

**Value Engineering Study Report**  
**Projects –STP-076-1 (22)(21)(23)**  
**Columbia County**



***SR 104/Washington Road***  
***P.I. 221800, 221805, 262080***

***Preserve Roadway Integrity – Serviceability – Safety***

**Value Management Team:**

**PBS&J**

**Design Teams:**

**HNTB**

**Washington Group International**

**Clark Patterson Associates**

**June 2007**



June 22, 2007

Ms. Lisa Myers  
Design Review Engineer Manager  
Georgia Department of Transportation  
#2 Capitol Square, Room 266  
Atlanta, GA 30334

RE: Submittal of the final Value Engineering Report  
Projects -STP-076-1 (22)(21)(23)  
Columbia County  
P.I.'s: 221800, 221805, 262080  
SR 104/Washington Road  
PBS&J Project Task Order No. 11

Dear Ms. Myers:

Please find enclosed four (4) hard copies and a CD of our final Value Engineering Report for the SR 104 Washington Road, Columbia, County, as referenced above.

This Value Engineering Study, which was performed during the period June 4 through June 7, 2007, identified **17 Alternative Ideas** which are recommended for implementation. The VE Team also identified **9 Design Suggestion Ideas** which are recommended for the Engineer to consider in his final design. We believe that the **17 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



# ***Value Engineering Study Report***

***Projects –STP-076-1 (22)(21)(23)  
Columbia County  
P.I. 221800, 221805, 262080  
SR 104 - Washington Road***

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### **Study Results**

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## *Executive Summary*

# *Executive Summary*

## **INTRODUCTION**

This report summarizes the analysis and conclusions by the PBS&J Value Engineering workshop team as they performed a VE Study during the period of June 4-7, 2007 in Atlanta, Georgia for the Georgia Department of Transportation. The subject of the Value Engineering study was STP-076-1 (22)(21)(23), Columbia County, which consists of three projects: P.I.s 221800, 221805, 262080, widening and reconstruction of SR 104/Washington Road. The three projects are being designed by: Washington Group International; Clark Patterson Associates; and HNTB respectively.

These projects represent approximately 11.46 miles of SR 104 and a portion (1,400') of SR 47, Columbia County, Ga. The projects begin just west of the US 221, SR 150, intersection with SR 104 and continue east to a point just beyond the CR 99 Gibbs Road intersection. The existing roadway varies from two to four travel lanes. The two lane portions have an intermittent third lane for passing and occasional turn lanes. The project is to increase the capacity of the existing by providing a minimum of four travel lanes with additional turning lanes as warranted. The westerly 7.44 miles will be a "rural" four lanes with a depressed 44' grassed median. The easterly 4.01 miles will be an "urban" four lanes with a 20' raised median.

More information about these projects may be found in the tabbed section of this report entitled *Project Descriptions*.

## **VALUE ENGINEERING PROCESS**

The Value Engineering Team followed the Seven Step Value Engineering job plan as promulgated by Georgia Department of Transportation. This Seven Step Job Plan includes the following:

- Investigation
- 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 detail process of the Value Engineering Study.

## **THE STUDY RESULTS**

During the speculation phase the VE Team identified 38 *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, 17 *Alternative Ideas* and 9 **Design Suggestions** remained for further consideration. These Alternative Ideas and Design Suggestions 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 AND DESIGN SUGGESTIONS

Alternative Number	DESCRIPTION OF ALTERNATIVE	Initial Cost Savings	Implemented Cost Savings/Disposition
	<b>Project STP-076-1 (22) PI 221800</b>		
22-1	Save and re-use existing pavement as is from Sta. 195 up to Sta. 270	\$790,720	
22-2	Minimize earth work for new lanes	\$269,999	
22-4	Reduce right of way width	\$535,300	
22-6	Reduce fill slopes to 4:1 and reduce 12' wide (see section in project 21)	\$161,625	
22-7	Sta. 116+ reduce fill (adjust vertical curve entering and exiting)	\$398,020	
22-9	SR 150 – Begin construction at proposed new curve point	\$97,154	
22-10	Delete driveway at 136+00	DS	
22-11	Confirm sediment basins being provided at each outfall, and floating silt barriers in lakes	DS	
22-12	Provide silt barriers in lakes	DS	
22-14	Use 11' travel lanes	\$947,712	
	<b>Project STP-076-1 (21) PI 221805</b>		
21-1	Consider widening existing bridges by adding 2' to each side (instead of 4' on one side)	\$126,457	
21-2	If there is to be an overlay on the existing bridges, consider bridge replacement	DS	
21-3	Use existing pavement where practical	\$511,371	
21-4	New Bridge at Sta 290+, set to elevation of existing and reduce fill	DS	
21-7	Reduce right of way width where practical	\$1,561,883	
21-8	Minimize earth work for new lanes	\$91,674	
21-9	Use 11' travel lanes	\$1,275,949	



**SUMMARY OF ALTERNATIVES AND DESIGN SUGGESTIONS**

Alternative Number	DESCRIPTION OF ALTERNATIVE	Initial Cost Savings	Implemented Cost Savings/Disposition
	<b>Project STP-076-1 (23) PI 262080</b>		
23-2	Move bike lanes to a multi-use trail	\$761,986	
23-3	William Few intersection-provide two right turn lanes and provide for two left turn lanes	DS	
23-4	During Stage I, construct the new William Few intersection first to alleviate traffic delays	DS	
23-5	Lengthen right turn storage at William Few intersection	DS	
23-9	Delete Cobb Road re-alignment/ or modify proposed re-alignment	\$617,171	
23-10	Reduce right of way acquisition	\$5,232,782	
23-13	Verify whether or not there is to be an overlay on the existing bridges, and if so, consider bridge replacement	DS	
23-14	Adjust grades – Lower from Sta 439 to Sta 445 and raise from Sta 533 – 543	\$159,244	
23-15	Use 11' travel lanes	\$1,881,726	

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## ***Study Results***

# *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.

The documented alternatives also include Design Suggestions (DS). As their name implies, these are short write-ups making note of VE perspectives on technical issues and sharing some thoughts for consideration as the design moves forward.

This introductory sheet is followed by a *Summary of Alternatives & Design Suggestions* table. 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 following *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.

A 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*.



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# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (22) Columbia County– P.I. Number: 221800  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**22-1**

DESCRIPTION: **SAVE AND RE-USE EXISTING PAVEMENT AS IS FROM  
 STA. 195 UP TO STA. 270**

SHEET NO.: 1 of 4

**Original Design:**

The original design calls for the construction of 2-24' lanes with a 44' depressed median. All pavement would be new construction with no overlay/reuse of existing pavement.

**Alternative Design:**

This alternative design suggests to utilize existing pavement which exists in the proposed horizontal alignment. Modification of the vertical alignment would be required but would be limited to vertical differences in elevation of +/- 0.5'.

**Opportunities:**

- Cost savings
- Reduced construction time
- Minor savings in earthwork

**Risks:**

- Minor redesign costs

**Technical Discussion:**

Existing profile grade would be utilized but areas would be specified where the “best fit” method (specified in Section 149 of the Georgia Standard Specifications) would be utilized.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 5,255,548	\$ 0	\$ 5,255,548
ALTERNATIVE	\$ 4,464,828	\$ 0	\$ 4,464,828
SAVINGS	\$ 790,720	\$ 0	\$ 790,720

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (22) Columbia County-- P.I. Number: 221800  
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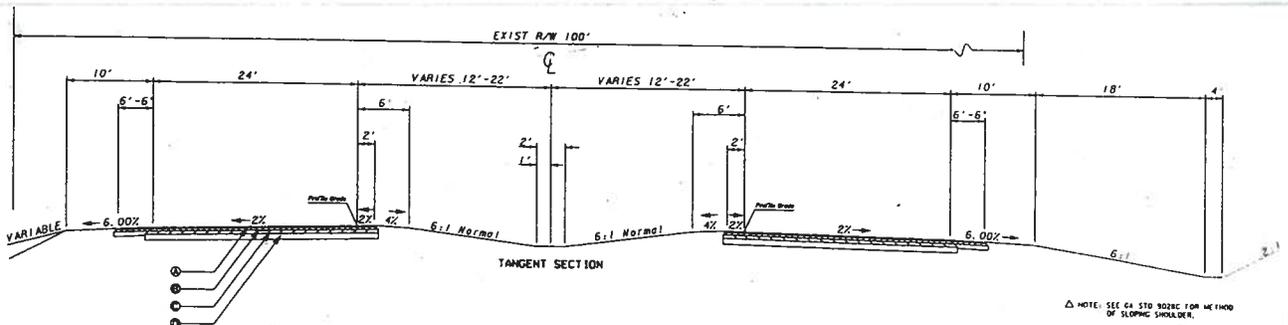
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PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (22) Columbia County-P.I. Number: 221800  
SR 104/Washington Road**

ALTERNATIVE NO.: **22-1**

DESCRIPTION: **SAVE AND RE-USE EXISTING PAVEMENT AS IS FROM STA.  
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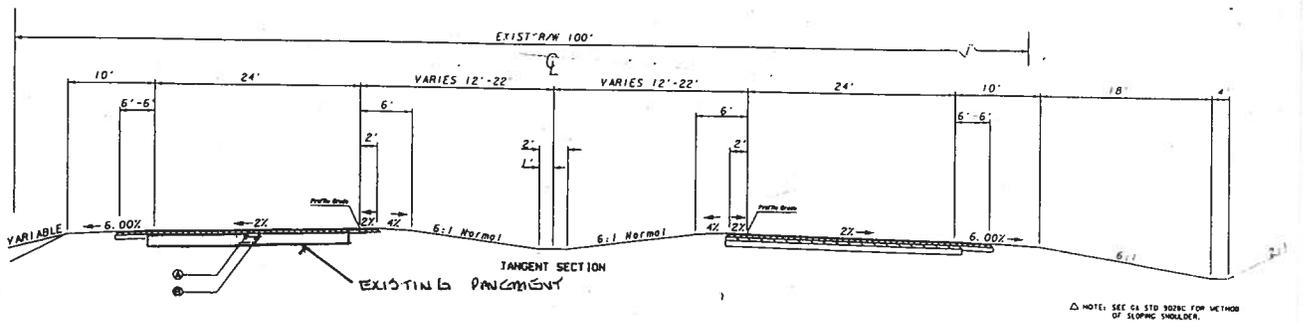
SHEET NO.: **2 of 4**



**ORIGINAL DESIGN**

**REQUIRED PAVEMENT**

- Ⓐ 165 LBS/SY RECYCLED ASPH CONC 12.5 MM SUPERPAVE, GP2 ONLY, INCL BITUM & H-L I.ME (SUPERPAVE DESIGN LEVEL 'B')
- Ⓑ 220 LBS/SY RECYCLED ASPH CONC 19 MM SUPERPAVE, GP1 OR 2, INCL BITUM & H-L I.ME (SUPERPAVE DESIGN LEVEL 'B')
- Ⓒ 440 LBS/SY RECYCLED ASPH CONC 25 MM SUPERPAVE, GP1 OR 2, INCL BITUM & H-L I.ME (SUPERPAVE DESIGN LEVEL 'A')
- Ⓓ 12" GRADED AGGREGATE BASE
- Ⓔ ASPH CONC LEVEL INC. INCL BITUM & L I.ME (AS REQ'D)



**ALTERNATE DESIGN**

# Calculations

**PBS&J**

PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (22) Columbia County- P.I. Number: 221800  
SR 104/Washington Road

ALTERNATIVE NO.:  
**22-1**

DESCRIPTION: SAVE AND RE-USE EXISTING PAVEMENT AS IS FROM STA. 195  
UP TO STA. 270 SHEET NO.: 3 of 4

AREAS WHERE HORIZONTAL ALIGNMENT  
CLOSELY MATCHES PROPOSED ALIGNMENT  
AND NEW AND PROPOSED ELEVATIONS ARE  
 $\pm 1.0'$

STA 165+00 - STA 194+50 2950 LF

STA 200+50 - STA 210+00 950 LF

TOTAL 3900 LF

$$3900 \text{ LF} \times 24 \text{ FT} = \underline{93600 \text{ SF}} = \boxed{10400 \text{ SY}}$$

ELIMINATE 25 mm BASE AND GRADED  
AGGREGATE BASE

25mm SUPERPAVE

$$440 \text{ LBS/SY} \times 10,400 \text{ SY} \div 2000 = \underline{2288 \text{ TN}}$$

GRAVS

$$145 \text{ LBS/FT}^3 \times 93600 \text{ SF} \times 1.0 \text{ FT (DEPTH)} \div 2000 = \boxed{6786 \text{ TN}}$$

ALLOW 1000 TONS OF LEVELING TO CORRECT  
CROSS SLOPES AND MINOR GRADE  
CHANGES

# COST WORKSHEET



<b>PROJECT: STP-076-1 (22) Columbia County- P.I.</b> <b>Number: 221800</b> <b>SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>  <b>SHEET NO:</b>	<b>22-1</b>  <b>4 OF 4</b>
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<b>DESCRIPTION:</b>	<b>SAVE AND RE-USE EXISTING PAVEMENT AS IS FROM STA. 195 UP TO STA. 270</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
310-5120 GR AGGR BASE CRS 12 IN *	SY	88,075	19.49	1,716,581	77,675	19.49	1,513,885
402-3121 RECYCLED ASPH CONC 25 MM	TN	36,014	85.00	3,061,190	29,228	85.00	2,484,380
402-1812 RECYCLED ASPH CONC LEVELING	TN	0	60.67	0	1,000	60.67	60,670

\* PAY ITEM CHANGED FROM COST ESTIMATE REPORT TO MATCH PLAN TYPICAL SECTION

<b>SUB-TOTAL</b>				4,777,771			4,058,935
<b>MARK-UP @ 10%</b>				477,777			405,893
<b>TOTAL</b>				5,255,548			4,464,828

# Value Analysis Design Alternative



PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (22) Columbia County– P.I. No: 221800**  
**SR 104/Washington Road**

ALTERNATIVE NO.:  
**22-2**

DESCRIPTION: **MINIMIZE EARTH WORK FOR NEW LANES**

SHEET NO.: 1 of 4

**Original Design:**

The original design calls for the construction of one profile grade that is the same for both sides of the proposed typical section.

**Alternative Design:**

This alternative design suggests to create a separate profile grade for each set of lanes where possible, up to a 5' elevation difference between the profile grades. This will reduce the cut/fill in areas where the opposing travel lanes can be different heights.

**Opportunities:**

- Reduces earthwork
- Reduces construction time
- Reduces construction limits which could reduce right-of-way

**Risks:**

- Minor redesign required

**Technical Discussion:**

Per section 4.4.3 of the GDOT Design Policy Manual, this is discussed and allowable. It states "standard 44' median width can be maintained with independent profiles until the difference in elevations in opposing PGL's is approximately 5'."

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,275,268	\$ 0	\$ 2,275,268
ALTERNATIVE	\$ 1,978,269	\$ 0	\$ 1,978,269
SAVINGS	\$ 269,999	\$ 0	\$ 269,999

# Illustrations

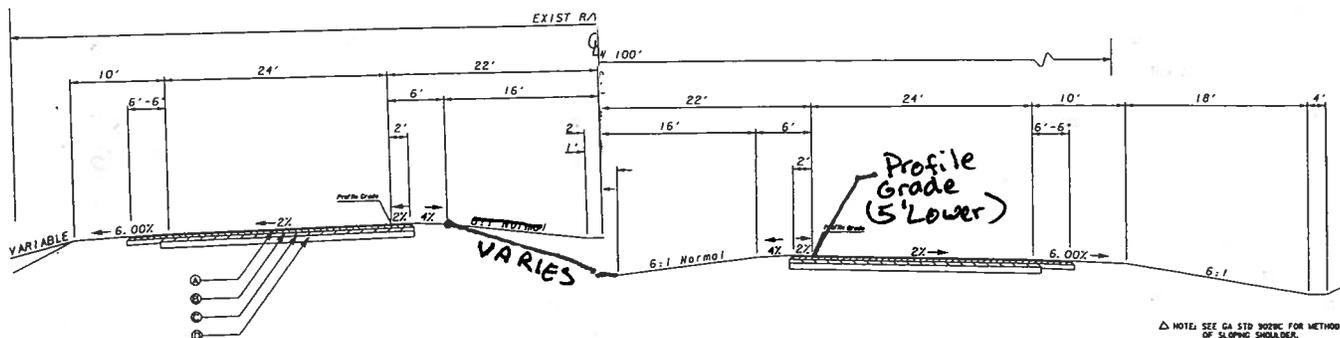


PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (22) Columbia County--P.I. Number: 221800  
SR 104/Washington Road

ALTERNATIVE NO.: 22-2

DESCRIPTION: MINIMIZE EARTH WORK FOR NEW LANES

SHEET NO.: 2 of 4



PROPOSED TYPICAL

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (22) Columbia County - P.I. Number: 221800  
SR 104/Washington Road

ALTERNATIVE NO.:  
**22-2**

DESCRIPTION: MINIMIZE EARTH WORK FOR NEW LANES

SHEET NO.: 3 of 4

For 5' reduction/increase in height, approximate earthwork per typical section is equal to  
24' travel lanes + 10' outside shoulder + 6' inside shoulder  
= 40' width  
x  
5' depth  
= 200 ft<sup>2</sup> per typical section

Areas where different profile grades are possible

Sta. 184+00 to Sta. 256+00 = 7200 ft

Sta. 145+00 to Sta. 154+00 = 900 ft

8100 ft

x

200 ft<sup>2</sup> per typical section

1,620,000 ft<sup>3</sup> earthwork  
= 60,000 yd<sup>3</sup> earthwork

Say  $\Rightarrow$  30,000 yd<sup>3</sup> borrow excavation  
30,000 yd<sup>3</sup> unclassified excavation

Original estimate

unclassified exc = 240,449 - 30,000 = 210,449 yd<sup>3</sup>

borrow exc = 219,201 - 30,000 = 189,201 yd<sup>3</sup>

# COST WORKSHEET



<b>PROJECT: STP-076-1 (22) Columbia County– P.I. Number: 221800 SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>	<b>22-2</b>
<b>SHEET NO:</b>		<b>4 OF 4</b>

<b>DESCRIPTION:</b>	<b>MINIMIZE EARTH WORK FOR NEW LANES</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
UN-CLASS EXCAV	CY	240,449	4.50	1,082,020	210,499	4.50	947,021
BORROW EXCAV	CY	219,201	4.50	986,405	189,201	4.50	851,405
<b>SUB-TOTAL</b>				2,068,425			1,798,426
<b>MARK-UP @ 10%</b>				206,843			179,843
<b>TOTAL</b>				2,275,268			1,978,269

# Value Analysis Design Alternative



PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (22) Columbia County- P.I. No: 221800**  
**SR 104/Washington Road**

ALTERNATIVE NO.: **22-4**

DESCRIPTION: **REDUCE RIGHT-OF-WAY WIDTH**

SHEET NO.: **1 of 4**

**Original Design:**

The original design set right-of-Way limits based on minimum Right-of-Way requirements established for the project.

**Alternative Design:**

This alternative design sets Right-of-Way limits based on construction limits.

**Opportunities:**

- Reduce Right-of-Way impacts
- Reduces cost

**Risks:**

- Potential need for additional Right-of-Way on future widening projects
- Requires re-setting Right-of-Way limits on plans

**Technical Discussion:**

Based on cross sections and plans, the Right-of-Way limits can be reduced to meet construction limits. It is desirable to maintain a constant Right-of-Way line across an individual property, but the overall Right-of-Way requirement can be reduced.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 6,693,500	\$ 0	\$ 6,693,500
ALTERNATIVE	\$ 6,158,200	\$ 0	\$ 6,158,200
SAVINGS	\$ 535,300	\$ 0	\$ 535,300

# Illustrations



PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (22) Columbia County—P.I. Number: 221800**

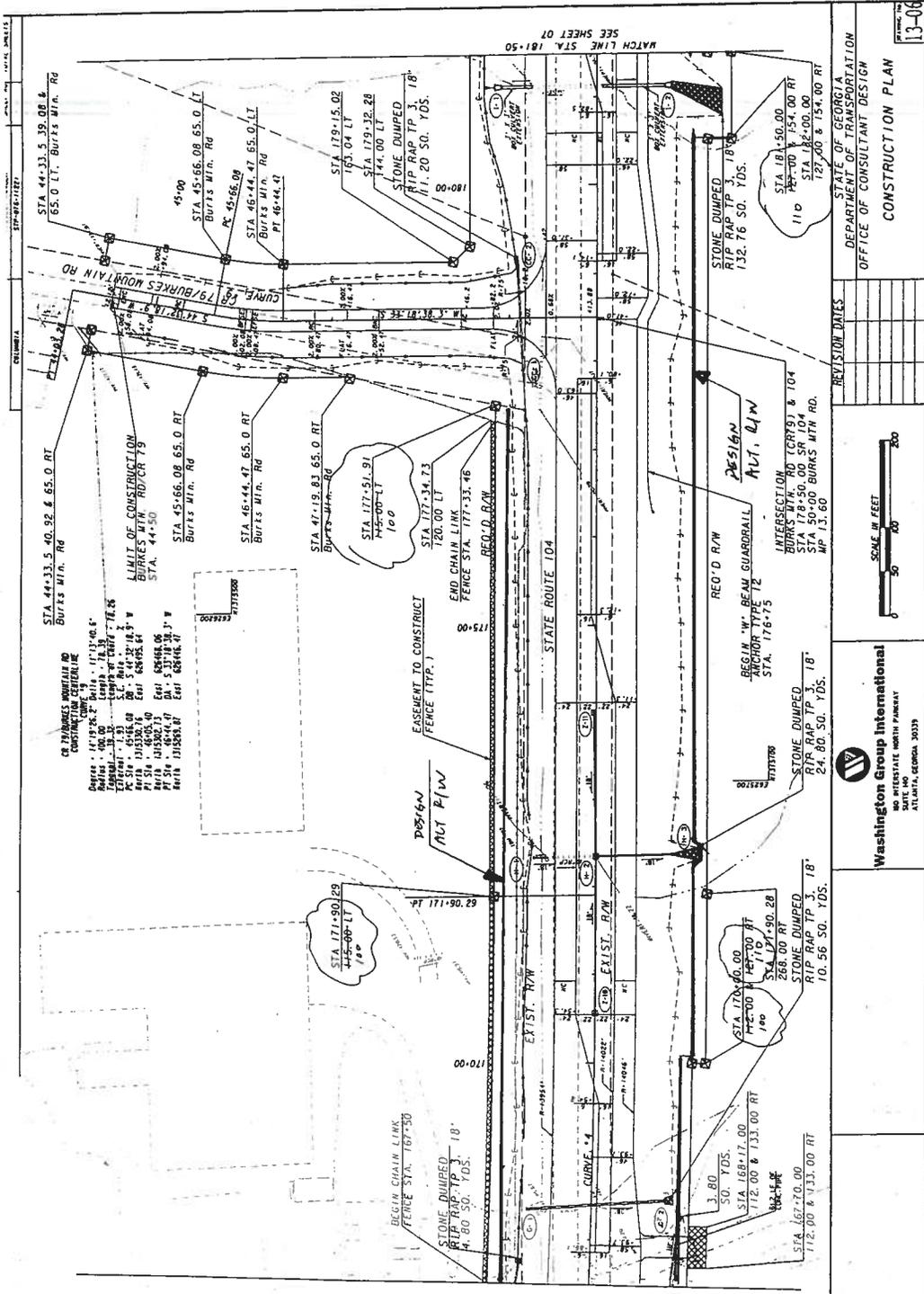
**SR 104/Washington Road**

ALTERNATIVE NO.:

**22-4**

DESCRIPTION: **REDUCE RIGHT OF WAY WIDTH**

SHEET NO.: **2 of 4**



	<b>Washington Group International</b> 100 INTERSTATE NORTH PARKWAY ATLANTA, GEORGIA 30333	REVISION DATES
		STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE OF CONSULTANT DESIGN
CONSTRUCTION PLAN		13-06

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (22) Columbia County- P.I. Number: 221800  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**22-4**

DESCRIPTION: REDUCE RIGHT OF WAY WIDTH

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

## ILLUSTRATIVE EXAMPLE

STA 167+50 TO STA 181+50

$$\text{EXIST R/W} : 100(1400) = 140000 \text{ SF}$$

$$\text{PROPOSED R/W (ORIGINAL DESIGN)} : (112+115)250 + (127+115)(1150) = 335050 \text{ SF}$$

$$\text{ALTERNATIVE DESIGN R/W} : (100+100)(250) + (110+100)(1150) = 291500 \text{ SF}$$

$$\frac{(291500 - 140000)}{(335050 - 140000)} = .78 \rightarrow 22\% \text{ Reduction}$$

THROUGHOUT PROJECT LENGTH:

LOCATION	LENGTH	REDUCTION
STA 126+50 to STA 137+50	1100	$1100 \times 22\% = 242$
STA 167+50 to STA 181+50	1400	$1400 \times 22\% = 308$
STA 181+50 to STA 196+50	1500	$1500 \times 12\% = 180$
STA 210+50 to STA 225+50	1500	$1500 \times 12\% = 180$
STA 225+50 to STA 240+50	1500	$1500 \times 11\% = 165$
STA 240+50 to STA 255+50	1500	$1500 \times 13\% = 270$

$$\frac{1345}{16920} = .08 \rightarrow 8\% \text{ WT'D AVG REDUCTION}$$

↑  
TOTAL PROJECT LENGTH

# COST WORKSHEET



<b>PROJECT: STP-076-1 (22) Columbia County– P.I. Number: 221800 SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>	<b>22-4</b>
	<b>SHEET NO:</b>	<b>4 of 4</b>

<b>DESCRIPTION:</b>	<b>REDUCE RIGHT OF WAY WIDTH</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
RIGHT-OF-WAY	LS	1	6,085,000	6,085,000	.92	6,085,000	5,598,200
<b>SUB-TOTAL</b>				6,085,000			5,598,200
<b>MARK-UP AT 10%</b>				608,500			589,820
<b>TOTAL</b>				6,693,500			6,158,200

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (22) Columbia County- P.I. No: 221800  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**22-6**

DESCRIPTION: **REDUCE FILL SLOPES FROM 6:1 TO 4:1 WITH A 12' WIDTH**

SHEET NO.: 1 of 4

**Original Design:**

The original design calls for the construction of a typical section consisting of an 18' wide fore slope at a 6:1 slope in a cut section.

