



*State of Georgia  
Department of Transportation  
District 3*

***SR9 WIDENING AND RECONSTRUCTION  
FROM SR 141 TO SR 20  
STP-1336(11), P.I. No. 121690  
Forsyth County, Georgia***

**Value Engineering Study Report  
Concept Submittal**

April 2007

*Designer:*



**Kimley-Horn  
and Associates, Inc.**

*Value Engineering Consultant*



**Lewis & Zimmerman Associates, Inc.**



**Lewis & Zimmerman Associates, Inc.**

*Taking the Chance out of Change*

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April 20, 2007

Ms. Lisa Myers  
Design Review Engineer Manager  
State of Georgia  
Department of Transportation  
No. 2 Capital Square, Room 265  
Atlanta, Georgia 30334

**re: SR 9 Widening from SR 141 to SR 20  
Project No. STP-1336(11), P.I. No. 121690  
Value Engineering Study Report**

Dear Ms. Myers:

Lewis & Zimmerman Associates, Inc. is pleased to submit four hard copies and an electronic copy of the referenced value engineering study report. We hope that the VE recommendations offered in this report enhance the value and constructability of the SR 9 Widening Project.

The alignment of the project appears optimized. However, right-of-way costs have grown to a level in excess of \$33M. Further review of the alignment during the design development process is needed to optimize the right-of-way elements and minimize the takes for the expense small commercial parcels. Analysis of the vertical profile will be needed to optimize the fill quantities and balance import to export. The cost of right-of-way on this project places huge pressure on the typical section width and may require that compromises be made in lane and median widths as well as placement of a potential bicycle lane.

We appreciate the excellent participation of the GDOT staff and Kimbley-Horn design personnel throughout the study. Please feel free to contact me at (253)-925-8741 if you have any questions as you review this report. On behalf of Lewis & Zimmerman Associates Inc., and the entire VE team, we hope our services have been informative and useful to the goal of value improvement on this project.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.

A handwritten signature in black ink, appearing to read 'David A. Hamilton', is written over a horizontal line.

David A. Hamilton, P.E., CVS, CCE, LEED™ AP  
Vice President  
Certified Value Specialist No. 910506 - Life

Enclosures

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## **EXECUTIVE SUMMARY**

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### **INTRODUCTION**

This value engineering (VE) study report summarizes the events and results of the VE study conducted by Lewis & Zimmerman Associates, Inc. (LZA) for the Georgia Department of Transportation (GDOT). The subject of the study was the SR 9 Widening and Reconstruction from SR 141 to SR 20 currently being designed by Kimley-Horn and Associates, Inc. (Kimley-Horn) for GDOT. This project includes major lane widening, turn lanes, signals, sidewalks, and curb and gutter along a three-mile segment of SR 9 located just south of the City of Cumming, Floyd County, Georgia. The current project total cost is \$52M, which includes \$18M in construction cost and \$34M in new right-of-way.

The study was conducted April 2 – 5, 2007 at the GDOT Central Office, Atlanta, Georgia, under the value engineering guidelines of GDOT, FHWA, and SAVE International. VE team members consisted of a Certified Value Specialist and design and construction professionals from local engineering consultants.

### **PURPOSE AND NEED**

The purpose of this project is to reduce congestion, improve safety, increase capacity, and upgrade substandard conditions along the SR 9 segment which is located immediately west of GA 400. To accomplish the project goals, the alignment will be reconstructed and a median and sidewalks will be added. A bicycle lane may be added to the project; a final decision is pending. The new four-lane section will improve the level of service (LOS) at the design year of 2032 from “F” to “D” in most locations along the corridor and improve safety while reducing accidents through access control gained with a new roadway median.

### **PROJECT DESCRIPTION**

Rapid growth in and around the City of Cumming is generating increasing volumes along SR 9 between SR 141 and SR 20. The intersection of SR 20 and SR 9 has become the primary commercial node serving residents of Forsyth County. This intersection is the location of four shopping centers. The development of this commercial area has contributed to the increasing traffic volumes along SR 9. The purpose of this project is to provide increased capacity along SR 9 from SR 141 to SR 20. Current volumes (AADT) on SR 9 are 19,500 in 2007 with design year projections of 37,500 in 2032. Eight existing intersections along the project length were analyzed under design year 2032 traffic conditions to determine laneage, storage lengths, and potential signalization needs and upgrades on Pendley Road, Piney Grove Road, Redi Road, Valley Hill Circle South, Valley Hill Circle North, Old Atlanta Road, Hutchinson, Road, and SR 20. As a result of the additional recommended laneage and phasing improvements, all signalized intersections were projected to operate at LOS D or better under Design Year 2032 traffic conditions.

Project STP-1336(11) consists of widening and reconstructing SR 9 (Atlanta Highway) from 1,000 feet north of SR 141 (Pendley Road) to SR 20 (Buford Highway) in Forsyth County, Georgia. The existing two lanes of SR 9 will be retained and reconstructed, except where horizontal and vertical geometry does not meet current design criteria. The proposed section will be two 12-ft. travel lanes in each direction separated by a 24-ft. raised median, with a 16-ft. shoulder on each side incorporating curb and gutter and a 5-ft. sidewalk. Horizontal and vertical geometry will meet a 45-mph design speed, and required right-of-way will be set at the shoulder break for a 104-ft. minimum. Bicycle lanes may be added to the project; a final decision is pending. A new traffic signal will be added at the intersection of SR 9 and Piney Grove Road.

Minor improvements will be made to the side roads on this project. Where appropriate, side road intersections will be revised to intersect SR 9 at or near 90 degrees. In addition, turn lanes, where necessary, will be added to the side roads to accommodate the projected traffic volumes. The reconstruction of side roads will typically require the acquisition of new right-of-way.

## **PROJECT COST AND SCHEDULE**

The current project cost estimate prepared by Kimley-Horn indicates the probable cost of construction to be \$18M, which includes all contractor markups for overhead, profit, and escalation. A total of \$34M in new right-of-way is required to accommodate the new wider section. Combined, the total project cost will be approximately \$50M depending upon the final decision on the need for a bike lane in the project.

Project planning anticipates that the project will be bid in 2012, with construction completion by 2014. The construction schedule duration for the project is anticipated to be approximately 24 months.

## **CONCERNS AND OBJECTIVES**

During the presentation by the representatives from the Kimley-Horn design team on the first day of the VE study, several areas of concern in the development of the project were noted. These items were identified as areas of opportunity to improve value, meet design requirements, satisfy goals, and reduce project risk.

- A decision to include bike lanes on the project is pending, and may substantially increase both construction and right-of-way costs.
- Traffic growth in the area has grown substantially over the years from 10,000 AADT in 1990 to projected vehicle counts of 37,000 AADT in the design year 2032.
- The existing lake located near Valley Circle Road is located very close to SR 9 and will necessitate due caution in the design of adjacent ditches and excavations. This area also has several existing drainage courses which must be maintained.
- Requirements for storm drainage have not been identified at this time, and storm retention basins have not been detailed.
- Some land should be included in the right-of-way budget for storm drainage improvements.
- The traffic counts reveal approximately 14% trucks in this corridor, which places emphasis upon maintaining the 12-ft. lanes and a reasonably sized median.

- Some unsuitable soils are known to exist under the pavement. These will need to be identified during future soil investigations and appropriate contingencies should be added to the project budget for removal and replacement of these materials.
- The heavy traffic along the corridor will require careful phasing of construction and may require the use of temporary pavement to ensure that two lanes are maintained throughout construction.

## **Project Constraints**

Discussions held during the VE study evolved around several key constraints that must be incorporated in the design:

- The present alignment of SR 9 includes substantial investment for the State and development over the years as fronted the roadway. Expansion necessitates the use of this asset and provides the lowest cost solution to meet higher traffic projections.
- An existing dam and lake located on the east side of SR 9 will require further investigation to ensure that these facilities are protected during construction.

## **RESULTS**

To address the concerns noted above, the VE team conducted a brainstorming session and identified ways to improve the value and constructability of the project.

A summary of the key recommendations includes:

### **Typical Section**

A total of 12 different road sections were investigated by the VE team for overall application on the SR 9 project. Each of the sections investigated would provide similar improvements in the LOS from “F” to “D” in the year 2032. These sections included both four- and six-lane facilities with and without bike facilities. The key variables included lane width of 11 ft. or 12 ft., median widths from 16 ft. to 24 ft., placement of bike lanes in traffic areas or shoulders, separate bike lanes or combinations of multi-use path widths, plus various distances of grass set-back distances. Each of the sections were evaluated and advantages/disadvantages listed so that appropriate perspectives were maintained for safety, LOS, accident reduction, pedestrian and bike friendliness and the ability to handle the relatively high truck counts. The VE team rated the typical sections with letter grades such as A, B, C, & D and distinguished the highest rated sections with A or B.

Since bike lanes may be added to the project, several sections are recommended for further analysis and investigation. The highest rated sections include the following.

- The Base-Bid or As-Designed section consists of 12-ft.-wide lanes, 24-ft. median and 5-ft. sidewalks, but no bike lane. It requires a total of 104 ft. of right-of-way with a total project cost of \$52M. This combination offers fair value, but the 24-ft. median drives the cost higher than other options, some of which include bike paths. For this reason, other solutions were sought.
- Alt. No. S-6 includes 12-ft. lanes, a 20-ft. median, and a 10-ft. multi-use path on one side. This section requires 101 ft. of right-of-way and has a total project cost of \$49M. This alternative offers good value but requires bikes to cross the road to reach the bike path.

- Alt. No. S-11 includes 12-ft. lanes, a 20-ft. median, and 8-ft. multi-use paths on both sides with narrower grass set-backs. This section requires a right-of-way of 100 ft. and a total project cost of \$45M. Alt. No. S-11 appears to offer excellent value while accommodating bicycles at the same time.

### **Alignment**

- Some optimization could be achieved by reducing the left-turn storage length on SR 9 going south at Pendley Road from 1,000 ft. to 700 ft.
- Other savings could be achieved by converting from an 8" x 30" curb and gutter section to an 8" x 24" Type 7 curb section.

### **Right-of-Way**

Safety along the corridor can be optimized by limiting the number of driveway entrances and streets fronting SR 9. Several of the side roads need to be modified by combining the roads before they reach SR 9. This may require additional right-of-way, but can definitely improve safety. Similarly, a number of parcels have multiple access points onto SR 9. These extra entries should be eliminated through a proactive program of access control.

### **Construction Management**

The project is early in the concept phase and optional phasing arrangements should be evaluated to optimize available construction funds on those areas of the alignment with the greatest need. In this light, the north and far south ends of the corridor have the highest traffic and appear to have many of the recent accidents. A phasing program that would construct these two ends of the project now and defer the other half of the funds later should be evaluated.

### **Risk Reduction**

Some project risks have been identified and stem primarily from the high cost of right-of-way along the corridor. Purchasing the needed land as soon as possible may mitigate some of the cost escalation that plagues highway projects. Consideration should be given to purchasing land for a full six-lane roadway section. Although this width may not be needed for 25 years, the investment may mitigate this escalation.

In summary, the current scope of work planned for the SR 9 corridor is very well conceived, but its value may be improved by incorporating some of the VE alternatives noted above. Additional details of these and other recommendations are contained in the report.



# SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: <b>SR 9 WIDENING FROM SR 141 TO SR 20</b> <i>Project No. STP-1336(11) Forsyth County, Georgia</i>		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
<b>TYPICAL SECTIONS (S)</b>		<i>(Capital + R/W Cost)</i>				<i>VE Team Rating</i>
<b><u>BASE</u></b>	As-designed section without bike lane, 12-ft. lanes, 24-ft. median, and 5-ft. sidewalks. - 104-ft. Total R/W	\$ 52M	<i>Base - As Designed Scheme</i>			B-
S-1	Add two 4-ft. bike lanes to the roadway	\$ 50,206,950	\$ 56,049,180	\$ (5,842,230)		C+
S-2	Provide for a 10-ft. multi-use trail on one shoulder in lieu of two 4-ft. bike path lanes	\$ 56,049,180	\$ 53,939,550	\$ 2,109,630		B+
S-3	Provide four 11-ft. travel lanes with a 10-ft. multi-use trail in lieu of two 4-ft. wide bike lanes	\$ 56,049,180	\$ 50,946,630	\$ 5,102,550		C
S-4	Use 12-ft. lanes with 24-ft. median and 8-ft. multi-use path on both sides	\$ 56,049,180	\$ 54,572,050	\$ 1,477,130		B+
S-5	Use 11-ft. lanes with a 20-ft. median and an 8-ft. multi-use path on both sides	\$ 56,049,180	\$ 48,303,280	\$ 7,745,900		C
S-6	Use 12-ft. lanes with 20-ft. median and a 10-ft. multi-use path one on side	\$ 56,049,180	\$ 49,122,570	\$ 6,926,610		B
S-7	Use 11-ft. lanes with 20-ft. median, 5-ft. sidewalks and a 10-ft. multi-use path on one side	\$ 56,049,180	\$ 45,970,680	\$ 10,078,500		C
S-8	Provide enough right-of-way for ultimate six-lane urban section	\$ 33,694,000	\$ 53,000,000	\$(19,306,000)		D
S-9	Section with 44-ft. median to provide enough right-of-way for ultimate six-lane urban section	\$ 33,694,000	\$ 53,000,000	\$(19,306,000)		D
S-11	Reduce the median to 16 ft.	\$ 50,206,950	\$ 44,747,940	\$ 5,459,010		A



# SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: <b>SR 9 WIDENING FROM SR 141 TO SR 20</b> <i>Project No. STP-1336(11) Forsyth County, Georgia</i>		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
S-12	Section with 12-ft. lanes, 16-ft. median, and 8-ft. multi-use paths on both sides	\$ 50,000,000	\$ 43,000,000	\$ 7,000,000		B
<b>ALIGNMENT (A)</b>						
A-2	Reduce the left-turn storage length on SR 9 going south at Pendly Road from 1,000 ft. to 700 ft.	\$ 66,666	\$ 46,666	\$ 20,000		\$ 20,000
A-4	Use 8" x 24" Type 7 curb and gutter in lieu of 8" x 30" curb in the medians	\$ 534,900	\$ 346,500	\$ 188,400		\$ 188,400
<b>TRAFFIC (T)</b>						
T-1	To maximize traffic flow, synchronize the traffic lights between North Old Atlanta Road and Buford Highway	DESIGN SUGGESTION				
<b>RIGHT-OF-WAY (RW)</b>						
RW-1	To improve safety, combine the two subdivision access roads at Piney Grove Road and the east side of SR 9	DESIGN SUGGESTION				
RW-2	To improve safety, combine Highland Gate Drive and Lexington Lane at Sta 45+00	DESIGN SUGGESTION				
RW-3	To control access, eliminate the four driveway entrances for the single parcel community north of Redi Road	DESIGN SUGGESTION				
RW-4	Combine two driveway entrances at Sta 35+00 and one driveway entrance opposite Holly Park Drive	DESIGN SUGGESTION				
RW-5	Identify possible locations for storm water detention ponds and new drainage facilities	DESIGN SUGGESTION				



# SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: <b>SR 9 WIDENING FROM SR 141 TO SR 20</b> <i>Project No. STP-1336(11) Forsyth County, Georgia</i>		PRESENT WORTH OF COST SAVINGS				
ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
<b>CONSTRUCTION MANAGEMENT (CM)</b>						
CM-1	Require contractor to recycle existing pavement					
CM-2	To minimize through traffic during construction on SR 9, detour traffic to GA 400 during construction					
CM-3	To minimize risk to the contractor, identify and negotiate temporary easements for contractor lay down areas					
CM-4	Split the project into two segments; build high priority segments now and defer the other for future funding allocations	\$ 51,855,287	\$ 20,742,115	\$ 31,113,172		<i>(Deferred to Future)</i>
CM-5	To minimize through traffic on SR 9 during construction, use Pendley and North Old Atlanta Roads as detours					
CM-6	To accommodate phasing, increase the cost estimate line item for traffic control from \$150,00 to \$500,000	\$ 150,000	\$ 500,000	\$ (350,000)		\$ (350,000)
<b>RISK REDUCTION (RR)</b>						
RR-1	Clarify the amount of unsuitable soils on site through a soil boring program; establish a budget line item					
RR-2	Project funds are limited. Consider phasing the project into multiple segments					
RR-3	Further investigate construction impacts around the dam site					
RR-4	Clarify that there are no other historic properties along the alignment					
RR-5	Clarify the impact of retaining walls along the alignment					



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## STUDY RESULTS

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### GENERAL

The results are the major feature of a VE study since they represent the benefits that can be realized on the project by GDOT, local patrons who use SR 9 between SR 141 and SR 20, and the Kimley-Horn design team.

