



Georgia Department of Transportation  
EDS-72(39)

## *SR 72 Widening and Relocation*

P.I. No. 122650  
Madison and Elbert Counties, Georgia

# Value Engineering Study Report

Preliminary Design  
May 2006

*Design Consultant*

Parsons Brinckerhoff Quade & Douglas, Inc.



*Value Engineering Consultant*



**Lewis & Zimmerman Associates, Inc.**



**Lewis & Zimmerman Associates, Inc.**

*Taking the Chance out of Change*

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June 02, 2006

Ms. Lisa L. Myers  
Design Review Engineer Manager/VE Coordinator  
State of Georgia Department of Transportation, General Office  
No. 2 Capitol Square, Room 266  
Atlanta, Georgia 30334-1002

re: Project Number EDS-72(39), P.I. No. 122650, SR 72 Widening and Relocation in  
Madison and Elbert Counties, Georgia  
Value Engineering Study Report

Dear Ms. Myers:

Lewis & Zimmerman Associates, Inc. is pleased to submit four hard copies and one electronic copy of the Value Engineering Study Report on the referenced report.

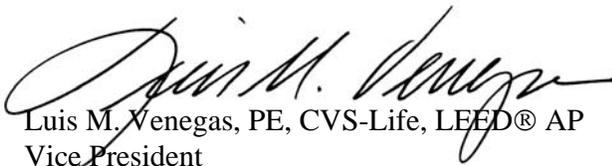
The report contains multiple alternatives addressing the concerns of the project, particularly reducing cost and increasing safety. The VE team focused on reducing the number the number of intersections and their associated costs for this partial control access facility. This resulted in recommendations to eliminate six intersections and save nearly \$1,500,000.

The team also developed two alternatives addressing safety concerns with the location of the new SR 72 Bypass and SR 98 intersection near Comer Elementary School.

We thank you and the State of Georgia Department of Transportation for your hospitality and Parsons Brinckerhoff Quade & Douglas, Inc., for providing the information necessary for the VE team to generate creative solutions for this project. We look forward to working with you on future assignments.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.

  
Luis M. Venegas, PE, CVS-Life, LEED® AP  
Vice President

Attachment

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## **EXECUTIVE SUMMARY**

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### **INTRODUCTION**

This value engineering (VE) study report summarizes the events of the VE study conducted by Lewis & Zimmerman Associates, Inc., for the State of Georgia Department of Transportation (GDOT), Atlanta, Georgia. The subject of the study was Project EDS-72(39), Widening and Relocation of State Route 72 known, P. I. No. 122650, in Madison and Elbert Counties, Georgia, being designed by Parsons Brinckerhoff Quade & Douglas, Inc. The VE study was conducted May 17–19, 2006, at GDOT's offices in Atlanta, Georgia.

### **PROJECT DESCRIPTION**

Project EDS-72(39) will widen existing SR 72 from two lanes to four lanes with a depressed grass median. The project alignment will relocate existing SR 72 to bypass the Towns of Comer and Carlton. The total project length is approximately 9.33 miles, beginning at milepost 9.743 in Madison County and extending to milepost 0.720 in Elbert County. The project includes a new bridge over the Broad River and maintenance work on the parallel existing historic bridge. There will also be a triple 9' x 6' concrete bridge culvert conveying Rocky Shoals Creek. The project is part of the Governor's Road Improvement Project (GRIP) that has been proposed to stimulate economic growth throughout the state.

The current projected probable cost of construction is \$33,346,132.

### **CONCERNS AND OBJECTIVES**

Current project documentation indicates that the project is to have partial control access versus full control access. GDOT defines partial control access as follows: "...preference is given to through traffic to a degree. Access connections, which may be at-grade or grade-separated, are provided with selected public roads and private driveways." Based on this approach, there appears to be an excessive number of access points onto the proposed 65-mph facility, especially from short, side road connections.

A second concern is the safety of the new at-grade SR 72/SR 98 (Gholston Street) Intersection and the nearby Comer Elementary School. The school is located at 565 Gholston Street and is approximately 1,100 direct, linear feet (335 m) from the new intersection. The new intersection will dramatically alter school users' expectation, as speed limits along the existing adjacent, arterial feeder roads of Brickyard Road/CR 327, Gholston Street/SR 98, and Clover Avenue/Pine Valley Farm Road (CR 302) are between 25 and 35 mph. The new intersection does not currently acknowledge nor accommodate the potential for elementary school-age children and their guardians crossing at this point, thus creating a potential for pedestrian accidents.

In order to accomplish the project's goals in an expeditious and cost-effective manner, and to assist in ameliorating the concerns noted, GDOT engaged this VE study. The objective of the effort was to identify opportunities that would improve the value of the project in terms of fulfilling the intent of

this GRIP corridor, improving travel time, completing the corridor, and potentially reducing capital cost.

## **HIGHLIGHTS OF THE STUDY**

The VE team focused on reducing the number of crossings/intersections and their associated costs while seeking other simpler and less costly methodologies.

The team developed six alternatives that eliminate intersections. The total combined savings with these alternatives is \$1,502,000:

- Alternative 3 eliminates the Paoli Road (CR 294) intersection and saves about \$155,000;
- Alternative 4 eliminates the SR 72/SR 98 intersection, saving nearly \$160,000;
- Alternative 11 deletes the Pine Valley Road (CR 302) intersection and saves close to \$192,000;
- Alternative 12 eliminates the Duckworth-Brown Road (CR 304) intersection and saves nearly \$246,000;
- Alternative 13 eliminates the New Town Church Road (CR 287) intersection and adds about \$196,000;
- Alternative 19 eliminates the Noble Road (CR 297) intersection and saves nearly \$945,000.

To address the safety concern, the VE team developed two alternatives. Alternative 2 recommends adding a pedestrian overpass at the intersection of the SR 72 bypass and SR 98, which is close to Comer Elementary School. Although this adds over \$203,000 to the project, it is a worthwhile undertaking for the safety of elementary school-age children and their guardians. Another option is provided in Alternative 6, which recommends signalizing the intersection and providing a raised concrete median to serve as a safety zone while crossing at this location. This option would add about \$62,000 to the project. However, of the two, the pedestrian overpass would serve the public better as the elementary school also has playing fields that are used during weekends and holidays. The overpass would provide a safer crossing of unsupervised children headed to the playing fields at off-school times, weekends, and holidays.

The Summary of Potential Cost Savings worksheet follows this narrative and summarizes all of the alternatives developed by the VE team. Some of the alternatives are mutually exclusive or interrelated so that addition of all project cost savings does not equal total savings for the project. A full listing of all of the ideas considered by the VE team can be found on the Creative Idea Listing worksheets in the Value Analysis and Conclusions section of this report.



# SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION**  
**MADISON AND ELBERT COUNTIES, GEORGIA**  
*Preliminary Design Stage*

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
2	Provide a pedestrian overpass at the SR 78/SR 98 intersection	\$0	\$203,734	(\$203,734)		(\$203,734)
3	Eliminate the Paoli Road (CR 294) Connector	\$154,981	\$0	\$154,981		\$154,981
4	Eliminate the SR 72/SR 98 Intersection and provide an eastbound exit ramp from SR 72 to Business SR 72	\$188,564	\$29,369	\$159,195		\$159,195
6	Signalize the SR 72/SR 98 intersection and add a concrete island	\$0	\$61,892	(\$61,892)		(\$61,892)
11	Eliminate the Pine Valley Farm Road (CR 302) intersection	\$191,493	\$0	\$191,493		\$191,493
12	Eliminate the Duckworth-Brown Road (CR 304) intersection	\$235,949	\$0	\$235,949		\$235,949
13	Extend Paoli Road (CR 294) on the north side of the mainline to New Town Church Road (CR 287) and eliminate the intersection	\$13,838	\$209,353	(\$195,515)		(\$195,515)
15	Shorten the length of relocation of New Town Church Road (CR 287)	\$67,251	\$0	\$67,251		\$67,251
19	Eliminate the Noble Road (CR 297) intersection	\$943,507	\$0	\$943,507		\$943,507

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## **STUDY RESULTS**

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### **INTRODUCTION**

The results are the major feature of a value engineering (VE) study since they represent the benefits that can be realized on the project by the owner, users, and designer. The results will directly affect the project design and will require coordination among the designer, the user, and the owner to determine the ultimate acceptance of each alternative.

The creative ideas are organized according to the order in which they were originally generated by the VE team during their function analysis creative sessions.

### **RESULTS OF THE STUDY**

The VE team generated 19 ideas for change during the Function Analysis and Speculation phases of the VE job plan. The evaluation of these ideas was based upon their potential for capital cost savings, probability of acceptance, availability of information to properly develop an idea, compliance with perceived quality, adherence to universally accepted standards and procedures, life cycle cost efficiency, safety, maintainability, constructability, and soundness of the idea.

Of the 19 ideas generated, 9 of them were sufficiently rated to warrant further investigation. Continued research and development of these ideas yielded 9 alternatives for change with an impact on project costs. All of these alternatives are presented in detail following this narrative and on the Summary of Potential Cost Savings worksheet.

### **EVALUATION OF ALTERNATIVES**

Once the aforementioned ideas are developed, it is important to consider each part of an individual alternative on its own merit. There is a tendency to disregard an alternative because of concern about one portion of it. Separate consideration should be given to each of the areas within an alternative that are acceptable, and those parts should be considered in the final design, even if the entire alternative is not implemented.

Cost is the primary basis of comparison for alternative designs. To ensure that costs are comparable within the alternatives proposed by the VE team, the designer's cost estimates, where possible, is to be used as the pricing basis. Where appropriate, the impact of energy costs, replacement costs, and effect on operations and maintenance should be shown within each alternative.

Some of the alternatives are interrelated, so acceptance of one may preclude the acceptance of another. The reader should evaluate those alternatives carefully to select the ideas with the greatest beneficial impact to the project.

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION, MADISON & ELBERT COUNTIES, GA**  
*Preliminary Design Stage*

ALTERNATIVE NO.: **2**

DESCRIPTION: **PROVIDE A PEDESTRIAN OVERPASS AT THE SR 72/SR 98 INTERSECTION**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:**

The current design only provides a limited-access intersection at the SR 72/SR 98 intersection without provision for pedestrian crossing from the north to Comer Elementary School.

**ALTERNATIVE:** (Sketch attached)

Construct a 10-ft. wide pedestrian overpass bridge west of SR 98 to span both directions of the SR 72 corridor.

**ADVANTAGES:**

- Improves public safety
- Minimizes traffic slow-downs
- More user friendly than crossing a high-speed intersection
- Improves GDOT's good neighbor image

**DISADVANTAGES:**

- Additional initial cost
- Increases O&M costs

**DISCUSSION:**

Comer Elementary School is located just southwest of the SR 72/SR 98 intersection. Providing a pedestrian bridge parallel to SR 98 over SR 72 will make accessibility to the school much safer for pedestrians north of SR 72.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 203,734	—	\$ 203,734
SAVINGS	\$ (203,734)	—	\$ (203,734)