**Alternative Design:**

This alternative design suggests creating a typical section consisting of a 12' wide fore slope at a 4:1 slope in a cut section. This would agree with the typical for PI 221805(21) which connects to this project.

**Opportunities:**

- Consistent with connecting project
- Reduces earthwork
- Reduces right of way

**Risks:**

- Decreases clear zone width

**Technical Discussion:**

Section 6.2.3 of the GDOT Design Policy Manual states that 4:1 slopes are acceptable as long as clear zone requirements are met. Table 6.3 states that for a 4 lane rural arterial roadway, the minimum horizontal clearance from edge of travel lane is 26 ft, which equals clear zone plus 4' typical section.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 8,968,768	\$ 0	\$ 8,968,768
ALTERNATIVE	\$ 8,807,143	\$ 0	\$ 8,807,143
SAVINGS	\$ 161,625	\$ 0	\$ 161,625

# Illustrations

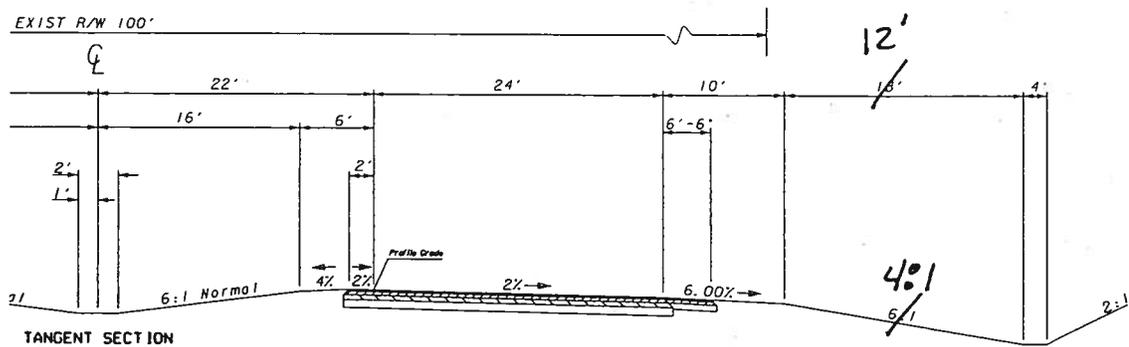


PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (22) Columbia County- P.I. Number: 221800**  
**SR 104/Washington Road**

ALTERNATIVE NO.: **22-6**

DESCRIPTION: **REDUCE FILL SLOPES FROM ~~6~~:1 TO 4:1 WITH A 12' WIDTH**

SHEET NO.: **2 of 4**



New Typical Section

# Calculations

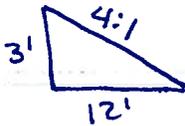
PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (22) Columbia County- P.I. Number: 221800  
 SR 104/Washington Road

ALTERNATIVE NO.:  
 22-6

DESCRIPTION: REDUCE FILL SLOPES FROM 6:1 TO 4:1 WITH A 12' WIDTH

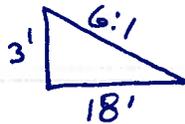
SHEET NO.: 3 of 4

NEW FORE SLOPE



$$A = \frac{1}{2}(12)(3) = 18 \text{ ft}^2$$

EXISTING FORE SLOPE



$$A = \frac{1}{2}(18)(3) = 27 \text{ ft}^2$$

$$27 \text{ ft}^2 - 18 \text{ ft}^2 = 9 \text{ ft}^2 \text{ less per linear foot}$$

Total length of project  $\Rightarrow$  Sta 270+00 - 101+80 = 16,820 ft  
 16,820 ft  $\times$  2 (both sides) = 33,640 ft

Assume half of project is in cut slope  $\Rightarrow$  33,640 / 2  
 = 16,820 ft

$$16,820 \text{ ft} \times 9 \text{ ft}^2 = 151,380 \text{ ft}^3 / 27 = \underline{\underline{5,607 \text{ cy}}}$$

SAY 4200 cy unclass exc less  
 1407 cy borrow exc less

Original estimate =

$$\text{unclass exc} = 240,449 - 4200 = 236,249 \text{ cy}$$

$$\text{borrow exc} = 219,201 - 1407 = 217,794 \text{ cy}$$

ROW Savings

Total original width of typical section = 134'

Total new width of typical section = 128'

Approx reduction = 4.7%

SAY 4% reduction for half of project

$$\text{Original ROW cost} = \$6,085,000 / 2 = \$3,042,500 \times 0.04 = \$121,700$$

$$\text{New cost} = \$6,085,000 - \$121,700 = \$5,963,300$$

# COST WORKSHEET



PROJECT: STP-076-1 (22) Columbia County- P.I. Number: 221800 SR 104/Washington Road					ALTERNATIVE NO: 22-6	SHEET NO: 4 OF 4		
DESCRIPTION:		<b>REDUCE FILL SLOPES FROM 6:1 TO 4:1 WITH A 12' WIDTH</b>						
CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE			
ITEM	UNIT S	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL	
UNCLASS EXCAV	CY	240,449	4.50	1,082,020	236,249	4.50	1,063,121	
BORROW EXCAV	CY	219,201	4.50	986,405	217,794	4.50	980,073	
ROW	LS	1		6,085,000	0.98		5,963,300	
<b>SUB-TOTAL</b>				8,153,425			8,006,494	
<b>MARK-UP AT 10%</b>				815,343			800,649	
<b>TOTAL</b>				8,968,768			8,807,143	

# Value Analysis Design Alternative



PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (22) Columbia County- P.I. Number: 221800**  
**SR 104/Washington Road**

ALTERNATIVE NO.:  
**22-7**

DESCRIPTION: **STA. 116+00 REDUCE FILL (ADJUST VERTICAL CURVE ENTERING AND EXITING)**

SHEET NO.: **1 of 4**

**Original Design:**

The original design calls for the construction of SR 104 between Sta 109+75 and Sta 120+00 on a new elevated profile grade.

**Alternative Design:**

This alternative design suggests to modify the profile grade shown in the plans and reduce the amount of fill in this area. Lowering the profile grade will eliminate the need of some temporary pavement for stage construction due to reducing the difference between existing and new pavements.

**Opportunities:**

- Reduced costs
- Reduced construction time
- Elimination/reduction of staging

**Risks:**

- Increased grade to low point

**Technical Discussion:**

The existing profile does not optimize the K values on the two crest verticals approaching the sag. Changing the PVT stations and both vertical curves and increasing the percent of grade to the low point could lower the fill by 5 feet. In addition, the existing culvert may not be designed to accommodate the additional fill.

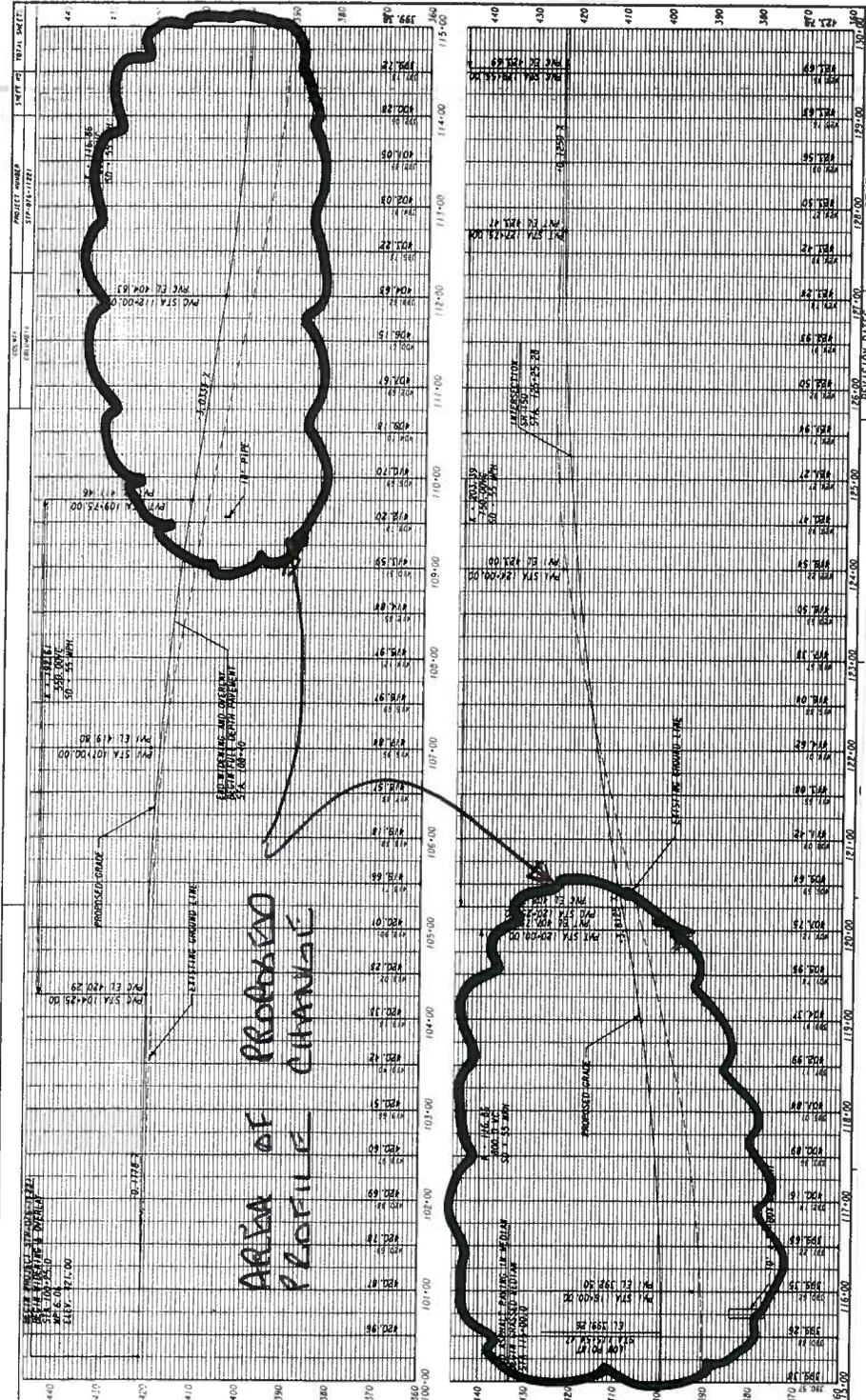
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 7,015,275	\$ 0	\$ 7,015,275
ALTERNATIVE	\$ 6,617,255	\$ 0	\$ 6,617,255
SAVINGS	\$ 398,020	\$ 0	\$ 398,020

PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (22) Columbia County- P.I. Number: 221800**  
**SR 104/Washington Road**

ALTERNATIVE NO.: **22-7**

DESCRIPTION: **STA.+116 REDUCE FILL (ADJUST VERTICAL CURVE ENTERING  
AND EXITING)**

SHEET NO.: **2 of 4**



# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (22) Columbia County- P.I. Number: 221800  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**22-7**

DESCRIPTION: STA.+116 REDUCE FILL (ADJUST VERTICAL CURVE  
 ENTERING AND EXITING)

SHEET NO.: 3 of 4

EARTHWORK CALCULATIONS - STA 109+00 - STA 120+00  
 ORIGINAL DESIGN - AVE WIDTH OF FILL 140'  
 - AVE DEPTH OF FILL 4.3'

$$1100 \text{ LF} \times 140 \text{ LF} \times 4.3 \text{ LF} \div 27 = \underline{24525 \text{ CY}}$$

ALTERNATE DESIGN - AVE WIDTH OF FILL 122'  
 - AVE DEPTH OF FILL 1.8'

$$1100 \text{ LF} \times 122 \text{ LF} \times 1.8 \text{ LF} \div 27 = \underline{8946 \text{ CY}}$$

TEMPORARY PAVEMENT FOR STAGE CONSTRUCTION

ORIGINAL DESIGN - STA 104+00 - STA 136+00

$$2800 \text{ LF} \times 24 \text{ LF} \div 9 = \underline{7466 \text{ SY}} \quad (\text{DEDUCT } 400 \text{ LF FOR TAPER})$$

ALTERNATE DESIGN - STA 112+00 - STA 120+00

$$400 \text{ LF} \times 24 \text{ LF} \div 9 = \underline{1066 \text{ SY}} \quad (\text{DEDUCT } 400 \text{ LF FOR TAPER})$$

TYPICAL SECTION FOR TEMPORARY PAVEMENT

GAB - 10" DEPTH, 19mm SUPERPAVE - 2", 12.5mm SUPERPAVE  
 1 1/2"

REDUCE TEMPORARY PAVEMENT BY 6400 SY

$$\text{GAB } 145 \#/\text{ft}^3 \times 6400' \times 9 \times 0.83' \div 2000 = 3466 \text{ TN}$$

$$19 \text{ mm SUPERPAVE } 220 \#/\text{yd}^2 \times 6400 \div 2000 = 704 \text{ TN}$$

$$12.5 \text{ mm SUPERPAVE } 165 \#/\text{yd}^2 \times 6400 \div 2000 = 528 \text{ TN}$$

# COST WORKSHEET



<b>PROJECT: STP-076-1 (22) Columbia County-- P.I. Number: 221800 SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>	<b>22-7</b>
<b>SHEET NO:</b>		<b>4 OF 4</b>

<b>DESCRIPTION:</b>	<b>STA. 116+00 REDUCE FILL (ADJUST VERTICAL CURVE ENTERING AND EXITING)</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
208-0100 IN PLACE EMBANKMENT	CY	150,000	10.19	1,528,500	134,421	10.19	1,369,749
310-1101 GR AGGR BASE CRS	TN	76,498	28.38	2,171,013	73,032	28.38	2,072,648
402-3130 RECYCLED ASPH CONC 12MM	TN	8,518	85.00	724,030	7,990	85.00	679,150
402-3190 RECYCLED ASPH CONC 19MM	TN	22,988	85.00	1,953,980	22,284	85.00	1,894,140
<b>SUB-TOTAL</b>				6,377,523			6,015,687
<b>MARK-UP @ 10%</b>				637,752			601,568
<b>TOTAL</b>				7,015,275			6,617,255

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (22) Columbia County- P.I. No: 221800  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**22-9**

DESCRIPTION: **SR 150 – BEGIN CONSTRUCTION AT PROPOSED  
 NEW CURVE POINT**

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

**Original Design:**

The original design shifts the alignment of SR 150 to the west to improve an existing five point intersection and to intersect SR 150 with SR 104 at ninety degrees. The tie-in on SR 150 extends 450 feet along tangent on SR 150.

**Alternative Design:**

This alternative design suggests to end the tie-in at or near the curve PT.

**Opportunities:**

- Reduces construction time
- Reduces amount of new pavement
- Reduces cost

**Risks:**

- Requires plan revision

**Technical Discussion:**

Based on plans and profile, the tie-in on SR 150 can be achieved at the P-7 for curve No. 8. Ending tie-in at this point reduces pavement on SR 150 and the need to purchase Right-of-Way along SR 150 eliminating a cross drain and driveway work.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 415,419	\$ 0	\$ 415,419
ALTERNATIVE	\$ 318,265	\$ 0	\$ 318,265
SAVINGS	\$ 97,154	\$ 0	\$ 97,154



# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (22) Columbia County- P.I. Number: 221800  
 SR 104/Washington Road

ALTERNATIVE NO.:  
 22-9

DESCRIPTION: SR 150 - BEGIN CONSTRUCTION AT PROPOSED NEW CURVE POINT

SHEET NO.: 3 of 4

PAVEMENT PRODUCTION  $\frac{450(32)}{9} = 1600 \text{ SY}$

GAB  $450(24) = 10,800 \text{ ft}^2$

12.5mm SUPERPAVE  $165 \text{ LB/SY}(1600) = 264,000 \text{ LB} = 132 \text{ TONS}$

19mm SUPERPAVE  $220 \text{ LB/SY}(1600) = 352,000 \text{ LB} = 176 \text{ TONS}$

25mm SUPERPAVE  $440 \text{ LB/SY}(1600) = 704,000 \text{ LB} = 352 \text{ TONS}$

GAB 12"  $\frac{10,800}{9} (12/10)$  MEAN ITEM SUMMARY FOR 10" = 1440 SY  
 STORM DRAIN PIPE 12" → 10"

TOTAL SR 150

$\frac{1950(32)}{9} = 6933 \text{ SY}$  GAB  $1950(24) = 46,800 \text{ SF}$

12.5mm SUPERPAVE  $165(6933) = 1,143,945 \text{ LB} = 572 \text{ TONS}$

19mm SUPERPAVE  $220(6933) = 1,525,260 \text{ LB} = 763 \text{ TONS}$

25mm SUPERPAVE  $440(6933) = 3,050,520 \text{ LB} = 1525 \text{ TONS}$

GAB  $\frac{46,800}{9} (12/10) = 6240 \text{ SY}$

STORM DRAIN PIPE 18" 100'  
 30" 120'

# COST WORKSHEET



<b>PROJECT: STP-076-1 (22) Columbia County– P.I. Number: 221800 SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>	<b>22-9</b>
<b>SHEET NO:</b>		<b>4 OF 4</b>

<b>DESCRIPTION:</b>	<b>SR 150 – BEGIN CONSTRUCTION AT PROPOSED NEW CURVE POINT</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
12.5 SUPERPAVE	TN	572	85.00	48,620	440	85.00	37,400
19 MM SUPERPAVE	TN	763	85.00	64,855	587	85.00	49,895
25MM SUPERPAVE	TN	1,525	85.00	129,625	1,173	85.00	99,705
GAB 12 IN	SY	6,240	19.49	121,618	4,800	19.49	93,552
STORM DRAIN 13 IN	LF	100	41.56	4,156	0	41.56	0
STORMM DRAIN 30 IN	LF	120	73.17	8,780	120	73.17	8,780

\* NOTE: ADDITIONAL COST SAVINGS COULD BE FOUND IN RIGHT OF WAY IS REDUCED AND IF DRIVEWAY WORK IS ELIMINATED.

<b>SUB-TOTAL</b>				377,654				289,332
<b>MARK-UP AT 10%</b>				37,765				28,933
<b>TOTAL</b>				415,419				318,265

# Value Analysis Design Suggestion



PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (22) Columbia County– P.I. Number: 221800**  
**SR 104/Washington Road**

ALTERNATIVE NO.: **22-10**

DESCRIPTION: **DELETE DRIVEWAY AT 136+00**

SHEET NO.: **1 of 1**

## Original Design:

The current design calls for a driveway at Sta. 136+00 +/- RT off of SR 104/Washington Rd. This is to provide access to the property that is located in the corner where SR 150, SR 104, and SR 150/US 221 intersect.

## Alternative:

The suggests alternative is to delete this driveway because the property already has an existing driveway to existing SR 150/US 221 and also existing SR 150.

## Opportunities:

- Increases safety of intersection
- Eliminates conflicts with right turn lane taper

## Risks

- Property owner may not favor the idea

## Technical Discussion:

The location of this driveway is very close to the proposed intersection, which could lead to safety concerns. The driveway is also located in the beginning of a taper of a right turn lane which is not desirable. Also the location of the driveway does not provide an opportunity for a left hand turn.

# Value Analysis Design Suggestion



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (22) Columbia County- P.I. Number: 221800  
SR 104/Washington Road

ALTERNATIVE NO.:  
22-11

DESCRIPTION: **CONFIRM SEDIMENT BASINS BEING PROVIDED AT EACH OUTFALL**

SHEET NO.: 1 of 1

## Original Design:

The original design specifies a total of 29 sediment basins for use on the project; however, significantly fewer sediment basins are shown on the plans.

## Alternative:

The alternative design would specify sediment basins adjacent to existing lakes and streams. Possible consideration should be given to major cross drains and areas outside the project limits where lakes exist within one mile of the project..

## Opportunities:

- Reduced construction costs
- Reduced Right of Way costs

## Risks

- Normal erosion control devices (silt fence) may fail in heavy rains

## Technical Discussion:

The plans indicate three streams, two lakes and eight major cross drain installations. Protection of these areas should be controlled by a maximum of fifteen sediment basins utilizing standard erosion and sedimentation control guidelines.

# Value Analysis Design Suggestion



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (22) Columbia County- P.I. Number: 221800  
SR 104/Washington Road

ALTERNATIVE NO.:  
22-12

DESCRIPTION: **PROVIDE SILT BARRIERS IN LAKES**

SHEET NO.: 1 of 1

## Original Design:

The original design indicates construction activity adjacent to existing lakes at STA 145+85 and at STA 164+00. Due to the close proximity of the lakes to the proposed roadway, no sediment basins are shown on pipes feeding the lakes.

## Alternative:

The alternative design would provide for floating silt barrier to be set up as a pay item and installed in each lake.

## Opportunities:

- Minimize probability of lake siltation
- Reduced costs to remove silt intrusion

## Risks

- Additional costs for easement to install barrier

## Technical Discussion:

The location of the lakes adjacent to the limits of construction does not allow installation of sediment basins at end of pipes. Floating silt retention barrier is an approved method of sediment control in lakes.

# Value Analysis Design Alternative



PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (22) Columbia County– P.I. Number: 221800**  
**SR 104/Washington Road**

ALTERNATIVE NO.:  
**22-14**

DESCRIPTION: **USE 11' TRAVEL LANES**

SHEET NO.: **1 of 4**

**Original Design:**

The original design calls for the construction of 2 – 12' travel lanes in each direction.

**Alternative Design:**

This alternative design suggests to create 2 – 11' travel lanes in each direction, thus reducing the total pavement width by 4'.

**Opportunities:**

- Reduced pavement quantities
- Reduced earthwork
- Reduced right of way

**Risks:**

- Minor redesign costs
- Reduces the safety and comfort of driving
- Lower level of service

**Technical Discussion:**

According to the AASHTO Design Manual, Chapter 4 – Cross Section Elements, there is a section discussing lane widths used under varying conditions. It states that lane widths of 9 ft to 12 ft lanes are generally used. It also says that while 12' lanes are preferred, 11 ft lanes are acceptable under certain circumstances.

