
RD-18	Use 12' center turn lane instead of 14' turn lane	\$171,885
<b>WALLS (WL)</b>		
WL-2	Use Modular Block Wall in-lieu of poured in place GA STD 9031-L Gravity Retaining Wall	\$131,452

# **STUDY RESULTS**

## **INTRODUCTION**

This section includes the study results presented in the form of fully developed value engineering alternatives that include descriptions of the original design, description of the alternative design configurations, comments on the technical justifications, opportunities and risks associated with the alternatives, sketches, calculations and technical justification for these alternatives. For the most part, these fully developed alternatives represent an array of choices that clearly could have an impact on the eventual cost and performance of the finished project.

This introductory sheet is followed by a **Summary of Alternatives and Design Suggestions**. It should be noted that the alternatives that are included, which have cost estimates attached are not necessarily representative of the final cost outcome for each alternative. Some of these alternatives have components that are mutually exclusive so they may not be added together.

The users of this report are asked to consider these alternatives and design suggestions as a smorgasbord of choices for selection and use as the project moves forward. The enclosed **Summary of Alternatives & Design Suggestions** may also be used as a “score sheet” within the bounds of an implementation meeting.

## **COST CALCULATIONS**

The cost calculations are intended only as a guide to the approximate results that might be expected from implementation of the alternatives. They should be helpful in making clear choices as to the pursuit of individual alternatives.

The composite mark-up of 10% for the construction cost comparisons was derived from the cost estimate for the project. This estimate can be found in the section of this report entitled **Project Description**.

# Summary of Alternatives & Design Suggestions



PROJECT: **Georgia Department of Transportation**  
**STP00-0174-01(007) – P.I. No. 231440**  
**SR 232 Reconstruction**  
**Columbia County**

SHEET NO.: 1 of 1

ALTERNATIVE NUMBER	DESCRIPTION OF ALTERNATIVE	INITIAL COST SAVINGS
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<b>WALLS (WL)</b>		
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# Value Analysis Design Alternative



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-1**

DESCRIPTION: **Use 11' travel lanes**

SHEET NO.:  
**1 of 4**

## Original Design:

The original design utilizes 12'-0" travel lanes throughout the project.

## Alternative:

The alternative design proposes using 11'-0" travel lanes throughout project.

## Opportunities:

- Reduction in pavement costs
- Reduction in earthwork costs
- Reduction in right-of way costs

## Risks:

- Moderate increase in design effort
- Requires an exception to GDOT policy

## Technical Discussion:

Reduction in the width of travel lanes throughout the project would result in 4'-0" of full build-up widening and bridge width that would not have to be constructed, resulting in significant cost savings. Although 11'-0" lanes would require an exception to GDOT policy, AASHTO's "Policy on Geometric Design of Highways 2004" states that 11'-0" lanes are permissible. It also states that under interrupted-flow operating conditions at low speeds (45 mph or less), narrower lanes are normally adequate and have some advantages. (See Pages 472-473). Due to the low speed (45mph), low % trucks, and urban character of the project, 11'-0" lanes should pose no operational issues.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,027,769		\$ 4,027,769
ALTERNATIVE	\$ 3,684,009		\$ 3,684,009
SAVINGS	\$ 343,760		\$ 343,760

# Illustration

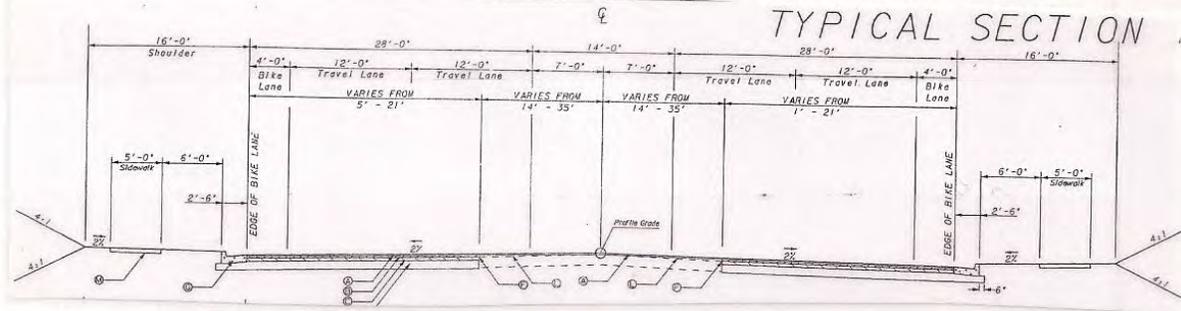


PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

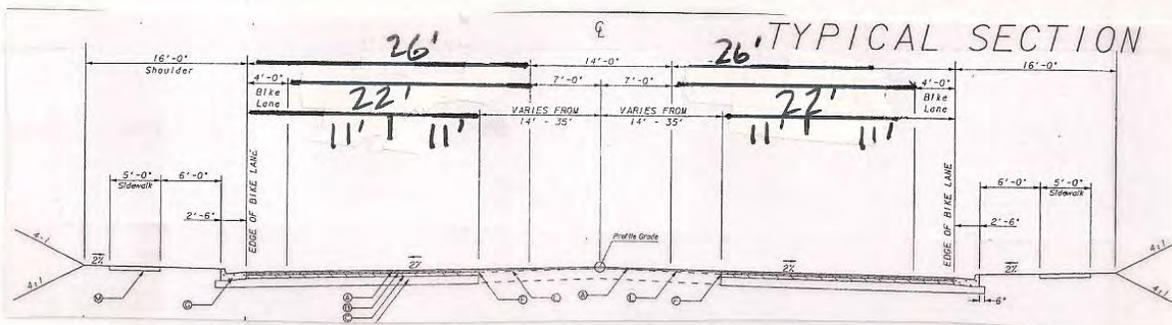
ALTERNATIVE NO.:  
**RD-1**

DESCRIPTION: **Use 11' travel lanes**

SHEET NO.: **2 of 4**



**ORIGINAL**



**ALTERNATIVE**

# Calculations



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-1**

DESCRIPTION: **Use 11' travel lanes**

SHEET NO.: **3 of 4**

### Assumptions:

Reduce pavement width by 4' overall; 1' reduction each in lane width.  
Project limits=STA 188+00-STA 282+03=9403LF  
9403LF x 4' overall width reduction/9=4179SY pavement area reduction

### Pavement quantity reduction-

-GAB @ 12"= 4179SY x 1200lb/sy=5014800/2000=2507 ton reduction  
-25mm Superpave@660lb/sy= 4179SY x 660/2000=1379 ton reduction  
-19mm Superpave@ 220lb/sy=4179SY x 220/2000=460 ton reduction  
-12.5mm Superpave@165lb/sy=4179SY x 165/2000=345 ton reduction

Assume ROW cost savings at 10% of total ROW burdened costs to reflect the 4' reduction in ROW required by narrowing travel lanes to 11'.

Total ROW costs=\$1,303,100 x 10%= \$130,310 cost reduction

# Cost Worksheet



PROJECT:	<b>Georgia Department of Transportation</b> <b>STP00-0174-01(007) - P.I. No. 231440</b> <b>SR 232 Reconstruction</b> <b>Columbia County</b>	ALTERNATIVE NO.:	<b>RD-1</b>
DESCRIPTION:	<b>Use 11' travel lanes</b>	SHEET NO.:	<b>4 of 4</b>

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
25mm Superpave	TN	12,338	\$ 59.90	\$ 739,046	10,959	\$ 59.90	\$ 656,444
19mm Superpave	TN	10,000	\$ 67.17	\$ 671,700	9,540	\$ 67.17	\$ 640,802
12.5mm Superpave	TN	7,500	\$ 67.89	\$ 509,175	7,155	\$ 67.89	\$ 485,753
GAB, inc mat'l	TN	24,285	\$ 18.06	\$ 438,587	21,778	\$ 18.06	\$ 393,311
ROW total costs	LS	1	\$ 1,303,100	\$ 1,303,100	0.9	\$ 1,303,100	\$ 1,172,790
<b>Sub-total</b>				\$ 3,661,608			\$ 3,349,100
<b>Mark-up at 10.00%</b>				\$ 366,161			\$ 334,910
<b>TOTAL</b>				<b>\$ 4,027,769</b>			<b>\$ 3,684,009</b>

Estimated Savings: \$343,760

# Value Analysis Design Alternative



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-2**

DESCRIPTION: **Use 10'-0" shoulder throughout project**

SHEET NO.: **1 of 4**

### Original Design:

The original design proposes constructing a 16'-0" urban shoulder throughout the majority of the project.

### Alternative:

The alternative proposes constructing a 10'-0" shoulder throughout the entire project.

### Opportunities:

- Reduction in ROW costs
- Narrower footprint for future maintenance

### Risks:

- Minor design impacts
- Reduced utility strip on shoulder

### Technical Discussion:

The reduction of the shoulder width from 16'-0" to 10' -0" throughout the project would allow the curb and gutter and the 5'-0" sidewalk to be constructed while reducing the ROW impact required to construct the project. The 10'-0" shoulders proposed for the entire project are being utilized on the project currently in selected sections, primarily east of the bridge at STA 231+86 eastward. This will reduce longitudinal stream impacts, as well as reduce utility impacts to the large utility poles running throughout the south side of the project. Recognizing that the reduced 10'-0" shoulder section will be utilized in part on the project, it is the intent of the alternative to extend the narrowed shoulder to the whole of the project.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,433,410	\$ 0	\$ 1,433,410
ALTERNATIVE	\$ 1,003,387	\$ 0	\$ 1,003,387
SAVINGS	\$ 430,023	\$ 0	\$ 430,023

# Illustration

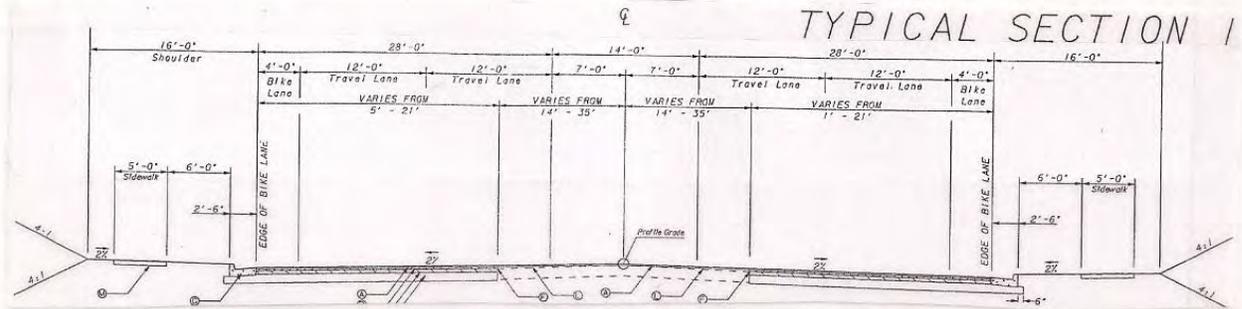


PROJECT: Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County

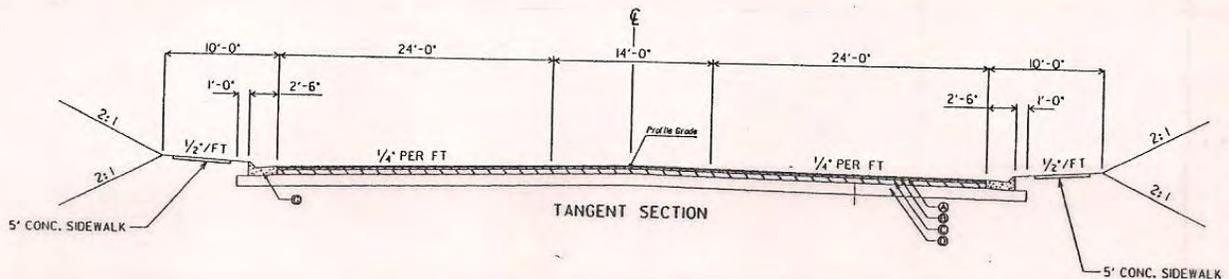
ALTERNATIVE NO.:  
**RD-2**

DESCRIPTION: Use 10'-0" shoulder throughout project

SHEET NO.: 2 of 4



ORIGINAL



ALTERNATIVE

# Calculations



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-2**

DESCRIPTION: **Use 10' shoulder throughout project**

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

## Assumptions:

The reduction of shoulder width from 16' to 10' will result in savings of 12' of ROW throughout the project.