The recommended engineering and construction management suggestions are presented as individual alternatives for specific change. These may be in the form of VE alternatives with cost savings or design suggestions without associated cost. Individual comments on the current design are presented with a summary of the original design, a description of the proposed enhancements to the chosen improvement scheme and, if appropriate, an evaluation of the advantages and disadvantages. Suggested alternatives are accompanied by a brief narrative to compare the original design and the proposed modifications. Sketches, where appropriate, are also presented.

Examples of improved value include improved constructability, ease of maintenance, minimization of risk, and less disruption of interstate operations during construction. Some ideas cannot be quantified in terms of cost with the design information provided; these are presented as design suggestions and are intended to improve the quality of the project.

The summaries of the more favorable improvements to the interchanges follow this narrative on the Summary of Potential Cost Savings table. The table is divided into major project elements and used to divide the results section. The complete documentation of the developed VE alternatives follows the Summary of Potential Cost Savings.

### RESULTS OF THE STUDY

The value engineering team brainstormed 37 ideas that could enhance the value of the project in the areas noted by GDOT as being desirable such as cost control, safety, durability, ease of operation, expected life, and traffic improvement. Evaluation of those ideas considered the full range of project value objectives and resulted in the development of a number of recommendations.

The alternatives are presented with the following designations to aid in organization and review.

CATEGORY	PREFIX
Typical Section	S
Alignment	A
Traffic	T
Right-of-Way	RW
Construction Management	CM
Risk Reduction	RR

## **EVALUATION OF ALTERNATIVES**

When reviewing the study results, the reader should consider each part of an alternative or design suggestion on its own merit. There may be a tendency to disregard an alternative because of concern about one part of it. Each area within an alternative that is acceptable should be considered for use in the final design, even if the entire alternative is not implemented. Design variations of these alternatives are encouraged.

Cost is a primary basis of comparison for alternative designs, but other project criteria must be considered also when selecting alternatives for further analysis. Negative impacts upon existing traffic is extremely critical, and design modifications that impact traffic, right-of-way, safety, or environmental elements should be selected carefully following detailed review.

The various alternatives are “mutually exclusive,” so acceptance of one may preclude the acceptance of another. Multiple solutions to a single function were sought. All alternatives or design suggestions were developed independently of each other. However, some of the alternatives are interrelated, so acceptance of one element may also be included in other alternatives. The reader should evaluate those alternatives carefully in order to select the combination of ideas with the greatest beneficial impact on the project.

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-1**

DESCRIPTION: **ADD TWO 4-FT. BIKE LANES TO THE ROADWAY**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:** (Sketch attached)

The original concept does not include 4-ft. bike lanes.

**ALTERNATIVE:** (Sketch attached)

Add two 4-ft. bike lanes to the roadway typical section.

**ADVANTAGES:**

- Provides facilities for bike travel

**DISADVANTAGES:**

- Increases construction cost
- Increases right-of-way (R/W) cost
- Reduces safety

**DISCUSSION:**

The local government (Forsyth County) and the State Bicycle Coordinator are proposing bike facilities along SR 9 in Forsyth County. Therefore, bike lanes will be proposed on this project for implementation.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 50,206,950	—	\$ 50,206,950
ALTERNATIVE	\$ 56,049,180	—	\$ 56,049,180
SAVINGS (Original minus Alternative)	\$ (5,842,230)	—	\$ (5,842,230)

# CALCULATIONS



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
 Project No. STP-1336(11) Forsyth County, Georgia

ALTERNATIVE NO.: **S-1**

## CROSS-SECTIONS

SHEET NO.: **2 of 4**

Additional

- Cost to add 4' Bike Lane in each Direction
- Pavement: for 12.5mm  $\left[ (.125' \times 8' \times (3 \times 5,280)') \times .076 \frac{T}{CF} \right] =$   
 $\Rightarrow 12.5mm = 1204 \text{ tons} \times \$115/T = \$138,500$
- 19mm:  $\left[ (.167' \times 8' \times 3 \text{ mi} \times 5,280'/\text{mi}) \times .076 \frac{T}{CF} \right] =$   
 $\Rightarrow 19mm = 1610 \text{ tons} \times \$100/T = \$161,000$
- 25mm:  $\left[ (.333' \times 8' \times 3 \text{ mi} \times 5,280'/\text{mi}) \times .076 \frac{T}{CF} \right] =$   
 $\Rightarrow 25mm = 3,212 \text{ Tons} \times \$90/T = \$289,100$
- GAB 12"  $\left[ 1' \times 8' \times 3 \text{ mi} \times 5,280'/\text{mi} \times .076 \frac{T}{CF} \right] =$   
 $\Rightarrow \text{GAB: } 9,632 \text{ tons} \times \$25/T = \$241,000$

Subtotal Pavement = \$414,670

Clear & Grubbing:  $\frac{(8' \times 3 \text{ mi} \times 5,280')}{43560 \text{ SF/AC}} = 3 \text{ AC} \times \frac{\$8,000}{\text{AC}} = \$24,000$

Earthwork:  $(.140 \times \$3,250,000) =$   
 $\uparrow$  14% of total earthwork = \$455,000

Drainage: Longer X-Drains  
 (400' x \$45/LF) = \$18,000

Erosion Control/Sign & Striping/etc.  
 (\$500,000 x 14%) = \$70,000

\$981,670  
 + 10% = \$98,330

① Const. lost for 8' (Bike Lanes) → \$1,080,000

Total Project Construction: \$16,513,250 = \$17,593,250

# CALCULATIONS



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
 Project No. STP-1336(11) Forsyth County, Georgia

ALTERNATIVE NO.: **S-1**

## Cross-sections

SHEET NO.: **3 of 4**

Additional R/W cost for two 4' Bike Lanes

$$R/W (8' \times 3 \text{ mi} \times 5,280'_{\text{mi}}) \times \$10.83_{\text{SF}} = \$1,372,400$$

$$\text{Cost Wt. Avg. / SF} \left[ (.27 \times \$20.66_{\text{SF}}) + (.54 \times \$8.43) + (.19 \times \$3.67) \right] = \$10.83_{\text{SF}}$$

$$\text{Net Cost } \$1,372,400 \times (3.47) = \$4,762,230 \leftarrow$$

(Sch. Cont. + Adm/Cont. + Infl. Factor)

Initial (as designed): \$16,513,250

Additional Constr: \$1,080,000

Initial R/W (as designed): \$33,693,700

Additional R/W Cost: \$4,762,230

Alternate Total Cost: \$56,049,180

(Includes Bike Lanes in Roadway)

Original Cost (as designed) \$16,513,250 Constr.

\$33,693,700 R/W

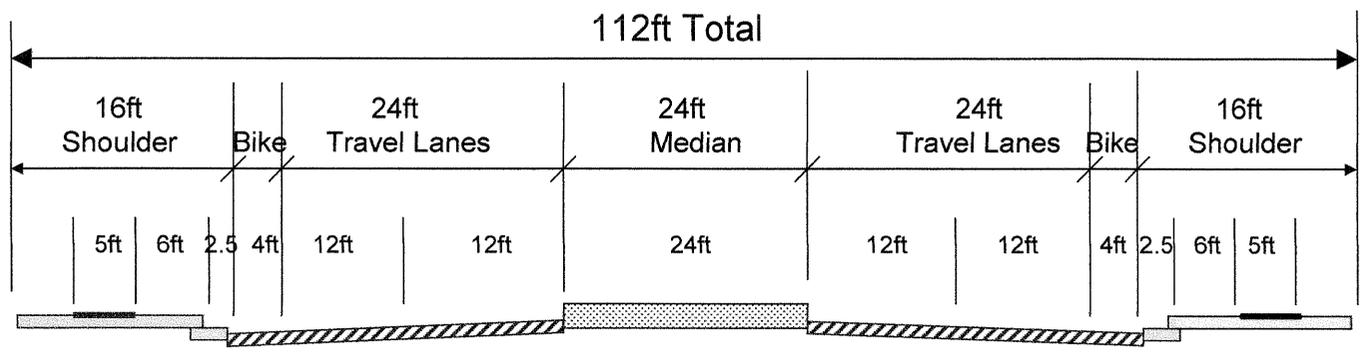
\$50,206,950

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: S-1

AS DESIGNED     ALTERNATIVE

SHEET NO.: **4 of 4**



AS-DESIGNED TYPICAL SECTION  
(w/Bike Lane)

VE ALTERNATIVE - SECTION

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-2**

DESCRIPTION: **PROVIDE A 10-FT. MULTI-USE TRAIL ON ONE SHOULDER IN LIEU OF TWO 4-FT. BIKE PATH LANES**

SHEET NO.: **1 of 5**

**ORIGINAL DESIGN:** (Sketch attached)

The original typical section incorporates the 4-ft. bike lanes in the roadway travel lanes portion.

**ALTERNATIVE:** (Sketch attached)

Provide a 10-ft. multi-use trail on one shoulder in lieu of using two 4-ft. bike lanes.

**ADVANTAGES:**

- Separates bicycles from the vehicle traffic
- Reduces construction cost
- Reduces R/W cost

**DISADVANTAGES:**

- Combines bike and pedestrian traffic
- Requires bikes to cross roadway

**DISCUSSION:**

The 10-ft. multi-use trail would replace the two 4-ft. bike lanes, requiring less additional R/W and reducing the pavement section (7.5 in. vs. 2 in.) of asphalt concrete.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 56,049,180	—	\$ 56,049,180
ALTERNATIVE	\$ 53,939,550	—	\$ 53,939,550
SAVINGS (Original minus Alternative)	\$ 2,109,630	—	\$ 2,109,630

# CALCULATIONS



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
 Project No. STP-1336(11) Forsyth County, Georgia

ALTERNATIVE NO.: **S-2**

SHEET NO.: **2 of 5**

CONSTR. COST:

10' multi-use trail: 2" ASPH CONC, 4" GAB  
 $(.167' \times 10' \times 3 \text{ mi} \times 5,280' / \text{mi} \times .076 \frac{\text{T}}{\text{CF}}) = 2,010 \text{ tons (12.5 mm)}$

4" GAB  $(.333' \times 10' \times 3 \text{ mi} \times 5,280' \times .076 \frac{\text{T}}{\text{CF}}) = 4,012 \text{ tons}$

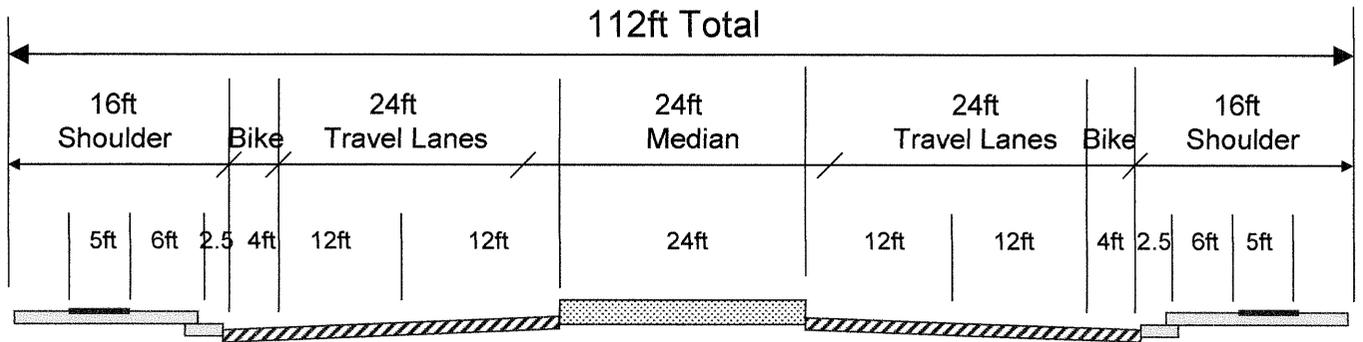
R/W net cost:  $(5' \times 3 \text{ mi} \times 5,280' / \text{mi}) = 79,200 \text{ S.F.}$

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

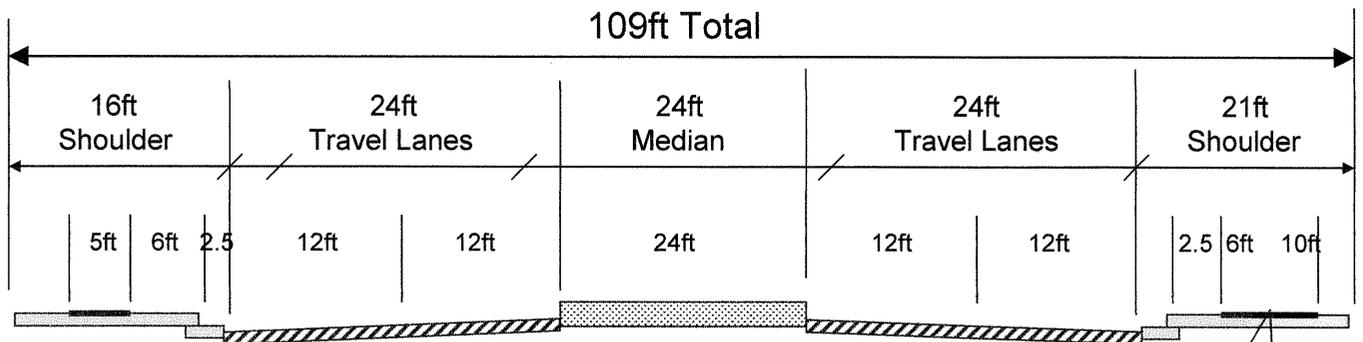
ALTERNATIVE NO.: **S-2**

AS DESIGNED     ALTERNATIVE

SHEET NO.: **3 of 5**



**AS-DESIGNED TYPICAL SECTION**  
(w/Bike Lane)



**ALTERNATIVE S-2 - TYPICAL SECTION**  
(w/Multi-Use Path)

**21 ft**  
Shoulder  
with 10ft  
wide Multi-  
Use Path

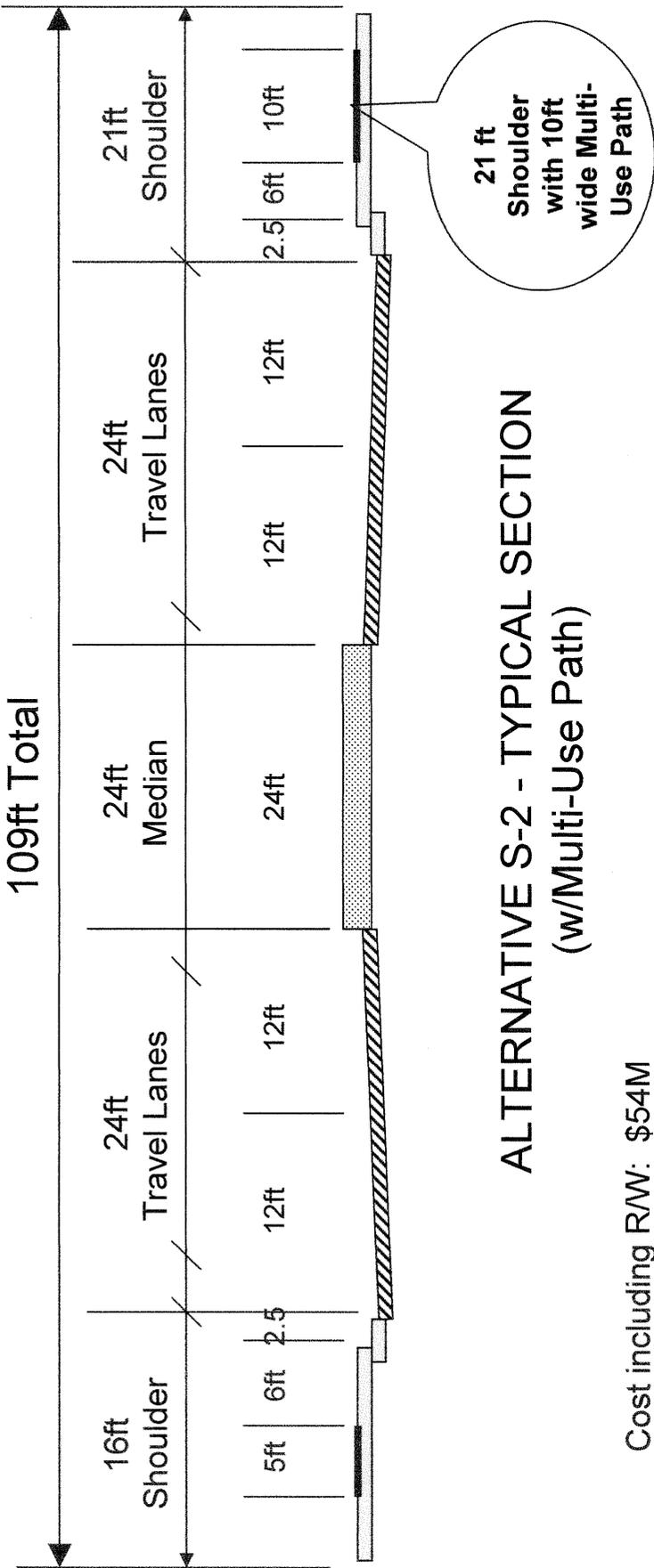
# COST WORKSHEET



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20** ALTERNATIVE NO.: *5-2*  
 Project No. *STP-1336(11) Forsyth County, Georgia*  
 DESCRIPTION: **IDEA DESCRIPTION (abbreviate if necessary to fit)** SHEET NO.: *4 of 5*  
*For using 10' multi-use Trail vs. 4' Bike Lanes*

