# VALUE ENGINEERING REPORT

SR 133 Widening
Project No. STP00-0000-00(473) (475) (519) & (520)
PI Nos. 0000473, 0000475, 0000519, & 0000520
Dougherty, Worth and Colquitt Counties

February 9, 2010

OWNER AND DESIGN TEAM:

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# EXECUTIVE SUMMARY

# Executive Summary

## VALUE ENGINEERING STUDY

**SR 133 Widening**
**PI Nos. 0000473, 0000475, 0000519, & 0000520**
**Dougherty, Worth and Colquitt Counties**
**January 19-22, 2010**

## Introduction

This report presents the results of a value engineering (VE) study conducted on the proposed design for widening 32.34 miles of SR 133 through Dougherty, Colquitt and Worth Counties. State Route 133 is included in the Governor's Road Improvement Program (GRIP). The proposed project would widen the existing two-lane roadway to a four-land divided roadway with a 44-foot median, except for three intermediate sections totaling 6 miles in length where the median width would be reduced to 32 or 24 feet to minimize impacts on wetlands and adjacent properties. Future (2030) traffic projections for this corridor vary from 9,460 to 16,285 ADT.

The Georgia/Florida Railway generally parallels the project corridor. There are 2 existing at-grade crossings and 1 train per day. The current project includes two grade separations of the railway. The first grade separation is near Station 205 at the southern end of the project and due to the proposed alignment, also requires a new bridge to cross the side road, SR 33. The second grade separation is at Station 1670 near the north end of the project.

Major project contract work items include roadway excavation, roadway embankment, drainage, asphalt pavement, retaining walls, concrete side barrier, guardrail, erosion control and structures. The total project has an estimated cost of $100 million. The design is currently at 30 percent. The study took place January 19-22, 2010, at the Georgia DOT Headquarters in Atlanta, using a five person VE team.

This report presents the Team's recommendations and all 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 support information about each recommendation. The **Appendix** includes a complete record of the Team's activities and findings. The reader is encouraged to review all sections of the report in order to obtain a complete understanding of the VE process.

## Considerations

The VE team was presented with several constraints to consider when developing their recommendations. The constraints included; not making any additional change to the roadway that would impact the Doerun Pitcher Plant Bog Natural area, not changing the new roadway alignment north of Piney Woods Drive, and maintaining the roadway alignment / narrow median through the Gibson / Flat Shoals Road area.

## Results Obtained

The VE team focused their efforts on the high cost items of the project. Through the use of functional analysis and "brain storming" techniques, the team generated 40 ideas with 22 being identified for additional evaluation as possible recommendations or design considerations. The VE team developed nine independent recommendations and two alternate recommendations. Depending upon which recommendations are implemented, they have the potential to reduce the project cost by approximately $13.2 - 21.3 million. A detailed write-up of each recommendation is contained in the respective portion of this report. A brief summary of the recommendations follows.

# Recommendation Highlights

**Idea A-1: Reduce the amount of northerly shift in the SR 133 alignment to eliminate the need to grade separate SR 33 while keeping the SR 133 railroad grade separation.**

The current design shifts SR 133 away from the existing alignment to eliminate construction conflicts of the SR 33 and the Georgia / Florida Railway grade separations from existing SR 133 traffic.

This recommendation realigns SR 133 closer to the existing alignment to eliminate the SR 33 grade separation while keeping the proposed railroad grade separation. It also realigns the at-grade SR 33 intersection to reduce the skew angle. This concept eliminates the proposed SR 33 Connector Road and the two bridges over SR 33. It reduces construction costs, R/W, the amount of borrow, and future maintenance since there would be less bridge deck area to maintain.

***The total potential savings if accepted is $1,838,000.***

**Idea A-1.1: Maintain the existing SR 133 alignment and construct new at-grade crossings in-lieu-of grade separations SR 33 and the Georgia / Florida Railway.**

The current design shifts SR 133 away from the existing alignment to eliminate construction conflicts of the SR 33 and the Georgia / Florida Railway grade separations from existing SR 133 traffic.

This recommendation realigns SR 133 closer to the existing alignment and eliminates the SR 33 and Georgia / Florida Railway grade separations. It provides new at-grade intersections at SR 33 and the Georgia / Florida Railway. With only 1 train per day at this crossing and no apparent history of accidents, injuries, or fatalities, the railroad grade separation may not be cost beneficial or warranted at this time. This concept reduces construction cost, R/W, simplifies construction, reduces project time, and minimizes railroad construction impacts. Future maintenance cost would also be reduced since there would be no bridge decks to maintain.

***The total potential savings if accepted is $6,807,000.***

**Idea A-6: Reduce the pavement thickness for the median left / U-turn lanes.**

The current roadway design uses the same full depth asphalt pavement section for the median left / U-turn lanes as it does for the SR 133 mainline through traffic lanes.

This recommendation reduces the full depth pavement section for the median left / U-turn median lanes. The low traffic utilizing the left / U-turn lanes does not support the need for the same full depth section as the through traffic lane. This recommendation provides a significant cost savings and provides the same function.

***The total potential savings if accepted is $4,755,000.***

**Idea A-7: Use the minimum allowable lengths for the storage areas in the median left / U-turn lanes.**

The current design for most of the 45 median opening left / U-turn lanes along the entire project provides for a 650-foot storage area.

This recommendation reduces the length of the median left / U-turn lane storage areas from 650 feet to 450 feet. The traffic volumes utilizing the left turns and u-turns were not specifically provided but are assumed to be low. Using the minimum allowable length of 450 feet for the left / U-turn lanes conforms to the GDOT standard detail for a type B median opening (M-3) and provides substantial cost savings.

***The total potential savings if accepted is $1,600,000.***

**Idea A-8: Reduce the median width from 44 feet wide to 32 feet wide for the entire length of the project.**

The current SR 133 design is a four-lane divided highway with a 44-foot wide median. The project also includes three areas where the median is less than 44 feet wide (One area [2.7 miles] with a 32-foot median and two areas [2.3 miles and 1 mile] with a 24-foot median).

This recommendation reduces all 44-foot wide median sections to 32-foot wide sections. With several sections of the project already having narrower medians to minimize local impacts, it is advantageous to reduce the wider medians throughout the entire project. This project has low (2030) traffic projections (9,460 to 16,285 ADT). Reducing the median width to 32 feet for the entire corridor would reduce impacts to wetlands, historic properties and local residents. Reducing the median width saves R/W, clearing &grubbing, and embankment costs.

***The total potential savings if accepted is $878,000.***

**Idea A-9: Reduce the width of paved outside shoulder from 6.5 feet to 4.0 feet.**

The current typical pavement section uses a 6-foot 6-inch paved outside shoulder width with a 10-foot total shoulder.

It is recommended that a paved 4-foot wide outside shoulder be constructed instead of the proposed 6-foot 6-inch paved shoulder while keeping the 10-foot total shoulder width. This project has low (2030) traffic projections (9,460 to 16,285 ADT). The 6-foot 6-inch paved shoulder enables stopped vehicles to safely secure one half (not the full vehicle width) of their tires on solid pavement versus a non-paved surface. The reduced 4-foot paved shoulder width provides the same function. This concept results in significant cost savings without jeopardizing the project's approved need and purpose statement.

***The total potential savings if accepted is $1,375,000.***

**Idea B-2: Reverse the girder direction (make perpendicular to the RR alignment) of the SR 133 Bridge over the Georgia/Florida Railway at Station 1670.**

The current design includes dual 3-span, 360-foot bridges over the Georgia / Florida Railway track at Station 1670. The current bridge beam alignment is parallel to SR 133 and requires the use of Bulb Tee 74" and Bulb Tee 63" beams.

This recommendation would construct a single span bridge over the Georgia/Florida Railway by reversing the direction of beams (make perpendicular to the railroad alignment). This concept allows the use of Type III AASHTO beams to span the shorter distance. The use of the smaller Type III beams would reduce the height of the roadway over the railroad, simplify construction, accelerate construction, and reduce the impact to the railroad.

***The total potential savings if accepted is $418,000.***

**Idea B-2.1: Eliminate the SR 133 Bridge over the Georgia / Florida Railway track at Station 1670 and construct an at-grade crossing.**

The current design includes dual 3-span, 360-foot bridges over the Georgia / Florida Railway track at Station 1670. The current bridge beam alignment is parallel to SR 133 and requires the use of Bulb Tee 74-inch and Bulb Tee 63-inch beams.

This recommendation eliminates the SR 133 / Georgia / Florida Railway grade separation and provides for a new at-grade railroad crossing with standard flashing lights, gates, new track crossing, and appropriate signing / pavement markings. With only 1 train per day at this crossing and no apparent history of accidents, injuries, or fatalities, the railroad grade separation may not be cost beneficial or warranted at this time. This concept reduces construction cost, R/W, simplifies construction, reduces project time, and minimizes railroad construction impacts. Future maintenance cost would also be reduced since there would be no bridge decks to maintain.

***The total potential savings if accepted is $3,564,000.***

**Idea B-8: Reduce the length of the SR 133 bridge over SR 33 by reducing the horizontal clear area from 26 feet to 14 feet.**

The current design includes two single span structures to carry SR 133 over SR 33. The 139-foot spans require Bulb Tee 74-inch prestress concrete beams and provide a 26-foot clear area on both sides of the SR 33.

This recommendation reduces the length of the SR 133 structures over SR 33 by reducing the 26-foot clear area to a 14-foot clear area. Reducing the bridge length from 139 feet to 95 feet allows for a reduction in the beam size from a BT 74-inch beam to a BT 54-inch beam. The smaller beams and shorter beam length will result in cost savings and improve constructability. The 14-foot clear area provides for a 12-foot shoulder and 2 feet extra for a barrier in front of the retaining wall.

***The total potential savings if accepted is $529,000.***

**Idea D-1: Reduce all 6:1 sloped shoulder sections to 4:1 slopes throughout entire project.**

The current general typical section uses a 6:1 slope from the shoulder breakpoint down to the edge of the graded ditch line. The horizontal dimension associated with this section is typically 18-feet. The remaining typical sections use 4:1 slope from the shoulder breakpoint down to the edge of the graded ditch line and have a typical horizontal dimension of 12-feet.

It is recommended that the project use 4:1 sloped shoulders in-lieu-of 6:1 sloped shoulders. This concept results in the reduction of approximately 12 feet of R/W width (6-feet on each side), reduced borrow / excavation quantities, and the reduction of clearing & grubbing and erosion control items throughout the 32-mile corridor. It results in a cost savings without jeopardizing the project's approved need and purpose statement.

***The total potential savings if accepted is $943,000.***

**Idea J-3: Substitute Type W guardrail for Type T guardrail throughout the entire project.**

The current design uses both Type T guardrail and Type W guardrail on the plans.

This recommendation substitutes Type W guardrail for Type T guardrail throughout the length of the project. There does not appear to be any locations where the type T guardrail has to be used and substituting the type W guardrail would provide significant cost savings.

***The total potential savings if accepted is $892,000.***

## SR 133 Widening – Dougherty, Worth and Colquitt Counties
## SUMMARY OF POTENTIAL COST SAVINGS

| ITEM No. | CREATIVE IDEA DESCRIPTION | ORIGINAL INITIAL COST | PROPOSED INITIAL COST | INITIAL COST SAVINGS | FUTURE SAVINGS | TOTAL LIFE CYCLE SAVINGS | SAVINGS POTENTIAL* (%) |
|---|---|---|---|---|---|---|---|
| | **RECOMMENDATIONS** | | | | | | |
| **A-1** | Reduce the amount of northerly shift in the SR 133 alignment to eliminate the need to grade separate SR 33 while keeping the SR 133 railroad grade separation. | $2,207,000 | $369,000 | $1,838,000 | $0 | $1,838,000 | 100% |
| **A-1.1** | Follow the existing SR 133 alignment and construct new at-grade crossings in-lieu-of grade separations SR 33 and the Georgia / Florida Railway. | $7,576,000 | $769,000 | $6,807,000 | $0 | $6,807,000 | 100% |
| **A-6** | Reduce the pavement thickness for the median left / U-turn lanes. | $4.755,000 | $0 | $4,755,000 | $0 | $4,755,000 | 100% |
| **A-7** | Use the minimum allowable lengths for the storage areas in the median left / U-turn lanes. | $1,600,000 | $0 | $1,600,000 | $0 | $1,600,000 | 100% |
| **A-8** | Reduce the median width from 44 feet to 32 feet for the entire length of the project. | $878,000 | $0 | $878,000 | $0 | $878,000 | 100% |
| **A-9** | Reduce the width of the paved outside shoulder from 6 ½ feet to 4 feet. | $1,375,000 | $0 | $1,375,000 | $0 | $1,375,000 | 100% |
| | | | | | | | |

## SR 133 Widening – Dougherty, Worth and Colquitt Counties
## SUMMARY OF POTENTIAL COST SAVINGS

| ITEM No. | CREATIVE IDEA DESCRIPTION | ORIGINAL INITIAL COST | PROPOSED INITIAL COST | INITIAL COST SAVINGS | FUTURE SAVINGS | TOTAL LIFE CYCLE SAVINGS | SAVINGS POTENTIAL* (%) |
|---|---|---|---|---|---|---|---|
| **B-2** | Reverse the girder direction (make perpendicular to the railroad alignment) of the SR 133 Bridge over the railroad at Station 1670. | $3,364,000 | $2,946,000 | $418,000 | $0 | $418,000 | 100% |
| **B-2.1** | Eliminate the SR 133 Bridge over the railroad at Station 1670 and construct an at-grade crossing. | $4,065,000 | $500,000 | $3,565,000 | $0 | $3,565,000 | 100% |
| **B-8** | Reduce the length of the SR 133 Bridge over SR 33. | $1,261,000 | $732,000 | $529,000 | $0 | $529,000 | 100% |
| **D-1** | Construct 4:1 shoulder slopes through the project to reduce borrow and R/W. | $943,000 | $0 | $943,000 | $0 | $943,000 | 100% |
| **J-3** | Replace Type T guardrail with Type W guardrail. | $1,395,000 | $503,000 | $892,000 | $0 | $892,000 | 100% |
| | | | | | | | |
| | | | | | | | |
| | * Note: Savings Potential represents how much of an individual item, exclusive of any overlapping dependent items, can be implemented. | | | | | | |
| | | | | | | | |

# STUDY IDENTIFICATION

# Study Identification

| | |
|---|---|
| **Project:** SR 133 Widening | **Date:** January 19-22, 2010 |
| **Location:** Dougherty, Worth and Colquitt Counties | |

## VE Team Members

| Name: | Title: | Organization: | Telephone: |
|---|---|---|---|
| George Obaranec | Roadway Design | MACTEC | 770-421-3346 |
| Samuel Moka | Roadway Design | PARSONS | 678-969-2460 |
| Aruna Sastry | Structures | Sastry & Assoc. | 678-366-9375 |
| Dan Cogan | Construction | Kennedy Engineering Assoc. | 678-904-8591 |
| Keith Borkenhagen | VE Team Facilitator | MACTEC | 623-556-1875 |
| | | | |

**Project Description**

The proposed project would widen 32.34 miles of SR 133 through Dougherty, Colquitt and Worth Counties. State Route 133 is included in the Governor's Road Improvement Program (GRIP). The proposed project would widen the existing two-lane roadway to a four-land divided roadway with a 44-foot median, except for three intermediate sections totaling 6 miles in length where the median width would be reduced to 32 or 24 feet to minimize impacts on wetlands and adjacent properties. Future (2030) traffic projections for this corridor vary from 9,460 to 16,285 ADT.

The Georgia/Florida Railway generally parallels the project corridor. There are 2 existing at-grade crossings and 1 train per day. The current project includes two grade separations of the railway. The first grade separation is near Station 205 at the southern end of the project and due to the proposed alignment, also requires a new bridge to cross the side road, SR 33. The second grade separation is at Station 1670 near the north end of the project.

Major project contract work items include roadway excavation, roadway embankment, drainage, asphalt pavement, retaining walls, concrete side barrier, guardrail, erosion control and structures. The total project has an estimated cost of $100 million. The design is currently at 30 percent. The study took place January 19-22, 2010, at the Georgia DOT Headquarters in Atlanta, using a five person VE team.