Cost figures were derived from the ROW Cost Estimate provided to the VE team dated June 2, 2008.

ROW cost savings estimated at 30% of total, burdened ROW costs. The estimated savings reflect reduction in sizes of parcels more so than an overall reduction in the number of parcels that are to be acquired. Cost savings realized may be greater by reducing the number of parcels acquired if the 10' shoulders are implemented. A "best fit" approach following implementation of this alternative by the designer would optimize the potential ROW savings.



# Value Analysis Design Alternative



PROJECT:	<b>Georgia Department of Transportation STP00-0174-01(007) – P.I. No. 231440 SR 232 Reconstruction Columbia County</b>	ALTERNATIVE NO.:	<b>RD-6</b>
DESCRIPTION:	<b>Eliminate bike lanes and sidewalks from STA 260+00 to eastern limits of project</b>	SHEET NO.:	<b>1 of 4</b>

**Original Design:**

The original design calls for construction of 4'-0" bike lanes and 5'-0" sidewalks in each direction throughout the project.

**Alternative:**

The alternative would eliminate the construction of bike lanes and sidewalks from STA 260+00(+/-) eastward to the end of the project.

**Opportunities:**

- Reduction in concrete sidewalk quantities
- Reduction in asphalt pavement quantities

**Risks:**

- Minimal design impacts
- Reduces pedestrian/bicycle connectivity

**Technical Discussion:**

The alternative proposes to tie in to the existing full five-lane section beginning at approximate STA 260+00, and not constructing the proposed bike lanes and sidewalk through this area. This section appears to be an existing five-lane section with curb and gutter. Constructing the proposed improvements would require removal of the existing curb and gutter in each direction to widen the roadway 4' -0" on either side to accommodate the bike lanes, while constructing the sidewalk behind the existing curb and gutter. The alternative would limit the proposed improvements to tying in to the existing five lane section, and perhaps overlaying/restriping the section from STA 260+00 eastward for continuity. The identified problems include leaving stub termini for pedestrian and bike traffic and nonconformity with the local bike plan. It is noted that there appears to be no sidewalks or bike lanes that continue beyond the eastern and western limits of the project.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,999,929	\$ 0	\$ 2,999,929
ALTERNATIVE	\$ 2,817,827	\$ 0	\$ 2,817,827
SAVINGS	\$ 182,102	\$ 0	\$ 182,102



# Calculations



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-6**

DESCRIPTION: **Eliminate bike lanes and sidewalks from STA 260+00 to  
eastern limits of project**

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

## Assumptions:

Delete bike lanes and sidewalks from STA 260+00(+/-) to the eastern terminus of the project at STA 282+03.

STA 282+03-STA 260+00= 2203 LF x 2 sides=4403 LF impacted.

## Sidewalk:

4403 LF x 5'9"=2446 SY reduction in sidewalk.

## Pavement quantity reduction:

4403 LF x 4' w/9"=1957 SY reduction

-GAB @ 12"= 1957SY x 1200lb/sy=2348400/2000=1174 ton reduction

-25mm Superpave@660lb/sy= 1957SY x 660/2000=646 ton reduction

-19mm Superpave@ 220lb/sy=1957SY x 220/2000=215 ton reduction

-12.5mm Superpave@ 165lb/sy=1957SY x 165/2000=161 ton reduction



# Value Analysis Design Alternative



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-7**

DESCRIPTION: **Minimize the retaining walls**

SHEET NO.: **1** of **4**

**Original Design:**

The original design requires Retaining Wall A, B, and C with berm and concrete ditch to eliminate the conflict with electrical transmission poles.

**Alternative:**

The alternative would eliminate the berm and relocate the concrete ditch to the top of the retaining wall to reduce the required wall height and length.

**Opportunities:**

- Reduce EW costs
- Reduce retaining wall costs
- Ease construction
- Improve sight distance for driveways

**Risks:**

- Eliminate purpose of berm

**Technical Discussion:**

The elimination of the berm and the relocation of the concrete ditch to the top of the retaining wall will reduce the required fill material and the effective height of the wall. This will also allow for better sight distance for the intersecting driveways, allowing the driver’s line of sight over the wall, which is blocked in the original design.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 136,323	\$ 0	\$ 136,323
ALTERNATIVE	\$ 69,104	\$ 0	\$ 69,104
SAVINGS	\$ 67,219	\$ 0	\$ 67,219

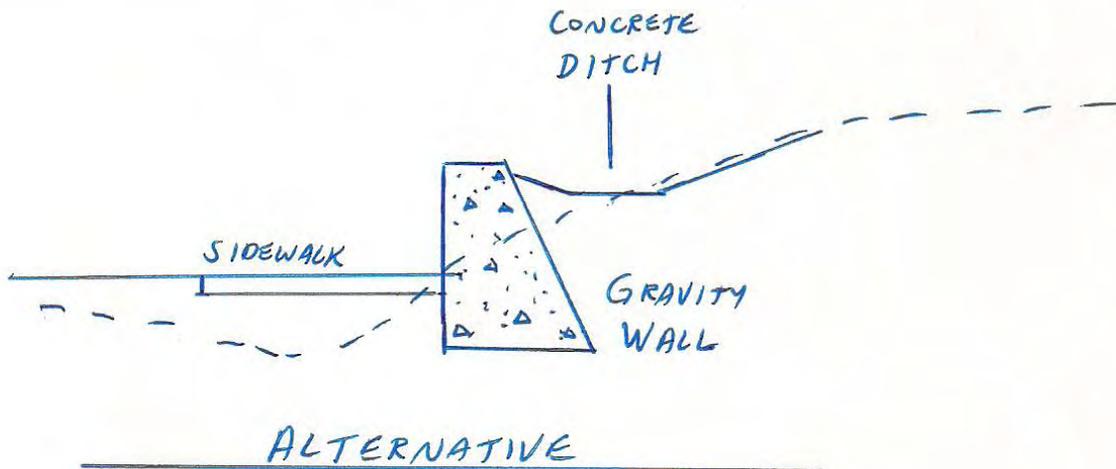
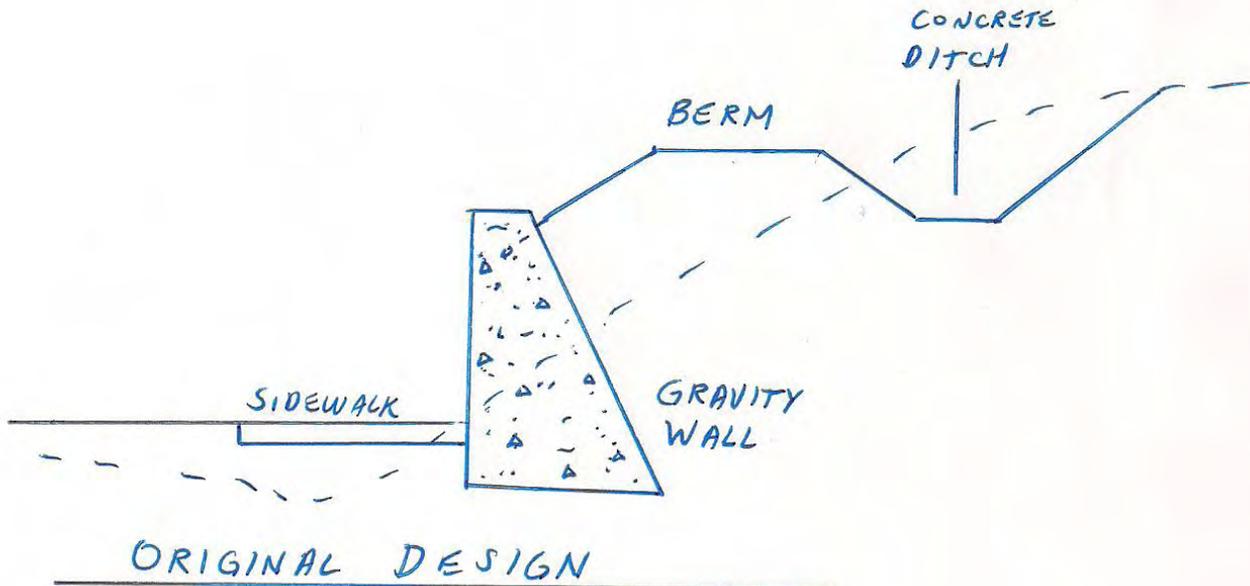
# Illustration

PROJECT: Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County

ALTERNATIVE NO.:  
**RD-7**

DESCRIPTION: Minimize the retaining Walls

SHEET NO.: 2 of 4



# Calculations



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-7**

DESCRIPTION: **Minimize retaining walls**

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

Shorten and reduce the length of the required Retaining Wall A, B and C, by eliminating the berm and relocating the required concrete ditch to the top of the retaining wall.

Original Design:

(approx.) EW for berm = 2.5' tall x 4' wide x 1350' length = 13,500cf / (27cf/cy) = 500 cy

(approx.) Class B Concrete for retaining wall (Avg. Ht. = 5.9' tall)

$$\text{Vol} = ((5.9')8''/12 + (5.9')(5.9'/2)/2) (1350' \text{ length}) = 17,085 \text{ cf} / (27\text{cf/cy}) = 634 \text{ cy}$$

Alternative:

(approx.) Class B Concrete for retaining wall (Avg. Ht. = 4.0' tall) (length = 1325')

$$\text{Vol} = ((4.0')8''/12 + (4.0')(4.0'/2)/2) (1325' \text{ length}) = 8850 \text{ cf} / (27\text{cf/cy}) = 328 \text{ cy}$$



# Value Analysis Design Alternative



PROJECT:	<b>Georgia Department of Transportation STP00-0174-01(007) – P.I. No. 231440 SR 232 Reconstruction Columbia County</b>	ALTERNATIVE NO.:	<b>RD-8</b>
DESCRIPTION:	<b>Don't realign Shepherd Way – construct eastbound acceleration lane for Maple Creek Dr.</b>	SHEET NO.:	<b>1 of 3</b>

**Original Design:**

The original design requires relocation of 550' of Shepherd Way to form a 4-leg intersection at Columbia Road with Maple Creek Drive.

**Alternative:**

The alternative is to leave the Shepherd Way alignment unaffected and provide an acceleration lane for the right turns from Maple Creek.

**Opportunities:**

- Eliminate all costs of relocated roadway
- Eliminate costs of the Required ROW
- Retain existing traffic pattern
- Ease construction and MOT
- Provide better traffic flow from Maple Creek Rd.

**Risks:**

- Undesirable alignment of offset of intersections
- Will not accommodate possible future signalization

**Technical Discussion:**

The AASHTO Green Book notes the benefits of 4-leg intersections particularly when there are crossing movements on the minor roadway. Since both Shepherd Way and Maple Creek Dr. are primarily collector roads to the arterial (Columbia Rd.) with the predominate movement being eastbound turns, the original design realignment will have minor benefits only. Providing an eastbound acceleration lane for the right turns from Maple Creek Dr. allow for free flow onto Columbia Road.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 197,813	\$ 0	\$ 197,813
ALTERNATIVE	\$ 21,671	\$ 0	\$ 21,671
SAVINGS	\$ 176,142	\$ 0	\$ 176,142

# Calculations



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-8**

DESCRIPTION: **Don't realign Shepherd Way – construct eastbound  
acceleration lane for Maple Creek Dr.**

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

These calculations show approximate quantities associated with the relocation of 550' of Shepherd Way. There are other cost savings associated with clearing & grubbing, pavement removal, MOT and grading (earthwork). The alternative assumes a minimal amount of work on Shepherd Way to make the tie-in.