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
<i>10' multi-Trail</i>							
12.5mm (2")	tons				2,010	115	231,150
GAB (4")	tons				4,012	25	100,300
Clear & Grub	AC				1.82	8000	14,600
EARTHwork	8.8%				.088	3,250,000	286,000
DRAINage	LF				250	45	11,250
EROS. Control/signetc	8.8%				.088	500,000	44,000
Add R/W	SF				79,200	10.83	857,800
<i>4' Bike Lane</i>							
12.5mm (1 1/2")	tons	1,204	\$115	138,500			
19mm (2")	tons	1,610	\$100	161,000			
25mm (4")	tons	3,212	\$90	289,100			
GAB (12")	tons	9,632	\$25	241,000			
Clear & Grub	AC	3	\$8,000	24,000			
EARTHwork	(14%)	.14	3,250,000	455,000			
DRAINage	LF	400	\$45	18,000			
EROS. Control/sign/etc.	(14%)	.14	\$500,000	70,000			
Add R/W	SF	126,720	10.83	1,372,400			
Const. Subtotal				981,670	Const. Subt		687,300
R/W Subtotal				1,372,400			857,800
Markup (%) at 10% Const				98,330			68,730
markup 2.4% <del>TOTAL</del> R/W				3,389,830			2,118,870

TOTAL \$584,230 \$3,732,600  
 Original Cost: \$50,206,950 \$50,206,950  
\$56,049,180 \$53,939,550



**ALTERNATIVE S-2 - TYPICAL SECTION**  
(w/Multi-Use Path)

Cost including RW: \$54M

Advantages:

- One bike lane
- 24ft median
- 12ft lanes

Disadvantages:

None apparent

VE TEAM OVERALL RATING: B+

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-3**

DESCRIPTION: **PROVIDE FOUR 11-FT. TRAVEL LANES WITH A 10-FT. MULTI-USE TRAIL IN LIEU OF TWO 4-FT. WIDE BIKE LANES**

SHEET NO.: **1 of 5**

**ORIGINAL DESIGN:** (Sketch attached)

The original typical section has four 12-ft. travel lanes with two 4-ft. wide bike lanes.

**ALTERNATIVE:** (Sketch attached)

Provide four 11-ft. travel lanes with a 10-ft. multi-use trail in lieu of two 4-ft. wide bike lanes.

**ADVANTAGES:**

- Reduces construction costs
- Reduces R/W costs

**DISADVANTAGES:**

- 11-ft. lane could affect safety aspect
- Requires two-way bike traffic on multi-use trail

**DISCUSSION:**

This proposal would reduce the construction cost and R/W by saving 4 ft. of full depth pavement. Even though 11-ft. lanes are less desirable than 12-ft. lanes, there have been other projects that have used 11-ft. lanes for less cost and less impact.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 56,049,180	—	\$ 56,049,180
ALTERNATIVE	\$ 50,946,630	—	\$ 50,946,630
SAVINGS (Original minus Alternative)	\$ 5,102,550	—	\$ 5,102,550

# CALCULATIONS



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
 Project No. STP-1336(11) Forsyth County, Georgia

ALTERNATIVE NO.: **53**

SHEET NO.: **2 of 5**

Bikes w/ 10' multi-use trail —  
 ‡ (4-11' travel lanes.)

SAVINGS:  $\sqrt{4' \times 3 \text{ mi} \times 5,280' / \text{mi} \times .125' \times .076 \frac{T}{CF}} = 602 \text{ tons (12.5' min)}$

Asph.  $\sqrt{4' \times 3 \text{ mi} \times 5,280' / \text{mi} \times .167' \times .076} = 804 \text{ tons (19' min)}$

CONC.  $\sqrt{4' \times 3 \text{ mi} \times 5,280' / \text{mi} \times .333' \times .076} = 1,606 \text{ tons (25' min)}$

GAB 12"  $(63,360 \text{ SF} \times 1' \times .076 \frac{T}{CF}) = 4,816 \text{ tons GAB}$

SAVE

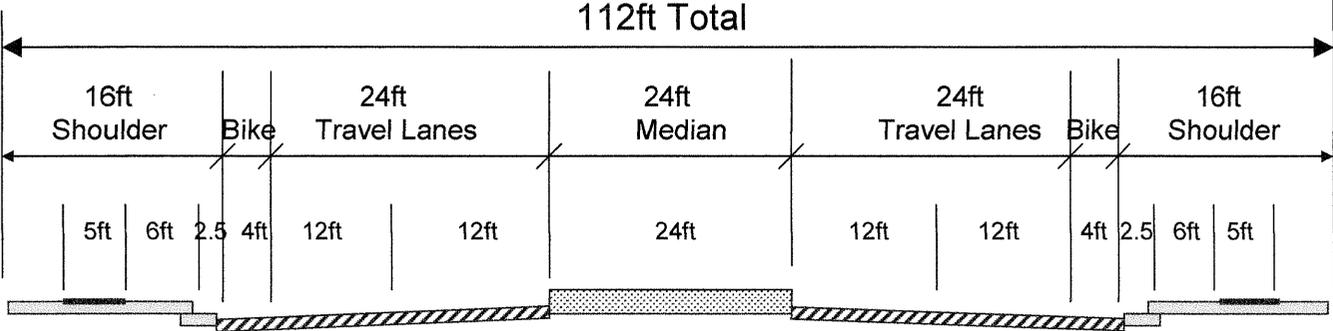
R/W: 63,360 SF

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

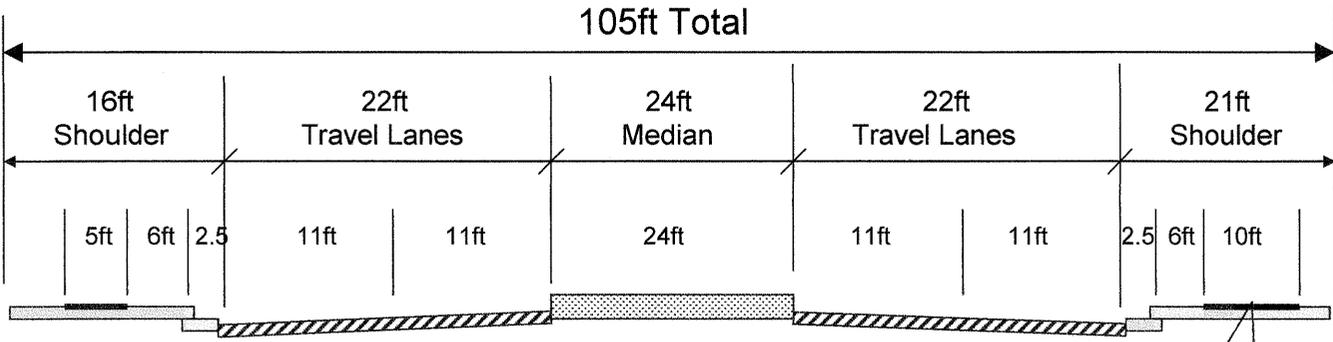
ALTERNATIVE NO.: S-3

AS DESIGNED     ALTERNATIVE

SHEET NO.: **3 of 5**



AS-DESIGNED TYPICAL SECTION  
 (w/Bike Lane)



ALTERNATIVE S-3 - TYPICAL SECTION  
 (11ft lanes w/10ft wide Multi-Use Path)

21 ft  
 Shoulder  
 with 10ft  
 wide Multi-  
 Use Path

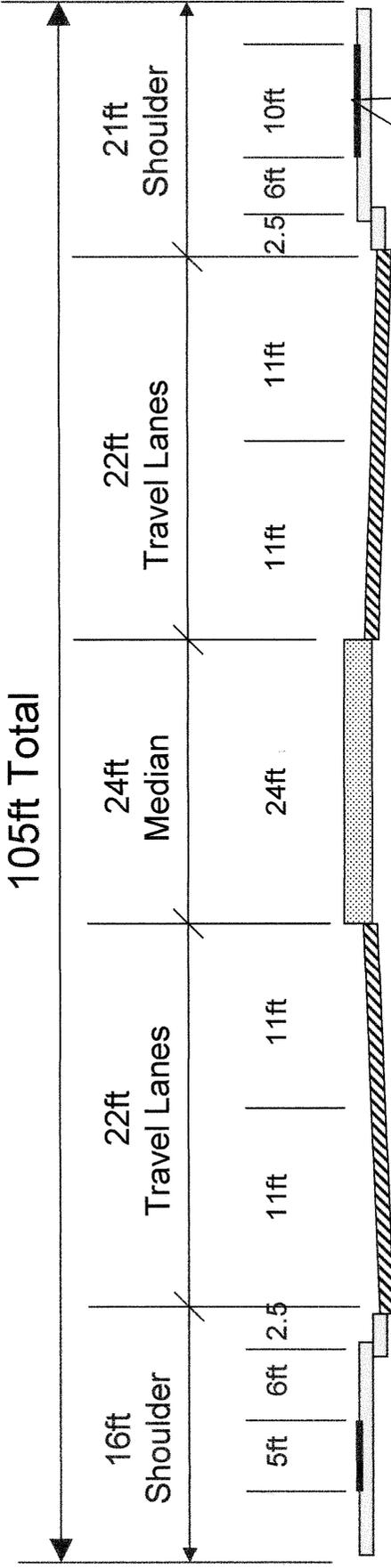
# COST WORKSHEET

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20** ALTERNATIVE NO.: **53**  
 Project No. *STP-1336(11) Forsyth County, Georgia*  
 DESCRIPTION: **IDEA DESCRIPTION (abbreviate if necessary to fit)** *four - 11' Lanes & 10' multi-use trail* SHEET NO.: **4 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
<i>Savings 11' Lanes</i>							
<i>12.5 mm</i>	<i>tons</i>				<i>602</i>	<i>115</i>	<i>69,230</i>
<i>19 mm</i>	<i>tons</i>				<i>804</i>	<i>100</i>	<i>80,400</i>
<i>25 mm</i>	<i>tons</i>				<i>1,606</i>	<i>90</i>	<i>144,540</i>
<i>GAB 12"</i>	<i>tons</i>				<i>4,816</i>	<i>25</i>	<i>120,400</i>
<i>Earthwork</i>	<i>3.5%</i>				<i>.035</i>	<i>3,250,000</i>	<i>113,750</i>
<i>Drainage</i>	<i>LF</i>				<i>100</i>	<i>45</i>	<i>4,500</i>
<i>Eros. Control/sign/etc.</i>	<i>3.5%</i>				<i>.035</i>	<i>500,000</i>	<i>17,500</i>
<i>Clear. &amp; Grubbing</i>	<i>AC</i>				<i>.75</i>	<i>8,000</i>	<i>6,000</i>
<i>SAVING R/W</i>					<i>63,360</i>	<i>10.83</i>	<i>686,190</i>
<i>Savings of 10' multi-use trail over 4' Bike Lanes</i>							
<i>see alt. 2</i>							
<i>CONSTR SAVINGS</i>							<i>294,370</i>
<i>R/W Savings</i>							<i>514,600</i>
<i>constl. subtotal</i>							<i>850,690</i>
<i>R/W Subtotal</i>							<i>1,200,790</i>
<i>Markup (%) at 10% constl.</i>							<i>85,070</i>
<i>markup 2.47 TOTAL R/W</i>							<i>2,966,000</i>

*total Savings: \$ 5,102,550*

63 5/5



**ALTERNATIVE S-3 - TYPICAL SECTION**  
 (11ft lanes w/10ft wide Multi-Use Path)

Cost including RW: \$51M

Advantages:

- Lower cost
- 24ft median
- Includes 10ft Multi-Use Path

Disadvantages:

- 11ft lanes

VE TEAM OVERALL RATING: C

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-4**

DESCRIPTION: **USE 12-FT. LANES WITH 24-FT. MEDIAN AND AN 8-FT. MULTI-USE PATH ON BOTH SIDES**

SHEET NO.: **1 of 5**

**ORIGINAL DESIGN:** (Sketch attached)

Present typical sections would use 4-ft. bike lanes.

**ALTERNATIVE:** (Sketch attached)

Use two 8-ft. multi-use trails (one in each direction) in lieu of 5-ft. sidewalks and 4-ft. bike lanes.

**ADVANTAGES:**

- Reduces construction costs
- Reduces R/W costs

**DISADVANTAGES:**

- Mixes users on multi-use trail bikes and pedestrians

**DISCUSSION:**

Move the bicycle traffic from the roadway by using an 8-ft. multi-use trail on each side in lieu of 4-ft. bike lanes.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 56,049,180	—	\$ 56,049,180
ALTERNATIVE	\$ 54,572,050	—	\$ 54,572,050
SAVINGS (Original minus Alternative)	\$ 1,477,130	—	\$ 1,477,130

# CALCULATIONS



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
Project No. STP-1336(11) Forsyth County, Georgia

ALTERNATIVE NO.: 5-4

SHEET NO.: 2 of 5

19' shoulder vs. (16' shoulder w  
4' Bike Lanes)

For cost increase the Present cost estimate  
for 3' extra on each shoulder.

5' sidewalk vs. 8' sidewalk  
(10' total) (16' total)  
extra: sidewalk  $\frac{6' \times 3 \text{ mi} \times 5,280' / \text{mi}}{9} = 10,560 \text{ SF}$

+ R/W =  $6' \times 3 \text{ mi} \times 5,280' / \text{mi} = 95,040 \text{ SF}$

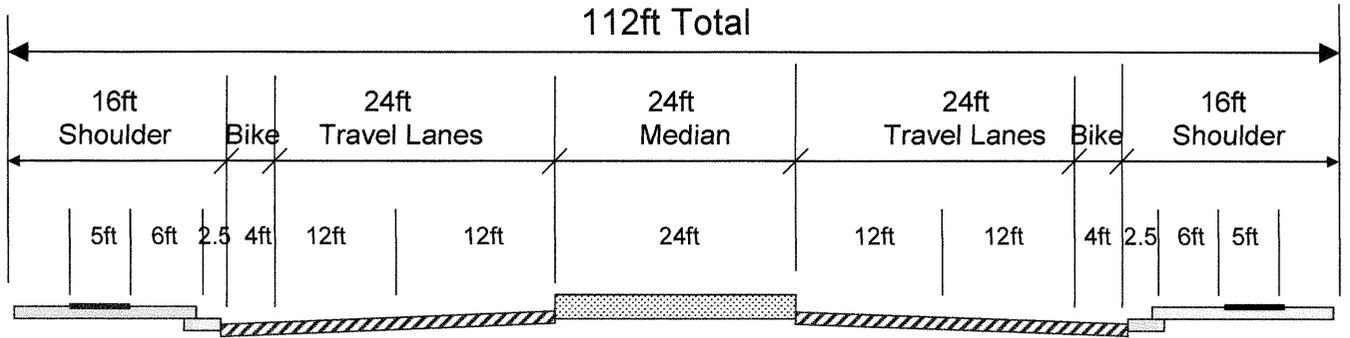


PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

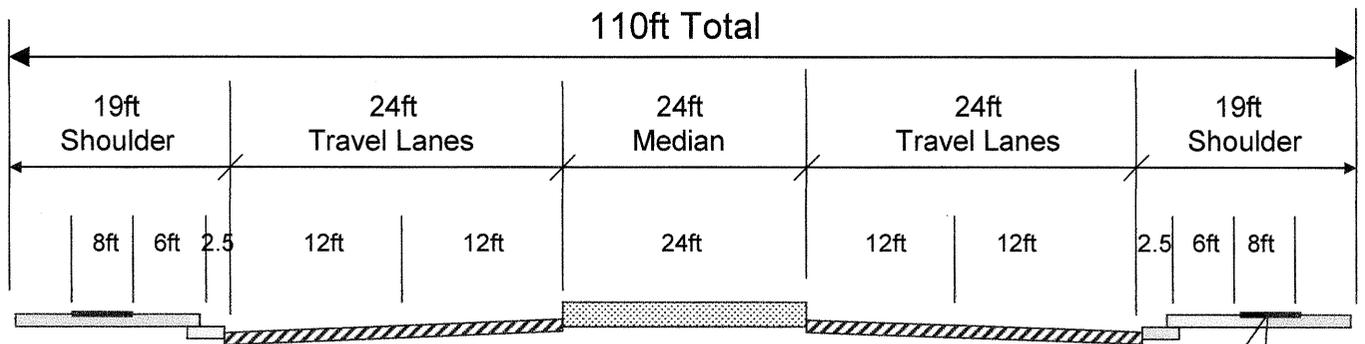
ALTERNATIVE NO.: **S-4**

AS DESIGNED     ALTERNATIVE

SHEET NO.: **3 of 5**



**AS-DESIGNED TYPICAL SECTION**  
 (w/Bike Lane)



**ALTERNATIVE S-4**  
 (w/8ft Wide Sidewalks)

8ft wide  
 Multi-Use  
 Trail both  
 sides

# COST WORKSHEET



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
 Project No. STP-1336(11) Forsyth County, Georgia