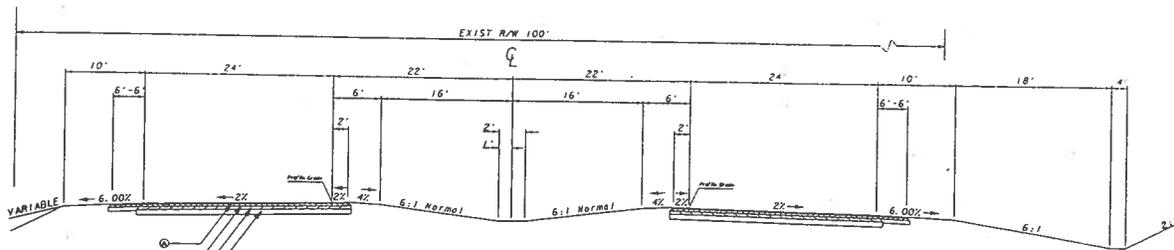
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 18,012,751	\$ 0	\$ 18,012,751
ALTERNATIVE	\$ 17,065,039	\$ 0	\$ 17,065,039
SAVINGS	\$ 947,712	\$ 0	\$ 947,712

PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (22) Columbia County- P.I. Number: 221800  
SR 104/Washington Road

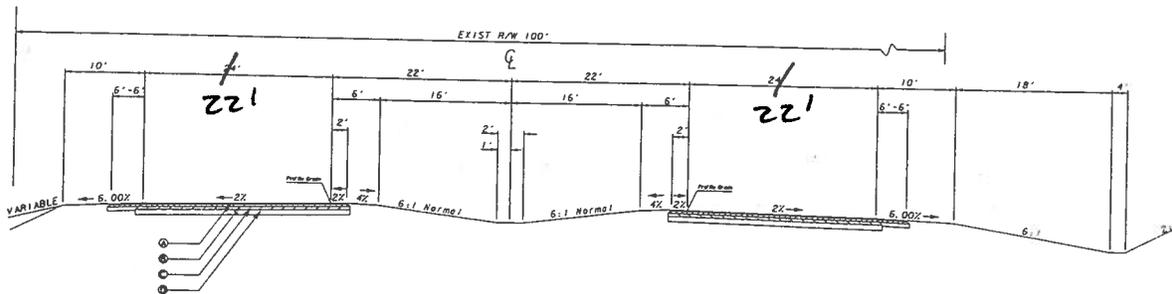
ALTERNATIVE NO.: 22-14

DESCRIPTION: USE 11' TRAVEL LANES

SHEET NO.: 2 of 4



ORIGINAL TYPICAL SECTION



REVISED TYPICAL SECTION

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (22) Columbia County- P.I. Number: 221800  
 SR 104/Washington Road

ALTERNATIVE NO.: 22-14

DESCRIPTION: USE 11' TRAVEL LANES

SHEET NO.: 3 of 4

2-12' lanes each direction  $\Rightarrow$  48' total

2-11' lanes each direction  $\Rightarrow$  44' total

$\Rightarrow$  4' less pavement

Sta. 108+40 to Sta 276+00  $\Rightarrow$  16,160ft

$\times$   
4ft

$$\frac{64,640ft^2}{= 7,182yd^2}$$

12.5mm Superpave

$$165 lbs/sy \times 7,182yd^2 \div 2000 lbs/ton = 593 tons$$

19mm Superpave

$$220 lbs/sy \times 7,182yd^2 \div 2000 lbs/ton = 790 tons$$

25mm Superpave

$$440 lbs/sy \times 7,182yd^2 \div 2000 lbs/ton = 1580 tons$$

GAB

$$145 lbs/ft \times 64,640ft^2 \times 1.0ft (depth) \div 2000 lbs/ton = 4,686 tons$$

$\Rightarrow 64,640ft^2 = 7,182yd^2 \Rightarrow$  USED FOR COST ESTIMATE

Reduction of lane widths from 48' to 44' results in an approximate earthwork reduction of  $(1 - 44/48) 100 \approx 8\%$

Assume right of way reduction to be approximately 5%

Original earthwork UNCLASS EXC  $240,449 \times 8\% = 19,236 cy$

BORROW EXC  $219,201 \times 8\% = 17,536 cy$

Original ROW cost =  $\$6,085,000 \times 5\% = \$304,250$

# COST WORKSHEET



<b>PROJECT: STP-076-1 (22) Columbia County– P.I. Number: 221800 SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>	<b>22-14</b>
	<b>SHEET NO:</b>	<b>4 OF 4</b>

<b>DESCRIPTION:</b>	<b>USE 11' TRAVEL LANES</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
310-5120 GR AGGR BASE CRS 12 IN	SY	88,075	19.49	1,716,582	80.893	19.49	1,576,605
400-3205 ASPH CONC 12.5MM *	TN	13,511	85.00	1,148,435	12,918	85.00	1,098,030
402-3121 ASPH CONC 25MM	TN	36,014	85.00	3,061,190	34,434	85.00	2,926,890
402-3190 ASPH CONC 19MM	TN	27,007	85.00	2,295,595	26,217	85.00	2,228,445
UNCLASS EXC	CY	240,449	4.50	1,082,021	331,213	4.50	995,459
BORROW EXC	CY	219,201	4.50	986,405	201,665	4.50	907,493
RIGHT OF WAY	LS	1		6,085,000	0.95		5,780,750

\*PAY ITEM CHANGED FROM COST ESTIMATE REPORT TO MATCH PLAN TYPICAL SECTION

<b>SUB-TOTAL</b>				16,375,228			15,513,672
<b>MARK-UP AT 10%</b>				1,637,523			1,551,367
<b>TOTAL</b>				18,012,751			17,065,039

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (21) Columbia County– P.I. Number: 221805  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**21-1**

DESCRIPTION: **CONSIDER WIDENING EXISTING BRIDGES BY ADDING 2' TO EACH SIDE (INSTEAD OF 4' ON ONE SIDE)** SHEET NO.: 1 of 4

**Original Design:**

The original design calls for the construction of widened bridges by widening to one side only.

**Alternative Design:**

This alternative design suggests to widen the bridges by adding two (2) feet +/- to each side.

**Opportunities:**

- Reduces amount of substructure construction
- Reduces construction cost

**Risks:**

- New overhang wider than half of beam spacing

**Technical Discussion:**

Widening the bridges, approximately 2 feet on each side, creates overhang widths of 4'-7 1/2". Although greater than half the beam spacing, it is within GDOT maximum overhang policy. The proposed Alternative eliminates need for substructure including driving piles and the reinforced concrete pier on Little Kiokee Creek.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 323,852	\$ 0	\$ 323,852
ALTERNATIVE	\$ 197,395	\$ 0	\$ 197,395
SAVINGS	\$ 126,457	\$ 0	\$ 126,457

# Illustrations

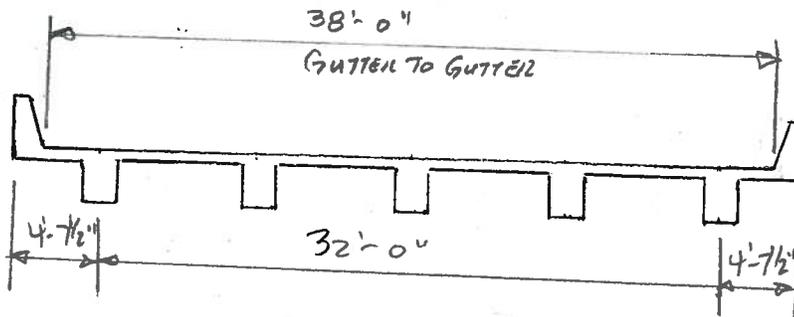
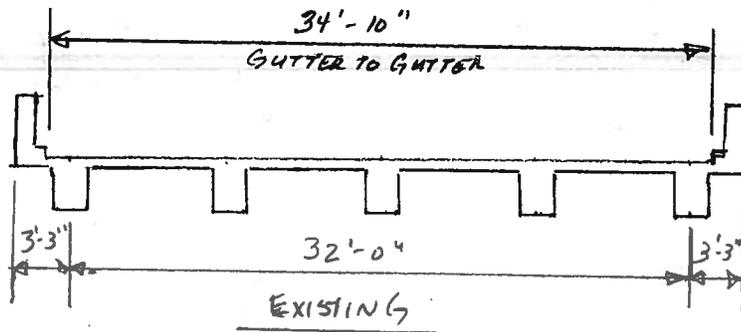


PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (21) Columbia County— P.I. Number: 221805  
SR 104/Washington Road

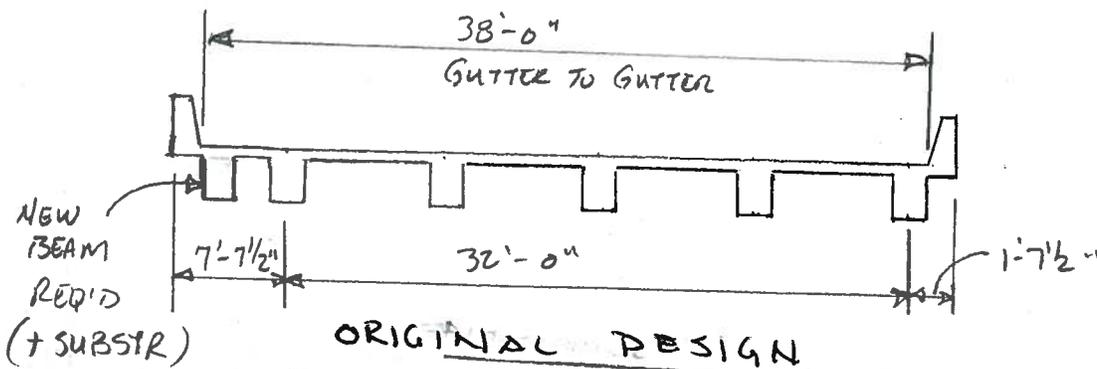
ALTERNATIVE NO.: 21-1

DESCRIPTION: CONSIDER WIDENING EXISTING BRIDGES BY ADDING  
2' TO EACH SIDE (INSTEAD OF 4' ON ONE SIDE)

SHEET NO.: 2 of 4



ALTERNATIVE DESIGN



ORIGINAL DESIGN

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (21) Columbia County- P.I. Number: 221805  
 SR 104/Washington Road

ALTERNATIVE NO.: 21-1

DESCRIPTION: CONSIDER WIDENING EXISTING BRIDGES BY ADDING  
 2' TO EACH SIDE (INSTEAD OF 4' ON ONE SIDE)

SHEET NO.: 3 of 4

## ALTERNATIVE: WIDEN 2'± EACH SIDE DESIGN

ADDITIONAL MATERIAL: SLAB  $\frac{8(3.875)(2)}{12} = 5.1667 \text{ ft}^3/\text{ft}$   
 SUPERSTRUCTURE  $= .1914 \text{ cy}/\text{ft}$

REINF  $.1914(225) = 43 \text{ LB}/\text{ft}$

BARRIER 2 LF/FT

END POST  $4(4)(3) \frac{(1.0833)}{27} = 1.92 \rightarrow 2 \text{ cy}$

REBAR 500 LB

SUBSTRUCTURE END BENT CAP  $2.75(2)(3) = 16.5 \text{ ft}^3 = .6$

$(.6)^2 = 1.2 \text{ cy}$

WING WALL  $8(5.5833)(1)(4) = 6.6 \text{ cy}$   
 $\frac{27}$

REBAR  $8(150) = 1200 \text{ LB}$  7.8 → 8 cy

## ORIGINAL: WIDEN TO ONE SIDE ONLY 4'±

ADDITIONAL MATERIAL: SUPERSTRUCTURE SLAB  $7.75 \left(\frac{8}{12}\right) = .1914 \text{ cy}/\text{ft}$

BEAM  $\frac{2.25(1.5)}{27} = .1215 \text{ cy}/\text{ft}$   
 $.3164 \text{ cy}/\text{ft}$

REBAR  $.3164(225) = 71 \text{ LB}/\text{ft}$

SUBSTRUCTURE: END BENT/WING WALL SAME AS ABOVE

INT BENT  $\frac{5.25(2.5)(4)}{27} + \frac{5.25(4)(2)}{27} = 3.5 \text{ cy}$  - BASED ON EXIST PLANS (KIDGEE CUBIC)

REINF  $3.5(150) = 525 \text{ LB}$

LF PILE (12X53) = 450 LF - BASED ON EXISTING PLANS

	ALT A					ALT B					
	SUPR CONC	REBAR	SUB CONC	REBAR	PILING	SUPR CONC	REBAR	SUB CONC	REBAR	PILING	
BRIDGE 1	53	11,900		8	1200	0	87	19,600	11.5	1725	450
BRIDGE 2	34	7,700		8	1200	0	57	12,800	16	3100	150

# COST WORKSHEET



<b>PROJECT: STP-076-1 (21) Columbia County- P.I. Number: 221805</b> <b>SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b> SHEET NO:	<b>21-1</b> <b>4 OF 4</b>
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<b>DESCRIPTION:</b>	<b>CONSIDER WIDENING EXISTING BRIDGES BY ADDING 2' TO EACH SIDE (INSTEAD OF 4' ON ONE SIDE)</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
<b>BRIDGE 1</b>							
SUPER CONC	CY	87	1,122.40	97,649	53	1,122.40	59,487
SUPER REBAR	LB	19,600	0.95	18,620	11,900	0.95	11,305
BARRIER	LF	552	56.44	31,155	552	56.44	31,155
SUB CONC	CY	11.50	587.75	6,760	8	587.75	4,702
SUB REBAR	LB	1,725	0.96	1,656	1,200	0.96	1,152
PILING (HP 12X53)	LF	450	49.56	22,302	0	49.56	0
<b>BRIDGE 2</b>							
SUPER CONC	LY	57	1,122.40	63,977	34	1,122.40	38,162
SUPER REBAR	LB	12,800	0.95	12,160	7,700	0.95	7,315
BARRIER	LF	360	56.44	20,318	360	56.44	20,318
SUB CONC	CY	16	587.75	9,404	8	587.75	4,702
SUB REBAR	LB	3,100	0.96	2,976	1,200	0.96	1,152
PILING (HP 12X53)	LF	150	49.56	7,434	0	49.56	0

**NOTE: ADDITIONAL ITEMS THAT WOULD BE SAME FOR BOTH ALTERNATIVES ARE NOT INCLUDED**

<b>SUB-TOTAL</b>	294,411		179,450
<b>MARK-UP AT</b>	29,441		17,945
<b>TOTAL</b>	323,852		197,395

## Value Analysis Design Suggestion

PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (21) Columbia County-- P.I. Number: 221805  
SR 104/Washington Road

ALTERNATIVE NO.:  
  
21-2

DESCRIPTION: **VERIFY WHETHER OR NOT THERE IS TO BE AN OVERLAY  
ON THE EXISTING BRIDGES, AND IF SO, CONSIDER BRIDGE  
REPLACEMENT**

SHEET NO.: 1 of 1

### Original Design:

The Concept Report recommends widening existing bridges and constructing new parallel bridges at Kiokee Creek and Little Kiokee Creek crossings. If the bridges are to be widened will the normal crown be retained or will overlay be required?

### Alternative:

If the existing bridges are to be overlaid, it should be verified that widening is more economical than replacement.

### Opportunities:

- Reduce construction cost
- Replace 40 year old bridges

### Risks

- Maintenance reports indicate bridges are in good condition

### Technical Discussion:

Based on existing bridge plans the existing bridges are constructed on normal crown. The roadway typical section, in tangents, is normal crown, 4-lane divided. This typical section results in each direction of roadway sloping at 2% to the outside. To accomplish on the bridges requires approximately 8" of overlay. The existing bridge should be evaluated for the additional dead load and the cost of the overlay. The overlay thickness of 8" may require reinforced steel adding to construction cost.

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (21) Columbia County– P.I. Number: 221805  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**21-3**

DESCRIPTION: **USE EXISTING PAVEMENT WHERE PRACTICAL**

SHEET NO.: 1 of 4

**Original Design:**

The original design calls for the construction of 2-24' lanes with a 44' depressed median. All pavement would be new construction with no overlay and reuse of existing pavement.

**Alternative Design:**

This alternative design suggests to utilize existing pavement which exists in the proposed horizontal alignment. Modification of the vertical alignment would be required but would be limited to vertical differences in elevation of +/- 1.0'.

**Opportunities:**

- Cost savings
- Reduced construction time
- Minor savings in earthwork

**Risks:**

- Minor design costs

**Technical Discussion:**

Existing profile grade would be utilized but areas would be specified where the “best fit” method, described in section 149 of the Georgia Standard Specifications could be utilized.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 3,983,365	\$ 0	\$ 3,983,365
ALTERNATIVE	\$ 3,471,994	\$ 0	\$ 3,471,994
SAVINGS	\$ 511,371	\$ 0	\$ 511,371

# Illustrations

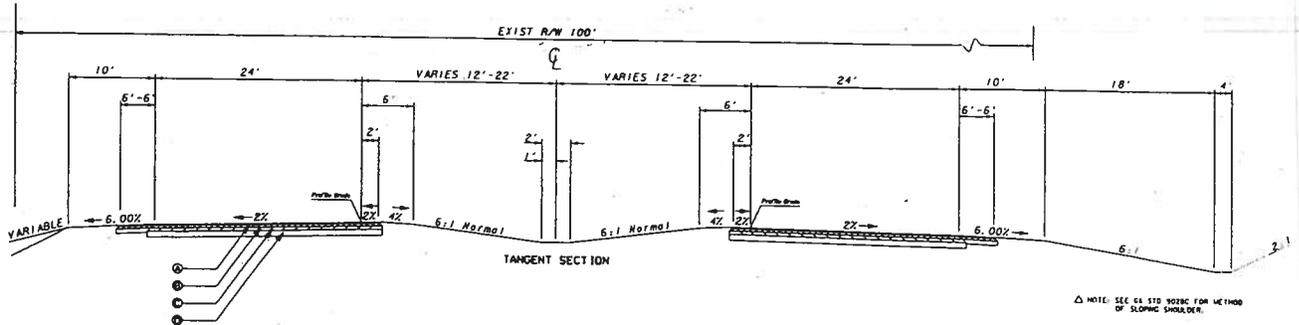


PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (21) Columbia County—P.I. Number: 221805  
SR 104/Washington Road**

ALTERNATIVE NO.: **21-3**

DESCRIPTION: **USE EXISTING PAVEMENT WHERE PRACTICAL**

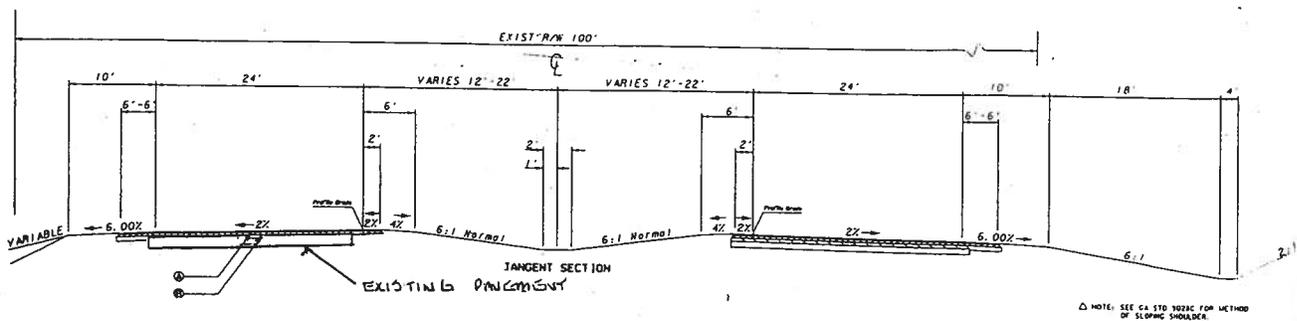
SHEET NO.: **2 of 4**



**ORIGINAL DESIGN**

**REQUIRED PAVEMENT**

- ② 165 LBS/SY RECYCLED ASPH CONC 12.5 MM SUPERPAVE, GP2 ONLY, INCL BITUM & H-L LIME (SUPERPAVE DESIGN LEVEL 'B')
- ③ 220 LBS/SY RECYCLED ASPH CONC 19 MM SUPERPAVE, GP1 OR 2, INCL BITUM & H-L LIME (SUPERPAVE DESIGN LEVEL 'B')
- ④ 440 LBS/SY RECYCLED ASPH CONC 25 MM SUPERPAVE, GP1 OR 2, INCL BITUM & H-L LIME (SUPERPAVE DESIGN LEVEL 'A')
- ① 12" GRADED AGGREGATE BASE
- ⑤ ASPH CONC LEVELING, INCL BITUM & LIME (AS REQ'D)



**ALTERNATE DESIGN**

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (21) Columbia County-- P.I. Number: 221805  
SR 104/Washington Road

ALTERNATIVE NO.:  
**21-3**

DESCRIPTION: USE EXISTING PAVEMENT WHERE PRACTICAL

SHEET NO.: 3 of 4

$$\text{Sta. } 273+00 \text{ to sta } 280+00 = 700 \text{ ft}$$

$$\text{Sta. } 283+00 \text{ to sta. } 288+00 = 500 \text{ ft}$$

$$\text{Sta. } 291+50 \text{ to sta. } 298+00 = 650 \text{ ft}$$

$$\text{Sta. } 336+00 \text{ to sta. } 340+00 = 400 \text{ ft}$$

$$\text{Sta. } 363+00 \text{ to sta. } 370+50 = 750 \text{ ft}$$

$$\text{Sta. } 372+50 \text{ to sta. } 375+00 = 250 \text{ ft}$$

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$$3250 \text{ ft}$$

$$3250 \text{ ft} \times 24 \text{ ft} = 78,000 \text{ ft}^2 = 8,667 \text{ yd}^2$$

Eliminate 25mm base and graded aggregate base  
25mm Superpave

$$440 \text{ lb/sy} \times 8,667 \text{ sy} \div 2000 \text{ lb/ton} = 1907 \text{ tons}$$

GAB

$$145 \text{ lb/ft}^3 \times 78,000 \text{ ft} \times 1.0 \text{ ft (depth)} \div 2000 \text{ lb/ton}$$

$$= 5,655 \text{ tons}$$

Allow 800 tons of leveling to correct cross slopes  
and minor grade changes

# COST WORKSHEET



<b>PROJECT: STP-076-1 (21) Columbia County-- P.I. Number: 221805</b> <b>SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>	<b>21-3</b>
	<b>SHEET NO:</b>	<b>4 OF 4</b>

<b>DESCRIPTION:</b>	<b>USE EXISTING PAVEMENT WHERE PRACTICAL</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
310-5120 GR AGGR BASE CRS 12 IN	TN	82,415	17.17	1,415,066	80,508	17.17	1,382,322
402-3121 RECYCLED ASPH CONC 25 MM	TN	25,955	85.00	2,206,175	20,300	85.00	1,725,500
402-1812 RECYCLED ASPH CON LEVELING	TN	0	60.67	0	800	60.67	48,536
<b>SUB-TOTAL</b>				3,621,241			3,156,358
<b>MARK-UP AT 10%</b>				362,124			315,636
<b>TOTAL</b>				3,983,365			3,471,994

# Value Analysis Design Suggestion



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (21) Columbia County- P.I. Number: 221805  
SR 104/Washington Road

ALTERNATIVE NO.:  
**21-4**

DESCRIPTION: **BRIDGE AT STA 290+, SET TO ELEVATION OF EXISTING  
REDUCE FILL**

SHEET NO.: 1 of 1

## Original Design:

The proposed bridge at STA 290, Kiokee Creek, is shown at 4ft higher elevation than the existing bridge at this location.

## Alternative:

The alternative design is to set the proposed bridge at the elevation of the existing bridge and reduce roadway fill.

## Opportunities:

- Reduce roadway fill
- Reduce construction cost

## Risks

- Bridge hydraulics study may require proposed bridge to be at higher elevation

## Technical Discussion:

The bridge hydraulics report is not available to the VE team. Based on information provided, it does not appear that an elevation difference of 4 to 5 ft is necessary. If longer spans are desired ( i.e. to remove pier from creek) this could be achieved with 80 ft spans with AASHTO Type III beams. ( It is desirable to align piers for new bridge with existing, if possible.) The Type III beams would require 2 ft or less elevation difference. It may be possible to keep a structure similar to the existing thus keeping proposed bridge elevation same as existing. If the hydraulics study indicates that a substantial increase in bridge elevation is required then replacing the existing bridge should be considered.

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (21) Columbia County– P.I. Number: 221805  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**21-7**

DESCRIPTION: **REDUCE RIGHT-OF-WAY WIDTH WHERE PRACTICAL**

SHEET NO.: 1 of 4

**Original Design:**

The original design sets the Right-of-Way limits based on minimum Right-of-Way requirements established for the project.

**Alternative Design:**

This alternative design suggests setting Right-of-Way limits based on construction limits.