Original Design:

Pavement Area (Full Depth) = (2440-2047)length x 24' width = 9,432sf / 9sf/sy = 1,048 sy

Pavement Area (Widening) = (2500-2420)length x 12' width = 969sf / 9sf/sy = 107 sy

Total Pavement Area = 1,048 + 107 = 1155 sy

12" GAB- (10,400 sf) x (12"/12")x(135#/cf) / (2000#/ton) => 702 tons  
12.5 mm Superpave- (1155 sy) x (165#/sy) / (2000#/ton) => 96 tons  
19.0 mm Superpave- (1155 sy) x (220#/sy) / (2000#/ton) => 127 tons  
25.0 mm Superpave- (1155 sy) x (660#/sy) / (2000#/ton) => 381 tons

C & G = 2550 – 2050 = 500' per side = 500' x 2 = 1000 lf

Sidewalk = 2530 – 2050 = 480' per side = 480' x 2 x 5' wide / 9sf/sy = 533 sy

Guardrail = 2526 – 2139 = 387 lf & 1- Type 1 Anchor & 1- Type 12 Anchor

Drainage = G-1 to G-5 = 329 lf of 18" Storm Drain & 4-Catch Basins & 1- FES

Reduction in Right-of-Way = 46,000 sf / 43,560sf/ac = 1.0 Ac.

Net Cost- 1.0 AC x (\$28,000 / AC) = \$28,000

Right of way: Net cost	=	\$28,000
Scheduling @ 55%	=	\$ 15,400
Court cost @ 60%	=	\$ 16,800
Appreciation @ 10%	=	<u>\$ 2,800</u>
Total	=	\$ 63,000

Alternative: Assume 50' full depth to make tie

Pavement Area (Full Depth) = 2,000 sf / 9sf/sy = 222 sy

12" GAB- (2,000 sf) x (12"/12")x(135#/cf) / (2000#/ton) => 135 tons  
12.5 mm Superpave- (222 sy) x (165#/sy) / (2000#/ton) => 18 tons  
19.0 mm Superpave- (222 sy) x (220#/sy) / (2000#/ton) => 25 tons  
25.0 mm Superpave- (222 sy) x (660#/sy) / (2000#/ton) => 73 tons

C & G = 50' per side = 50' x 2 = 100 lf

Drainage = 150 lf of 18" Storm Drain & 1-Catch Basin

# Cost Worksheet



<b>PROJECT:</b>	<b>Georgia Department of Transportation</b> <b>STP00-0174-01(007) - P.I. No. 231440</b> <b>SR 232 Reconstruction</b> <b>Columbia County</b> <b>Don't Realign Shepherd - construct</b> <b>acceleration lane for Maple Creek Dr.</b>	<b>ALTERNATIVE NO.:</b>	<b>RD-8</b>
<b>DESCRIPTION:</b>		<b>SHEET NO.:</b>	<b>3 of 3</b>

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE			
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL	
25mm Superpave	TN	381	\$ 59.90	\$ 22,822	73	\$ 59.90	\$ 4,373	
19mm Superpave	TN	127	\$ 67.17	\$ 8,531	25	\$ 67.17	\$ 1,679	
12.5mm Superpave	TN	96	\$ 67.89	\$ 6,517	18	\$ 67.89	\$ 1,222	
GAB, inc mat'l	TN	702	18.06	\$ 12,678	135	18.06	\$ 2,438	
Conc. Sidewalk, 4" Tk.	SY	533	\$ 32.82	\$ 17,493	0	\$ 32.82	\$ -	
Conc. Curb & Gutter 8"x30"	LF	1,000	\$ 15.89	\$ 15,890	100	\$ 15.89	\$ 1,589	
Guardrail, Tp W	LF	387	\$ 17.60	\$ 6,811	0	\$ 17.60	\$ -	
Guardrail Anchorage, TP 1	EA	1	\$ 665.08	\$ 665	0	\$ 665.08	\$ -	
Guardrail Anchorage, TP 12	EA	1	\$ 1,862.72	\$ 1,863	0	\$ 1,862.72	\$ -	
Storm Drain Pipe, 18", H 1-10	LF	329	\$ 39.05	\$ 12,847	150	\$ 39.05	\$ 5,858	
Catch Basin, GP 1	EA	4	\$ 2,541.90	\$ 10,168	1	\$ 2,541.90	\$ 2,542	
Safety End Section, 18"	EA	1	\$ 544.70	\$ 545	0	\$ 544.70	\$ -	
Right-of-Way	LS	1	\$ 63,000.00	\$ 63,000	0	\$ -	\$ -	
<b>Sub-total</b>				\$ 179,830				\$ 19,700
<b>Mark-up at 10.00%</b>				\$ 17,983				\$ 1,970
<b>TOTAL</b>				<b>\$ 197,813</b>				<b>\$ 21,671</b>

Estimated Savings: \$176,142

# Value Analysis Design Alternative



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-16**

DESCRIPTION: **Reconfigure the intersection at Old Belair Road**

SHEET NO.: **1** of **4**

## Original Design:

The original design realigns Old Belair Rd. (CR-1300) to form a 90 degree intersection with Columbia Rd. by relocating approximately 560' of roadway creating a new 3-leg intersection.

## Alternative:

The alternative is to revise the Old Belair Rd. realignment to tie to Columbia Rd. at 194+50, requiring 425' of relocated roadway.

## Opportunities:

- Reduce construction costs
- Improve traffic flow through intersection

## Risks:

- Reduce spacing of offset intersections
- Redesign required

## Technical Discussion:

The original design places the realigned Old Belair Rd. intersection at the beginning of the 2-lane to 5-lane transition of Columbia Rd. The alternative moves the intersection about 300' east to a point where the transition is over 4 lanes wide. This would provide a left turn lane for Columbia Rd. eastbound onto Old Belair Rd and allow free flow on the eastbound thru lane. The alternative serves the same purpose as the original design but with reduced length of relocated roadway. The offset spacing of the two 3-leg intersections is reduced from 1100' to 800'. Due to the low traffic volume on Old Belair Rd., this reduction will have minimal affect on the traffic flow within the Columbia Rd. corridor.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 139,053	\$ 0	\$ 139,053
ALTERNATIVE	\$ 110,691	\$ 0	\$ 110,691
SAVINGS	\$ 28,362	\$ 0	\$ 28,362

# Illustration

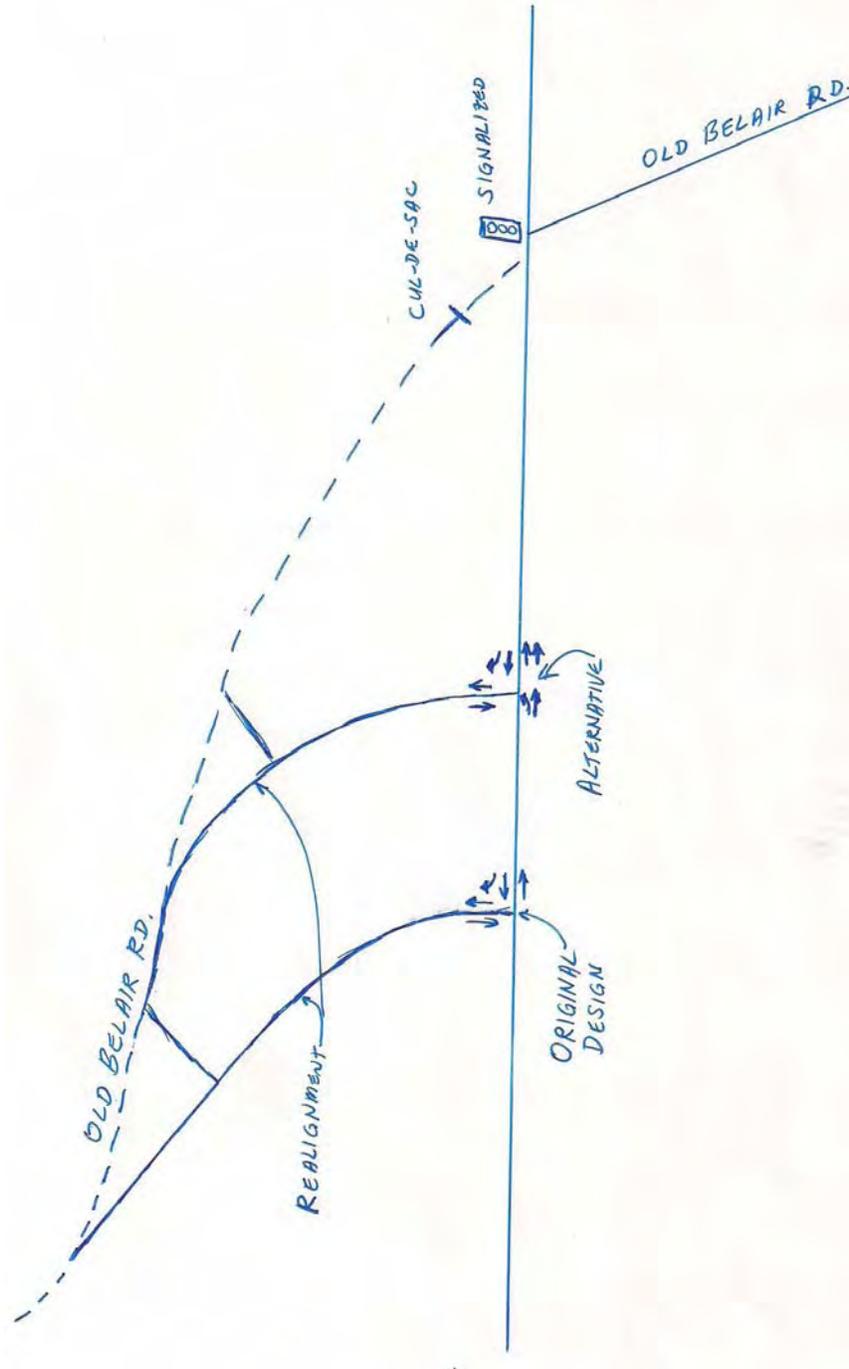


PROJECT: Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County

ALTERNATIVE NO.:  
**RD-16**

DESCRIPTION: Reconfigure the intersection at Old Belair Road

SHEET NO.: 2 of 4



# Calculations



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-16**

DESCRIPTION: **Reconfigure intersection at Old Belair Road**

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

This calculation is for the reduction of required length of relocation / overlay of Old Belair Rd. from the original design to the alternative.

