

# VALUE ENGINEERING REPORT

US 23/SR 87 Widening and Reconstruction  
MLP-87 (45)  
Dodge and Bleckley Counties

December 3, 2007

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OWNER:



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US 23/SR 87 Widening and Reconstruction  
MLP 87 – (45)

**VALUE ENGINEERING STUDY**

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# EXECUTIVE SUMMARY

# Executive Summary

## VALUE ENGINEERING STUDY

### US 23/SR 87 Widening and Reconstruction

November 5-8, 2007

#### Introduction

This report summarizes the results of a value engineering (VE) study conducted for the US 23/SR 87 Widening and Reconstruction project, located between McRae and Cochran, in Dodge and Bleckley Counties. The project consists of 9.5 miles of two lane roadway which will be upgraded and widened to a four lane facility. The estimated construction cost including Right of Way is \$48Million. The design is currently at the Preliminary Field Plan Review stage and the current scheduled let date is February, 2011. The project is being designed by GDOT Office of Road Design. The VE study was conducted November 5-8, 2007, at the GDOT offices in Atlanta using a three-person team.

This report presents the Team's recommendations and includes back-up information for consideration by the decision-makers. This **Executive Summary** includes a brief description of each recommendation. The **Study Identification** section contains information about the project and the team. The **Recommendations** section presents a more detailed description and supporting information about each recommendation. Lastly, the **Appendix** includes a complete record of the Team's activities and findings as well as a meeting attendees list. The reader is encouraged to review all sections of the report in order to obtain a complete understanding of the VE process.

#### Considerations

Although quite long and costly, this project is not very complex from a technical perspective. There are no major structures or grade-separated intersections. The most complex aspect of the project is the fact that it includes six distinct typical sections in seven portions of the 9.5 mile length, including two transition sections. The R/W cost is projected to be \$17M including the taking of 40 dwellings. Earthwork costs, including clearing and grubbing, have been estimated at \$7M. All existing pavement is proposed to be removed and replaced with a total cost estimated at \$16M. The VE Team concentrated on these major project elements during this study.

#### Results Obtained

The VE Team generated eight recommendations involving revisions to the proposed typical section in several areas, and a reconsideration/reevaluation of the vertical alignment and possible retention of some of the existing pavement. These recommendations have the potential to significantly reduce construction and R/W costs as well as enhancing roadway operation, as outlined in the following pages.

## **Recommendation Highlights**

### **E-1 Review Profile Grade/Retain Existing Pavement**

The baseline concept is to remove and replace all the existing pavement. The profile grade varies significantly from the existing alignment which the Team believes would not be necessary to provide the appropriate design speed. If the proposed profile grade can be kept at or closer to the existing grade, particularly in the depressed median sections, a significant amount of the existing pavement could be retained if further pavement analyses finds it suitable for re-use. The following is a very rough estimate of potential savings for purposes of illustration only.

*The total potential savings if accepted is \$3,200,000.*

### **1-5 Reduce Clear Zone Width**

The clear zone could be significantly reduced in some sections of the project while continuing to meet the applicable design standard. This change would reduce R/W impacts, including the avoidance of about 6 or more displacements, and would reduce project cost significantly.

*The total potential savings if accepted is \$1,100,000.*

### **2-1 Use a Flush Median in lieu of Raised Median**

The proposed typical section from Sta.109+00 to Sta.135+00 is a 24' raised median. The VE Team recommends the use of a 14' flush median as will be used in other sections of the project. This change would increase typical section continuity and enhance the project from a driver expectation perspective while providing some cost reductions.

*The total potential savings if accepted is \$105,000.*

### **2-4 Reduce Width of Raised Median**

If the previous recommendation cannot be implemented, the VE Team recommends a narrower raised median and the elimination of a median opening, in order to increase continuity and enhance operations. This recommendation would provide slightly more modest savings.

*The total potential savings if accepted is \$40,000.*

### **7-5 Use a Flush Median with Urban Shoulder**

From Sta. 542+00 to Sta. 590+00, the baseline proposes to construct a flush median with rural shoulders. The VE Team recommends the use of an urban shoulder with curb, gutter, and sidewalk, which would reduce the width of the roadway footprint and the R/W impact.

*The total potential savings if accepted is \$380,000.*

### **5-1 Use 44' Median Section Between Sta. 344+00 and Sta. 388+00**

This short section of the project is proposed to be constructed with a 14' flush median. The VE Team believes that the 44' depressed median could be constructed in this area without significant additional R/W impact. This would increase the project's continuity.

*The total potential savings if accepted is \$140,000.*

### **4-3 Eliminate Skew at Wilson Woodard Road Intersection (CR 352)**

The VE Team noted that this idea was raised during the recent PFPR and decided to add our support for making this adjustment to enhance safety and operations and maintaining conformity to GDOT design criteria, min. 70° skew angle.

*There would be little if any change in construction or R/W cost as a result of this recommendation.*

### **7-6 Eliminate Intersection with CR 284**

During the PFPR, the County representative recommended that the proposed three closely-spaced accesses in this area be consolidated. The VE Team concurs with that idea and recommends that CR 284 should be the one that is closed. This would eliminate an offset intersection.

*The total potential savings if accepted is \$45,000.*

**US 23/SR 87 Widening and Reconstruction  
SUMMARY OF V.E. RECOMMENDATIONS**

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS	COMMENTS
	<b>EARTHWORK</b>						
E-1	Review Profile Grade/Retain Existing Pavement	\$23.3M	\$20.1M	\$3.2M +/-	Nominal	\$3.2M+/-	Rough Estimate
	<b>TYPICAL SECTIONS</b>						
1-5	Reduce Clear Zone Width			\$1.1M	Nominal	\$1.1M	Potential to save 6 residences
2-1	Use Flush Median In Section 2 (Sta. 109+00 to 135+00) in lieu of Raised Median			\$105,000	Nominal	\$105,000	Reduce Impacts
2-4	If Raised Median Used, Reduce Width and Eliminate One Opening			\$40,000	Nominal	\$40,000	Reduce Impacts
7-5	Use Flush Median with Curb and Gutter in Section 7 (Sta. 542+00 to 590+00)	\$900,000	\$520,000	\$380,000	Nominal	\$380,000	Reduce Impacts
5-1	Use 44' Median in Section 5 (Sta. 344+00 to 388+00)	\$210,000	\$70,000	\$140,000	Nominal	\$140,000	Increase Continuity

**US 23/SR 87 Widening and Reconstruction  
SUMMARY OF V.E. RECOMMENDATIONS**

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL LIFE CYCLE SAVINGS	COMMENTS
	<b>INTERSECTIONS</b>						
4-3	Eliminate Skew at Wilson Woodard Rd.			No significant change	No Change		Lesser impact to church
7-6	Eliminate Intersection with CR 284			\$45,000	No Change		Per County Comment

# STUDY IDENTIFICATION

## Study Identification

<b>Project: US 23/SR 87 Widening and Reconstruction</b>	<b>Dates: November 5-8, 2007</b>
<b>Location: GDOT Offices, Downtown Atlanta</b>	