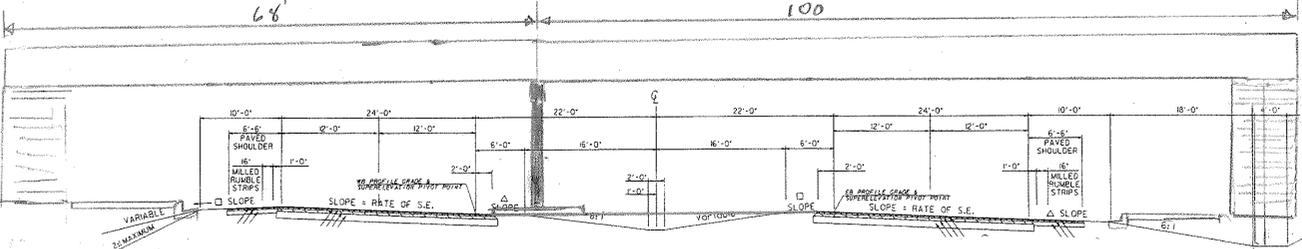
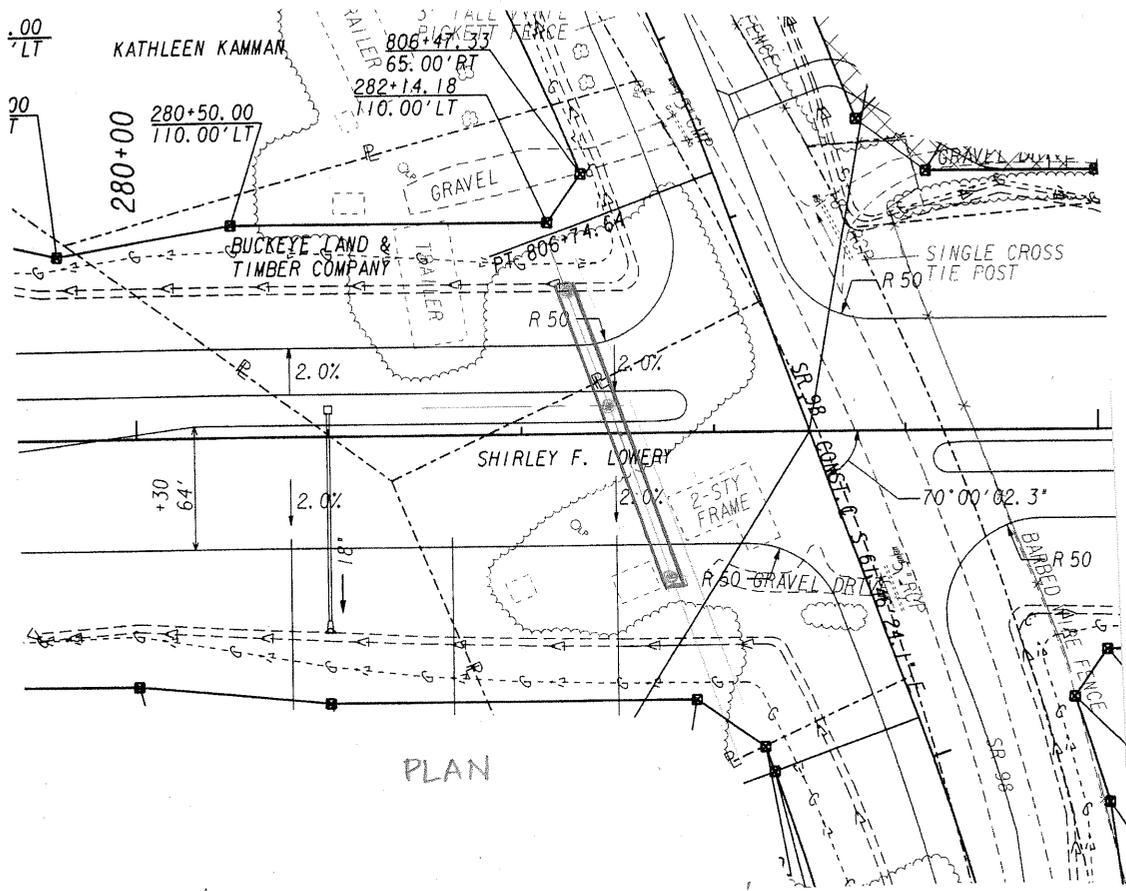
**PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA**  
*Preliminary Design Stage*

ALTERNATIVE NO.:

2

AS DESIGNED     ALTERNATIVE

SHEET NO.: 2 of 4



# CALCULATIONS



PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.:

2

DESCRIPTION:

SHEET NO.: 3 of 4

BRIDGE WIDTH = 2 10'  
BRIDGE SPANS 2 68' AND 100'

USE 2 - TYPE III ARCHED BEAM SUPERSTRUCTURES  
WITH SINGLE ROUND COLUMNS.

$$\text{AREA} = 10' \times (68' + 100') = 1,680 \text{ SF.}$$



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.: 3

**DESCRIPTION:** ELIMINATE THE PAOLI ROAD (CR 294) CONNECTOR

SHEET NO.: 1 of 4

**ORIGINAL DESIGN:** (Sketch attached)

The current design provides a limited-access intersection between western Paoli Road and the new SR 72 corridor.

**ALTERNATIVE:**

Eliminate proposed Paoli Road (CR 294) connector.

**ADVANTAGES:**

- Safer limited-access system
- Initial cost savings
- One less direct access onto the corridor
- Improves traffic flow

**DISADVANTAGES:**

- Direct access to the bypass is further away
- Loss of an amenity

**DISCUSSION:**

Limiting access to the new SR 72 bypass provides for a safer corridor. Those served by the Paoli Road access in the current design can continue on and take the Paoli Road intersection near Osley Mill Road.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 154,981	—	\$ 154,981
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 154,981	—	\$ 154,981

# SKETCHES

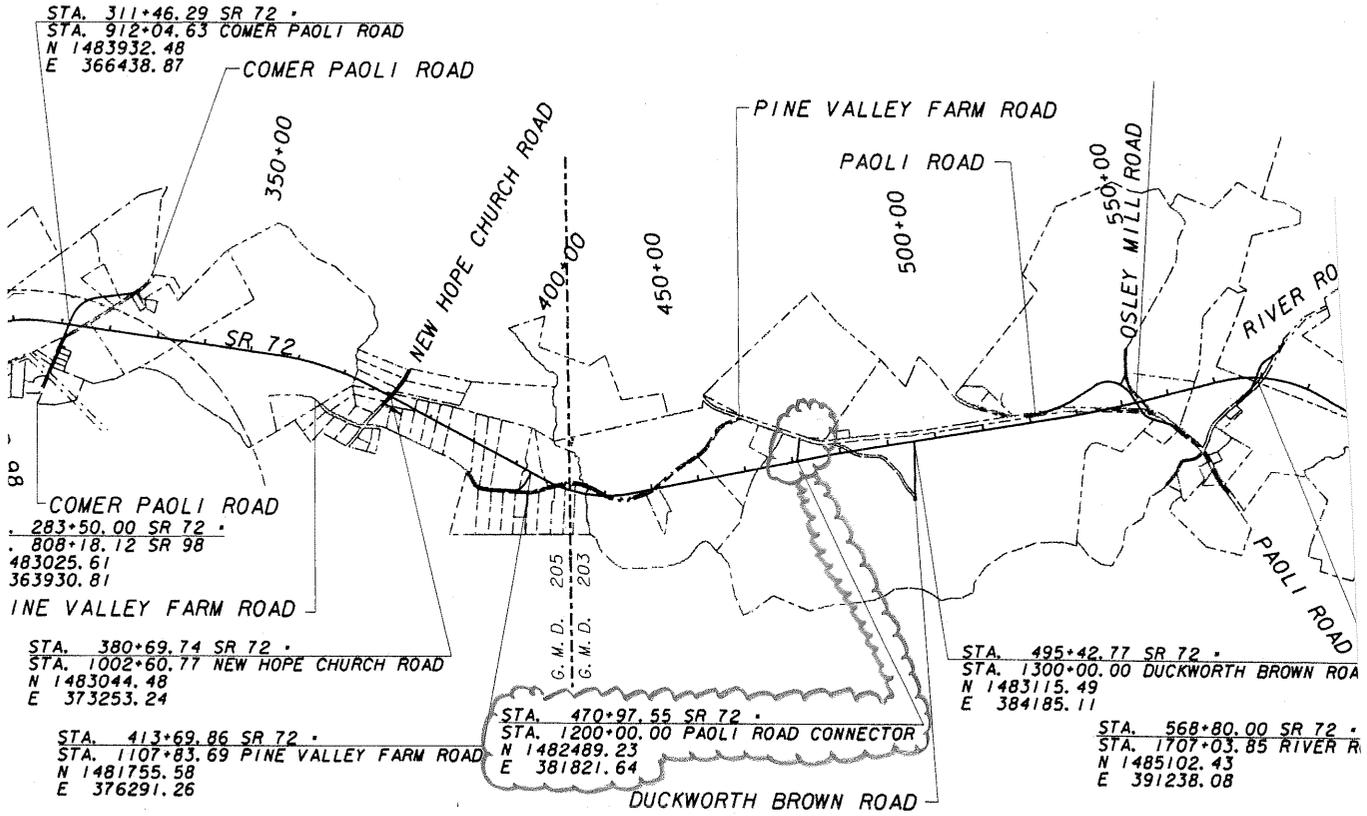
PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
 MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.:

3

AS DESIGNED     ALTERNATIVE

SHEET NO.: 2 of 4



# CALCULATIONS



PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.:

3

DESCRIPTION:

SHEET NO.: 3 of 4

## PAVEMENT:

$$28' \times 850' = 23,800 \text{ SF}$$

$$12' \times 500' = 6,000$$

$$24' \times 400' = \underline{9,600}$$

$$39,400 \text{ SF} = 4,378 \text{ SY}$$

$$4,378 \text{ SY} = 2" \text{ SUPERPAVE } 25 \text{ MM} = 482 \text{ TN}$$

$$6" \quad \quad \quad 12.5 \text{ MM} = 1445 \text{ TN}$$

$$8" \text{ GAB} = 1926 \text{ TNS}$$

$$\text{ROW} = 440' \times 120' = 43560 = 1.21 \text{ ACRES}$$

## SIGNING & MARKING:

$$12" \text{ SOLID STRIPE } (2 \times 500 + 385') = 1385' \quad 24" = 693 \text{ LF}$$

$$\text{TP } 2 \text{ ARROWS} = 4$$

$$5" \text{ GRIP YELLOW} = 440'$$

$$5" \text{ SOLID WHITE} = 2 \times 440' = 880'$$



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION, MADISON & ELBERT COUNTIES, GA  
*Preliminary Design Stage*

ALTERNATIVE NO.: 4

**DESCRIPTION:** ELIMINATE THE SR 72/SR 98 INTERSECTION AND PROVIDE AN EASTBOUND EXIT RAMP FROM SR 72 TO BUSINESS SR 72

SHEET NO.: 1 of 3

**ORIGINAL DESIGN:**

The present design signalizes the intersection at SR 72/Bus SR 72 west of Comer.

**ALTERNATIVE:**

Eliminate the SR 72/Bus SR 72 intersection and add an exit ramp from SR 72 EB to Bus SR 72 EB.

**ADVANTAGES:**

- Eliminates a signalized intersection
- Reduces initial cost
- Eliminates a potential bottleneck
- Improves safety
- Precludes a left-turning movement onto high-speed mainline

**DISADVANTAGES:**

- Forces some users to travel further to access new bypass
- Loss of an amenity

**DISCUSSION:**

The intersection can be eliminated by adding an access ramp from SR 72 EB to Bus SR 72. Travelers on SR 72 WB who want to go to Comer and to access Bus SR 72 can use SR 98 SB.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 188,564	—	\$ 188,564
ALTERNATIVE	\$ 29,369	—	\$ 29,369
SAVINGS	\$ 159,195	—	\$ 159,195

# CALCULATIONS



PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.:

4

DESCRIPTION:

SHEET NO.: 2 of 3

Bus SR 72 - 2" 25 MM Superpave -  $1000 \times 24 \div 9 = 2667 \text{ SY} = 293.4 \text{ Tons}$   
6" 12.5 " " " -  $= 2667 \text{ SY} = 880.1 \text{ Tons}$   
8" GAB -  $= 2667 \text{ SY} = 1,173.5 \text{ Tons}$

Pav't Marking - 1000 LF Skip Traffic Stripe 5"  
2000 LF Traffic Stripe 5"

R/W -  $1000 \text{ LF} \times 120 \div 43560 = 2.75 \text{ Ac}$

Exit Ramp - 2" 25 MM Superpave -  $500 \times 14 \div 9 = 778 \text{ SY} = 85.6 \text{ Tons}$   
6" 12.5 " " " -  $= 778 \text{ SY} = 256.7 \text{ Tons}$   
8" GAB -  $= 778 \text{ SY} = 342.3 \text{ Tons}$

Pav't Marking - 1000 LF Traffic Stripe

R/W -  $500' \times 60' \div 2 \div 43,560 = 0.34 \text{ Ac}$



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** EDS-72(39), PI No. 122650, SR 72 WIDENING AND  
RELOCATION, MADISON & ELBERT COUNTIES, GA  
*Preliminary Design Stage*

ALTERNATIVE NO.: 6

**DESCRIPTION:** SIGNALIZE THE SR 72/SR 98 INTERSECTION AND ADD  
A CONCRETE ISLAND

SHEET NO.: 1 of 2

**ORIGINAL DESIGN:**

The SR 72/SR 98 intersection is not signalized as part of the current design.

**ALTERNATIVE:**

Signalize the SR 72/SR 98 intersection and add an 8' x 10.5' x 6" concrete island in the median. Reduce the speed limit in this area.

**ADVANTAGES:**

- Improves safety
- Makes intersection more pedestrian friendly

**DISADVANTAGES:**

- Adds cost
- Increases O & M costs
- Could create a bottleneck
- Impedes traffic flow
- Forces a reduction in travel velocity

**DISCUSSION:**

Signalize the intersection of SR 72/SR 98 to improve safety. Comer Elementary School is located within 1,000 feet of the intersection, and the safety of children crossing SR 72 must be a prime consideration.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 61,892	—	\$ 61,892
SAVINGS	\$ (61,892)	—	\$ (61,892)



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** EDS-72(39), PI No. 122650, SR 72 WIDENING AND  
RELOCATION, MADISON & ELBERT COUNTIES, GA  
*Preliminary Design Stage*

ALTERNATIVE NO.: 11

**DESCRIPTION:** ELIMINATE THE PINE VALLEY FARM ROAD (CR 302)  
INTERSECTION

SHEET NO.: 1 of 4

**ORIGINAL DESIGN:** (Sketch attached)

The current design provides a limited-access intersection where the new alignment bisects Pine Valley Farm Road (CR 302).

**ALTERNATIVE:**

Eliminate the proposed SR 72/CR 302 intersection and cul-de-sac Pine Valley Farm Road.