## Original Design

Relocated Pavement Area (Full Depth) =  $(3600 - 3040)\text{length} \times 24' \text{ width} = 13,440\text{sf} / 9\text{sf/sy} = 1,493 \text{ sy}$

Overlay Pavement Area =  $(3875 - 3600)\text{length} \times 24' \text{ width} = 6,600\text{sf} / 9\text{sf/sy} = 733 \text{ sy}$

12" GAB-  $(13,440 \text{ sf}) \times (12''/12'') \times (135\#/cf) / (2000\#/ton) \Rightarrow 907 \text{ tons}$

12.5 mm Superpave-  $(1493 \text{ sy} + 733 \text{ sy}) \times (165\#/sy) / (2000\#/ton) \Rightarrow 184 \text{ tons}$

19.0 mm Superpave-  $(1493 \text{ sy}) \times (220\#/sy) / (2000\#/ton) \Rightarrow 164 \text{ tons}$

25.0 mm Superpave-  $(1493 \text{ sy}) \times (660\#/sy) / (2000\#/ton) \Rightarrow 493 \text{ tons}$

C & G =  $3875 - 3040 = 835'$  per side =  $835' \times 2 = 1670 \text{ lf}$

Sidewalk =  $3875 - 3040 = 835'$  per side =  $835' \times 2 \times 5' \text{ wide} / 9\text{sf/sy} = 928 \text{ sy}$

## Alternative:

Relocated Pavement Area (Full Depth) =  $(3490 - 3040)\text{length} \times 24' \text{ width} = 10,800\text{sf} / 9\text{sf/sy} = 1,200 \text{ sy}$

Overlay Pavement Area =  $(3700 - 3490)\text{length} \times 24' \text{ width} = 5040\text{sf} / 9\text{sf/sy} = 560 \text{ sy}$

12" GAB-  $(10,800 \text{ sf}) \times (12''/12'') \times (135\#/cf) / (2000\#/ton) \Rightarrow 729 \text{ tons}$

12.5 mm Superpave-  $(1200 \text{ sy} + 560 \text{ sy}) \times (165\#/sy) / (2000\#/ton) \Rightarrow 145 \text{ tons}$

19.0 mm Superpave-  $(1200 \text{ sy}) \times (220\#/sy) / (2000\#/ton) \Rightarrow 132 \text{ tons}$

25.0 mm Superpave-  $(1200 \text{ sy}) \times (660\#/sy) / (2000\#/ton) \Rightarrow 396 \text{ tons}$

C & G =  $3700 - 3040 = 660'$  per side =  $660' \times 2 = 1320 \text{ lf}$

Sidewalk =  $3700 - 3040 = 660'$  per side =  $660' \times 2 \times 5' \text{ wide} / 9\text{sf/sy} = 733 \text{ sy}$

There are additional construction cost savings associated with reduced clearing and grubbing, earthwork and Right-of-Way. The length of the connector spur to the cul-de-sac and drainage requirements are assumed equal.

# Cost Worksheet



PROJECT:	<b>Georgia Department of Transportation</b> <b>STP00-0174-01(007) - P.I. No. 231440</b> <b>SR 232 Reconstruction</b> <b>Columbia County</b>	ALTERNATIVE NO.:	<b>RD-16</b>
DESCRIPTION:	<b>Reconfigure the intersection at Old Belair Rd.</b>	SHEET NO.:	<b>4 of 4</b>

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
25mm Superpave	TN	493	\$59.90	\$ 29,531	396	\$59.90	\$ 23,720
19mm Superpave	TN	164	\$67.17	\$ 11,016	132	\$67.17	\$ 8,866
12.5mm Superpave	TN	184	\$67.89	\$ 12,492	145	\$67.89	\$ 9,844
GAB, inc mat'l	TN	907	\$ 18.06	\$ 16,380	729	\$ 18.06	\$ 13,166
Conc. Sidewalk, 4" Tk.	SY	928	\$32.82	\$ 30,457	733	\$32.82	\$ 24,057
Conc. Curb & Gutter 8"x30"	LF	1,670	\$15.89	\$ 26,536	1320	\$15.89	\$ 20,975
<b>Sub-total</b>				\$ 126,412			\$ 100,628
<b>Mark-up at 10.00%</b>				\$ 12,641			\$ 10,063
<b>TOTAL</b>				<b>\$ 139,053</b>			<b>\$ 110,691</b>

Estimated Savings:	\$28,362
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# Value Analysis Design Alternative



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-18**

DESCRIPTION: **Use 12' center turn lane**

SHEET NO.: **1** of **4**

### Original Design:

The original design calls for the construction of a 14' two-way left turn lane.

### Alternative:

The alternative design calls for the construction of a 12' two-way turn lane.

### Opportunities:

- Reduction in pavement quantities
- Reduction in ROW width required

### Risks:

- Minor redesign effort

### Technical Discussion:

The alternative proposes narrowing the 14' two-way left turn lane to 12' throughout the project. The resulting savings would be calculated based on reduction in full build-up pavement costs. The 12' two-way left turn lane would be operationally sufficient in a 45 mph design speed.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 4,027,769	\$ 0	\$4,027,769
ALTERNATIVE	\$ 3,855,884	\$ 0	\$3,855,884
SAVINGS	\$ 171,885	\$ 0	\$ 171,885

# Illustration

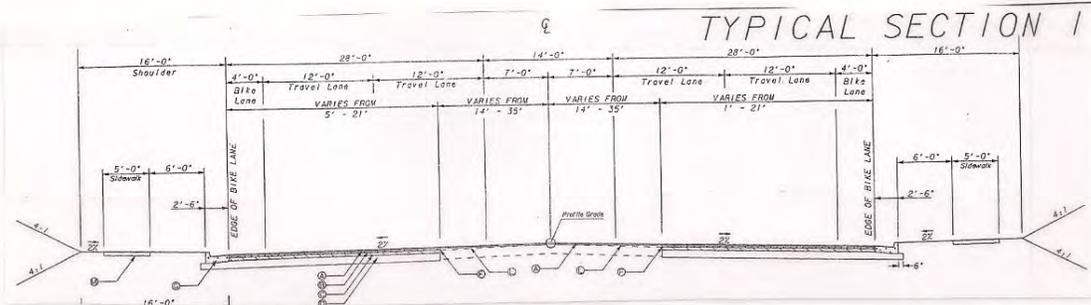


PROJECT: Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County

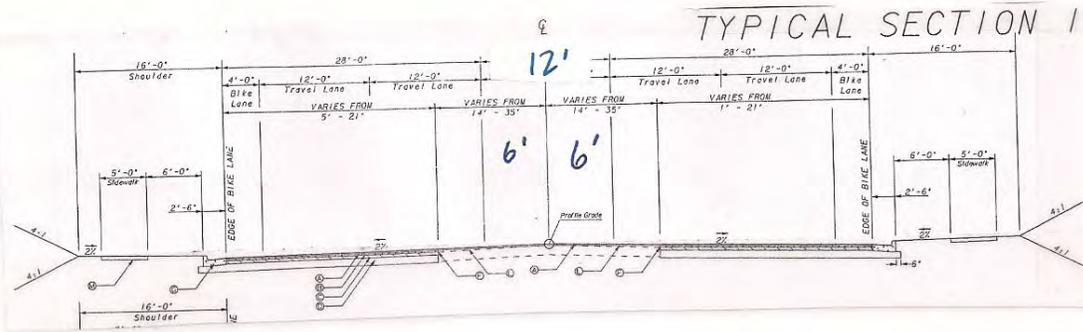
ALTERNATIVE NO.:  
**RD-18**

DESCRIPTION: Use 12' center turn lane

SHEET NO.: 2 of 4



ORIGINAL



ALTERNATIVE

# Calculations



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**RD-18**

DESCRIPTION: **Use 12' center turn lane**

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

**Assumptions:**

Reduce pavement width by 2' overall.

Project limits=STA 188+00-STA 282+03=9403LF

9403LF x 2' overall width reduction/9=2090SY pavement area reduction

**Pavement quantity reduction-**

-GAB @ 12"= 2090SY x 1200lb/sy=2508000/2000= 1254 ton reduction

-25mm Superpave@660lb/sy= 2090SY x 660/2000= 690 ton reduction

-19mm Superpave@ 220lb/sy=2090SY x 220/2000=230 ton reduction

-12.5mm Superpave@165lb/sy=2090SY x 165/2000= 172 ton reduction

Assume ROW cost savings at 5% of total ROW burdened costs to reflect the 2'reduction in ROW required by narrowing center turn lane to 12' from 14'.

Total ROW costs=\$1,303,100 x 5%= \$65,165 cost reduction

# Cost Worksheet



PROJECT:	<b>Georgia Department of Transportation</b> <b>STP00-0174-01(007) - P.I. No. 231440</b> <b>SR 232 Reconstruction</b> <b>Columbia County</b>	ALTERNATIVE NO.:	<b>RD-18</b>
DESCRIPTION:	<b>Use 12' center turn lane</b>	SHEET NO.:	<b>4 of 4</b>

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
25mm Superpave	TN	12,338	\$ 59.90	\$ 739,046	11,648	\$ 59.90	\$ 697,715
19mm Superpave	TN	10,000	\$ 67.17	\$ 671,700	9,770	\$ 67.17	\$ 656,251
12.5mm Superpave	TN	7,500	\$ 67.89	\$ 509,175	7,328	\$ 67.89	\$ 497,498
GAB, inc mat'l	TN	24,285	18.06	\$ 438,587	23,031	\$ 18.06	\$ 415,940
ROW total costs	LS	1	\$ 1,303,100	\$ 1,303,100	0.95	\$1,303,100	\$ 1,237,945
<b>Sub-total</b>				\$ 3,661,608			\$ 3,505,349
<b>Mark-up at 10.00%</b>				\$ 366,161			\$ 350,535
<b>TOTAL</b>				<b>\$ 4,027,769</b>			<b>\$ 3,855,884</b>

Estimated Savings: \$171,885

# Value Analysis Design Alternative



PROJECT:	<b>Georgia Department of Transportation STP00-0174-01(007) – P.I. No. 231440 SR 232 Reconstruction Columbia County</b>	ALTERNATIVE NO.:	<b>WL-2</b>
DESCRIPTION:	<b>Use Modular Block Wall in-lieu of poured in place GA STD 9031-L Gravity Retaining Wall</b>	SHEET NO.:	<b>1 of 4</b>

**Original Design:**

The original design calls for five stretches of Ga. Std. 9031-L, Gravity Retaining Walls:  
**Walls A, B & C** are on the South side of SR 232 from Sta. 241+00 to Sta. 250+00 approximately.  
**Walls D & E** are on the North side of SR 232 from Sta. 250+15 to Sta. 254+00 approximately.  
 The average height of the walls varies from 2.5 feet to 7.0 feet.

**Alternative:**

The alternative proposes the use of Modular Block Wall (Eg: Keystone) in lieu of the cast-in-place Gravity Retaining Walls.

The alternatives maintain the original design wall envelope and geometry.

**Opportunities:**

- Cost savings
- Reduced construction time
- Manufacturer designs and installs the system
- Improved aesthetics

**Risks:**

- Minimal redesign effort

**Technical Discussion:**

Modular Block walls have demonstrated acceptable performance and longevity. Performance warranties are also provided by the manufacturers. They are a common wall type used in urban areas similar to where the current project is located.

Optionally, the berms behind walls may be reduced and the swales built adjacent to the wall. This alternative is being developed in the Roadway Sections (RD-7).

