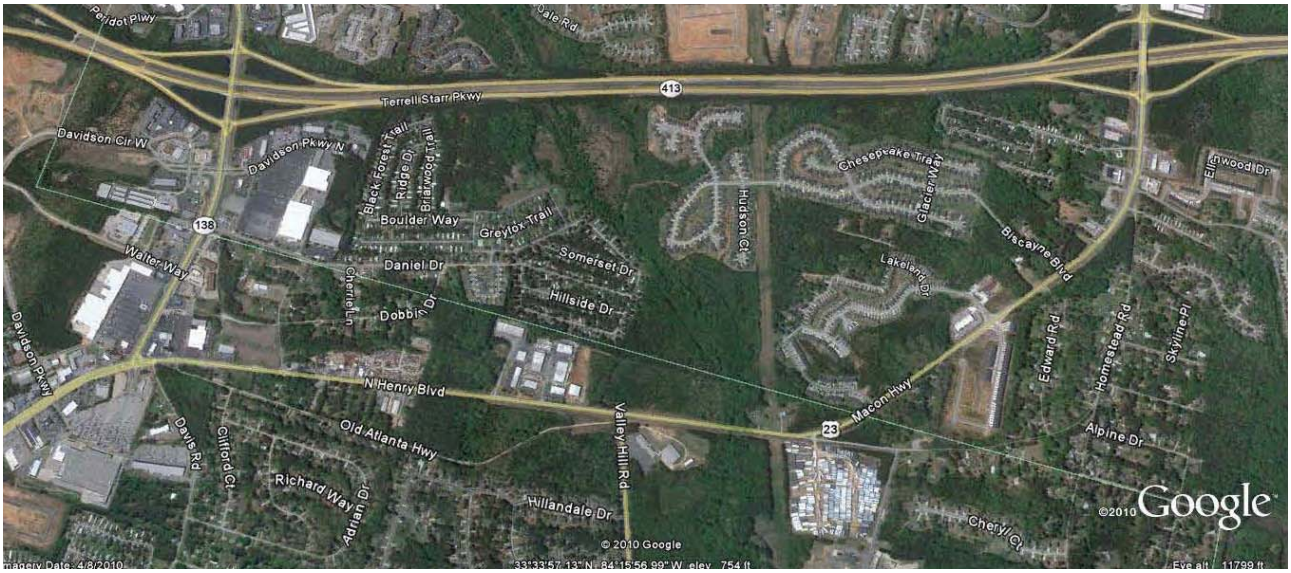
GEORGIA DEPARTMENT OF TRANSPORTATION

Widening SR 42/US 23 from SR 138/Henry to I-675/Clayton

Clayton/Henry Counties

STP00-0037-02(056) – P.I. No. 322050-

VALUE ENGINEERING REPORT



JANUARY 2011

Submitted by:

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February 8, 2011

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

RE: Value Engineering Report
STP00-0037-02(056) – P.I. No. 322050-
Widening SR 42/US 23 from SR 138 to I-675
Clayton/Henry Counties

Dear Ms. Myers:

Please find enclosed two (2) hard copies and one (1) CD of our Value Engineering (VE) Report for the proposed widening of SR 42/US 23 from SR 138 to I-675. Using the VE "Job Plan" – Investigation, Analysis (*Function)*, Speculation, Evaluation & Development, the VE Team identified:

Seven (7) Alternatives recommended for improving the project value.

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.

Please contact me at 678-677-6420 should you have any questions regarding this submittal.

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

Yours truly,

Les M. Thomas

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

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

The primary purpose of the proposed project is to provide additional capacity along SR 42/US 23 between SR 138 and I-675. This will improve mobility and connectivity from I-675 to the city of Stockbridge. Project documents were designed by Williams-Russell and Johnson, Inc.

1.2 PROJECT DESCRIPTION

The proposed project begins at SR 138 intersection, north of Stockbridge and extends 2.2 miles long along US 42/US 23 northwesterly to I-675. The proposed project will consist of the removal of existing turn lane markings between the existing five-lane section and Davis Road and resurfacing and restriping this section for through traffic. The proposed widening and reconstruction will be for the existing two-lane roadway to be a four-lane roadway with 12 foot travel lanes, a 20 foot raised median, urban shoulders with curb and gutter, and five foot sidewalks on both sides. Design speed is 45 mph.

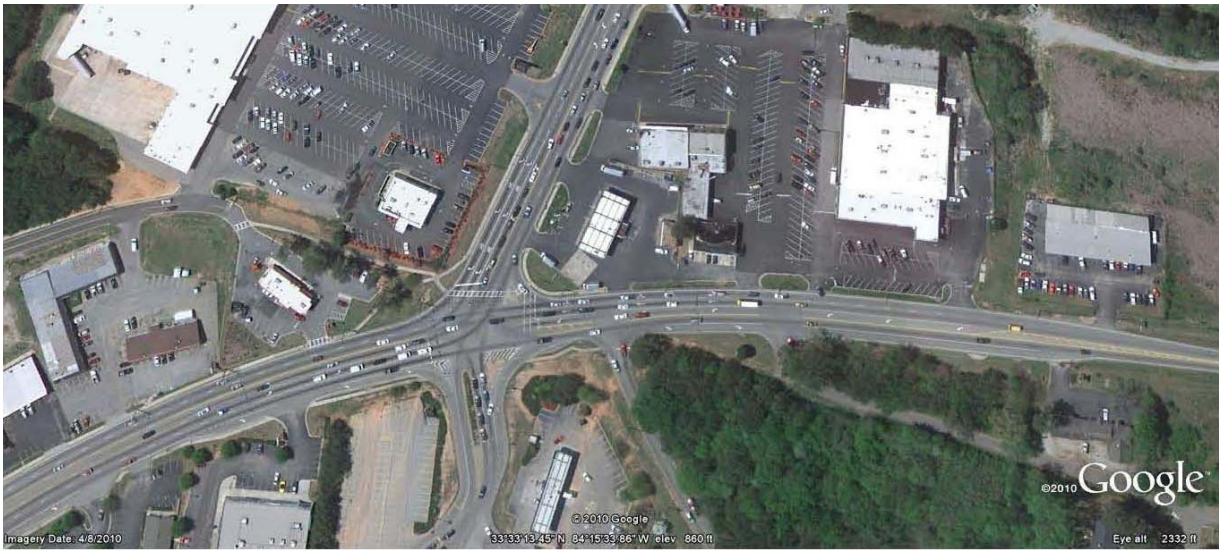


Figure 1-1: Existing SR 138 and SR 42 intersection

Figure 1-2: Existing SR 138 and I-695 intersection looking north

The Value Engineering (VE) team followed the seven step Value Engineering job plan as promulgated by SAVE International. Refer to Section 4.2 of this report for additional information on the VE process. The seven-step Job Plan includes the following:

Information Phase – during this phase of the VE Team's work, the team received a briefing from the design team. This briefing included discussions of the design intent behind the project, the cost concerns, and the physical project limitations. In the working session that followed, the VE team developed cost models from the cost data provided by the designers and familiarized themselves with the construction drawings and other data that was made available to the team. The VE Team thence visited the project site.

Function Analysis Phase – during this phase the VE Team determined the "**Functions"** of the project. This was accompanied by reviewing the project by asking the questions of "What is the project supposed to do?" and "How is it supposed to accomplish this purpose?" In the Value Engineering vernacular, the answers to these questions are cast in the form of active verbs and measurable nouns. These verb/noun pairs form the basis of the function analysis which distinguishes a Value Engineering effort from a potentially damaging cost cutting exercise. A Functional Analysis System Technique (FAST) diagram was prepared highlighting the project's required functions.

Speculation/Creative Phase – The VE Team performed a brainstorming session to identify ideas that might help meet the project objectives. These ideas fell into the following major headings:

Roadway Horizontal Alignment
Roadway Vertical Alignment
Right-of Way

The brainstorming session identified seventeen (17) ideas, which are as shown below.

CREATIVE IDEA LISTING

PROJECT: **Georgia Department of Transportation**
STP00-0037-02(056) – P.I. No. 322050-
Widening SR 42/US23 from SR 138 to I-675
Clayton/Henry Counties

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

NO.	IDEA DESCRIPTION	RATING
	ROADWAY (RD)	
RD-1	Use 11' inside lanes, 12' outside lanes throughout the project	4
RD-2	Use 11' lanes throughout the project	1
RD-3	Shorten tie on Old Macon Highway	4
RD-4	Eliminate Old Main Highway from SR 42 to Treatment Plant Road	2
RD-5	Retain existing flush median where practical	2
RD-6	Use an 8' urban shoulder	2
RD-7	Use a 12' urban shoulder	5
RD-8	Shorten selected vertical curves to reduce leveling	2
RD-9	Modify outfalls at Panther Creek	OBS
RD-10	Use raised grass median in-lieu of concrete	3
RD-11	Use modular block walls in-lieu of concrete	5
RD-12	Use gravity walls in-lieu of concrete	4
RD-13	Avoid overhead existing utilities – Use 4' sidewalks in residential area with 8' total shoulder	2
RD-14	Use 4' sidewalks in-lieu of 5' sidewalks in residential area	1
RD-15	Use 4" in-lieu of 7 1/2" concrete median for new median (not on existing pavement)	5
RD-16	Remove and replace existing pavement to eliminate leveling in select areas	5
RD-17	Use bridge in-lieu of box culverts	1

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

Evaluation Phase – During this phase, the VE Team determines which of the creative ideas offer the best opportunity to improve the value of the project for further development. The first step is to determine the criteria that the ideas should be evaluated against. The VE Team reflected back on the project constraints and objectives shared with the team by the Owner's representatives and the design team members and listed the following:

First costs
Impact on existing utilities
Impact on traffic congestion
Impact on wetlands
Operational and maintenance costs

Development Phase – During this phase, the VE Team developed each of the selected alternatives whose score was 4 or greater because of time constraints. If time permits, the team will develop additional recommendations. This effort included a detailed explanation of the idea with sketches as appropriate to clarify the idea from the original concept, advantages and disadvantages, a technical explanation and an estimation of the cost and resultant cost savings if implemented.