**ADVANTAGES:**

- Safer limited-access system
- Initial savings
- Decreases right-of-way impact
- One less direct access onto mainline

**DISADVANTAGES:**

- Forces users to travel further to access SR 72
- Loss of an amenity

**DISCUSSION:**

Limiting access to the new SR 72 bypass provides for a safer corridor. Access for those served by Pine Valley Farm Road south of the new corridor can be shifted to the New Hope Church Road intersection, not that much farther to the west.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 191,493	—	\$ 191,493
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 191,493	—	\$ 191,493

# SKETCHES

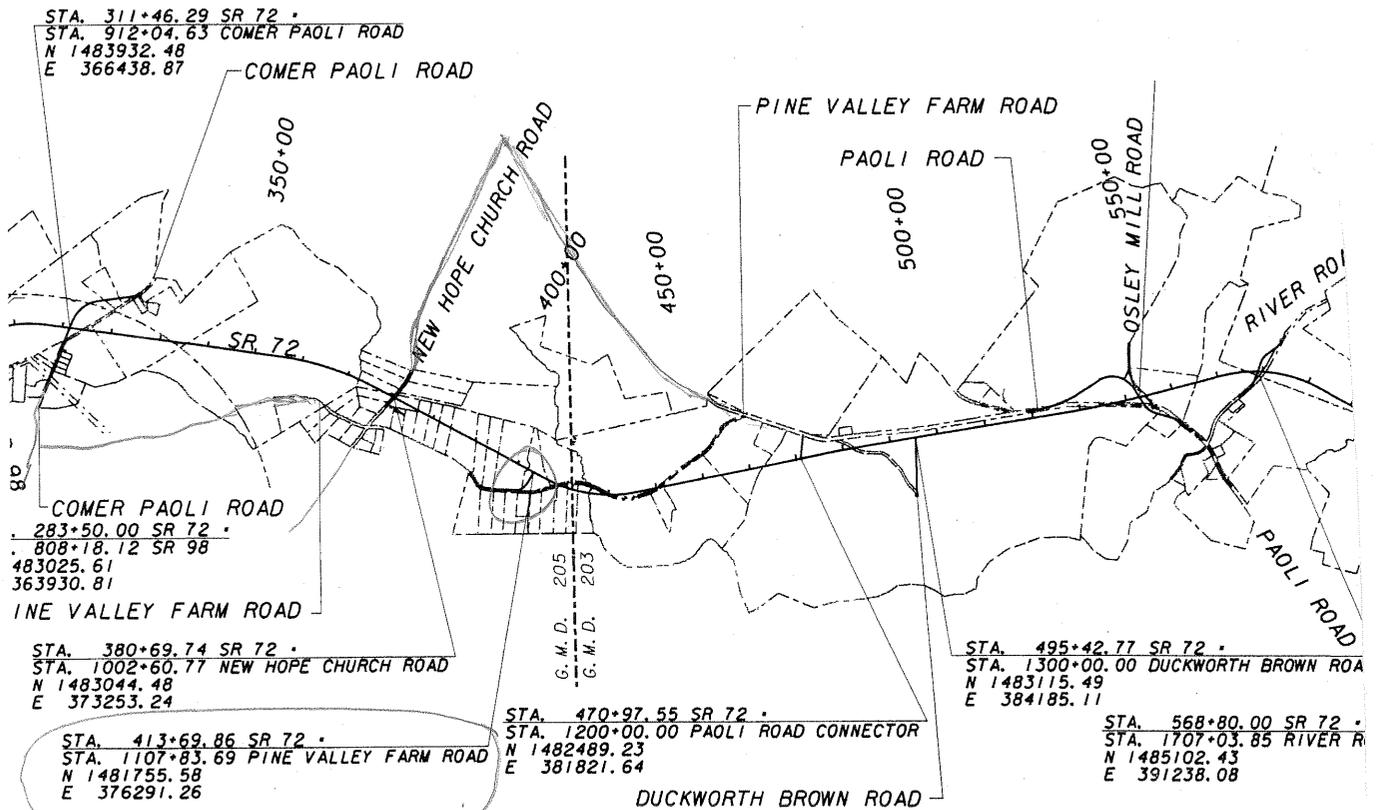


PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
 MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.: 11

AS DESIGNED     ALTERNATIVE

SHEET NO.: 2 of 4



# CALCULATIONS



PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.:

11

DESCRIPTION:

SHEET NO.: 3 of 4

## PAVEMENT:

$$\begin{aligned} 26' \times 850' &= 23,800 \text{ SF} \\ + 12' \times 500' &= 6,000 \\ 24' \times 730' &= 17,520 \\ \hline 47,320 \text{ SF} &= 5257.8 \text{ SY} \end{aligned}$$

$$\begin{aligned} 5258 \text{ SY} \cdot 2" \text{ SUPERPAVE 15 MM} &: 578 \text{ TN} \\ 6" \quad \quad \quad 125 \text{ MM} &: 1,735 \text{ TN} \\ 8" \text{ GAB} &: 2,314 \text{ TN} \end{aligned}$$

$$\text{ROW} = 784' \times 100' \div 43560 = 1.80 \text{ ACRES}$$

## SIGNING & MARKING:

$$12" \text{ SOLID STRIPE} \cdot (2 \times 500' + 388') = 1385'$$

$$24" = 693 \text{ LF}$$

$$\text{TP 2 ARROWS} = 4$$

$$5" \text{ SKIP YELLOW} = 784'$$

$$5" \text{ SOLID WHITE} = 2 \times 784' = 1564'$$



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION, MADISON & ELBERT COUNTIES, GA**  
*Preliminary Design Stage*

ALTERNATIVE NO.: 12

DESCRIPTION: **ELIMINATE DUCKWORTH-BROWN ROAD (CR 304) INTERSECTION**

SHEET NO.: 1 of 4

**ORIGINAL DESIGN:** (Sketch attached)

The current design provides limited-access intersection where the new alignment severs the Duckworth-Brown Road connection to Paoli Road.

**ALTERNATIVE:**

Eliminate the proposed Duckworth-Brown Road intersection and cul-de-sac Duckworth-Brown Road.

**ADVANTAGES:**

- Safer limited access
- Initial savings
- Precludes a potential bottleneck
- Improves traffic flow

**DISADVANTAGES:**

- Next access to the SR 72 bypass is farther away
- Loss of amenity

**DISCUSSION:**

Limiting access to the new SR 72 provides for a safer corridor. Those served by Duckworth-Brown Road intersection in the current design can take the Paoli Road or River Road intersection via Bertha Willis Road in the south.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 235,949	—	\$ 235,949
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 235,949	—	\$ 235,949

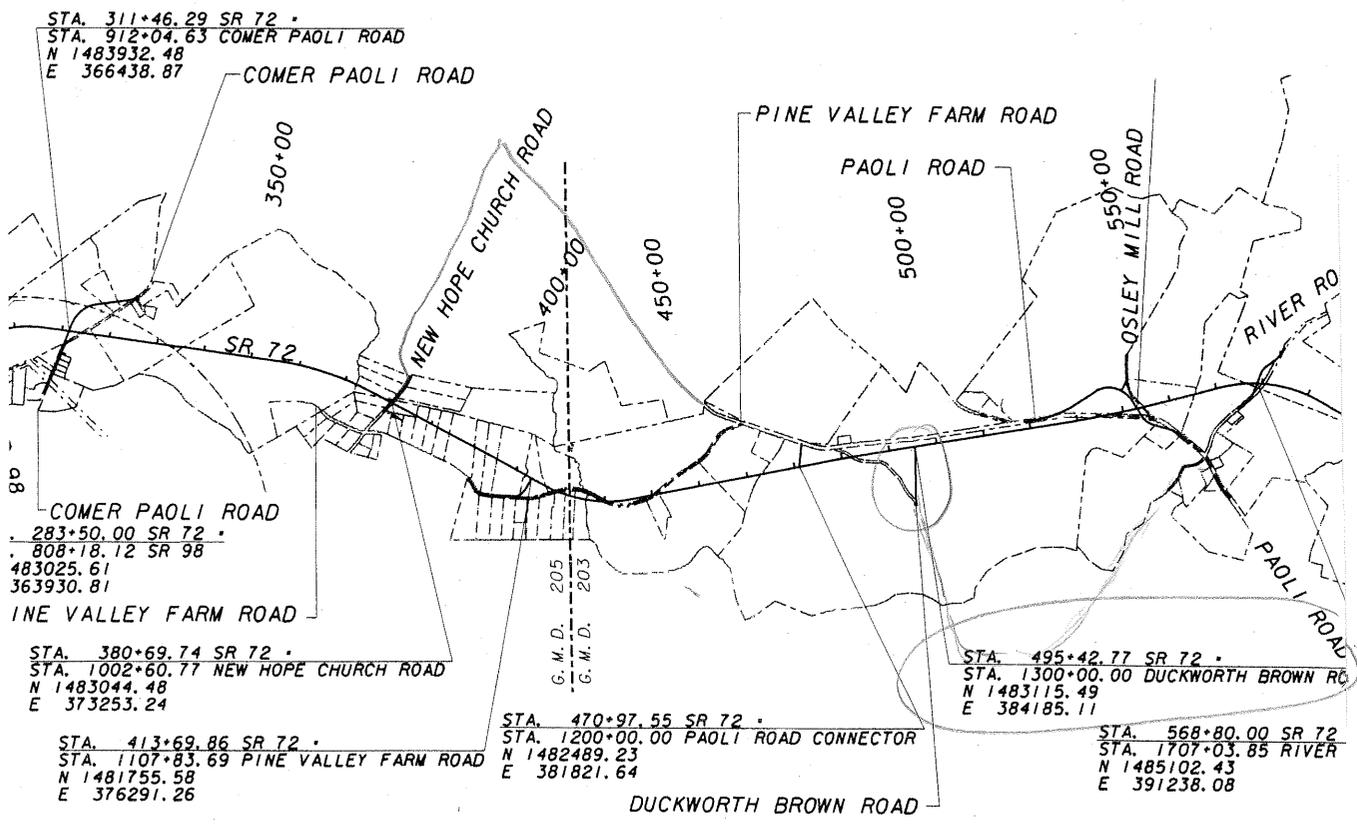
PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
 MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.:

12

AS DESIGNED     ALTERNATIVE

SHEET NO.: 2 of 4



STA. 311+46.29 SR 72 •  
 STA. 912+04.63 COMER PAOLI ROAD  
 N 1483932.48  
 E 366438.87

COMER PAOLI ROAD  
 STA. 283+50.00 SR 72 •  
 STA. 808+18.12 SR 98  
 483025.61  
 363930.81

STA. 380+69.74 SR 72 •  
 STA. 1002+60.77 NEW HOPE CHURCH ROAD  
 N 1483044.48  
 E 373253.24

STA. 413+69.86 SR 72 •  
 STA. 1107+83.69 PINE VALLEY FARM ROAD  
 N 1481755.58  
 E 376291.26

STA. 470+97.55 SR 72 •  
 STA. 1200+00.00 PAOLI ROAD CONNECTOR  
 N 1482489.23  
 E 381821.64

G.M.D. 205  
 G.M.D. 203

STA. 495+42.77 SR 72 •  
 STA. 1300+00.00 DUCKWORTH BROWN RD  
 N 1483115.49  
 E 384185.11

STA. 568+80.00 SR 72  
 STA. 1707+03.85 RIVER  
 N 1485102.43  
 E 391238.08

DUCKWORTH BROWN ROAD

# CALCULATIONS



PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.:

12

DESCRIPTION:

SHEET NO.: 3 of 4

## PAVEMENT:

$$26' \times 850' = 22,100 \text{ SF}$$

$$12' \times 500' = 6,000$$

$$24' \times 1133' = 27,192 \text{ SF}$$

$$\underline{56,092 \text{ SF}} = 6332.4 \text{ SY.}$$

$$6332 \text{ 2" SUPERPAVE 25MM} = 697 \text{ TON}$$

$$6" \text{ " 12.5MM} = 2,090 \text{ TON}$$

$$8" \text{ GAB} = 2,786$$

$$\text{ROW: } 1083' \times 100' = 43560 = 2.50 \text{ ACRES}$$

## SIGNING & MARKING..

$$12" \text{ SOLID STRIPE: } (2 \times 500' + 385') = 1385$$

$$24" = 693 \text{ LF}$$

$$\text{TP 2 ARROWS} = 4$$

$$5" \text{ SKIP YELLOW} = 1083'$$

$$5" \text{ SOLID WHITE} = 2 \times 1083' = 2166'$$



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION, MADISON & ELBERT COUNTIES, GA  
*Preliminary Design Stage*

ALTERNATIVE NO.: 13

**DESCRIPTION:** EXTEND PAOLI ROAD (CR 294) ON THE NORTH SIDE OF THE MAINLINE TO NEW TOWN CHURCH ROAD (CR 287) AND ELIMINATE THE INTERSECTION

SHEET NO.: 1 of 4

**ORIGINAL DESIGN:** (Sketch attached)

Paoli Road (CR 294) is relocated with Osley Mill Road (CR 306) to intersect the mainline, and New Town Church Road (CR 287) is also relocated to intersect the mainline.