ALTERNATIVE NO.: **5-4**

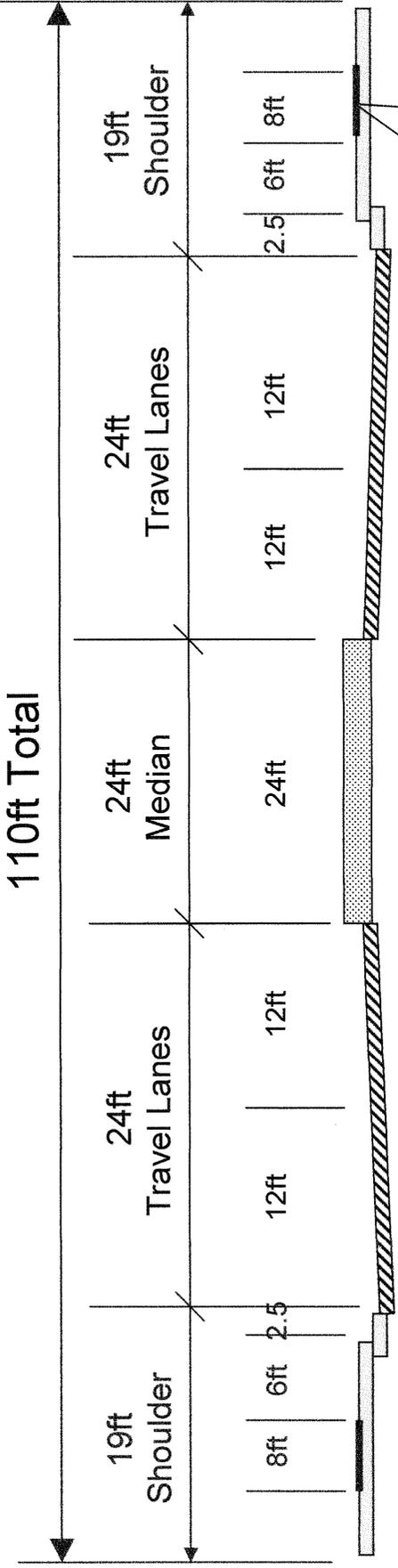
DESCRIPTION: **IDEA DESCRIPTION (abbreviate if necessary to fit)**

SHEET NO.: **4 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
increase for							
19' shldes with 8' sidewalks/							
multi-use trail for Bikes							
6' extra							
sidewalks	S.Y.				10,560	\$30	316,800
clear & grub	AC.				2	\$8,000	16,000
Earthwork	10%				.10	3,250,000	325,000
Drainage	LF				300	45	13,500
Eros, Contol, Sign. Etc.	10%				.10	500,000	50,000
EXTRA R/W	SF				95,040	10.83	1,029,300
Consto. subtotal							721,300
R/W Subtotal							1,029,300
Markup (%) at 10% Consto.							72,130
Markup 2.47% TOTAL R/W							2,542,370

Total

extra for 19' shldes  
 & 8' sidewalks + \$4,365,100  
 Original Cost = \$50,200,950  
 Alternate = \$54,572,050



8ft wide Multi-Use Trail both sides

**ALTERNATIVE S-4**  
(w/8ft Wide Sidewalks)

Cost including R/W: \$55M

Advantages:

- 24ft median
- 12 ft lanes

Disadvantages:

None apparent

VE TEAM OVERALL RATING: B+

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-5**

DESCRIPTION: **USE 11-FT. LANES WITH A 20-FT. MEDIAN AND AN 8-FT. MULTI-USE PATH ON BOTH SIDES**

SHEET NO.: **1 of 5**

**ORIGINAL DESIGN:** (Sketch attached)

The original typical section would use a 24-ft. median, 12-ft. lanes and 4-ft. bike lanes.

**ALTERNATIVE:** (Sketch attached)

Use a typical section with a 20-ft. median, 11-ft. lanes and 8-ft. sidewalks with a multi-use trail.

**ADVANTAGES:**

- Reduces construction costs
- Reduces R/W costs
- Moves bikes out of vehicle traffic

**DISADVANTAGES:**

- Mixes pedestrian and bike traffic
- Narrows lanes and median operation

**DISCUSSION:**

This saves costs by utilizing 11-ft. lanes and a 20-ft. median, which has been done previously. Also utilizes two 8-ft. trails for pedestrians and bikes.

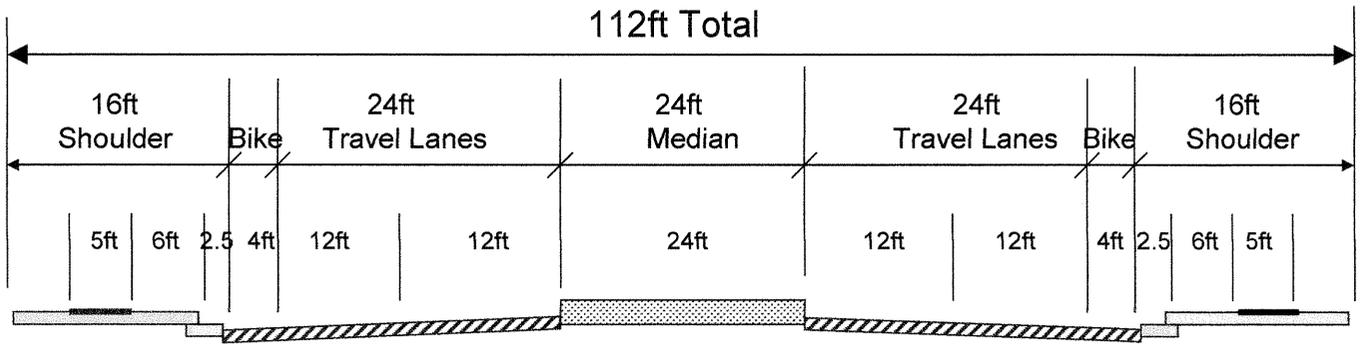
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 56,049,180	—	\$ 56,049,180
ALTERNATIVE	\$ 48,303,280	—	\$ 48,303,280
SAVINGS (Original minus Alternative)	\$ 7,745,900	—	\$ 7,745,900

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

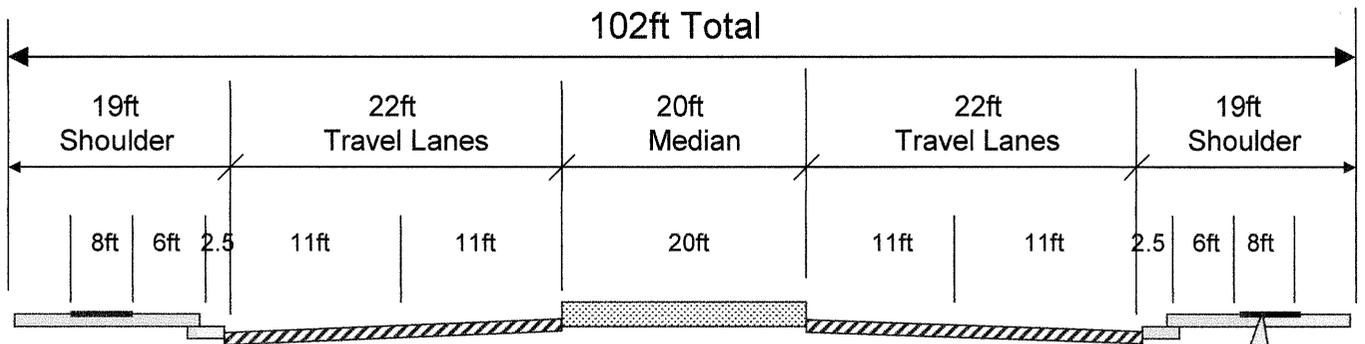
ALTERNATIVE NO.: **S-5**

AS DESIGNED     ALTERNATIVE

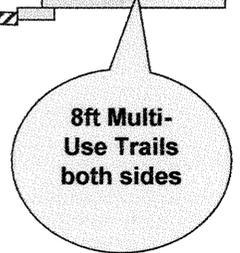
SHEET NO.: **2 of 5**



**AS-DESIGNED TYPICAL SECTION**  
 (w/Bike Lane)



**VE ALTERNATIVE S-5**  
 (w/11ft Lanes, 20ft Median, and 8ft Multi-Use Trails)



# COST WORKSHEET

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: *55*

DESCRIPTION: **IDEA DESCRIPTION (abbreviate if necessary to fit)**

SHEET NO.: **3** of **5**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
<u>SAVINGS</u>							
Const.							(700,730)
Markup 10%							(70,080)
Const. Subtotal							(770,810)
SAVE R/W							(1,372,380)
Markup 2.47							(3,389,780)
SAVE R/W Subtotal							(4,762,160)
Increase							
Const.							+ 721,300
Markup 10%							+ 72,130
Const. Subtotal							+ 793,430
Increase R/W							+ 1,029,280
Markup 2.47							+ 2,542,320
							+ 3,571,600
Const. Subtotal (already markup)							+ 22,620
R/W Subtotal							(6,190,560)
<del>Markup (%) at</del>							
<b>TOTAL</b>							SAVINGS (1,167,940)

Original Concept. \$50,206,950

TOTAL \$48,039,010

# COST WORKSHEET



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
 Project No. STP-1336(11) Forsyth County, Georgia

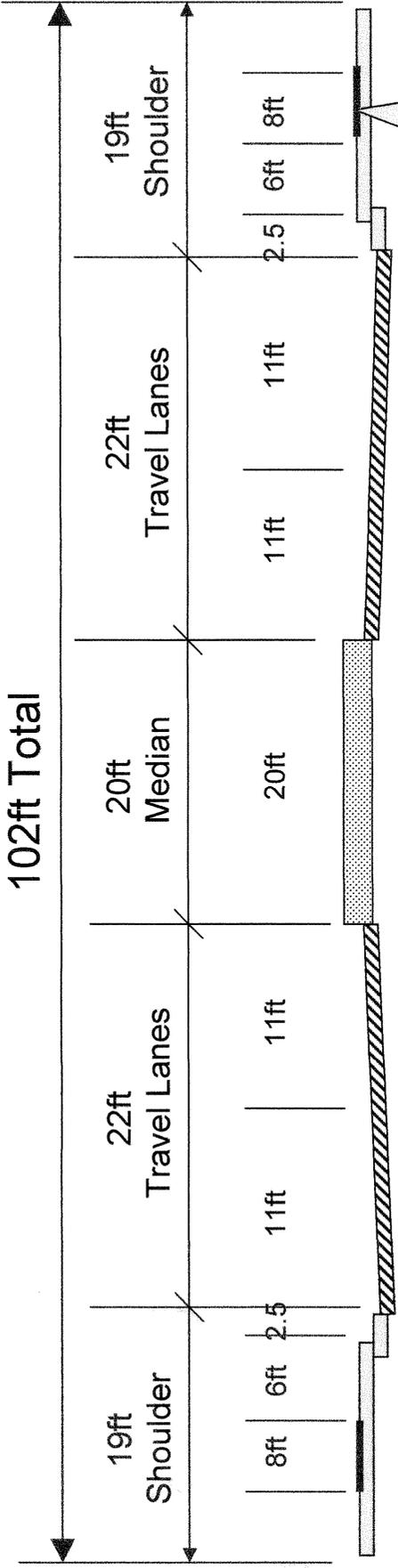
ALTERNATIVE NO.: **5-5**

DESCRIPTION: **IDEA DESCRIPTION (abbreviate if necessary to fit)**

SHEET NO.: **4 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
SAOC 8'w/ 11' Lanes & 20' med.							
12.5mm					602	115	69,230
19mm					804	100	80,400
25mm					1606	90	144,450
GAB					4816	25	120,400
Earthwork		% of total					223,750
Drainage					100	45	4,500
Clear & Grubbing/EROS control/sign/etc.							58,000
SAOC 4' Pavement		net constr. decrease					(700,730)
SAOC R/W					126,710	10.83	(1,372,380)
INCREASE TO ORIGINAL COST w/o Bike lanes for 19' shoulders & 8' sidewalks/Trail (+3)							
6' extra							
Sidewalks	S.Y.				10,560	30 +	316,800
Clear & Grub	AC				2	8000 +	16,000
Earthwork	10%				.10	3,325,000 +	325,000
Drainage	LF				300	45 +	13,500
Eros Control/sign/etc.	.10				.10	500,000 +	50,000
19' shldr		net constr. increase					+ 721,300
EXTRA R/W	SF				95,040	10.83 +	1,029,280
				STEP 15 R			
<b>Subtotal</b>							
<b>Markup (%) at</b>							
<b>TOTAL</b>							

S-5  
5/5



**VE ALTERNATIVE S-5**  
 (w/11ft Lanes, 20ft Median, and 8ft Multi-Use Trails)

Cost including RW: \$48M

Advantages:

Lower cost

Disadvantages:

11ft lanes

20ft median

VE TEAM OVERALL RATING: C

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-6**

DESCRIPTION: **USE 12-FT. LANES WITH 20-FT. MEDIAN AND A 10-FT. MULTI-USE PATH ON ONE SIDE**

SHEET NO.: **1 of 5**

**ORIGINAL DESIGN:** (Sketch attached)

The original typical section proposes a 24-ft. median, 16-ft. shoulders, and 4-ft. bike lanes.

**ALTERNATIVE:** (Sketch attached)

Narrow the median to 20 ft. and reduce one shoulder to 12 ft. with a 5-ft. sidewalk. The other would be 21 ft. with a 10-ft. multi-use trail.

**ADVANTAGES:**

- Reduces costs
- Moves bicycles out of roadway
- Pedestrian would have option of not sharing path with bikes

**DISADVANTAGES:**

- Narrows median, affecting traffic operation and possibly safety
- Mixes pedestrian with bike traffic

**DISCUSSION:**

This typical section would reduce the project cost by reducing the R/W cost enough to “pay” for the multi-use trail.