Recommendation Phase – During this phase the VE Team reviews the alternative ideas to confirm which ones are appropriate for the project, provide an opportunity for success and which will improve the value of the project if implemented.

Presentation Phase – the team made a presentation to the Georgia Department of Transportation on the last day of the workshop. This presentation was designed to express the intent and clarify each of the recommended alternatives. This report is intended to formalize those findings.

1.3 OBSERVATIONS

The VE team identified an alternative idea which was to modify the outfall at Panther Creek to not angle the wing walls on the upstream side to reduce the eddying of the stream.

1.4 CONCLUSIONS AND RECOMMENDATIONS

The VE Team identified, developed, and recommends ***seven design alternatives*** for implementation to improve the value of the project as shown on the following page:

Summary of Alternatives & Design Suggestions

PROJECT: **Georgia Department of Transportation**
STP00-0037-02(056) – P.I. No. 322050-
Widening SR 42/US 23 from SR 138 to I-675
Clayton/Henry Counties

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

ALTERNATIVE NUMBER	DESCRIPTION OF ALTERNATIVE	INITIAL COST SAVINGS
	Roadway (RD)	
RD-1	Use 11’ inside lanes, 12’ outside lanes throughout the project	$938,824
RD-3	Shorten tie on Old Macon Highway	$614,684
RD-7	Use a 12’ urban shoulder	$2,954,842
RD-11	Use modular block walls in-lieu of concrete	$225,394
RD-12	Use gravity walls in-lieu of concrete	$221,392
RD-15	Use 4” in-lieu of 7 1/2” concrete median for new median (not on existing pavement)	$246,092
RD-16	Remove and replace existing pavement to eliminate leveling in select areas	$579,921

2 STUDY RESULTS

2.1 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; opportunities and risks; technical discussions; sketches; calculations; and a cost estimate of the impact of the alternative.

It should be noted that the estimated cost/savings calculated for these alternatives are very preliminary and are only presented to indicate a probable magnitude of cost impact on the project.

Also, these alternatives are "stand alone" ideas. In some cases they may be "added" to another alternative, or in other cases they may present a different method of constructing the same elements and are therefore not additive. A summary is provided in Section 1-4 - Conclusions and Recommendations.

Therefore the users of this report are asked to consider these alternatives as a smorgasbord of choices for selection and use as appropriate as the project progresses.

2.2 COST CALCULATIONS

The cost calculations are intended only as an indicator 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.

2.3 ALTERNATIVES AND DESIGN SUGGESTIONS

Following are the ***seven design alternatives*** for implementation to improve the value of the project:

2.3.1 ALTERNATIVE NUMBER RD - 1

Value Analysis Design Alternative

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-1**
DESCRIPTION:	**Use 11' inside, 12' outside lanes throughout project**	SHEET NO.: **1** of **4**

Original Design:

The original design proposes construction of two 12' travel lanes eastbound and westbound throughout the project.

Alternative:

The alternative proposes constructing a 12' outside travel lane, as well as an 11' inside travel lane throughout the project.

Opportunities:

- Reduction in pavement costs
- Reduced right-of-way (ROW) footprint
- Reduction in construction time

Risks:

- May be contrary to driver expectations

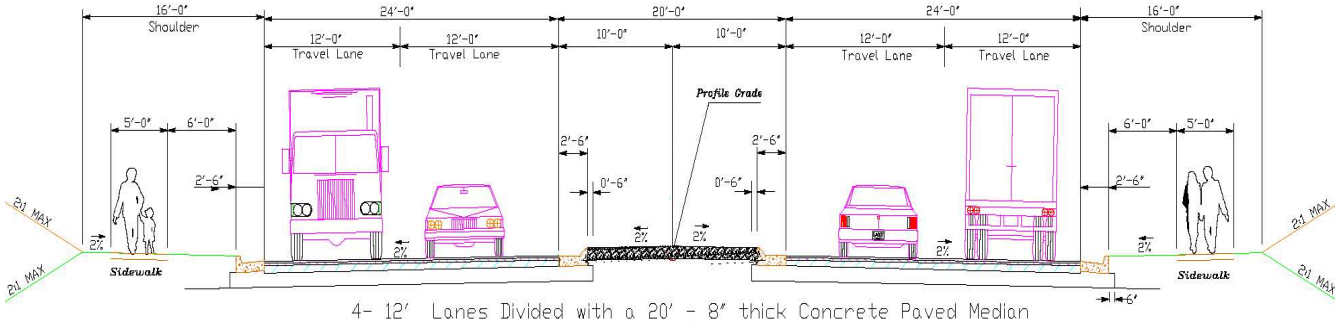
Technical Discussion:

Reduction of width of travel lanes throughout the project would result in 2' of full build-up widening that would not have to be constructed, resulting in significant cost savings. AASHTO's "Policy on Geometric Design of Highways 2004" states that 11' lanes are permissible. It also states that under interrupted –flow operating conditions at low speeds (45 mph or less), narrower lanes are normally adequate and have some advantages. (See Pages 472-473). The combination would construct 12' outside lanes to accommodate the local truck traffic, as well as allowing a greater turn radius to right-turning vehicles.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 13,846,800	$ 0	$ 13,846,800
ALTERNATIVE	$ 12,907,976	$ 0	$ 12,907,976
SAVINGS	$ 938,824	$ 0	$ 938,824

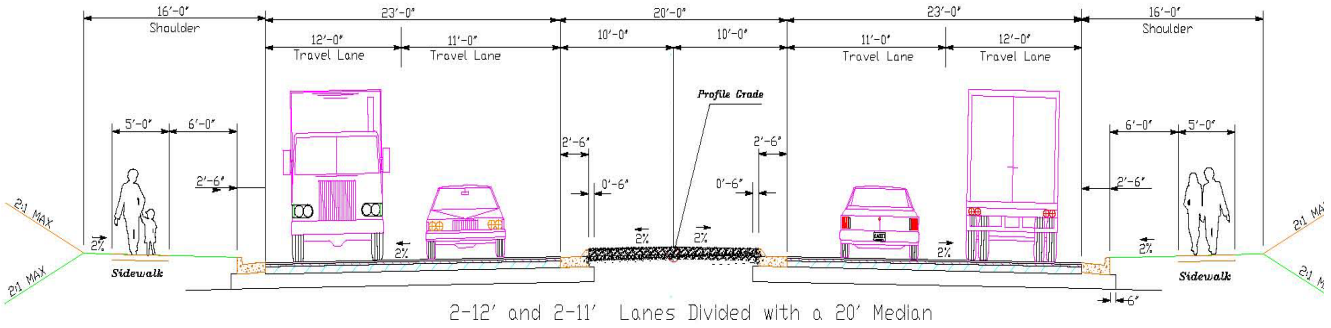
Illustrations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-1**
DESCRIPTION:	**Use 11' inside, 12' outside lanes throughout project**	SHEET NO.: **2** of **4**



4- 12' Lanes Divided with a 20' - 8" thick Concrete Paved Median

CURRENT DESIGN



2-12' and 2-11' Lanes Divided with a 20' Median

ALTERNATIVE DESIGN

Calculations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-1**
DESCRIPTION:	**Use 11' inside, 12' outside lanes throughout project**	SHEET NO.: **3** of **4**

-Reduce pavement width on inside lanes from 12' to 11'.
-Length of project=2.334 miles x 5280=12,324 LF per side x 2 sides=24,648LF x 1' width reduction/9=
2739 SY overall reduction in width for project

Unit Reductions:
-GAB- 1000LB/SY x 2739SY/2000=1370 ton reduction
-25mm Reduction-660 x 2739 SY/2000=904 ton reduction
-19mm Reduction-220 x 2739/2000=301 ton reduction
-12.5mm Reduction-165 x 2739/2000=226 ton reduction

Calculated Savings of 2' ROW:

- Corridor will be narrowed by 2' total, 1' in either direction by reducing the inside lanes widths from 12' to 11'.
- Widening limits= approximate STA 177+75 to approximate STA 301+00= 12,325LF
- 12,325LF x 2'w=SF/43,560= 0.57AC saved.
- ROW cost figures derived from Preliminary ROW Cost Estimates dated January 25, 2008 for Clayton and Henry Counties, included in the project concept report.