**ALTERNATIVE:** (Sketch attached)

Realign the intersection of Paoli Road (CR 294) and Osley Mill Road (CR 306), then extend Paoli Road (CR 294) to intersect New Town Church Road to eliminate the intersection with the mainline. Realign the intersection of Paoli Road (CR 294) and the mainline.

**ADVANTAGES:**

- Eliminates mainline intersection
- Improves safety
- Simplifies design
- Improves traffic flow on both systems

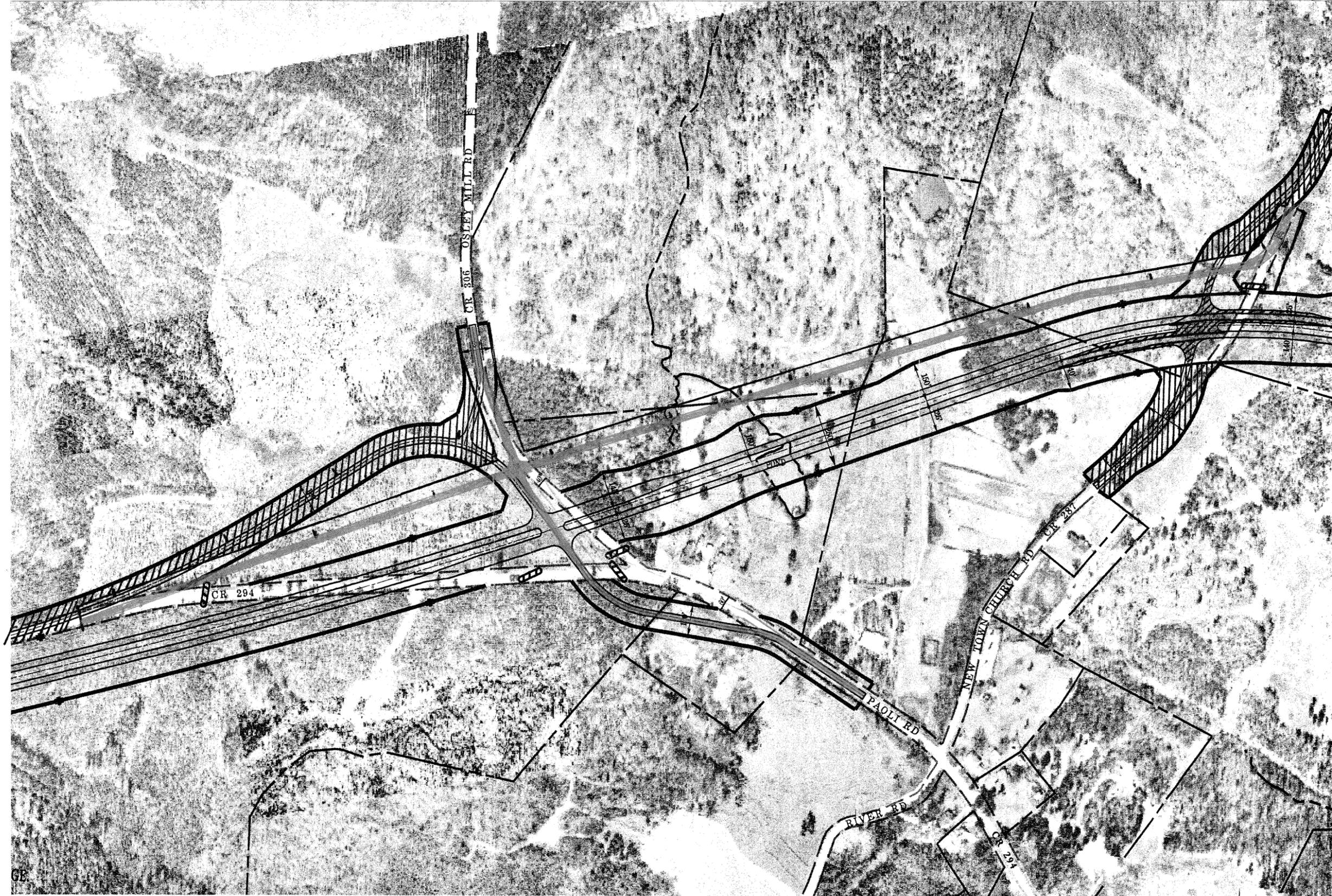
**DISADVANTAGES:**

- Increases distances for access to new SR 72
- Loss of amenity
- Increases initial cost

**DISCUSSION:**

The elimination of this intersection greatly simplifies the design and construction of this portion of the new bypass.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 13,838	—	\$ 13,838
ALTERNATIVE	\$ 209,353	—	\$ 209,353
SAVINGS	\$ (195,515)	—	\$ (195,515)



GB

1"=400'

# CALCULATIONS



PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA

ALTERNATIVE NO.: 13

*Preliminary Design Stage*

DESCRIPTION: Extend Pazzi Rd (CR 294) on North Side of Mainline to New Town  
Church Rd (CR 287) + Eliminate Intersection

SHEET NO.: 3 of 4

• Add'l Roadway - 5200 LF

• Reduction - 2250 LF + 700 LF + 1050 LF = 4000 LF

Add'l Pavement -  $5200 - 4000 = 1200 \text{ LF} \times 24' \div 9 = 3200 \text{ SY}$

Pavement Reduction at Median Opening:  $44' \times 150' \div 9 = 733 \text{ SY}$

$350' \times 24' \div 9 = 933 \text{ SY}$

$350' \times 24' \div 9 = 933 \text{ SY}$

$400' \times 12' \div 9 = 533 \text{ SY}$

$400' \times 12' \div 9 = 533 \text{ SY}$

3665 SY

Total Reduction in Pavement of 465 SY

Add'l R/W -  $5000 \text{ LF} \times 200' \div 43560 = 23 \text{ Ac}$

Reduction -  $2250 \text{ LF} \times 120' \div 43560 = 6.2 \text{ Ac}$

$700' \times 120' \div 43560 = 1.9 \text{ Ac}$

$1050' \times 120' \div 43560 = 2.9 \text{ Ac}$

12 Ac

110 lbs/in/sy

Pavement - 465 SY - 2" Superpave 25 MM - 51.2 Tons

6" " 12.5 MM - 153.5 Tons

8" GAB - 204.7 Tons

Signing + Marking - 1200 LF  $\times 2 = 2400 \text{ LF}$  - Traffic Stripe

1200 LF - Skip Stripe



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION, MADISON & ELBERT COUNTIES, GA**  
*Preliminary Design Stage*

ALTERNATIVE NO.: **15**

DESCRIPTION: **SHORTEN THE LENGTH OF NEW TOWN CHURCH ROAD (CR 287) RELOCATION**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:**

The current design relocates New Town Church Road (CR 287) at the intersection with the mainline to the north of the mainline by approximately 1,950 ft.

**ALTERNATIVE:** (Sketch attached)

Reduce the length of the New Town Church Road (CR 287) relocation by tying into the existing alignment at a location closer to the intersection.

**ADVANTAGES:**

- Reduces length of relocation
- Reduces initial cost
- Simplifies design
- Easier to construct
- Reduces right-of-way takes
- Improves safety

**DISADVANTAGES:**

- Sharper curve onto relocated New Town Church Road (CR 287)

**DISCUSSION:**

The proposed relocation length of New Town Church Road (CR 287) is longer than necessary if a sharper curve is acceptable. The sharper curve could be seen as an advantage as it will ensure a slow-down by users approaching the mainline and produce a safer crossing.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 67,251	—	\$ 67,251
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 67,251	—	\$ 67,251



# CALCULATIONS



PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.:

15

DESCRIPTION:

SHEET NO.: 3 of 4

Pav't Reduction - 2" 12.5 MM Superpave -  $750' \times 24 \div 9 = 200054 = 220 \text{ Tons}$   
6" 25 " " "  $= 200059 = 660 \text{ Tons}$   
8" GAB  $= 200059 = 880 \text{ Tons}$

Pav't Marking - 750' Skip Traffic Stripe - 5"  
1500' Traffic Stripe - 5"

R/W Reduction -  $750' \times 24 \div 43560 = 0.41 \text{ AC}$



# VALUE ENGINEERING ALTERNATIVE



**PROJECT:** EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION, MADISON & ELBERT COUNTIES, GA  
*Preliminary Design Stage*

ALTERNATIVE NO.: 19

**DESCRIPTION:** ELIMINATE THE NOBLE ROAD (CR 297) INTERSECTION

SHEET NO.: 1 of 6

**ORIGINAL DESIGN:** (Sketch attached)

The original design includes an intersection to allow CR 287 to cross proposed SR 72. It includes the realignment of CR 287 in order to allow it to cross SR 72 at an angle that is 70° (the minimum per GDOT standards). Left-turn lanes and right deceleration lanes are included on the mainline. Portions of CR 287 are to be obliterated, and another portion of it is to be realigned to tie it into CR 297.

**ALTERNATIVE:** (Sketch attached)

The alternative eliminates the intersection of SR 72 and CR 287. No work is to be done to CR 287 to the north of SR 72, and it will be barricaded at the northern right-of-way limit of SR 72. CR 287 is to be relocated to tie into CR 297; however, it is to be tied into existing CR 287 as shown on the attached sketch.

**ADVANTAGES:**

- Eliminates an unnecessary access point
- Decreases right-of-way impacts
- Improves portion of CR 297 south of SR 72
- Reduces initial cost
- Simplifies design and construction
- Improves safety