## Considerations

The VE team was presented with several constraints to consider when developing their recommendations. The constraints included:

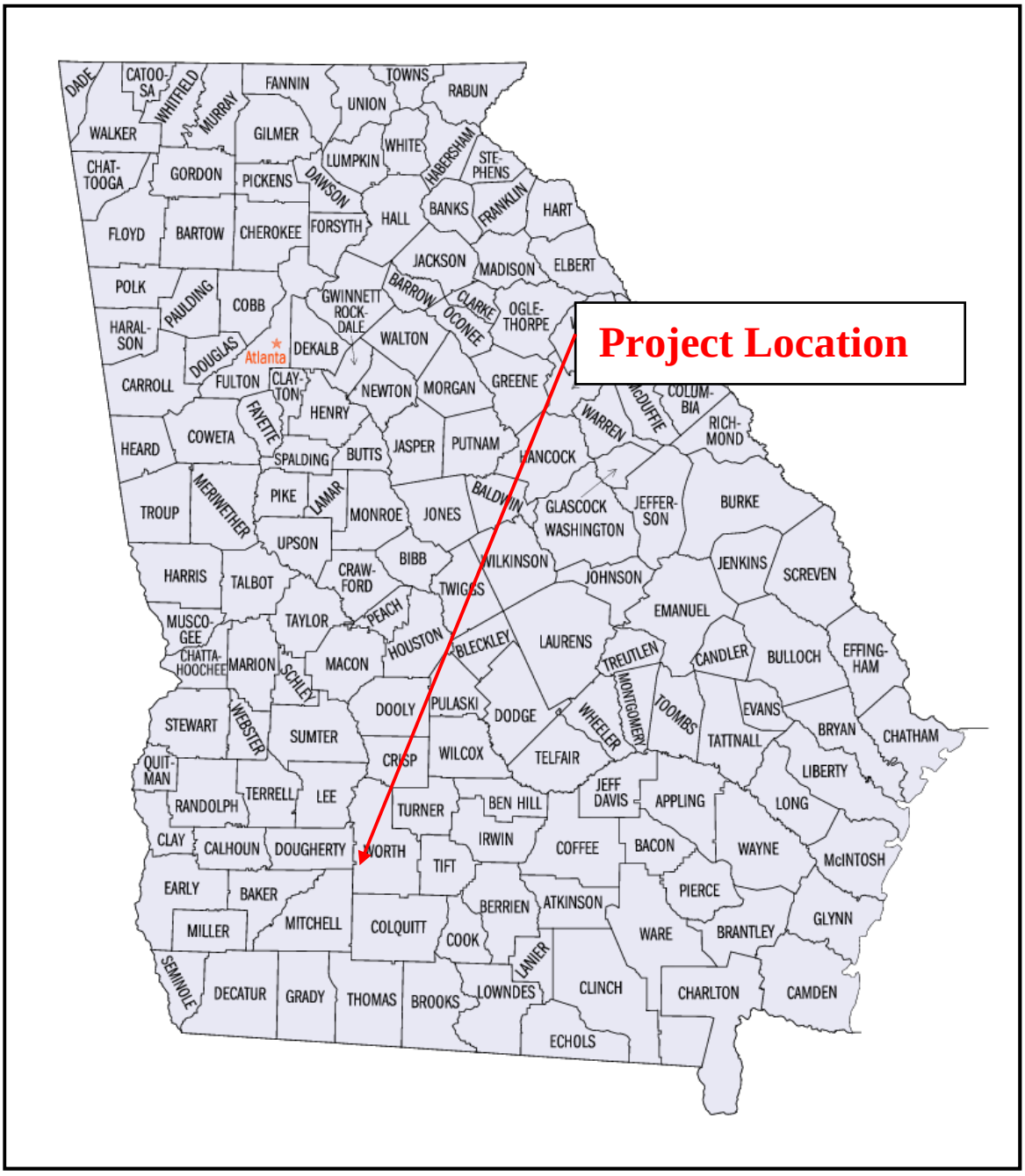
- not making any change to the roadway that would impact the Doerun Pitcher Plant Bog Natural area,
- not changing the new roadway alignment north of Piney Woods Drive, and
- keeping the proposed roadway alignment / narrow median through the Gibson / Flat Shoals Road area.

## Design Briefing

At the start of the VE Study, the design team gave a presentation on the current status of the project. The following items were discussed:

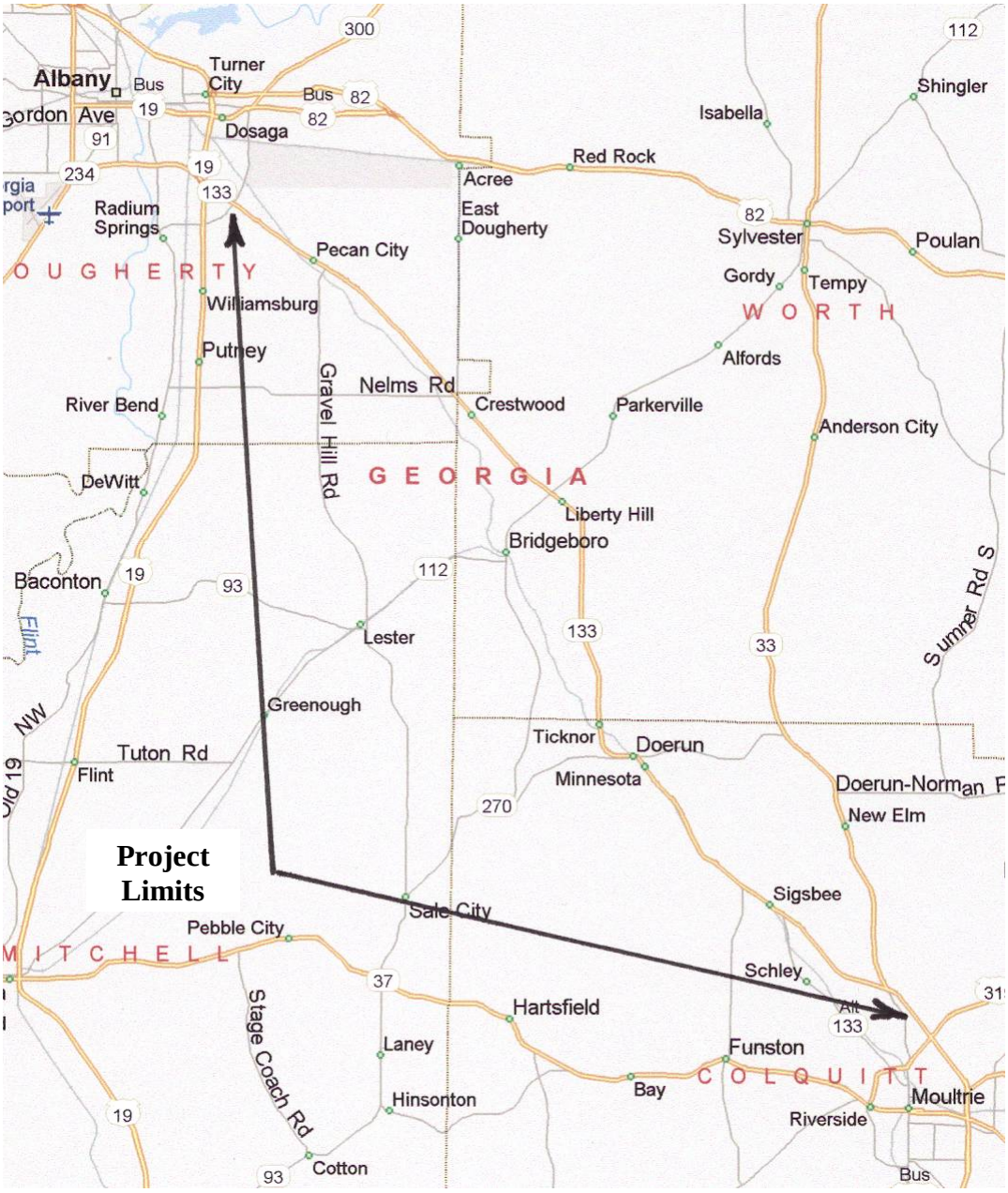
- The total project includes four sections (520), (519), (475), and (473). It is 32.3 miles long and begins north of the City of Moultrie and ends south of the City of Albany.
- SR 133 is being widened to comply with GRIP. The existing two-lane roadway is being widened to a divided four-lane roadway with a 44-foot median. Current and future traffic volumes do not warrant the widening.
- There are three sections of roadway where the 44-foot median width will be modified to reduce / minimize impacts. The first section reduces the median to 32 feet to lessen the impact to adjacent wetlands. The second section reduces the median to 24 feet to fit between the Doerun Pitcher Plant Bog Natural area and the railroad. The third section reduces the median to 24 feet to appease residents of the Gibson / Flat Shoals Road area.
- The design speed for the new roadway is 65 MPH except in the two areas with the 24-foot medians where the design speed and posted speed is 55 MPH.
- The project will realign most of the at-grade street intersections to provide a more perpendicular crossing.
- The project includes two railroad grade separations. The first railroad crossing near Station 205 will also include a grade separation of SR 33. The SR 33 grade separation includes two bridges spanning SR 33. The railroad grade separation includes a single bridge. The second railroad crossing near Station 1670 includes two bridges spanning the railroad.
- Current rail traffic is one train per day.
- Based on the geotechnical analysis completed to date, approximately half of the existing pavement on section (520) can be milled and overlaid and half the roadway will have to be replaced in its entirety. An earlier report from another firm indicated that the pavement in the other sections will have to be replaced.
- The bypass section around the City of Doerun has been set. The city has accepted the proposed location for the bypass.
- Section (475) will be widened /realigned to the right to provide a better angle for the SR 133 / County Line Road. The realign also eliminates any possible impacts to private property containing an endangered plant.
- The Draft Environmental Assessment was completed in August 2008. Preparation of the Final Environmental Assessment is underway.

**Figure 1**
**Project Vicinity Map**




**County Map of Georgia**

# Project Sketch Map



# VE RECOMMENDATIONS

## DEVELOPMENT AND RECOMMENDATION PHASE

**SR 133 Widening – Dougherty, Worth and Colquitt Counties**

| **IDEA No.:** | **Sheet No.:** | **CREATIVE IDEA:** Reduce the amount of northerly shift in the SR 133 alignment to eliminate the need to grade separate SR 33 while keeping the railroad grade separation. |
|---|---|---|
| A-1 | 1 of 9 | |

Comp By: SMM Date: 01/21/2010 Checked By: KB Date: 1/26/2010

**Original Concept:**

Approximately 2,000 feet south of the SR 133 and SR 33 intersection, the horizontal alignment shifts to the north on new alignment to flatten the existing curve. This shift in alignment allows for better maintenance of traffic for the construction of the proposed grade separations of SR 33 and the Georgia/Florida Railway. The SR 33 grade separation requires a new SR 33 Connector Road to be constructed to provide connectivity between SR 133 and SR 33. This roadway is located immediately to the south of the proposed alignment shift.

**Proposed Change:**

This recommendation would realign SR 133 closer to the existing alignment in order to eliminate the SR 133 / SR 33 grade separation while keeping a SR 133 grade separation with the railroad. It would also realign the SR 133 / SR 33 intersection to reduce the skew angle and eliminate the proposed SR 33 Connector Road.

**Justification:**

State Route 133 is being widened from two-lanes to four-lanes to comply with the State's GRIP program. Traffic projections (2030) for this section of the corridor are 11,183 ADT. Keeping the new alignment closer to the existing alignment eliminates the need to grade separate SR 133 / SR 33 while allowing for a grade separation at the railroad. Constructing the new railroad grade separation closer to the existing roadway will likely require a temporary retaining wall or shoring to build the roadway embankment over the railroad.

| **LIFE CYCLE COST SUMMARY** | **CAPITAL COST** | **FUTURE COST** | **TOTAL COST** |
|---|---|---|---|
| **INITIAL COST: - Original** | $2,207,000 | | |
| **- Proposed** | $369,000 | | |
| **- Savings** | $1,838,000 | | $1,838,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$1,838,000** |

## CONTINUATION

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1<br>Client: GDOT<br>Sheet 2 of 9 |
|---|---|

Realigning the SR 133 / SR 33 intersection to reduce the skew angle would require an additional 1,000 feet of new roadway approaches for SR 33. The "no-build" option for the SR 33 / SR 133 intersection shows a design year 2030 LOS of "B" indicating that a grade separation is not needed for traffic reasons. In addition, continuing to keep the at-grade SR 33 / SR 133 intersection eliminates the need for the SR 33 Connector Road.

This concept would reduce cost, reduce the amount of borrow, eliminate the dual structures over SR 33, save R/W, and accelerate construction. Future maintenance cost would also be reduced since there would be less bridge deck area to maintain.

# SKETCH

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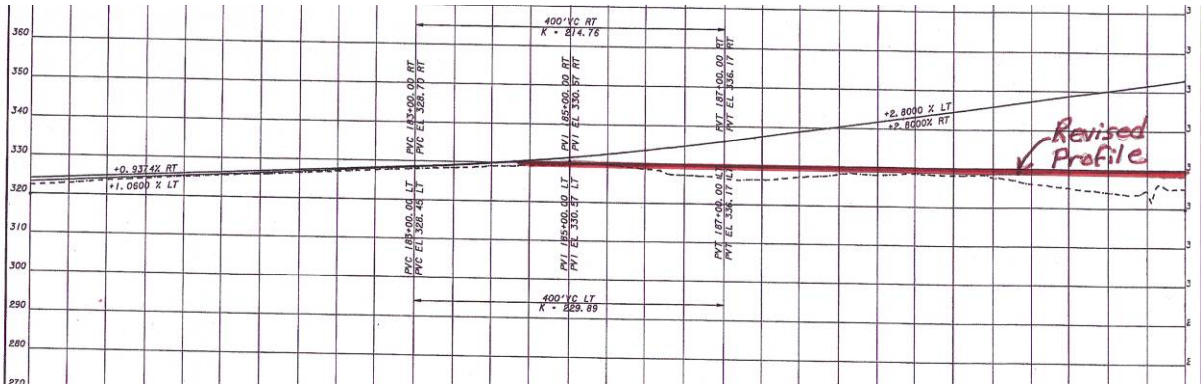
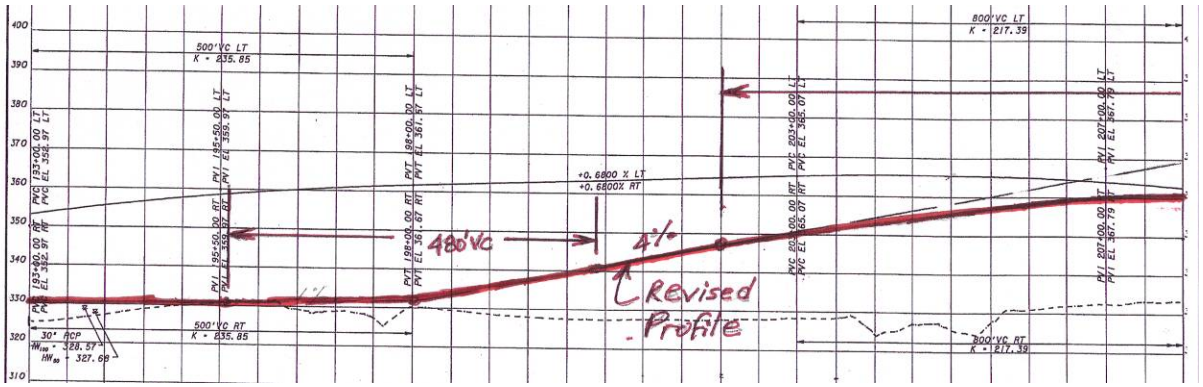
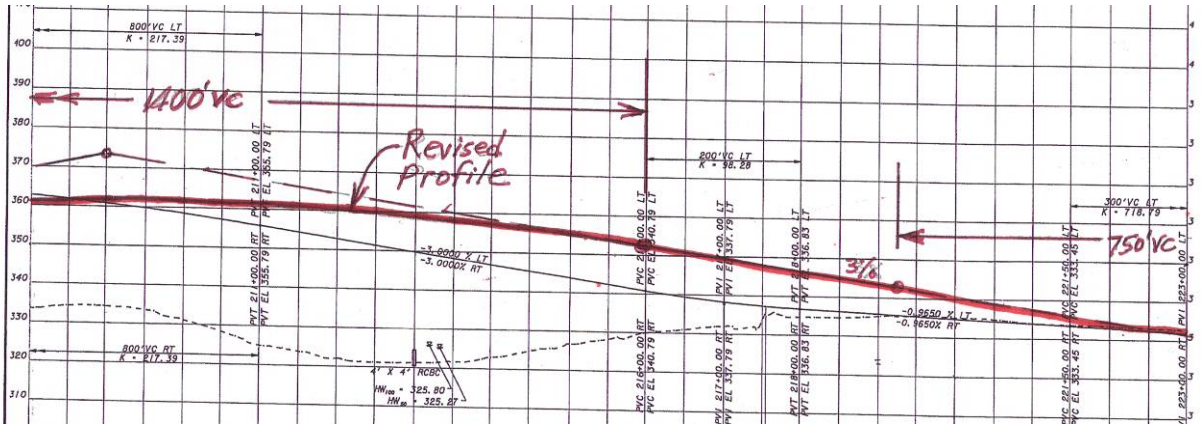
|---|---|
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1<br>Client: GDOT<br>Sheet 3 of 9 |