**Opportunities:**

- Reduce Right-of-Way impacts
- Reduce costs

**Risks:**

- Potential need for addition Right-of-Way on future widening projects
- Requires re-setting Right-of-Way limits on plans

**Technical Discussion:**

Based on cross sections and plans, the Right-of-Way limits can be reduced to meet construction limits. It is desirable to maintain a constant across an individual property, however, the overall Right-of-Way requirement can be reduced.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 15,618,825	\$ 0	\$ 15,618,825
ALTERNATIVE	\$ 14,056,942	\$ 0	\$ 14,056,942
SAVINGS	\$ 1,561,883	\$ 0	\$ 1,561,883



# Calculations



PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (21) Columbia County- P.I. Number: 221805**  
**SR 104/Washington Road**

ALTERNATIVE NO.: **21-7**

DESCRIPTION: **REDUCE RIGHT OF WAY WIDTH WHERE PRACTICAL**

SHEET NO.: **3 of 4**

## ILLUSTRATIVE EXAMPLE

STA 354+00 TO STA 369+00

$$\text{EXIST. R/W ; } 100(1500) = 150000 \text{ SF}$$

$$\text{PROPOSED R/W (ORIGINAL DESIGN) : } 230(1500) = 345000 \text{ SF}$$

$$\text{PROPOSED R/W ALTERNATIVE DESIGN: } 200(450) + 190(300) + 180(750) = 282,000 \text{ SF}$$

$$\frac{(282000 - 150000)}{(345000 - 150000)} = .68 \rightarrow 32\% \text{ REDUCTION}$$

THROUGHOUT PROJECT LENGTH!

LOCATION                      LENGTH REDUCTION

$$\text{STA 298+00 TO STA 311+00 } 1300 \times 5\% = 65$$

$$\text{STA 311+00 TO STA 325+00 } 1400 \times 10\% = 140$$

$$\text{STA 354+00 TO STA 369+00 } 1500 \times 32\% = 480$$

$$\text{STA 339+00 TO STA 354+00 } 1500 \times 20\% = 300$$

$$\text{STA 414+00 TO STA 428+00 } 1400 \times 14\% = 196$$

$$\frac{1181}{12,300} = .10 \rightarrow 10\% \text{ WT'D AVG REDUCTION}$$

TOTAL PROJECT LENGTH ↑

# COST WORKSHEET



<b>PROJECT: STP-076-1 (21) Columbia County— P.I. Number: 221805 SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>	<b>21-7</b>
<b>SHEET NO:</b>		<b>4 OF 4</b>

<b>DESCRIPTION:</b>	<b>REDUCE RIGHT OF WAY WIDTH WHERE PRACTICAL</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
RIGHT-OF-WAY	LS	1	14,198,932	14,198,932	0.90	14,198,932	12,779,038
<b>SUB-TOTAL</b>				14,198,932			12,779,038
<b>MARK-UP AT 10%</b>				1,419,893			1,277,904
<b>TOTAL</b>				15,618,825			14,056,942

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (21) Columbia County-- P.I. Number: 221805  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**21-8**

DESCRIPTION: MINIMIZE EARTH WORK FOR NEW LANES

SHEET NO.: 1 of 4

**Original Design:**

The original design calls for the construction of one profile grade that is the same for both sides of the proposed typical section.

**Alternative Design:**

This alternative design suggests creating a separate profile grade for each set of lanes where possible, up to a 5' elevation difference between the profile grades. This will reduce the cut/fill in areas where the opposing travel lanes can be different heights.

**Opportunities:**

- Reduces earthwork
- Reduces construction time
- Reduces construction limits which could reduce right of way

**Risks:**

- Minor redesign required

**Technical Discussion:**

Per section 4.4.3 of the GDOT Design Policy Manual, this is discussed and allowable. It states "standard 44 ft median width can be maintained with independent profiles until the difference in elevations in opposing PGL's is approximately 5 ft."

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 2,711,104	\$ 0	\$ 2,711,104
ALTERNATIVE	\$ 2,619,430	\$ 0	\$ 2,619,430
SAVINGS	\$ 91,674	\$ 0	\$ 91,674

# Illustrations

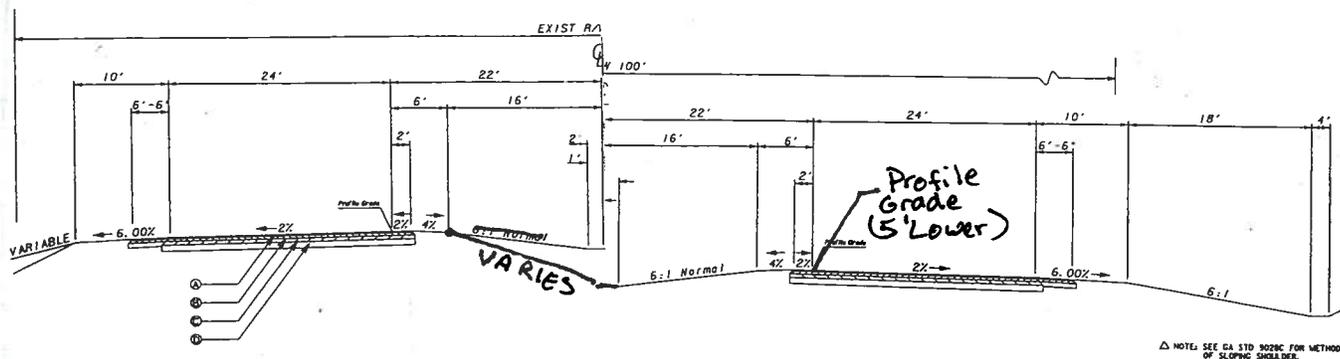


PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (21) Columbia County—P.I. Number: 221805  
SR 104/Washington Road

ALTERNATIVE NO.: 21-8

DESCRIPTION: MINIMIZE EARTH WORK FOR NEW LANES

SHEET NO.: 2 of 4



PROPOSED TYPICAL

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (21) Columbia County - P.I. Number: 221805  
SR 104/Washington Road

ALTERNATIVE NO.:  
**21-8**

DESCRIPTION: MINIMIZE EARTH WORK FOR NEW LANES

SHEET NO.: 3 of 4

For 5' reduction (increase in height, approximate earthwork per typical section is equal to

$$\begin{aligned} & 24' \text{ travel lanes} + 10' \text{ outside shoulder} + 6' \text{ inside shoulder} \\ & = 40' \text{ width} \\ & \quad \times \\ & \quad 5' \text{ depth} \\ & = 200 \text{ ft}^2 \text{ per typical section} \end{aligned}$$

Areas where different profile grades are possible

$$\begin{aligned} \text{Sta. } 340+00 \text{ to } 365+00 & = 2500 \text{ ft} \\ & \quad \times \\ & \quad 200 \text{ ft}^2 \text{ per typical section} \\ \hline & 500,000 \text{ ft}^3 \\ & = 18,519 \text{ yd}^3 \text{ earthwork} \end{aligned}$$

$$\begin{aligned} & \text{Say } -9,260 \text{ yd}^3 \text{ borrow excavation} \\ & \quad -9,260 \text{ yd}^3 \text{ unclass excavation} \end{aligned}$$

Original estimate had lumpsum for grading complete, so use \$4.50 cy for borrow/unclass excavation from project 221800(22) to determine savings.

# COST WORKSHEET



<b>PROJECT: STP-076-1 (21) Columbia County-- P.I. Number: 221805</b> <b>SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b> SHEET NO:	<b>21-8</b> <b>4 OF 4</b>
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<b>DESCRIPTION:</b>	<b>MINIMIZE EARTH WORK FOR NEW LANES</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
GRADING COMPLETE	LS	1		2,464,64	1		2,464,640
UNCLASS EXC	CY	---	---	---	-9,260	4.50	(41,670)
BORROW EXC	CY	---	---	---	-9,260	4.50	(41,670)
<b>SUB-TOTAL</b>				2,464,640			2,381,300
<b>MARK-UP AT 10%</b>				246,464			238,130
<b>TOTAL</b>				2,711,104			2,619,430

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (21) Columbia County- P.I. Number: 221805  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**21-9**

DESCRIPTION: **USE 11' TRAVEL LANES**

SHEET NO.: 1 of 4

**Original Design:**

The original design calls for the construction of 2 – 12’ travel lanes in each direction.

**Alternative Design:**

This alternative design suggests to create 2 – 11’ travel lanes in each direction, thus reducing the total pavement width by 4’.

**Opportunities:**

- Reduced pavement quantities
- Reduced earthwork
- Reduced Right-of -Way

**Risks:**

- Minor redesign costs
- Reduces the safety and comfort of driving
- Lower level of service

**Technical Discussion:**

According to the AASHTO Design Manual, Chapter 4 – Cross Section Elements, there is a section discussing lane widths used under varying conditions. It states that lane widths of 9 ft to 12 ft lanes are generally used. It also says that while 12’ lanes are preferred, 11 ft lanes are acceptable under certain circumstances.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 24,830,314	\$ 0	\$ 24,830,314
ALTERNATIVE	\$ 23,554,365	\$ 0	\$ 23,554,365
SAVINGS	\$ 1,275,949	\$ 0	\$ 1,275,949

# Illustrations

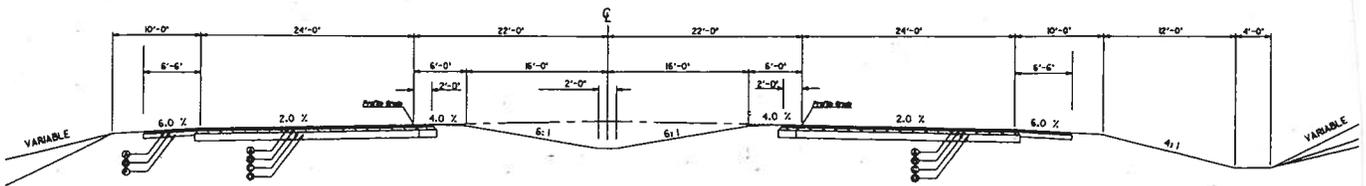


PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (21) Columbia County—P.I. Number: 221805  
SR 104/Washington Road**

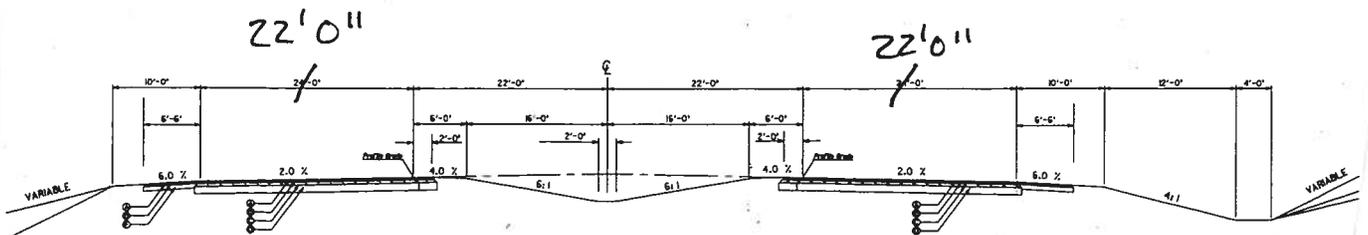
ALTERNATIVE NO.: **21-9**

DESCRIPTION: **USE 11' TRAVEL LANES**

SHEET NO.: **2 of 4**



ORIGINAL TYPICAL SECTION



REVISED TYPICAL SECTION

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (21) Columbia County- P.I. Number: 221805  
 SR 104/Washington Road

ALTERNATIVE NO.: 21-9

DESCRIPTION: USE 11' TRAVEL LANES

SHEET NO.: 3 of 4

2-12' lanes each direction  $\Rightarrow$  48' total  
 2-11' lanes each direction  $\Rightarrow$  44' total  
 $\Rightarrow$  4' less pavement

$$\begin{array}{r} \text{Sta. } 270+00 \text{ to } 393+00 \Rightarrow 12,300\text{ft} \\ \times \\ 4\text{ft} \\ \hline 49,200\text{ft}^2 \\ = 5,467\text{yd}^2 \end{array}$$

12.5mm Superpave  
 $165\text{ lbs/sy} \times 5467\text{yd}^2 \div 2000\text{ lbs/ton} = \boxed{451\text{ tons}}$

19mm Superpave  
 $220\text{ lbs/sy} \times 5467\text{yd}^2 \div 2000\text{ lbs/ton} = \boxed{601\text{ tons}}$

25mm Superpave  
 $440\text{ lbs/sy} \times 5467\text{yd}^2 \div 2000\text{ lbs/ton} = \boxed{1202\text{ tons}}$

GAB  
 $145\text{ lbs/cf} \times 49,200\text{ft}^2 \times 1.0\text{ft (depth)} \div 2000\text{ lbs/ton} = \boxed{3567\text{ tons}}$

Reduction of lane widths from 48' to 44' results in  
 an approximate earthwork reduction of  $(1 - 44/48)100 \approx 8\%$

Assume right of way reduction to be approximately 5%

Original earthwork  
 Grading Complete  $\$2,464,640 \text{ LS} \times 8\% = \$197,171$

Original ROW Cost  
 $\$14,198,932 \times 5\% = \$709,947$

# COST WORKSHEET



<b>PROJECT: STP-076-1 (21) Columbia County-- P.I. Number: 221805</b> <b>SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b> SHEET NO:	<b>21-9</b> <b>4 OF 4</b>
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<b>DESCRIPTION:</b>	<b>USE 11' TRAVEL LANES</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
310-1101 GR AGGR BASE CRS 12 IN	TN	82,415	17.17	1,415,066	78,848	17.17	1,353,820
402-3113 ASPH CON 12.5 MM	TN	11,665	85.00	991,525	11,214	85.00	953,190
402-3121 ASPH CONC 25 MM	TN	25,955	85.00	2,206,175	24,753	85.00	2,104,005
402-3190 ASPH CONC 19 MM	TN	15,255	85.00	1,296,675	14,654	85.00	1,245,590
GRADING COMPLETE	LS	1	2,464,640	2,464,640	0.92	2,464,640	2,267,469
RIGHT-OF-WAY	LS	1	14,198,932	14,198,932	0.95	14,198,932	13,488,985
<b>SUB-TOTAL</b>				22,573,013			21,413,059
<b>MARK-UP AT 10%</b>				2,257,301			2,141,306
<b>TOTAL</b>				24,830,314			23,554,365

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (23) Columbia County-- P.I. Number: 262080  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**23-2**

DESCRIPTION: **MOVE BIKE LANES TO A MULTI-USE TRAIL**

SHEET NO.: **1 of 4**

**Original Design:**

The original design calls for the construction of a 4' wide bike lane in each direction of travel. Also included is a 5' wide sidewalk on each side of the roadway which is located on 12' wide shoulder.

**Alternative Design:**

This alternative design suggests to remove the 4' bike lanes width by the same 4'. Increase the width of the sidewalk by 3' to create an 8' wide multi use trail. The trail would be located on the 16' wide shoulder to provide a 5' wide grass strip behind the curb and gutter.

**Opportunities:**

- Cost savings due to reduced pavement
- Separation of bike traffic from high speed vehicular traffic

**Risks:**

- Minor redesign required
- Possible operational issues

**Technical Discussion:**

The "Guide for Development of Bicycle Facilities" indicates sidewalk bikeways are allowed "along high speed or heavily traveled roadways" and on "long narrow bridges". This section of roadway will have a design speed of 45mph and includes a 252' long bridge.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 9,208,449	\$ 0	\$ 9,208,449
ALTERNATIVE	\$ 8,446,463	\$ 0	\$ 8,446,463
SAVINGS	\$ 761,986	\$ 0	\$ 761,986

# Illustrations

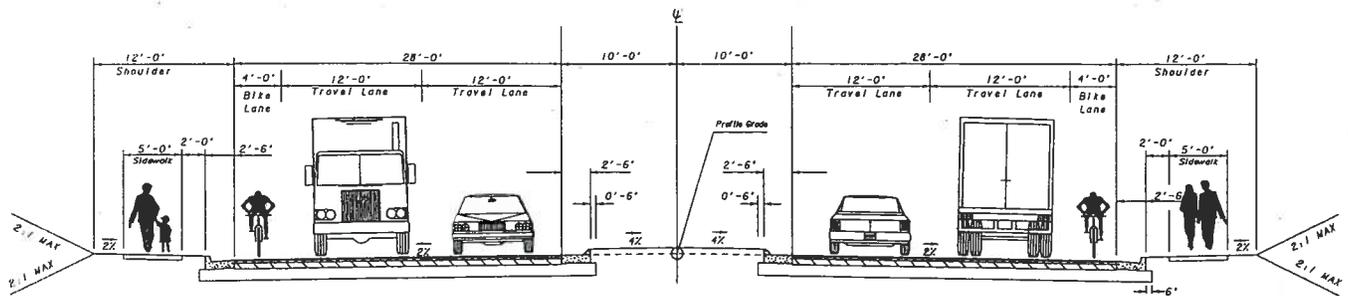


PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (23) Columbia County- P.I. Number: 262080  
SR 104/Washington Road

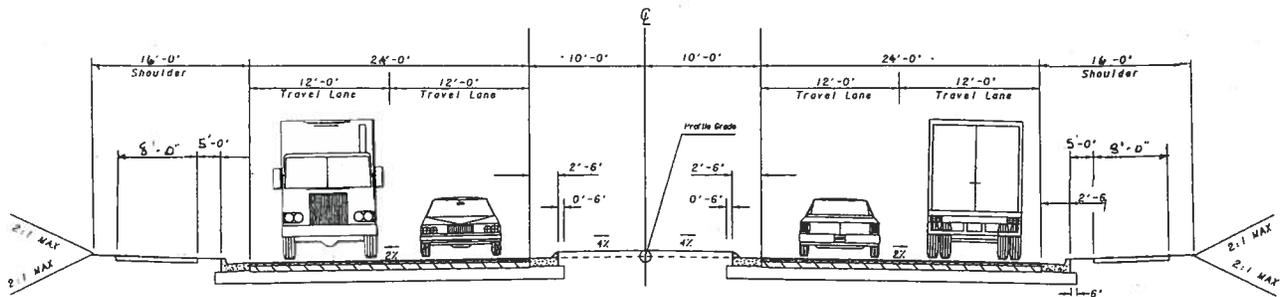
ALTERNATIVE NO.: 23-2

DESCRIPTION: MOVE BIKE LANES TO A MULTI-USE TRAIL

SHEET NO.: 2 of 4



ORIGINAL DESIGN



ALTERNATE DESIGN

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (23) Columbia County- P.I. Number: 262080  
 SR 104/Washington Road

ALTERNATIVE NO.: 23-2

DESCRIPTION: MOVE BIKE LANES TO A MULTI-USE TRAIL

SHEET NO.: 3 of 4

LENGTH OF URBAN SECTION

STA 409+00 - STA 605+00 - 19 600 LF

BIKE LANES - 4 FT WIDTH PER DIRECTION

$4' \times 2 \times 19600' = 156800 \text{ SF} = 17422 \text{ SY}$

## REDUCED QUANTITIES

12.5 mm SUPERPAVE

$165 \#/\text{SY} \times 17422 \text{ SY} \div 2000 = \underline{1437 \text{ TN}}$

19 mm SUPERPAVE

$440 \#/\text{SY} \times 17422 \text{ SY} \div 2000 = \underline{3832 \text{ TN}}$

25 mm SUPERPAVE

$350 \#/\text{SY} \times 17422 \text{ SY} \div 2000 = \underline{4791 \text{ TN}}$

GAB

ANZA

$145 \#/\text{FT}^3 \times 156800 \text{ SF} \times 1 \text{ FT (DEPTH)} \div 2000 = \underline{11368 \text{ TN}}$

## INCREASED QUANTITIES

CONCRETE SIDEWALK

$3' \times 2 \times 19600 \text{ LF} \div 9 = \underline{13066 \text{ SY}}$

# COST WORKSHEET



<b>PROJECT: STP-076-1 (23) Columbia County-- P.I. Number: 262080</b> <b>SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>	<b>23-2</b>
<b>SHEET NO:</b>		<b>4 OF 4</b>

<b>DESCRIPTION:</b>	<b>MOVE BIKE LANES TO A MULTI-USE TRAIL</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
310-1101 GR AGGR BASE CRS	TN	76,498	28.38	2,171,013	65,130	28.38	1,848,389
402-3190 RECYCLED ASPH CONC 19 MM	TN	22,988	85.00	1,953,980	19,156	85.00	1,628,260
402-3130 RECYCLED ASPH CONC 12.5 MM *	TN	8,518	85.00	724,030	7,081	85.00	601,885
402-3121 RECYCLED ASPH CONC 25 MM	TN	29,211	85.00	2,482,935	24,420	85.00	2,075,700
441-0104 CONC SIDEWALK 4 INCH	SY	28,000	37.12	1,039,360	41,066	37.12	1,524,369

\* ITEM CHANGED FROM PAY ITEM SHOWN ON ESTIMATE REPORT

<b>SUB-TOTAL</b>				8,371,318			7,678,603
<b>MARK-UP AT 10%</b>				837,131			767,860
<b>TOTAL</b>				9,208,449			8,446,463

# Value Analysis Design Suggestion



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (23) Columbia County- P.I. Number: 262080  
SR 104/Washington Road

ALTERNATIVE NO.:  
**23-3**

DESCRIPTION: **WILLIAM FEW INTERSECTION-PROVIDE TWO RIGHT  
TURN LANES AND PROVIDE FOR TWO LEFT TURN LANES**

SHEET NO.: 1 of 1

## Original Design:

The current design calls for a single right turn lane on the westbound side of SR 104/Washington Rd turning northbound on to William Few Parkway and a single left turn on the eastbound side of SR 104/Washington Rd turning northbound on to William Few Parkway.

## Alternative:

The alternative suggestion to help the congestion through the intersection would be to provide dual right and left turns in the locations described above.

### Opportunities:

- Improves safety
- Helps ease congestion of thru lanes located at intersection
- Helps vehicles turn on to William Few Parkway with less wait time at traffic light

### Risks

- Minor redesign costs
- Increases right of way, earthwork, and pavement costs
- May have to widen William Few Parkway to accommodate dual turns

## Technical Discussion:

Due to high traffic volumes going through this intersection and turning on to William Few Parkway because of the school, it would help the intersection level of service if dual right and left turn lanes would be added. A traffic engineer would have to study the intersection to determine lengths of turn lanes and signal phasing.

# Value Analysis Design Suggestion



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (23) Columbia County– P.I. Number: 262080  
SR 104/Washington Road

ALTERNATIVE NO.:  
23-4

DESCRIPTION: **DURING STAGE I, CONSTRUCT THE NEW WILLIAM FEW  
INTERSECTION FIRST TO ALLEVIATE TRAFFIC DELAYS**

SHEET NO.: 1 of 1

## Original Design:

No construction staging plans have been developed since the project is in the early stages of the design process.

## Alternative:

The suggestion would be to set up the phasing of the construction staging plan to construct this intersection as early as possible in Stage 1.

## Opportunities:

- Help ease congestion on SR 104 and through intersection of William Few Parkway earlier in the construction of the project.

## Risks

- Possible additional construction costs and time due to being limited to work in one area

## Technical Discussion:

Due to high traffic volumes going through this intersection and turning on to William Few Parkway because of the school, this intersection is one of the main areas of congestion on SR 104. It is suggested to build the improvements at this intersection before the rest of the construction on this project is started to help ease the congestion of this area while waiting on the completion of the entire project.

# Value Analysis Design Suggestion

PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (23) Columbia County– P.I. Number: 262080  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**23-5**

DESCRIPTION: **LENGTHEN RIGHT TURN STORAGE AT WILLIAM FEW  
 INTERSECTION**

SHEET NO.: 1 of 1

## Original Design:

The current design calls for a 400 ft right turn lane on the westbound side of SR 104/Washington Rd turning northbound on to William Few Parkway intersection.

## Alternative:

An alternate suggestion to help the congestion through the intersection would be to lengthen the right turn lane described above.

## Opportunities:

- Improves safety
- Helps ease congestion of thru lanes located at intersection

## Risks

- Minor redesign costs
- Increases right of way, earthwork, and pavement costs

## Technical Discussion:

Due to high traffic volumes going through this intersection and turning on to William Few Parkway because of the school, it would help the intersection level of service if the right turn lane would be lengthened. A traffic engineer would have to study the intersection to determine the distance the right turn lane would have to be lengthened.