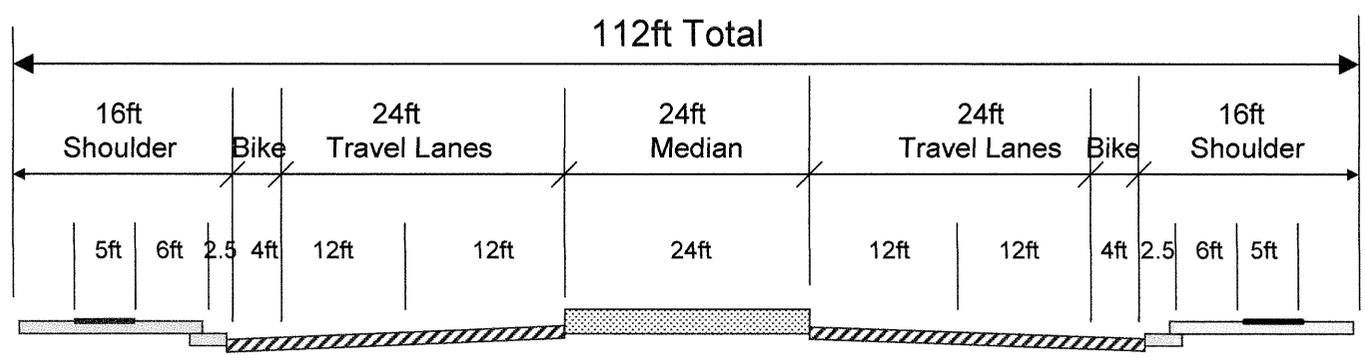
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 56,049,180	—	\$ 56,049,180
ALTERNATIVE	\$ 49,122,570	—	\$ 49,122,570
SAVINGS (Original minus Alternative)	\$ 6,926,610	—	\$ 6,926,610

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

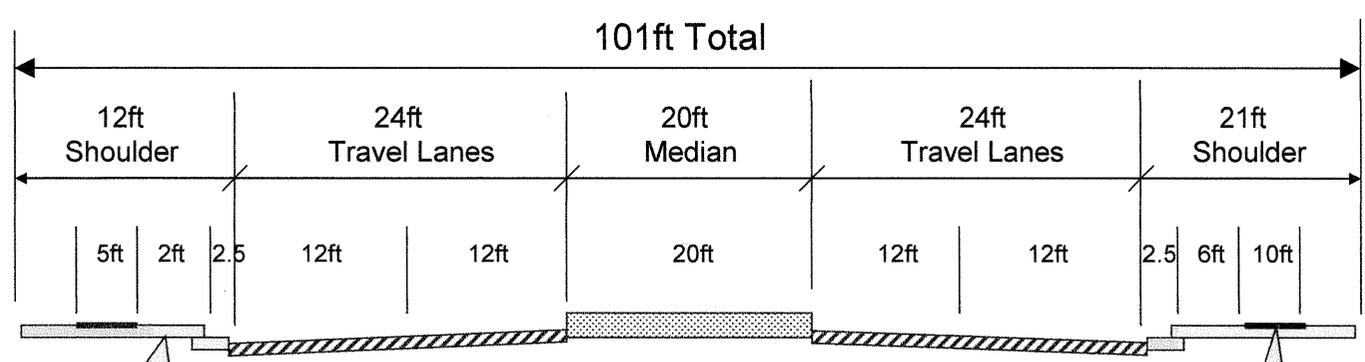
ALTERNATIVE NO.: **S-6**

AS DESIGNED     ALTERNATIVE

SHEET NO.: **2 of 5**



**AS-DESIGNED TYPICAL SECTION**  
 (w/Bike Lane)



5ft Sidewalk & 2ft Grass Off-set

**VE ALTERNATIVE S-6**  
 (w/12ft Lanes, 20ft Median, and 5ft Sidewalk & 10ft Multi-Use Trail)

10ft Multi-Use Trail

# COST WORKSHEET

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20** ALTERNATIVE NO.: **5-6**  
 Project No. STP-1336(11) Forsyth County, Georgia  
 DESCRIPTION: **IDEA DESCRIPTION (abbreviate if necessary to fit)** SHEET NO.: **3 of 5**  
*Reduce median to 20' and one 12' shoulder for sidewalk*

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
<i>Savings Reduce med to 20' (4')</i>							
<i>SAVE Pavement thru intersections</i>							
Earthwork	% of total						(30,000)
DRAINAGE	LF				100	45	(4,500)
Erosion Control/sign, etc.	% of total						(17,500)
CLEAR & Grubb	AC				1	8000	(8,000)
<i>SAVE on 12' vs 16' shoulder</i>							
<i>4' (savings)</i>							
Earthwork							(213,750)
DRAINAGE					100	45	(4,500)
Erosion Control/sign, etc.	% of total						(17,500)
CLEAR & Grubb					1	8000	(8,000)
<i>subtotal Constr. Savings</i>							(517,500)
<i>Increase for 10' multi-use TRAIL</i>							
12.5 mm	tons				2010	115	231,150
GIAB 4"	tons				4012	25	100,300
CLEAR & Grubby	AC				1.82	8000	14,600
Earthwork	% of total						286,000
DRAINAGE	LF				250	45	11,250
Eros Control/sign/etc.	% of total						44,000
							+ 687,300
<b>Subtotal</b>							
<b>Markup (%) at</b>							
<b>TOTAL</b>							

# COST WORKSHEET

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20** ALTERNATIVE NO.: **36**  
*Project No. STP-1336(11) Forsyth County, Georgia*

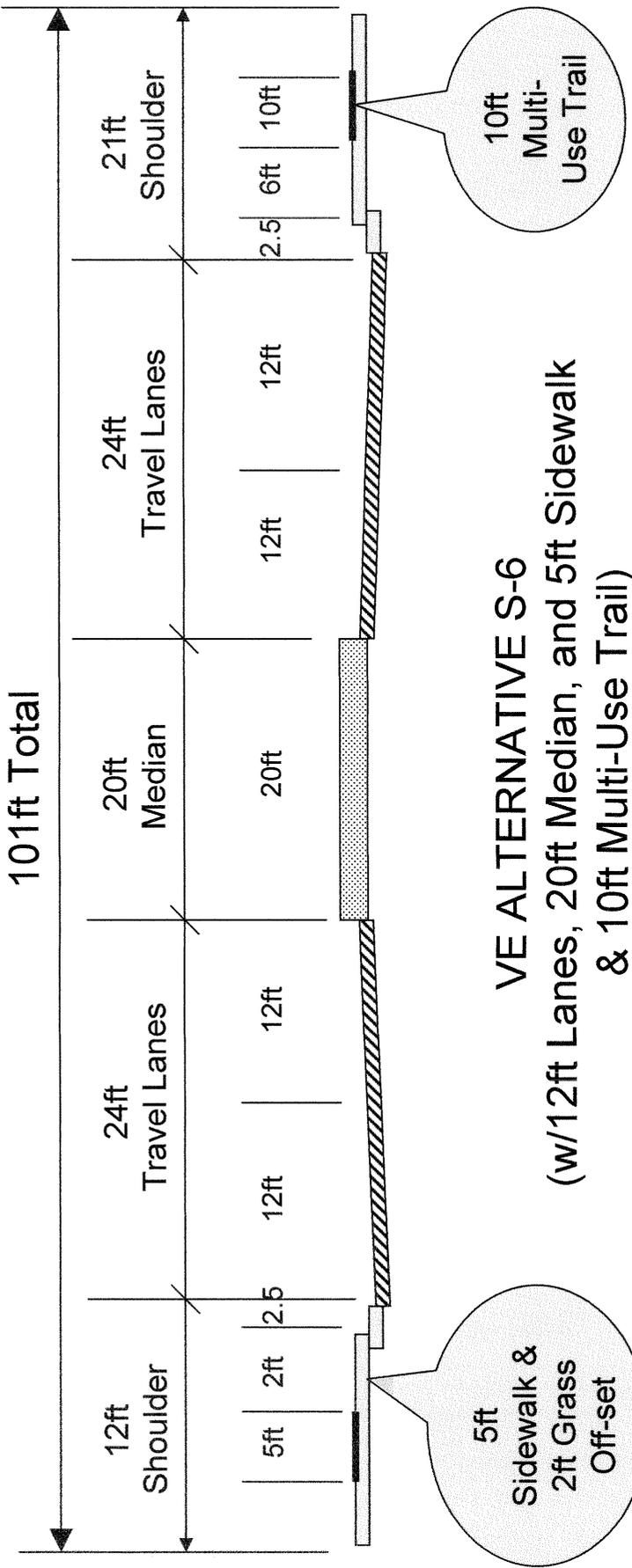
DESCRIPTION: **IDEA DESCRIPTION (abbreviate if necessary to fit)** SHEET NO.: **4 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
SAVINGS -							
Const. R.							(517,500)
Markup 10%							(51,750)
SAVINGS Const. R. Subtotal =							(569,250)
Increase for 10' multi use Trail							
Const. R.							687,300
Markup 10%							68,730
Increase Const. R. Subtotal =							+ 756,030
SAVING 3' of R/W from Concept Original (8'-5')=3'							
R/W					47,500	10.83	514,640
Const. (Already markup)							+ 186,780
R/W Subtotal							- (514,640)
Markup (%) at 2.47 R/W							- (1,271,160)
<b>TOTAL</b>							- (1,084,380)

(w/o Bike) Concept Original Cost: 50,206,950

Total **49,122,570**

ALT. S-6  
5/5



**VE ALTERNATIVE S-6**  
(w/12ft Lanes, 20ft Median, and 5ft Sidewalk & 10ft Multi-Use Trail)

Cost including RW: \$49M

Advantages:

12ft lanes

Disadvantages:

20ft median

VE TEAM OVERALL RATING: B

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-7**

DESCRIPTION: **USE 11-FT. LANES WITH 20-FT. MEDIAN, 5-FT. SIDEWALKS  
 AND A 10-FT. MULTI-USE PATH ON ONE SIDE**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:** (Sketch attached)

The original typical section with bike lanes proposes 12-ft. lanes, 4-ft. bike lanes, and 16-ft. shoulders.

**ALTERNATIVE:** (Sketch attached)

Reduce the travel lanes to 11 ft., the median to 20 ft., and one shoulder to 12 ft., and increase one shoulder to 21 ft. for a multi-use trail.

**ADVANTAGES:**

- Reduces construction costs
- Reduces R/W costs

**DISADVANTAGES:**

- Adversely affects traffic operations with 11-ft. lanes

**DISCUSSION:**

This has the greatest savings due to reducing the full depth pavement by 12 ft. (two 4-ft. bike lanes) and using four 11-ft. traffic lanes.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 56,049,180	—	\$ 56,049,180
ALTERNATIVE	\$ 45,970,680	—	\$ 45,970,680
SAVINGS (Original minus Alternative)	\$ 10,078,500	—	\$ 10,078,500

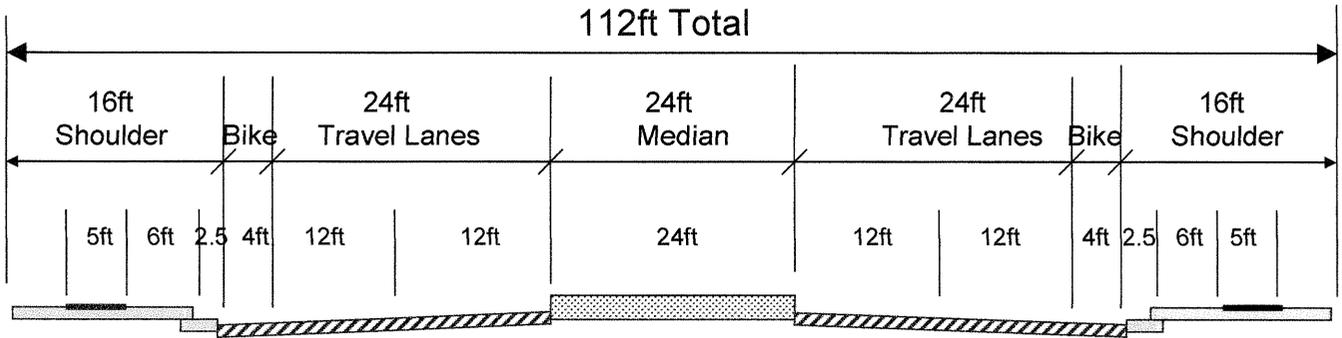


PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia.*

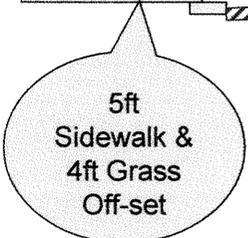
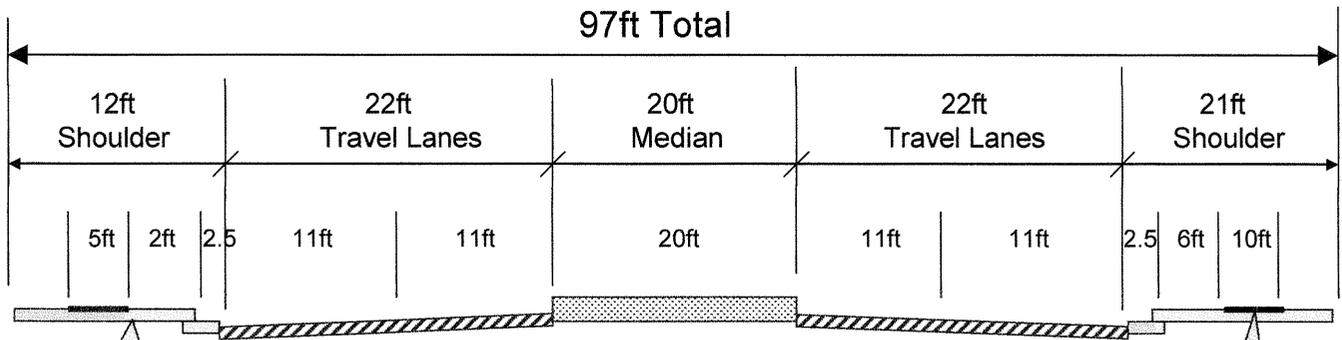
ALTERNATIVE NO.: S-7

AS DESIGNED     ALTERNATIVE

SHEET NO.: 2 of 4



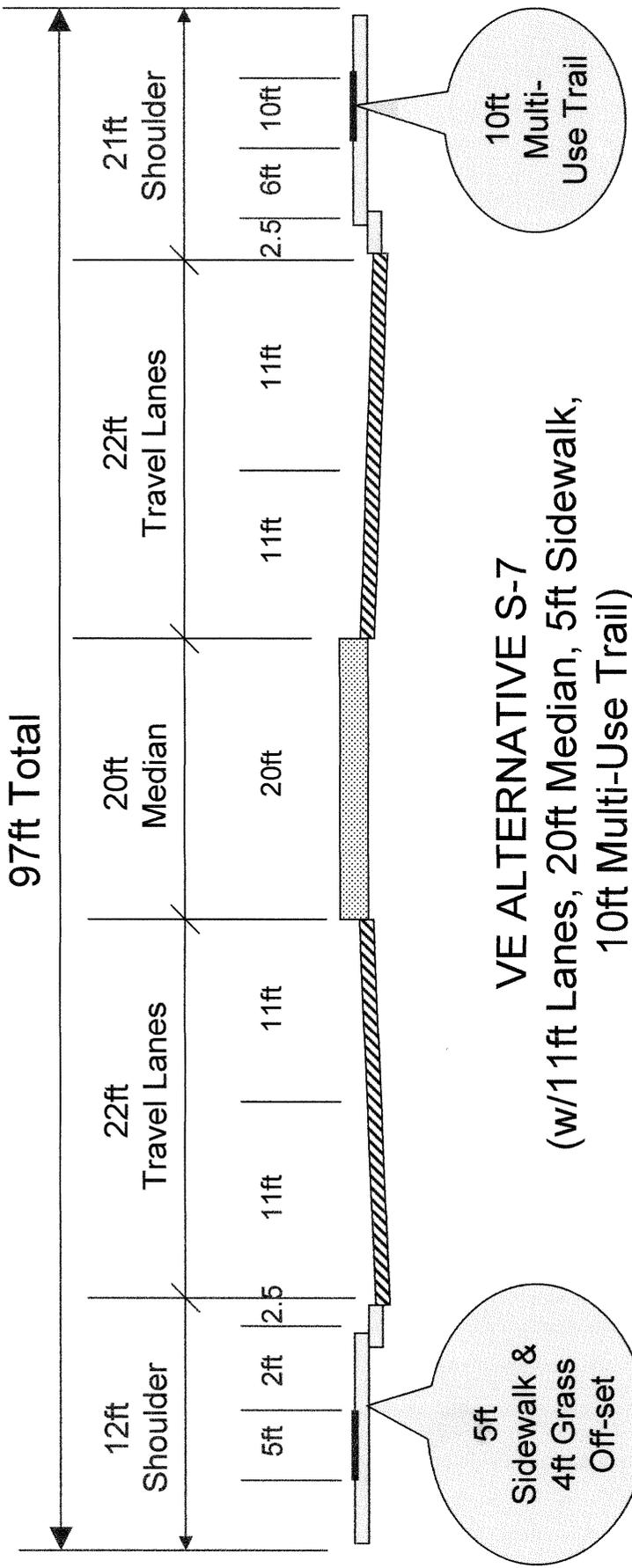
**AS-DESIGNED TYPICAL SECTION**  
 (w/Bike Lane)



**VE ALTERNATIVE S-7**  
 (w/11ft Lanes, 20ft Median, 5ft Sidewalk,  
 10ft Multi-Use Trail)







Cost including RW: \$46M

Advantages:

- Less RW
- Only 97ft total section width

Disadvantages:

- 11ft lanes
- 20ft median

VE TEAM OVERALL RATING: C

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-8**

DESCRIPTION: **PROVIDE ENOUGH RIGHT-OF-WAY FOR ULTIMATE SIX-LANE URBAN SECTION**

SHEET NO.: **1 of 5**

**ORIGINAL DESIGN:** (Sketch attached)

The original typical section proposes a four-lane urban section with a 24-ft. median and 16-ft. shoulders with a 104-ft. R/W. If two 4-ft. bike lanes are added, the R/W would be 112 ft.