## SKETCH

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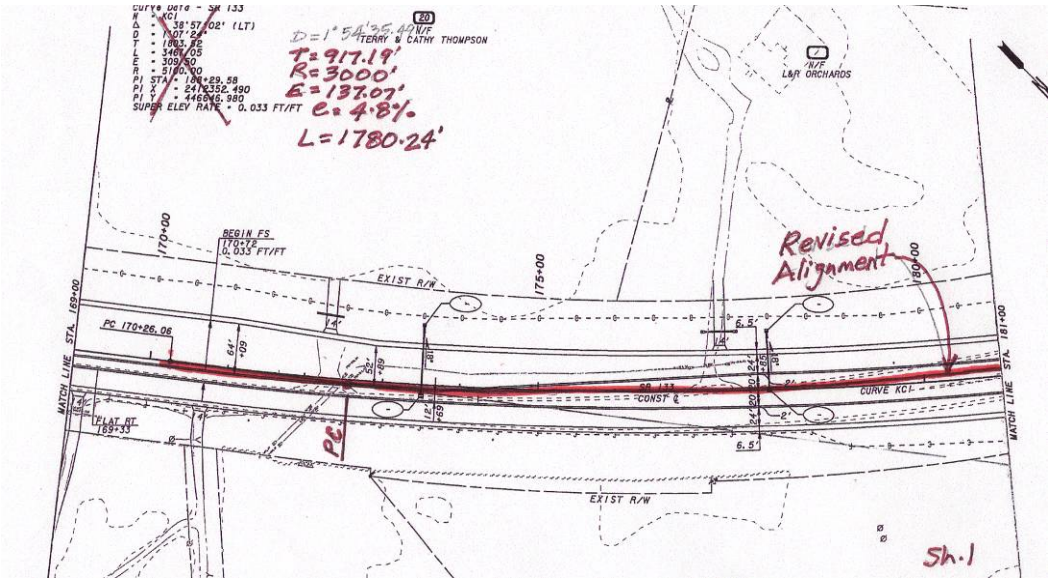
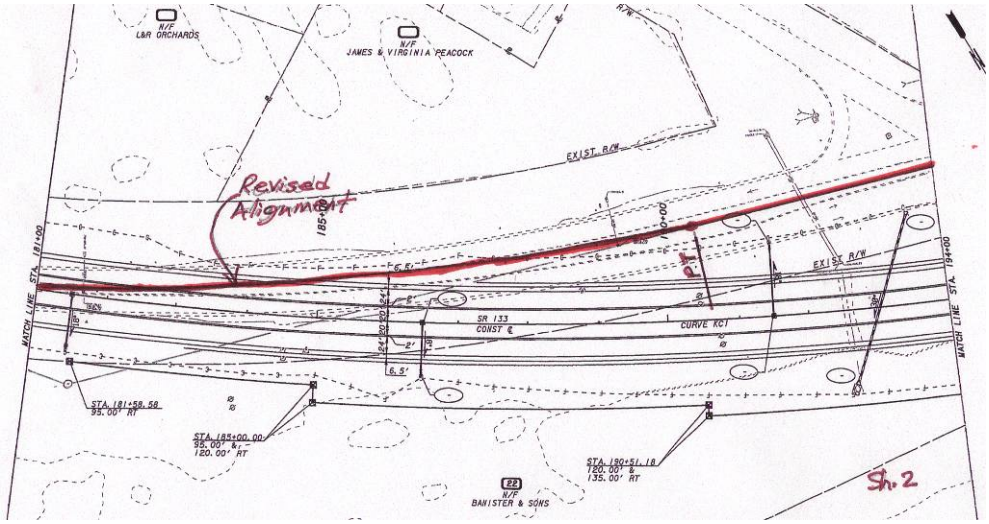
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1<br>Client: GDOT<br>Sheet 4 of 9 |



# SKETCH

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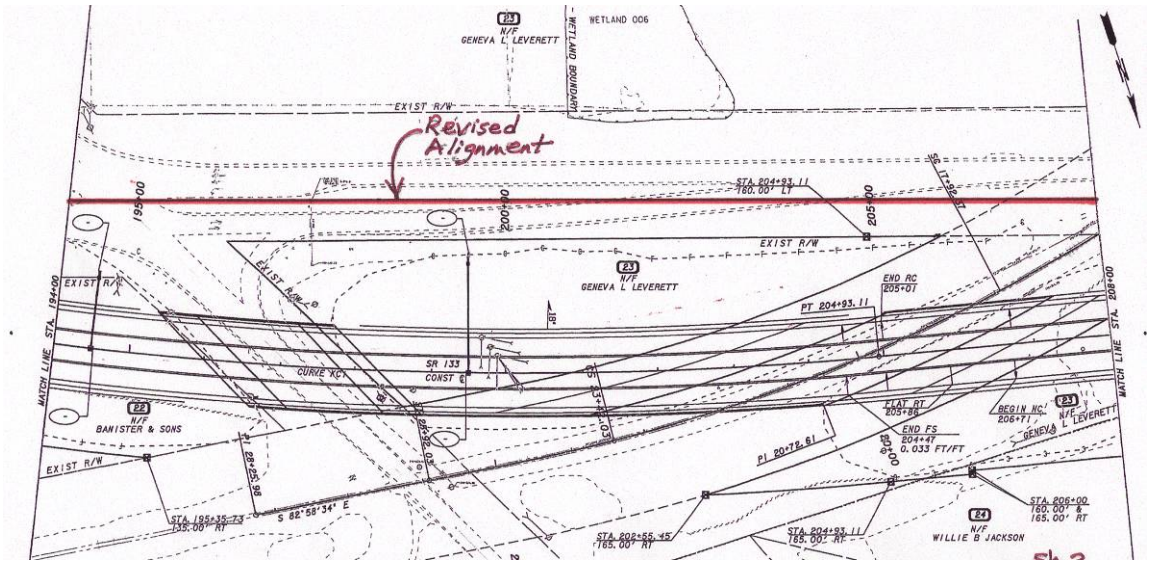
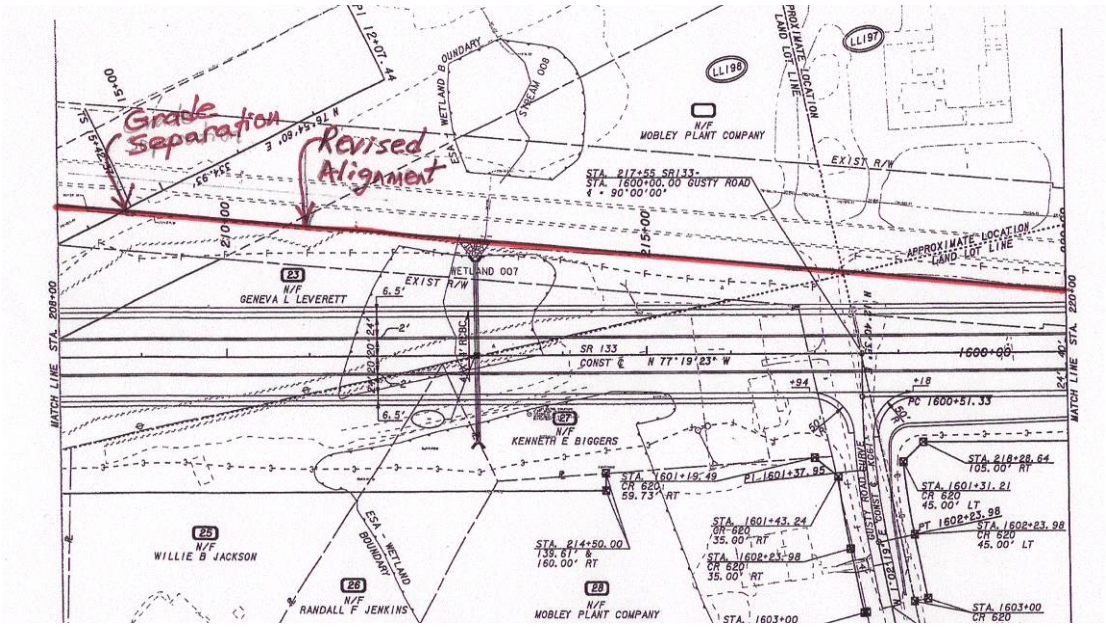
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1<br>Client: GDOT<br>Sheet 5 of 9 |



# SKETCH

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1<br>Client: GDOT<br>Sheet 6 of 9 |
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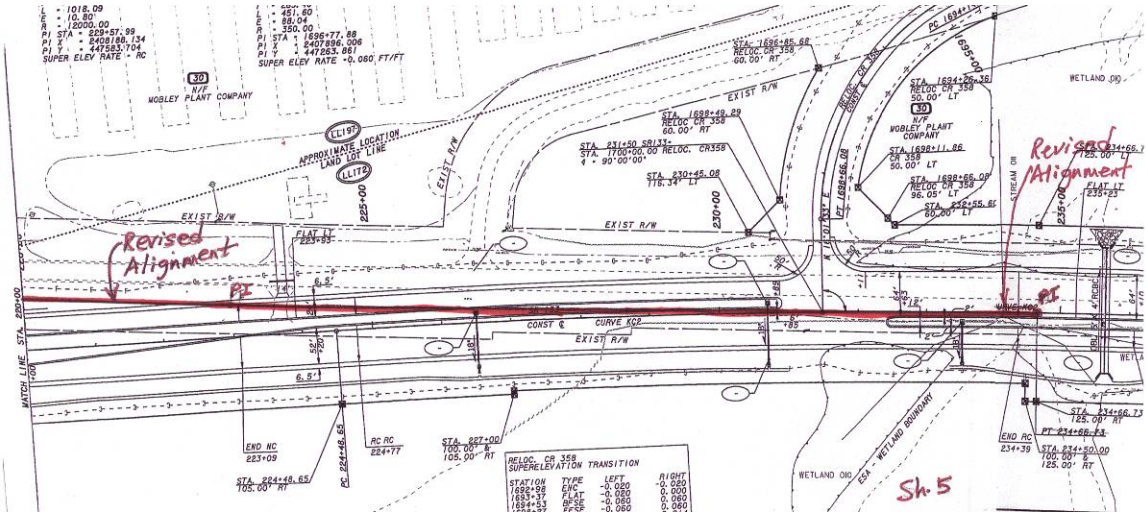

# COST WORKSHEET

**Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties

Idea No.: A-1
Client: GDOT
Sheet 7 of 9

| CONSTRUCTION ELEMENT | | ORIGINAL ESTIMATE | | | NEW ESTIMATE | | |
|---|---|---|---|---|---|---|---|
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Current Design: Grade Separate Both SR 33 and the Railroad: | | | | | | | |
| VE Recommendation: Grade Separate Only Railroad Quantity Reductions: | | | | | | | |
| Borrow Excavation | CY | 194,444 | $3.78 | $734,998 | 0 | $0 | $0 |
| SR 33 Bridge | SF | 11,467.5 | $110.00 | $1,261,425 | 0 | $0 | $0 |
| Right-of-Way | AC | 11 | $10,000 | $110,000 | 0 | $0 | $0 |
| SR 33 Connector Road | | | | | | | |
| Asphalt Pavement | Ton | 1,275 | $60.00 | $76,500 | 0 | $0 | $0 |
| GAB | Ton | 1,620 | $15.00 | $24,300 | 0 | $0 | $0 |
| | | | | | | | |
| Additional Items to build New RR grade separation closer to SR 133: | | | | | | | |
| Temporary Retaining Wall | LS | 0 | $0 | $0 | 1 | $100,000 | $100,000 |
| Realign SR 33 with SR 133 | | | | | | | |
| Asphalt Pavement 8 ½ in | Ton | 0 | $0 | $0 | 3,400 | $60.00 | $204,000 |
| GAB 12 in | Ton | 0 | $0 | $0 | 4,300 | $15.00 | $64,500 |
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| **SUBTOTAL** | | | | $2,207,223 | | | $368,500 |
| **TOTAL ROUNDED** | | | | **$2,207,000** | | | **$369,000** |

## CALCULATIONS

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1<br>Client: GDOT<br>Sheet 8 of 9 |
|---|---|

**Revised Concept: Eliminate the SR 133 / SR 33 Bridge & Embankment and Grade Separate Only SR 133 and the Railroad.**

**RW – Reduction**
Area = 4,000 ft x 120 ft = 480,000 SF / (43,560 SF/AC) = 11 AC
Unit Cost = $10,000/AC
Savings = 11 AC x $10,000 = $110,000.00

**Earthwork - Reduction**
Borrow (Unclassified) Excavation
Sta. 190+00 to Sta. 202+00, L = 1,200 ft
Assumed Avg. depth of embankment = 25 ft
Assumed Avg. width of embankment = 175 ft
Area = 25 ft x 175 ft = 4,375 SF
Volume = 4,375 SF x 1,200 ft / 27 = **194,444 CY** @ $3.78 = $734,998

**SR 133 Bridge over SR 33 - Reduction**
Bridge Area = 2 x 41.25' x 139' = 11,467.5 SF
Unit Cost = $110.00/SF
Savings = $1,261,425.00

**Realign SR 33 for perpendicular crossing of SR 133**
Assume 1,000 feet of realignment per side:
Through Lanes: 2 @ 12 ft x 1,000 ft = 24,000 SF
Left Turn Lane 1 @ 12 ft x 450 ft +(1 @ 12 ft x 420 ft) x ½ = 5,400 + 2,520 SF = 7,920 SF
Total pavement = (24,000 SF + 7,920 SF) x 2 = 63,840 SF
Current Pavement Design: 8 ½ inches asphalt; 12 inches GAB

Asphalt - 8 ½ inches thick
(8.5 / 12 cu ft) 150# / cu ft (1 Ton / 2000#) = 0.053125 Ton / SF
63,840 SF x 0.053125 Ton/SF = 3,391.5 Tons **Say 3,400 Tons**
GAB - 12 inches thick
(12 / 12 cu ft) 135# / cu ft ( 1 Ton / 2000#) = 0.0675 Ton / SF
63,840 SF x 0.0675 Tons / SF = 4,309.2 Tons **Say 4,300 Tons**

## CALCULATIONS

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1<br>Client: GDOT<br>Sheet 9 of 9 |
|---|---|

**Eliminate the SR 33 Connector Road**

Asphalt - 8 ½ inches thick
Through Lanes: 2 @ 12 ft x 1,000 ft = 24,000 SF
24,000 SF x 0.053125 Ton/SF = **1,275 Tons**

GAB - 12 inches thick
24,000 SF x 0.0675 Tons / SF = **1,620 Tons**

## DEVELOPMENT AND RECOMMENDATION PHASE

**SR 133 Widening – Dougherty, Worth and Colquitt Counties**

| **IDEA No.:** | **Sheet No.:** | **CREATIVE IDEA:** Follow the existing SR 133 alignment and construct new at-grade crossings in-lieu-of grade separations at SR 33 and the railroad. |
|---|---|---|
| A-1.1 | 1 of 5 | |

Comp By: SMM Date: 01/21/2010 Checked By: KB Date: 1/26/2010

**Original Concept:**

Approximately 2,000 feet south of the SR 133 and SR 33 intersection, the horizontal alignment shifts to the north on new alignment to flatten the existing curve. This shift in alignment allows for better maintenance of traffic for the construction of the proposed grade separations of SR 33 and the Georgia/Florida Railway. The SR 33 grade separation requires a new SR 33 Connector Road to be constructed to provide connectivity between SR 133 and SR 33. This roadway is located immediately to the south of the proposed alignment shift.

**Proposed Change:**

This recommendation realigns SR 133 closer to the existing alignment and eliminates the SR 33 and Georgia / Florida Railway grade separations. It provides a new SR 33 at-grade intersection and an at-grade railroad crossing with standard flashing lights, gates, new track crossing, and appropriate signing / pavement markings. It would also realign the SR 133 / SR 33 intersection to reduce the skew angle.

**Justification:**

State Route 133 is being widened from two-lanes to four-lanes to comply with the State's GRIP program. The traffic projections (2030) for this section of the corridor are 11,183 ADT and there is only 1 train per day at this crossing with no apparent history of accidents, injuries or fatalities. If further investigation supports this assumption, then the cost of constructing a grade separation, while desirable, may not be cost beneficial and therefore not warranted at this time.

| **LIFE CYCLE COST SUMMARY** | **CAPITAL COST** | **FUTURE COST** | **TOTAL COST** |
|---|---|---|---|
| **INITIAL COST: - Original** | $7,576,000 | | |
| **- Proposed** | $769,000 | | |
| **- Savings** | $6,807,000 | | $6,807,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$6,807,000** |

## CONTINUATION

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1.1<br>Client: GDOT<br>Sheet 2 of 5 |
|---|---|

Delaying construction of the railroad grade separation until there is additional train traffic or when the future track is constructed also eliminates bridge maintenance costs until such time as the grade separation is needed.