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (23) Columbia County– P.I. Number: 262080  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**23-9**

DESCRIPTION: **DELETE COBB ROAD RE-ALIGNMENT**

SHEET NO.: **1 of 4**

**Original Design:**

The original design calls for the construction of Cobb Road in a relocated alignment to provide a perpendicular intersection with Washington Road.

**Alternative Design:**

This alternative design suggests retaining the existing alignment of Cobb Road.

**Opportunities:**

- Reduced construction costs
- Reduced Right-of-Way costs
- Eliminate two displacements

**Risks:**

- 

**Technical Discussion:**

The realignment of Cobb Road from a skewed intersection to a perpendicular intersection “decreases” the distance to the adjacent intersection. If you are going to realign, then the suggestion is to move to the west. Another suggestion is to consider realigning Hardy McManus from its original location.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 26,875,225	\$ 0	\$ 26,875,225
ALTERNATIVE	\$ 26,258,054	\$ 0	\$ 26,258,054
SAVINGS	\$ 617,171	\$ 0	\$ 617,171



# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (23) Columbia County - P.I. Number: 262080  
SR 104/Washington Road

ALTERNATIVE NO.: 23-9

DESCRIPTION: DELETE COBB ROAD RE-ALIGNMENT

SHEET NO.: 3 of 4

ELIMINATE CONSTRUCTION OF RELOCATED  
COBB ROAD FROM STA 41+02 - STA 44+12

ASSUME TYPICAL SECTION OF 24' WIDE  
ROADWAY - 6" GAB, 2" 19mm SUPERPAVE,  
1 1/2" 12.5mm SUPERPAVE

$$\text{AREA} = 310 \text{ LF} \times 24 \text{ F} = 7440 \text{ SF} = 826 \text{ SY}$$

$$\begin{aligned} \text{GAB} \quad 145 \#/\text{CY} \times 7440 \text{ SF} \times 0.5' (\text{DEPTH}) & \div 2000 \\ & = 269 \text{ TN} \end{aligned}$$

$$\begin{aligned} 19\text{mm} \quad 220 \#/\text{SY} \times 826 \text{ SY} & \div 2000 \\ & = 90 \text{ TN} \end{aligned}$$

$$\begin{aligned} 12.5\text{mm} \quad 165 \#/\text{SY} \times 826 \text{ SY} & \div 2000 \\ & = 68 \text{ TN} \end{aligned}$$

COST OF PURCHASE FOR TWO DISPLACEMENTS  
ON COBB ROAD ESTIMATED AT \$250,000  
PER PARCEL

COST OF REMOVAL FOR TWO HOUSES ON  
COBB ROAD ESTIMATED AT \$20,000 PER  
HOUSE COST REMOVED FROM CLEARING  
AND GRUBBING.

# COST WORKSHEET

<b>PROJECT: STP-076-1 (23) Columbia County– P.I. Number: 262080 SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>  <b>SHEET NO:</b>	<b>23-9</b>  <b>4 OF 4</b>
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<b>DESCRIPTION:</b>	<b>DELETE COBB ROAD RE-ALIGNMENT</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
201-1500 CLEARING & GRUBBING	LS	1	582,000	582,000	1	542,000	542,000
310-1101 GR AGGR BASE CRS	TN	76,498	28.38	2,171,013	76,229	28.38	2,163,379
403-3130 RECYCLED ASPH CONC 12.5 MM	TN	8,518	85.00	724,030	8,450	85.00	718,250
402-3190 RECYCLED ASPH CONC 19MM	TN	22,988	85.00	1,953,980	22,898	85.00	1,946,330
RIGHT-OF-WAY (APRIL 9,2007)				19,001,000			18,501,000
<b>SUB-TOTAL</b>				24,432,023			23,870,959
<b>MARK-UP AT 10%</b>				2,443,202			2,387,095
<b>TOTAL</b>				26,875,225			26,258,054

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (23) Columbia County- P.I. Number: 262080  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**23-10**

DESCRIPTION: **REDUCE-RIGHT-OF-WAY ACQUISITION**

SHEET NO.: **1 of 4**

**Original Design:**

The original design estimated Right-of-Way requirements for a rural section with 44 ft median and a 200 ft minimum Right-of-Way.

**Alternative Design:**

This alternative design suggests revising Right-of-Way requirements for the urban section, with 20 ft raised median, and set Right-of-Way based on construction limits instead of proposed minimum right-of-way.

**Opportunities:**

- Reduce Rght-of-Way impacts
- Reduce cost

**Risks:**

- Potential need for Right-of-Way at higher cost for future widening project
- Requires re-setting Right-of-Way limits on plans

**Technical Discussion:**

Based on cross sections the terrain on both sides of roadway is relatively flat, requiring less cut and fill slopes and less Right-of-Way for construction. In several locations construction limits are within existing R/W limits. This corridor is highly developed with higher than average Right-of-Way cost.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 20,931,130	\$ 0	\$ 20,931,130
ALTERNATIVE	\$ 15,698,348	\$ 0	\$ 15,698,348
SAVINGS	\$ 5,232,782	\$ 0	\$ 5,232,782

# Illustrations

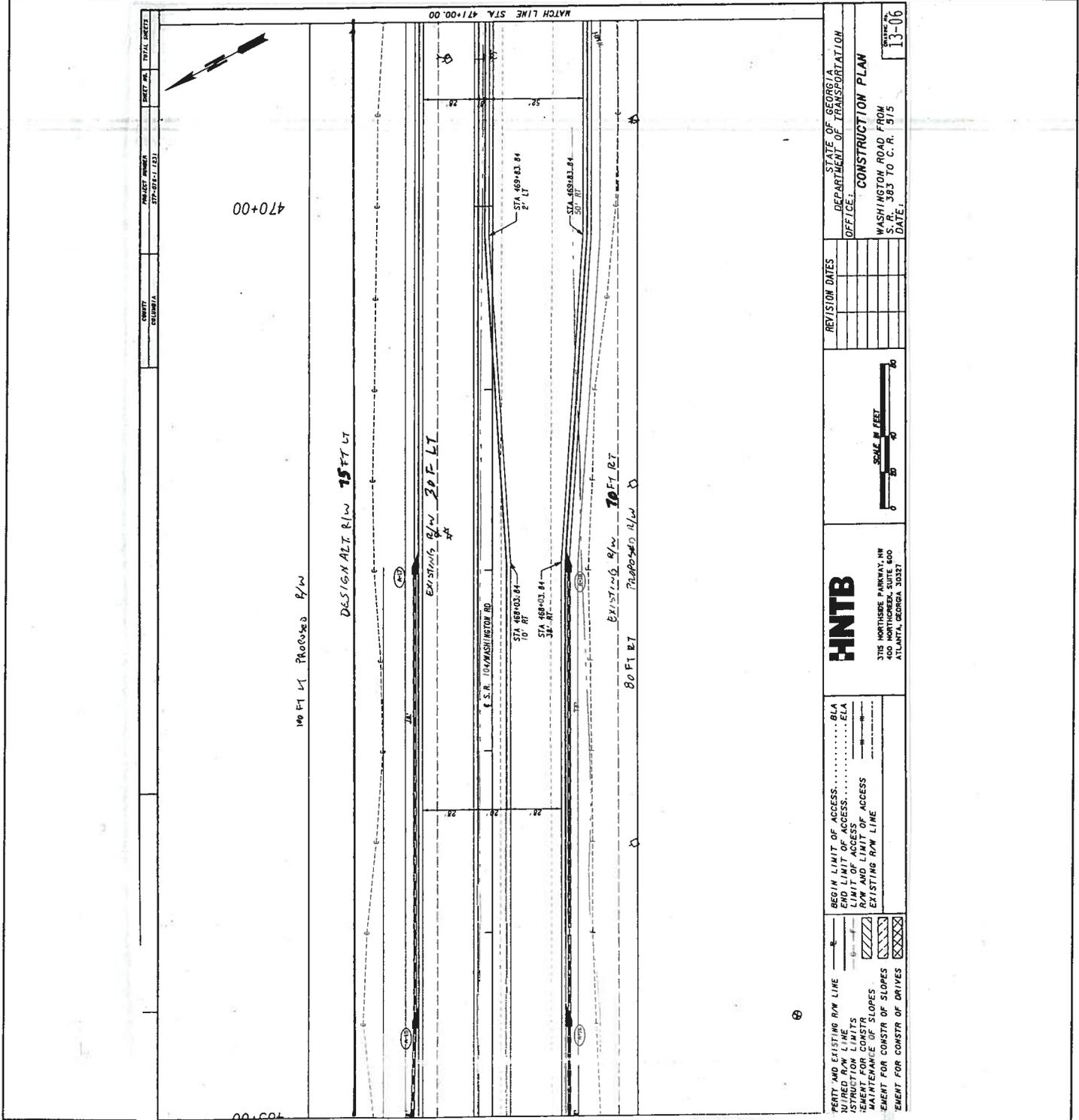


PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (23) Columbia County- P.I. Number: 262080  
 SR 104/Washington Road

ALTERNATIVE NO.: 23-10

DESCRIPTION: REDUCE RIGHT OF WAY ACQUISITION

SHEET NO.: 2 of 4



STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION OFFICE: CONSTRUCTION PLAN WASHINGTON ROAD FROM S.R. 383 TO C.R. 915 DATE: 13-06	REVISION DATES
	SCALE IN FEET 0 20 40 60 80
HNTB 315 NORTHSIDE PARKWAY, AN 400 NORTHSIDE, SUITE 600 ATLANTA, GEORGIA 30327	LEGEND _____ BEGIN LIMIT OF ACCESS _____ END LIMIT OF ACCESS _____ LIMIT OF ACQUISITION _____ R/W AND LIMIT OF ACCESS _____ EXISTING ROW LINE ▨ SLOPES ▩ CONSTANT SLOPES ▧ CONSTRAINED SLOPES

# Calculations



PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (23) Columbia County- P.I. Number: 262080**  
**SR 104/Washington Road**

ALTERNATIVE NO.:  
**23-10**

DESCRIPTION: **REDUCE RIGHT OF WAY ACQUISITION**

SHEET NO.: 3 of 4

ILLUSTRATIVE EXAMPLE:

STA 465+00 TO STA 471+00

EXIST. R/W :  $100 (600) = 60,000 \text{ SF}$

PROPOSED R/W ORIGINAL DESIGN:  $180 (600) = 108,000 \text{ SF}$

PROPOSED R/W ALTERNATIVE DESIGN:  $(75+70) (600) = 87,000 \text{ SF}$

ALTERNATIVE DESIGN RECOGNIZES THAT PROJECT  
CONSTRUCTION LIMITS ARE WITHIN R/W ON RIGHT  
SIDE OF ALIGNMENT (SOUTHERN SIDE)

$$\frac{(87,000 - 60,000)}{(108,000 - 60,000)} = .56 \rightarrow 44\% \text{ REDUCTION}$$

SIMILAR CALCULATIONS THROUGHOUT PROJECT INDICATE  
THAT THE OVERALL R/W REDUCTION COULD BE ON  
THE ORDER OF 25%

# COST WORKSHEET



<b>PROJECT: STP-076-1 (23) Columbia County— P.I. Number: 262080 SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>  <b>SHEET NO:</b>	<b>23-10</b>  <b>4 OF 4</b>
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<b>DESCRIPTION:</b>	<b>REDUCE RIGHT OF WAY ACQUISITION</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
RIGHT-OF-WAY	LS	1	19,028,300	19,028,300	0.75	19,028,300	14,271,225
<b>SUB-TOTAL</b>				19,028,300			14,271,225
<b>MARK-UP AT 10%</b>				1,902,830			1,427,123
<b>TOTAL</b>				20,931,130			15,698,348

# Value Analysis Design Suggestion

PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (23) Columbia County-- P.I. Number: 262080  
SR 104/Washington Road

ALTERNATIVE NO.:  
**23-13**

DESCRIPTION: **VERIFY WHETHER OR NOT THERE IS TO BE AN OVERLAY  
ON THE EXISTING BRIDGES, AND IF SO, CONSIDER  
BRIDGE REPLACEMENT**

SHEET NO.: 1 of 1

## Original Design:

The Concept Report recommends widening existing bridge and constructing a parallel bridge at Uchee Creek crossing. If the bridge is to be widened will the existing normal crown be retained or will overlay be required?

## Alternative:

If the existing bridge is to be overlaid, it should be verified that widening is more economical than replacement.

## Opportunities:

- Reduce Construction cost
- Replace 40 year old bridge

## Risks

- Maintenance report indicates bridge is good condition

## Technical Discussion:

Based on existing bridge plans, it appears that the existing bridge has a normal crown. The roadway typical section shows a normal crown with the PGL at the center of the median. To accomplish this on the existing bridge may require up to 8" of overlay. The existing bridge should be evaluated for the additional dead load. Additionally, the cost widening the existing bridge with overlay, possibly including rebar, should be compared with bridge replacement.

# Value Analysis Design Alternative



PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (23) Columbia County– P.I. Number: 262080**  
**SR 104/Washington Road**

ALTERNATIVE NO.: **23-14**

DESCRIPTION: **ADJUST GRADES – LOWER FROM STA 439 TO STA 445**  
**AND RAISE FROM STA 533 – 543**

SHEET NO.: **1 of 4**

**Original Design:**

The original design calls for the construction of 2 – 12’ lanes plus 4’ bike lanes in each direction. All pavement would be new construction with no overlay and reuse of existing pavement.

**Alternative Design:**

This alternative design suggests to utilize existing pavement which exists in the proposed horizontal alignment. Modification of the vertical alignment would be required but would be limited to vertical differences in elevation of +/- 1.0 ft.

**Opportunities:**

- Cost savings
- Reduced construction time
- Minor savings in earthwork

**Risks:**

- Minor redesign costs

**Technical Discussion:**

Existing profile grade would be utilized but areas would be specified where the “best fit” method, described in section 149 of the Georgia Standard Specifications, would be used.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 5,119,400	\$ 0	\$ 5,119,400
ALTERNATIVE	\$ 4,960,156	\$ 0	\$ 4,960,156
SAVINGS	\$ 159,244	\$ 0	\$ 159,244

# Illustrations

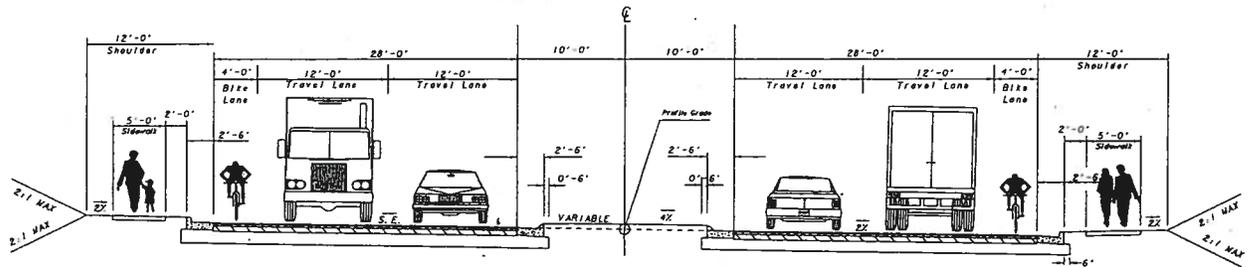


PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (23) Columbia County—P.I. Number: 262080  
SR 104/Washington Road**

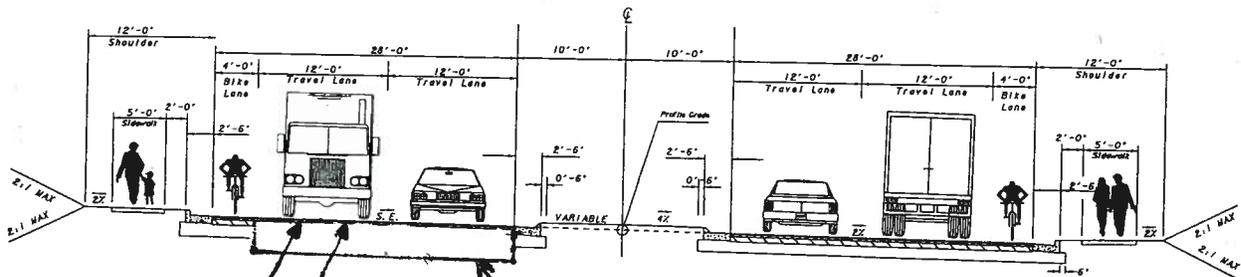
ALTERNATIVE NO.: **23-14**

DESCRIPTION: **ADJUST GRADES – LOWER FROM STA 439 TO STA 445 AND RAISE  
FROM STA 533 – 543**

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



ORIGINAL TYPICAL



EXISTING PAVEMENT

12.5mm Superpave

19mm Superpave

PROPOSED TYPICAL

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
STP-076-1 (23) Columbia County - P.I. Number: 262080  
SR 104/Washington Road

ALTERNATIVE NO.:  
23-14

DESCRIPTION: ADJUST GRADES - LOWER FROM STA 439 TO STA 445  
AND RAISE FROM STA 533 - 543

SHEET NO.: 3 of 4

$$\text{Sta. } 439+00 \text{ to Sta. } 445+00 = 600\text{ft}$$

$$\text{Sta. } 533+00 \text{ to Sta. } 543+00 = 1000\text{ft}$$

Total 1600ft

$$1600\text{ft} \times 24\text{ft} = \underline{38,400\text{ft}^2} = \underline{4,267\text{yd}^2}$$

Eliminate 25mm base and graded aggregate base

25mm Superpave

$$550\text{lb/sy} \times 4,267\text{sy} \div 2000\text{lb/ton} = 1173\text{tons}$$

GAB

$$145\text{lb/ft}^3 \times 38,400\text{ft}^2 \times 1.0\text{ft (Depth)} \div 2000\text{lb/ton} \\ = 2,784\text{tons}$$

Allow 400 tons of leveling to correct cross slopes  
and minor grade changes

# COST WORKSHEET



<b>PROJECT: STP-076-1 (23) Columbia County – P.I. Number: 262080</b> <b>SR 104/Washington Road</b>	<b>ALTERNATIVE NO:</b>	<b>23-14</b>
<b>SHEET NO:</b>		<b>4 OF 4</b>

<b>DESCRIPTION:</b>	<b>ADJUST GRADES – LOWER FROM STA 439 TO STA 445 AND</b> <b>RAISE FROM STA 533 – 543</b>
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CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
GRADED AGGREGATE BASE	TN	76,498	28.38	2,171,000	73,714	28.38	2,092,003
ASPH CONC 25 MM SUPERPAVE	TN	29,211	85.00	2,483,000	28,038	85.00	2,383,230
402-1812 RECYCLED ASPH CONC LEVELING	TN	0	85.00	0	400	85.00	34,000
<b>SUB-TOTAL</b>				4,654,000			4,509,233
<b>MARK-UP AT 10%</b>				465,400			450,923
<b>TOTAL</b>				5,119,400			4,960,156

# Value Analysis Design Alternative



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (23) Columbia County– P.I. Number: 262080  
 SR 104/Washington Road

ALTERNATIVE NO.:  
**23-15**

DESCRIPTION: USE 11' TRAVEL LANES

SHEET NO.: 1 of 4

**Original Design:**

The original design calls for the construction of 2 – 12' travel lanes in each direction.

**Alternative Design:**

This alternative design suggests creating 2 – 11' travel lanes in each direction, thus reducing the total pavement width by 4'.

**Opportunities:**

- Reduced pavement quantities
- Reduced earthwork
- Reduced right of way
- Shorter pedestrian crossings

**Risks:**

- Minor redesign costs
- Reduces the safety and comfort of driving
- Lower level of service
- Less buffer between bicycles and actual vehicles

**Technical Discussion:**

According to the AASHTO Design Manual, Chapter 4 – Cross Section Elements, there is a section discussing lane widths used under varying conditions. It states that lane widths of 9 ft to 12 ft lanes are generally used. It also says that while 12' lanes are preferred, 11 ft lanes are acceptable under certain circumstances. In urban areas especially, where pedestrian crossings, right of way, or existing development become stringent controls, the use of 11' lanes is acceptable.

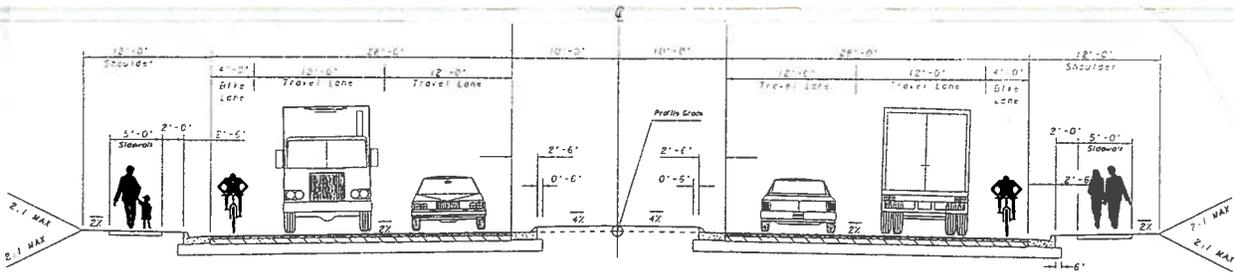
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 30,677,634	\$ 0	\$ 30,677,634
ALTERNATIVE	\$ 28,795,908	\$ 0	\$ 28,795,908
SAVINGS	\$ 1,881,726	\$ 0	\$ 1,881,726

PROJECT: **GEORGIA DEPARTMENT OF TRANSPORTATION**  
**STP-076-1 (23) Columbia County- P.I. Number: 262080**  
**SR 104/Washington Road**

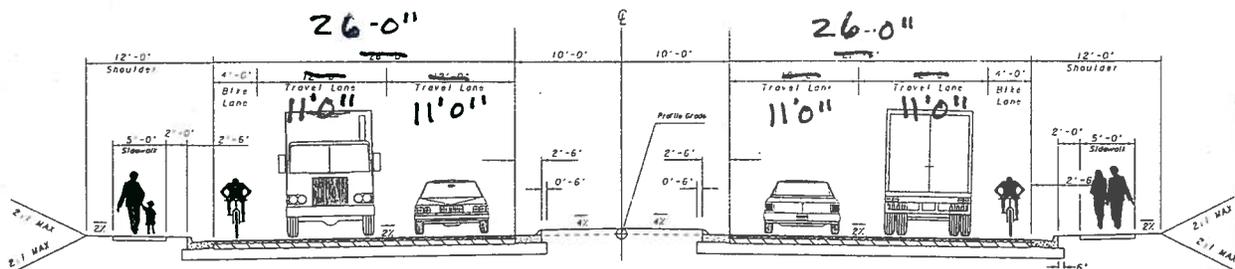
ALTERNATIVE NO.: **23-15**

DESCRIPTION: **USE 11' TRAVEL LANES**

SHEET NO.: **2 of 4**



ORIGINAL TYPICAL SECTION



REVISED TYPICAL SECTION

# Calculations



PROJECT: GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (23) Columbia County- P.I. Number: 262080  
 SR 104/Washington Road

ALTERNATIVE NO.: 23-15

DESCRIPTION: USE 11' TRAVEL LANES

SHEET NO.: 3 of 4

2-12' lanes each direction  $\Rightarrow$  48' total  
 2-11' lanes each direction  $\Rightarrow$  44' total  
 $\Rightarrow$  4' less pavement

$$\begin{aligned} \text{Sta } 393+00 \text{ to } 605+00 &\Rightarrow 21,200 \text{ ft} \\ &\times 4 \text{ ft} \\ \hline &84,800 \text{ ft}^2 \\ &= 9,422 \text{ yd}^2 \end{aligned}$$

12.5mm Superpave

$$165 \text{ lbs/sy} \times 9,422 \text{ yd}^2 \div 2000 \text{ lbs/ton} = \boxed{777 \text{ tons}}$$

19mm Superpave

$$440 \text{ lbs/sy} \times 9,422 \text{ yd}^2 \div 2000 \text{ lbs/ton} = \boxed{2073 \text{ tons}}$$

25mm Superpave

$$550 \text{ lbs/sy} \times 9,422 \text{ yd}^2 \div 2000 \text{ lbs/ton} = \boxed{2591 \text{ tons}}$$

GAB

$$145 \text{ lbs/cf} \times 84,800 \text{ ft}^2 \times 1.0 \text{ ft (depth)} \div 2000 \text{ lbs/ton} = \boxed{6148 \text{ tons}}$$

Reduction of lane widths from 48' to 44' results in  
 an approximate earthwork reduction of  $(1 - 44/48)100 \approx 8\%$   
 Assume right of way reduction to be approximately 5%

Original earthwork

$$\text{IN PLACE EMBANKMENT } 150,000 \text{ cy} \times 8\% = 12,000 \text{ cy}$$

Original Low Cost

$$\$19,028,300 \times 5\% = \boxed{\$951,415}$$

# COST WORKSHEET



<b>PROJECT: STP-076-1 (23) Columbia County- P.I. Number: 262080 SR 104/Washington Road</b>					<b>ALTERNATIVE NO: 23-15</b>		<b>SHEET NO: 4 OF 4</b>	
<b>DESCRIPTION:</b>			<b>USE 11' TRAVEL LANES</b>					
CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE			
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL	
310—1101 GR AGGR BASE CRS 12 IN	TN	76,498	28.38	2,171,013	70,350	28.38	1,996,533	
400-3205 ASPH CONC 12.5 MM	TN	8,518	85.00	724,030	7,741	85.00	657,985	
402-321 ASPH CONC 25 MM	TN	29,211	85.00	2,482,935	26,620	85.00	2,262,700	
402-3190 ASPH CONC 19 MM	TN	22,988	85.00	1,953,980	20,915	85.00	1,777,775	
208-0100 IN PLACE EMBANKMENT	CY	150,000	10.19	1,528,500	138,000	10.19	1,406,220	
RIGHT OF WAY	LS	1		19,028,300	0.95		18,076,885	
<b>SUB-TOTAL</b>				27,888,758			26,178,098	
<b>MARK-UP AT 10%</b>				2,788,876			2,617,810	
<b>TOTAL</b>				30,677,634			28,795,908	

## **PROJECT DESCRIPTION**

These projects represent approximately 11.46 miles of SR 104 and a portion (1,400') of SR 47, Columbia County, Ga. The projects begin just west of the US 221, SR 150, intersection with SR 104 and continue east to a point just beyond the CR 99 Gibbs Road intersection. The existing roadway varies from two to four travel lanes. The two lane portions have an intermittent third lane for passing and occasional turn lanes. The project is to increase the capacity of the existing by providing a minimum of four travel lanes with additional turning lanes as warranted. The westerly 7.44 miles will be a "rural" four lanes with a depressed 44' grassed median. The easterly 4.01 miles will be an "urban" four lanes with a 20' raised median.