## VE Team Members

Name:	Discipline:	Organization:	Telephone:
Rod Curtis, PE CVS	VE Team Facilitator	MACTEC	602-770-1062
George Obaranec, PE	Highway Design	MACTEC	770-421-3346
Jim Chambers, PE	Highway Construction	Street Smarts	770-813-0882

### Project Description

From the Revised Project Concept Report, dated April, 2005: “This project entails the widening and reconstruction of US 23/SR 87 to four lanes with a divided median from CR 332 to 500 feet north of SR 257. Approximately 88% of the project’s total length lies in Dodge County and approximately 12% lies in Bleckley County. The southern end of MLP-87(45) ties into project NHS-066-1(28), a project that added a northbound passing and turn lanes from CR 141 to just north of CR 78. The northern end of MLP-87(45) ties into proposed project MLP-87(43) a Bleckley County widening project.” The beginning and ending points have been adjusted somewhat since the approval of the revised scope. The project is currently approximately 9.5 miles long and estimated to cost nearly \$48M including R/W, but not including mark-ups. Several median types are proposed to be constructed – a 44’ depressed median will be provided for the longest portion, approximately 5 miles; 14’ flush median sections with urban shoulders and with rural shoulders, and a raised median section are also proposed in developed portions of the project. Design and Posted speeds in the 44’ median sections will be 55 mph and in the others areas will be 45 mph.

Key elements of the work include R/W (\$17.8M); Pavement (\$16.1M), and Earthwork (\$7.2M). Please refer to the Cost Model in the Appendix for more cost information.

This project recently had its Preliminary Field Plan Review. The right of way and final design phases are progressing. The current schedule is to let the project in FY 2011.

## Kick Off Meeting

A brief kickoff meeting was conducted on the first morning of the VE study. The following were in attendance:

- Lisa Myers – GDOT Engineering Services
- Nabil Raad – GDOT Traffic Operations
- Tim Matthews – GDOT Road Design – Project Manager
- Brent Story – GDOT State Road Design Engineer
- Andy Casey – GDOT Road Design
- Joshua Taylor – GDOT Road Design
- George Obaranec – MACTEC - VE Team
- Jim Chambers – Street Smarts – VE Team
- Rod Curtis – MACTEC – VE Team

The following items were noted during the Design Presentation by the Roadway Design representatives:

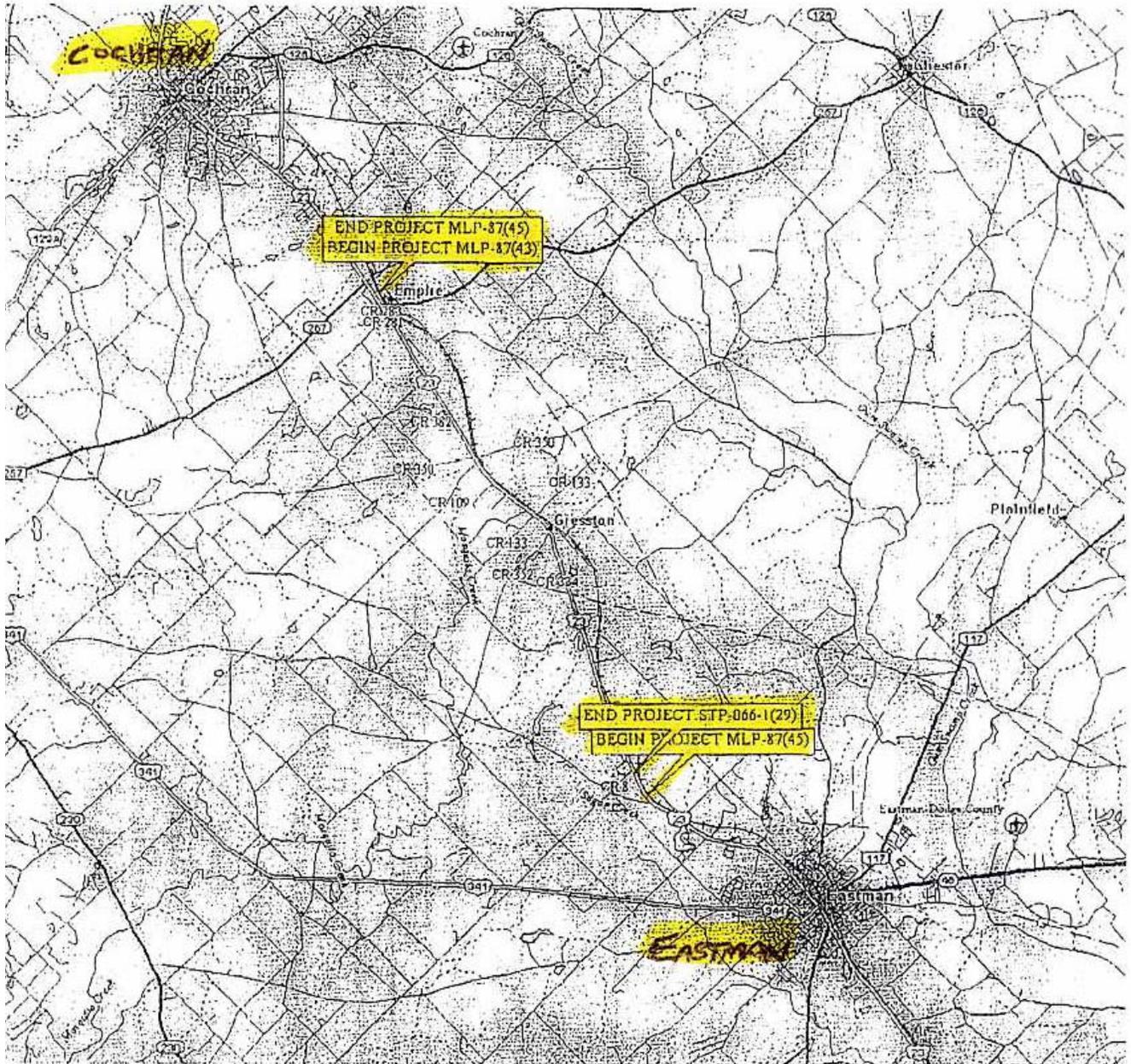
- The “Spur” project, which begins at the southern terminus of this project, is under concept design. Plans for that project were provided to the VE Team.
- The major environmental consideration is a fire station that must be relocated within its existing service area.
- The flush median sections are proposed primarily to reduce R/W impacts in the developed sections, especially the village/unincorporated area of Gresston.
- The roadway shares a continuous R/W and parallels a R/R for much of its length. Impacts to the R/R will be limited to some side road work and will require easements.
- The Design Team is working with a church at the intersection of CR 352 to minimize impacts to their property including potential future expansion.
- The environmental document has been approved.
- R/W plans are in progress. Only one property has been acquired to date.
- During the PFPR, County representatives requested a consolidation of accesses to SR 87 at the northern end of the project.
- This project is a continuation of corridor improvements already constructed and planned for SR 87.
- The traffic volumes shown on the plans have been updated: 2009 =10,000; 2029 =16,600
- Although the R/W impact is substantial, the Design Team had not received many comments or issues from the public in that regard.