Realigning the SR 133 / SR 33 intersection to reduce the skew angle would require an additional 1,000 feet of new roadway approaches for SR 33. The "no-build" option for the SR 33 / SR 133 intersection shows a design year 2030 LOS of "B" indicating that a grade separation is not needed for traffic reasons. In addition, continuing to keep the at-grade SR 33 / SR 133 intersection eliminates the need for the SR 33 Connector Road.

This concept reduces cost, saves right-of-way, reduces the amount of borrow, eliminates the structures over SR 33 and the railroad, simplifies construction, reduces project time, and minimizes railroad construction impacts. Future maintenance cost would also be reduced since there would be less bridge deck area to maintain.

# COST WORKSHEET

**Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties

Idea No.: A-1.1
Client: GDOT
Sheet 3 of 5

| CONSTRUCTION ELEMENT | | ORIGINAL ESTIMATE | | | NEW ESTIMATE | | |
|---|---|---|---|---|---|---|---|
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Eliminate Grade Separations: | | | | | | | |
| | | | | | | | |
| Quantity Reductions: | | | | | | | |
| Borrow Excavation | CY | 478,009 | $3.78 | $1,806,874 | 0 | $0 | $0 |
| Bridge (SR 33) | SF | 11,457.5 | $110.00 | $1,261,425 | 0 | $0 | $0 |
| Bridge (Railroad) | SF | 39,060 | $110.00 | $4,296,600 | 0 | $0 | $0 |
| Right-of-Way | AC | 11 | $10,000 | $110,000 | 0 | $0 | $0 |
| SR 33 Connector Road | | | | | | | |
| Asphalt Pavement | Ton | 1,275 | $60.00 | $76,500 | 0 | $0 | $0 |
| GAB | Ton | 1,620 | $15.00 | $24,300 | 0 | $0 | $0 |
| | | | | | | | |
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| | | | | | | | |
| Railroad Signing, Signals, Gates, Road Crossing, etc. | LS | 0 | $0 | $0 | 1 | $500,000 | $500,000 |
| Realign SR 33 with SR 133 | | | | | | | |
| Asphalt Pavement 8 ½ in | Ton | 0 | $0 | $0 | 3,400 | $60.00 | $204,000 |
| GAB 12 in | Ton | 0 | $0 | $0 | 4,300 | $15.00 | $64,500 |
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| **SUBTOTAL** | | | | $7,575,699 | | | $768,500 |
| **TOTAL ROUNDED** | | | | **$7,576,000** | | | **$769,000** |

## CALCULATIONS

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1.1<br>Client: GDOT<br>Sheet 4 of 5 |
|---|---|

**Revised Concept: Eliminate both the SR 33 and Railroad grade separations and construct a new SR 133 / SR 33 intersection and SR 133 at-grade railroad crossing.**

**RW – Reduction**
Area = 4,000 ft x 120 ft = 480,000 SF / (43,560 SF /AC) = 11 AC
Unit Cost = $10,000/AC
Savings = 11 AC x $10,000 = $110,000.00

**Earthwork**
Borrow (Unclassified) Excavation - Reduction
Sta. 187+00 to Sta. 216+50, L = 2,950 ft
Assumed Avg. depth of embankment = 25 ft
Assumed Avg. width of embankment = 175 ft
Area = 25 ft x 175 ft = 4,375 SF
Total Volume = 4,375 SF x 2,950 ft / 27 = 478,009 CY @ $3.78 / CY = $1,806,874.02

**SR 133 Bridge over SR 33 – Reduction**

Bridge Area = 2 x 41.25 ft x 139 ft = 11,467.5 SF
Unit Cost = $110.00/SF = Savings = $1,261,425.00

**SR 133 Bridge over Railroad - Reduction**

Bridge Area = 126 ft x 300 ft = 39,060 SF
Unit Cost = $110.00/SF = Savings = $4,296,600.00

Railroad Signals and Gate Assembly – Addition

Total Cost = $500,000.00

# CALCULATIONS

| | |
|---|---|
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-1.1<br>Client: GDOT<br>Sheet 5 of 5 |

**Realign SR 33 for perpendicular crossing of SR 133**

Assume 1,000 ft realignment per side:
Through Lanes: 2 @ 12 ft x 1,000 ft = 24,000 SF
Left Turn Lane 1 @ 12 ft x 450 ft +(1 @ 12 ft x 420 ft) x ½ = 5,400 + 2,520 SF = 7,920 SF
Total pavement = (24,000 SF + 7,920 SF) x 2 sides = 63,840 SF
Current Pavement Design: 8 ½ inches asphalt; 12 inches GAB

Asphalt - 8 ½ inches thick
(8.5 / 12 cu ft) 150# / cu ft (1 Ton / 2000#) = 0.053125 Ton / SF
63,840 SF x 0.053125 Ton/SF = 3,391.5 Tons **Say 3,400 Tons**
GAB - 12 inches thick
(12 / 12 cu ft) 135# / cu ft ( 1 Ton / 2000#) = 0.0675 Ton / SF
63,840 SF x 0.0675 Tons / SF = 4,309.2 Tons **Say 4,300 Tons**

**Eliminate the SR 33 Connector Road**

Asphalt - 8 ½ inches thick
Through Lanes: 2 @ 12 ft x 1,000 ft = 24,000 SF
24,000 SF x 0.053125 Ton/SF = **1,275 Tons**

GAB - 12 inches thick
24,000 SF x 0.0675 Tons / SF = **1,620 Tons**

## DEVELOPMENT AND RECOMMENDATION PHASE

**SR 133 Widening – Dougherty, Worth and Colquitt Counties**

| IDEA No.: | Sheet No.: | CREATIVE IDEA: |
|---|---|---|
| A-6 | 1 of 4 | Reduce pavement thickness for the median left turn / U-turn lanes. |

Comp By: GAO Date: 1/20/2010 Checked By: K.B. Date: 1/26/2010

**Original Concept:**

The current roadway plans use the same full depth pavement design for the median left / U-turn lanes as for the SR 133 mainline roadway through traffic lanes.

**Proposed Change:**

This recommendation reduces the pavement design thickness for the median left U-turn median lanes.

**Justification:**

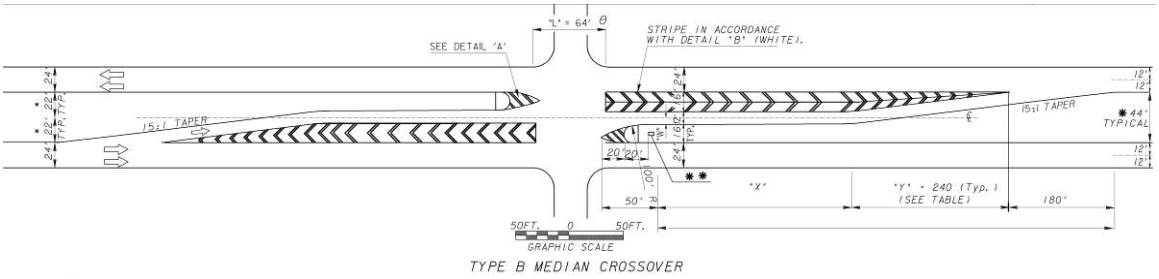
State Route 133 is being widened from two-lanes to four-lanes to comply with the State's GRIP program. The traffic projections (2030) for this corridor vary from 9,460 to 16,285 ADT. The traffic volumes utilizing the left / U-turns lanes were not specifically provided for all median openings but are assumed to be significantly lower than the mainline through volumes. Therefore, a reduced depth pavement section can be designed and constructed for these turn areas to support the appropriate traffic volumes.

The median turn areas are large enough so constructability should not be an issue. Constructing a thinner median turn lane pavement section will be a similar to constructing a shoulder. This recommendation would provide a significant cost savings while providing the same function.

| LIFE CYCLE COST SUMMARY | CAPITAL COST | FUTURE COST | TOTAL COST |
|---|---|---|---|
| **INITIAL COST: - Original** | $4,755,000 | | |
| **- Proposed** | $0 | | |
| **- Savings** | $4,755,000 | | $4,755,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$4,755,000** |

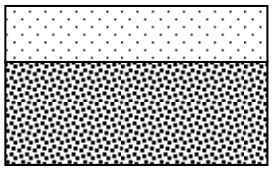
# SKETCH

| | |
|---|---|
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-6<br>Client: GDOT<br>Sheet 2 of 4 |

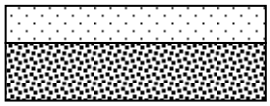



TYPE B MEDIAN CROSSOVER

Current Design
8 ½ " Asphalt & 12 " GAB



Recommended Design
4 " Asphalt & 6 " GAB



# COST WORKSHEET

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | | | | | Idea No.: A-6<br>Client: GDOT<br>Sheet 3 of 4 | | |
|---|---|---|---|---|---|---|---|
| **CONSTRUCTION ELEMENT** | | **ORIGINAL ESTIMATE** | | | **NEW ESTIMATE** | | |
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Reduce median turn lane and U-turn lane pavement thickness: | | | | | | | |
| Asphalt Reduction | | | | | | | |
| Reduce 8 ½ in to 4 in | Ton | 61,000 | $60.00 | $3,660,000 | 0 | 0 | $0 |
| GAB Reduction | | | | | | | |
| Reduce 12 in to 6 in | Ton | 73,000 | $15.00 | $1,095,000 | 0 | 0 | $0 |
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| **SUBTOTAL** | | | | $4,755,000 | | | $0 |
| **TOTAL ROUNDED** | | | | **$4,755,000** | | | **$0** |

# CALCULATIONS

| | |
|---|---|
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-6<br>Client: GDOT<br>Sheet 4 of 4 |

There are 45 median opening locations throughout the entire project length:
Left turn / U-turn lanes have an average storage length of 650 ft, full width, 16 + 12 = 28 ft
Typical lane approach and taper length is 420 ft

Total pavement area per approach:
(650 ft x 28ft ) + ½ (420 ft x 28ft) = 18,200 SF+ 5,880 SF = 24,080 SF per approach
(45 median opening locations x 2 directions) = 24,080 SF x 2 x 45 = 2,167,200 SF

Current Design:
Standard section; 8 ½ inches asphalt; 12 inches GAB
VE asphalt pavement section reduction:
Reduced section; use 4 inches asphalt, 6 inches of GAB

Reduction:
**Asphalt - 4 ½ inches thick**
(4.5 / 12 cu ft) 150# / cu ft (1 Ton / 2000#) = 0.028125 Ton / SF
2,167,200 SF x 0.028125 Ton/SF = 60,952.5 Tons **Say 61,000 Tons**

**GAB - 6 inches thick**
(6 / 12 cu ft) 135# / cu ft ( 1 Ton / 2000#) = 0.03375 Ton / SF
2,167,200 SF x 0.03375 Tons / SF = 73,143 Tons **Say 73,000 Tons**

## DEVELOPMENT AND RECOMMENDATION PHASE

**SR 133 Widening – Dougherty, Worth and Colquitt Counties**

| IDEA No.: | Sheet No.: | CREATIVE IDEA: |
|---|---|---|
| A-7 | 1 of 4 | Use the minimum allowable lengths for the storage areas in the median left / U-turn lanes. |

Comp By: GAO Date: 1/21/10 Checked By: K.B. Date: 1/26/2010

**Original Concept:**

The current design includes 45 median openings along the entire length of the project. The design for the majority of these left / U-turn lane includes a 650-foot long storage area.

**Proposed Change:**

This recommendation reduces the length of the storage areas from 650 feet to 450 feet which is the minimum allowable length for a 65 MPH design with a 44 ft median.

**Justification:**

State Route 133 is being widened from two-lanes to four-lanes to comply with the State's GRIP program. The traffic projections (2030) for this corridor vary from 9,460 to 16,285 ADT. The traffic volumes utilizing the left / U-turns were not specifically provided but are assumed to be very minor, at most location less than 50 per day.

Using the minimum allowable length of 450 feet for the left / U-turn lanes conforms to the GDOT standard detail for a type B median opening (M-3) and provides substantial cost savings.

| LIFE CYCLE COST SUMMARY | CAPITAL COST | FUTURE COST | TOTAL COST |
|---|---|---|---|
| **INITIAL COST: - Original** | $1,600,000 | | |
| **- Proposed** | $0 | | |
| **- Savings** | $1,600,000 | | $1,600,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$1,600,000** |

# SKETCH

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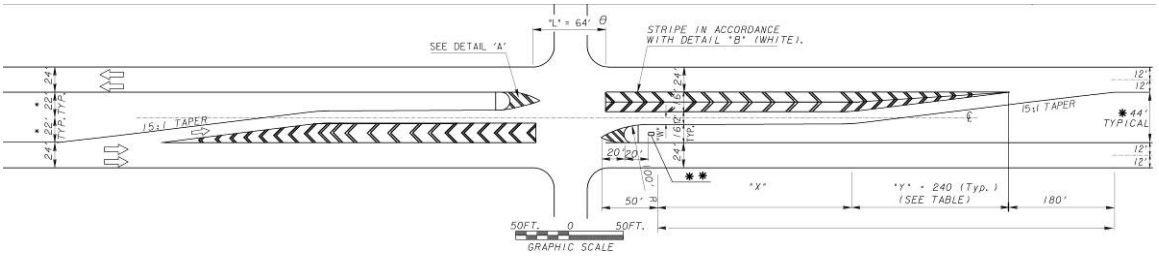
|---|---|
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-7<br>Client: GDOT<br>Sheet 2 of 4 |




TYPE B MEDIAN CROSSOVER

| TYPE B MEDIAN CROSSOVERS ● | | | | | |
|---|---|---|---|---|---|
| | DECELERATION LENGTH = Δ(FT.) | | | | |
| WIDTH OF MEDIAN | DESIGN SPEED | | | Y | W |
| | 45 MPH | 55MPH | 65 MPH | | |
| 32 | 350(200MIN) | 450(350MIN) | 650(450MIN) | 60 | 4 |
| 44 | 150(50MIN) | 300(150MIN) | 450(300MIN) | 240 | 16 |
| 64 | N/A | 150(50MIN) | 300(150MIN) | 390 | 26 |

# COST WORKSHEET

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | | | | | Idea No.: A-7<br>Client: GDOT<br>Sheet 3 of 4 | | |
|---|---|---|---|---|---|---|---|
| **CONSTRUCTION ELEMENT** | | **ORIGINAL ESTIMATE** | | | **NEW ESTIMATE** | | |
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Reduce lane storage area from 650 feet to 450 feet: | | | | | | | |
| Reduced Quantities | | | | | | | |
| Asphalt | Ton | 20,230 | $60.00 | $1,213,800 | 0 | $0 | $0 |
| GAB | Ton | 25,704 | $15.00 | $385,560 | 0 | $0 | $0 |
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| **SUBTOTAL** | | | | $1,599,360 | | | $0 |
| **TOTAL ROUNDED** | | | | **$1,600,000** | | | **$0** |

# CALCULATIONS

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-7<br>Client: GDOT<br>Sheet 4 of 4 |
|---|---|

There are 34 median opening locations with left / u-turn lane lengths of 650 feet
Width reduction of Type B left turn lane = 12' lane + 16' painted median = 28 feet
Length reduction = 650 ft – 450 ft = 200 ft per direction

Reduced pavement area = 34 x 2 directions x 28 ft x 200 ft = 380,800 SF
Standard pavement section; 8 ½ inches asphalt; 12 inches GAB

Asphalt - 8 ½ inches thick
(8.5 / 12 cu ft) 150# / cu ft (1 Ton / 2000#) = 0.053125 Ton / SF
380,800 SF x 0.053125 Ton/SF = 20,230 Tons
GAB - 12 inches thick
(12 / 12 cu ft) 135# / cu ft ( 1 Ton / 2000#) = 0.0675 Ton / SF
380,800 SF x 0.0675 Tons / SF = 25,704 Tons

## DEVELOPMENT AND RECOMMENDATION PHASE

**SR 133 Widening – Dougherty, Worth and Colquitt Counties**

| IDEA No.: | Sheet No.: | CREATIVE IDEA: |
|---|---|---|
| A-8 | 1 of | Reduce the median width from 44 feet wide to 32 feet wide for the entire length of the project. |

Comp By: GO Date: 1/21/2010 Checked By: K.B. Date: 1/26/2010

**Original Concept:**

The current roadway design for SR 133 is essentially a four-lane divided highway with a 44-foot wide median. However, the median width is reduced to 32 feet in one 2.7-mile section and to 24 feet in two other (2.3 miles and 1-mile) sections.