**ALTERNATIVE:** (Sketch attached)

This proposes 132 ft. of R/W (minimum) to build a four-lane roadway on a six-lane urban section R/W width.

**ADVANTAGES:**

- Reduces construction cost with no outside longitudinal drainage system
- Facilitates the work to six-lane in the future
- Could save on acquiring R/W now instead of in the future

**DISADVANTAGES:**

- Increases R/W cost

**DISCUSSION:**

This proposes a rural four-lane section with a ditch. The extra R/W for the ditch would provide enough R/W for a future six-lane project with urban designers.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 33,694,000	—	\$ 33,694,000
ALTERNATIVE	\$ 53,000,000	—	\$ 53,000,000
SAVINGS (Original minus Alternative)	\$ (19,306,000)	—	\$ (19,306,000)

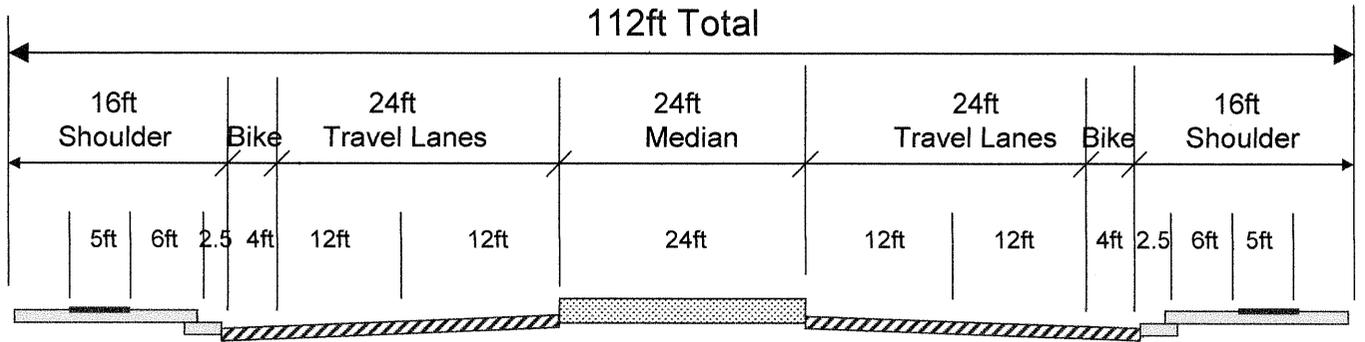


PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

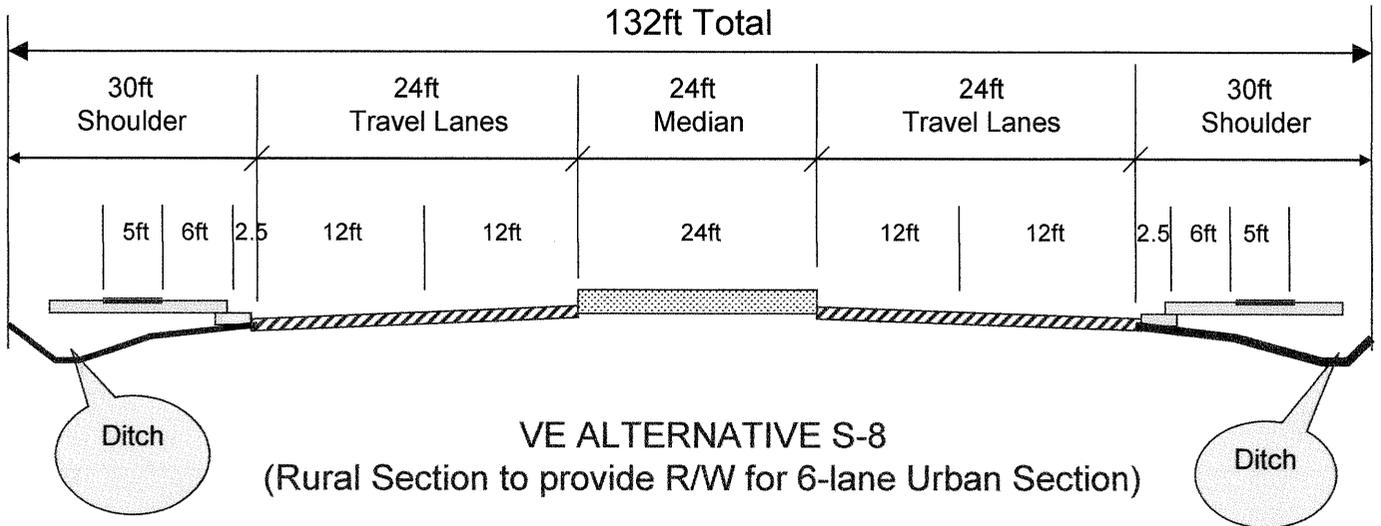
ALTERNATIVE NO.: **S-8**

AS DESIGNED     ALTERNATIVE

SHEET NO.: **2 of 5**



AS-DESIGNED TYPICAL SECTION  
 (w/Bike Lane)



VE ALTERNATIVE S-8  
 (Rural Section to provide R/W for 6-lane Urban Section)

# CALCULATIONS



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.:

S-8

SHEET NO.:

3 of 5

$$RW: 8' \times 3 \text{ mi} \times 5,280' / \text{mi} = 126,720 \text{ SF}$$

# COST WORKSHEET



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

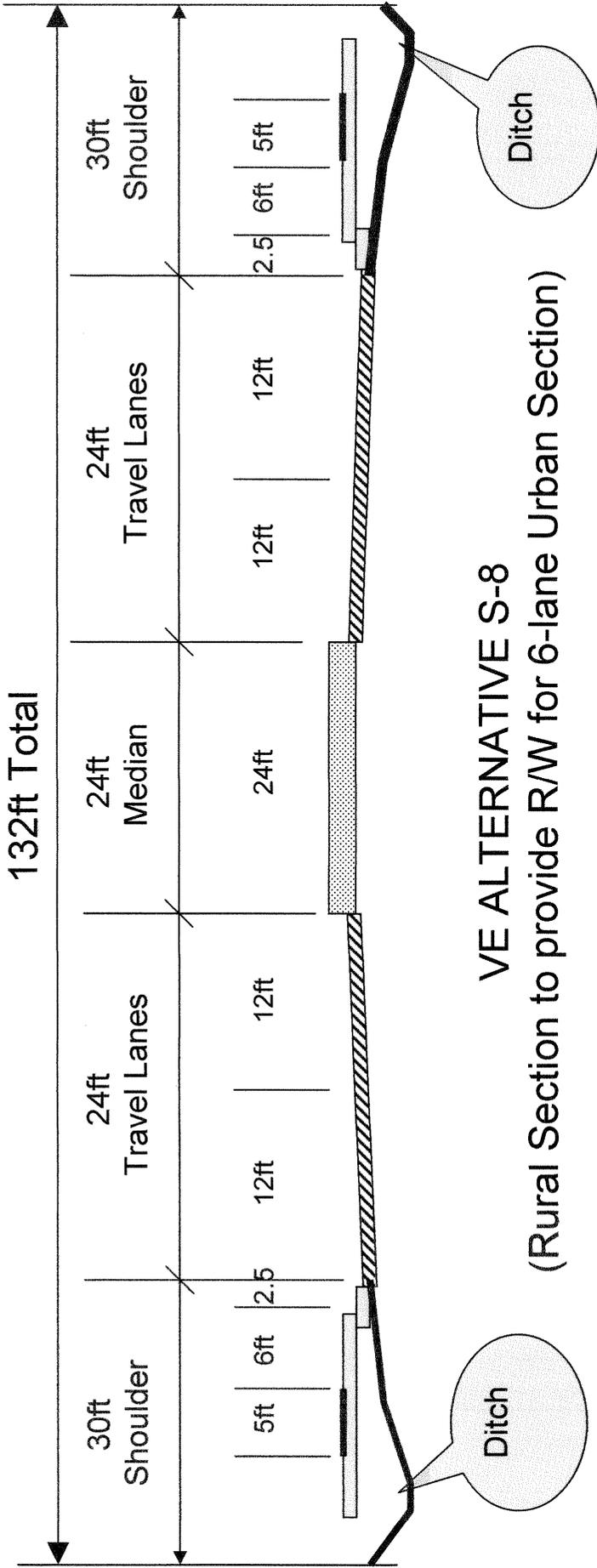
ALTERNATIVE NO.: **S-8**

DESCRIPTION: **IDEA DESCRIPTION (abbreviate if necessary to fit)**

SHEET NO.: **4 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
Concept Typical w/o Bikes R/W (from DOT)				33,693,700 (incl. markup)			33,693,700 (incl. markup)
Additional R/W SF 228'					10,83		4,803,320
Improvements Reloc. Damages						3,000,000	
						\$ 7,803,320	
				(markup 2.47)		\$ 19,274,200	
<b>R/W Subtotal</b>				33,694,000			53,000,000
<b>Markup (%) at</b>							
<b>TOTAL</b>							

ALT. S-8  
5/5



**VE ALTERNATIVE S-8**  
(Rural Section to provide R/W for 6-lane Urban Section)

Cost including R/W: \$53M

Advantages:

- 24ft median
- 12ft lanes
- Reduces future R/W cost

Disadvantages:

- Needs more R/W, some business damages
- Ditch maintenance
- Very wide section

VE TEAM OVERALL RATING: D

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-9**

DESCRIPTION: **SECTION WITH 44-FT. MEDIAN TO PROVIDE ENOUGH  
 RIGHT-OF-WAY FOR ULTIMATE SIX-LANE URBAN  
 SECTION**

SHEET NO.: **1 of 3**

**ORIGINAL DESIGN:** (Sketch attached)

The original typical section proposes a four-lane urban section with a 24-ft. median and 16-ft. shoulders with a 104-ft. R/W. If two 4-ft. bike lanes are added, the R/W would be 112 ft.

**ALTERNATIVE:** (Sketch attached)

This proposes 132 ft. of R/W (minimum) to build a four-lane roadway on a six-lane urban section R/W width.

**ADVANTAGES:**

- Wider median would provide a safer facility
- Could save on acquiring R/W now instead of later

**DISADVANTAGES:**

- Increases R/W cost

**DISCUSSION:**

This proposes to build a four-lane urban section (on the outside) with curb and gutter and have a 44-ft. depressed grass median for extra width to expand the road to six lanes with a 20-ft. median in the future. The extra R/W for the ditch would provide enough R/W for a future six-lane project with urban designers.

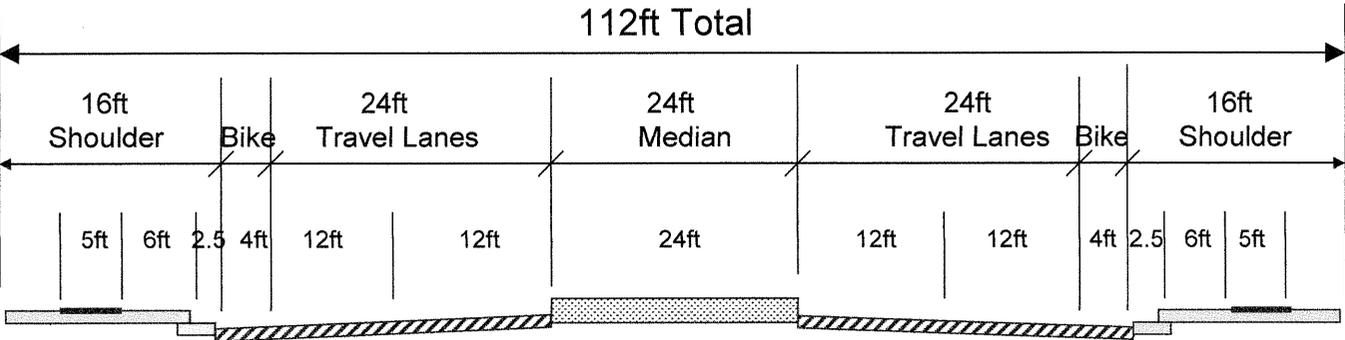
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 33,694,000	—	\$ 33,694,000
ALTERNATIVE	\$ 53,000,000	—	\$ 53,000,000
SAVINGS (Original minus Alternative)	\$ (19,306,000)	—	\$ (19,306,000)

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

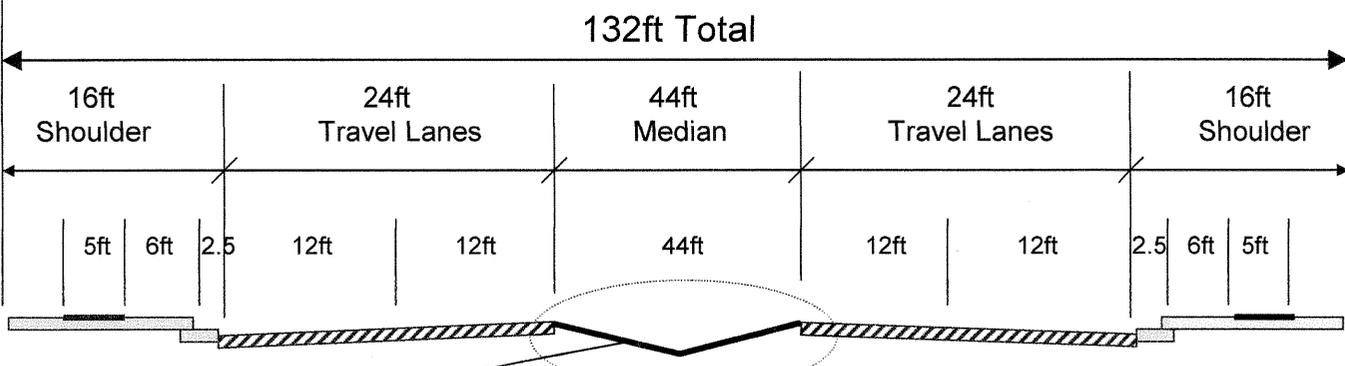
ALTERNATIVE NO.: **S-9**

AS DESIGNED     ALTERNATIVE

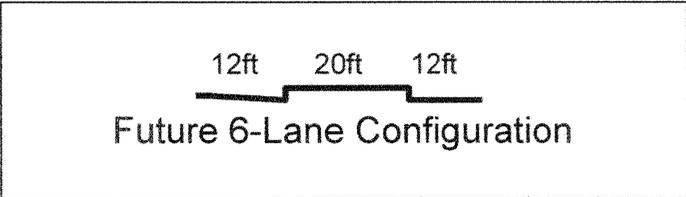
SHEET NO.: **2 of 3**



AS-DESIGNED TYPICAL SECTION  
(w/Bike Lane)

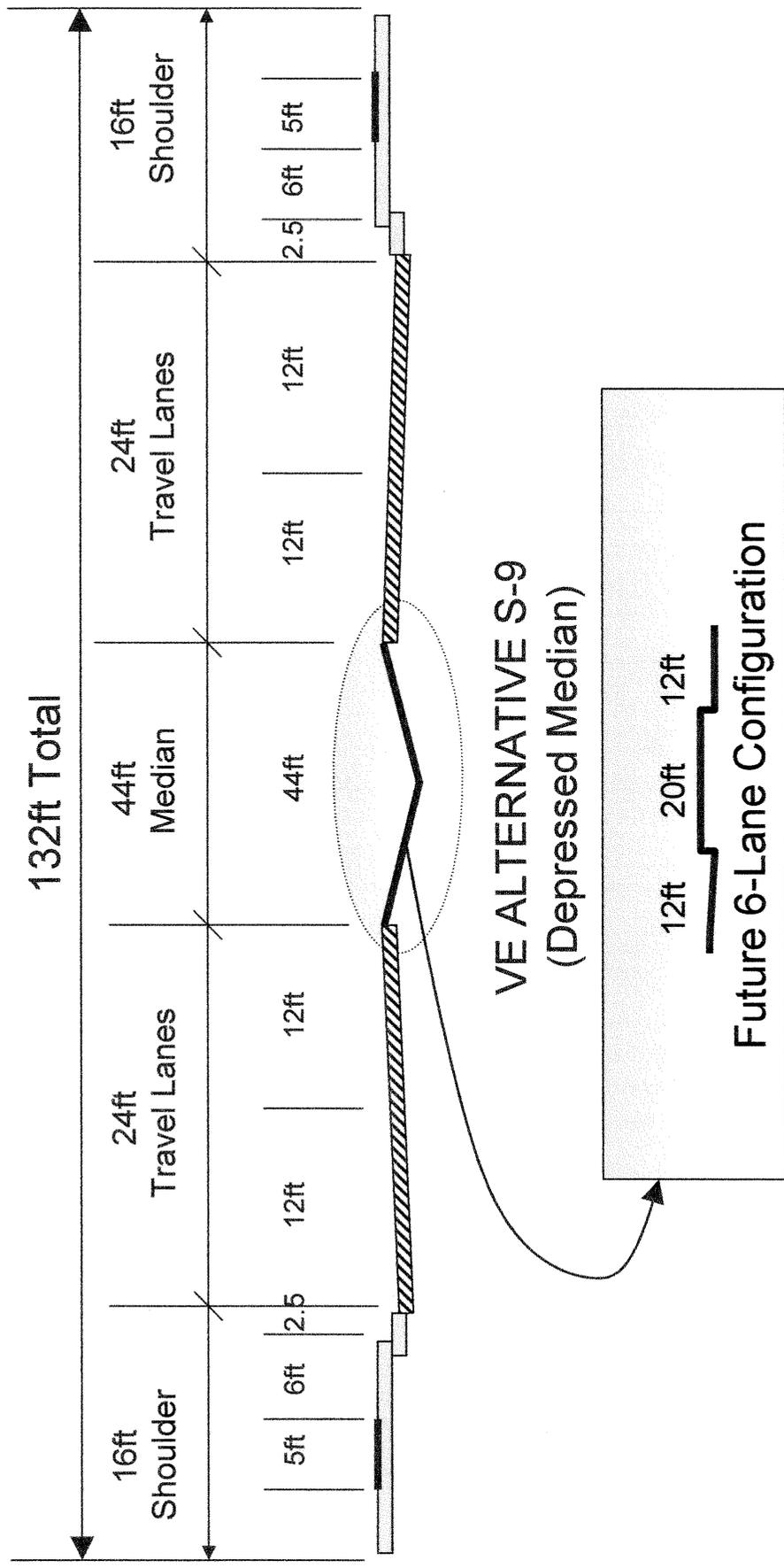


VE ALTERNATIVE S-9  
(Depressed Median)