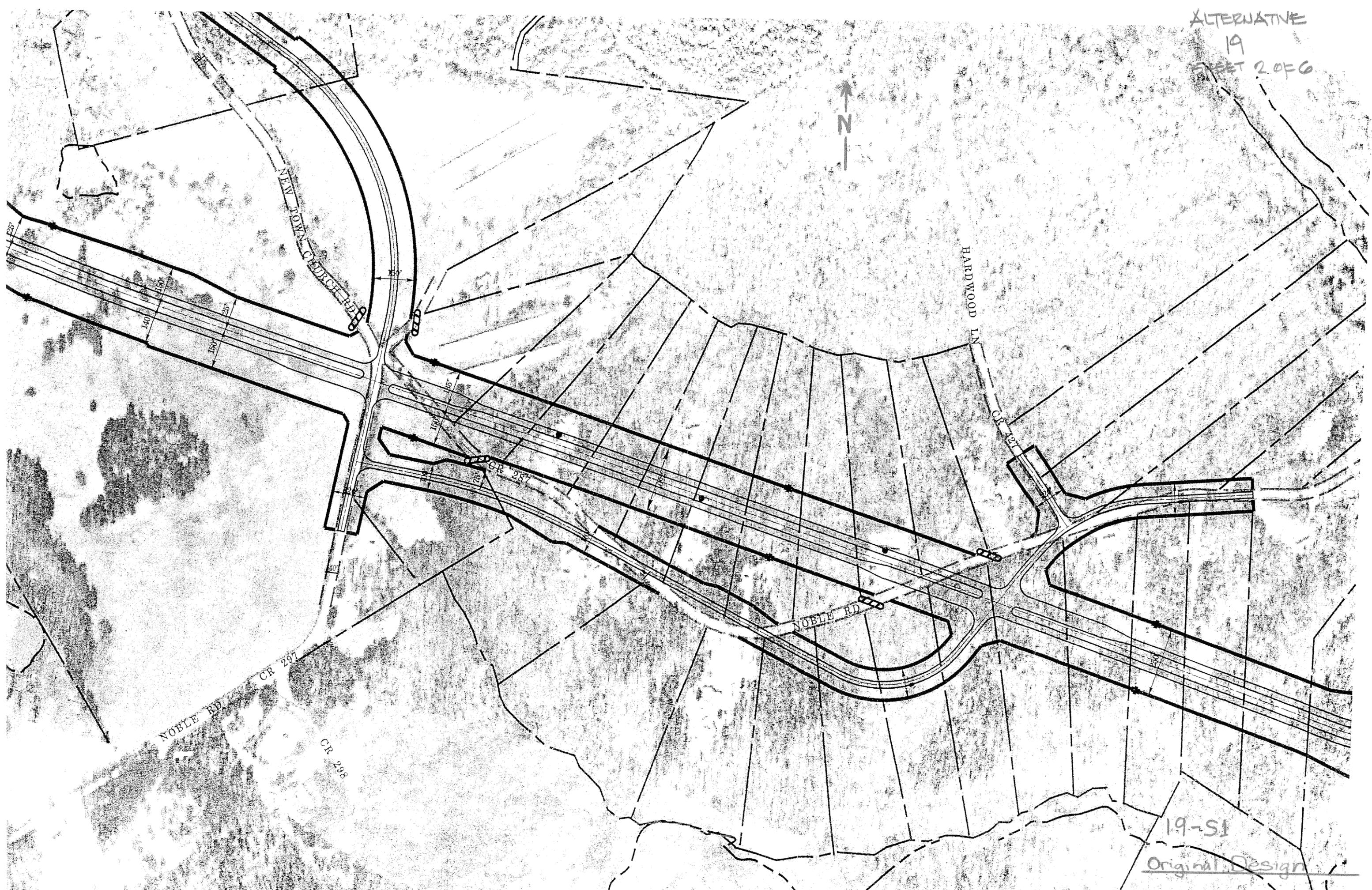
**DISADVANTAGES:**

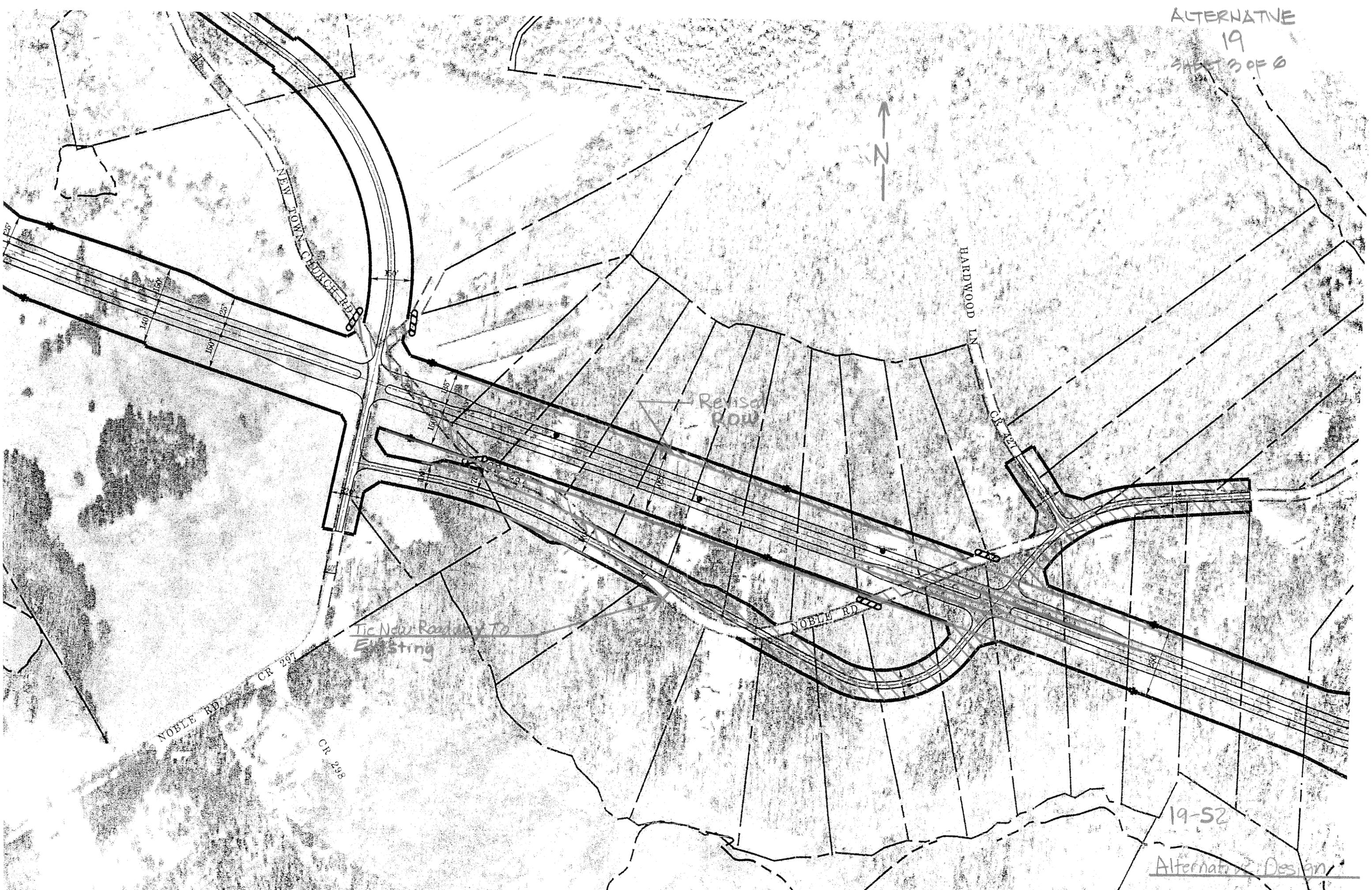
- Adds travel time to those traveling from south of SR 72 to the north and vice versa
- Loss of an amenity

**DISCUSSION:**

The elimination of the intersection of SR 72 at CR 287 decreases the cost of the project substantially. Reasonable access is maintained to the north and south of SR 72.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 943,507	—	\$ 943,507
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS	\$ 943,507	—	\$ 943,507





Tic New Roadway To  
Existing

Revised  
ROW

19-52

Alternative Design

# CALCULATIONS



PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
 MADISON AND ELBERT COUNTIES, GEORGIA  
 Preliminary Design Stage

ALTERNATIVE NO.:

19

DESCRIPTION:

SHEET NO.: 4 of 6

Length of roadway eliminated:

$$1400' + 1700' + 300' = 3400 \text{ LF} \quad - \text{ Rdways}$$

$\left. \begin{array}{l} \text{Nof} \\ \text{SR72} \end{array} \right\} \left. \begin{array}{l} \text{Sof} \\ \text{SR72} \end{array} \right\} \left. \begin{array}{l} \text{Nof} \\ \text{SR72} \end{array} \right\}$

$$500' + 450' + 450' + 500' = 1900 \text{ LF} \quad - \text{ Turn \& Decel Lanes}$$

$$5300 \text{ LF} \cdot 40' = 212,000 \text{ SF} / 9 \text{ SF} = 23,556 \text{ SY}$$

110lb/sy/in

ROW Eliminated:

$$120' \cdot 1400' + 300' \cdot 120' + 110' \cdot 1700' + \frac{1}{2} \cdot 2300' \cdot 35' \\ = 431,250 \text{ SF} = \underline{10 \text{ acres}}$$

Drainage Eliminated:

$$24" - 95' + 47' = 142 \text{ LF}$$

$$18" = 35' + 35' + 35' + 35' = 140 \text{ LF}$$

$$\underline{282 \text{ LF}}$$

Earthwork Eliminated:

Borrow:

$$\left( \frac{1}{2} \cdot 300' \cdot 7' + \frac{1}{2} \cdot 70' \cdot 2' + \frac{1}{2} \cdot 60' \cdot 6' + \frac{1}{2} \cdot 370' \cdot 5' \right) 50' \\ = 111,250 \text{ ft}^3 = \underline{4120 \text{ CY}}$$

Excavation:

$$50 \left( \frac{1}{2} \cdot 250' \cdot 10' + \frac{1}{2} \cdot 300' \cdot 8' + \frac{1}{2} \cdot 200' \cdot 3' + 400' \cdot 5' \right) 50' \\ = 237,500 \text{ ft}^3 \\ = \underline{8796 \text{ CY}}$$

# CALCULATIONS



PROJECT: EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION  
MADISON AND ELBERT COUNTIES, GEORGIA  
*Preliminary Design Stage*

ALTERNATIVE NO.:

19

DESCRIPTION:

SHEET NO.: 5 of 6

Pavement:

2" 25MM Superpave  
6" 12.5MM Superpave  
8" GAB

110 lb/sy/in

2" 25MM Superpave

$$2 \text{ in} \cdot 110 \text{ lb/sy/in} = 220 \text{ lb/sy}$$

$$220 \text{ lb/sy} \cdot 23,556 \text{ SY} = 5,182,320 \text{ lb}$$

$$= \underline{2,591 \text{ TN}}$$

6" 12.5MM Superpave

$$6 \text{ in} \cdot 110 \text{ lb/sy/in} = 660 \text{ lb/sy}$$

$$660 \text{ lb/sy} \cdot 23,556 \text{ SY} = 15,546,960 \text{ lb}$$

$$= \underline{7,773 \text{ TN}}$$

8" GAB

$$8 \text{ in} \cdot 110 \text{ lb/sy/in} = 880 \text{ lb/sy}$$

$$880 \text{ lb/sy} \cdot 23,556 \text{ SY} = 20,729,280 \text{ lb}$$

$$= \underline{10,365 \text{ TN}}$$



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## PROJECT DESCRIPTION

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### PROJECT CONCEPT REPORT

This project comprises the State Route (SR) 72 relocation from SR 72 in the Town of Comer at the west city limits commencing at milepost 9.60 (15.5 kilometers) at the end of Project EDS-72(28), northeast on a new location to SR 72 in Elbert County just east of the Broad River. The project proposes the construction of a 14.60-km (9.07 mile) segment of the SR 72 corridor that will provide vital connectivity between Comer and Elbert County. The SR 72 corridor serves as primary west-east transportation corridor in northeast Georgia, running from Athens to South Carolina. This project will aid in the completion of the “multi-laning” of the SR 72 Governor’s Road Improvement Program (GRIP) corridor and increase capacity and level of service. Projected traffic on this project in the opening year of 2000 is 2,250 vehicles per day (VPD) and 3,500 VPD in the year 2020. The proposed speed design is 105 km/hr (65 mph).

This section of the SR 72 corridor begins on SR 72, 259 m (850 ft.) west of the Comer Town limits. The roadway proceeds on a new location in a northeasterly direction paralleling a power line and crossing SR 98 152.0 m (499 ft.) south of the intersection of County Road (CR) 327/Brickyard Road. It will continue in a northeasterly direction crossing CR 301/South Paoli Road just south of the Comer Town limits. It will then turn to an easterly direction, crossing CR 277/New Hope Church Road 240m (787 ft.) north of CR 302/Pine Valley Farm Road. The alignment will then intersect CR 302/Pine Valley Farm Road just west of Rocky Shoals Creek, crossing back and forth before becoming parallel on the south side to CR 294/East Paoli Road. It will then cross CR 294 just west of CR 306/Osley Mill Road, continuing in an easterly direction crossing CR 287/New Town Church Road 485.0 m (1,592 ft.) north of the intersection of CR 294 and will then turn in a southeasterly direction crossing CR 287 at the intersection with CR 297/Noble Road. It will continue, crossing CR 287 southeast of CR 427 and then again north of the intersection of SR 72. The alignment will then tie back into SR 72 just before crossing the Madison-Elbert County line at the Broad River. It will cross the Broad River, adding a parallel bridge on the north side, and continue to CR 79/Nickville Road where it will tie into the existing four lanes with a 4.20 m (15 ft.) flush median, which is milepost 0.3 (0.5 km) in Elbert County.

The project is proposed as a four-lane divided roadway, two lanes in each direction, separated by a 13.0 m (43 ft.) depressed grassed median. The proposed right-of-way will vary from 64.0 m (210 ft.) to 76.0 m (250 ft.).

Major structures will be as follows:

1. Broad River - add parallel bridge, 169.8 m (557 ft.) x 15.0 m (50 ft.); and
2. Rocky Shoals Creek - Construct triple 2.74 m (9.0 ft.) x 1.8 m (6.0 ft.) culvert.

Access will be partially controlled on the portion on new location and by permit along the existing roadway. No design exceptions are required to implement this project. Traffic will be maintained on existing roads during construction.

Environmental concerns include the following:

- A U.S. Army Corps of Engineers (COE) 404 Permit (Discharge of Dredge or Fill Material Into Water);
- Preparation of an Environmental Effects Report;
- Requires 18 displacements - 13 residences, 1 chicken house, and 4 mobile homes;
- A public hearing will be held; and
- Time-saving procedures are not appropriate.

Local Government Project Agreement (LGPA) was sent on July 21, 1993, requesting Madison County and the Town of Comer to be responsible for utility relocation costs. The City of Canton refused its LGPA on August 3, 1993.

## **ALTERNATIVES CONSIDERED**

1. No Build.
2. Alternative 1 - Follow the existing SR 72 through Comer with one-way pair, through Carlton to CR 79 in Elbert County.
3. Alternative 2 - Bypass Comer to the north, follow SR 72 from CR 281 through Carlton to CR 79 in Elbert County.
4. Alternative 3 - Follow the existing SR 72 through Comer with one-way pair, bypass Carlton to the north, and follow SR 72 from East Paoli Road in Madison County to CR 79 in Elbert County.
5. Alternative 4 - Bypass Comer to the north, follow SR 72 from CR 281 to west of Carlton, bypass Carlton to the north, follow SR 72 from East Paoli Road in Madison County to CR 79 in Elbert County.

## **PROJECT REVIEW TEAM COMMENTS**

- EDS 72(39) was combined from units 38 and 39 into one project.
- The tie-in at CR 79 in Elbert County is to a 90 km/h (55 mph) design speed.
- Because of the team meeting, the alignment was shifted (1) north of intersection of CR 277 and CR 302, (2) parallel to the south side of CR 294, and (3) north of intersection of CR 294 and CR 287.
- A State Transportation Improvement project (STIP) number has not been assigned to this project at this time.