**Proposed Change:**

This recommendation would reduce the normal 44-foot wide median to 32-foot wide.

**Justification:**

State Route 133 is being widened from two-lanes to four-lanes to comply with the State's GRIP program. The traffic projections (2030) for this corridor vary from 9,460 to 16,285 ADT. Several sections, approximately six miles, of the proposed route widening will be constructed with less than 44-foot wide medians to minimize impacts the wetlands, parks, and local residents.

Reducing the median width to 32 feet for the entire corridor would further reduce impacts along the corridor (which include several historic properties). Reducing the median width would save R/W, Clearing &Grubbing, and embankment costs. This concept would also reduce future maintenance cost due to the reduced width of the median.

| LIFE CYCLE COST SUMMARY | CAPITAL COST | FUTURE COST | TOTAL COST |
|---|---|---|---|
| **INITIAL COST: - Original** | $878,000 | | |
| **- Proposed** | $0 | | |
| **- Savings** | $878,000 | | $878,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$878,000** |

# COST WORKSHEET

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | | | | | Idea No.: A-8<br>Client: GDOT<br>Sheet 2 of 3 | | |
|---|---|---|---|---|---|---|---|
| **CONSTRUCTION ELEMENT** | | **ORIGINAL ESTIMATE** | | | **NEW ESTIMATE** | | |
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Recommended median reduction from 44 feet to 32 feet: | | | | | | | |
| Quantity Reductions: | | | | | | | |
| R/W Savings | Acre | 38.11 | $10,000 | $381,100 | 0 | 0 | $0 |
| Clear & Grubb - 10% Savings | LS | 1 | $264,800 | $264,800 | 0 | 0 | $0 |
| Embankment | CY | 61,491 | $3.78 | $232,436 | 0 | 0 | $0 |
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| **SUBTOTAL** | | | | $878,336 | | | $0 |
| **TOTAL ROUNDED** | | | | **$878,000** | | | **$0** |

## CALCULATIONS

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: A-8<br>Client: GDOT<br>Sheet 3 of 3 |
|---|---|

Total project length: 32.34 miles x 5,280 ft = 170,755 ft
Length with 32 ft median: = Station 263 – 407 = 14,400 ft
Length with 24 ft median: = Station 529 – 650 = 12,100 ft
= Station 1725 – 1784 = 5,900 ft
Total length with 44 ft median: = 170,755 – 32,400 = 138,355 ft

R/W Savings:
Area = 138,355 ft x 12 ft / 43,560 SF = 38.11 Acres
38.11 Acres x $10,000 / Acre = $381,100

Clearing & Grubbing Savings:
Assume 10% of estimated costs = 10% x $2,648,000 = $264,800

Embankment Savings:
Volume = 12 ft x 1 ft x 138,355 ft / 27 CF =61,491 CY
61,491 x $3.78 = $232,435.98

## DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 133 Widening - Dougherty, Worth and Colquitt Counties**

| IDEA No.: | Sheet No.: | CREATIVE IDEA: |
|---|---|---|
| A-9 | 1 of 4 | Reduce the width of paved outside shoulder from 6.5 feet to 4.0 feet. |

Comp By: DPC Date: 1/212010 Checked By: KB Date: 1/26/2010

**Original Concept:**

The current design for the proposed Typical Section for all four projects specify the use of a 6-foot 6-inch paved outside shoulder width with a 10-foot total shoulder width.

**Proposed Change:**

It is recommended that GDOT utilize a project wide 4-foot wide paved outside shoulder width instead of the proposed 6-foot 6-inch paved shoulder width while holding the 10-foot total shoulder width.

**Justification:**

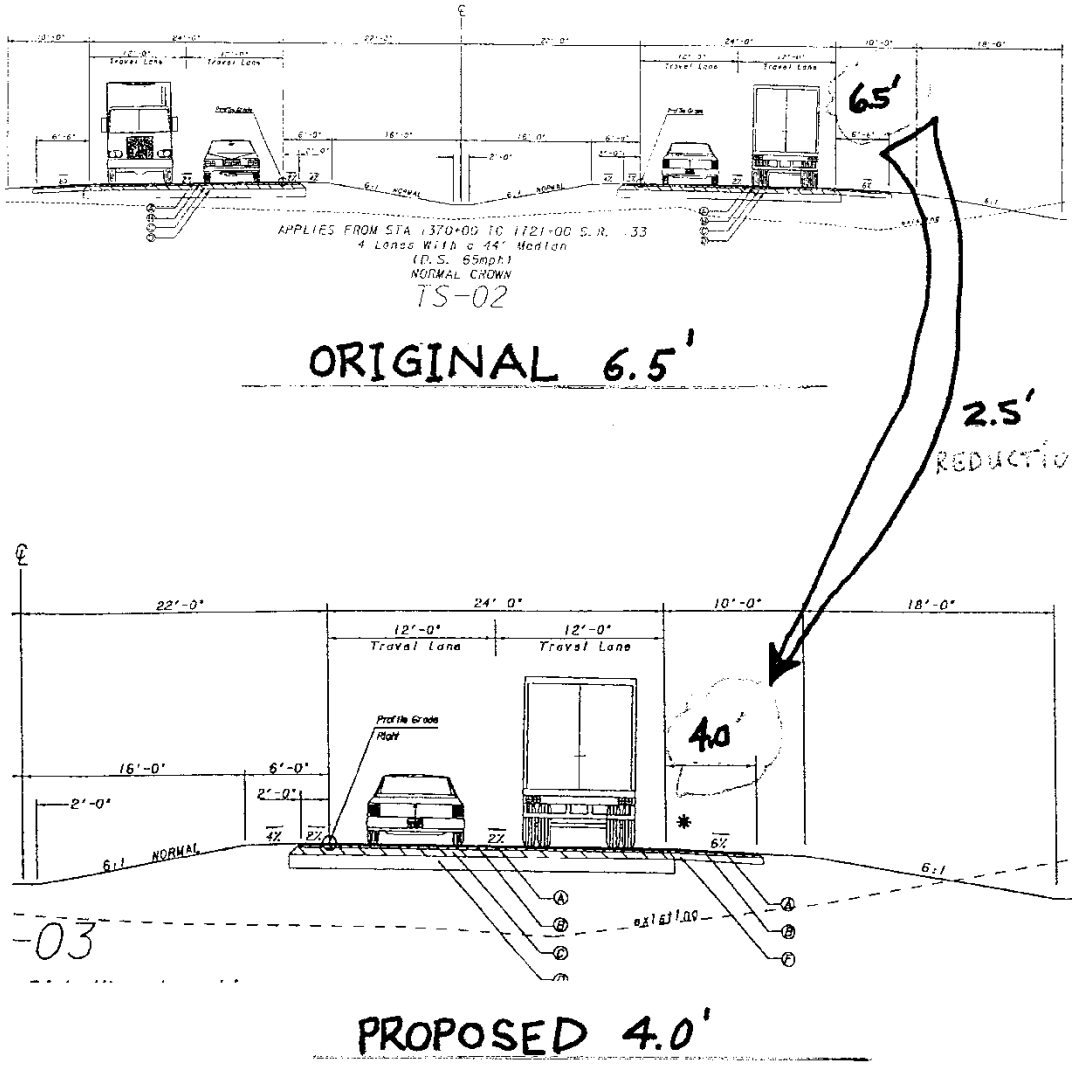
State Route 133 is being widened from two-lanes to four-lanes to comply with the State's GRIP program. The traffic projections (2030) for this corridor vary from 9,460 to 16,285 ADT. A 5-foot reduction in the total outside paved shoulder width (2.5-feet each side of corridor) reduces excavation/embankment quantities and asphaltic pavement section quantities throughout the entire 32-mile corridor. This concept results in significant cost savings without jeopardizing the projects approved need and purpose statement.

The significance of the 6-foot 6-inch paved shoulder width enables stopped vehicles to safely secure one half (not the full vehicle width) of their tires on solid pavement versus a non-paved surface. The reduced 4-foot paved shoulder width provides the same function while reducing material use and installation costs.

| LIFE CYCLE COST SUMMARY | CAPITAL COST | FUTURE COST | TOTAL COST |
|---|---|---|---|
| **INITIAL COST: - Original** | $1,375,000 | | |
| **- Proposed** | $0 | | |
| **- Savings** | $1,375,000 | | $1,375,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$1,375,000** |

## SKETCH

| | |
|---|---|
| **Project:** SR 133 Widening - Dougherty, Worth and Colquitt Counties | Idea No.: A-9<br>Client: GDOT<br>Sheet 2 of 4 |



# COST WORKSHEET

**Project:** SR 133 Widening - Dougherty, Worth and Colquitt Counties

Idea No.: A-9
Client: GDOT
Sheet 3 of 4

| CONSTRUCTION ELEMENT | | ORIGINAL ESTIMATE | | | NEW ESTIMATE | | |
|---|---|---|---|---|---|---|---|
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Recommendation to reduce outside paved shoulder from 6 ½ feet to 4 feet: | | | | | | | |
| Quantity Reductions: | | | | | | | |
| Excavation / Embankment | CY | 25,105 | $3.78 | $94,897 | 0 | $0 | $0 |
| GAB | TN | 6,355 | $14.97 | $95,135 | 0 | $0 | $0 |
| Recycled 12.5 MM Asphalt | TN | 7,767 | $58.48 | $454,214 | 0 | $0 | $0 |
| Recycled. 19 MM Asphalt | TN | 10,356 | $65.00 | $673,140 | 0 | $0 | $0 |
| Bituminous Tack Coat | GL | 33,892 | $1.70 | $57,616 | 0 | $0 | $0 |
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| **SUBTOTAL** | | | | $1,375,002 | | | $0 |
| **TOTAL ROUNDED** | | | | $1,375,000 | | | $0 |

# CALCULATIONS

| | |
|---|---|
| **Project:** SR 133 Widening - Dougherty, Worth and Colquitt Counties | Idea No.: A-9<br>Client: GDOT<br>Sheet 4 of 4 |

**Excavation / Embankment:**

Project length is from STA 89+00 to STA 1783+60 +/- which is approximately 169,460 feet. Eliminating 2.5 feet from each side equates to 169,460 feet x (2.5 feet x 2) = 847,300 SF. Therefore, 847,300 SF of surface area x 9.5 inches (0.8 feet) paved shoulder depth = 677,840 CF / 27 CF /CY = 25,105 CY of eliminated material and associated labor activity.

**Asphalt Pavement Section:**

SY to Ton conversion calculations: 847,300 SF /9 SF/SY = 94,145 SY

1. GAB – 135 #/SY x 94,145 SY / 2,000 #/TN = 6,355 Tons
2. 12.5 mm mix – 165 #/SY x 94,145 SY / 2,000 #/TN = 7,767 Tons
3. 19 mm mix – 220 #/SY x 94,145 SY / 2,000 #/TN = 10,356 Tons

**Bituminous Tack Coat:**

Application rate is approximately 0.04 gallons per square foot, therefore total of 847,300 SF x 0.04 gal/SF = 33,892 gallons.

## DEVELOPMENT AND RECOMMENDATION PHASE

**SR 133 Widening – Dougherty, Worth and Colquitt Counties**

| **IDEA No.:** | **Sheet No.:** | **CREATIVE IDEA:** Reverse the girder direction (make perpendicular to the RR alignment) of the SR 133 Bridge over the Georgia/Florida Railway at Station 1670. |
|---|---|---|
| B-2 | 1 of 5 | |

Comp By: AS Date: 1/21/2010 Checked By: KB Date: 1/26/2010

**Original Concept:**

The current design includes dual 3-span (110 ft x 140 ft x 110 ft) bridges over the Georgia / Florida Railway track at Station 1670. The current design has the bridge beam alignment parallel to the SR 133 alignment which requires the use of Bulb Tee 74" and Bulb Tee 63" beams. The current design also provides 25 feet 3 inches of minimum vertical clearance and adequate horizontal clearance for a future second track.

**Proposed Change:**

This recommendation would construct a single SR 133 Bridge over the Georgia/Florida Railway by reversing the direction of beams (make perpendicular to the railroad alignment). This concept would result in a new bridge that is 79 feet wide and 404.54 feet long. It would be constructed partly on MSE wall pile end bents and partly on concrete intermediate bents.

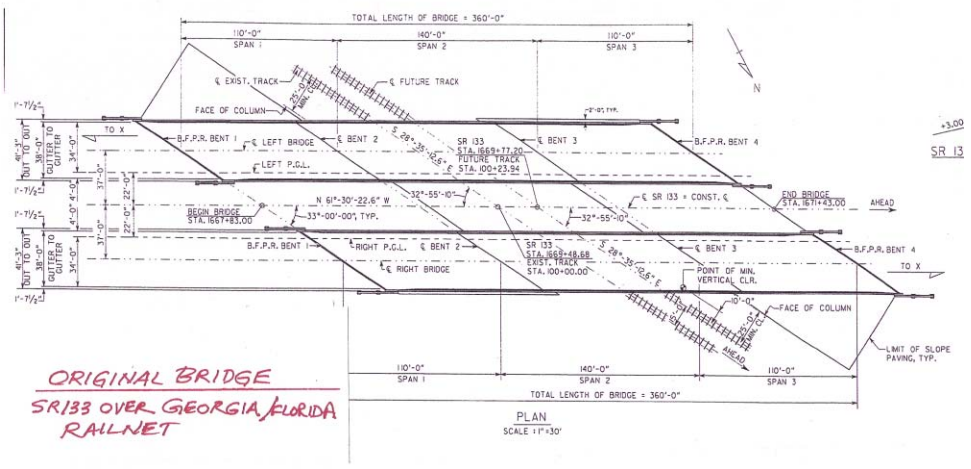
**Justification:**

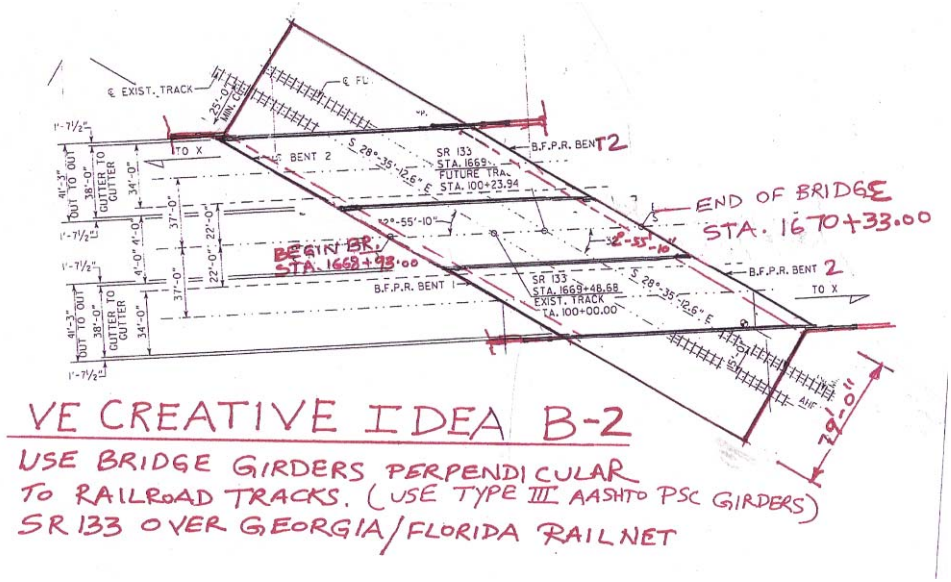
This concept results in a smaller overall deck section and shorter beams. The shorter beams would allow Type III AASHTO prestressed concrete beams to be used instead of Bulb Tee 74" and Bulb Tee 63". The use of the smaller Type III beams would also reduce the overall height of the roadway over the railroad. Construction using smaller beams would be simpler and quicker with less impact to the railroad.

| **LIFE CYCLE COST SUMMARY** | **CAPITAL COST** | **FUTURE COST** | **TOTAL COST** |
|---|---|---|---|
| **INITIAL COST: - Original** | $3,364,000 | | |
| **- Proposed** | $2,946,000 | | |
| **- Savings** | $418,000 | | $418,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$418,000** |