Cost Worksheet

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056)) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.:	**RD- 1**
DESCRIPTION:	**Use 11' inside, 12' outside lanes throughout project**	SHEET NO.:	**4** of **4**

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
310-1101-GAB, inc mat'l	TN	45,000	$ 24.80	$ 1,116,000	43,630	$ 24.80	$ 1,082,024
402-3121- 25mm Superpave	TN	10,000	$ 75.00	$ 750,000	9096	$ 75.00	$ 682,200
402-3190- 19mm Superpave	TN	12,000	$ 75.00	$ 900,000	11699	$ 75.00	$ 877,425
402-3130- 12.5mm Superpave	TN	9,200	$ 79.00	$ 726,800	8974	$ 79.00	$ 708,946
ROW Required	AC	7.81	$1,307,452	$ 10,211,200	7.24	$ 1,307,452	$ 9,465,952
Sub-total				$ 12,588,000			$ 11,734,523
Cons't Mark-up 10.00%				$ 1,258,800			$ 1,173,452
TOTAL				**$ 13,846,800**			**$ 12,907,976**
Estimated Savings:							$938,824

2.3.2

ALTERNATIVE NUMBER RD-3

Value Analysis Design Alternative

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry Counties**	ALTERNATIVE NO.: **RD-3**
DESCRIPTION:	**Shorten tie on Old Macon Highway**	SHEET NO.: **1** of **4**

Original Design:

The original design proposes reconstructing/relocating approximately 850 feet of Old Macon Highway. The original design also introduces a new horizontal vertical curve to create a 90^ intersection at Station ~246+46.

Alternative:

The alternative design proposes reconstructing a shorter section of Old Macon Highway and utilizing a larger radius horizontal to create a 90^ "right in – right out" intersection at Station ~ 252+00.

Opportunities:

- Reduce paving costs
- Reduce R.O.W. costs
- Improve intersection geometry
- Eliminate a median opening
- Reduce potential impact on Cemetery

Risks:

- Creates a slightly more circuitous route for a portion of the local traffic (less than a total of 500 VPD; <150 VPD SR-42 Southbound to O.M.H. Northbound and <250 VPD O.M.H. Southbound to SR-42 Southbound.

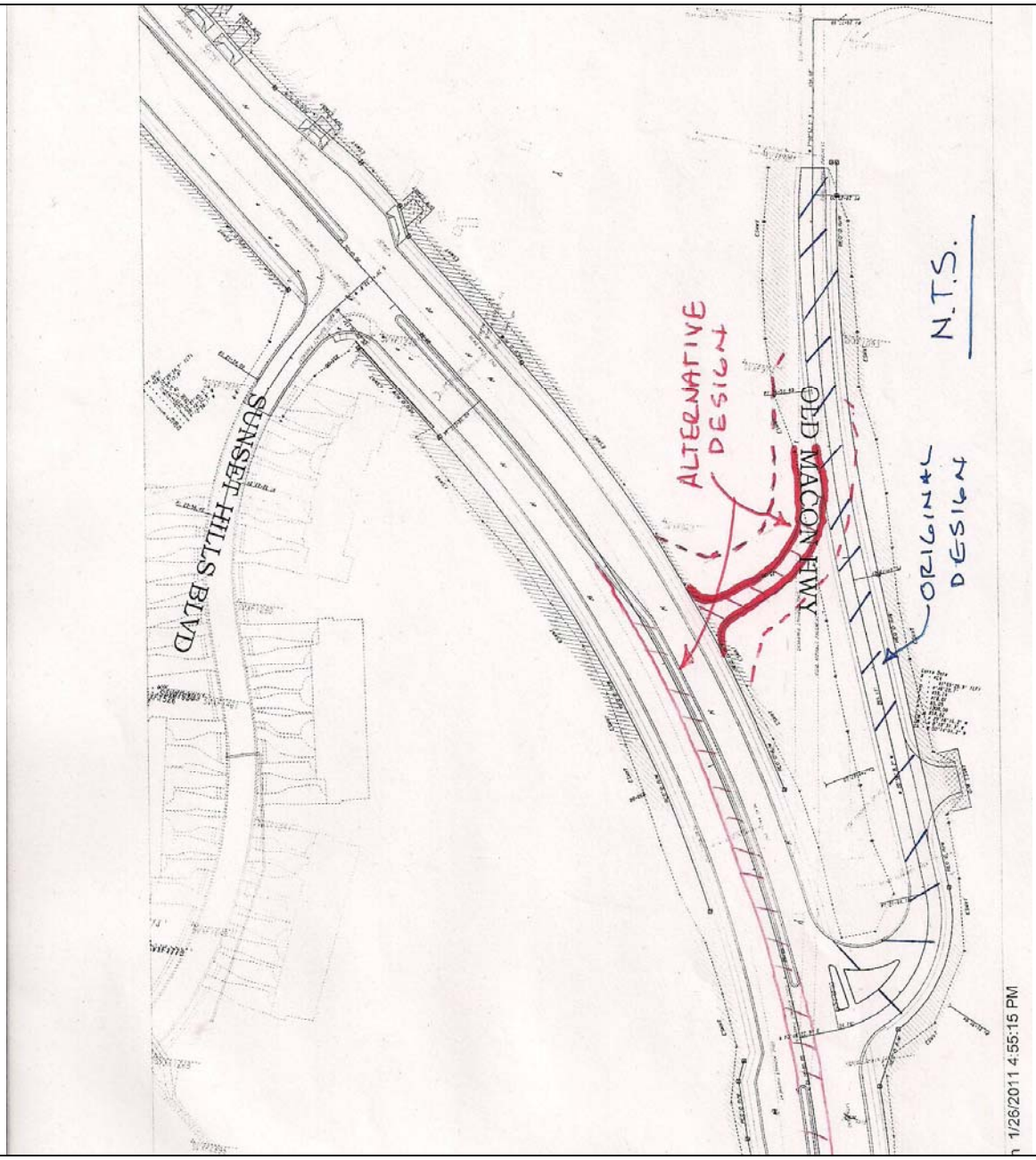
Technical Discussion:

Old Macon Highway between SR-42 and the neighborhood to northeast of the project along Homestead Road is sparsely developed. Most of the traffic generated at this intersection is due to ingress and egress to the neighborhood and not from adjacent development. The project will provide access between the neighborhood and SR-42 via Crooked Creek Road, Breckenridge Run and Edward Road with numerous interconnects for "backstreet circulation".

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 618,795	$ 0	$ 618,795
ALTERNATIVE	$ 4,112	$ 0	$ 4,112
SAVINGS	$ 614,684	$ 0	$ 614,684

Illustrations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry Counties**	ALTERNATIVE NO.: **RD-3**
DESCRIPTION:	**Shorten tie on Old Macon Highway**	SHEET NO.: **2** of **4**



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Calculations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry Counties**	ALTERNATIVE NO.: **RD-3**
DESCRIPTION:	**Shorten tie on Old Macon Highway**	SHEET NO.: **3** of **4**

Right of Way: Assume right of way is reduced from 1.25 acres to 0.75 acres

Land	(1.25 AC – 0.75 AC) x ($250,000/AC) = $	125,000
Scheduling	55% = $	68,750
Administrative	60% = $	116,250
Inflation	40% = $	124,000
Total	= $	434,000

Paving:
Assume the improvements along Old Macon Highway can be reduced from 800 LF to ~350 LF.
450 LF X 28 FT = 12,600SF
Assume elimination of 800 LF of Paving with an average width of 12 FT.
800 LF X 12 FT = 9,600SF
TOTAL = 22,200 SF / (9SF/SY) 2,467 SY

Superpave 12.5mm	= [(2,467 SY x 165#/SY-IN) / (2000#/Ton)]	=> 204 TN
Superpave 19.0mm	= [(2,467 SY x 220#/SY-IN) / (2000#/Ton)]	=> 272 TN
Superpave 25.0mm	= [(2,467 SY x 660 #/SY-IN) / (2000#/Ton)]	= > 814 TN
10" GAB	= (22,200 SF x 10/12 FT) x (135 #/ CF) / (2000#/Ton)	= > 1,249 TN

Additional Curb and Gutter = 300 LF

Cost Worksheet

PROJECT: **Georgia Department of Transportation STP00-0037-02(056)) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry Counties**

ALTERNATIVE NO.: **RD-3**

DESCRIPTION: **Shorten tie on Old Macon Highwayareas**

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

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
12.5 mm Superpave	TN	204	$ 79.00	$ 16,116	0	$ 79.00	$ -
19.0 mm Superpave	TN	272	$ 75.00	$ 20,400	0	$ 75.00	$ -
25.0 mm Superpave	TN	814	$ 75.00	$ 61,050	0	$ 75.00	$ -
10" GAB	TN	1,249	$ 24.80	$ 30,975	0	$ 24.80	$ -
ROW	LS	1	$ 434,000	$ 434,000	0	$ 434,000	$ -
Curb and Gutter	LF	0	$ 12.46	$ -	300	$ 12.46	$ 3,738
Sub-total				$ 562,541			$ 3,738
Cons't Mark-up 10.00%				$ 56,254			$ 374
TOTAL				**$ 618,795**			**$ 4,112**
Estimated Savings:							$614,684

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2.3.3 ALTERNATIVE NUMBER RD-7

Value Analysis Design Alternative

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-7**
DESCRIPTION:	**Construct a 12' urban shoulder**	SHEET NO.: **1** of **4**

Original Design:

The original design calls for the construction of 16' shoulders in either direction throughout the project

Alternative Design:

The alternative proposes constructing 12' shoulders in either direction throughout the project

Opportunities:

- Reduces ROW costs
- Reduces construction footprint

Risks:

- Possible reduction in construction staging areas

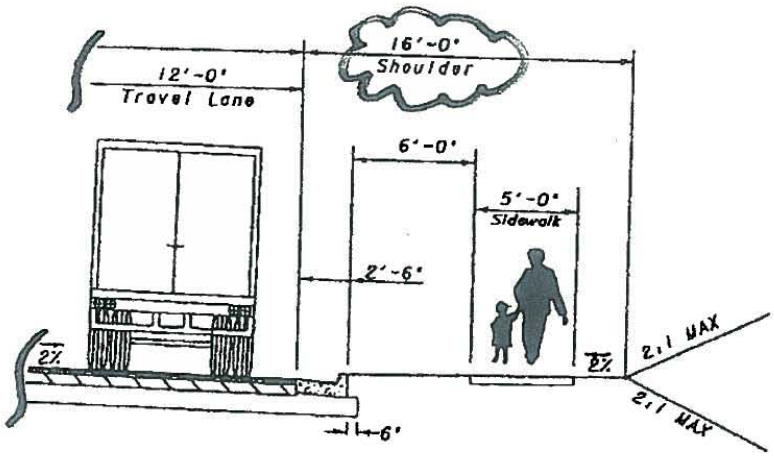
Technical Discussion:

The alternative proposes constructing 12' shoulders in both directions of the proposed roadway, in lieu of the as-designed 16' shoulders. The alternative will have the effect of reducing 4' of ROW required in each direction by narrowing the shoulders. All of the proposed design elements will remain on the alternative shoulders (i.e. 5' sidewalk). Identified risks include a possible reduction in width for staging during construction, which would need to be developed as the project plans progress. It may also be possible to utilize a 12' shoulder on one side, while constructing a full 16' urban shoulder on the other side if the relocation and placement of utilities would make uniform 12' shoulders undesirable throughout the project. The ROW savings using a 16'/12' shoulder would be half the figure shown in this alternative. It is noted that the Preliminary Right of Way Estimate dated 1/25/2008 provided to the VE Team in the concept report contained a total of 62 parcels and includes no temporary or permanent easement costs. The PM has advised that the parcel count is now 82 for the project. Therefore, the ROW costs will vary from the estimate provided to the team. The 8' width reduction cost savings are shown as proportional to the costs and quantities provided to the VE Team by the design consultant. See calculations page for more detail.

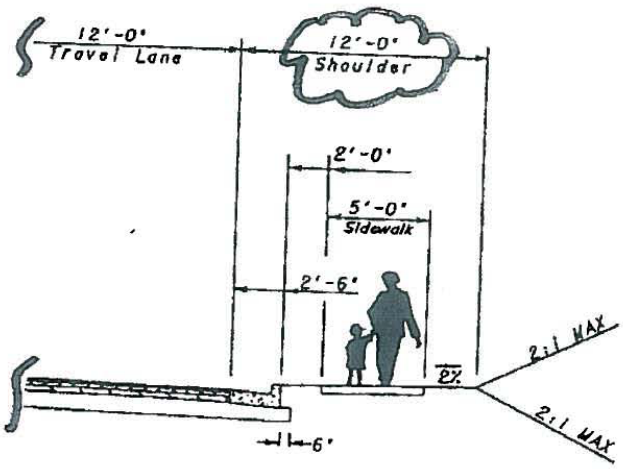
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 10,211,200	$ 0	$ 10,211,200
ALTERNATIVE	$ 7,256,359	$ 0	$ 7,256,359
SAVINGS	$ 2,954,842	$ 0	$ 2,954,842

Illustrations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-7**
DESCRIPTION:	**Construct a 12' urban shoulder**	SHEET NO.: **2** of **4**



ORIGINAL DESIGN



ALTERNATIVE DESIGN

Calculations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-7**
DESCRIPTION:	**Construct a 12' urban shoulder**	SHEET NO.: **3** of **4**

Assumptions:

- Corridor will be narrowed by 8' total, 4' in either direction by reducing the shoulder width from 16' to 12'.
- Widening limits= approximate STA 177+75 to approximate STA 301+00= 12,325LF
- 12,325LF x 8'w=SF/43,560=2.26AC saved.
- ROW cost figures derived from Preliminary ROW Cost Estimates dated January 25, 2008 for Clayton and Henry Counties, included in the project concept report.
- Cost estimate for acreage price was derived from the total number of acres to be acquired divided by the fully burdened cost in the latest ROW estimate provided to the VE team.
- In the event a 12' shoulder may be utilized on one side only due to staging/ utility issues, the cost savings for ROW would be halved from the current estimate.($2,954,842/2= $1,477,421 saved)

Cost Worksheet

PROJECT: **Georgia Department of Transportation STP00-0037-02(056)) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**

ALTERNATIVE NO.: **RD- 7**

DESCRIPTION: **Construct a 12' urban shoulder**

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

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
ROW Required	AC	7.81	$1,307,452	$ 10,211,200	5.55	$ 1,307,452	$ 7,256,359
Sub-total				$ 10,211,200			$ 7,256,359
Cons't Mark-up 10.00%							
TOTAL				**$ 10,211,200**			**$ 7,256,359**

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2.3.4 ALTERNATIVE NUMBER RD-11

Value Analysis Design Alternative

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-11**
DESCRIPTION:	**Use Modular Block Walls in-lieu of poured in place GA STD 4948-B Retaining Wall**	SHEET NO.: **1** of **5**

Original Design:

The original design calls for stretches of walls along the project at 10 locations. The walls are poured in place GA STD Retaining Walls. Walls heights vary from an average of 7 feet to an average of 10 feet.

Alternative:

The alternative proposes the use of Modular Block walls in-lieu of the cast-in-place concrete retaining walls. The alternative maintains the original design geometry.

Opportunities:

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

Risks:

- Minimal or no redesign effort and cost

Technical Discussion:

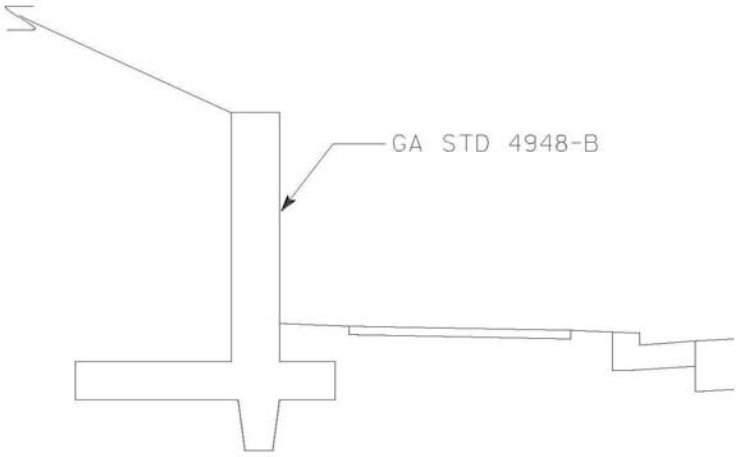
Modular Block walls have demonstrated acceptable performance and longevity. Performance warranties are also provided by the manufacturers.

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

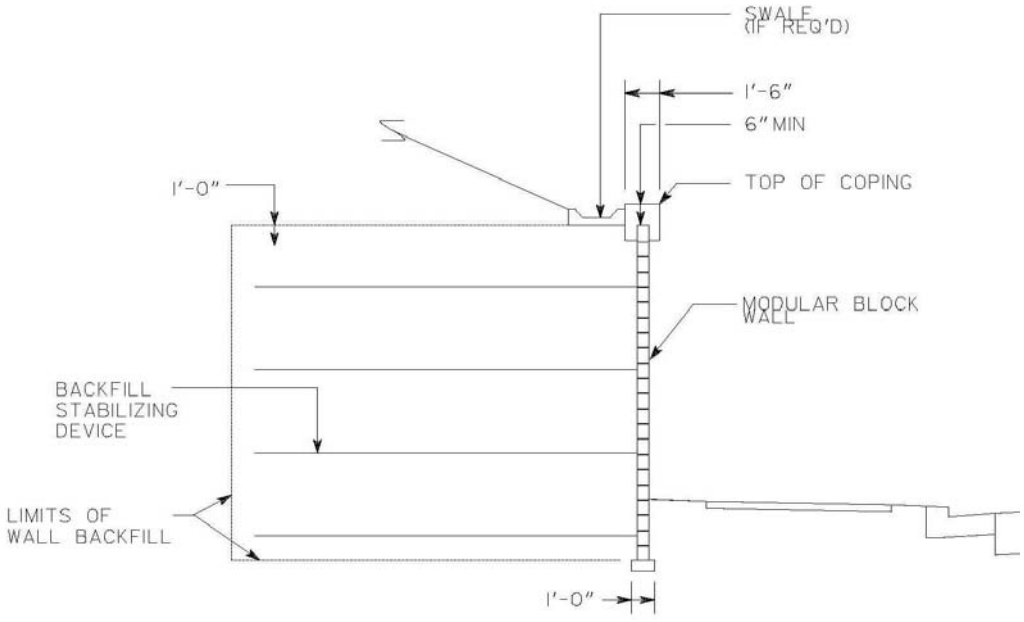
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 540,296	$ 0	$ 540,296
ALTERNATIVE	$ 314,903	$ 0	$ 314,903
SAVINGS	$ 225,394	$ 0	$ 225,394

Illustrations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-11**
DESCRIPTION:	**Use Modular Block Walls in-lieu of poured in place GA STD 4948-B Retaining Wall**	SHEET NO.: **2** of **5**



CURRENT DESIGN: GA STD 4948-B



ELEVATION: MODULAR BLOCK WALL

Illustrations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-11**
DESCRIPTION:	**Use Modular Block Walls in-lieu of poured in place GA STD 4948-B Retaining Wall**	SHEET NO.: **3** of **5**

CASE STUDY — HIGHWAY APPLICATION

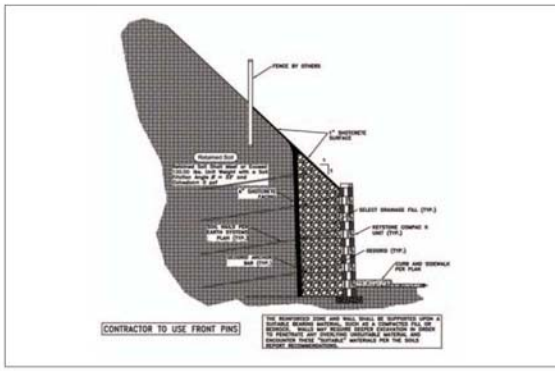
After those nails were placed, the sacrificial nail had to be sealed. Each boring was pressure grouted until all of the air was removed. This process ensured that the galvanized nail did not erode due to moisture contact. The slope face was then shotcreted to prevent erosion or slope failure. Next, the top half of the ramp was removed in order to access the middle portion of the slope and the soil nailing and shotcreting process was repeated.