## **PROJECT DESCRIPTION**

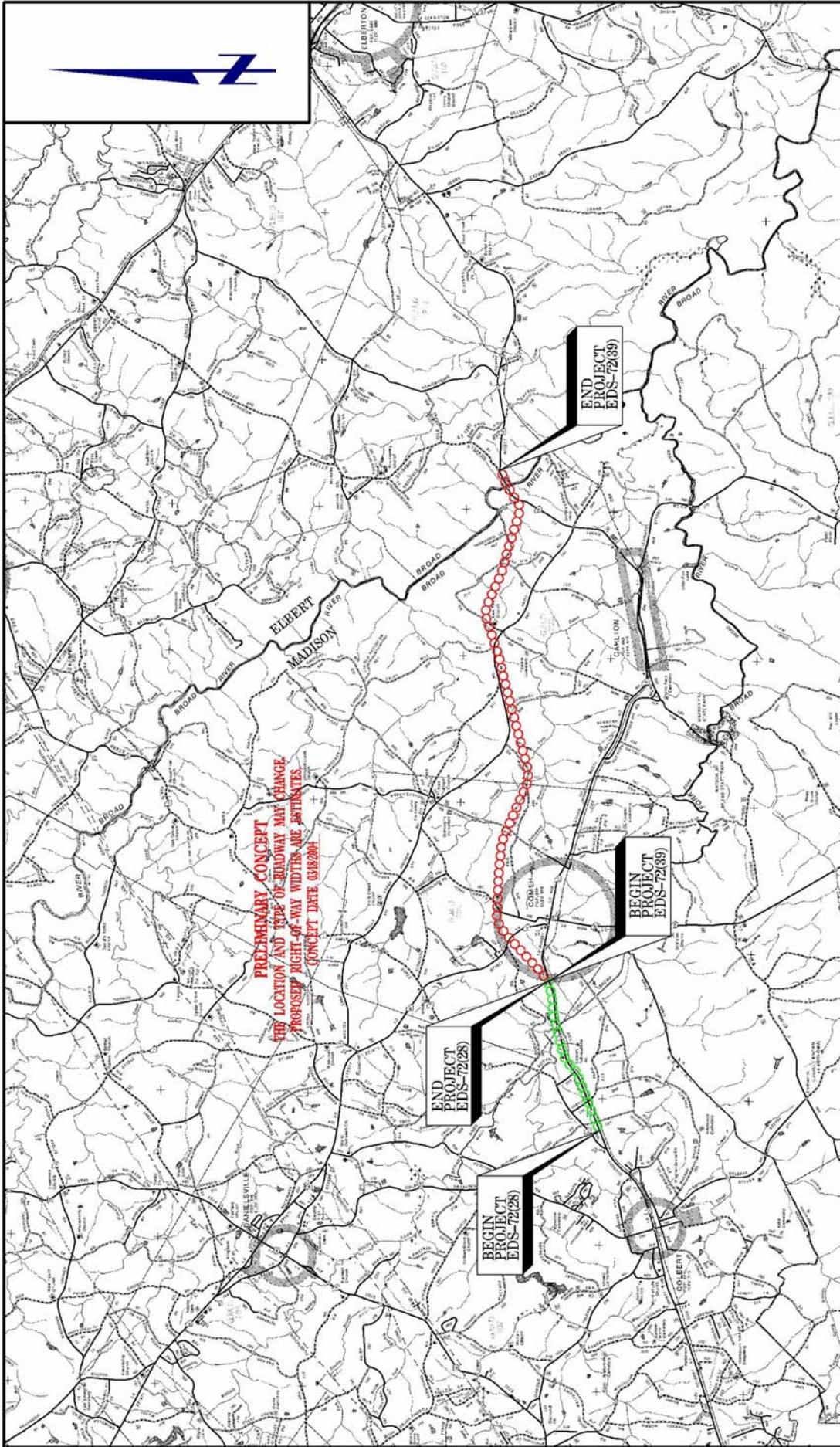
Project EDS-72(39) is a widening and relocation project in Madison and Elbert Counties. The project will widen existing SR 72 from two lanes to four lanes with a depressed grass median. The project alignment will relocate existing SR 72 to bypass the Towns of Comer and Carlton. The total project length is approximately 9.33 miles (15.0 km), beginning at milepost 9.743 (15.68 km) in Madison County and extending to milepost 0.720 (1.16 km) in Elbert County. The project includes a new bridge over the Broad River and maintenance work on the parallel existing historic bridge. There will also be a triple 9' x 6' (2.75 m x 1.82 m) concrete bridge culvert conveying Rocky Shoals Creek. The project is part of the GRIP that has been proposed to stimulate economic growth throughout the state.

## **PROJECT INFORMATION**

The project concept has been approved and preliminary plans have been prepared, but the Preliminary Field Plan Review (PFPR) has not been held. The environmental document has not been approved. Public Information Open Houses have been held, most recently on March 18, 2004. The preliminary bridge layout and the hydraulic report have been approved. Final soil survey has been conducted and approved. Hard rock requiring blasting for removal was encountered along a total of 0.53 miles (0.85 km) of the project centerline. GDOT's proposed construction letting is December 2007. This project is being designed by the consultant firm of Parsons Brinckerhoff Quade & Douglas, Inc. The project begins at the end of EDS-72(28), a 2.67 mile (4.30 km) long widening project also currently being designed by the same consultant.

## **PROJECT COSTS**

The current projected probable cost of construction is \$33,346,132 and is based on the Parsons Brinckerhoff Quade & Douglas, Inc., document entitled Detailed Estimate: Cost Estimate Report for File "122650" dated May 5, 2006. This figure includes an Engineering and Construction (E&C) Rate of 10.00% and an Escalation Rate of 10.25% (based on 5.00% per year for two years).



**PRELIMINARY CONCEPT**  
**THE LOCATION AND TYPE OF ROADWAY MAY CHANGE.**  
**PROPOSED RIGHT-OF-WAY WIDTHS ARE ESTIMATES.**  
**CONCEPT DATE 03/18/2004**



SCALE IN MILES



LOCATION

**WALL MAP**  
**EDS-72(28),(39)**  
**MADISON, ELBERT COUNTY**  
**P.I.# 122100, 122650**

SOURCE: GENERAL HIGHWAY MAP, MADISON/ELBERT CO., GEORGIA  
 PREPARED BY THE GEORGIA DEPARTMENT OF TRANSPORTATION, 1989/1992

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## VALUE ANALYSIS AND CONCLUSIONS

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### GENERAL

This section describes the value analysis procedure used during the used during the VE study on the SR 72 Widening project conducted by Lewis & Zimmerman Associates, Inc., for GDOT. The workshop was performed May 17–19, 2006, at GDOT's offices in Atlanta, Georgia. The project designer, Parsons Brinckerhoff Quade & Douglas, Inc. (PB), provided information for the VE team to use as the basis of the study.

A systematic approach was used in the VE study. The key steps taken were organized into three distinct parts: (1) Pre-study preparation, (2) VE orientation/kickoff meeting and workshop, and (3) post-study reporting and implementation. A Task Flow Diagram, which outlines each of the procedures included in the VE study, is attached for reference.

In the sections following the VA procedure, separate narratives and supporting documentation identify the following:

- Value Engineering Workshop Agenda
- Value Engineering Workshop Participants
- Cost Estimate Summary
- Function Analysis
- Creative Ideas and Evaluation

### PREPARATION EFFORT

Pre-study preparation for the VE effort consisted of scheduling study participants and tasks, gathering necessary background information on the facility, and compiling project data into a cost model and graphic cost histogram. Information relating to the design, construction, and operation of the facility is important as it forms the basis of comparison for the study effort. Information relating to funding, project planning operating needs, systems evaluations, basis of cost, soil conditions, and construction of the facility was also a part of the analysis.

### VALUE ENGINEERING WORKSHOP EFFORT

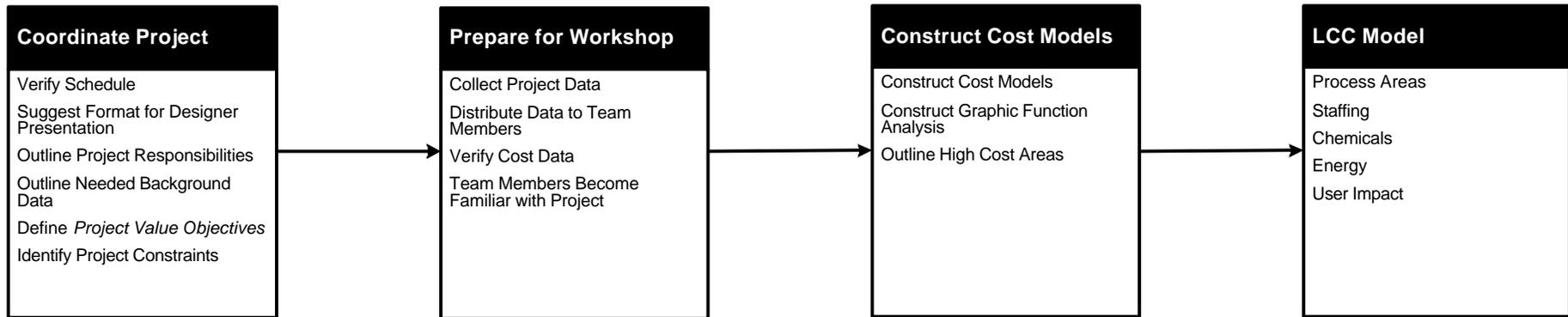
The VE workshop was a three-day effort (see attached agenda). During the workshop, the VE job plan was followed. The job plan guided the search for high-cost areas in the project and included procedures for developing alternative solutions for consideration. It includes six phases:

- Information Phase
- Function Identification and Analysis Phase
- Speculation Phase
- Evaluation Phase

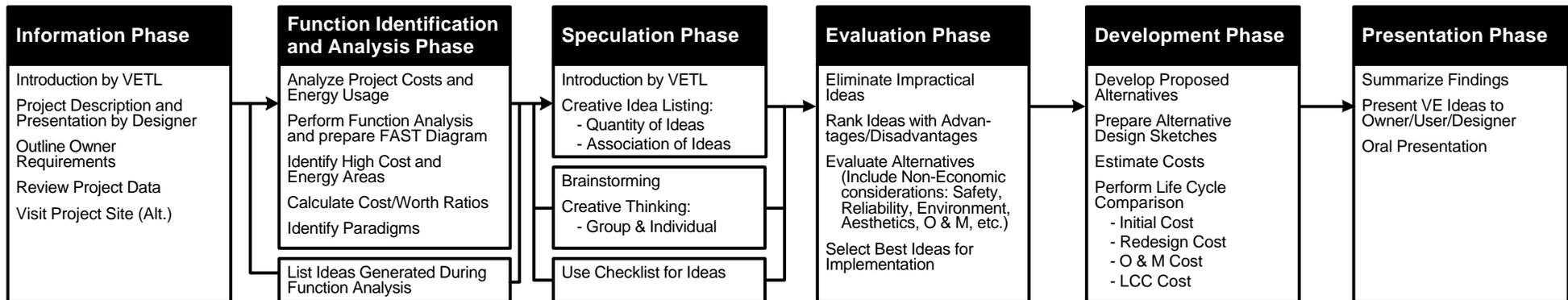


# Value Engineering Study Task Flow Diagram

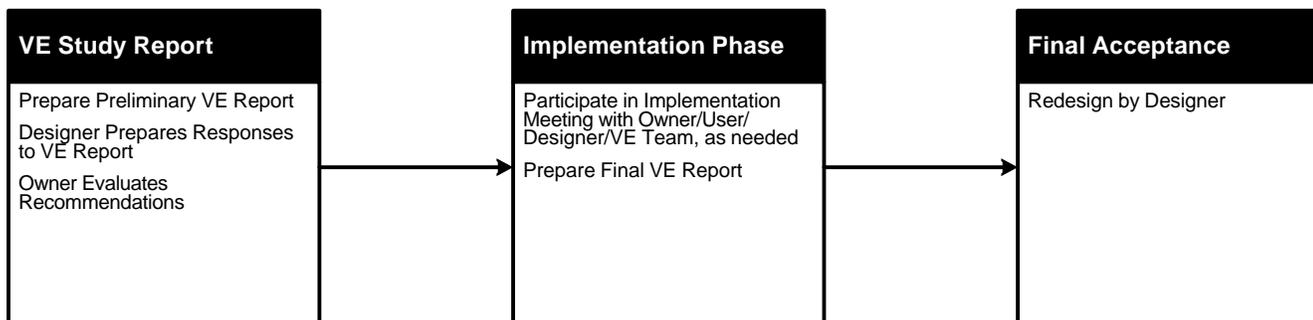
## Preparation Effort



## Workshop Effort



## Post-Workshop Effort



- Development Phase
- Presentation Phase (not conducted)

## Information Phase

At the beginning of the study, the conditions and decisions that have influenced the development of the project must be reviewed and understood. For this reason, the development manager presented information about the project to the VE team on first day of the session. Following the presentation, the VE team discussed the project using the following documents:

- ***Project Concept Report*** prepared by the Department of Transportation, State of Georgia, Office of Preconstruction for the Widening and Relocation of SR 72, Project Number EDS-72(39) Madison-Elbert Counties, P.I. No. 122650, dated July 24, 1998, containing location sketch, project location and description, preliminary cost estimates, typical roadway sections, and copies of concept team meeting minutes
- ***Detailed Estimate*** prepared by Parsons Brinckerhoff Quade & Douglas, Inc., dated May 5, 2006
- ***Public Hearing Open House Information Sheet*** for SR 72 Improvements Madison/Elbert Counties prepared Parsons Brinckerhoff Quade & Douglas, Inc., dated March 18, 2005
- ***Preliminary Right of Way Cost Estimate*** for EDS-72(30) Madison-Elbert prepared the Department of Transportation, State of Georgia, Office of Right-of-Way, dated June 16, 2003
- ***Bicycle Lane Signing and Marking Sketch***, Figure B-1, prepared by the Department of Transportation, State of Georgia, dated November 2003
- ***Transportation Online Policy & Procedure System (TOPPS)*** No. 2434-1 for Method of Payment for Earthwork, dated March 22, 1999
- ***Transportation Online Policy & Procedure System (TOPPS)*** No. 4A-3 for Establishing Access Control, dated September 23, 2005
- ***Transportation Online Policy & Procedure System (TOPPS)*** No. 4A-4 for Granting Breaks in Access Control, dated December 14, 2004
- ***Interdepartmental Correspondence*** prepared by the Department of Transportation, State of Georgia, Office of Materials and Research, Pavement Design Approval for the Widening and Relocation of SR 72, dated November 8, 2005
- ***Half Size Copy of Original Plan and Profile*** of SR 72 Bridge over the Broad River, dated April 16, 1934
- ***Full Size Copy of Engineering Drawings*** of Widening SR 72 Bridge over the Broad River, prepared by Lee Wan and Associates, Inc., dated July, 1983
- ***General Highway Map***, Madison County, prepared by the Department of Transportation, State of Georgia, Division of Planning and Programming in cooperation with the U.S. Department of Transportation, Federal Highway Administration, dated 1983
- ***General Highway Map***, Elbert County, prepared by the Department of Transportation, State of Georgia, Division of Planning and Programming in cooperation with the U.S. Department of Transportation, Federal Highway Administration, dated 1984
- ***Aerials*** of the SR 72 with Preferred/Preliminary Alignment prepared by Parsons Brinckerhoff Quade & Douglas, Inc., dated February 26, 1998
- ***Half Size Plan and Profile Drawings*** for Proposed SR 72 Widening and Relocation, Federal Aid Project, EDS-72(39), Madison and Elbert Counties, P. I. No. 122650 prepared by Parsons Brinckerhoff Quade & Douglas, Inc., for the Department of Transportation, State of Georgia, undated

- **Soil Survey Summary**, Project Number: EDS-72(39), P.I. Number: 122650, SR 72 Relocation and Widening, Madison and Elbert Counties, prepared by Professional Services Industries, Inc., for the Department of Transportation, State of Georgia as Subconsultant to Parsons Brinckerhoff Quade & Douglas, Inc., dated June 1, 2005
- **Bridge Foundation Investigation**, Project Number: EDS-72(39), P.I. Number: 122650, SR 72 Relocation and Widening, Madison and Elbert Counties, prepared by Professional Services Industries, Inc. for the Department of Transportation, State of Georgia as Subconsultant to Parsons Brinckerhoff Quade & Douglas, Inc., dated June 7, 2005
- **Traffic Development Technical Memorandum** for SR 72 Project Number: EDS-72(39) and SR 72 Comer Bypass, Madison County, prepared by Parsons Brinckerhoff Quade & Douglas, Inc., for the Department of Transportation, State of Georgia, dated March 19, 2002
- **Compact Disc** containing the design drawings for Proposed SR 72 Widening and Relocation, EDS-72(39), Madison and Elbert Counties, P.I. No. 122650 prepared by Parsons Brinckerhoff Quade & Douglas, Inc., for the Department of Transportation, State of Georgia, dated May 16, 2006
- **Wall Map** indicating overall project alignment Proposed SR 72 Widening and Relocation, EDS-72(39), Madison and Elbert Counties, P.I. No. 122650 prepared by Parsons Brinckerhoff Quade & Douglas, Inc., plotted April 20, 2006

### **Function Identification and Analysis Phase**

Based on historical and background data, a cost model and graphic function analysis were developed for this project by major construction elements. They were used to distribute costs by project element, serve as a basis for alternative functional categorization, and assign worth to the categories, where worth is the least cost to provide the required function, as determined by the VE team. The VE team identified the functions of the various project elements and subsystems by using random function generation techniques, resulting in the attached Random Function Analysis worksheet and Function Analysis Systems Technique (F.A.S.T.) diagram.

### **Speculation Phase**

This VE study phase involved the creation and listing of ideas. Creative idea worksheets were organized by project element. During this phase, the VE team developed as many ideas as possible to provide the necessary functions within the project at a lower cost to the owner, or to improve the quality of the project. Judgment of the ideas was restricted at this point. The VE team was looking for a large quantity of ideas and association of ideas.

The GDOT and PB representatives may wish to review the creative list since it may contain ideas that can be further evaluated for potential use in the design.

### **Evaluation Phase**

During this phase of the workshop, the VE team judged the ideas generated during the speculation phase. Advantages and disadvantages of each idea were discussed to find the best ideas for development. Ideas found to be irrelevant or not worthy of additional study were discarded. Those that represented the greatest potential for cost savings or improvement to the project were then developed further.

The VE team would like to develop all ideas, but time constraints usually limit the number that can be developed. Therefore, each idea was compared with the present design concepts in terms of how well it met the design intent. Advantages and disadvantages were discussed, and each team member rated the ideas on a scale of one to five, with the best ideas rated five. Total scores were summed for each idea, and only highly rated ideas were developed into alternatives.

The creative listing was re-evaluated frequently during the process of developing alternatives. As the relationship between creative ideas became more clearly defined, their importance and ratings may have changed, or they may have been combined into a single alternative. For these reasons, some of the originally highly rated items may not have been developed into alternatives.

### **Development Phase**

During the development phase, each highly rated idea was expanded into a workable solution. The development consisted of a description of the alternative, life cycle cost comparisons, where applicable, and a descriptive evaluation of the advantages and disadvantages of the proposed alternatives. Each alternative was written with a brief narrative to compare the original design to the proposed change. Sketches and design calculations, where appropriate, were also prepared in this part of the study. The VE alternatives are included in the Study Results section of this report.

### **Presentation Phase**

The last phase of the VE study would have been to present the findings of the study; however, GDOT now conducts the presentation internally upon receipt of the report. The VE alternatives were screened by the VE team before draft copies of the Summary of Potential Cost Savings worksheets were provided to GDOT representatives. The VE alternatives were arranged in the same order as the idea listing sheets to facilitate cross-referencing.

### **POST-WORKSHOP EFFORT**

The post-study portion of the VE study includes the preparation of this Value Engineering Study Report. Personnel from GDOT and the PB design firm will analyze each alternative and prepare a short response, recommending either incorporating the alternative into the project, offering modifications before implementation, or presenting reasons for rejection. Lewis & Zimmerman Associates, Inc., is available at your convenience as you review the alternatives. Please do not hesitate to call on us for clarification or further information as you consider an implementation approach.

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## VALUE ENGINEERING STUDY AGENDA

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Lewis & Zimmerman Associates, Inc. (LZA) will conduct a 24-hour Value Engineering (VE) study on the **EDS-72(39), P.I. No. 122650, SR 72 Widening and Relocation** project located in Madison and Elbert Counties, Georgia. It is expected the owner, the Georgia Department of Transportation (GDOT) and the design team headed by Parsons Brinckerhoff Quade and Douglas, Inc. (PB) will be available to make a formal presentation concerning the project at the beginning of the workshop and be available to answer questions during the VE study effort.

### VE Study Agenda

The VE study will follow the outline described below and be conducted May 17 – 19, 2006. The study will be conducted in Room 444, Road Design Conference Room in GDOT's General Office located at No. 2 Capitol Square Street, Atlanta, Georgia 30334. The point-of-contact is Ms. Lisa L. Myers, Design Review Engineer Manager, who can be reached at 404-651-7468.

### Wednesday, May 17<sup>th</sup>

9:00 am – 9:15 am                      **General Introduction of all Parties and review of the VE Process**

9:15 am - 11:15 am                    **Owner's / Designer's Presentation**

GDOT and PB are to present information concerning the project including, but not necessarily limited to: rationale for design; criteria for specific areas of study; project constraints and the reasons for design decisions.

11:15 am - 12:00 noon                **Commence Function Analysis Phase**

The VE team will continue their familiarization with the cost models and project data for each area of study. The cost model(s) will be refined, as necessary; define the function of each project element or system in the cost model, select the primary or basic functions, and determine the worth, or least cost, to provide the function. Cost / worth or value index ratios will be calculated, and high cost / low worth areas for study identified. In addition, the VE team will continue defining the function of each element / system to gain a thorough understanding of the project's needs and requirements.

12:00 noon - 1:00 pm                **Lunch**

1:00 pm - 5:00 pm                    **Conclude the Function Analysis Phase and Commence the Creative Phase**

The VE team will conduct a brainstorming session and list as many ideas as possible for consideration. The aim is to obtain a large quantity of ideas through free association, by eliminating roadblocks to creativity and deferring judgment.

## **Thursday, May 18<sup>th</sup>**

8:30 am - 10:00 am                      **Conclude Creative Phase and Complete Evaluation / Analytical Phase**

The VE team will analyze the ideas listed in the creative phase and select the best ideas for further development.

10:00 am - 12:00 noon                  **Development Phase**

VE team will develop creative ideas into alternate design solutions. Initial and life cycle cost estimates comparing original and proposed alternatives will be prepared. Selected alternatives for change will be developed and supported with sketches, calculations and written substantiation.

12:00 noon - 1:00 pm                  **Lunch**

1:00 pm - 5:00 pm                      **Continue Development Phase**

## **Friday, May 19<sup>th</sup>**

8:30 am - 12:00 am                      **Continue Development Phase**

12:00 noon - 1:00 pm                  **Lunch**

1:00 pm - 4:00 pm                      **Conclude Development Phase and Commence Summary Worksheets**

Upon completion of the Development Phase, the VE facilitator will commence preparation of the summary worksheets based on the alternatives developed by the VE team. The summary work sheets form the basis of the informal oral presentation.

4:00 – 5:00 pm                          **Finalize Summary Worksheets**

The VE team will provide draft copies of the *Summary of Potential Cost Savings* worksheets to GDOT representatives and be available to clarify any points.

## VALUE ENGINEERING WORKSHOP PARTICIPANTS

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The VE team was organized to provide specific expertise on the unique project elements involved. Team members formed a multidisciplinary group with professional design experience and a working knowledge of VE procedures. The VE team included the following professionals:

<u>VE Team Member</u>	<u>Specialization</u>	<u>Organization</u>
Dominic F. Saulino	Transportation Engineer	HNTB
Alex Pascual, PE	Structural / Bridge Engineer	HNTB
Jeffery G. Dingle, PE	Construction Specialist/Transportation Engineer	Delon Hampton and Associates
Luis M. Venegas, PE, CVS, LEED® AP	VE Team Leader	Lewis & Zimmerman Associates, Inc.

### OWNER'S/DESIGNER'S PRESENTATION

The design firm of Parsons Brinckerhoff Quade & Douglas, Inc., presented an overview of the project on Wednesday, May 17, 2006. The purpose of this meeting, in addition to being an integral part of the Information Gathering Phase of the VE study, was to bring the VE team “up to speed” regarding the overall project. Additionally, the meeting afforded the design team the opportunity to highlight in greater detail those areas of the project requiring additional or special attention.

### VALUE ENGINEERING TEAM'S FINAL PRESENTATION

The VE team did not conduct a final presentation on Friday, March 22, 2006 to GDOT. However, copies of the draft Summary of Potential Cost Savings worksheets were provided for interim use by GDOT personnel.

A list of the meeting participants is attached for reference.