See the next sheet for the calculation of the savings noted below.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
<b>ORIGINAL DESIGN</b>	\$ 375,852	\$ 0	\$ 375,852
<b>ALTERNATIVE</b>	\$ 244,400	\$ 0	\$ 244,400
<b>SAVINGS</b>	\$ 131,452	\$ 0	\$ 131,452

# Illustration

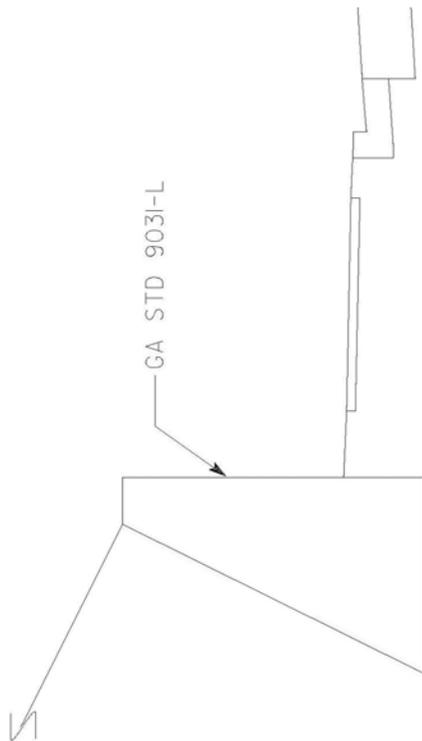


PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

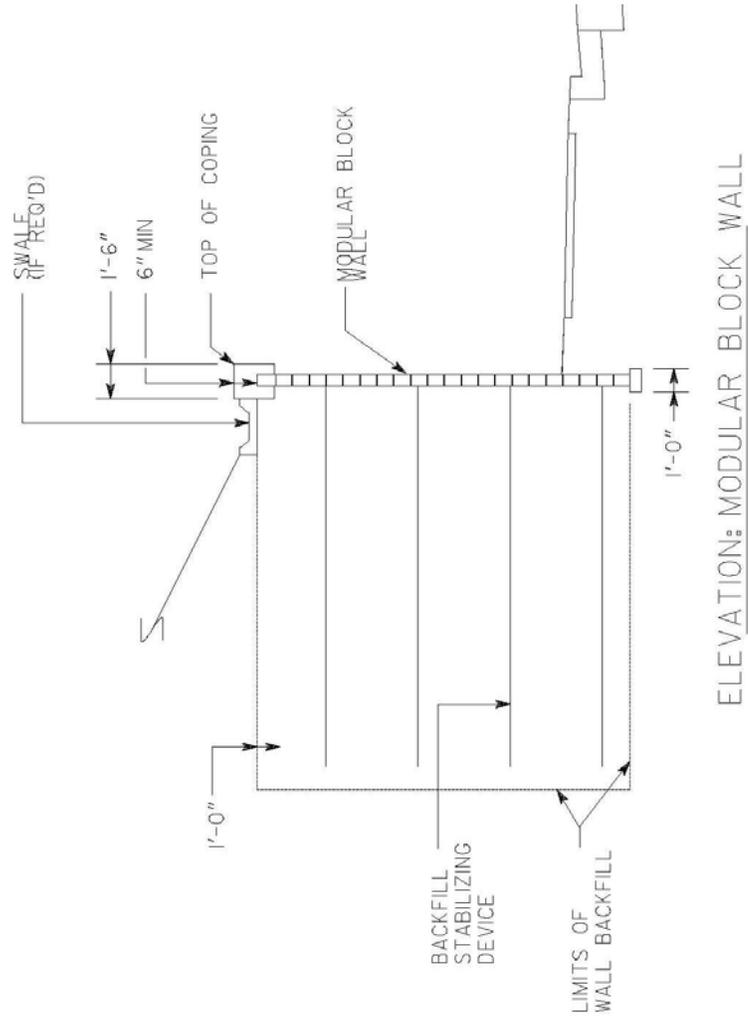
ALTERNATIVE NO.:  
**WL-2**

DESCRIPTION: **Use Modular Block Wall in-lieu of poured in place  
GA STD 9031-L Gravity Retaining Wall**

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



CURRENT DESIGN: GA STD 9031-L



# Calculations



PROJECT: **Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

ALTERNATIVE NO.:  
**WL-2**

DESCRIPTION: **Use Modular Block Wall in-lieu of poured in place  
GA STD 9031-L Gravity Retaining Wall**

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

**Current Design – Walls A, B, C, D & E: GDOT STD. 9031-L, Cast-in-Place Gravity Retaining Walls**

**Quantities:**

	Stations		ft	ft	ft	ft	ft	ft	sq.ft.	cu.ft.
	From	To	Length	Max Ht.	Min Ht.	Avg. Ht.	Top Width	Bot. Width	CS Area	Volume
<b>Wall A</b>	241+00	242+6994	169.88	7.00	6.50	6.75	0.67	4.05	15.91	2703.32
	242+6994	242+7632	6.44	7.00	7.00	7.00	0.67	4.17	16.94	109.09
	242+7632	242+7632	6.25	7.17	7.00	7.09	0.67	4.21	17.30	108.10
	242+7632	242+7632	13.96	7.17	4.93	6.05	0.67	3.70	13.20	184.33
	242+7632	242+7632	9.79	4.93	2.22	3.58	0.67	2.46	5.59	54.73
<b>Wall B</b>	242+9104	242+9104	9.85	4.93	2.22	3.58	0.67	2.46	5.59	55.07
	242+9104	242+9104	13.84	7.51	4.93	6.22	0.67	3.78	13.84	191.54
	242+9104	242+9104	4.85	7.51	7.00	7.26	0.67	4.30	18.02	87.40
	242+9104	242+9742	6.38	7.00	7.00	7.00	0.67	4.17	16.94	108.08
	242+9742	244+8130	183.88	7.00	7.00	7.00	0.67	4.17	16.94	3114.93
	244+8130	244+8776	6.46	7.00	7.00	7.00	0.67	4.17	16.94	109.43
	244+8776	244+8776	4.68	7.11	7.00	7.06	0.67	4.20	17.17	80.36
	244+8776	244+8776	13.97	7.11	4.46	5.79	0.67	3.56	12.24	171.03
244+8776	244+8776	8.79	4.46	2.23	3.35	0.67	2.34	5.04	44.29	
<b>Wall C</b>	245+0279	245+0279	22.75	7.53	2.30	4.92	0.67	3.13	9.33	212.31
	245+0279	245+0279	4.68	6.96	7.53	7.25	0.67	4.29	17.98	84.13
	245+0279	245+0926	6.47	6.96	6.83	6.90	0.67	4.12	16.50	106.79
	245+0926	242+6000	190.68	6.86	5.48	6.17	0.67	3.76	13.65	2603.00
	242+6000	245+0000	300.06	5.48	4.00	4.74	0.67	3.04	8.79	2638.34
<b>Wall D</b>	250+1500	251+1000	96.00	5.18	1.35	3.27	0.67	2.30	4.85	465.85
<b>Wall E</b>	252+0000	252+9000	90.00	3.00	3.50	3.25	0.67	2.30	4.82	433.63
	252+9000	253+0000	10.00	5.35	3.50	4.43	0.67	2.88	7.86	78.60
	253+0000	254+0000	100.00	7.00	5.35	6.18	0.67	3.76	13.67	1366.99
<b>TOTAL</b>			<b>1280.00</b>							<b>15111.00</b>

Total Volume of Class B Concrete used for Gravity Wall = 15111/27 = 560 CF

**Alternate – Modular Block Walls with Coping**

Length of Coping = 1280 LF (See table above)

Wall area = 7259 SF (As determined graphically from Wall Envelopes provided electronically)



# ***PROJECT DESCRIPTION***

## **INTRODUCTION**

The project for this Value Engineering Study is project No. STP00-0174-01(007) - P.I. No. 231440 the reconstruction and widening of State Route 232 (Columbia Road) from Old Belair Road to State Route 383/Belair Road in Columbia County. The length of the project is 1.83 miles. The design is in the preliminary stage. The designer is District II - Georgia Department of Transportation.

The need for the project is to improve safety and reduce the number of accidents which currently is above the statewide average for similar facilities. This project is needed to accommodate existing and future traffic demands

State Route 232 is currently classified as an Urban Minor Arterial and operates on a Level of Service of "E". With no improvements, this segment of State Road 232 will operate at a LOS of "F" in 2025.

Currently State Route 232 consists of one 12-ft travel lane in each direction with 5' rural shoulders from west of Crawford Creek to County Road 79 (Shady Grove Drive) and two twelve foot lanes in each direction with a 14' flush median from County Road 799 to State Route 383 (Belair Road). There is a bridge over Crawford Creek that is to be widened.

The proposed design consists of constructing two 12-ft lanes in each direction with a 14' center turn lane. The plans specify a 16' shoulders to include curb and gutter, sidewalk, and a 4' bicycle lane on each side. The bridge over Crawford Creek will be widened to 86'.

The estimated construction costs are \$8,955,817 with additional Right-of-Way costs of \$1,303,061 and reimbursable utility costs of \$267,500. The projected total project cost is \$10,526,378.

## **REPRESENTATIVE DOCUMENTS**

- Georgia Department of Transportation
  - Construction Cost Estimates
  - Preliminary Right-of-Way Cost Estimate
  - Concept Report
  - Project Location Map
  - Pavement Analysis
  - Accident Data
  - Construction plans and specifications

The VE Team utilized the supplied project materials noted above.

## REVISED PROJECT CONCEPT REPORT

**Need and Purpose:** *See attached sheets.*

**Project Location:** *This project is located on SR 232 from Old Belair Road (M.P. 8.40) to Belair Road (M.P. 10.23) in Columbia County.*

**Description of the approved concept:**

*The approved concept consists of constructing 2 – 12ft. travel lanes in each direction with a 14ft. flush median. The proposed 16ft. shoulders will consist of curb, gutter and sidewalk each side to accommodate ADA regulations. The existing bridge over Crawford Creek will be widened to 74ft. to accommodate the newly constructed roadway and sidewalks. The project will tie into an existing 5-lane section of roadway on SR 232 just west of the intersection of SR 232 and SR 388 (Belair Road).*

**PDP Classification:** Major  Minor

**Federal Oversight:** Full Oversight  Exempt  State Funded  Other

**Functional Classification:** *Urban Minor Arterial*

**U.S. Route Number(s):** *None*      **State Route Number(s):** *232*

**Traffic (AADT) as shown in the approved concept:**

Current Year: *1998 (11,450)*

Design Year: *2018 (17,760)*

**Proposed features to be revised:**

*Typical Section  
Proposed Bridge Width*

**Describe the revised feature(s) to be approved:**

*The concept is now revised to add 4' bicycle lanes each side throughout the project limits on State Route 232 to accommodate the Augusta-Richmond Bicycle Plan (ARTS). The concept is also being revised to widen the existing bridge to ~~82'~~<sup>86'</sup> to accommodate the new travel lanes and the additional width for the bicycle lanes.*

**Updated traffic data (AADT):**

Current Year: *2009 (11,750)*

Design Year: *2029 (19,000)*

**Programmed Schedule:**

P.E. *2001*

R/W: *2005*

Construction: *LR*

**Revised Cost Estimates:**

1. Construction costs including inflation and E&C: *\$4,866,540*
2. Right of Way Cost: *\$478,000*

3. Utility Costs: \$267,500

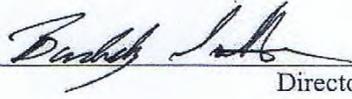
Is the project in a Non-Attainment area?  Yes  No

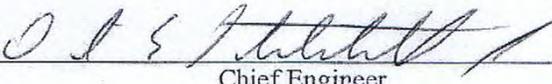
**Recommendation:**

*The district recommends that the proposed revision to the concept be approved for implementation.*

**Attachments:**

*Sketch Map  
Cost Estimate  
Need and Purpose Statement  
Typical Section*

Concur:   
Director of Preconstruction

Approved:   
Chief Engineer

# STP-174-1(7) Columbia



**Need and Purpose Statement**  
**SR 232 from Old Belair Road to Belair Road**  
**Columbia County; PI 231440**  
**Project No. STP-174-1(7)**

**Background**

In 2000 the Augusta MPO adopted its Long Range Transportation Plan (LRTP). This adopted Long Range Plan is the direct result of a comprehensive, cooperative and continuous planning process conducted by the local governments and the Georgia Department of Transportation in cooperation with the Federal Highway and Federal Transit Administrations. The city of Augusta recommends in its Long Range Transportation Plan the widening of SR 232 from Old Belair Rd. (CR 221) to Belair Rd. (SR 383). The LRTP recommendation is to widen the road from two to four through lanes.