# SKETCH

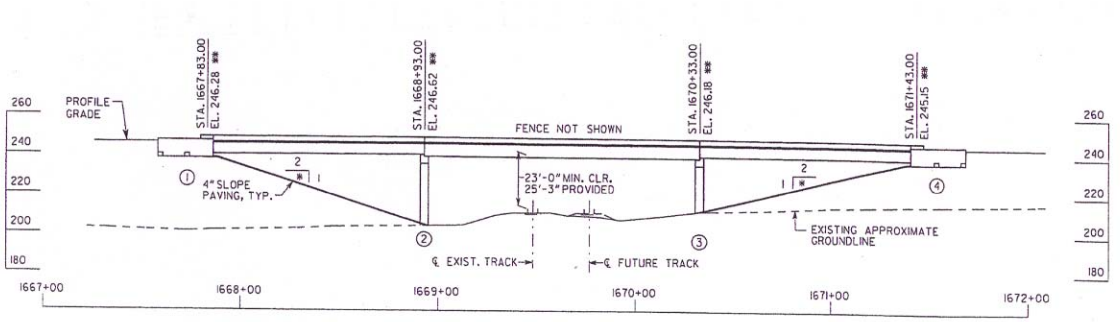
| | |
|---|---|
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: B-2<br>Client: GDOT<br>Sheet 2 of 5 |



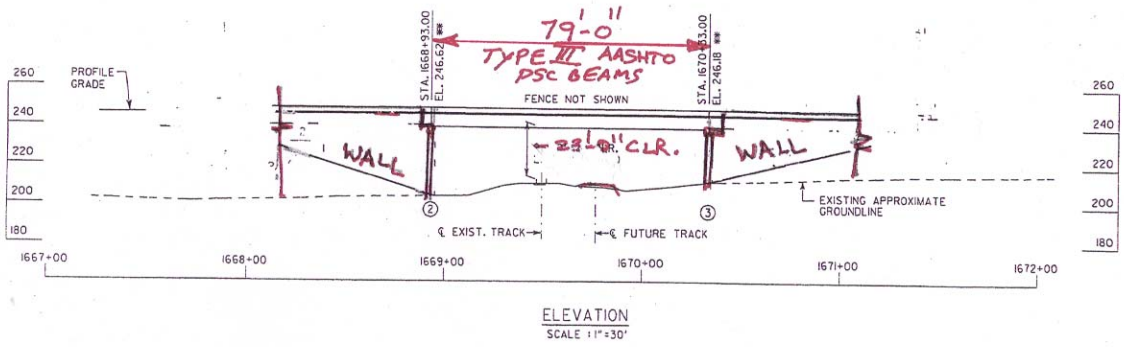
# SKETCH

| | |
|---|---|
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: B-2<br>Client: GDOT<br>Sheet 3 of 5 |




ORIGINAL BRIDGE
SR 133 OVER GEORGIA/FLORIDA RAILNET

ELEVATION
SCALE : 1"=30'




ELEVATION
SCALE : 1"=30'

VE CREATIVE IDEA B-2
SR 133 OVER GEORGIA/FLORIDA RAILNET
USE 79'-0" TYPE III AASHTO PSC BEAMS

# COST WORKSHEET

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | | | | | Idea No.: B-2<br>Client: GDOT<br>Sheet 4 of 5 | | |
|---|---|---|---|---|---|---|---|
| **CONSTRUCTION ELEMENT** | | **ORIGINAL ESTIMATE** | | | **NEW ESTIMATE** | | |
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Current bridge: | | | | | | | |
| Dual 360 x 2 x 41.25 = 29,700 | SF | 29,700 | $110.00 | $3,267,000 | 0 | $0 | $0 |
| Embankment Reduction: (-4 ft) | | | | | | | |
| 2,300 x 4 x ½ x 150 /27 = 25,556 | CY | 25,556 | $3.78 | $96,602 | 0 | $0 | $0 |
| | | | | | | | |
| VE Bridge: | | | | | | | |
| 79 ft single span perpendicular to the railroad | | | | | | | |
| Single 404.54 x 79 = 31,959 | SF | 0 | $0 | $0 | 31,959 | $90.00 | $2,876,310 |
| Additional embankment | CY | 0 | $0 | $0 | 18,333 | $3.78 | $69,299 |
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| **SUBTOTAL** | | | | $3,363,602 | | | $2,945,609 |
| **TOTAL ROUNDED** | | | | **$3,364,000** | | | **$2,946,000** |

## CALCULATIONS

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: B-2<br>Client: GDOT<br>Sheet 5 of 5 |
|---|---|

Original SR 133 Bridge over the railroad:
Two structures @ 360 ft x 41.25 ft = 29,700 SF
Cost = 29,700 SF x $110 / SF = $3,267,000

Reduction in roadway embankment:
Lower height of roadway 2 ft for smaller beams & 2 ft for vertical clearance (from 25 to 23)
Volume = (2,300 ft x 4 ft x 150 ft) x ½ = 690,000 SF / 27 = 25,556 CY
25,556 CY @ $3.78 = $96,692

VE Recommended Bridge:
Single structure @ 79 ft x 404.54 ft = 31,958.66 SF
Use reduced cost of $90 /SF
31,959 SF x $90 / SF = $2,876,310

Additional embankment for VE bridge:
Volume = 110 ft x 30 ft x 150 ft = 495,000 SF / 27 =18,333 CY
18,333 CY @ $3.78 = $69,298.74

## DEVELOPMENT AND RECOMMENDATION PHASE

**SR 133 Widening – Dougherty, Worth and Colquitt Counties**

| **IDEA No.:** | **Sheet No.:** | **CREATIVE IDEA:** Eliminate the SR 133 Bridge over the Georgia / Florida Railway track at Station 1670 and construct an at-grade crossing. |
|---|---|---|
| B-2.1 | 1 of 3 | |

Comp By: GAO Date: 1/21/2010 Checked By: KB Date: 1/26/2010

**Original Concept:**
The current design includes dual 3-span (110 ft x 140 ft x 110 ft) bridges over the Georgia / Florida Railway track at Station 1670. The current design has the bridge beam alignment parallel to the SR 133 alignment which requires the use of Bulb Tee 74" and Bulb Tee 63" beams. The current design also provides 25 feet 3 inches of minimum vertical clearance and adequate horizontal clearance for a future second track.

**Proposed Change:**
This recommendation eliminates the dual railroad structures over the Georgia / Florida Railway track and provides for a new at-grade railroad crossing with standard flashing lights, gates, new track crossing, and appropriate signing / pavement markings.

**Justification:**
State Route 133 is being widened from two-lanes to four-lanes to comply with the State's GRIP program. Traffic projections (2030) for this section of the corridor are 16,285 ADT and there is only 1 train per day at this crossing with no apparent history of accidents, injuries or fatalities. If further investigation supports this assumption, then the cost of constructing a grade separation, while desirable, may not be cost beneficial and therefore not warranted at this time.

Delaying construction of the railroad grade separation until there is additional train traffic or when the future track is constructed also eliminates bridge maintenance costs until such time as the grade separation is needed. This concept reduces cost, simplifies construction, reduces project time, and minimizes railroad construction impacts. Future maintenance cost would also be reduced since there would be less bridge deck area to maintain.

| **LIFE CYCLE COST SUMMARY** | **CAPITAL COST** | **FUTURE COST** | **TOTAL COST** |
|---|---|---|---|
| **INITIAL COST: - Original** | $4,065,000 | | |
| **- Proposed** | $500,000 | | |
| **- Savings** | $3,565,000 | | $3,565,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$3,565,000** |

# COST WORKSHEET

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | | | | | Idea No.: B-2.1<br>Client: GDOT<br>Sheet 2 of 3 | | |
|---|---|---|---|---|---|---|---|
| **CONSTRUCTION ELEMENT** | | **ORIGINAL ESTIMATE** | | | **NEW ESTIMATE** | | |
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Current Design: | | | | | | | |
| SR 133 / Railroad Grade Separation | | | | | | | |
| Two bridges over Railroad | SF | 29,700 | $110.00 | $3,267,000 | | | |
| Grade Separation Earthwork | CY | 211,111 | $3.78 | $798,000 | | | |
| | | | | | | | |
| VE Recommended Concept: | | | | | | | |
| Construct new At-Grade Crossings, warning lights, signals, gates, signing, etc. | LS | | | | 1 | $500,000 | $500,000 |
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| **SUBTOTAL** | | | | $4,065,000 | | | $500,000 |
| **TOTAL ROUNDED** | | | | **$4,065,000** | | | **$500,000** |

# CALCULATIONS

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: B-2.1<br>Client: GDOT<br>Sheet 3 of 3 |
|---|---|

Bridges over Railroad
2 @ 360 ft x 41.25 ft = 29,700 SF

Earthwork – fill

| Station | Length (ft) | Avg ht (ft) | Amount of fill (SF) |
|---|---|---|---|
| 1657+00 | | | |
| | 800 | 12 | 9,600 |
| 1665+00 | | | |
| | 800 | 25 | 20,000 |
| 1673+00 | | | |
| | 700 | 12 | 8,400 |
| 1680+00 | | | |
| | | Total | 38,000 SF |

Average width of template – 150 ft
38,000 sq ft x 150 ft = 5,700,000 cu ft = 211,111 CY

## DEVELOPMENT AND RECOMMENDATION PHASE

**SR 133 Widening – Dougherty, Worth and Colquitt Counties**

| IDEA No.: | Sheet No.: | CREATIVE IDEA: |
|---|---|---|
| B-8 | 1 of 4 | Reduce the length of the SR 133 bridge over SR 33 by reducing the clear area from 26 feet to 14 feet. |

Comp By: AS Date: 1/21/2010 Checked By: KB Date: 1/26/2010

**Original Concept:**

The original design proposes two single span structures to carry SR 133 over SR 33. The spans would be 139 feet long and require Bulb Tee 74-inch prestress concrete beams. These structures would provide a 26-foot clear area on both sides of the SR 33 roadway.

**Proposed Change:**

This recommendation would reduce the length of the SR 133 structures over SR 33 by reducing the 26-foot clear area to a 14-foot clear area.

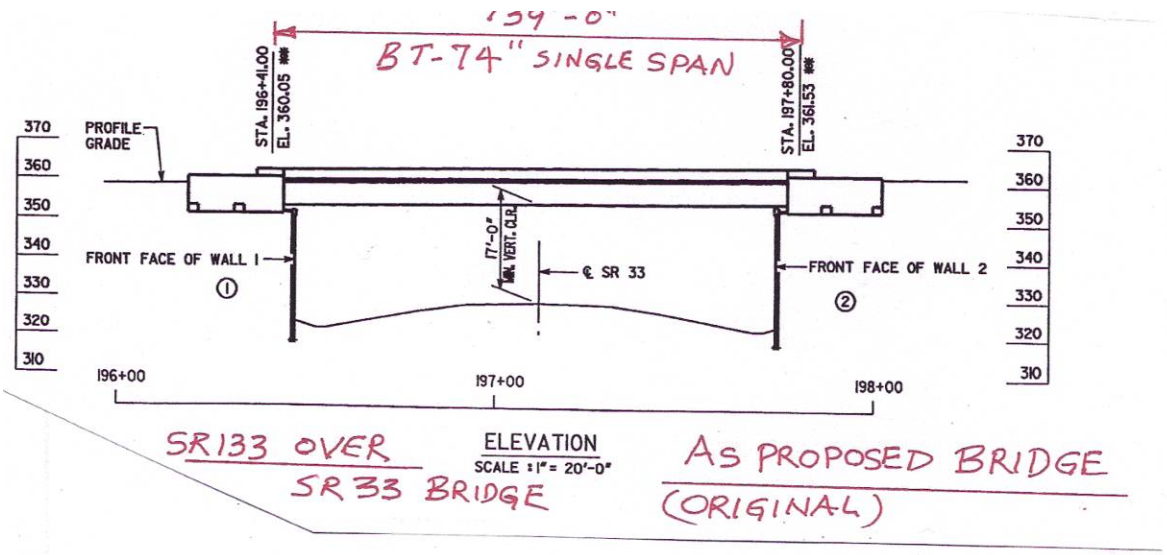
**Justification:**

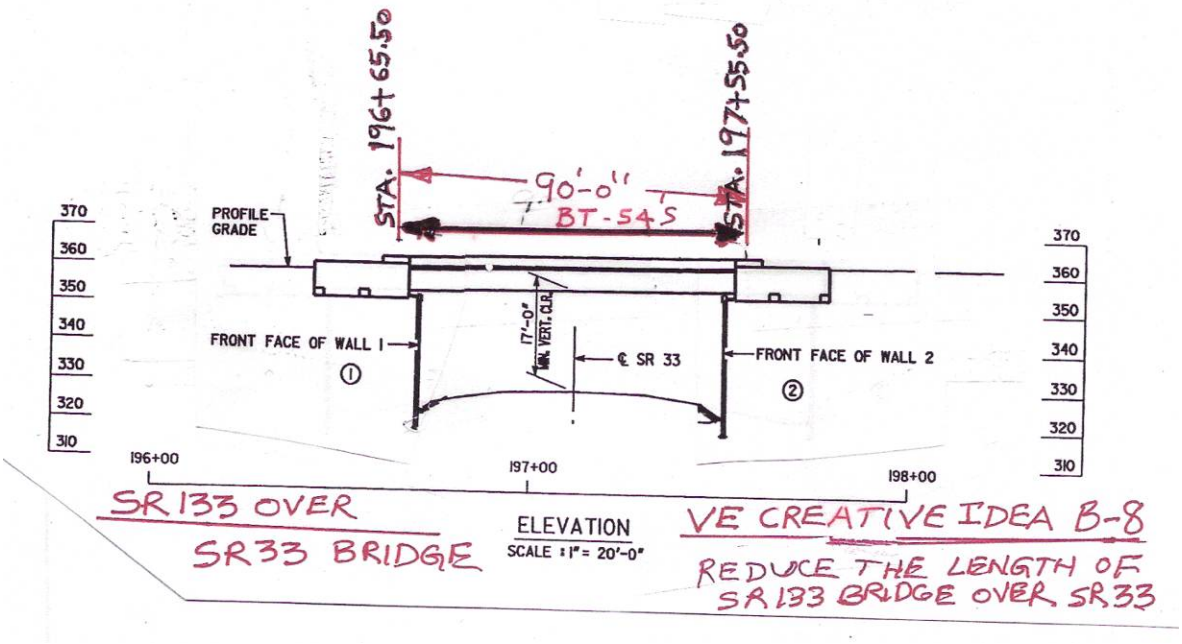
Providing 14-foot clear areas on both sides of the SR 33 roadway would reduce the bridge length from 139 feet to 95 feet. The shorter bridge length would allow for a reduction in the beam size from a BT 74" beam to a BT 54" beam. The smaller beams and shorter beam length will result in cost savings. The smaller beams would also improve constructability. The 14-foot horizontal clear area would provide for a 12-foot shoulder and 2 feet extra for a barrier in front of retaining wall.

| LIFE CYCLE COST SUMMARY | CAPITAL COST | FUTURE COST | TOTAL COST |
|---|---|---|---|
| **INITIAL COST: - Original** | $1,261,000 | | |
| **- Proposed** | $732,000 | | |
| **- Savings** | $529,000 | | $529,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$529,000** |

## SKETCH

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: B-8<br>Client: GDOT<br>Sheet 2 of 4 |
|---|---|



# COST WORKSHEET

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | | | | | Idea No.: B-8<br>Client: GDOT<br>Sheet 3 of 4 | | |
|---|---|---|---|---|---|---|---|
| **CONSTRUCTION ELEMENT** | | **ORIGINAL ESTIMATE** | | | **NEW ESTIMATE** | | |
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Original Bridge Design: | | | | | | | |
| BT-74 Beams Spanning 139 ft | SF | 11,467.5 | $110.00 | $1,261,425 | | | |
| | | | | | | | |
| VE Proposed Bridge: | | | | | | | |
| BT 54 Beams Spanning 95 ft | SF | | | | 7,837.5 | $90.00 | $705,375 |
| Additional Pavement | Ton | | | | 62 | $60.00 | $3,720 |
| Additional GAB | Ton | | | | 85 | $15.00 | $1,275 |
| Additional Embankment | CY | | | | 5,700 | $3.78 | $21,546 |
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| **SUBTOTAL** | | | | $1,261,425 | | | $731,916 |
| **TOTAL ROUNDED** | | | | **$1,261,000** | | | **$732,000** |

# CALCULATIONS

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: B-8<br>Client: GDOT<br>Sheet 4 of 4 |
|---|---|

Reduce the length of the SR 133 bridge over SR 33
Reduced bridge length is due to providing minimum clearance of 14 ft. instead of 26 ft.

Original Bridge cost:
139 ft x 41.25 ft x 2 bridges = 11,467.5 SF @ $ 110/SF = $1,261,425.

Proposed Bridge cost:
95 ft x 41.25 ft x 2 bridges = 7,837.5 SF @ $90/SF = $705,375.