The VE Team conducted a brief presentation of its findings and recommendations on the last morning of the study. The following were in attendance:

- Lisa Myers – GDOT Engineering Services
- Brian Summers – GDOT Engineering Services, Project Review Engineer
- Todd Long – GDOT Direction of Preconstruction
- Tim Matthews – GDOT Roadway Design
- Andy Casey – GDOT Roadway Design
- Joshua Taylor – GDOT Roadway Design

The VE Team appreciated these folks taking time from their busy schedules to participate in this study.

# Project Location Map



# VE RECOMMENDATIONS

<b>DEVELOPMENT AND RECOMMENDATION PHASE</b>			
<b>US 23/SR 87 Widening and Reconstruction</b>			
<b>IDEA No.:</b>	<b>Sheet No.:</b>	<b>CREATIVE IDEA:</b>	
E-1	1 of 2	Review Profile Grades/Retain Existing Pavement	
<b>Prepared By: GO      Date: 11/7/07      Checked By: RHC      Date: 11/15/07</b>			
<p><b>Original Concept:</b> The baseline profile includes some cuts and fills that seem to be greater than required to achieve the Design Speed (45 mph or 55 mph). Per the Pavement Evaluation Report, all existing pavement is recommended to be removed and replaced.</p> <p><b>Proposed Change:</b> The V.E. Team recommends that the Design Team review the vertical alignment with the goal of keeping the new profile as close to the existing as possible, and specifically consider retaining some or all of the existing pavement in the 44' median sections of the project.</p> <p><b>Justification:</b> The Need and Purpose statement in the Revised Concept Report does not indicate that the correction of vertical alignment deficiencies is a goal of this project. If the new profile can be kept at or closer to the existing grade, particularly in the 44' median sections, it may be feasible to retain a significant amount of the existing pavement. Even if some minor design exceptions would be required, the new roadway would be much safer than the existing.</p> <p>The Pavement Evaluation, dated October 9, 2003, states "Because of the combination of distresses and changes in alignment and grade, it is not recommended to retain any portion of the existing pavement." If there were to be no changes in alignment and grade, it is possible that the recommendation of the Pavement Evaluation could have been different. Retaining some of the existing pavement becomes even more feasible given the plan to overlay some or all of the roadway within the project limits, prior to this project being constructed, as noted in the Preliminary Field Plan Review Inspection Report, dated October 19, 2007.</p> <p>Specifically, we identified two locations that may be candidates for significant profile revision. From Sta. 195+00 to Sta. 212+00 (fill section) and Sta. 422+00 to Sta. 448+00 (cut section), it appears that a vertical alignment closer to the existing could be achieved and still meet the required 55 mph design speed. The topography in this area varies from flat to rolling, making it relatively easy to achieve the design speed. A significant reduction in overall earthwork effort could be achieved improving the project's constructibility and sequencing, reducing construction time and minimizing property impacts. A thorough analysis of the earthwork quantities for this lengthy project was beyond the scope of the VE study but the VE Team recommends that the Design Team revisit this aspect of the project design.</p> <p>It is also possible that at least one dwelling (Parcel 153, Sta 435) could be avoided by reducing or eliminating the cut in that area.</p>			
<b>LIFE CYCLE COST SUMMARY</b>	<b>CAPITAL COST</b>	<b>FUTURE COST</b>	<b>TOTAL COST</b>
<b>INITIAL COST - Original</b>	23,300,000		
<b>- Proposed</b>	20,100,000		
<b>- Savings</b>	\$3,200,000 +/-		\$3,200,000
<b>FUTURE COST – Savings</b>		Nominal Impact	\$0
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$3,200,000 +/-</b>

## CALCULATIONS

Project Name: SR 23/SR 87 Widening and Reconstruction

ITEM No: E-1

Sheet 2 of 2

Assume: ½ of the existing pavement in the 44' median sections of the project could be retained by keeping the new profile grade at the same elevation as the existing, widening as required, and overlaying. We have used \$4.75/sf estimated cost of pavement and base. Use \$4.00 net of required overlay (say 2")

Assume: Earthwork could be reduced 25% by retaining existing grade line (entire project).

These are rough estimates intended to show the order of magnitude of potential savings under this recommendation.

Cost of Earthwork = \$7.2M including clearing and grubbing

Cost of Pavement and Base = \$16.1M

Length of 44' median sections = approximately 5 miles of 9.5 mile total

Rough estimate of potential savings from paving = 5 miles X 5280 X ½ X 24' width X \$4.00  
= say \$1.3 M

Rough estimate of potential savings from earthwork reduction = 0.25 X \$7.2M = SAY \$1.8M

SAY potential savings on the order of \$3.2M not including reduced R/W impacts.

## DEVELOPMENT AND RECOMMENDATION PHASE

### US 23/SR 87 Widening and Reconstruction

<b>Idea No.</b> 1-5	<b>Sheet No.:</b> 1 of 2	<b>CREATIVE IDEA:</b> Reduce Clear Zone Widths
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**Prepared By: JRC                      Date: 11-07-07                      Checked By: RHC                      Date: 11/14/07**

**Original Concept:** In the baseline concept, roadways with graded outside shoulders have a 32-foot clear zone, regardless of design speed or ADT volume. Apparently a design speed of 60 mph was used for the entire project, which would require a clear zone of 30'-32' for a 6:1 front slope.

**Proposed Change:**

**Typical Section # 1 - Sta. 90+00 to Sta. 109+00.** Design speed is 45 mph, design ADT is 11,000 vpd. For this situation, the Roadside Design Guide recommends clear zones of 20'-22' (6:1) and 24'-28' (4:1). VE recommendation: Reduce clear zone to 22'.

**Typical Section # 2 - Sta. 109+00 to Sta. 135+00.** Design speed is 45 mph, design ADT is 11,400 vpd. For this situation, the Roadside Design Guide recommends clear zones of 20'-22' (6:1) and 24'-28' (4:1). VE recommendation: Reduce clear zone to 22'.

**Typical Section # 3 - Sta. 135+00 to Sta. 264+00.** Design speed is 55 mph, design ADT is 11,400 vpd. For this situation, the Roadside Design Guide recommends clear zones of 22'-24' (6:1) and 26'-32' (4:1). VE recommendation: Reduce clear zone to 24'.

**Typical Section # 7 - Sta. 542+00 to Sta. 590+00.** Design speed is 55 mph, design ADT is 11,400 vpd. For this situation, the Roadside Design Guide recommends clear zones of 22'-24' (6:1) and 26'-32' (4:1). VE recommendation: Reduce clear zone to 24'.

NOTE: At some locations, the cut ditch may not be deep enough hydraulically or deep enough to provide cover for side drain pipes at driveways. In these situations, a larger clear zone should be used.