# CREATIVE IDEA/BRAINSTORMING SESSION PARTICIPANTS



PROJECT: <b>EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION MADISON AND ELBERT COUNTIES, GEORGIA</b> <i>Preliminary Design Stage</i>		DATE: <b>17 – 19 May 2006</b>
NAME and E-MAIL (PLEASE PRINT)	ORGANIZATION / TITLE	PHONE / CELL / FAX
Jenny Harris-Dunham em: jenny.harris-dunham@dot.state.ga.us	Georgia Department of Transportation (GDOT), Office of Bridge Design  Assistant Bridge Design Group Leader	ph: 404-656-5198 cell:  fx: 404-651-7076
Randall (Randy) L. Hart, PE em: randall.hart@dot.state.ga.us	Georgia Department of Transportation (GDOT), Office of Construction  Construction Liaison Engineer	ph: 404-656-5306 cell:  fx: 404-656-3507
Thomas (Tom) A. Hodges, PE em: tom.hodges@dot.state.ga.us	GDOT, Office of Consultant Design/Office of Program Delivery  Design Group Manager	ph: 404-656-5397 cell:  fx: 404-463-6136
Alexis John em: alexis.john@dot.state.ga.us	GDOT, Office of Environment/Location  Transportation Environmental Planner Associate	ph: 404-699-6865 cell:  fx: 404-699-4440
Jerry Milligan em: jerry.milligan@dot.state.ga.us	GDOT, Office of Right-Of-Way  Supervisor Appraisal Estimator	ph: 770-986-1541 cell:  fx: 770-986-1558
James S. Moore em: james.moore@dot.state.ga.us	GDOT, District 1, Office of Construction  District Construction Engineer	ph: 770-532-5528 cell:  fx: 770-532-5542
Lisa L. Myers em: lisa.myers@dot.state.ga.us	GDOT, General Office  Design Review Engineer Manager/VE Coordinator	ph: 404-651-7468 cell:  fx: 404-463-6131
Raad M. Nabil em: radd.nabil@dot.state.ga.us	GDOT, Office of Traffic, Safety and Design  Traffic Engineer 2	ph: 404-635-8126 cell:  fx: 404-638-8116
Robert (Bob) R. Moses, PE em: moses@pbworld.com	Parsons Brinckerhoff Quade & Douglas, Inc.  Project Manager/Senior Engineer	ph: 404-364-2674 cell: 770-853-1862  fx: 404-237-3015
Alex Pascual, PE em: apascual@hntb.com	HNTB  Structural Engineering/Bridge Engineer	ph: 404-946-5738 cell:  fx: 404-841-2820



## ECONOMIC DATA

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The VE team developed economic criteria used for evaluation with information gathered from the State of Georgia Department of Transportation and the PB design team. To express costs in a meaningful manner, the VE team alternatives are presented on the basis of discounted present worth. Criteria for planning project period interest rates are based on the following parameters:

Year of Analysis:	<b>2006</b>
Construction Start Up:	<b>2009</b>
Construction Duration:	<b>±36 Months (2012)</b>
Economic Planning Life:	<b>35 years for Pavement</b>
Economic Planning Life:	<b>50 years for Bridges</b>

### Cost

Composite Mark-Up (Construction): <i>(Composed of: Inflation [based on 5.00% per annum for two year] at 10.25%; and Engineering and Construction at 10.00 %.)</i>	<b>21.27% (1.2127)</b>
Composite Mark-Up (Right-of-Way): <i>(Composed of: Scheduling Contingency at 55.00%; Administration / Court Costs at 60.00%; and Inflation Factor at 40.00 %.)</i>	<b>247.20% (2.4720)</b>

## **COST ESTIMATE SUMMARY**

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The VE team reviewed the project costs based on the Parsons Brinckerhoff Quade & Douglas, Inc., Detailed Estimate: Cost Estimate Report for File "122650," dated May 5, 2006, for EDS-72(39), SR 72 Widening and Relocation in Madison and Elbert Counties. As can be expected, judgments at this stage of the study are based on experience and intuition rather than facts, which are not uncovered until well along in the analysis of function. As a result of these qualified hypotheses, there appears to be a potential for initial savings in the following areas:

- Roadway
  - Unclassified Excavation
  - Aggregate Base
  - Recycled Asphalt Concrete
  - Borrow Excavations
  - Clearing and Grubbing
- Drainage
  - Class A Concrete
  - Storm Drain Piping
- Erosion Control
  - Mulch
  - Sediment Basins
  - Erosion Control Mats
  - Silt Fences
- Bridges
  - New and Complete Bridge

## **DESIGNER'S COST ESTIMATE**

The cost estimate, as described above, did contain sufficiently detailed information to perform a VE study when considering the current, conceptual level of design.

## FUNCTION ANALYSIS

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A function analysis was performed to (1) define the requirements for each project element and (2) to ensure a complete and thorough understanding by the VE team of the basic function(s) needed to attain a given requirement. A Random Function Analysis worksheet for the project is attached. This part of the function analysis stimulated the VE team members to think in terms of the areas in which to channel their creative idea development.

Function Analysis is a means of evaluating a project to see if the expenditures actually perform the requirements of the project, or if there are disproportionate amounts of money spent on support functions. These elements add cost to the final product but have a relatively low worth to the basic function.

In addition to the random function analysis, the VE Facilitator worked with members of the study team to develop a Function Analysis System Technique (F.A.S.T.) diagram. The F.A.S.T. diagram was used to show the flow of function within the phases. It helps to confirm the project is addressing those issues that have been voiced by the owner as being important. The diagrams were generated by asking the key question, "What is the most important function to be accomplished by this phase?" The answer is characterized by a verb/noun pair. In turn, another question is asked: "Why?" The answer is again listed in a verb/noun pair, and the process continues from left to right. If the result is a true F.A.S.T. diagram, the flow of functions from right to left will answer the question, "Why?" No F.A.S.T. diagram is ever complete. The readers of this report may wish to challenge themselves to see how far they can carry the construction of the F.A.S.T. diagram.

This F.A.S.T. diagram notes the critical function paths and identifies the project's basic function as **IMPROVE/CORRIDOR** by **Completing/Corridor, Improving/Travel Time, and Widen and Relocate SR 72**, thereby improving/safety, facilitating/mobility, reducing/travel time, and improving arterial efficiency. The F.A.S.T. diagram is included following the Random Function Analysis worksheet.

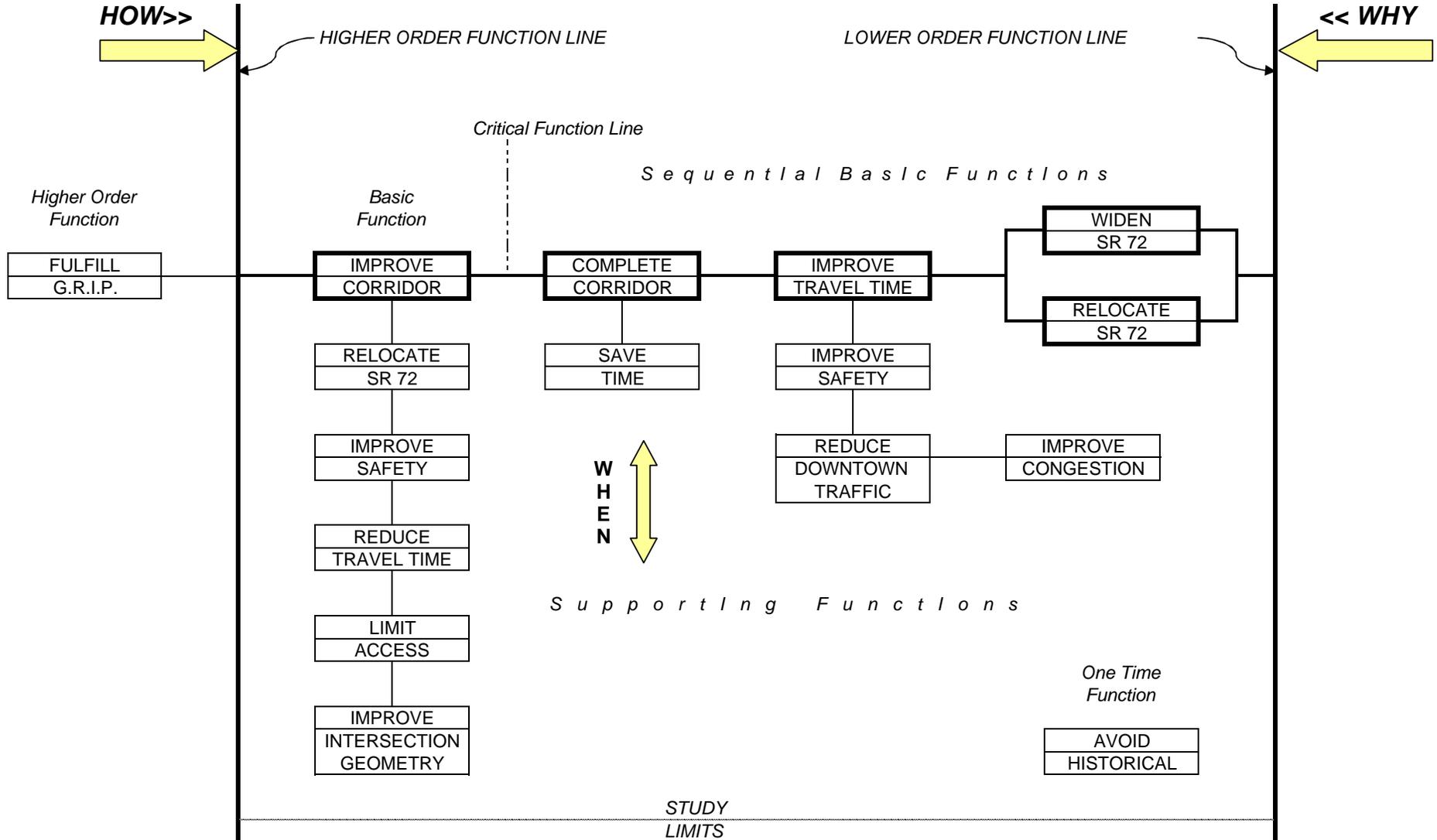


# FUNCTION ANALYSIS SYSTEMS TECHNIQUE (F. A. S. T.)

## SR 72 WIDENING AND RELOCATION, EDS-72(39), PI No. 122650



Georgia Department of Transportation, District 1  
Madison and Elbert Counties , Georgia



## **CREATIVE IDEA LISTING AND JUDGMENT OF IDEAS**

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During the creative phase, numerous ideas, alternative proposals, and/or recommendations were generated using conventional brainstorming techniques as recorded on the following pages.

These ideas were then discussed and the advantages/disadvantages of each listed. The VE team compared each of the ideas with the concept solution to determine whether it improved value, was equal in value, or lessened the value of the solution.

The ideas were then ranked on a scale of 1 to 5 on how well the VE team believed the idea met necessary criteria and program needs. The higher rated ideas were then developed into formal alternatives and included in the evaluation. Some ideas were judged to have minimal cost impacts on the project but provided enhancements in the form of improved operations, efficiency, constructability, or potential to save unknown or hidden costs. These were given the designation “DS,” which indicates a design suggestion. This designation is also used when an idea is difficult to price but improves the functionality of the project or system and is deemed to be of significant value to the owner, user, operator, or designer.

Typically, all ideas rated 4 or above are included in the study report. When this is not the case, an idea was combined with another related idea or discarded as a result of additional research that indicated the concept as not being cost-effective or technically feasible.

All readers are encouraged to review the Creative Idea Listing and Evaluation worksheets since they may suggest additional ideas that can be applied to the design.

# CREATIVE IDEA LISTING



PROJECT: **EDS-72(39), PI No. 122650, SR 72 WIDENING AND RELOCATION**  
**MADISON AND ELBERT COUNTIES, GEORGIA**  
*Preliminary Design Stage*

SHEET NO.: 1 of 1

NO.	IDEA DESCRIPTION	RATING
1	Grade separate SR 72 and SR 98	3
2	Provide a pedestrian overpass at the SR 72/SR 98 intersection	4
3	Eliminate the western-most Paoli Road (CR 294) access to relocated SR 72	3+
4	Provide an eastbound exit/slip ramp to the Town of Comer and eliminate new business 72 intersection	4
5	Use a westbound flyover from business 72 to commencement of relocation of SR 72	1
6	Signalize the SR 72/SR 98 intersection	5
7	Relocate the west Comer intersection (i.e., the commencement of the SR 72 relocation) further east	2
8	Reduce the angle of the south Paoli Road (CR 301) intersection	4
9	Construct bridge over south Paoli Road (CR 301) intersection; i.e., grade separate	2
10	Flatten the mainline curve at Rocky Shoals Creek	2
11	Eliminate the Pine Valley Road (CR 302) intersection	4
12	Eliminate the Duckworth-Brown Road (CR 304) intersection	4
13	Extend Paoli Road along the north side of mainline and eliminate either the Paoli Road (CR 311) intersection or the New Town Church Road (CR 287) intersection	5
14	Flatten mainline curve at New Town Church Road (CR 287)	2
15	Minimize northern New Town Church Road (CR 287) intersection extension	4
16	Realign the mainline southward from Rocky Shoals Creek to SR 72 at the Broad River	1
17	Realign the mainline northward from New Hope Church Road (CR 277) to New Town Church Road (CR 287)	1+
18	Rotate Noble Road (CR 297) intersection to minimize work on the north side of mainline to Harwood Road (CR 427) and New Town Church Road (CR 287)	4

Rating: 1 → 2 = Not to be Developed; 3 – 4 = Varying Degree of Development Potential;  
 5 = Most Likely to be Developed; ABD = Already Being Done; N/A = Not Applicable