After removing the last of the ramp, construction of the wall began. As the wall progressed, contractors followed a strict soil nail testing schedule. Using a 100-ton hydraulic jack, they tested every nail for a predetermined amount of design load (dtl) over a certain amount of time using a pressure gauge. For contractors, the danger of this testing is that if you have any nails that fail the pullout test, you must drill and sacrifice a new nail, grout it, and then let it set up before retesting. This delay shuts down wall construction while the new nail cures. Fortunately, this project experienced no failures.

Making the Connection

Keystone segmental retaining walls are capable of making a very strong connection to soil or rock nails. Each nail had a threaded end that was wrapped to remain clean during the shotcreting process. That cover was then removed and a four-inch diameter galvanized hook was screwed on. A four-inch galvanized pipe was then woven through the eyelets. After the eyelets were attached and the pipe woven through, it made a very uniform point of connection. The Keystone Compac wall was built using conventional methods with the exception of geogrid placement. The geogrid, was positioned over the fiberglass pins, then placed around the pipe and returned to the wall on the next course up. According to McCaffery, this process created a very structurally sound wall. In the end, Geogrid was able to beat the 61 days allowed to construct all three walls. "I know the developer was blown away as we literally cut his construction time in half and we eliminated the excessive costs associated with excavation and crushing," said McCaffery.

"In this case, the soil nailing was just a means to an end," said Daniel Bruffett of wall contractor Geogrid. "The job called for a permanent solution that was also aesthetically pleasing – to me soil nails and shotcrete are neither. Keystone Compac units were perfect for the job, offering flexibility, strength and good looks."



Over 16,000 square feet of Keystone Compac II units, produced by Keystone supplier RCP Block & Brick, were used on the project. The wall reached 27 feet at its highest point.

Keystone Compac offers outstanding structural performance in a lightweight, space-saving design – perfect for tighter radius curves and corners.

For more information on Keystone Compac or the other innovative Keystone products, please visit **www.keystonewalls.com** or call (800) 747-8971.

KEYSTONE® RETAINING WALL SYSTEMS A CONTECH COMPANY
Retaining Excellence™

Keystone is a subsidiary of CONTECH EARTH STABILIZATION SOLUTIONS INC.

Calculations

PROJECT: **Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**

ALTERNATIVE NO.: **RD-11**

DESCRIPTION: **Use Modular Block Walls in-lieu of poured in place GA STD 4948-B Retaining Wall**

SHEET NO.: **4** of **5**

Current Design – Cast-in-Place Concrete Retaining Walls – GDOT Standards

Quantities (As provided to the VE Team):

Location	Length (LF)	Avg. Height (Feet)	Quantity (CY)
Sta. 179+51	154	10	91
Sta. 184+00	135	8	80
Sta. 187+00	147	7	71
Sta. 198+72	70.5	8	37.6
Sta. 200+08	45	8	24.2
Sta. 200+81	111	8	59.6
Sta. 190+00	228	8	122.4
Sta. 202+20	67	7	32.3
Sta. 254+00	103	10	64.9
Sta. 266+00	327	8	175.6

Total volume of Class A Concrete = 758.6 CY

Note: Handrails, Backfill and other treatments assumed to be similar for original design and alternative and hence not included in cost and quantities comparison. (Conservative).

Alternative – Modular Block Walls with Coping

Location	Length (LF)	Avg. Height (Feet)	Quantity (SF)
Sta. 179+51	154	10	1540
Sta. 184+00	135	8	1080
Sta. 187+00	147	7	1029
Sta. 198+72	70.5	8	564
Sta. 200+08	45	8	360
Sta. 200+81	111	8	888
Sta. 190+00	228	8	1824
Sta. 202+20	67	7	469
Sta. 254+00	103	10	1030
Sta. 266+00	327	8	2616

Length of Coping = 1387.5 LF

Total Wall area = 11400 SF

Cost Worksheet

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056)) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.:	**RD- 11**
DESCRIPTION:	**Use Modular Block Walls in-lieu of poured in place GA STD 4948-B Retaining Wall**	SHEET NO.:	**5** of **5**

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Class A Concrete (Incl. R/F)	CY	758.6	$ 647.48	$491,178	0	$ 647.48	$0
Modular Block Walls (7 -10 ft)	SF	0	$ 20.00	$0	11400	$ 20.00	$228,000
Coping	LF	0	$ 42.00	$0	1387.5	$ 42.00	$58,275
Note: Cost per SF of Modular							
Block wall is in place cost as							
provided by manufacturer.							
Sub-total				$ 491,178			$ 286,275
Cons't Mark-up 10.00%				$ 49,118			$ 28,628
TOTAL				**$ 540,296**			**$ 314,903**
Estimated Savings:							$ 225,394

2.3.5 ALTERNATIVE NUMBER RD-12

Value Analysis Design Alternative

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-12**
DESCRIPTION:	**Use GA STD 9031-L Gravity Walls in-lieu of poured in place GA STD 4948-B Retaining Wall**	SHEET NO.: **1** of **4**

Original Design:

The original design calls for stretches of walls along the project at 10 locations. The walls are poured in place GA STD Retaining Walls. Walls heights vary from an average of 7 feet to an average of 10 feet.

Alternative:

The alternative proposes the use of GA STD 9031-L Gravity Retaining Walls in-lieu of GA STD 4948-B cast-in-place concrete retaining walls. The alternative maintains the original design geometry.

Opportunities:

- Cost savings
- Reduced construction time

Risks:

- Minimal or no redesign effort and cost

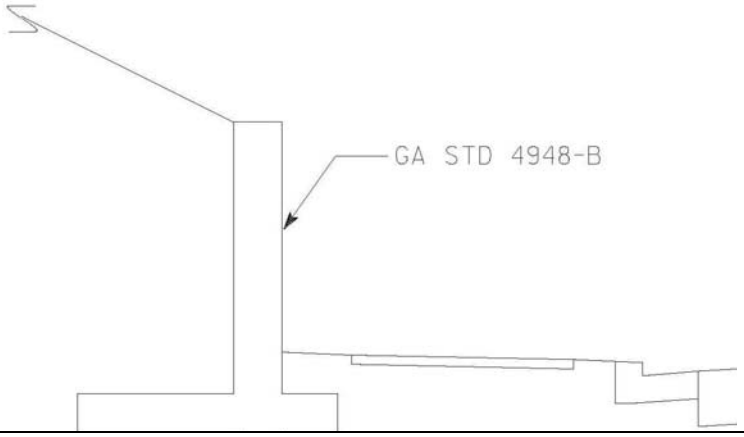
Technical Discussion:

Gravity Retaining walls are commonly used where wall heights are below 10 feet. Their performance and longevity on case-studies has been satisfactory.

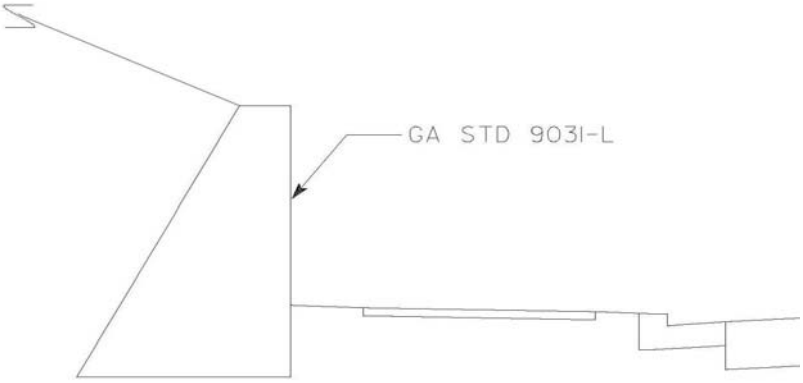
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 540,296	$ 0	$ 540,296
ALTERNATIVE	$ 318,904	$ 0	$ 318,904
SAVINGS	$ 221,392	$ 0	$ 221,392

Illustrations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-12**
DESCRIPTION:	**Use GA STD 9031-L Gravity Walls in-lieu of poured in place GA STD 4948-B Retaining Wall**	SHEET NO.: **2** of **4**



CURRENT DESIGN – GA STD 4948-B; CAST-IN-PLACE WALL



ALTERNATIVE – GA STD 9031-L; GRAVITY WALL

Calculations

PROJECT: **Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**

ALTERNATIVE NO.: **RD-12**

DESCRIPTION: Use GA STD 9031-L Gravity Walls in-lieu of poured in place GA STD 4948-B Retaining Wall

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

Current Design – Cast-in-Place Concrete Retaining Walls – GDOT Standards

Quantities (As provided to the VE Team):

Location	Length (LF)	Avg. Height (Feet)	Quantity (CY)
Sta. 179+51	154	10	91
Sta. 184+00	135	8	80
Sta. 187+00	147	7	71
Sta. 198+72	70.5	8	37.6
Sta. 200+08	45	8	24.2
Sta. 200+81	111	8	59.6
Sta. 190+00	228	8	122.4
Sta. 202+20	67	7	32.3
Sta. 254+00	103	10	64.9
Sta. 266+00	327	8	175.6

Total volume of Class A Concrete = 758.6 CY
For Class A Concrete with reinforcement use $647.48 per "Means Summary"

Note: Handrails, Backfill and other treatments assumed to be similar for original design and alternative and hence not included in cost and quantities comparison. (Conservative).