This project was originally programmed as part of project MLP-104 (13) which has been reprogrammed into three separate projects (STP-076-1(21), STP-076-1 (22), and STP-076-1 (23).

Please see the following enclosed documents:

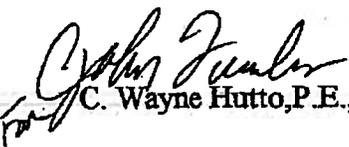
- Georgia Department of Transportation
  - The Concept Plan of Proposed STP-076-1(21,22,23) Columbia County, Georgia; PI Nos.: 221805, 221800, 262080
  - Construction Cost Estimates

The VE Team utilized the supplied project materials noted above, along with the design products from **HNTB, Clark Patterson Associates, Washington Group International**, and the current standard drawings, details and specifications during the conduct of their work in the VE Study effort.

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

**INTERDEPARTMENT CORRESPONDENCE**

**FILE** STP-076-1(21) Columbia County **OFFICE** Preconstruction  
P.I. No. 221805 **DATE** February 5, 2001

**FROM**  C. Wayne Hutto, P.E., Assistant Director of Preconstruction

**TO** Frank L. Danchetz, P.E., Chief Engineer

**SUBJECT** PROJECT CONCEPT REPORT

This project is the widening and reconstruction of SR 104 from just east of Mt. Rosemont Road/CR 80 to just east of Cumberland Drive/CR 515 for a total of 3.0 miles. Existing SR 104 consists of 2 and 3 lanes with 6' rural shoulders on 100' of existing right-of-way. State Route 104 is a northwesterly corridor serving Augusta-Richmond County, Columbia County and the Clark's Hill area. This route is currently operating at an unacceptable Level of Service (LOS) and will continue to worsen as Columbia County continues to develop. Without improvements, the corridor likely will continue to experience accident rates in excess of the statewide average. The projected (2006) traffic volumes along this section of SR 104 is 10,194 VPD. The current LOS along this section of SR 104 is "D." The projected design year (2026) traffic volume is 13,782 VPD. The future LOS under a no-build condition is "F." To provide an acceptable LOS in year 2026, four lanes are needed to meet the projected demand.

The construction proposes to widen SR 104 to provide four, 12' lanes, two in each direction with a 44' wide depressed grassed median on 200' of minimum proposed right-of-way. The existing bridges over Kiokee and Little Kiokee Creeks will be widened to 38'. Parallel bridges will be constructed over Kiokee and Little Kiokee Creeks to accommodate the new lanes. Traffic will be maintained via staging during construction.

Environmental concerns include requiring a COE 404 Permit; a Categorical Exclusion will be prepared; a public hearing will be held; time saving procedures are not appropriate.

The estimated costs for this project are:

	<u>PROPOSED</u>	<u>APPROVED</u>	<u>PROG DATE</u>	<u>LET DATE</u>
Construction (includes E&C and inflation)	\$9,603,000	\$9,530,000	2005	04-07
Right-of-Way	\$2,824,000	\$2,824,000		
Utilities*	LGPA	LGPA		





## Estimate Report for file "221805"

<b>Section DRAINAGE</b>					
Item Number	Quantity	Units	Unit Price	Item Description	Cost
500-3101	496	CY	578.66	CLASS A CONCRETE (BOX CULVERT)	287015.36
500-3200	20	CY	530.90	CLASS B CONCRETE (SAFETY INLET W/ GRATES)	10618.00
511-1000	1350	LB	0.95	BAR REINF STEEL (SAFETY INLET W/ GRATES)	1282.50
511-1000	52650	LB	0.95	BAR REINF STEEL (BOX CULVERT)	50017.50
550-1180	2067	LF	41.02	STORM DRAIN PIPE, 18 IN, H 1-10	84788.34
550-1240	450	LF	53.78	STORM DRAIN PIPE, 24 IN, H 1-10	24201.00
550-1300	338	LF	65.92	STORM DRAIN PIPE, 30 IN, H 1-10	22280.96
550-1360	78	LF	77.97	STORM DRAIN PIPE, 36 IN, H 1-10	6081.66
550-2180	1250	LF	28.99	SIDE DRAIN PIPE, 18 IN, H 1-10	36237.50
550-3618	56	EA	601.55	SAFETY END SECTION 18 IN, SIDE DRAIN, 6:1 SLOPE	33686.80
550-4218	18	EA	678.07	FLARED END SECTION 18 IN, STORM DRAIN	12205.26
550-4224	6	EA	882.93	FLARED END SECTION 24 IN, STORM DRAIN	5297.58
550-4230	4	EA	909.32	FLARED END SECTION 30 IN, STORM DRAIN	3637.28
550-4236	2	EA	1202.05	FLARED END SECTION 36 IN, STORM DRAIN	2404.10
576-1018	247	LF	26.13	SLOPE DRAIN PIPE, 18 IN	6454.11
668-2100	28	EA	4470.97	DROP INLET, GP 1	125187.16
668-2105	8	EA	4663.90	DROP INLET, GP 1, SPCL DES	37311.20
668-2110	5	LF	267.06	DROP INLET, GP 1, ADDL DEPTH	1335.30
<b>Section Sub Total:</b>					<b>\$750,041.61</b>

<b>Section EROSION CONTROL - TEMPORARY</b>					
Item Number	Quantity	Units	Unit Price	Item Description	Cost
163-0232	24	AC	571.97	TEMPORARY GRASSING	13727.28
163-0300	10	EA	2872.37	CONSTRUCTION EXIT	28723.70
163-0501	3	EA	924.07	CONSTRUCT AND REMOVE SILT CONTROL GATE, TP 1	2772.21
163-0531	12	EA	8070.58	CONSTRUCT AND REMOVE SEDIMENT BASIN, TP 1, STA NO -	96846.96
163-0550	42	EA	308.76	CONSTRUCT AND REMOVE INLET SEDIMENT TRAP	12967.92
165-0010	4100	LF	0.93	MAINTENANCE OF TEMPORARY SILT FENCE, TP A	3813.00
165-0030	6100	LF	1.83	MAINTENANCE OF TEMPORARY SILT FENCE, TP C	11163.00
165-0085	42	EA	313.22	MAINTENANCE OF SILT CONTROL GATE, TP 1	13155.24
165-0101	10	EA	660.01	MAINTENANCE OF CONSTRUCTION EXIT	6600.10
171-0010	8200	LF	1.80	TEMPORARY SILT FENCE, TYPE A	14760.00
171-0030	12200	LF	3.84	TEMPORARY SILT FENCE, TYPE C	46848.00
716-2000	23860	SY	1.15	EROSION CONTROL MATS, SLOPES	27439.00
<b>Section Sub Total:</b>					<b>\$278,816.41</b>

<b>Section EROSION CONTROL - PERMANENT</b>					
Item Number	Quantity	Units	Unit Price	Item Description	Cost
163-0240	932	TN	183.84	MULCH	171338.88
603-2180	600	SY	43.48	STN DUMPED RIP RAP, TP 3, 12 IN	26088.00
603-7000	750	SY	4.83	PLASTIC FILTER FABRIC	3622.50
700-6910	47	AC	906.91	PERMANENT GRASSING	42624.77
700-7000	141	TN	58.05	AGRICULTURAL LIME	8185.05
700-7010	118	GL	19.30	LIQUID LIME	2277.40
700-8000	43	TN	348.14	FERTILIZER MIXED GRADE	14970.02
700-8100	2350	LB	2.04	FERTILIZER NITROGEN CONTENT	4794.00
<b>Section Sub Total:</b>					<b>\$273,900.62</b>

<b>Section BRIDGE</b>					
Item Number	Quantity	Units	Unit Price	Item Description	Cost
543-1100	1	LS	1800000.00	CONSTR OF BRIDGE - COMPLETE - BRIDGE NO.1	1800000.00
543-1100	1	LS	1187500.00	CONSTR OF BRIDGE - COMPLETE - BRIDGE	1187500.00

			NO.2	
				<b>Section Sub Total: \$2,987,500.00</b>

<b>Section ROADWAY</b>					
Item Number	Quantity	Units	Unit Price	Item Description	Cost
150-1000	1	LS	100000.00	TRAFFIC CONTROL -	100000.00
150-5000	60	EA	486.45	TRAFFIC CONTROL, TEMPORARY SAND LOADED ATTENUATOR MODULE	29187.00
153-1300	1	EA	75272.56	FIELD ENGINEERS OFFICE TP 3	75272.56
207-0203	155	CY	50.55	FOUND BK FILL MATL, TP II	7835.25
210-0100	1	LS	2464640.00	GRADING COMPLETE -	2464640.00
310-1101	82415	TN	17.17	GR AGGR BASE CRS, INCL MATL	1415065.55
318-3000	2000	TN	17.21	AGGR SURF CRS	34420.00
402-3113	11665	TN	85.00	RECYCLED ASPH CONC 12.5 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	991525.00
402-3121	25955	TN	85.00	RECYCLED ASPH CONC 25 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	2206175.00
402-3190	15255	TN	85.00	RECYCLED ASPH CONC 19 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	1296675.00
413-1000	15715	GL	1.84	BITUM TACK COAT	28915.60
622-1033	1200	LF	50.00	PRECAST CONCRETE MEDIAN BARRIER, METHOD 3	60000.00
634-1200	200	EA	104.82	RIGHT OF WAY MARKERS	20964.00
641-1100	236	LF	51.47	GUARDRAIL, TP T	12146.92
641-1200	12792	LF	18.54	GUARDRAIL, TP W	237163.68
641-5001	18	EA	617.35	GUARDRAIL ANCHORAGE, TP 1	11112.30
641-5012	26	EA	1871.80	GUARDRAIL ANCHORAGE, TP 12	48666.80
<b>Section Sub Total:</b>					<b>\$9,039,764.66</b>

<b>Section SIGNING &amp; MARKING</b>					
Item Number	Quantity	Units	Unit Price	Item Description	Cost
636-1020	290	SF	15.31	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING, TP 3	4439.90
636-1031	230	SF	26.99	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING TP 6	6207.70
636-2070	816	LF	8.75	GALV STEEL POSTS, TP 7	7140.00
653-0120	45	EA	72.67	THERMOPLASTIC PVMT MARKING, ARROW, TP 2	3270.15
653-0170	31	EA	80.60	THERMOPLASTIC PVMT MARKING, ARROW, TP 7	2498.60
653-1501	26000	LF	0.63	THERMOPLASTIC SOLID TRAF STRIPE, 5 IN, WHITE	16380.00
653-1502	26300	LF	0.69	THERMOPLASTIC SOLID TRAF STRIPE, 5 IN, YELLOW	18147.00
653-1704	210	LF	5.02	THERMOPLASTIC SOLID TRAF STRIPE, 24 IN, WHITE	1054.20
653-3501	28300	GLF	0.48	THERMOPLASTIC SKIP TRAF STRIPE, 5 IN, WHITE	13584.00
653-6004	8720	SY	2.79	THERMOPLASTIC TRAF STRIPING, WHITE	24328.80
653-6006	250	SY	3.21	THERMOPLASTIC TRAF STRIPING, YELLOW	802.50
654-1001	90	EA	3.64	RAISED PVMT MARKERS TP 1	327.60
654-1003	1050	EA	3.78	RAISED PVMT MARKERS TP 3	3969.00
<b>Section Sub Total:</b>					<b>\$102,149.45</b>

**Total Estimated Cost: \$13,432,172.75**

**Subtotal Construction Cost \$13,432,172.75**

E&C Rate 10 % \$1,343,217.28

Inflation Rate 0.0 % @ 0.0 Years \$0.00

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**Total Construction Cost \$14,775,390.02**

Right Of Way	\$14,198,932.00
ReImb. Utilities	\$263,781.00

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<b>Grand Total Project Cost</b>	<b>\$29,238,103.02</b>
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412102

**DEPARTMENT OF TRANSPORTATION  
STATE OF GEORGIA**

**INTERDEPARTMENT CORRESPONDENCE**

**FILE** STP-076-1(22) Columbia County **OFFICE** Preconstruction  
P.I. No. 221800

**DATE** February 5, 2001

**FROM**  C. Wayne Hutto, P.E., Assistant Director of Preconstruction

**TO** Frank L. Danchetz, P.E., Chief Engineer

**SUBJECT** PROJECT CONCEPT REPORT

This project is the widening and reconstruction of SR 104 from 0.5 mile west of US 221/Pollard's Corner to just east of Mt. Rosemont Road/CR 80 for a total of 3.30 miles. Existing SR 104 consists of 2 and 3 lanes with 6' rural shoulders on 100' of existing right-of-way. State Route 104 is a northwesterly corridor serving Augusta-Richmond County, Columbia County and the Clark's Hill Lake area. This route is experiencing traffic congestion and delays as this area of Columbia County continues to develop and grow residentially as a bedroom community of Augusta. The projected (2006) traffic volumes along this section of SR 104 is 8,904 VPD. The current Level of Service (LOS) along SR 104 is "D." The projected design year (2026) traffic volume is 11,958 VPD, resulting in a LOS "F." To provide an acceptable LOS in year 2026, four lanes are needed to meet the projected demand.

The construction proposes to widen SR 104 to provide four, 12' lanes, two in each direction with a 44' wide depressed grassed median on 200' of minimum proposed right-of-way. Traffic will be maintained via staging during construction.

Environmental concerns include requiring a COE 404 Permit; a Categorical Exclusion will be prepared; a public hearing will be held; time saving procedures are not appropriate.

The estimated costs for this project are:

	<u>PROPOSED</u>	<u>APPROVED</u>	<u>PROG DATE</u>	<u>LET DATE</u>
Construction (includes E&C and inflation)	\$9,192,000	\$9,110,000	2006	FY-06
Right-of-Way	\$2,313,000	—		
Utilities*	LGPA	LGPA		

UTILITY COST ESTIMATE									
PROJECT #	COUNTY	PROJECT DESCRIPTION		P.I. NUMBER	LAYOUT DATE				
STP-076-1 (22)	Columbia	SR 104 from M.P. 11.95 Southeast / CR 80 to Northwest of SR 47 @ Pollards Corner		221800	5/22/2007				
REIMBURSABLE QUANTITY	NON-REIMBURSABLE QUANTITY	UNITS	ITEM DESCRIPTION	UNIT PRICE	REIMBURSABLE COST	NON-REIMBURSABLE COST			
44	5	Each	GEORGIA POWER COMPANY Relocate Distribution Power Poles	\$7,000.00	\$308,000.00	\$35,000.00			
			Georgia Power Company has facilities located approx. 55' from centerline throughout the project limits that may be eligible for reimbursement. Information for this estimate was provided by field measurements of poles.						
			<b>WATER</b>						
			* COLUMBIA COUNTY WATER & SEWER DEPARTMENT						
0	15630	Lin Ft	Relocate Water Main - 12" Ductile Iron	\$65.00	\$0.00	\$1,015,950.00			
0	10	Each	Relocate Fire Hydrant	\$1,700.00	\$0.00	\$17,000.00			
			Water is located throughout this project. Information for this estimate was provided by Eric Hinds with Columbia County Water & Sewer Department and Item Mean Summary.						
			<b>SEWER</b>						
			<b>NONE</b>						
			There are no sewer facilities located within the project limits. Information provided by Eric Hinds With Columbia County Water & Sewer Dept.		\$0.00	\$1,032,950.00			
			<b>TELEPHONE</b>						
			<b>BELLSOUTH</b>						
1		Each	4'X3'X1' Cross Box Cabinet located off R/W	\$25,000.00	\$25,000.00	\$0.00			
	3	Each	Relocate Telephone Poles	\$2,000.00	\$0.00	\$6,000.00			
			BellSouth has facilities located off the existing Right of Way that should be eligible for reimbursement. Also, they have facilities within the existing Right of Way throughout the project limits that should not be eligible for reimbursement. Information for this estimate was provided by Warren Geitgey with Bellsouth and field measurements.						
					\$25,000.00	\$6,000.00			
					\$0.00	\$0.00			
					\$25,000.00	\$6,000.00			



**Estimate Report for file "STP-076-1(22)"**

<b>Section ROADWAY</b>					
<b>Item Number</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Price</b>	<b>Item Description</b>	<b>Cost</b>
150-1000	1	LS	390000.00	TRAFFIC CONTROL -	390000.00
153-1300	1	EA	75000.00	FIELD ENGINEERS OFFICE TP 3	75000.00
201-1500	1	LS	1600000.00	CLEARING & GRUBBING -	1600000.00
205-0001	240449	CY	4.50	UNCLASS EXCAV	1082020.50
206-0002	219201	CY	4.50	BORROW EXCAV, INCL MATL	986404.50
310-5100	88075	SY	17.00	GR AGGR BASE CRS, 10 INCH, INCL MATL	1497275.00
400-3205	13511	TN	85.00	ASPH CONC 12.5 MM OGFC, GP 2 ONLY, INCL BITUM MATL & H LIME	1148435.00
402-3121	36014	TN	85.00	RECYCLED ASPH CONC 25 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	3061190.00
402-3190	27007	TN	85.00	RECYCLED ASPH CONC 19 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	2295595.00
413-1000	14913	GL	1.50	BITUM TACK COAT	22369.50
441-0016	2000	SY	50.00	DRIVEWAY CONCRETE, 6 IN TK	100000.00
441-0748	100	SY	60.00	CONCRETE MEDIAN, 6 IN	6000.00
446-1100	5000	LF	10.00	PVMT REINF FABRIC STRIPS, TP 2, 18 INCH WIDTH	50000.00
634-1200	120	EA	90.00	RIGHT OF WAY MARKERS	10800.00
641-1200	6000	LF	19.00	GUARDRAIL, TP W	114000.00
641-5001	10	EA	600.00	GUARDRAIL ANCHORAGE, TP 1	6000.00
641-5012	10	EA	1900.00	GUARDRAIL ANCHORAGE, TP 12	19000.00
643-4000	5000	LF	25.00	WOVEN WIRE FENCE	125000.00
647-1000	1	LS	120000.00	TRAFFIC SIGNAL INSTALLATION NO -	120000.00
<b>Section Sub Total:</b>					<b>\$12,709,089.50</b>

<b>Section DRAINAGE</b>					
<b>Item Number</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Price</b>	<b>Item Description</b>	<b>Cost</b>
207-0203	240	CY	40.00	FOUND BKFILL MATL, TP II	9600.00
500-3101	513	CY	800.00	CLASS A CONCRETE	410400.00
511-1000	56950	LB	1.50	BAR REINF STEEL	85425.00
550-1180	8900	LF	40.00	STORM DRAIN PIPE, 18 IN, H 1-10	356000.00
550-1240	2200	LF	47.00	STORM DRAIN PIPE, 24 IN, H 1-10	103400.00
550-1300	892	LF	55.00	STORM DRAIN PIPE, 30 IN, H 1-10	49060.00
550-3318	14	EA	700.00	SAFETY END SECTION 18 IN, STORM DRAIN, 4:1 SLOPE	9800.00
550-3324	4	EA	1000.00	SAFETY END SECTION 24 IN, STORM DRAIN, 4:1 SLOPE	4000.00
550-4218	18	EA	650.00	FLARED END SECTION 18 IN, STORM DRAIN	11700.00
550-4224	2	EA	700.00	FLARED END SECTION 24 IN, STORM DRAIN	1400.00
550-4230	14	EA	900.00	FLARED END SECTION 30 IN, STORM DRAIN	12600.00
603-2024	600	SY	60.00	STN DUMPED RIP RAP, TP 1, 24 IN	36000.00
603-7000	600	SY	3.50	PLASTIC FILTER FABRIC	2100.00
668-2100	69	EA	2250.00	DROP INLET, GP 1	155250.00
<b>Section Sub Total:</b>					<b>\$1,246,735.00</b>

<b>Section SIGNING&amp;MARKING</b>					
<b>Item Number</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Price</b>	<b>Item Description</b>	<b>Cost</b>
636-1020	70	SF	15.31	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING, TP 3	1071.70
636-1031	90	SF	26.99	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING TP 6	2429.10
636-2070	420	LF	8.75	GALV STEEL POSTS, TP 7	3675.00
652-2501	7	LM	342.37	SOLID TRAFFIC STRIPE, 5 IN, WHITE	2396.59
652-2502	8	LM	352.12	SOLID TRAFFIC STRIPE, 5 IN, YELLOW	2816.96
652-3501	6	GLM	291.76	SKIP TRAFFIC STRIPE, 5 IN, WHITE	1750.56
652-6301	600	GLF	0.26	SKIP TRAF STRIPE, 6 IN, WHITE	156.00
653-0110	38	EA	70.04	THERMOPLASTIC PVMT MARKING, ARROW, TP 1	2661.52
653-0120	15	EA	72.67	THERMOPLASTIC PVMT MARKING, ARROW, TP 2	1090.05
657-5001	17677	SY	31.73	PREFORMED PLASTIC PAVEMENT MARKING, WHITE, TP PB	560891.21

657-5002	3206	SY	21.00	PREFORMED PLASTIC PAVEMENT MARKING, YELLOW, TP PB	67326.00
<b>Section Sub Total:</b>					<b>\$646,264.69</b>

<b>Section EROSION CONTROL-PERMANENT</b>					
Item Number	Quantity	Units	Unit Price	Item Description	Cost
441-0204	160	SY	33.76	PLAIN CONC DITCH PAVING, 4 IN	5401.60
700-6910	67	AC	906.91	PERMANENT GRASSING	60762.97
700-7000	201	TN	58.05	AGRICULTURAL LIME	11668.05
700-7010	168	GL	19.30	LIQUID LIME	3242.40
700-8000	74	TN	348.14	FERTILIZER MIXED GRADE	25762.36
700-8100	3350	LB	2.04	FERTILIZER NITROGEN CONTENT	6834.00
710-9000	4000	SY	3.65	PERMANENT SOIL REINFORCING MAT	14600.00
715-2200	160	SY	1.95	BITUMINOUS TREATED ROVING, WATERWAYS	312.00
716-2000	4000	SY	1.15	EROSION CONTROL MATS, SLOPES	4600.00
<b>Section Sub Total:</b>					<b>\$133,183.38</b>

<b>Section EROSION CONTROL-TEMPORARY</b>					
Item Number	Quantity	Units	Unit Price	Item Description	Cost
163-0232	34	AC	571.97	TEMPORARY GRASSING	19446.98
163-0240	434	TN	183.84	MULCH	79786.56
163-0300	4	EA	2872.37	CONSTRUCTION EXIT	11489.48
163-0501	69	EA	924.07	CONSTRUCT AND REMOVE SILT CONTROL GATE, TP 1	63760.83
163-0503	4	EA	549.25	CONSTRUCT AND REMOVE SILT CONTROL GATE, TP 3	2197.00
163-0531	29	EA	8070.58	CONSTRUCT AND REMOVE SEDIMENT BASIN, TP 1, STA NO -	234046.82
165-0010	53824	LF	0.93	MAINTENANCE OF TEMPORARY SILT FENCE, TP A	50056.32
165-0030	1536	LF	1.83	MAINTENANCE OF TEMPORARY SILT FENCE, TP C	2810.88
165-0060	29	EA	1213.72	MAINTENANCE OF TEMPORARY SEDIMENT BASIN, STA NO -	35197.88
165-0070	480	LF	2.29	MAINTENANCE OF BALED STRAW EROSION CHECK	1099.20
165-0101	4	EA	660.01	MAINTENANCE OF CONSTRUCTION EXIT	2640.04
167-1000	2	EA	1349.35	WATER QUALITY MONITORING AND SAMPLING	2698.70
167-1500	24	MO	1035.76	WATER QUALITY INSPECTIONS	24858.24
171-0010	53824	LF	1.80	TEMPORARY SILT FENCE, TYPE A	96883.20
171-0030	1536	LF	3.84	TEMPORARY SILT FENCE, TYPE C	5898.24
<b>Section Sub Total:</b>					<b>\$632,870.37</b>

**Total Estimated Cost: \$15,368,142.94**

<b>Subtotal Construction Cost</b>	<b>\$15,368,142.94</b>
E&C Rate 10.0 %	\$1,536,814.29
Inflation Rate 0.0 % @ 0.0 Years	\$0.00
<b>Total Construction Cost</b>	<b>\$16,904,957.23</b>
Right Of Way	\$6,085,000.00
ReImb. Utilities	\$580,000.00
<b>Grand Total Project Cost</b>	<b>\$23,569,957.23</b>



# REVISED PROJECT CONCEPT REPORT

**Need and Purpose:** The need exists to provide local and through traffic with an improved travel way on SR 104/Washington Rd. SR 104/Washington Rd is currently operating at an unacceptable level of service which will continue to worsen as Columbia County continues to develop and grow. Without improvement, the corridor likely will continue to experience accident rates in excess of the statewide average. The purpose of the proposed improvement is to provide local and through traffic with a facility that will adequately serve current and future travel demand and provide the public with a safer driving environment.