**Justification:** Reducing the proposed clear zones to lower acceptable widths will reduce the size of the roadway footprint, which will reduce earthwork volumes and right of way impacts.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b>INITIAL COST - Original</b>	\$1,100,000		
<b>- Proposed</b>	\$0		
<b>- Savings</b>	\$1,100,000		\$1,100,000
<b>FUTURE COST – Savings</b>		N/A	\$0
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$1,100,000</b>

## CALCULATIONS

Project Name: SR 23/SR 87 Widening and Reconstruction

ITEM No: 1-5

Sheet 2 of 2

### Assumptions:

1. Each home displacement will cost \$170,000, including net cost, contingency, administrative/court costs, and inflation. (R/W estimate: \$2.1M for 40 residences X 3.5 markup = \$183,750 SAY \$170K to allow for other site improvement costs)
2. Earthwork estimates are order of magnitude and are not based on detailed calculations.

### Typical Section # 1 - Sta. 90+00 to Sta. 109+00. Reduce clear zone to 22'.

Earthwork savings would be minimal for this section. The required right of way indicates that four structures located on the right side will be displaced. With a reduction in clear zone width, it may be possible to avoid displacing as many as three of the structures. Potential savings:  $\$170,000 \times 3 = \$510,000$ .

### Typical Section # 2 - Sta. 109+00 to Sta. 135+00. Reduce clear zone to 22'.

A displacement at Sta. 119+00 cannot be eliminated even with a reduced clear zone. Earthwork quantity would be reduced by as much as approximately 9,000 CY (+/-), which would be a cost savings of  $9,000 \times \$5/\text{CY} = \$45,000$ .

### Typical Section # 3 - Sta. 135+00 to Sta. 264+00. Reduce clear zone to 24'.

There are no right of way displacements for this section. Earthwork savings could be significant. Assume an average reduction in earthwork of 20 SF/LF. Total earthwork reduction would be  $20 \times 12,900 / 27 = 9,500 \text{ CY} \times \$5.00 = \$45,000$ .

### Typical Section # 7 - Sta. 542+00 to Sta. 590+00. Reduce clear zone to 24'.

There are several residential displacements in this section. Three of the displacements can be potentially avoided by reducing the clear zone. Potential savings:  $\$170,000 \times 3 = \$510,000$ . Earthwork savings could be significant. Assume an average reduction in earthwork of 15 SF/LF. Total earthwork reduction would be  $15 \times 4,800 / 27 = 2,700 \text{ CY} \times \$5.00 = \$13,500$ .

Totals: R/W Potential Savings = \$1,020,000 for 6 residences avoided

Earthwork Potential Savings = \$ 103,500

**TOTAL = \$1,123,500 SAY \$1.1M**

**DEVELOPMENT AND RECOMMENDATION PHASE**

**US 23/SR 87 Widening and Reconstruction**

<b>IDEA No.:</b> 2-1	<b>Sheet No.:</b> 1 of 2	<b>CREATIVE IDEA:</b> Use a Flush Median (14-foot) From Sta. 109+00 to Sta. 135+00
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**Prepared By: JC      Date: 11/7/07      Checked By: RHC      Date: 11/14/07**

**Original Concept:**

The baseline concept features a 24-foot raised median for this section.

**Proposed Change:**

The VE recommendation is to use a 14-foot flush median for this section.

**Justification:** The 14-foot flush median is the recommended typical section for a four-lane arterial with design ADT volumes less than 24,000 vpd. A raised median may be built as an alternate under certain circumstances, such as an excessive number of driveways, but the VE team does not think that a raised median is warranted in this case. If this recommendation is accepted, the roadway footprint will be approximately 5 feet smaller on each side of the centerline. One of the seven typical sections on this project would be eliminated, resulting in more consistency and a better driver expectation condition. This recommendation would also avoid potential opposition to the right-in/right-out condition that might emerge as the project develops. A modest savings in construction and O&M costs would be realized.

<b>LIFE CYCLE COST SUMMARY</b>	<b>CAPITAL COST</b>	<b>FUTURE COST</b>	<b>TOTAL COST</b>
<b>INITIAL COST - Original</b>	\$105,000		
<b>- Proposed</b>	\$0		
<b>- Savings</b>	\$105,000		\$105,000
<b>FUTURE COST – Savings</b>		Nominal	L
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$105,000</b>

## CALCULATIONS

Project Name: SR 23/SR 87 Widening and Reconstruction

ITEM No: 2-1

Sheet 2 of 2

Earthwork will be reduced, but the quantity difference is negligible.

Subtract cost of curb and gutter (Type 7):  $4,960 \text{ LF} \times \$15.02 = \$74,499$

Subtract cost of concrete median:  $3,080 \text{ SY} \times \$31.64 = \$97,451$

Net additional asphaltic pavement =  $161,200 - 147,210 = 13,990 \text{ SF} \times \$4.75 = \$66,452$

Net savings =  $\$74,499 + \$97,451 - \$66,452 = \$105,498$  SAY \$105,000

**DEVELOPMENT AND RECOMMENDATION PHASE**

**US 23/SR 87 Widening and Reconstruction**

<b>IDEA No.:</b> 2-4	<b>Sheet No.:</b> 1 of 2	<b>CREATIVE IDEA:</b> Reduce Raised Median Width to 12' Sta. 109+00 to Sta. 135+00
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**Prepared By: JC      Date: 11/7/07      Checked By: RHC      Date: 11/14/07**

**Original Concept:**

The baseline concept features a 24-foot raised median for this section.

**Proposed Change:**

If the previous recommendation cannot be implemented (2-1), the VE team recommends that the raised median be reduced from 24' to 12'. The team also recommends consideration of eliminating the proposed median opening at Sta.122+00 in conjunction with the narrower median.

**Justification:** Although 24 feet is the preferred dimension for a raised median, a narrower raised median would minimize the roadway footprint and more closely match the flush median section to the south. Narrower medians have been accepted on other projects with similar conditions. Additionally, eliminating the median opening would avoid an undesirable operating condition. This can be implemented under either this recommendation or 2-1. Given that the adjacent land is residential, not commercial, the number of vehicles needing to travel approximately 2600 feet rather than 1200 feet to turn would be minimal. A modest construction and O&M savings would be realized.

<b>LIFE CYCLE COST SUMMARY</b>	<b>CAPITAL COST</b>	<b>FUTURE COST</b>	<b>TOTAL COST</b>
<b>INITIAL COST - Original</b>	\$40,000		
<b>- Proposed</b>	\$0		
<b>- Savings</b>	\$40,000		\$40,000
<b>FUTURE COST – Savings</b>		Nominal	
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$40,000</b>

## CALCULATIONS

Project Name: SR 23/SR 87 Widening and Reconstruction

ITEM No: 2-4

Sheet 2 of 2

Earthwork will be reduced, but the quantity difference is negligible.