Alternative – Gravity Retaining Wall – GDOT Standards

Location	Length (LF)	Avg. Height (Feet)	Quantity (CY)
Sta. 179+51	154	10	180.62
Sta. 184+00	135	8	106.67
Sta. 187+00	147	7	92.10
Sta. 198+72	70.5	8	55.70
Sta. 200+08	45	8	35.56
Sta. 200+81	111	8	87.70
Sta. 190+00	228	8	180.15
Sta. 202+20	67	7	41.98
Sta. 254+00	103	10	120.80
Sta. 266+00	327	8	258.37

Total volume of Class B Concrete = 1159.65 CY
For Class B Concrete without reinforcement use $449.93 per "Means Summary"

Cost Worksheet

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056)) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.:	**RD- 12**
DESCRIPTION:	**Use GA STD 9031-L Gravity Walls in-lieu of poured in place GA STD 4948-B Retaining**	SHEET NO.:	**4** of **4**

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Class A Concrete (Incl. R/F)	CY	758.6	$ 647.48	$491,178	0	$ 647.48	$0
Class B Concrete (w/o R/F)	CY	0	$ 449.93	$0	1159.7	$ 250.00	$289,913
(OR Random Rubble Masonry						**(Assumed)**	
Sub-total				$ 491,178			$ 289,913
Cons't Mark-up 10.00%				$ 49,118			$ 28,991
TOTAL				**$ 540,296**			**$ 318,904**
Estimated Savings:							$ 221,392

2.3.6 ALTERNATIVE NUMBER RD-15

Value Analysis Design Alternative

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-15**
DESCRIPTION:	**Use a 4" concrete median thickness in lieu of 7.5"**	SHEET NO.: **1** of **4**

Original Design:

The original design calls for the construction of a 7.5" concrete median as the surface for the 20' proposed raised median.

Alternative:

The alternative proposes using a 4" concrete median as the surface for the proposed 20' raised median.

Opportunities:

- Lower initial costs
- Reduction in construction time

Risks:

- Minimal design impacts
- Will require additional fill for base construction

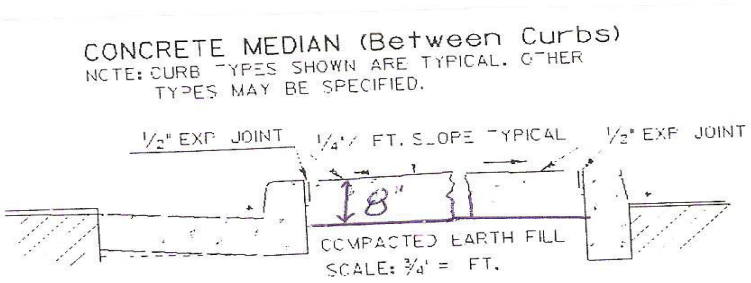
Technical Discussion:

The alternative proposal would reduce the proposed thickness of the 20' concrete median from 7.5" original to 4" proposed. The resulting cost savings are based on the differential in unit prices of the above items. Additional costs may be incurred in providing fill to account for the vertical difference between the 7.5" proposed surface and the 4" alternative treatment.

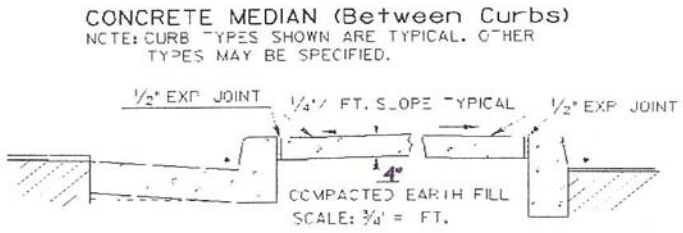
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 420,112	$ 0	$ 420,112
ALTERNATIVE	$ 174,020	$ 0	$ 174,020
SAVINGS	$ 246,092	$ 0	$ 246,092

Illustrations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-15**
DESCRIPTION:	**Use a 4" concrete median thickness in lieu of 7.5"**	SHEET NO.: **2** of **4**



ORIGINAL



ALTERNATIVE

Calculations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.: **RD-15**
DESCRIPTION:	**Use a 4" concrete median thickness in lieu of 7.5"**	SHEET NO.: **3** of **4**

Assumptions:

The VE team reviewed the cost estimate dated 7/31/2009, and found a quantity of 3,500 SY set up for item 441-0754, Concrete median 7.5". The VE team feels this quantity has been underestimated by approximately half following closer inspection. The quantities for this alternative have been adjusted to reflect 7,000 SY of concrete median. This alternative savings recognized is the sum of the unit price differential between these two items.

The price for item 441-0754, 7.5" Concrete median was found in the cost estimate provided by the designer to the VE Team dated 7/31/2009. The price for item 441-0740, 4" Concrete median was derived from GDOT's Item Mean Summary dated 1/11/2010.

Cost Worksheet

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056)) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry County**	ALTERNATIVE NO.:	**RD- 15**
DESCRIPTION:	**Use a 4" concrete median thickness in lieu of 7.5"**	SHEET NO.:	**4** of **4**

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
441-0754 Conc. Med.- 7.5"	SY	7,000	$54.56	$ 381,920	0	$54.56	$ -
441-0740 Concrete Median, 4"	SY	0	$22.60	$ -	7,000	$22.60	$ 158,200
Sub-total				$ 381,920			$ 158,200
Cons't Mark-up **10.00%**				$ 38,192			$ 15,820
TOTAL				**$ 420,112**			**$ 174,020**
Estimated Savings:							$246,092

2.3.7 ALTERNATIVE NUMBER RD-16

Value Analysis Design Alternative

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry Counties**	ALTERNATIVE NO.: **RD-16**
DESCRIPTION:	**Remove and replace existing pavement to eliminate leveling in select areas**	SHEET NO.: **1** of **4**

Original Design:

The original design proposes leaving the existing roadway in place and overlaying with a leveling layer up to 4.0 feet thick.

Alternative:

The alternative design proposes removing the existing pavement and constructing a new pavement structure in selected areas.

Opportunities:

- Reduce paving costs
- Reduce construction delays

Risks:

- None apparent

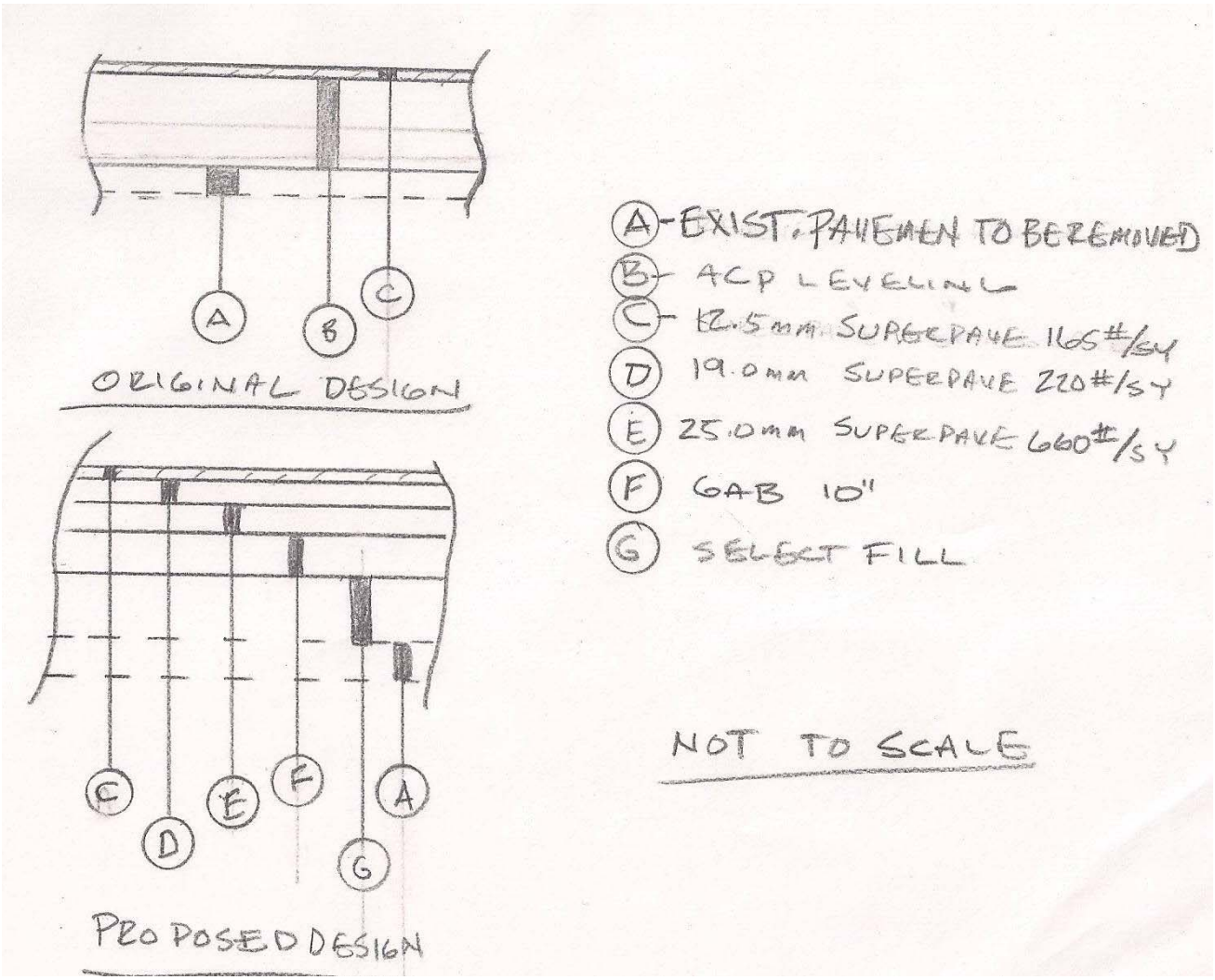
Technical Discussion:

Portions of the proposed roadway are to have leveling that is up to 4.0 feet thick. Placing ACP leveling that thick in addition to being extremely expensive would most likely not be able to be done under traffic. The typical pavement structure could be constructed and the existing pavement removed. Removing the pavement in the areas where there is PGL is 1.625' to 4.00' higher would eliminate placing a small layer of fill between two layers of asphalt paving. The removed pavement could also be use as fill on other portions of the job.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 861,012	$ 0	$ 861,012
ALTERNATIVE	$ 281,091	$ 0	$ 281,091
SAVINGS	$ 579,921	$ 0	$ 579,921

Illustrations

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry Counties**	ALTERNATIVE NO.: **RD-16**
DESCRIPTION:	**Remove and replace existing pavement to eliminate leveling in select areas**	SHEET NO.: **2** of **4**



Calculations

PROJECT: **Georgia Department of Transportation STP00-0037-02(056) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry Counties**

ALTERNATIVE NO.: **RD-16**

DESCRIPTION: **Remove and replace existing pavement to eliminate leveling in select areas**

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

Station	Width	Depth
225 + 50	22.5	1.70
226 + 00	22.7	1.90
226 + 50	22.8	2.30
227 + 00	22.8	2.60
227 + 50	32.7	2.90
228 + 00	36.8	3.20
228 + 50	36.0	3.40
229 + 00	36.0	3.50
229 + 50	44.7	4.00
230 + 00	39.8	3.50
230 + 50	32.4	3.30
231 + 00	27.0	3.00
231 + 50	24.5	2.90
232 + 00	24.5	2.80
232 + 50	24.6	2.80
233 + 00	24.6	3.00
233 + 50	24.7	3.60
234 + 00	24.7	3.90

Station	Width	Depth
234 + 50	24.8	3.90
235 + 00	24.0	3.40
235 + 50	24.0	2.60
236 + 00	24.0	1.80
236 + 50	24.0	1.80
237 + 00	24.0	2.20
237 + 50	24.0	2.30
238 + 00	24.0	2.50
238 + 50	24.0	2.60
239 + 00	24.0	2.60
239 + 50	24.0	2.70
240 + 00	24.0	2.60
240 + 50	24.0	2.30
Average:	**27.0'**	**2.80'**

Paving: Station ~225+50 to Station ~240+50=> 1,500 LF
(1,500 LF x 27.0' wide) = 40,500 SF/ (9 SF/SY) => 4,500 SY

Original Pavement-
Superpave 12.5mm = [(4,500 SY) x 165#/SY-IN / (2000#/Ton)] => 372 TN
ACP Leveling = [(4,500 SY) x [(2.80- 0.13 ft) x(12"/ft)]110#/SY-IN / (2000#/Ton)] => 7,930 TN

Alternative Pavement-
Superpave 12.5mm = [(4,500 SY) x 165#/SY-IN / (2000#/Ton)] => 372 TN
Superpave 19.0mm = [(4,500 SY) x 220#/SY-IN / (2000#/Ton)] => 495 TN
Superpave 25.0mm = [(4,500 SY) x 660#/SY-IN / (2000#/Ton)] => 1,485 TN
10" GAB = (40,500 SF) x (10/12 ft depth) x(135#/cf)) / (2000#/Ton)=> 2,280 TN
Assume existing paving to be excavated is 1.50' thick and may be used as fill elsewhere on the job.
Excavation =[(40,500 SF) x (1.50 ft excavation depth + 2.80 ft roadway height – 1.625 ft pavement depth] / (27cf/cy) => 4,020 CY

Cost Worksheet

PROJECT:	**Georgia Department of Transportation STP00-0037-02(056)) – P.I. No. 322050- Widening SR 42/US23 from SR 138 to I-675 Clayton/Henry Counties**	ALTERNATIVE NO.:	**RD- 16**
DESCRIPTION:	**Remove and replace existing pavement to eliminate leveling in select areas**	SHEET NO.:	**4** of **4**

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
12.5 mm Superpave	TN	372	$ 79.00	$ 29,388	372	$ 79.00	$ 29,388
19.0 mm Superpave	TN	0	$ 75.00	$ -	495	$ 75.00	$ 37,125
25.0 mm Superpave	TN	0	$ 75.00	$ -	1485	$ 75.00	$ 111,375
10" GAB	TN	0	$ 24.80	$ -	2280	$ 24.80	$ 56,544
ACP Leveling	TN	7,930	$ 95.00	$ 753,350	0	$ 95.00	$ -
Unclassified Excavation	CY	0	$ 5.25		4,020	$ 5.25	$ 21,105
Sub-total				$ 782,738			$ 255,537
Cons't Mark-up 10.00%				$ 78,274			$ 25,554
TOTAL				**$ 861,012**			**$ 281,091**
Estimated Savings:							$579,921

3 PROJECT DESCRIPTION

The proposed project begins at SR 138 intersection, north of Stockbridge and extends 2.2 miles long along US 42/US 23 northwesterly to I-675. The proposed project will consist of the removal of existing turn lane markings between the existing five-lane section and Davis Road and resurfacing and restriping this section for through traffic. The proposed widening and reconstruction will be for the existing two lane roadway to be a four lane roadway with 12 foot travel lanes, a 20 foot raised median, urban shoulders with curb and gutter, and five-foot sidewalks on both sides. Design speed is 45 mph.

3.1 NEED AND PURPOSE

As growth continues in this gateway area, the volume of traffic continues to increase. The need to increase the capacity access to I-675 and I-285 drives this project. The ever increasing need to access safely makes this project important. The adjacent users need to access the roadway without deteriorating the movement in a safe manner. Therefore this project is to provide greater capacity and greater separation of the traffic movements to improve the level of service.

3.2 KICK-OFF PRESENTATION

Mr. Clifford Kong of Williams-Russell & Johnson, Inc., made a presentation to the VE Team on Monday morning of the VE Study as part of the information phase. He described the project and its constraints. Discussion included the environmental permitting status and needs of the project.

4 VALUE ENGINEERING PROCESS

4.1 WORK SHOP TEAM

PBS&J's Value Engineering (VE) team performed a VE study January 24-27, 2011 in the offices of Georgia Department of Transportation (GDOT), Atlanta, Georgia. The team followed the SAVE International's seven-step Value Engineering job plan as outlined in this section. The VE Study team consisted of the following members:

Les Thomas, P.E., CVS	Team Leader
Luke Clarke, P.E., AVS	Team Highway Design Engineer
Ramesh Kalvakaalva, P.E., AVS	Team Structural Engineer
Kevin Martin, Esq., AVS	Team Construction Specialist
Randy Thomas, CVS	Assistant Team Leader

4.2 SEVEN-STEP VALUE ENGINEERING JOB PLAN

The VE team followed the SAVE International's Seven-step Value Engineering job plan:

Information Phase
Function Analysis Phase
Speculation/Creative Phase
Evaluation Phase
Development Phase
Recommendation Phase
Presentation Phase

Information Phase— during this phase of the VE Team's work, the team received a briefing from the GDOT staff members and their design team. This briefing included discussions of the design intent behind the project, the cost concerns, and the physical project limitations. In the working session that followed, the VE team developed cost models from the cost data provided by the designers and familiarized themselves with the construction drawings and other data that was made available to the team.

Function Analysis Phase— during this phase the VE Team determined the "**Functions**" of the project. This was accompanied by reviewing the project by asking the questions such as: "*What is the project supposed to do?",* and "*How is it supposed to accomplish this purpose?"* In the Value Engineering vernacular, the answers to these questions are cast in the form of active verbs and measurable nouns. These verb/noun pairs form the basis of the function analysis that distinguishes a Value Engineering effort from a potentially damaging cost-cutting exercise. A Functional Analysis System Technique (FAST) diagram was prepared highlighting the projects required functions.