**Design**

State Route 232 from Old Belair Road to Belair Road currently consists of one 12' lane in each direction with 5' rural shoulders from west of Crawford Creek to County Road 799 (Shady Grove Drive), and 2-12' lanes in each direction separated by a 14' flush median with curb and gutter from County Road 799 to State Route 383. The proposed improvement will widen SR 232 to 2-12' lanes in each direction separated by a 20' raised concrete median with urban shoulders. There is a bridge crossing at Crawford Creek that is to be replaced under project BR-0001-00(809). (See Attachment A for Project limits).

**Logical Termini**

SR 383 is a logical terminus because SR 232 is an existing four-lane highway east of this point and the highway carries 17,300 AADT on this section (Traffic Count Station 183). (See Attachment A for TC Station Locations). Old Belair Road (CR 221) is a logical terminus due to the drop in traffic volumes that occur west of this point. TC Station 181 currently carries 6,800 AADT. Traffic volumes drop at Old Belair Rd. due to the heavy residential development east of Old Belair Rd. There is little development and thus less traffic west of Old Belair Rd.

**Travel Demand and Operational Conditions**

SR 232 is classified as an Urban Minor Arterial. Level-of-Service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream. There are six identified LOS at which a roadway can operate. A letter, "A" through "F", identifies each of the six. LOS "A" represents free flow traffic where drivers are virtually unaffected by the presence of other vehicles; whereas, level "F" represents operating conditions in which demand exceeds capacity.

According to historical traffic counts for the past ten years, the traffic volumes on the subject section are increasing at a 1.5% growth rate. The subject section of SR 232 is currently operating at a LOS of "E" at TC Station 183. With no improvements, this segment of SR 232 will be operating at a LOS of "F" in 2025. Widening and improving SR 232 from Old Belair Road to Belair Road would improve the existing and future operational conditions.

**Community Issues**

Data from the 2000 Census indicates that 15,713 people reside within the limits of this project. 85% of the residents are White and 10% are Black. The land use along this corridor of SR 232 is zoned primarily residential. However, there are several businesses located along the project corridor. The project as proposed will impact 50 parcels of land with no displacements. SR 232

serves as the primary route to and from the neighborhoods in this corridor. The proposed improvements will provide area residents with improved access between their jobs, schools and other community activities.

**Safety**

For the years 1995-1997 (the most recent years for which complete accident data is available) the accident rate on SR 232 has been higher, on average, than the statewide average for similar facilities. Injury rates, on average, are above the statewide average for this type of facility and no fatalities occurred on this section of SR 232. The following table summarizes the corridor's accident statistics:

	1995		1996		1997	
	SR 232	State	SR 232	State	SR 232	State
Accidents	55		66		62	
Accident Rate	1,355	549	1,418	525	1,347	549
Injuries	17		20		13	
Injury Rate	419	162	430	152	282	155
Fatalities	0		0		0	
Fatality Rate	0	1.39	0	1.56	0	1.41

From 1995-1997, 33% of reported accidents for this subject section of SR 232 were as a result of one vehicle rear-ending another. 30% of all accidents were angle intersection related. The proposed turn lanes will allow motorists to exit the through lane before turning, thus reducing the opportunity for rear-end accidents. The raised median will help reduce the opportunity for angle intersection accidents by reducing the number of conflict points that are caused by driveways and side streets. While no fatalities have occurred from 1995-1997 on this portion of SR 232, accident rates and injury rates exceed statewide averages for similar facilities.

**Other projects in the Area**

The only other project located nearby is a bridge replacement (BR-0001-00(809)). PE is authorized, ROW is scheduled for 2002 and construction is scheduled for 2003.

**Need and Purpose**

This project is needed to satisfactorily accommodate existing and future traffic demands. The purpose of the proposed improvement is to provide a facility that will adequately and safely serve current and future travel demand.

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

-----  
INTERDEPARTMENT CORRESPONDENCE

**FILE PROJECT** No. STP00-0174-01(007), Columbia Co.  
P.I. No. 231440

**OFFICE** Tennille - Design

**DATE** 2/11/2009

**FROM** Foster C. Grimes, District Design Squad Leader

**TO** Ronald E. Wishon Acting Project Review Engineer

**SUBJECT REVISIONS TO PROGRAMMED COSTS**

**PROJECT MANAGER** Foster Grimes

**MNGT LET DATE** 5/1/2010

**MNGT R/W DATE** 11/1/2008

**PROGRAMMED COST (TPro W/OUT INFLATION)**

**LAST ESTIMATE UPDATE**

CONSTRUCTION \$8,590,000

DATE 2/11/2009

RIGHT OF WAY \$1,303,061

DATE

UTILITIES \$267,500

DATE

**REVISED COST ESTIMATES**

CONSTRUCTION\* \$8,955,817.27

RIGHT OF WAY \$

UTILITIES\*\* \$

\* Costs contain 5% Engineering and Inspection and 6% Construction Contingencies and Fuel and Liquid AC Adjustments.

**REASON FOR COST INCREASE** Updated Unit Prices and added Fuel and Liquid AC Adjustments

Revised: October 24, 2008



## Estimate Report for file "STP-174-1(7) Columbia\_2007-03-13\_2009-02-11"

### Section 1. ROADWAY

Item Number	Quantity	Units	Unit Price	Item Description	Cost
150-1000	1	LUMP	150000.00	TRAFFIC CONTROL - STP-174-1(7)	150000.00
153-1300	1	EA	70578.50	FIELD ENGINEERS OFFICE TP 3	70578.50
207-0203	24	CY	53.25	FOUND BK FILL MATL, TP II	1278.00
210-0100	1	LUMP	750000.00	GRADING COMPLETE - STP-174-1(7)	750000.00
310-1101	24285	TN	18.06	GR AGGR BASE CRS, INCL MATL	438587.10
318-3000	1100	SY	21.01	AGGR SURF CRS	23111.00
402-1812	1500	TN	69.41	RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME	104115.00
402-3113	7500	TN	67.89	RECYCLED ASPH CONC 12.5 MM SUPERPAVE, GP 1 OR 2 INCL BITUM MATL & H LIME	509175.00
402-3121	12338	TN	59.90	RECYCLED ASPH CONC 25 MM SUPERPAVE, GP 1 OR 2 INCL BITUM MATL & H LIME	739046.20
402-3190	10000	TN	67.17	RECYCLED ASPH CONC 19 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	671700.00
413-1000	5131	GL	2.13	BITUM TACK COAT	10929.03
432-5010	19000	SY	1.25	MILL ASPH CONC PVMT, VARIABLE DEPTH	23750.00
433-1100	602	SY	149.63	REINF CONC APPROACH SLAB, INCL CURB	90077.26
441-0016	268	SY	41.13	DRIVE CONCRETE, 6 IN TK	11022.84
441-0018	479	SY	45.60	DRIVEWAY CONCRETE, 8 IN TK	21842.40
441-0104	11234	SY	32.82	CONC SIDEWALK, 4 IN	368699.88
441-0204	775	SY	38.39	PLAIN CONC DITCH PAVING, 4 IN	29752.25
441-0740	625	SY	36.12	CONCRETE MEDIAN, 4 IN	22575.00
441-3999	125	LF	20.15	CONCRETE V GUTTER	2518.75
441-4020	610	SY	42.93	CONC VALLEY GUTTER, 6 IN	26187.30
441-4030	147	SY	46.42	CONC VALLEY GUTTER, 8 IN	6823.74
441-6222	22747	LF	15.89	CONC CURB & GUTTER, 8 IN X 30 IN, TP 2	361449.83
444-1000	24	LF	2.71	SAWED JOINTS IN EXIST PAVEMENTS - PCC	65.04
446-1100	19592	LF	5.14	PVMT REINF FABRIC STRIPS, TP 2, 18 INCH WIDTH	100702.88
500-3101	788	CY	248.21	CLASS A CONCRETE	195589.48
500-9999	25	CY	191.53	CLASS B CONC, BASE OR PVMT WIDENING	4788.25
511-1000	5351	LB	0.87	BAR REINF STEEL	4655.37
550-1180	9050	LF	39.05	STORM DRAIN PIPE, 18 IN, H 1-10	353402.50
550-1240	1594	LF	46.58	STORM DRAIN PIPE, 24 IN, H 1-10	74248.52
550-1300	354	LF	59.46	STORM DRAIN PIPE, 30 IN, H 1-10	21048.84
550-2182	152	LF	32.05	SIDE DRAIN PIPE, 18 IN, H 15-20	4871.60
550-3618	8	EA	544.70	SAFETY END SECTION 18 IN, SIDE DRAIN, 6:1 SLOPE	4357.60
550-4224	5	EA	744.82	FLARED END SECTION 24 IN (STORM DRAIN)	3724.10
550-4230	4	EA	843.65	FLARED END SECTION 30 IN, STORM DRAIN	3374.60
573-2006	2000	LF	15.97	UNDDR PIPE INCL DRAINAGE AGGR, 6 IN	31940.00
576-1018	100	LF	42.38	SLOPE DRAIN PIPE, 18 IN	4238.00
611-3000	5	EA	2671.11	RECONSTR CATCH BASIN, GROUP 1	13355.55
611-3010	4	EA	997.50	RECONSTR DROP INLET, GROUP 1	3990.00
634-1200	65	EA	99.08	RIGHT OF WAY MARKERS	6440.20
641-1200	3558	LF	17.60	GUARDRAIL, TP W	62620.80
641-5001	7	EA	665.08	GUARDRAIL ANCHORAGE, TP 1	4655.56
641-5012	7	EA	1862.72	GUARDRAIL ANCHORAGE, TP 12	13039.04
643-1137	2580	LF	15.25	CH LK FENCE, ZC COAT, 5 FT, 11 GA	39345.00
643-8010	4	EA	1029.25	GATE, CH LK ZC COAT - 10 FT. WIDE	4117.00
668-1100	59	EA	2541.90	CATCH BASIN, GP 1	149972.10
668-2100	37	EA	2425.77	DROP INLET, GP 1	89753.49
668-5000	7	EA	1901.62	JUNCTION BOX	13311.34
<b>Section Sub Total:</b>					<b>\$5,640,825.94</b>

### Section 2. EROSION CONTROL

Item Number	Quantity	Units	Unit Price	Item Description	Cost
603-2181	1243	SY	36.79	STN RIP RAP, TP 3, 18 IN	45729.97
603-7000	1243	SY	4.43	PLASTIC FILTER FABRIC	5506.49
700-6910	35	AC	825.66	PERMANENT GRASSING	28898.10
700-7000	70	TN	63.09	AGRICULTURAL LIME	4416.30

700-7010	88	GL	21.49	LIQUID LIME	1891.12
700-8000	231	TN	384.56	FERTILIZER MIXED GRADE	88833.36
700-8100	1750	LB	2.30	FERTILIZER NITROGEN CONTENT	4025.00
710-9000	300	SY	4.66	PERMANENT SOIL REINFORCING MAT	1398.00
715-2200	300	SY	1.59	BITUMINOUS TREATED ROVING, WATERWAYS	477.00
716-1000	1000	SY	2.08	EROSION CONTROL MATS, WATERWAYS	2080.00
716-2000	10783	SY	0.96	EROSION CONTROL MATS, SLOPES	10351.68

**Section Sub Total: \$193,607.02**

**Section 3. TEMPORARY EROSION CONTROL**

Item Number	Quantity	Units	Unit Price	Item Description	Cost
163-0232	105	AC	385.22	TEMPORARY GRASSING	40448.10
163-0240	315	TN	172.38	MULCH	54299.70
163-0300	11	EA	1234.88	CONSTRUCTION EXIT	13583.68
163-0530	7500	LF	2.69	CONSTR & REM BALED STRAW EROSION CHECK	20175.00
165-0010	3750	LF	0.70	MAINTNANCE OF TEMPORARY SILT FENCE, TYPE A	2625.00
165-0030	7313	LF	0.78	MAINTNANCE OF TEMPORARY SILT FENCE, TYPE C	5704.14
165-0070	3750	LF	2.22	MAINTENANCE OF BALED STRAW EROSION CHECK	8325.00
165-0101	22	EA	511.06	MAINTENANCE OF CONSTRUCTION EXIT	11243.32
167-1000	2	EA	597.96	WATER QUALITY MONITORING AND SAMPLING	1195.92
171-0010	7500	LF	2.45	TEMPORARY SILT FENCE, TYPE A	18375.00
171-0030	14626	LF	3.46	TEMPORARY SILT FENCE, TYPE C	50605.96
643-8200	1585	LF	2.78	BARRIER FENCE (ORANGE), 4 FT	4406.30