Current Pavement Design:
Standard section; 8 ½ inches asphalt; 12 inches GAB

**Asphalt - 8 ½ inches thick**
24 ft x 24 ft x 2 = 1,152 SF
(8.5 / 12 cu ft) 150# / cu ft (1 Ton / 2000#) = 0.053125 Ton / SF
1,152 SF x 0.053125 Ton/SF = 61.2 Tons **Say 62 Tons**

**GAB - 12 inches thick**
24 ft x 26 ft x 2 = 1,248 SF
(12 / 12 cu ft) 135# / cu ft ( 1 Ton / 2000#) = 0.0675 Ton / sq ft
1,248 SF x 0.0675 Tons / SF = 84.24 Tons **Say 85 Tons**

**Borrow (Embankment)**
2 x (30 ft x 60 ft x 1/2) x 24 ft + (30 ft x 152 ft) x 24 ft = 43,200 CF + 109,440 CF
43,200 CF + 109,440 CF = 152,640 CF / 27 = 5,653 CY **Say 5,700 CY**

## DEVELOPMENT AND RECOMMENDATION PHASE

**Project: SR 133 Widening - Dougherty, Worth and Colquitt Counties**

| IDEA No.: | Sheet No.: | CREATIVE IDEA: |
|---|---|---|
| **D-1** | 1 of 4 | Reduce all 6:1 sloped shoulder sections to 4:1 slopes throughout entire project. |

Comp By: DPC Date: 1/20/2010 Checked By: KB Date: 1/26/2010

**Original Concept:**

A select few typical sections indicate the construction of a permanent 6:1 slope beginning at the shoulder breakpoint leading down to the edge of the graded ditch line. The horizontal dimension associated with these section details is typically 18-feet. On the remaining typical section details there is a design to construction a permanent 4:1 slope beginning at the shoulder breakpoint leading down to the edge of the graded ditch line and the horizontal dimension associated with it is typically 12-feet.

**Proposed Change:**

It is recommended that GDOT utilize a project wide 4:1 slope beginning at the shoulder breakpoint leading down to the edge of the graded ditch line. The horizontal dimension associated with this section detail is typically determined to be 12-feet, a 6-foot reduction.

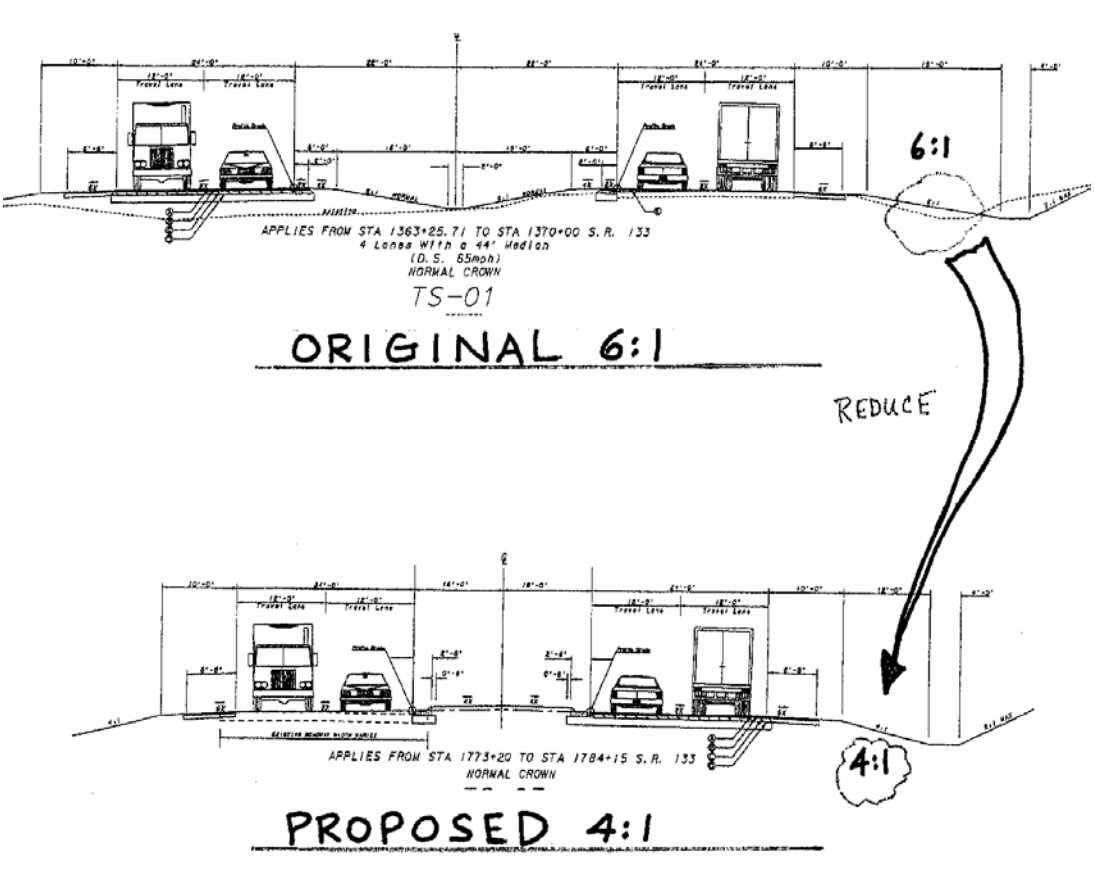
**Justification:**

Reduction of approximately 12-foot of Right-of-way width (6-feet each side of corridor), reduced borrow excavation quantities, elimination of ample clearing & grubbing and erosion control items throughout this 32-mile corridor results in significant cost savings without jeopardizing the project's approved need and purpose statement.

| LIFE CYCLE COST SUMMARY | CAPITAL COST | FUTURE COST | TOTAL COST |
|---|---|---|---|
| **INITIAL COST: - Original** | $943,000 | | |
| **- Proposed** | $0 | | |
| **- Savings** | $943,000 | | $943,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$943,000** |

## SKETCH

| | |
|---|---|
| **Project:** SR 133 Widening - Dougherty, Worth and Colquitt Counties | Idea No.: D -1<br>Client: GDOT<br>Sheet 2 of 4 |



# COST WORKSHEET

| **Project: SR 133 Widening - Dougherty, Worth and Colquitt Counties** | | | | | Idea No.: D - 1<br>Client: GDOT<br>Sheet 3 of 4 | | |
|---|---|---|---|---|---|---|---|
| **CONSTRUCTION ELEMENT** | | **ORIGINAL ESTIMATE** | | | **NEW ESTIMATE** | | |
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Items Reduced by Changing the Slopes from 6:1 to 4:1 | | | | | | | |
| Right-of-Way | AC | 34.7 | $10,000 | $347,000 | 0 | 0 | $0 |
| Clearing and grubbing | AC | 34.7 | $4,000 | $138,800 | 0 | 0 | $0 |
| Borrow Excavation | CY | 86,097 | $3.78 | $325,447 | 0 | 0 | $0 |
| Erosion Control Items – Temp. | LS | 0.1 | $207,417 | $20,742 | 0 | 0 | $0 |
| Permanent Grassing | AC | 34.7 | $642.05 | $22,279 | 0 | 0 | $0 |
| Mulch | TN | 87.6 | $147.23 | $12,897 | 0 | 0 | $0 |
| Storm Drain Pipe, var. IN, H 1-10 | LF | 2,412 | $31.57 | $76,145 | 0 | 0 | $0 |
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| **SUBTOTAL** | | | | $943,310 | | | $0 |
| **TOTAL ROUNDED** | | | | **$943,000** | | | **$0** |

# CALCULATIONS

| **Project:** SR 133 Widening - Dougherty, Worth and Colquitt Counties | Idea No.: D - 1<br>Client: GDOT<br>Sheet 4 of 4 |
|---|---|

**6:1 Slope Calculations:**

**UNIT (520) Typical Sections TS-01 through TS-07 indicating 6:1 slopes:**
STA 89+00 to STA 820+00 with an approximate length of 40,000 feet times (2) sides equates to approximately 80,000 linear feet.

**UNIT (519) Typical Sections TS-01 through TS-05 indicating 6:1 slopes:**
STA 820+00 to STA 1165+00 with an approximate length of 30,000 feet times (2) sides equates to approximately 60,000 linear feet.

**UNIT (475) Typical Sections TS-01 through TS-05 indicating 6:1 slopes:**
STA 1165+00 to STA 1378+00 with an approximate length of 20,000 feet times (2) sides equates to approximately 40,000 linear feet.

**UNIT (473) Typical Sections TS-01 through TS-03 indicating 6:1 slopes:**
STA 1378+00 to STA 1784+00 with an approximate length of 36,000 feet times (2) sides equates to approximately 72,000 linear feet.

***Total: 252,000 feet long x 6-foot wide equates to 1,512,000 SF / 43,560 SF per AC = 34.7 acres of land not required if slopes were drawn back from 6:1 to 4:1 in the above outlines areas.***

Total project length is STA 1784+00 to STA 89+00 = 169,500 x 2 sides = 339,000 feet. Use this for percentage comparisons. 252,000 lf / 339,000 lf = 74% of project length has 6:1 slopes

**Embankment / Excavation:**
Current cost estimates indicate approximately 1,721,934 CY of Excavation on project and 0 CY of Embankment. Based on review of cross-section plans use 5% of total quantity estimated to determine approximately how much excavation will be eliminated once we reduce slopes from 6:1 to 4:1. 1,721,934 x 5% = 86,097 CY reduction.

**Mulch:**
Current cost estimates indicate approximately 1,752 tons of mulch on project. Based on review of cross-section plans use 5% of total quantity as an estimate on how much mulch will be eliminated once we reduce slopes from 6:1 to 4:1. 1,752 x 5% = 87.6 tons.

**Storm Drain Pipes exiting slopes:**
Review and take off of each project plan sheet reveals approximately 402 locations where cross drain pipes will be effected if we draw slopes back from 6:1 to 4:1. Each location will be reduced by 6-feet. 402 pipe locations x 6-feet = 2,412 feet. Various pipe diameters were noted and the linear cost of pipe was estimated and rounded to best reflect estimated cost.

## DEVELOPMENT AND RECOMMENDATION PHASE

**SR 133 Widening – Dougherty, Worth and Colquitt Counties**

| IDEA No.: | Sheet No.: | CREATIVE IDEA: |
|---|---|---|
| J-3 | 1 of 3 | Substitute Type W guardrail for Type T guardrail throughout the entire project. |

Comp By: GAO Date: 1/21/2010 Checked By: KB Date: 1/26/2010

**Original Concept:**

The current design uses both Type T guardrail and Type W guardrail on the plans.

**Proposed Change:**

This recommendation substitutes Type W guardrail for Type T guardrail throughout the length of the project.

**Justification:**

The plans do not show specific areas where Type T guardrail is to be used; however the cost estimates reflect a quantity of 34,550 linear feet. There does not appear to be any locations where the type T guardrail has to be used and substituting the type W guardrail would provide significant cost savings.

| LIFE CYCLE COST SUMMARY | CAPITAL COST | FUTURE COST | TOTAL COST |
|---|---|---|---|
| **INITIAL COST: - Original** | $1,395,000 | | |
| **- Proposed** | $503,000 | | |
| **- Savings** | $892,0 00 | | $982,000 |
| **FUTURE COST: – Savings** | | | |
| **TOTAL PRESENT WORTH SAVINGS** | | | **$892,000** |

# COST WORKSHEET

| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | | | | | Idea No.: J-3<br>Client: GDOT<br>Sheet 2 of 3 | | |
|---|---|---|---|---|---|---|---|
| **CONSTRUCTION ELEMENT** | | **ORIGINAL ESTIMATE** | | | **NEW ESTIMATE** | | |
| **Item** | **Unit** | **No. Units** | **Cost/Unit** | **Total Cost** | **No. Units** | **Cost/Unit** | **Total Cost** |
| | | | | | | | |
| Current Design: | | | | | | | |
| Guardrail Type T | LF | 34,550 | $40.36 | $1,394,438 | | | |
| | | | | | | | |
| VE Recommended Design: | | | | | | | |
| Guardrail, Type W | LF | | | | 34,550 | $14.55 | $502,702 |
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| **SUBTOTAL** | | | | $1,394,438 | | | $502,702 |
| **TOTAL ROUNDED** | | | | **$1,395,000** | | | **$503,000** |

# CALCULATIONS

| | |
|---|---|
| **Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties | Idea No.: J-3<br>Client: GDOT<br>Sheet 3 of 3 |

Total length of Type T guardrail – per project

| | | |
|---|---|---|
| 520 | 18,000 | |
| 519 | 500 | |
| 475 | 8,550 | |
| 473 | 7,500 | |
| | 34,550 | lf |

# APPENDIX

# Sources

## Approving/Authorizing Persons

| Name: | Position: | Telephone: |
|---|---|---|
| Ron Wishon | Project Review Engineer | 404-631-1753 |
| Doug Fadool | Program Delivery | 404-308-1353 |
| David Norwood | Program Control | 404-631-1581 |
| | | |

## Personal Contacts

| Name: | Telephone: | Notes: |
|---|---|---|
| Steve Linley | Hatch Mott McDonald | Discuss the reason for the Texas Rail on the project. (none) |
| Steve Linley | Hatch Mott McDonald | Discuss the location / need for the side barrier (RR close to road)<br>Discuss guardrail locations (fill slopes > 10 feet with 2:1 slopes) |
| Steve Linley | Hatch Mott McDonald | Discuss the location / need of the retaining walls (R/W & Bridges)<br>Discuss the 10-foot cut area by Station 1309 (balance job) |
| | | |

## Documents/Abstracts

| Reference: | Reference: |
|---|---|
| 30% Plans | General Project Information |
| 30% Cost Estimate | Route Accident History |
| Roadway Typical Sections | Roadway Cross Sections |
| Roadway Profile | 400 Scale Layout Sheets |
| 200 Scale layout Sheets | Environmental Document |
| R/W Listing | |
| | |

# SR 133 Widening

# Cost Model / Distribution

| Item | Description | $ Amount | % of Total Project |
|---|---|---|---|
| | | | |
| **A** | Asphalt Pavement | $47,821,000 | 47.8% |
| **B** | Bridges | $14,135,000 | 14.1% |
| **C** | Aggregate Base Course | $10,372,000 | 10.4% |
| **D** | Borrow Excavation | $6,508,000 | 6.5% |
| **E** | Erosion Control | $3,334,000 | 3.3% |
| **F** | Miscellaneous | $3,078,000 | 3.1% |
| **G** | Clearing & Grubbing | $2,648,000 | 2.6% |
| **H** | Class A Concrete & Reinforcing Steel | $2,458,000 | 2.5% |
| **I** | Drainage | $2,445,000 | 2.4% |
| **J** | Guardrail | $1,598,000 | 1.6% |
| **K** | Excavation | $1,488,000 | 1.5% |
| **L** | Traffic Control | $1,302,000 | 1.3% |
| **M** | Concrete Side Barrier | $1,163,000 | 1.2% |
| **N** | Texas rail | $925,000 | 0.9% |
| **O** | Retaining Walls | $461,000 | 0.5% |
| **P** | Concrete Curb & Gutter | $261,000 | 0.3% |
| | | | |
| | Construction Total: | $99,997,000 | 100% |
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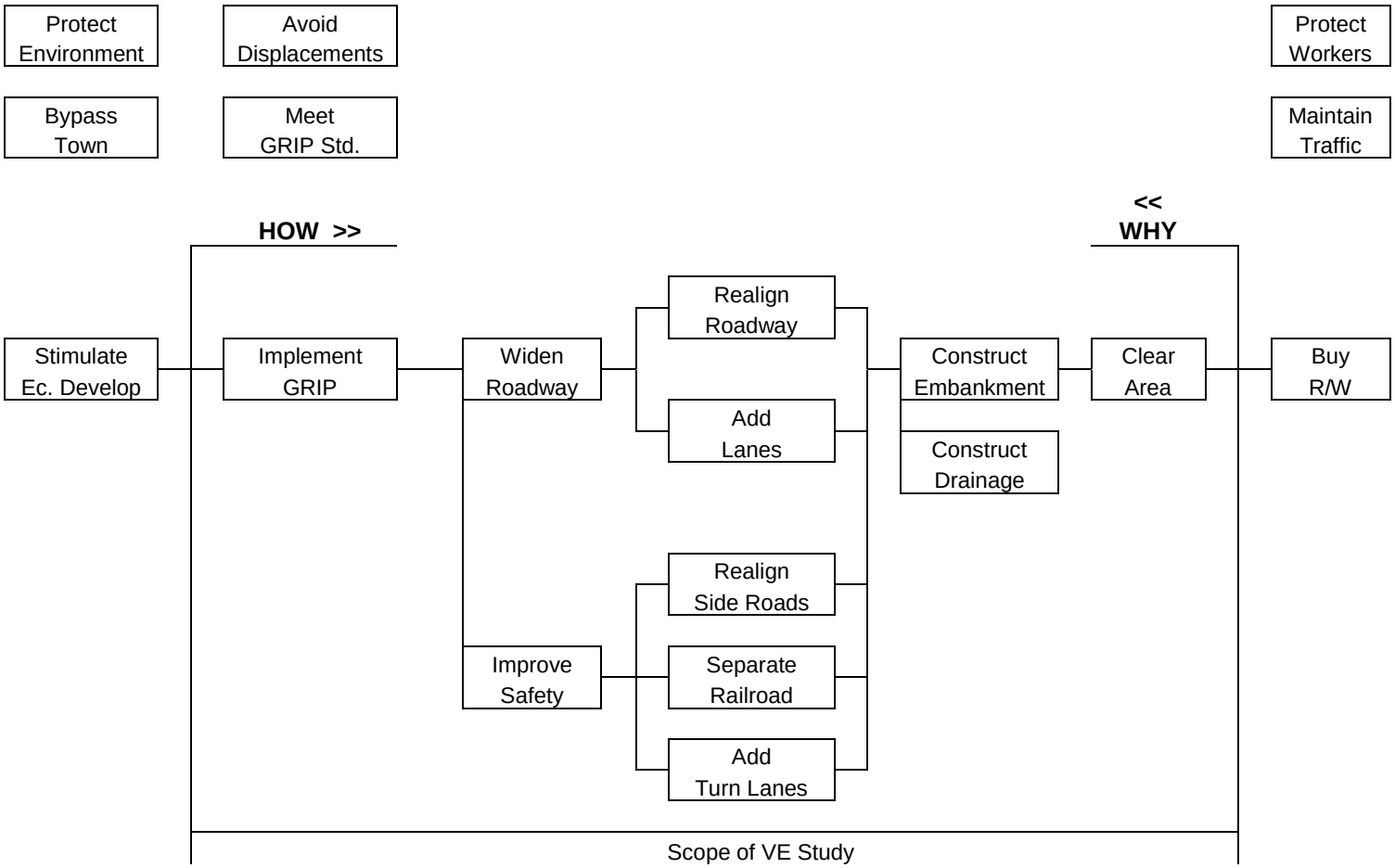
# FAST DIAGRAM