Additional cost of curb and gutter (Type 7) at original median opening:  $160 \text{ LF} \times \$15.02 = \$2,403$

Subtract cost of curb and gutter that will not be present at intersection with Log Cabin Road:  
 $600 \text{ LF} \times \$15.02 = \$9,012$

Net savings for curb and gutter:  $\$9,012 - \$2,403 = \$6,609$

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Subtract cost of reduced concrete median:  $3,080 \text{ SY} - (2,520)(7) / 9 \text{ SY} = 1,120 \text{ SY} \times \$31.64 = \$35,437$

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Net savings =  $\$6,609 + \$35,437 = \$42,046$  SAY \$40,000

**DEVELOPMENT AND RECOMMENDATION PHASE**

**US 23/SR 87 Widening and Reconstruction**

<b>IDEA No.:</b> 7-5	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA:</b> Use an Urban Shoulder (Curb and Gutter) from Sta. 542+00 to Sta. 591+00.
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**Prepared By: JC      Date: 11/7/07      Checked By: RHC      Date: 11/14/07**

**Original Concept:**

The baseline concept features a graded shoulder for this section.

**Proposed Change:**

The VE recommendation is to use an urban shoulder with curb and gutter for this section.

**Justification:**

If this recommendation is accepted, the roadway footprint will be significantly smaller and will have reduced right of way impacts as well as reducing impacts to two wetlands areas. As many as 4-5 residential displacements may be avoided. Sidewalks would be required.

Impact on O&M cost would be minimal – reduced shoulder maintenance but added curb, gutter, and sidewalk maintenance.

<b>LIFE CYCLE COST SUMMARY</b>	<b>CAPITAL COST</b>	<b>FUTURE COST</b>	<b>TOTAL COST</b>
<b>INITIAL COST - Original</b>	900,000		
<b>- Proposed</b>	520,000		
<b>- Savings</b>	380,000		380,000
<b>FUTURE COST – Savings</b>		Nominal	
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$380,000</b>



## CALCULATIONS

Project Name: SR 23/SR 87 Widening and Reconstruction

ITEM No: 7-5

Sheet 3 of 3

Earthwork will be reduced. Assume 100 SF reduction per LF

$$4,900 \times 100 / 27 = 18,148 \text{ CY}$$

$$18,148 \text{ CY} \times \$5.00 = \$90,740$$

Added cost of curb and gutter:  $4,900 \times 2 \times \$19.04 = \$186,592$

Added cost of sidewalk:  $4,900 \times 2 \times 5 / 9 \times \$33.67 = \$183,314$

Reduced pavement (6'-6" shoulders):  $4,900 \times 13.0 \times \$4.75 = \$302,574$

Added closed drainage system = SAY \$150,000

Assume that three displacements will be avoided. Net right of way savings will be  $\$170,000 \times 3 = \$510,000$ .

## DEVELOPMENT AND RECOMMENDATION PHASE

### US 23/SR 87 Widening and Reconstruction

<b>IDEA No.:</b> 5-1	<b>Sheet No.:</b> 1 of 4	<b>CREATIVE IDEA:</b> Use a 44' Median for Typical Section 5 (Sta. 344+00 to 388+00)
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**Prepared By: GO      Date: 11/8/07      Checked By: RHC      Date: 11/13/07**

**Original Concept:**

The baseline concept is to construct a 4400' section of roadway with a 14' flush median and rural shoulders.

**Proposed Change:**

The V.E. recommendation is to construct instead a 44' depressed median typical section in this area, as is proposed for other portions of the project.

**Justification:**

This change would eliminate one of seven separate typical sections proposed for the project and provide a more consistent typical section with a 55 mph design speed. The adjoining property in this section of the project is undeveloped and R/W would be available and relatively inexpensive. Only one building is close enough to the roadway to be affected (Parcel 132), and it would appear to be impacted under the baseline concept. The railroad alignment is quite close to the roadway in this area, but that constraint could likely be mitigated with a modest shift in the horizontal alignment.

We roughly estimated a modest construction cost savings that could be realized with this change. Impact on O&M effort would be nominal, with some savings in pavement maintenance but likely some increase to maintain the depressed median.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	TOTAL COST
<b>INITIAL COST - Original</b>	\$210,000		
<b>- Proposed</b>	\$70,000		
<b>- Savings</b>	\$140,000		\$140,000
<b>FUTURE COST – Savings</b>		Nominal Change	
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$140,000</b>

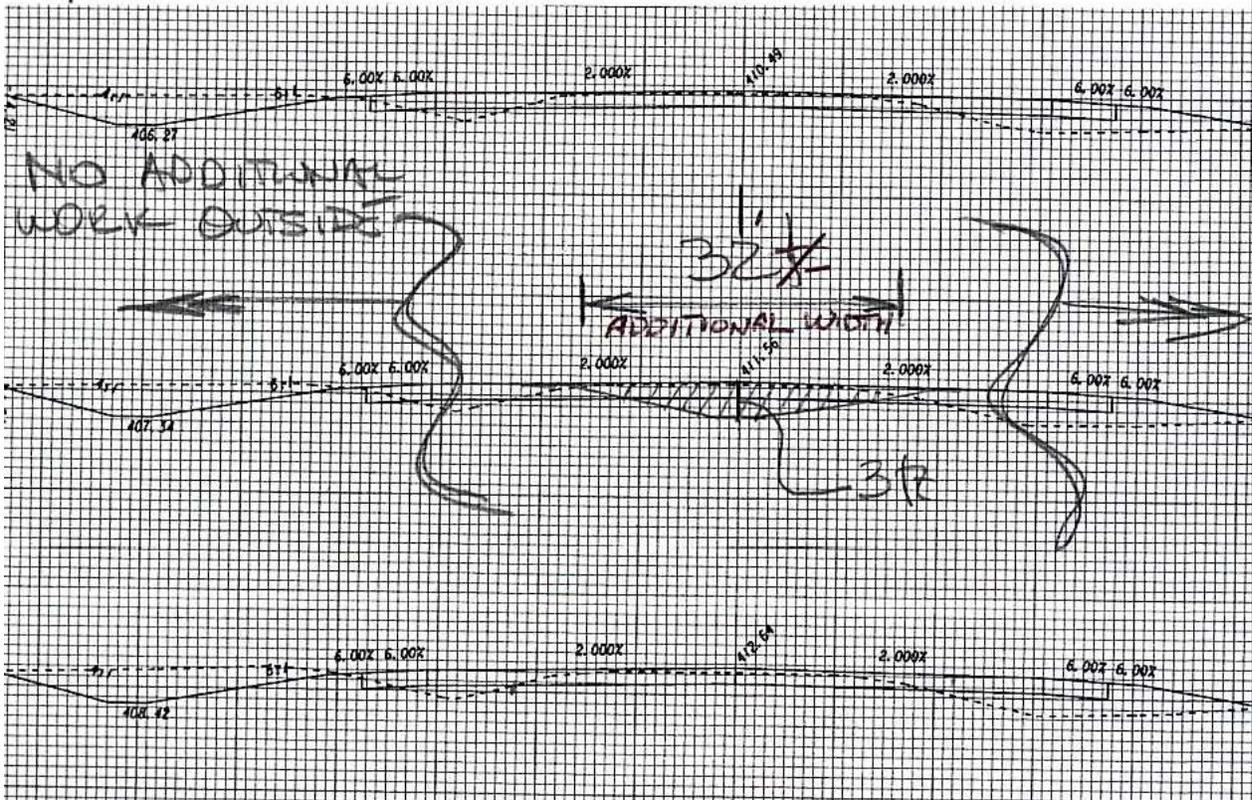
# SKETCH

Project Name: US 23/SR 87

IDEA No: 5-1  
CLIENT:

Comp By: 690 Date: 11/7/07 Ckd By RHC Date 11/18/07

Sheet 2 of 4



## COST WORKSHEET

<b>Project Name: SR 23/SR 87 Widening and Reconstruction</b>					IDEA No: 5-1		
					Sheet 3 of 4		
CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			NEW ESTIMATE		
ITEM	UNITS	N <sup>o</sup> UNITS	COST/ UNIT	TOTAL COST	N <sup>o</sup> UNITS	COST/ UNIT	TOTAL COST
Excavation	CY				7800	4.82	37,596
Right of Way	Acre				3	10,500	31,500
AC and base	SF	44,000	4.75	209,000			
<b>TOTAL</b>				209,000			69,096
<b>TOTAL ROUNDED</b>				<b>210,000</b>			<b>70,000</b>

## CALCULATIONS

Project Name: SR 23/SR 87 Widening and Reconstruction

ITEM No: 5-1

Sheet 4 of 4

Assume: no significant change in earthwork requirement due to widening and/or shifting horizontal alignment to avoid R/R. Topography in this section is relatively flat.

Assume: horizontal shift to avoid R/R would not increase R/W requirement (inexpensive anyway)

Assume: R/W cost = 3.5 X the net cost of Say \$3000/acre = \$10,500 per acre

Use: \$4.75/SF cost for pavement and base (68' average width at \$16.1M)

Additional earthwork for wider median: say 32' X 3' average X 1/2 X 4400' = 7800 CY

Additional R/W : 30' X 4400' = 132,000 sf = 3 acres

Pavement reduction: 14' flush median drops to two 2' paved inside shoulders = 10' net

10' X 4400 lf = 44,000 sf

**DEVELOPMENT AND RECOMMENDATION PHASE**

**US 23/SR 87 Widening and Reconstruction**

<b>IDEA No.:</b> 4-3	<b>Sheet No.:</b> 1 of 2	<b>CREATIVE IDEA:</b> Eliminate Skew at Intersection With Wilson Woodard Road
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**Prepared By: GO      Date: 11/7/07      Checked By: RHC      Date: 11/13/07**

**Original Concept:**

The skew angle proposed in the baseline plans is 64.8 degrees.

**Proposed Change:**

The VE Team recommends an adjustment of the alignments such that the skew angle will be a minimum of 70 degrees as required under GDOT design standards, thereby not requiring a D.V.

**Justification:**

Note: After this recommendation had been prepared, the Team noted that a comment to this effect was included in the PFPR report. We were not sure if the Design Team intended to make this change and thus we decided to retain the recommendation to add our input to the issue. This revision would avoid the need for a design variance, and result in a safer intersection. An improved skew angle would also tend to move the crossroad farther from the church property which would be desirable for the church's future expansion plans as discussed during the kickoff meeting.

There would be no significant change in construction, R/W, or O&M costs associated with this recommendation.

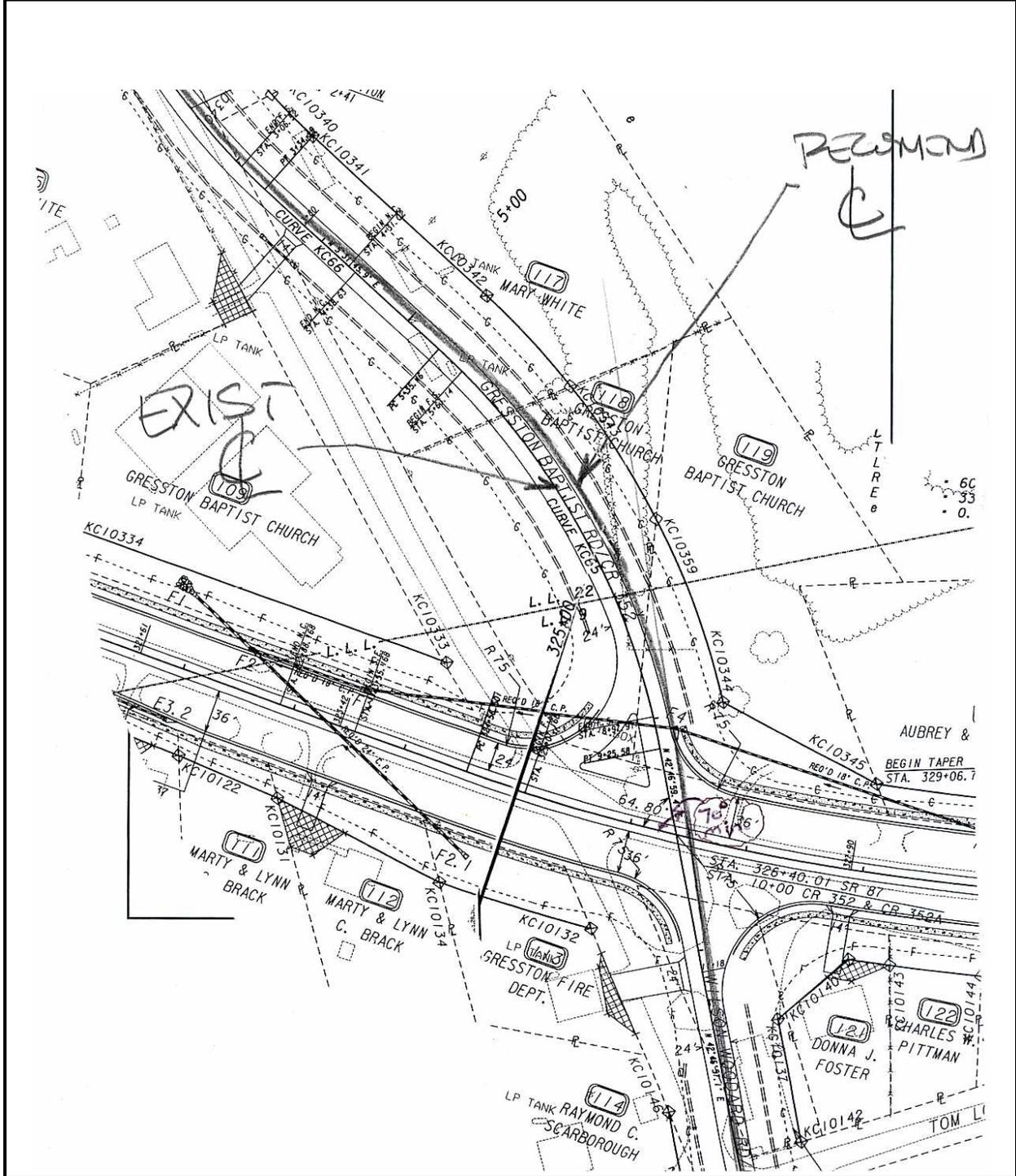
<b>LIFE CYCLE COST SUMMARY</b>	<b>CAPITAL COST</b>	<b>FUTURE COST</b>	<b>TOTAL COST</b>
<b>INITIAL COST - Original</b>			
<b>- Proposed</b>			
<b>- Savings</b>			
<b>FUTURE COST – Savings</b>			
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>No Change</b>

# SKETCH

Project Name: SR 23/SR 87 Widening and Reconstruction

IDEA No: 4-3

Sheet 2 of 2



**DEVELOPMENT AND RECOMMENDATION PHASE**

**US 23/SR 87 Widening and Reconstruction**

<b>IDEA No.:</b> 7-6	<b>Sheet No.:</b> 1 of 3	<b>CREATIVE IDEA:</b> Eliminate Intersection with County Road 284
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**Prepared By: GO      Date: 11/7/07      Checked By: RHC      Date: 11/13/07**

**Original Concept:**

The baseline plans show three access roads north of Bates Road/CR 281 (Sta. 560+00 to 575+00 +/-): CR 283S, CR284, and CR 283N.