**Section Sub Total: \$230,987.12**

**Section 5. WIDENING OF BRIDGE OVER CRAWFORD CREEK**

Item Number	Quantity	Units	Unit Price	Item Description	Cost
540-1202	1	LS	29644.00	REMOVAL OF PARTS OF EXISTING BRIDGE, BR NO -	29644.00
543-1100	1	LS	620000.00	WIDENING OF BRIDGE - COMPLETE - STP-174-1(7)	620000.00
603-2024	2270	SY	47.81	STN RIP RAP, TP 1, 24 IN	108528.70
603-7000	2270	SY	4.43	PLASTIC FILTER FABRIC	10056.10

**Section Sub Total: \$768,228.80**

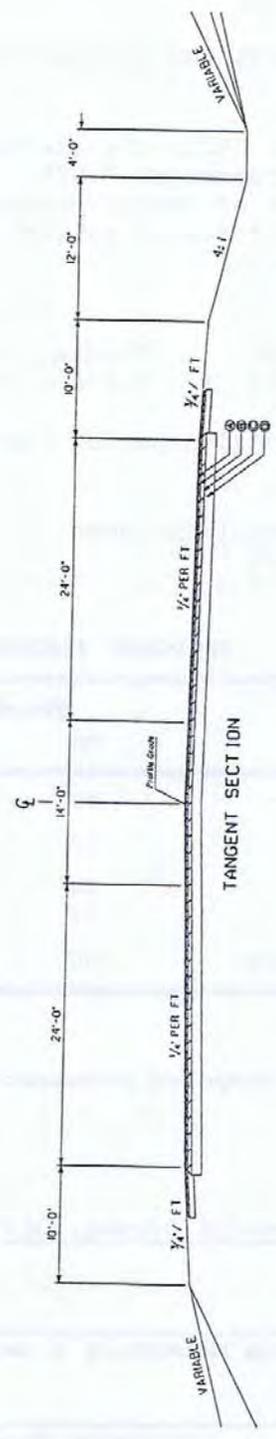
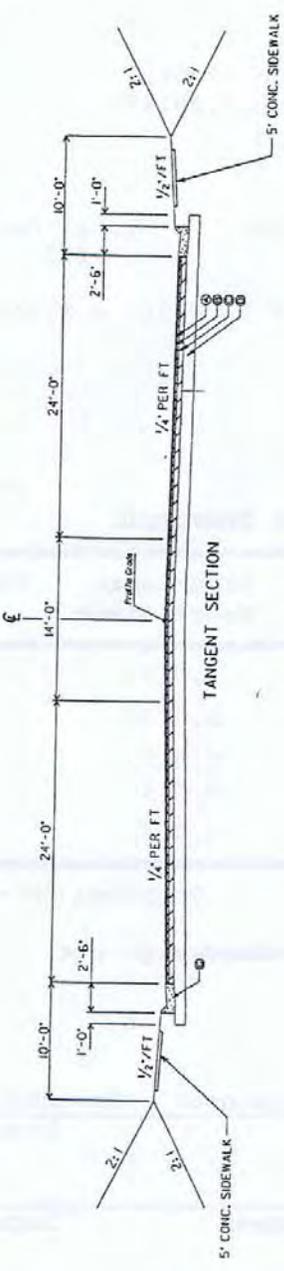
**Section 4. SIGNING AND MARKING**

Item Number	Quantity	Units	Unit Price	Item Description	Cost
636-1020	225	SF	16.74	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING TP 3	3766.50
636-1033	320	SF	20.20	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING, TP 9	6464.00
636-1041	38	SF	46.28	HIGHWAY SIGNS, TP 2 MATL, REFL SHEETING, TP 9	1758.64
636-2070	425	LF	9.14	GALV STEEL POSTS, TP 7	3884.50
636-2090	270	LF	9.43	GALV STEEL POSTS, TP 9	2546.10
639-5000	8	EA	6178.72	PRESTRESSED CONC STRAIN POLE, TP - IV	49429.76
647-1000	1	LS	65000.00	TRAFFIC SIGNAL INSTALLATION NO - 2	65000.00
647-1000	1	LS	65000.00	TRAFFIC SIGNAL INSTALLATION NO - 1	65000.00
652-2501	3	LM	333.70	SOLID TRAFFIC STRIPE, 5 IN, WHITE	1001.10
652-5301	13600	LF	0.15	SOLID TRAF STRIPE, 6 IN, WHITE	2040.00
653-0120	89	EA	73.08	THERMOPLASTIC PVMT MARKING, ARROW, TP 2	6504.12
653-1502	25000	LF	0.48	THERMOPLASTIC SOLID TRAF STRIPE, 5 IN, YELLOW	12000.00
653-1704	400	LF	3.48	THERMOPLASTIC SOLID TRAF STRIPE, 24 IN, WHITE	1392.00
653-1804	1975	LF	1.70	THERMOPLASTIC SOLID TRAF STRIPE, 8 IN, WHITE	3357.50
653-3501	25000	GLF	0.33	THERMOPLASTIC SKIP TRAF STRIPE, 5 IN, WHITE	8250.00
653-3502	23000	GLF	0.24	THERMOPLASTIC SKIP TRAF STRIPE, 5 IN,	5520.00

653-6004	385	SY	2.77	YELLOW	
653-6006	1035	SY	2.69	THERMOPLASTIC TRAF STRIPING, WHITE	1066.45
654-1001	570	EA	3.06	THERMOPLASTIC TRAF STRIPING, YELLOW	2784.15
654-1003	290	EA	3.26	RAISED PVMT MARKERS TP 1	1744.20
				RAISED PVMT MARKERS TP 3	945.40
<b>Section Sub Total:</b>					<b>\$244,454.42</b>

**Total Estimated Cost: \$7,078,103.30**

DATE	PROJECT NUMBER	SHEET NUMBER	TOTAL SHEETS
04/01	SR 232	10	10



NOT TO SCALE

WIDENING OF SR 232 FROM OLD BELAIR ROAD

STATE OF GEORGIA  
DEPARTMENT OF TRANSPORTATION

o:\231440\concept\typical.dgn Apr. 04, 2002 09:34:22

FLEXIBLE PAVEMENT DESIGN ANALYSIS

Project: STP-174-1(7) County: COLUMBIA  
 P.I. no.: 231440  
 Description: WIDENING AND RECONSTRUCTION OF SR 232

Traffic Data (NOTE: AADTs are one-way)  
 24-hour Truck Percentage: 7.00%  
 AADT initial year of design period: 6,500 vpd (2006)  
 AADT final year of design period: 10,500 vpd (2026)  
 Mean AADT (one-way): 8,500 vpd

Design Loading  
 Mean AADT LDF Trucks 18-K ESAL Total Daily Loads  
 8,500 \* 0.80 \* 0.070 \* 0.95 = 453

Total predicted design period loading = 453 \* 20 \* 365 = 3,306,900

Design Data  
 Terminal Serviceability Index: 2.50  
 Soil Support: 3.00  
 Regional Factor: 1.60

PROPOSED FLEXIBLE PAVEMENT STRUCTURE

Material	Thickness mm	(in.)	Structural Coefficient	Structural Value
9.5 mm Superpave	40	(1.57)	0.0173	0.69
19 mm Superpave	50	(1.97)	0.0173	0.86
25 mm Superpave	24	(0.94)	0.0173	0.42
	76	(2.99)	0.0118	0.90
Graded Aggregate Base	250	(9.84)	0.0063	1.58
Required SN = 5.06			Proposed SN = 4.45	

>>> Proposed pavement is 12.1% Underdesign <<<

Remarks:

Prepared by George Brewer, Dist. Design Engineer November 5, 2001  
 Date

Recommended State Materials & Research Engineer Date

Approved District Engineer Date

# VALUE ENGINEERING PROCESS

This report summarizes the analysis and conclusions by the PBS&J Value Engineering team as they performed a VE Study during the period of April 21 through April 24, 2009 in Atlanta, Georgia, for the Georgia Department of Transportation.

## INTRODUCTION

The Value Engineering Study team and its leadership were provided by PBS&J. This VE Team consisted of the following:

Les M. Thomas, PE, CVS-Life	Certified Value Specialist
Jeff Strickland, PE	Senior Highway Design Engineer
Kevin Martin, Esq. AVS	Highway Construction Specialist
Ramesh Kalvakaalva, PE, CVS	Senior Structural Engineer
Randy S. Thomas, CVS	Assistant Team Leader

The Value Engineering Team followed the Seven Step Value Engineering job plan as promulgated by SAVE International. This Seven Step job plan includes the following:

- **Investigation/Information Phase** – during this phase of the VE Team’s work, the team received a briefing from the Georgia Department of Transportation (GDOT) staff and Parsons Engineering. This briefing included discussions of the design intent behind the project, the cost concerns, and the physical project limitations. In the working session that followed, the VE Team developed cost models from the cost data provided by the designers and familiarized themselves with the construction drawings and other data that was available to the team. Some of the representative project information (concept report, cost estimate, and special provisions) may be found in the tabbed section of this report entitled **Project Description**. Following this current narrative the reader will also find a cost model done in the Pareto fashion, i.e., identifying the highest costs down to the lowest costs for the larger construction cost elements. This cost model, developed by the VE Team, was used by the VE Team to help focus their week of work. The headings on the Pareto Chart also were used as headings for creative phase activities.
- **Analysis Phase** – during this phase the VE Team determined the “**Functions**” of the project. This was accomplished by reviewing the project from the simplest format in asking the questions of “What is the project supposed to do?”, and “How is it supposed to accomplish this purpose? In the Value Engineering vernacular, the answers to these questions are cast in the form of active verbs and measurable nouns.

These verb/noun pairs form the basis of the function analysis which distinguishes a Value Engineering effort from a potentially damaging cost cutting exercise.

- The important functions of the project were identified as follows:
  - **Project Objective/Goals**
    - **Improve safety**
    - **Improve Level of Service**
    - **Increase capacity**
  - **Project Basic Functions**
    - **Enhance safety**
    - **Improve traffic operations**
    - **Increase capacity**
- **Speculation Phase** - The VE team performed a brainstorming session to identify ideas that might help meet the project objectives:
  - **Reduce amount of bike lanes**
  - **Reduce amount of sidewalks**
  - **Reduce earthwork**
  - **Reduce shoulder width**
  - **Reconfigure intersection**
  - **Shorten culvert extension**
  - **Reduce center turn lane width**

This brainstorming session initially identified numerous ideas that were then evaluated in the Judgment phase. The reader will find the creative worksheets enclosed. These same work sheets were also used to record the results of the Judgment/Evaluation Phase.

- **Evaluation Phase** – Once the VE Team identified the creative ideas, it was necessary to decide which alternatives should be carried forward. This is the work of the Evaluation or Judgment Phase. The VE Team reflected back on the project constraints and objectives shared with the team by the owner's representatives, in the kick-off meeting on the first day of the workshop. From that guidance, the team selected ideas that they believed would improve the project by a vote process.