Project: SR 133 Widening



# INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties
**Function:** Implement GRIP

| ITEM No. | DESCRIPTION | FUNCTION | | INITIAL DOLLARS | | |
|---|---|---|---|---|---|---|
| | | Verb | Noun | Cost | % of Total | Worth/Save |
| **A** | Asphalt Pavement | Widen | Roadway | $47,821,000 | 47.8% | Yes |
| | | Realign | Intersections | | | |
| | | Meet | 65 MPH Des | | | |
| | | Support | Loads | | | |
| | | Replace | Existing | | | |
| | | Meet | GRIP | | | |
| | | Construct | Bypass | | | |
| | | Provide | Turn Lanes | | | |
| | | Provide | Shoulders | | | |
| | | | | | | |
| **B** | Bridges | Separate | Grades | $14,135,000 | 14.1% | Yes |
| | | Cross | Railroad | | | |
| | | Improve | Hydraulics | | | |
| | | Minimize | Env. Impacts | | | |
| | | Improve | Safety | | | |
| | | Span | Waterways | | | |
| | | | | | | |
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# INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties
**Function:** Implement GRIP

| ITEM No. | DESCRIPTION | FUNCTION | | INITIAL DOLLARS | | |
|---|---|---|---|---|---|---|
| | | Verb | Noun | Cost | % of Total | Worth/Save |
| C | Aggregate Base Course | Support | Loads | $10,372,000 | 10.4% | Yes |
| | | Drain | Pavements | | | |
| | | Support | Shoulders | | | |
| | | Support | Turn Lanes | | | |
| | | | | | | |
| D | Borrow Excavation | Raise | Grade | $6,508,000 | 6.5% | Yes |
| | | Support | Widening | | | |
| | | Construct | Embankments | | | |
| | | Close | Median | | | |
| | | Replace | Unsuitable Mat. | | | |
| | | Roll | Grades | | | |
| | | Realign | Roadway | | | |
| | | | | | | |
| E | Erosion Control | Protect | Slopes | $3,334,000 | 3.3% | No |
| | | Control | Sediment | | | |
| | | Minimize | Env. Impacts | | | |
| | | | | | | |
| F | Miscellaneous | Complete | Project | $3,078,000 | 3.1% | No |

# INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties
**Function:** Implement GRIP

| ITEM No. | DESCRIPTION | FUNCTION | | INITIAL DOLLARS | | |
|---|---|---|---|---|---|---|
| | | Verb | Noun | Cost | % of Total | Worth/Save |
| G | Clearing & Grubbing | Allow | Construction | $2,648,000 | 2.6% | No |
| | | Clear | R/W | | | |
| | | | | | | |
| H | Class A Concrete & Reinf. Steel | Construct | Box Culverts | $2,458,000 | 2.5% | No |
| | | Construct | Drainage Str. | | | |
| | | | | | | |
| I | Drainage | Remove | Water | $2,445,000 | 2.4% | Yes |
| | | Drain | Roadway | | | |
| | | Equalize | Flow | | | |
| | | Drain | Median | | | |
| | | | | | | |
| J | Guard Rail | Protect | Structures | $1,598,000 | 1.6% | Yes |
| | | Protect | Public | | | |
| | | Protect | RR Approach | | | |
| | | Protect | Wetlands | | | |
| | | | | | | |
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# INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties
**Function:** Implement GRIP

| ITEM No. | DESCRIPTION | FUNCTION | | INITIAL DOLLARS | | |
|---|---|---|---|---|---|---|
| | | Verb | Noun | Cost | % of Total | Worth/Save |
| **K** | Excavation | Remove | Old Roadway | $1,488,000 | 1.5% | Yes |
| | | Establish | Ditch Grade | | | |
| | | Establish | Template | | | |
| | | Construct | New Roadway | | | |
| | | Establish | Median | | | |
| | | | | | | |
| **L** | Traffic Control | Stage | Construction | $1,302,000 | 1.3% | No |
| | | Protect | Railroad | | | |
| | | Allow | Traffic | | | |
| | | Protect | Motorists | | | |
| | | | | | | |
| **M** | Concrete Side Barrier | Protect | Motorists | $1,163,000 | 1.2% | Yes |
| | | Protect | Piers | | | |
| | | | | | | |
| **N** | Texas Rail | Replace | Br. Parapet | $925,000 | 0.9% | Yes |
| | | Enhance | Aesthetics | | | |
| | | Meet | Conditions | | | |
| | | | | | | |

# INFORMATION PHASE – FUNCTION ANALYSIS

**Project:** SR 133 Widening – Dougherty, Worth and Colquitt Counties
**Function:** Implement GRIP

| ITEM No. | DESCRIPTION | FUNCTION | | INITIAL DOLLARS | | |
|---|---|---|---|---|---|---|
| | | Verb | Noun | Cost | % of Total | Worth/Save |
| O | Retaining Walls | Hold | Embankment | $461,000 | 0.5% | Yes |
| | | Connect | Structures | | | |
| | | Minimize | R/W | | | |
| | | | | | | |
| P | Curb & Gutter | Construct | Raised Median | $261,000 | 0.3% | Yes |
| | | Channel | Water | | | |
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| CREATIVE PHASE<br>Creative Idea Listing | | JUDGMENT PHASE<br>Idea Evaluation | |
|---|---|---|---|
| **No.** | **CREATIVE IDEA** | **COMMENTS** | **IDEA RATING** |
| **A** | **Asphalt Pavement** | | |
| A-1 | Realign SR 133 / SR 33 / Railroad Grade Crossing | Eliminate a bridge, reduce borrow, reduce cost | ✓ |
| A-2 | Construct SR 133 with 11-foot travel lanes | Not realistic due to truck traffic | X |
| A-3 | Construct one 11-foot travel lane per direction | Reduce cost | ✓ |
| A-4 | Take SR 133 under the railroad instead of over | Larger impact to railroad, Likely high water table in area. | X |
| A-5 | Reduce the total thickness of the pavement section | Current section shown in plans relatively thin | X |
| A-6 | Reduce the pavement thickness of the left turn lanes | Light traffic, reduce cost, | ✓ |
| A-7 | Reduce the length of the left turn lanes to the "minimum" length allowed in the standard | Light traffic, Reduced cost, Simplify / speed construction | ✓ |
| A-8 | Reduce the median width from 44 feet to 32 feet throughout the entire length on the project | Reduce R/W needed for project, Reduce borrow needs | ✓ |
| A-9 | Reduce the width of the outside paved shoulder from 6 ½ feet to 4 feet or 2 feet | Reduce cost | ✓ |
| A-10 | Reuse more of the existing pavement | Needs additional pavement condition information | X |
| ✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team | | | |

| CREATIVE PHASE<br>Creative Idea Listing | | JUDGMENT PHASE<br>Idea Evaluation | |
|---|---|---|---|
| **No.** | **CREATIVE IDEA** | **COMMENTS** | **IDEA RATING** |
| **B** | **Bridges** | | |
| B-1 | Take SR 133 under the railroad | Larger impact to railroad, Likely high water table in area. | ✓ |
| B-2 | Reverse the direction of the beams / structure | Reduce the length of beams, shorter / narrower beams would reduce the height of the approach fill | ✓ |
| B-3 | Eliminate the bridge and keep as an at-grade | Reduce cost & construction time, Eliminates grade separation. | ✓ |
| B-4 | Reduce speed limit to 55 MPH from the south end of the project to the dual bridges over Ochlocknee River and reduce the width of the median | Save R/W, Reduce bridge widths | ✓ |
| B-5 | Use MSE walls for end spans and have a single span | Shorten the beam lengths, reduce cost | ✓ |
| B-6 | Optimize the bridge spans | Designer already doing this. | X |
| B-7 | Chance the bridge rail type to a standard barrier rail | See Idea N-1 | X |
| B-8 | Reduce length of bridge for SR 133 over SR 33 | Reduce cost | |
| **C** | **Aggregate Base Course** | | ✓ |
| C-1 | Reduce / revise overall pavement thickness | See Idea A-5 & A-6 | X |
| ✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team | | | |

| CREATIVE PHASE<br>Creative Idea Listing | | JUDGMENT PHASE<br>Idea Evaluation | |
|---|---|---|---|
| **No.** | **CREATIVE IDEA** | **COMMENTS** | **IDEA RATING** |
| **D** | **Borrow Excavation** | | |
| D-1 | Use 4:1 shoulder slopes throughout the project. | Reduce R/W, Reduce cost, Reduce borrow | ✓ |
| D-2 | Reduce the median width | See Idea A-8 | X |
| D-3 | Revise the SR 133 / SR 33 / Railroad area | See Ideas A-1 | X |
| D-4 | Roll the Grades | Minimize quantities, Reduce cost | ✓ |
| D-5 | Reduce the height of the railroad crossing. | Minimize quantities, Reduce cost | ✓ |
| | | | |
| **G** | **Clear & Grubbing** | | |
| G-1 | Reduce median width and R/W | See Idea A-8 | X |
| | | | |
| **H** | **Class A Concrete & Rebar** | | |
| H-1 | Use precast box culverts | Reduce cost, Speed construction | ✓ |
| | | | |
| **I** | **Drainage** | | |
| I-1 | Combine multiple pipe culverts into one box culvert | Minimize impacts, Simplify construction | DS |
| ✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team | | | |

| CREATIVE PHASE<br>Creative Idea Listing | | JUDGMENT PHASE<br>Idea Evaluation | |
|---|---|---|---|
| **No.** | **CREATIVE IDEA** | **COMMENTS** | **IDEA RATING** |
| I-2 | Use elliptical pipe to reduce the number of pipes and / Or to reduce the number of pipes (ie. 2 large elliptical vs. 3 smaller circular) | | DS |
| I-3 | Use single headwall in-lieu-of multiple end sections | Eliminates differential settlement | DS |
| | | | |
| **J** | **Guardrail** | | |
| J-1 | Replace with cable barrier | Reduce cost | ✓ |
| J-2 | Eliminate where possible | Reduce cost | X |
| J-3 | Replace the TPT guardrail with TPW guardrail | Reduce cost | ✓ |
| | | | |
| **K** | **Excavation** | | |
| K-1 | Reduce cut area around Station 1300+ | Needed to balance borrow | X |
| K-2 | Reduce median width | See Ideas A-8 & D-1 | X |
| | | | |
| | | | |
| ✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team | | | |

| CREATIVE PHASE<br>Creative Idea Listing | | JUDGMENT PHASE<br>Idea Evaluation | |
|---|---|---|---|
| **No.** | **CREATIVE IDEA** | **COMMENTS** | **IDEA RATING** |
| M | **Concrete Side Barrier** | | |
| M-1 | Replace with guard rail | Reduce cost, Higher maintenance cost | X |
| M-2 | Reduce length of barrier | Barrier eliminated from project (473) | X |
| | | | |
| **N** | **Texas Rail** | | |
| N-1 | Replace with standard bridge barrier parapet | Improve constructability (designer will do) | X |
| N-1 | Use other types of decorative railing | Not use in State | X |
| | | | |
| **O** | **Retaining Wall** | | |
| O-1 | Use other wall type for low walls | Not allowable in State | X |
| | | | |
| **P** | **Concrete Curb & Gutter** | | |
| P-1 | Use header curb in-lieu-of standard curb & gutter | Reduce cost, simplify construction | ✓ |
| P-2 | If no turn lanes, eliminate and used cable barrier | Reduce cost, simplify / speed construction | ✓ |
| | | | |
| ✓ = Will be considered further; X = will be dropped; DS = Design suggestion –written for consideration by design team | | | |

# VE STUDY SIGN-IN SHEET

Project No.: STP00-0000-00(473)(475)(519)(520) County: Dougherty, Worth Colquitt PI No.: 0000473, 0000475 0000519, 0000520 Date: Jan. 19-22,2010

| 1 | 4 | NAME | EMPLOYEE ID NO. | DOT OFFICE OR COMPANY | PHONE NUMBER | EMAIL ADDRESS |
|---|---|---|---|---|---|---|
| ✓ | ✓ | Lisa L. Myers | | Engineering Services | 404-631-1770 | lmyers@dot.ga.gov |
| ✓ | ✓ | Matt Sanders | | Engineering Services | 404-631-1752 | msanders@dot.ga.gov |
| ✓ | | James K. Magnus | | Construction | 404-631-1971 | jmagnus@dot.ga.gov |
| ✓ | | Ken Werho | | Traffic Operations | 404-635-8144 | kwerho@dot.ga.gov |
| ✓ | | Ron Wishon | | Engineering Services | 404-631-1753 | rwishon@dot.ga.gov |
| ✓ | | Mindy Sanders | N/A | Hatch Mott MacDonald | ~~404~~ 770-200-1710 | mindy.sanders@hatchmott.com |
| ✓ | ✓ | Sam Moka | N/A | PARSONS | 678-969-2460 | samuel.moka@parsons.com |
| ✓ | ✓ | Keith Borkenhagen | N/A | MACTEC | 623-556-1875 | Kborkenhagen@msn.com |
| ✓ | ✓ | GEORGE OBANDHEZ | | MACTEC | 770-421-3346 | GAOBANDHEZ@MACTEC.COM |
| ✓ | ✓ | DAN COGAN | N/A | KEA GROUP | 404-290-6424 | dcogan@keagroup.com |
| ✓ | ✓ | ARUNA SASTRY | N/A | SASTRY AND ASSOC. | 678-366 9375 / 404 932-0373 | Sast9375@bellsouth.net |
| ✓ | ✓ | Steve Linley | | HATCH MOTT MacDonald | 770 200-1706 | Steve.linley@hatchmott.com |
| ✓ | ✓ | Douglas Fadool | | Program Delivery | 404-308-1353 | dFadool@dot.ga.gov |
| ✓ | | Heather Perrin | N/A | McKenney | 678-~~591-4681~~ 3511 | hperrin@mckenneyinc.com |
| ✓ | | Jennifer Harris-Dunham | | BRIDGE | 404 631 1897 | jharris-dunham@dot.ga.gov |
| ✓ | ✓ | RAJU SHAH | | R.K. SHAH & ASSOC. Inc | 770-436-5070 | RAJU.SHAH@RKSHAH.COM |
| ✓ | ✓ | DAVID NORWOOD | | Program Control | 404-631-1561 | dnorwood@dot.ga.gov |
| ✓ | | ALEX St John | | Environmental Services | (404) 631-1407 | ajohn@dot.ga.gov |
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✓ Check all that apply 18 Attended Project Overview(Day 1) ____ Attended Project Presentation (Day 4)