**Proposed Change:**

The PFPR report contains a comment provided by the County suggesting that the Design Team consolidate this loop configuration in order to reduce the number of access points onto the main roadway. It was our understanding that the Design Team was generally favorable to this idea and was investigating it during the VE study. The VE Team also agreed with this comment and recommends that the CR 284 access be eliminated.

**Justification:**

This change would eliminate an undesirable offset intersection with SR 257. Access to all properties would be available from US 23 or from CR 283. Approximately 300' of side road construction would be eliminated resulting in a modest reduction in construction cost. An alternative approach would be to construct a cul-de-sac on CR 283 but this does not appear necessary to maintain access to the adjacent properties.

<b>LIFE CYCLE COST SUMMARY</b>	<b>CAPITAL COST</b>	<b>FUTURE COST</b>	<b>TOTAL COST</b>
<b>INITIAL COST - Original</b>	\$45,000		
<b>- Proposed</b>	\$0		
<b>- Savings</b>	\$45,000		\$45,000
<b>FUTURE COST – Savings</b>		Nominal	
<b>TOTAL PRESENT WORTH SAVINGS</b>			<b>\$45,000</b>



## CALCULATIONS

Project Name: SR 23/SR 87 Widening and Reconstruction

ITEM No: 7-6

Sheet 3 of 3

Assume: \$6.00/sf for pavement, base, earthwork, drainage items

Avoided side road = 300' X 24' = 7200 sf +/- X \$6 = \$43,200 SAY \$45,000

# APPENDIX

## Sources

### Approving/Authorizing Persons

Name:	Position:	Telephone:
Brian Summers	GDOT Engineering Services Project Review Engineer	

### Personal Contacts

Name:	Telephone:	Notes:
NONE		

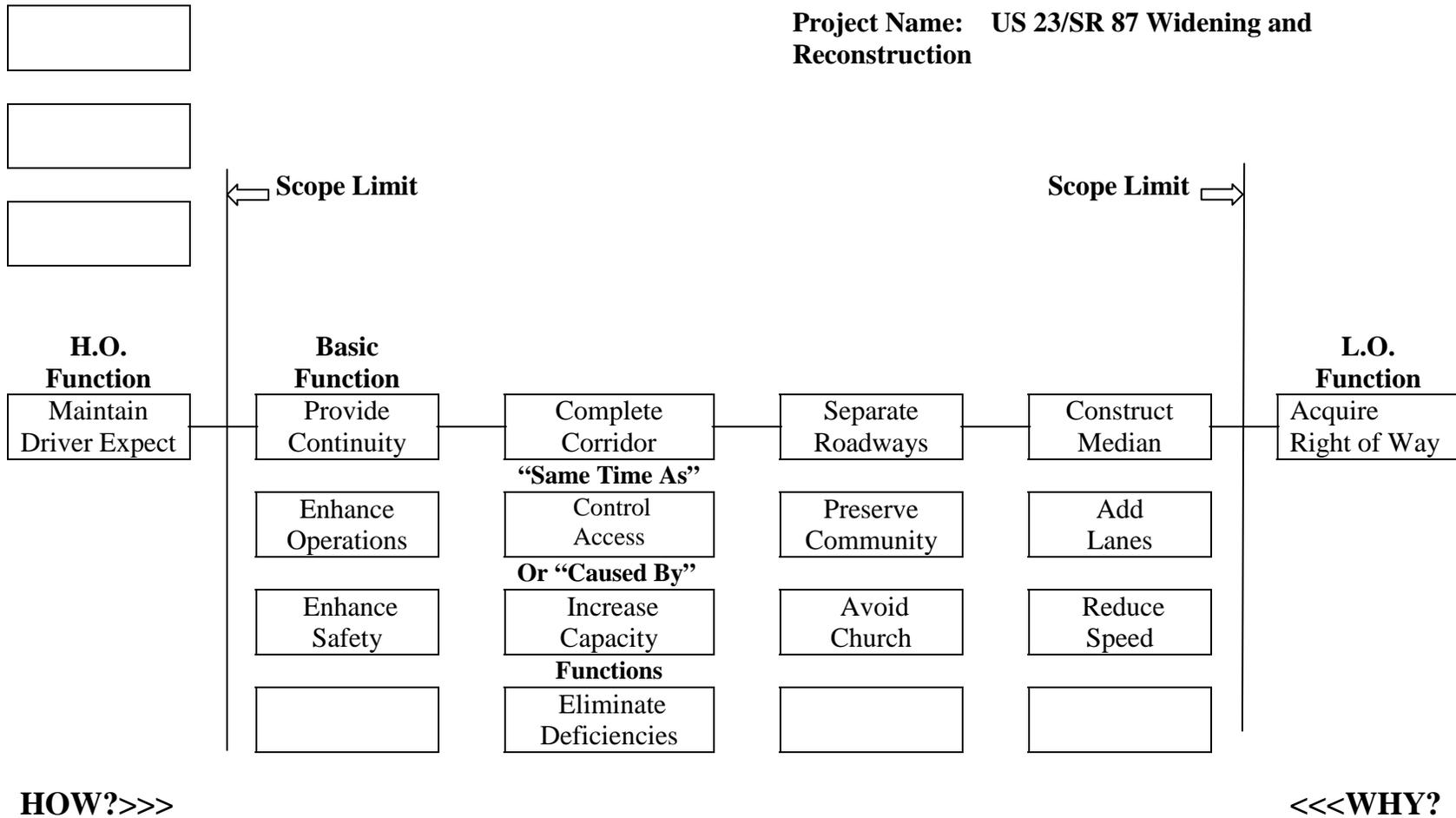
### Documents/Abstracts

Document:	Source:
Revised Project Concept Report - 4/5/07	GDOT
Project Concept Report - 1/30/97	GDOT
Preliminary Construction Plans	GDOT
Cross Sections	GDOT
Construction Cost Estimate – 9/11/2007	GDOT
Preliminary R/W Cost Estimate – 10/16/2007	GDOT
Preliminary Field Plan Review Report – 10/19/07	GDOT
Preliminary Plans – Spur Project (south terminus) Concept Layout	GDOT
Pavement Evaluation Summary – 10/2003	GDOT