**Project location:** Project STP-076-1(23) is located in Columbia County. The original project consists of the widening and reconstruction of 2.35 miles of SR 104 from just east of Cumberland Drive/CR 515 (milepost 8.95) to east of Halili Farm Road/CR 91 (milepost 6.6).

**Description of the approved concept:** The proposed project is to widen SR 104 to provide a typical section comprising of four 12-foot travel lanes (two lanes in each direction) with a 44-foot median. The inside shoulders are proposed to be 6-foot wide (2-feet paved). The outside shoulders are proposed to be 10-foot wide (6.5-feet paved) with open ditches. The right of way of the improved facility will be 200 feet wide minimum.

**PDP Classification:** Major     X     Minor                     

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

**Functional Classification:** Urban Minor Arterial

**U. S. Route Number(s):** NA **State Route Number(s):** SR 104

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

Current Year (2012): 30,200 Design Year (2032): 46,900

**Proposed features to be revised:**

*Typical Section*

*Project Termini*

*Major Structure*

*Functional Classification*

*Design Speed*

*Maximum Degree of Curvature*

*Maximum Grade*

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

- *Typical section* – The typical section is now revised to an urban section in order to be consistent with the development along the project corridor, to reduce the right-of-way

impacts, and to meet the 45 MPH design speed criteria. This will consist of four 12-foot travel lanes (two lanes in each direction), a 20-foot raised median, 4-foot bike lanes, and 12-foot urban shoulders which include curb and gutter, 2-foot grass strip, sidewalk and a closed drainage system on each side.

- *Project termini* - Widen and reconstruct 3.98 miles of SR 104 from just west of the intersection of General Woods Parkway and the relocated Old Washington Road (Sta. 393+90) to the intersection of Gibbs Road/CR99 (Sta 603+79.49).
  - General Woods Parkway is a roadway that has been constructed as part of a local development that currently ends approximately 200' short of the north side of the existing SR 104. The local developer is currently seeking a permit to extend General Wood Parkway to tie to SR 104 and it is expected that this will occur at some point in the near future. As part of this project STP-076-1(23), Old Washington Road/CR 320 will be relocated to create a 4-legged intersection with SR 104 and General Woods Parkway. This western terminus will transition from the urban to a rural section and tie to the end of the adjacent project, STP-076-1(21).
  - The eastern terminus will tie to a recently constructed 5-lane roadway section at Gibbs Road/CR99.
- *Major Structure* –
  - Widen to 41' the existing bridge over Uchee Creek.
  - Construct a new concrete 41'x252' bridge parallel to the existing bridge at Uchee Creek.
- *Controlling criteria:*
  - *Functional Classification* – Urban Principal Arterial
  - *Design Speed* – 45 mph
  - *Maximum Degree of Curvature* – 7°-45' (730' Radius minimum)
  - *Maximum Grade* – 6.00%

**Updated traffic data (AADT):**

Current Year (2012): 43,800

Design Year (2032): 65,700

**Programmed/Schedule:**

P.E. Authorized

R/W: LR

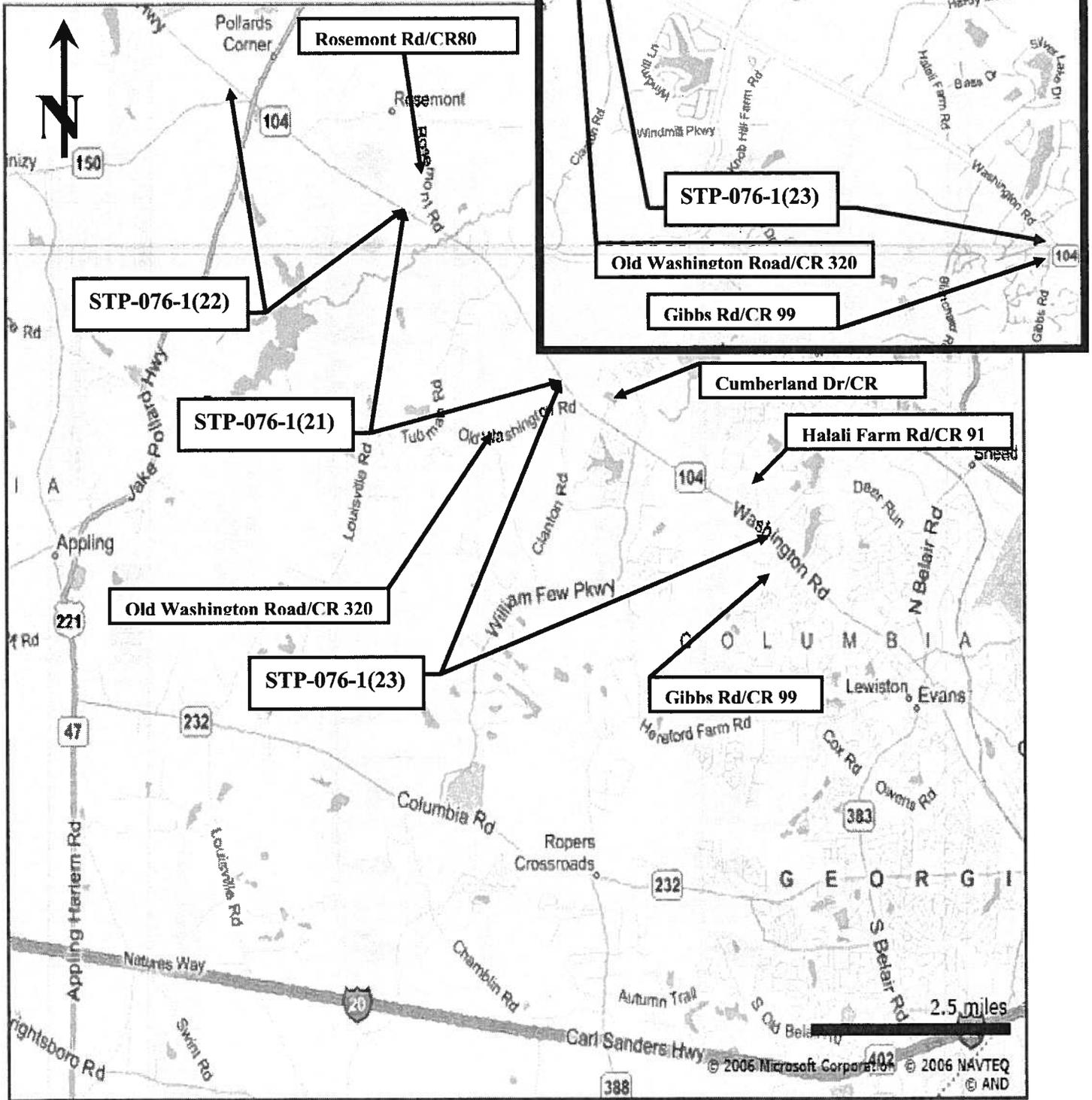
Construction: LR

**Revised cost estimates:**

	<b>P.I. No. 2626080 STP-076-1(23)</b>
<b>Right-of-Way</b>	<b>\$ 19,028,300</b>
<b>Utility</b>	<b>\$ 1,002,950</b>
<b>Construction</b>	<b>\$ 19,001,000</b>
<b>Total</b>	<b>\$ 39,032,250</b>

Is the project located in a Non-attainment area?        Yes   X   No

**PROJECT LOCATION MAP:  
STP-076-1(23)**



**Estimate Report for file "262080"**

<b>Section ROADWAY ITEMS</b>					
<b>Item Number</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Price</b>	<b>Item Description</b>	<b>Cost</b>
150-1000	1	LS	461000.00	TRAFFIC CONTROL -	461000.00
153-1300	1	EA	64000.00	FIELD ENGINEERS OFFICE TP 3	64000.00
201-1500	1	LS	582000.00	CLEARING & GRUBBING -	582000.00
207-0203	60	CY	50.55	FOUND BKFILL MATL, TP II	3033.00
208-0100	150000	CY	10.19	IN PLACE EMBANKMENT	1528500.00
310-1101	76498	TN	28.38	GR AGGR BASE CRS, INCL MATL	2171013.24
400-3205	8518	TN	85.00	ASPH CONC 12.5 MM OGFC, GP 2 ONLY, INCL BITUM MATL & H LIME	724030.00
402-1812	9000	TN	85.00	RECYCLED ASPH CONC LEVELING, INCL BITUM MATL & H LIME	765000.00
402-3121	29211	TN	85.00	RECYCLED ASPH CONC 25 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	2482935.00
402-3190	22988	TN	85.00	RECYCLED ASPH CONC 19 MM SUPERPAVE, GP 1 OR 2, INCL BITUM MATL & H LIME	1953980.00
413-1000	30000	GL	1.84	BITUM TACK COAT	55200.00
432-0208	50000	SY	2.00	MILL ASPH CONC PVMT, 2 IN DEPTH	100000.00
433-1000	2400	SY	135.15	REINF CONC APPROACH SLAB	324360.00
441-0016	2500	SY	39.88	DRIVEWAY CONCRETE, 6 IN TK	99700.00
441-0104	28000	SY	37.12	CONC SIDEWALK, 4 IN	1039360.00
441-0748	16000	SY	38.26	CONCRETE MEDIAN, 6 IN	612160.00
441-6022	50000	LF	19.34	CONC CURB & GUTTER, 6 IN X 30 IN, TP 2	967000.00
500-3200	20	CY	530.90	CLASS B CONCRETE	10618.00
500-3800	10	CY	896.15	CLASS A CONCRETE, INCL REINF STEEL	8961.50
550-1180	35000	LF	41.02	STORM DRAIN PIPE, 18 IN, H 1-10	1435700.00
550-1240	2900	LF	53.78	STORM DRAIN PIPE, 24 IN, H 1-10	155962.00
550-1300	56	LF	65.92	STORM DRAIN PIPE, 30 IN, H 1-10	3691.52
550-1420	55	LF	117.83	STORM DRAIN PIPE, 42 IN, H 1-10	6480.65
550-1480	200	LF	130.46	STORM DRAIN PIPE, 48 IN, H 1-10	26092.00
550-4218	10	EA	678.07	FLARED END SECTION 18 IN, STORM DRAIN	6780.70
550-4224	20	EA	882.93	FLARED END SECTION 24 IN, STORM DRAIN	17658.60
550-4230	2	EA	900.00	FLARED END SECTION 30 IN, STORM DRAIN	1800.00
634-1200	180	EA	104.00	RIGHT OF WAY MARKERS	18720.00
641-1100	100	LF	51.47	GUARDRAIL, TP T	5147.00
641-1200	5000	LF	19.53	GUARDRAIL, TP W	97650.00
641-5001	7	EA	617.35	GUARDRAIL ANCHORAGE, TP 1	4321.45
641-5012	7	EA	1871.80	GUARDRAIL ANCHORAGE, TP 12	13102.60
668-1200	220	EA	2500.00	CATCH BASIN, GP 2	550000.00
668-2200	45	EA	2500.00	DROP INLET, GP 2	112500.00
668-4400	7	EA	3500.00	STORM SEWER MANHOLE, TP 2	24500.00
<b>Section Sub Total:</b>					<b>\$16,432,957.26</b>

<b>Section EROSION CONTROL - PERMANENT</b>					
<b>Item Number</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Price</b>	<b>Item Description</b>	<b>Cost</b>
441-0204	360	SY	33.76	PLAIN CONC DITCH PAVING, 4 IN	12153.60
603-2180	350	SY	43.48	STN DUMPED RIP RAP, TP 3, 12 IN	15218.00
603-7000	350	SY	4.83	PLASTIC FILTER FABRIC	1690.50
700-6910	58	AC	906.91	PERMANENT GRASSING	52600.78
700-7000	195	TN	59.69	AGRICULTURAL LIME	11639.55
700-7010	163	GL	19.30	LIQUID LIME	3145.90
700-8000	72	TN	348.14	FERTILIZER MIXED GRADE	25066.08
700-8100	3250	LB	2.04	FERTILIZER NITROGEN CONTENT	6630.00
710-9000	2400	SY	3.65	PERMANENT SOIL REINFORCING MAT	8760.00
716-2000	70000	SY	1.15	EROSION CONTROL MATS, SLOPES	80500.00
<b>Section Sub Total:</b>					<b>\$217,404.41</b>

<b>Section EROSION CONTROL - TEMPORARY</b>					
<b>Item Number</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Price</b>	<b>Item Description</b>	<b>Cost</b>
163-0232	33	AC	571.97	TEMPORARY GRASSING	18875.01
163-0240	856	TN	183.84	MULCH	157367.04
163-0300	10	EA	2872.37	CONSTRUCTION EXIT	28723.70
163-0503	10	EA	550.00	CONSTRUCT AND REMOVE SILT CONTROL	5500.00

				GATE, TP 3	
165-0010	42240	LF	1.00	MAINTENANCE OF TEMPORARY SILT FENCE, TP A	42240.00
165-0030	21120	LF	1.83	MAINTENANCE OF TEMPORARY SILT FENCE, TP C	38649.60
165-0087	10	EA	178.48	MAINTENANCE OF SILT CONTROL GATE, TP 3	1784.80
165-0101	10	EA	660.01	MAINTENANCE OF CONSTRUCTION EXIT	6600.10
167-1000	2	EA	1349.35	WATER QUALITY MONITORING AND SAMPLING	2698.70
167-1500	24	MO	1035.76	WATER QUALITY INSPECTIONS	24858.24
171-0010	42240	LF	1.80	TEMPORARY SILT FENCE, TYPE A	76032.00
171-0030	21120	LF	3.84	TEMPORARY SILT FENCE, TYPE C	81100.80
<b>Section Sub Total:</b>					<b>\$484,429.99</b>

**Section.SIGNING AND MARKING/SIGNAL ITEMS**

Item Number	Quantity	Units	Unit Price	Item Description	Cost
636-1020	800	SF	15.31	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING, TP 3	12248.00
636-1031	800	SF	26.99	HIGHWAY SIGNS, TP 1 MATL, REFL SHEETING TP 6	21592.00
636-2070	3000	LF	8.75	GALV STEEL POSTS, TP 7	26250.00
636-2080	500	LF	11.30	GALV STEEL POSTS, TP 8	5650.00
639-5000	6	EA	5253.94	PRESTRESSED CONC STRAIN POLE, TP -	31523.64
647-1000	6	LS	90000.00	TRAFFIC SIGNAL INSTALLATION NO -	540000.00
652-2501	8	LM	342.37	SOLID TRAFFIC STRIPE, 5 IN, WHITE	2738.96
652-2502	8	LM	352.12	SOLID TRAFFIC STRIPE, 5 IN, YELLOW	2816.96
652-3501	8	GLM	291.76	SKIP TRAFFIC STRIPE, 5 IN, WHITE	2334.08
652-3502	2	GLM	262.98	SKIP TRAFFIC STRIPE, 5 IN, YELLOW	525.96
653-0120	222	EA	72.67	THERMOPLASTIC PVMT MARKING, ARROW, TP 2	16132.74
653-1704	1500	LF	5.02	THERMOPLASTIC SOLID TRAF STRIPE, 24 IN, WHITE	7530.00
653-6004	2774	SY	2.79	THERMOPLASTIC TRAF STRIPING, WHITE	7739.46
654-1003	1700	EA	3.78	RAISED PVMT MARKERS TP 3	6426.00
<b>Section Sub Total:</b>					<b>\$683,507.80</b>

**Section CONCRETE BRIDGE CULVERT ITEMS**

Item Number	Quantity	Units	Unit Price	Item Description	Cost
500-3200	300	CY	530.90	CLASS B CONCRETE	159270.00
511-1000	42000	LB	0.95	BAR REINF STEEL	39900.00
<b>Section Sub Total:</b>					<b>\$199,170.00</b>

**Section RETAINING WALLS AND ALTERNATES**

Item Number	Quantity	Units	Unit Price	Item Description	Cost
500-3107	50	CY	450.00	CLASS A CONCRETE, RETAINING WALL	22500.00
<b>Section Sub Total:</b>					<b>\$22,500.00</b>

**Section BRIDGE ITEMS**

Item Number	Quantity	Units	Unit Price	Item Description	Cost
543-9000	1	Lump Sum	740000.00	CONSTRUCTION OF BRIDGE COMPLETE - BRIDGE NO. 1A	740000.00
543-9000	1	Lump Sum	110000.00	CONSTRUCTION OF BRIDGE COMPLETE - BRIDGE NO. 1B	110000.00
<b>Section Sub Total:</b>					<b>\$850,000.00</b>

**Total Estimated Cost: \$18,889,969.46**

**Typical Section**

Urban Widening: 2 To 4-Lanes with 20 ft Raised Median Widen Symmetrical

Typical Section Length  Miles

Right-of-Way Width  Feet

**GRADING AND DRAINAGE**

- 1. EARTHWORK
  - a. Unclassified Excavation Soil
  - b. Unclassified Excavation Rock
  - c. In-Place Embankment
- 2. MINOR DRAINAGE

QUANTITY	UNIT COST	TOTAL
	CY	
	CY	
15,000	CY 4.25	64,000
3.98	MI 395,192	1,581,000
<b>GRADING AND DRAINAGE SUBTOTAL</b>		<b>\$1,645,000</b>

**BASE AND PAVING**

- 1. GRADED AGGREGATE BASE
- 2. ASPHALT PAVING
  - a. Asph Conc 12.5 mm Superpave
  - b. Asph Conc 19 mm Superpave
  - c. Asph Conc 25 mm Superpave
  - d. Bituminous Tack Coat
- 3. CONCRETE PAVING
  - a. Curb and Gutter
  - b. Miscellaneous
- 4. OTHER PAVING

THICKNESS and SPREAD RATE	QUANTITY	UNIT COST	TOTAL
12"	76,498 TN	28.38	2,171,000
1 1/2" (165 LB/SY)	8,518 TN	85.00	724,000
4" (440 LB/SY)	22,988 TN	85.00	1,954,000
5" (550 LB/SY)	29,211 TN	85.00	2,483,000
	16,151 GL	2.39	39,000
	86,320 LF	34.92	3,014,000
	3.98 MI	111,391	446,000
			1,083,000
<b>BASE AND PAVING SUBTOTAL</b>			<b>\$11,914,000</b>

**LUMP ITEMS**

- 1. TRAFFIC CONTROL
- 2. CLEARING AND GRUBBING
- 3. EROSION CONTROL
- 4. SIGNING & MARKING
- 5. MISCELLANEOUS

QUANTITY	UNIT COST	TOTAL
4.00	MI 115,304	461,000
96.97	AC 6,000	582,000
3.98	MI 114,677	459,000
3.98	MI 52,543	210,000
3.98	MI 137,089	548,000
<b>LUMP ITEM SUBTOTAL</b>		<b>\$2,260,000</b>

**MISCELLANEOUS PROJECT ITEMS**

- 1. GUARDRAIL
- 2. GUARDRAIL ANCHORS
- 3. DETOURS
- 4. SPECIAL FEATURES

QUANTITY	UNIT COST	TOTAL
5,000	LF 19.53	98,000
15	EA 528.26	8,000
	MI 327,097	
<b>MISCELLANEOUS SUBTOTAL</b>		<b>\$106,000</b>

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# ***Value Engineering Process***

# **VALUE ENGINEERING PROCESS**

## **Introduction**

This report summarizes the analysis and conclusions by the PBS&J Value Engineering team as they performed a VE Study during the period of June 4-7, 2007 in Atlanta, Georgia, for the Georgia Department of Transportation.

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

Les Thomas, P.E., CVS-Life	Certified Value Specialist
Randy S. Thomas	Associate Value Specialist
Michael Holt, P.E.	Highway Design Engineer
Barry Brown, P.E.	Bridge Structural Engineer
Gary King	Highway Construction Specialist

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 designers and project delivery team representatives of the Georgia Department of Transportation (GDOT). This briefing included discussions of the design intent behind the project, the cost concerns, and was followed by a tour of the existing facilities. 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 suppose to do?”, and “How is it suppose 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 Line-of-Sight**
    - **Increase Capacity**
    - **Separate Traffic**
    - **Provide for near future growth**
  - **Project Basic Functions**
    - **Construct Additional Traffic Lanes**
    - **Construction Additional Turn Lanes**
    - **Widen Bridge**
    - **Provide Raised Median**
    - **Route Stormwater**
    - **Direct Traffic**
- **Speculation Phase** - The VE team performed a brainstorming session to identify ideas that might help meet the project objectives:
  - Improve Operations
  - Improve Safety
  - Increase Capacity
  - Reduce construction and life cycle costs
  - Reduce the time of construction

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
  - Maintainability
  - Ability to Implement the Idea
  - General Acceptability of the Alternatives
  - Constructability

Based on these measurement sticks, 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. 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.