Speculation/Creative Phase — The VE Team performed a brainstorming session to identify ideas that might help meet the project objectives. These ideas fell into the following major headings:

Roadway Horizontal Alignment
Roadway Vertical Alignment
Right-of Way

The brainstorming session identified seventeen (17) ideas. See page 1-7 for listing.

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 and the design team members. This guidance emerged on the first day of the study at the kick-off meeting. From that guidance, the team was able to select ideas that they believed would improve the project by a matrix 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:

First Costs
Permit-ability
Constructability
Reliability
Operating Costs

Development Phase— During this phase, the VE team developed each of the selected alternatives whose score was 4 or higher because of time constraints. 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 titled ***Study Results***).

Recommendation Phase— The VE team prepares its recommendations to be presented to the Georgia Department of Transportation. The recommendation includes the team's estimate of the savings that might be realized if implemented.

Presentation Phase— As noted earlier, the team made an informal "out-briefing" on the last day of the workshop. This presentation was 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 is a flow chart that represents the work done prior to, during and after the VE workshop is completed on site:

Source: SAVE International

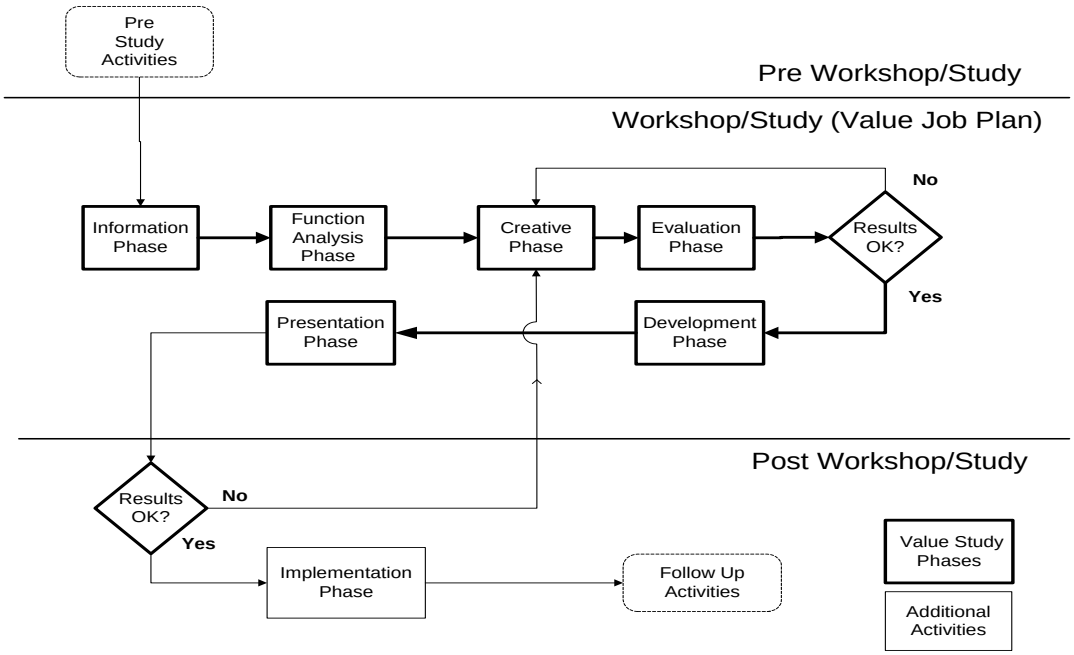


Figure 4-1 – Value Engineering Job Plan

4.3 VE WORKSHOP AGENDA

VALUE ENGINEERING STUDY AGENDA

SR 42/US 23 from SR 138 to I-675

Clayton/Henry Counties

January 24-27, 2011

Pre-Workshop Activities VE team leader organizes study, coordinates with the Owner and Designer to attain the project objectives and materials necessary. The VE team receives and reviews all project documents. The team develops a Pareto chart and/or cost model for the project.

Day One

9:00-10:30 Design team presentation (information phase)
Introduction of participants, owner, designer, and VE team members
Presentation of the project by the design engineer including:
History and background
Design criteria and constraints
Special needs
Current construction completion schedule
Project cost estimate if available and budget constraints
Owner presentation – special requirements, definition of life-cycle period and interest rate for life-cycle costs
Discussion, questions and answers
Overview of the VE process and agenda – workshop goals and project goals

10:30-12:00 VE Team reviews project (information phase)
Review design team's presentation
Review agenda and goals of the study
VE Team visits project site

1:00-2:30 Function Analysis Phase
Analyze cost model – Pareto
Identify basic and secondary functions
Complete function matrix/FAST diagram

2:30-5:00 Creative Phase
Brainstorming of alternative ideas

Day Two

8:00-10:00 Evaluation Phase
Establish criteria for evaluation
Rank ideas
Identify "best" ideas for development
Identify those ideas that will become design suggestions
Identify a "champion" for each idea to be developed

10:00-5:00 Development Phase
Develop alternative ideas design suggestions with assessment of original design and write up new alternatives including:
Opportunities and risks
Illustrations
Calculations
Cost worksheets
Life-cycle cost analysis

Day Three

8:00-5:00 Development Phase
Continue developing alternative ideas
Continue developing design suggestions
Prepare for presentation to Owners and Designers

Day Four

8:00-9:00 Prepare presentation
9:00-10:00 VE team presentation

4.4 CONSTRUCTION CAPITAL COST ESTIMATE

The VE Team was provided with a construction cost estimate. An estimate of the right of way acquisition cost was also given to the team. The team used this information to concentrate its efforts towards the area of the project having the least value.

4.5 FUNCTIONAL ANALYSIS SYSTEM TECHNIQUE (FAST) DIAGRAM

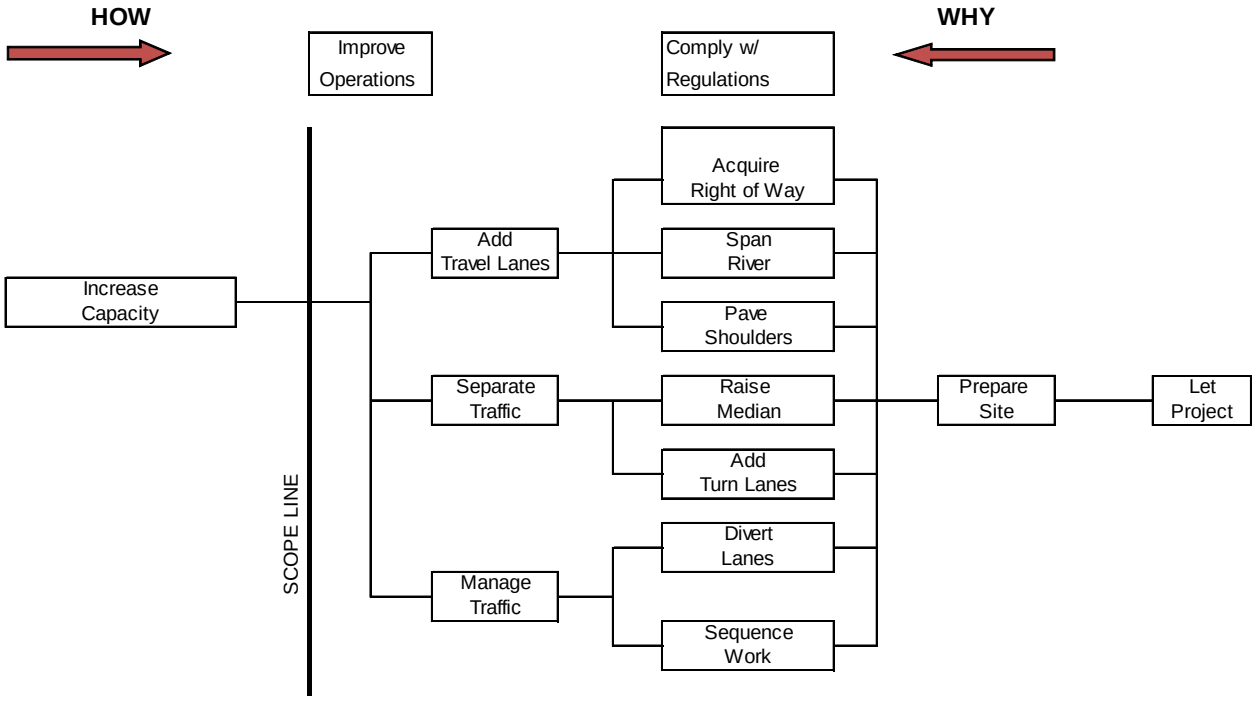
FUNCTIONAL ANALYSIS SYSTEMS TECHNIQUE (FAST)

Widening SR 42/US23 from SR 138 to I-675

Project No. STP00-0037-02(056)) – P.I. No. 322050-

Georgia Department of Transportation

Clayton/Henry Counties



4.6 ATTENDANCE SHEET FOR DESIGNERS AND VE TEAM PRESENTATIONS

DESIGNER PRESENTATION

PBSJ an Atkins company

MEETING PARTICIPANTS

Geogia Department of Transportation **January 24, 2011**

STP00-0037-02(056) - P.I. 322050-

Widening SR 42/US 23 from SR 138 to I-675

Clayton/Henry County

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VE TEAM PRESENTATION

MEETING PARTICIPANTS

Geogia Department of Transportation **January 27, 2011**

STP00-0037-02(056) - P.I. 322050-

Widening SR 42/US 23 from SR 138 to I-675

Clayton/Henry County

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