- Following that selection process, the VE Team used the following values as measures of whether or not an alternative had enough merit to be carried forward in the VE process:
  - Construction cost savings
  - Improve value
  - Maintainability
  - Ability to implement the idea
  - General acceptability of the alternatives
  - Constructability
  - Scheduling delays

Based on these criteria, the VE Team evaluated the alternatives and graded them from 5 (Excellent) down to 1 (Poor). Other notes about the alternatives are annotated at the bottom of the enclosed creative and evaluation sheets.

- **Development Phase** – During this phase, the VE Team developed each of the selected design alternatives whose rating was “4” or “5” because of time constraints. If time permitted, the team will develop additional recommendations. This effort included a detailed explanation of the idea with sketches as appropriate to clarify the idea from the original concept, advantages and disadvantages, a technical explanation and an estimation of the cost and resultant savings if implemented. (see the tabbed section – Study Results)
- **Recommendation Phase** – During this phase the VE Team reviews the alternative ideas to confirm which ones are appropriate for the project, have an opportunity for success and which will improve the value of the project if implemented.
- **Presentation Phase** – As noted earlier, the team made an informal “out-briefing” on the last day of the workshop, designed to inform the Owners and the Designers of the initial findings of the VE Study. This written report is intended to formalize those findings.

The following **Function – Worth - Cost** Analysis was utilized to focus the team and stimulate brainstorming; a copy of the **Attendance Sheets** is also attached so that the reader can be informed about who participated in the Study proceedings.

# FUNCTION ANALYSIS AND COST-WORTH



Georgia Department of Transportation  
 STP00-0174-01(007) – P.I. No. 231440  
 SR 232 Reconstruction  
 Columbia County

SHEET NO.: 1 of 2

NO.	ELEMENT	FUNCTION			COST (000)	WORTH (000)	COMMENTS
		VERB	NOUN	KIND			
1	<b>OVERALL PROJECT</b>	Enhance	Safety	S	7,857	6,500	C/W=1.2
		Improve	Traffic Operations	B			
2	<b>ASPHALT PAVING</b>	Create	Lanes	B	2,160	1,500	C/W=1.4
		Increase	Capacity	B			
3	<b>RIGHT-OF-WAY</b>	Accommodate	Roadway	B	1,304	1,304	C/W=1.0
		Facilitate	Utilities	RS			
4	<b>BRIDGE</b>	Cross	Creek	B	768	768	C/W=1.0
5	<b>DRAINAGE ITEMS</b>	Convey	Storm water	B	758		
6	<b>GRADING</b>	Stabilize	Earthwork	B	751	700	C/W=1.07
7	<b>BASE</b>	Support	Road	S	462	400	C/W=1.15
8	<b>CURB &amp; GUTTER</b>	Route	Stormwater	S	443	443	C/W=1.0
9	<b>EROSION CONTROL</b>	Stabilize	Earthwork	S	425	340	C/W=1.25

Function defined as: Action Verb  
 Measurable Noun

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

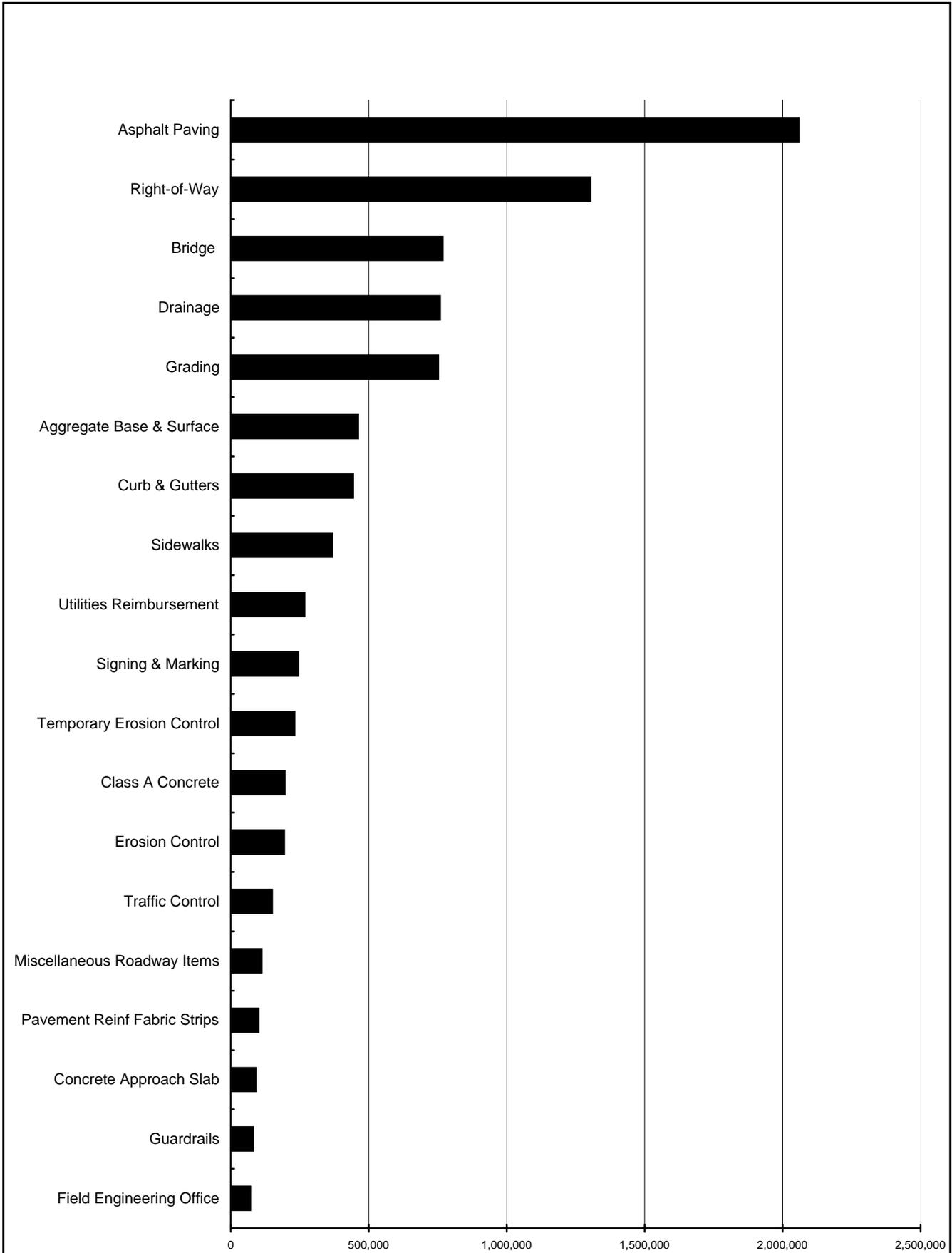
Cost/Worth Ratio =  
 (Total Cost ÷ Basic Worth)



# PARETO CHART - COST HISTOGRAM

**PROJECT: Georgia Department of Transportation**  
**STP00-0174-01(007) - P.I. No. 2314440**  
**State Route 232 Reconstruction**  
**Columbia County**

PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Asphalt Paving	2,058,715	29.09%	29.09%
Right-of-Way	1,303,061		29.09%
Bridge	768,229	10.85%	39.94%
Drainage	758,277	10.71%	50.65%
Grading	751,278	10.61%	61.27%
Aggregate Base & Surface	461,698	6.52%	67.79%
Curb & Gutters	443,409	6.26%	74.05%
Sidewalks	368,700	5.21%	79.26%
Utilities Reimbursement	267,500	3.78%	79.26%
Signing & Marking	244,452	3.45%	82.71%
Temporary Erosion Control	230,987	3.26%	85.98%
Class A Concrete	195,589	2.76%	88.74%
Erosion Control	193,607	2.74%	91.48%
Traffic Control	150,000	2.12%	93.59%
Miscellaneous Roadway Items	111,488	1.58%	95.17%
Pavement Reinf Fabric Strips	100,703	1.42%	96.59%
Concrete Approach Slab	90,077	1.27%	97.87%
Guardrails	80,315	1.13%	99.00%
Field Engineering Office	70,579	1.00%	100.00%
* Subtotal Construction does not include Right-of-Way or Reimbursable Utilities			
<b>*Subtotal Construction Cost</b>	<b>\$ 7,078,103</b>		
<b>E &amp; C Rate @11</b>	<b>\$ 778,591</b>		
<b>Inflation Rate 0%</b>	<b>\$ -</b>		
<b>Subtotal =</b>	<b>\$ 7,856,694</b>		
<b>Total Fuel Adjustment</b>	<b>\$ 1,088,161</b>		
<b>Total Liquid AC Adjustment</b>	<b>\$ 10,962</b>		
<b>Total Construction Cost =</b>	<b>\$ 8,955,817</b>		
<b>Reimb. Utilities =</b>	<b>\$ 267,500</b>		
<b>Right-of-Way</b>	<b>\$ 1,303,061</b>		
<b>TOTAL</b>	<b>\$ 10,526,378</b>		



# DESIGNER PRESENTATION



## MEETING PARTICIPANTS

Geogia Department of Transportation		April 21, 2009	
STP00-0174-01(007) - P.I. No. 231440 - Columbia County			
NAME	ORGANIZATION & TITLE	E-MAIL	PHONE
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Ron Wishon	 GDOT-Engineering Services	<a href="mailto:rwishon@dot.ga.gov">rwishon@dot.ga.gov</a>	404-631-1753
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Jamie Lindsey	 GDOT-District 2-Utilities Engineer	<a href="mailto:jlindsey@dot.ga.gov">jlindsey@dot.ga.gov</a>	478-552-4637
Sean Bush	 GDOT-District 2-Design Squad Leader	<a href="mailto:sbush@dot.ga.gov">sbush@dot.ga.gov</a>	478-552-4641

# VE TEAM PRESENTATION



## MEETING PARTICIPANTS

Georgia Department of Transportation		April 24, 2009		
STP00-0174-01(007) - P.I. No. 231440 - Columbia County				
NAME	ORGANIZATION & TITLE	E-MAIL	PHONE	
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Sean Bush	 GDOT-District 2-Design Squad Leader	<a href="mailto:sbush@dot.ga.gov">sbush@dot.ga.gov</a>	478-552-4641	

# CREATIVE IDEA LISTING



**PROJECT: Georgia Department of Transportation  
STP00-0174-01(007) – P.I. No. 231440  
SR 232 Reconstruction  
Columbia County**

SHEET NO.: 1 of 2

NO.	IDEA DESCRIPTION	RATING
	<b>ROADWAY (RD)</b>	
RD-1	Use 11' lanes	5
RD-2	Use a 10' shoulder throughout the project	5
RD-3	Use 6" curb and gutter instead of 8" curb and gutter	2
RD-4	Use 11' lanes	3
RD-5	Eliminate the sidewalks	3
RD-6	Eliminate bike lanes and sidewalks from Sta. 260+00 to the end of project	4
RD-7	Minimize the retaining walls	5
RD-8	Don't realign Shepherd Road intersection; construct an eastbound acceleration lane for Maple Creek Drive	5
RD-9	Don't signalize Old Belair Road intersection	2
RD-10	Eliminate small traffic islands	2
RD-11	Shorten culvert extension	2
RD-12	Reduce earthwork	3
RD-13	Delete curb and gutter	2
RD-14	Lower sidewalk to reduce fill (See RD-12)	2
RD-15	Reduce longitudinal storm drains with side ditch	3
RD-16	Reconfigure intersection at Old Belair Road	4
RD-17	Check GAB quantities	2
RD-18	Use 12' center turn lane instead of 14' turn lane	4
RD-19	Stop the bike lane and sidewalks at Sta. 270	2
RD-20	From Sta. 270 to end of the project locate sidewalks and bike lanes behind the existing curb	2

**Rating: 1→2 = Not to be Developed; 3 = Varying Degrees of Development Potential;  
4→5 = Most likely to be Developed; DS = Design Suggestion; ABD = Already Being Done; OB= Observation**