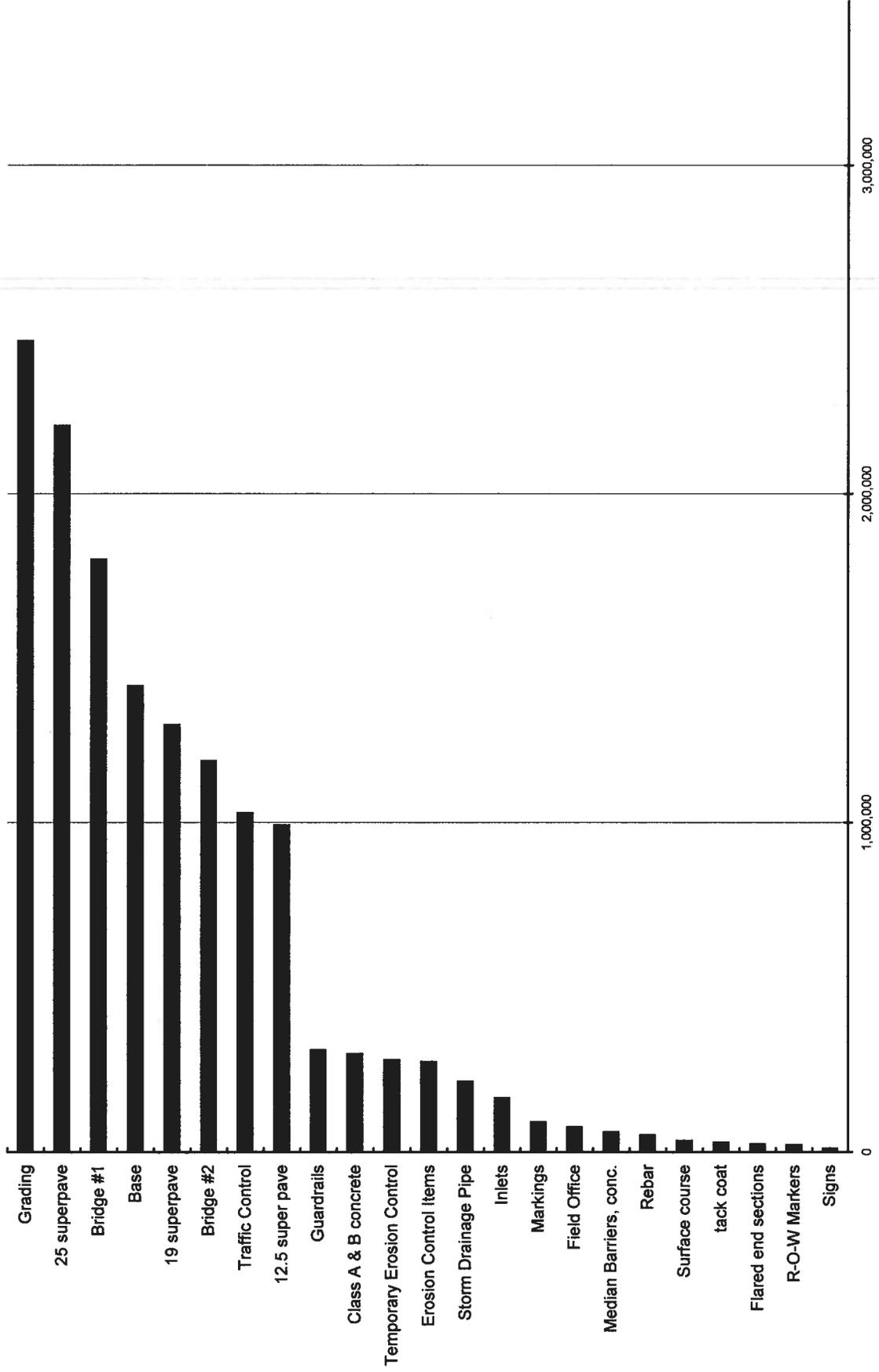
The following FAST Diagram and **Function – Worth - Cost** Analysis, were utilized to focus the team and stimulate brainstorming; a copy of the **Attendance Sheets** is also attached so that the reader can be informed about who participated in the Study proceedings.

# PARETO CHART - COST HISTOGRAM

PROJECT: SR 104 Washington Rd Widening STP--07601(21) PI 221805			
Columbia County, Georgia			
PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
Grading	2,464,640	17.21%	17.21%
25 superpave	2,206,175	15.40%	32.61%
Bridge #1	1,800,000	12.57%	45.17%
Base	1,415,065	9.88%	55.05%
19 superpave	1,296,675	9.05%	64.10%
Bridge #2	1,187,500	8.29%	72.39%
Traffic Control	1,029,187	7.18%	79.58%
12.5 super pave	991,525	6.92%	86.50%
Guardrails	309,087	2.16%	88.66%
Class A & B concrete	297,633	2.08%	90.74%
Temporary Erosion Control	278,816	1.95%	92.68%
Erosion Control Items	273,900	1.91%	94.60%
Storm Drainage Pipe	213,727	1.49%	96.09%
Inlets	163,833	1.14%	97.23%
Markings	91,503	0.64%	97.87%
Field Office	75,272	0.53%	98.40%
Median Barriers, conc.	60,000	0.42%	98.81%
Rebar	51,299	0.36%	99.17%
Surface course	34,420	0.24%	99.41%
tack coat	28,915	0.20%	99.61%
Flared end sections	23,543	0.16%	99.78%
R-O-W Markers	20,964	0.15%	99.93%
Signs	10,646	0.07%	100.00%
<b>Subtotal</b>	<b>\$ 14,324,325</b>	<b>100.00%</b>	
<b>E &amp; C Rate @ 10% INCL</b>	<b>\$ 1,432,433</b>		
<b>Subtotal =</b>	<b>\$ 15,756,758</b>		
<b>Total Construction Cost =</b>	<b>\$ 15,756,758</b>		
<b>Right-of-Way =</b>	14,198,932		
<b>Reimb. Utilities =</b>	263,781		
<b>TOTAL</b>	<b>\$ 30,219,471</b>	<b>Comp Mark-up:</b>	<b>111%</b>

Pareto Chart 2

STP-07601(21) PI 221805

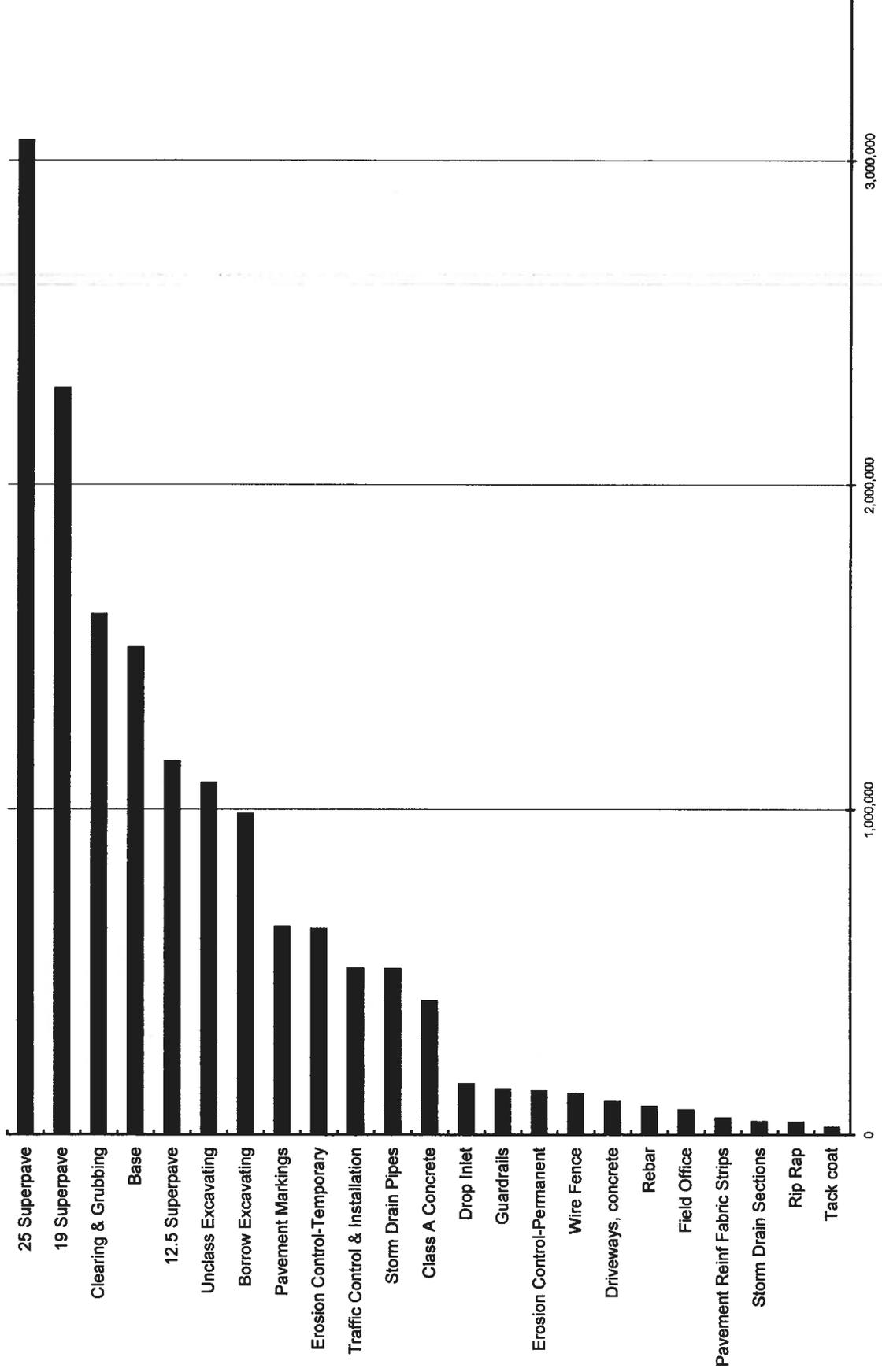


# PARETO CHART - COST HISTOGRAM

PROJECT: SR 104 Washington Rd Widening STP--07601(22) PI 221800			
Columbia County, Georgia			
PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
25 Superpave	3,061,190	19.92%	19.92%
19 Superpave	2,295,595	14.94%	34.86%
Clearing & Grubbing	1,600,000	10.41%	45.27%
Base	1,497,275	9.74%	55.01%
12.5 Superpave	1,148,435	7.47%	62.48%
Unclass Excavating	1,082,021	7.04%	69.52%
Borrow Excavating	986,405	6.42%	75.94%
Pavement Markings	639,089	4.16%	80.10%
Erosion Control-Temporary	632,870	4.12%	84.22%
Traffic Control & Installation	510,000	3.32%	87.54%
Storm Drain Pipes	508,460	3.31%	90.85%
Class A Concrete	410,400	2.67%	93.52%
Drop Inlet	155,250	1.01%	94.53%
Guardrails	139,000	0.90%	95.43%
Erosion Control-Permanent	133,183	0.87%	96.30%
Wire Fence	125,000	0.81%	97.11%
Driveways, concrete	100,000	0.65%	97.76%
Rebar	85,425	0.56%	98.32%
Field Office	75,000	0.49%	98.81%
Pavement Reinf Fabric Strips	50,000	0.33%	99.13%
Storm Drain Sections	39,500	0.26%	99.39%
Rip Rap	38,100	0.25%	99.64%
Tack coat	22,370	0.15%	99.78%
R-O-W Markers	10,800	0.07%	
Backfill	9,600	0.06%	
Highway Signs	7,176	0.05%	
Median Barriers	6,000	0.04%	
<b>Subtotal</b>	<b>\$ 15,368,143</b>	<b>100.00%</b>	
<b>E &amp; C Rate @ 10% INCL</b>	<b>\$ 1,536,814</b>		
<b>Subtotal =</b>	<b>\$ 16,904,957</b>		
<b>Total Construction Cost =</b>	<b>\$ 16,904,957</b>		
<b>Right-of-Way =</b>	6,085,000		
<b>Reimb. Utilities =</b>	580,000		
<b>TOTAL</b>	<b>\$ 23,569,957</b>	<b>Comp Mark-up:</b>	<b>53%</b>

Pareto Chart 2

STP-07601(22) PI 221800

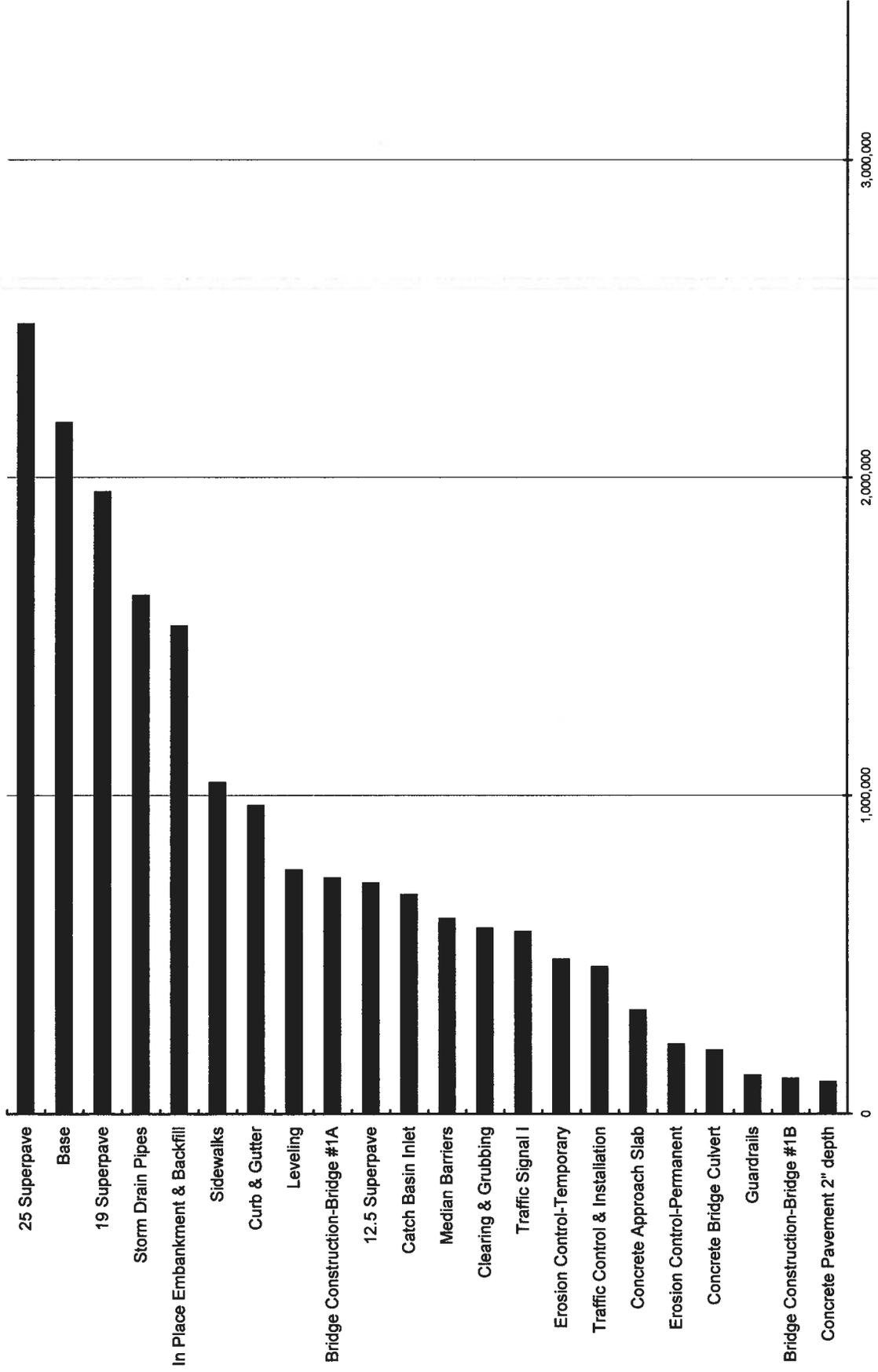


# PARETO CHART - COST HISTOGRAM

PROJECT: SR 104 Washington Rd Widening STP--07601(23) PI 262080			
Columbia County, Georgia			
PROJECT ELEMENT	COST	PERCENT	CUM. PERCENT
25 Superpave	2,482,935	13.14%	13.14%
Base	2,171,013	11.49%	24.64%
19 Superpave	1,953,980	10.34%	34.98%
Storm Drain Pipes	1,627,926	8.62%	43.60%
In Place Embankment & Backfill	1,531,533	8.11%	51.71%
Sidewalks	1,039,360	5.50%	57.21%
Curb & Gutter	967,000	5.12%	62.33%
Leveling	765,000	4.05%	66.38%
Bridge Construction-Bridge #1A	740,000	3.92%	70.30%
12.5 Superpave	724,030	3.83%	74.13%
Catch Basin Inlet	687,000	3.64%	77.76%
Median Barriers	612,160	3.24%	81.01%
Clearing & Grubbing	582,000	3.08%	84.09%
Traffic Signal I	571,524	3.03%	87.11%
Erosion Control-Temporary	484,430	2.56%	89.68%
Traffic Control & Installation	461,000	2.44%	92.12%
Concrete Approach Slab	324,360	1.72%	93.83%
Erosion Control-Permanent	217,404	1.15%	94.99%
Concrete Bridge Culvert	199,170	1.05%	96.04%
Guardrails	120,221	0.64%	96.68%
Bridge Construction-Bridge #1B	110,000	0.58%	97.26%
Concrete Pavement 2" depth	100,000	0.53%	97.79%
Driveways, concrete	99,700	0.53%	98.32%
Highway Signs	65,740	0.35%	98.66%
Field Office	64,000	0.34%	99.00%
Tack Coat	55,200	0.29%	99.29%
Markings	46,244	0.24%	99.54%
Storm Drain Sections	26,239	0.14%	99.68%
Retaining Walls	22,500	0.12%	99.80%
Class A & B Concrete	19,580	0.10%	99.90%
R-O-W Markers	18,720	0.10%	100.00%
<b>Subtotal</b>	<b>\$ 18,889,969</b>	<b>100.00%</b>	
<b>E &amp; C Rate @ 10%</b>	<b>INCL \$ 1,888,997</b>		
<b>Subtotal =</b>	<b>\$ 20,778,966</b>		
<b>Total Construction Cost =</b>	<b>\$ 20,778,966</b>		
<b>Right-of-Way =</b>	18,908,800		
<b>Reimb. Utilities =</b>	1,364,000		
<b>TOTAL</b>	<b>\$ 41,051,766</b>	<b>Comp Mark-up:</b>	<b>117%</b>

Pareto Chart 2

STP-07601(23) PI 262080



# DESIGNER'S PRESENTATION

## MEETING PARTICIPANTS



**Project:** Georgia Department of Transportation

**SR 104/Washington Rd.**

Date: 4 June 2007

Columbia		PI No. 221800,221805,262080	
NAME	ORGANIZATION & TITLE	E-MAIL	PHONE
Lisa Myers	GDOT - Engineering Services	<a href="mailto:lisa.myers@dot.state.ga.us">lisa.myers@dot.state.ga.us</a>	404-651-7468
Les Thomas	PBS&J	<a href="mailto:LThomasPE@aol.com">LThomasPE@aol.com</a>	678-677-6420
Michael Holt	PBS&J	<a href="mailto:maholt@pbsj.com">maholt@pbsj.com</a>	704-522-7275
Gary King	PBS&J	<a href="mailto:grking@pbsj.com">grking@pbsj.com</a>	770-933-0280
Barry L. Brown	PBS&J	<a href="mailto:blbrown@pbsj.com">blbrown@pbsj.com</a>	770-933-0280
Randy Thomas	PBS&J	<a href="mailto:LThomasPE@aol.com">LThomasPE@aol.com</a>	770-883-1545
Ron Wishon	GDOT-OES	<a href="mailto:ron.wishon@dot.state.ga.us">ron.wishon@dot.state.ga.us</a>	404-651-7470
Jerry Milligan	GDOT RAW	<a href="mailto:jerry.milligan@dot.state.ga.us">jerry.milligan@dot.state.ga.us</a>	770-986-1541
Ken Werho	GDOT TS&D Design and review	<a href="mailto:ken.werho@dot.state.ga.us">ken.werho@dot.state.ga.us</a>	404-635-8144
Lynn Bean	GDOT -District 2 Construction		478-553-2331
Erick Fry	Washington Group Int.	<a href="mailto:erick.fry@wgint.com">erick.fry@wgint.com</a>	770-952-8510
Joe Garland	Clark Patterson	<a href="mailto:jgarland@clarkpatterson.com">jgarland@clarkpatterson.com</a>	770-831-9000
Rob Lewis	HNTB		404-946-5735
Richard Marshall	GDOT-Construction	<a href="mailto:Richard.Marshall@dot.state.ga.us">Richard.Marshall@dot.state.ga.us</a>	404-656-5306
Vince Wilson	GDOT - Bridge Design	<a href="mailto:vince.wilson@dot.state.ga.us">vince.wilson@dot.state.ga.us</a>	404-656-5302
Bruce Hart	OEL	<a href="mailto:bruce.hart@dot.state.ga.us">bruce.hart@dot.state.ga.us</a>	404-699-4488
Jeff Car	GDOT/OEL	<a href="mailto:jeffrey.carr@dot.state.gacom">jeffrey.carr@dot.state.gacom</a>	404-699-4410
Jennifer Mathis	GDOT/OEL	<a href="mailto:jennifer.mathis@dot.state.ga.us">jennifer.mathis@dot.state.ga.us</a>	644-699-4408
Lauren Thompson	GDOT/OEL	<a href="mailto:jennifer.mathis@dot.state.ga.us">jennifer.mathis@dot.state.ga.us</a>	404-699-9431
Nicole Alexander	GDOT/OCD	<a href="mailto:nicole.alexander@dot.state.ga.us">nicole.alexander@dot.state.ga.us</a>	404-463-6135



# CREATIVE IDEA LIST and EVALUATION



**PROJECT:** GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (21), (22), (23) Columbia County  
 P.I. Nos: 221805, 221800, 262080  
 SR 104/Washington Road

SHEET NO.: 1 of 2

NO.	IDEA DESCRIPTION	RATING
<b>Project STP-076-1 (22) PI 221800</b>		
22-1	Save and re-use existing pavement as is from Sta. 195 up to Sta. 270	5
22-2	Minimize earth work for new lanes	4
22-3	Reduce median width from 44' to 32'	3
22-4	Reduce right of way width	4
22-5	Delete off-set turn lanes	2
22-6	Reduce fill slopes from 2:1 to 4:1 with a 12' width	5
22-7	Sta.+116 reduce fill (adjust vertical curve entering and exiting)	5
22-8	Do not re-align Burke's Mountain Road	2
22-9	SR 150 – Begin construction at proposed new curve point	5
22-10	Delete driveway at 136+00	DS
22-11	Confirm sediment basins being provided at each outfall	DS
22-12	Provide silt barriers in lakes	DS
22-13	Reduce paved shoulder from 6 1/2' to 4'	1
22-14	Use 11' travel lanes	5
<b>Project STP-076-1 (21) PI 221805</b>		
21-1	Consider widening existing bridges by adding 2' to each side (instead of 4' on one side)	5
21-2	Verify whether or not there is to be an overlay on the existing bridges, and if so, consider bridge replacement	DS
21-3	Use existing pavement where practical	5
21-4	Bridge at Sta 290+, set to elevation of existing and reduce fill	DS
21-5	Revise storm drainage, decrease piping	1
21-6	Reduce median width from 44' to 32'	3
21-7	Reduce right of way width where practical	4
21-8	Minimize earth work for new lanes	4
21-9	Use 11' travel lanes	5

**Rating:** 1→2 = Generally not acceptable; 3 = Little Opportunity for Positive Change; 4→5 = Most likely to be Developed;  
 DS = Design Suggestion; ABD = Already Being Done

# CREATIVE IDEA LIST and EVALUATION



**PROJECT:** GEORGIA DEPARTMENT OF TRANSPORTATION  
 STP-076-1 (21), (22), (23) Columbia County  
 P.I. Nos: 221805, 221800, 262080  
 SR 104/Washington Road

SHEET NO.: 2 of 2

NO.	IDEA DESCRIPTION	RATING
<b>Project STP-076-1 (23) 262080</b>		
23-1	Add either an accel/ decel lane or a parallel connector for driveways	1
23-2	Move bike lanes to a multi-use trail	5
23-3	<i>William Few</i> intersection-provide two right turn lanes and provide for two left turn lanes	DS
23-4	During Stage I, construct the new <i>William Few</i> intersection first to alleviate traffic delays	DS
23-5	Lengthen right turn storage at <i>William Few</i> intersection	DS
23-6	Reduce stormwater piping	2
23-7	Use HDPE for storm piping where cover allows	ABD
23-8	Delete <i>Halali Road</i> relocation, new signal should be ok	2
23-9	Delete <i>Cobb Road</i> realignment	4
23-10	Reduce right of way acquisition	4
23-11	Reduce sidewalk to 4'	1
23-12	Consider widening existing bridges by adding 2' to each side (instead of 4' on one side)	1
23-13	Verify whether or not there is to be an overlay on the existing bridges, and if so, consider bridge replacement	DS
23-14	Adjust grades – Lower from Sta 439 to Sta 445 and raise from Sta 533 – 543	4
23-15	Use 11' travel lanes	5
23-16	Delete or revise proposed relocation of Hardy McManus	1

Rating: 1→2 = Generally not acceptable; 3 = Little Opportunity for Positive Change; 4→5 = Most likely to be Developed;  
 DS = Design Suggestion; ABD = Already Being Done