# F.A.S.T. DIAGRAM

Project Name: US 23/SR 87 Widening and Reconstruction



## INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** US 23/SR 87 Widening and Reconstruction

**Function:** Provide Continuity

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
1	Typical Section 1 – Sta 90 to 108 +/- (3-lane section, shoulders added)	Add	Shoulders	LOW		
		Create	Refuge			
		Create	Transition			
		Reduce	Speed			
		Modify	Access Control			
		Enhance	Safety			
2	Typical Section 2 – Sta.108 to 135 +/- (4 lanes – 24' raised median)	Control	Access	MEDIUM		
		Preserve	Community			
		Separate	Roadways			
		Add	Lanes			
3	Typical Section 3 – Sta 135 to 265 +/- (4 lanes – 44' depressed median)	Maintain	Speed	HIGH		
		Control	Access			
		Eliminate	Deficiencies			
		Enhance	Safety			

## INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** US 23/SR 87 Widening and Reconstruction

**Function:** Provide Continuity

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
4	Typical Section 4 – Sta. 265 to 345 +/- (4 lanes – 14' flush median, urban shoulder)	Preserve	Community	MEDIUM		
		Narrow	Footprint			
		Enclose	Drainage			
		Reduce	Speed			
		Add	Lanes			
5	Typical Section 5 – Sta. 345 to 390 +/- (4 lanes – 14' flush median, rural shoulder)	Preserve	Community	LOW		
		Reduce	Speed			
		Add	Lanes			
		Narrow	Footprint			
6	Typical Section 6 – Sta. 390 to 535 +/- (4 lanes – 44' depressed median)	Maintain	Speed	HIGH		
		Control	Access			
		Eliminate	Deficiencies			
		Enhance	Safety			

## INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** US 23/SR 87 Widening and Reconstruction

**Function:** Provide Continuity

ITEM No.	DESCRIPTION	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth/Save
7	Typical Section 7 – Sta. 535 to 590 +/- (4 lanes – 14' flush median, rural shoulder	Create	Transition	LOW		
		Match	Adjacent Roadway			
		Preserve	Community			
E	Earthwork/Alignment	Eliminate	Deficiencies	\$7.2M		
		Add	Lanes			
		Avoid	Church			
P	Pavement and Base	Add	Lanes	\$16.1M		
		Replace	Existing Pavement			
TC	Maintenance of Traffic	Maintain	Capacity	\$2.5M		
		Protect	Public			
		Protect	Workers			
		Maximize	Efficiency			

<b>CREATIVE PHASE</b> <b>Creative Idea Listing (13 ideas dropped in first cut)</b>		<b>EVALUATION PHASE</b> <b>Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>ADVANTAGES/DISADVANTAGES</b>	<b>IDEA RATING</b>
1-3	11.5' lanes in 44' median sections	A – modest reduction in const and O&M costs	X
		D – does not meet current design standard	
		D – not recommended for high truck volumes	
		D – would not significantly improve R/W need	
1- 4	No new shoulders	A - reduced construction cost and O&M	X
		D – does not improve the section to standard	
		D – no space for rumble strips	
1-5	Reduce Clear Zone	A – reduce property impacts	✓
		A – reduced construction cost/earthwork/clearing and grubbing	
		A – narrower would meet applicable standards	
		D – possible that ditch depth may not be sufficient; less flood storage	
2-1	Continue flush median section from Typical Section 1	A – reduces right of way requirement/impact	✓
		D – reduces access control	
		A – construction and O&M reduction	
		A – provides more continuity in typical sections	
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>EVALUATION PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>ADVANTAGES/DISADVANTAGES</b>	<b>IDEA RATING</b>
2-1 cont		A – reduces length and cost of cross drains	
		A – eliminates need for median openings	
		A – residential area does not generate that many left turns into and out of properties	
2-2	Use 22' clear zone	A- reduces property need and impacts	✓
		A- would meet applicable standard	
		D – none perceived	
2-4	Eliminate a median opening	A – eliminates undesirable feature – safety and operations enhancement	✓
		A – potentially a modest cost reduction	
		A – provides more access control	
		D – may be seen as a negative by residents	
2-5	Use a narrower raised median – 14'	A – reduces property impacts and cost	✓
		A- turning movements are small on this route	
		A –matches 14' flush median width- adjacent section	
		D – not standard – would require a variance	
		A – reduces drainage costs.	
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>EVALUATION PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>ADVANTAGES/DISADVANTAGES</b>	<b>IDEA RATING</b>
3/6-4	Use a 24' clear zone in this section	A – reduces right of way impact and cost	✓
		A – reduces drainage, earthwork costs	
		D – provides low end solution	
		A – meets design standards	
3/6-5	Don't eliminate deficiencies or minimize this work	A – reduces construction cost	X
	(Maintain similar profile)	A – simplifies construction operations	
		D – pavement won't be saved thus potential savings is reduced	
		D – would not meet standards for profile, etc	
4-2	Use rural shoulder typical section w/ minimal clear zone	A – reduces number of typical sections used	X
		D- may not allow for draining cross culverts	
		D- typical section would be wider; more impact on properties	
		A – reduces drainage costs and O&M	
		D – may not work with driveways	
4-3	Eliminate skew on Wilson Woodard Road	A – enhanced operations	✓
		A – eliminates need for a design variance	
		A – nominal impact on costs	
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>EVALUATION PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>ADVANTAGES/DISADVANTAGES</b>	<b>IDEA RATING</b>
4-3 cont		D – possible impact on fire station	
		A – no negative impact on church – may be an enhancement	
5-1	Use 44' typical section	A – more consistency in driver expectation	✓
		A – less pavement, more earthwork, probable net savings	
		A – no detrimental impacts on communities	
		D – likely displace one additional residence	
7-3	Reduce clear zone – 24'	A – meets applicable design standard	✓
		A – reduces property impacts and costs	
		D- may not work with driveways and drainage	
7-5	Use 14' flush median with curb and gutter	A – reduces property impacts	✓
		D – requires closed drainage, higher cost and O&M	
		A – consistency in the preservation of communities – eliminate 4 or 5 takes	
		D – this section will be 55 mph	
		D – short section of roadway	
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			

<b>CREATIVE PHASE Creative Idea Listing</b>		<b>EVALUATION PHASE Idea Evaluation</b>	
<b>No.</b>	<b>CREATIVE IDEA</b>	<b>ADVANTAGES/DISADVANTAGES</b>	<b>IDEA RATING</b>
7-6	Eliminate SR 257/CR 264 intersection	A – meets County comment during review	✓
		A – acceptable level of access would remain	
		A – enhances operations and safety	
E-1	Review Profile	A – potential to save on earthwork	✓
		A – would continue to meet applicable standard	
		D – none perceived	
E-3	Drop 3-lane section between Spur Road and Section 2	A – Eliminates short (800’) section between two four-lane sections	X
P-1	Retain existing pavement where feasible	D – does not conform to Pavement Evaluation	To E-1
		A – potential for significant cost reduction	
		D – does not work with profile adjustments	
		A – profile adjustments may be avoidable	
✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team			