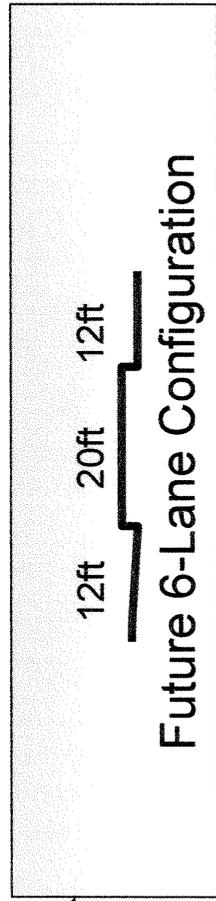


Alt. S-9

3/3



VE ALTERNATIVE S-9  
(Depressed Median)



Cost including RW: \$53M

Advantages:

- 44ft median expands to 6 lanes
- 12ft lanes
- Reduces future RW cost

Disadvantages:

- Needs more RW, some business damages
- Very wide section

VE TEAM OVERALL RATING: D

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-11**

DESCRIPTION: **REDUCE THE MEDIAN TO 16 FT.**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:** (Sketch attached)

The existing typical section proposes a 24-ft. median.

**ALTERNATIVE:** (Sketch attached)

Reduce the median to 16 ft.

**ADVANTAGES:**

- Reduces construction costs
- Reduces R/W costs

**DISADVANTAGES:**

- Affects traffic operation with reduced median width

**DISCUSSION:**

This would reduce the proposed 24 ft. median to 16 ft., which would meet the required R/W by 8 ft. This could be a substantial cost saving since the R/W is the most expensive item for the project.

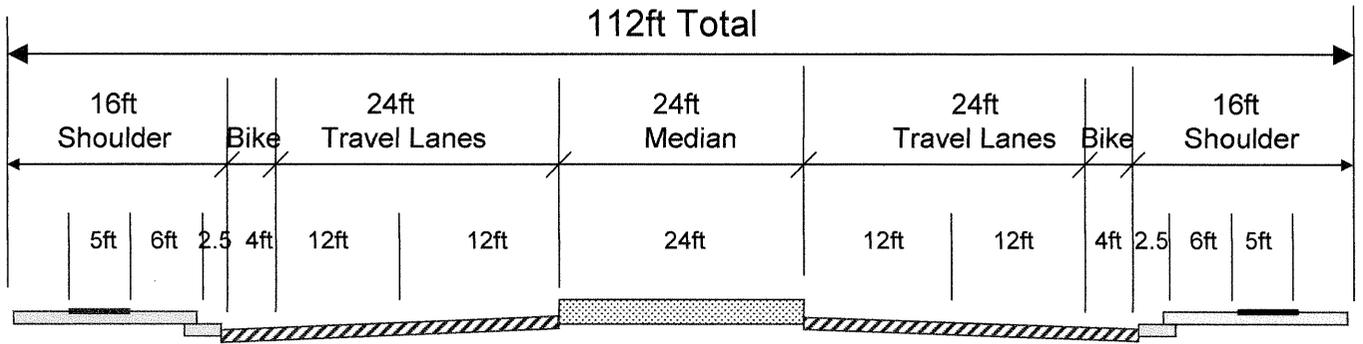
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 50,206,950	—	\$ 50,206,950
ALTERNATIVE	\$ 44,747,940	—	\$ 44,747,940
SAVINGS (Original minus Alternative)	\$ 5,549,010	—	\$ 5,549,010

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

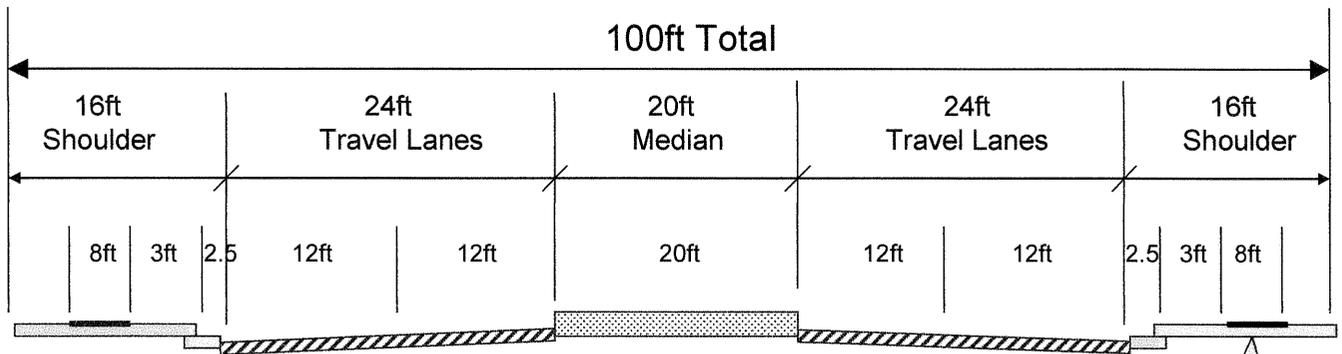
ALTERNATIVE NO.: **S-11**

AS DESIGNED     ALTERNATIVE

SHEET NO.: **2 of 4**



**AS-DESIGNED TYPICAL SECTION**  
(w/Bike Lane)



**VE ALTERNATIVE S-11**

**8ft Multi-Use Trail & 3ft Grass Set-Back on both sides**

# COST WORKSHEET



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20** ALTERNATIVE NO.: **S-11**  
 Project No. *STP-1336(11) Forsyth County, Georgia*  
 DESCRIPTION: **IDEA DESCRIPTION (abbreviate if necessary to fit)** SHEET NO.: **3** of **4**  
*Proposes 16' med in lieu of 20' median*

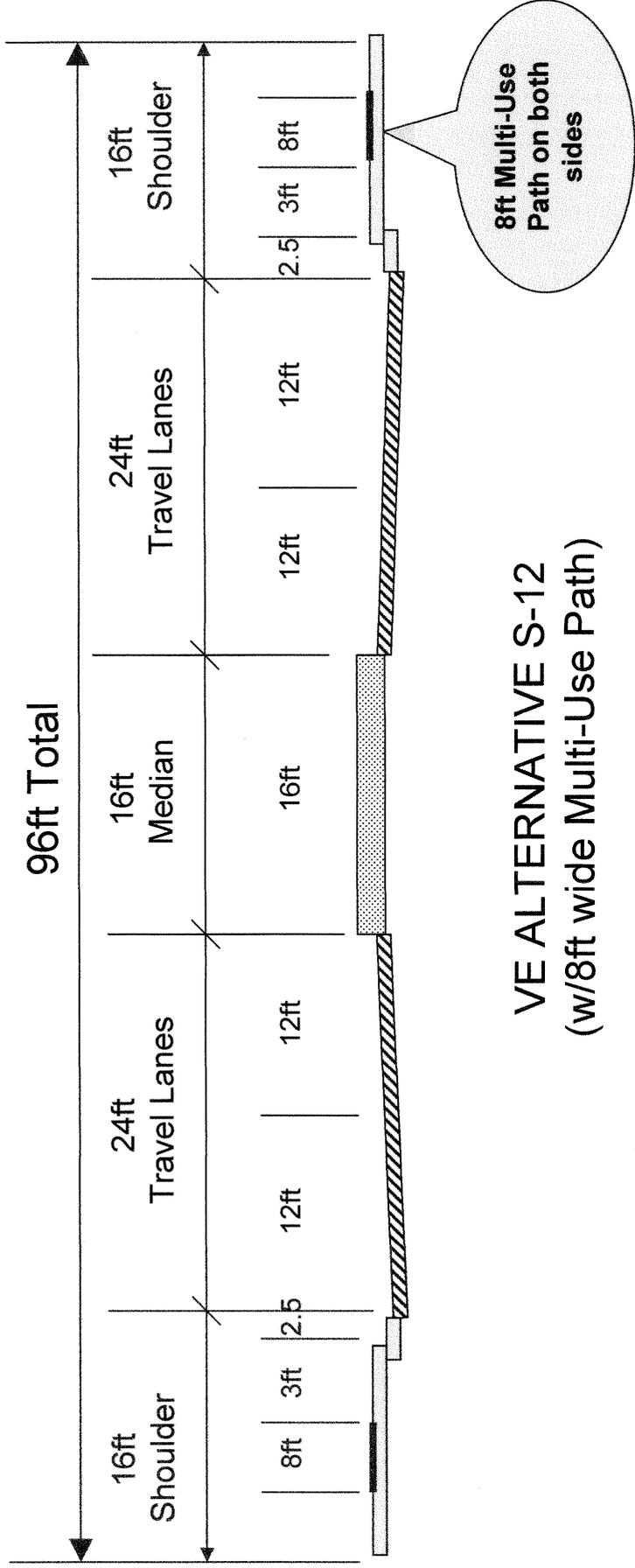
PROJECT ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/UNIT	TOTAL	NO. OF UNITS	COST/UNIT	TOTAL
<i>SAVES 8' R/W</i>							
<i>R/W</i>	<i>SF</i>				<i>126,720</i>	<i>10.83</i>	<i>1,372,380</i>
<i>SAVES 8' of median</i>							
<i>Earthwork</i>	<i>14% of total</i>				<i>.14</i>	<i>3,325,000</i>	<i>465,500</i>
<i>Drainage</i>	<i>LF</i>				<i>200</i>	<i>45</i>	<i>9,000</i>
<i>Clear &amp; Grubbing</i>					<i>3</i>	<i>8000</i>	<i>24,000</i>
<i>EROS. Control/sign/etc.</i>					<i>.14</i>	<i>500,000</i>	<i>70,000</i>
<i>Save Pavement thru intersections</i>							<i>65,000</i>
<i>R/W Subtotal</i>							<i>(1,372,380)</i>
<i>Constr Subtotal</i>							<i>(633,500)</i>
<i>Markup (%) at 2.47/R/W</i>							<i>(3,389,780)</i>
<i>markup 10% Const. TOTAL</i>							<i>(63,350)</i>

*(w/o Bikelines) Concept OR Original Cost*  
*Alternate Total*

*-(5,459,010)*  
*50,206,950*  


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*\$44,747,940*



**VE ALTERNATIVE S-12**  
 (w/8ft wide Multi-Use Path)

Cost including RW: \$43M

Advantages:

- Low cost
- Bikes path on both sides
- 12ft lanes
- Only 96ft total width

Disadvantages:

- Only 16ft median

VE TEAM OVERALL RATING: B

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **S-12**

DESCRIPTION: **SECTION WITH 12-FT. LANES, 16-FT. MEDIAN, AND 8-FT. MULTI-USE PATHS ON BOTH SIDES**

SHEET NO.: **1 of 3**

**ORIGINAL DESIGN:** (Sketch attached)

The existing typical section includes 12-ft. lanes, a 24-ft. median, and a 5-ft. sidewalk on both sides. The total R/W required is 112 ft.

**ALTERNATIVE:** (Sketch attached)

Modify the typical section to include 12-ft. lanes, a 16-ft. median, and an 8-ft. multi-use path on both sides. The total R/W required is 96 ft.

**ADVANTAGES:**

- Reduces costs
- Path separates bikes from traffic
- Paths on both sides
- Uses 12-ft. lanes
- Less R/W is required

**DISADVANTAGES:**

- Reduces the size of the median

**DISCUSSION:**

This alternative offers an optimum combination of median and multi-use paths while minimizing the R/W, providing bike paths on both sides of the street.

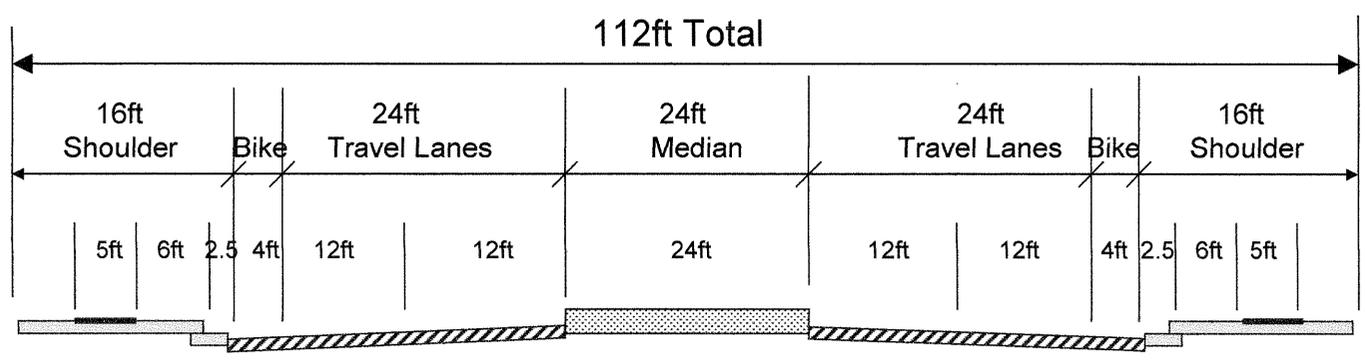
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 50,000,000	—	\$ 50,000,000
ALTERNATIVE	\$ 43,000,000	—	\$ 43,000,000
SAVINGS (Original minus Alternative)	\$ 7,000,000	—	\$ 7,000,000

PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

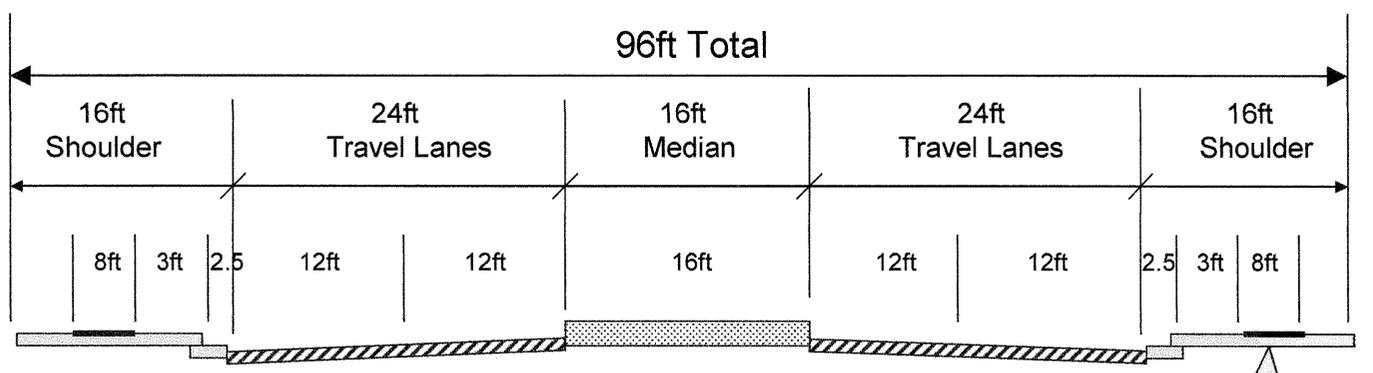
ALTERNATIVE NO.: **S-12**

X AS DESIGNED    X ALTERNATIVE

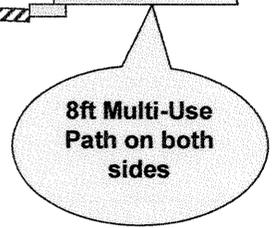
SHEET NO.: **2 of 3**

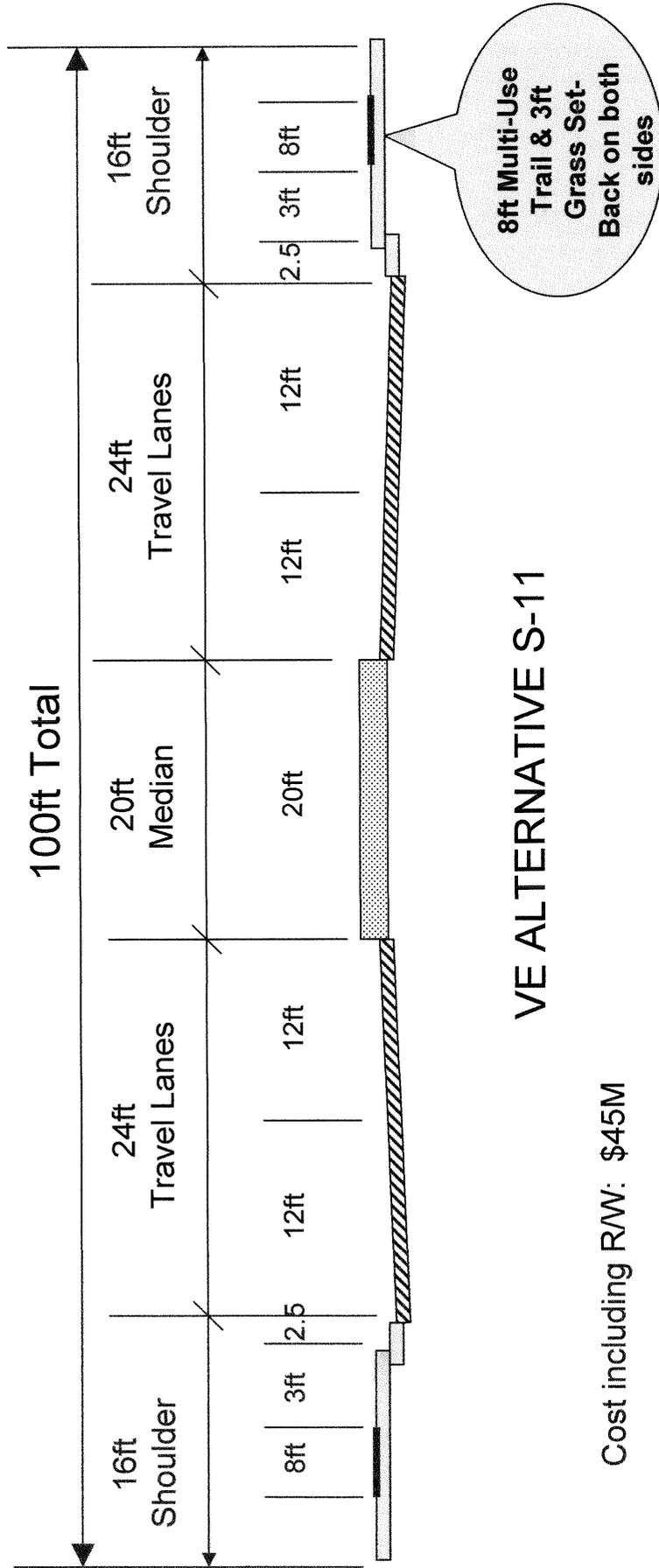


**AS-DESIGNED TYPICAL SECTION**  
(w/Bike Lane)



**VE ALTERNATIVE S-12**  
(w/8ft wide Multi-Use Path)





Cost including R/W: \$45M

Advantages:

Low cost

Path separates bikes from cars

12ft lanes

Much less R/W required

Disadvantages:

20ft median

VE TEAM OVERALL RATING: A

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **A-2**

DESCRIPTION: **REDUCE THE LEFT TURN STORAGE LENGTH ON SR 9  
 GOING SOUTH AT PENDLY ROAD FROM  
 1,000 FT. to 700 FT.**

SHEET NO.: **1 of 2**

**ORIGINAL DESIGN:** (Sketch attached)

1,000 ft. of storage length (enough for 50 vehicles on average) is provided for vehicles turning left onto Pendley Road. 2032 design peak-hour AM traffic is 874. For this volume, 1/5 of a mile of storage length is excessive.

**ALTERNATIVE:** (Sketch attached)

Instead of 1,000 ft. of storage length, provide 700 ft. of storage length (enough for 35 vehicles on average). This will save 300 ft. of 12-ft. wide asphalt pavement.

**ADVANTAGES:**

- Reduces construction cost

**DISADVANTAGES:**

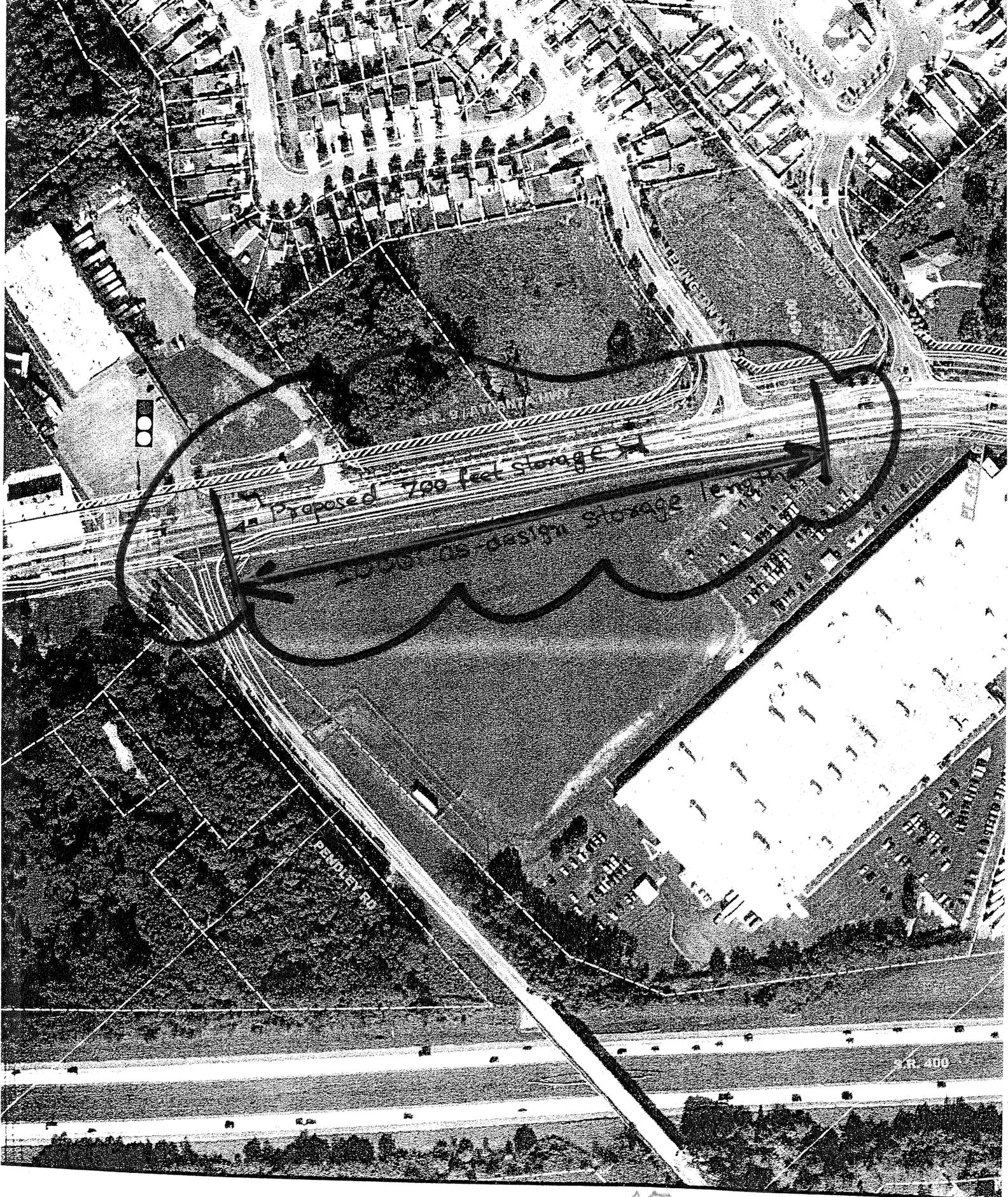
- On some days, traffic may back-up on SR 9 and occupy one of its lanes

**DISCUSSION:**

$$\frac{12 \text{ ft.} \times 300 \text{ ft.}}{9} = 400 \text{ SY}$$

At \$50 per SY of full depth pavement, the saving is  $\$50 \times 400 = \$20,000$

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 66,666	—	\$ 66,666
ALTERNATIVE	\$ 46,666	—	\$ 46,666
SAVINGS (Original minus Alternative)	\$ 20,000	—	\$ 20,000



A2: page 2 of 2



Scale: 1" = 200'

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **A-4**

DESCRIPTION: **USE 8" X 24" TYPE 7 CURB AND GUTTER IN LIEU OF 8" X 30" CURB IN THE MEDIANS**

SHEET NO.: **1 of 1**

**ORIGINAL DESIGN:**

8" x 30" Type 7 curb and gutter is used in the median. For a length of about three miles and excluding the gaps at the intersection, the total length of curb and gutter at the median is 3 x 5,000-ft./mile x 2 (both sides of median) = 30,000-ft. at \$17.83 per ft.

**ALTERNATIVE:**

Use 8" x 24" Type 7 curb and gutter in the median. This will cost \$11.55 per ft.

**ADVANTAGES:**

- Reduces costs

**DISADVANTAGES:**

- None apparent

**DISCUSSION:**

The curb and gutter at the median simply serves to hold the grassed earth. There is no reason to use more expensive curb and gutter.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 534,900	—	\$ 534,900
ALTERNATIVE	\$ 346,500	—	\$ 346,500
SAVINGS (Original minus Alternative)	\$ 188,400	—	\$ 188,400

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **T-1**

DESCRIPTION: **TO MAXIMIZE TRAFFIC FLOW, SYNCHRONIZE THE TRAFFIC LIGHTS BETWEEN NORTH OLD ATLANTA ROAD AND BUFORD HIGHWAY**

SHEET NO.: **1 of 1**

**ORIGINAL DESIGN:**

Unsynchronized traffic lights are proposed between North Old Atlanta Road and Buford Highway.

**ALTERNATIVE:**

Synchronize the three traffic lights, such that they turn green in quick succession.

**ADVANTAGES:**

- Traffic will flow more smoothly

**DISADVANTAGES:**

- Synchronization may be difficult, considering the fact that SR 9/SR 20 is a major intersection close to freeway GA 400

**DISCUSSION:**

Traffic flow will improve if the signals are synchronized.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	<b>DESIGN SUGGESTION</b>		
SAVINGS (Original minus Alternative)			

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **RW-1**

DESCRIPTION: **TO IMPROVE SAFETY, COMBINE THE TWO  
 SUBDIVISION ACCESS ROADS AT PINEY GROVE ROAD  
 AND THE EAST SIDE OF SR 9**

SHEET NO.: **1 of 2**

**ORIGINAL DESIGN:** (Sketch attached)

The center-to-center distance between the manufacturing plant driveway and the dealership driveway is only 125 ft. This poses a traffic hazard because these driveways are at the street intersection.

**ALTERNATIVE:** (Sketch attached)

Close the manufacturing plant driveway. Widen the dealership driveway to a 36-ft. width with one 12-ft. left turn lane. Acquire permanent easement from the dealership owner so that the plant employees and others have the rightful access.

**ADVANTAGES:**

- Improves traffic flow
- Safer conditions

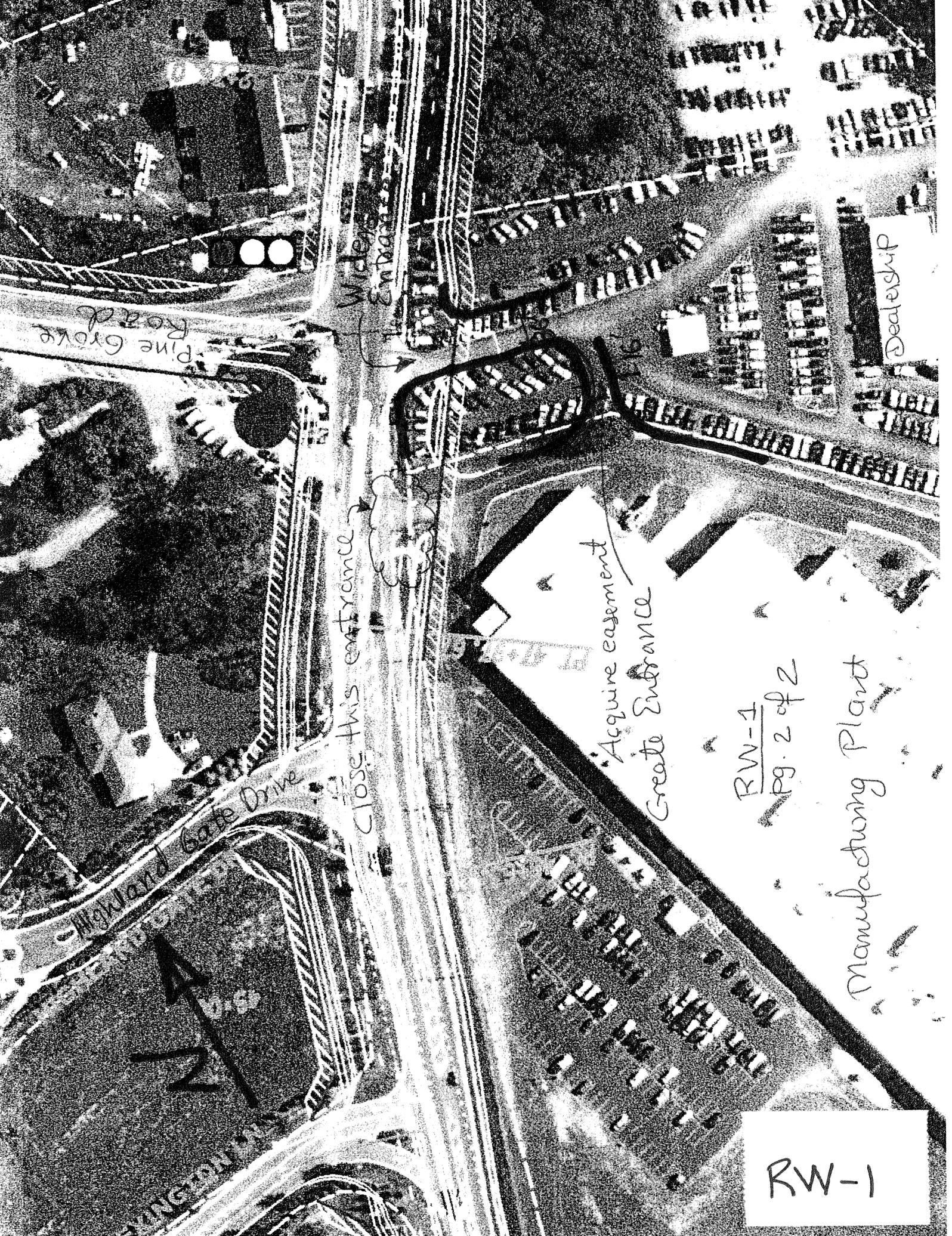
**DISADVANTAGES:**

- Slight inconvenience to plant drivers
- Extra cost to acquire the easement

**DISCUSSION:**

Combining the roadways may be difficult if easements cannot be negotiated with the property owners. However, the overall safety of the corridor requires that this situation be addressed.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	<b>DESIGN SUGGESTION</b>		
SAVINGS (Original minus Alternative)			



Pine Grove Road

Widened Entrance

Dealership

Close this entrance

Acquire easement  
Create Entrance

RW-1  
Pg. 2 of 2

Manufacturing Plant

RW-1

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **RW-2**

DESCRIPTION: **TO IMPROVE SAFETY, COMBINE HIGHLAND GATE DRIVE AND LEXINGTON LANE AT STA 45+00**

SHEET NO.: **1 of 2**

**ORIGINAL DESIGN:** (Sketch attached)

The two streets intersecting SR 9 are only 300 ft. apart, creating traffic hazards for vehicles going south on SR 9. Highland Gate Drive is also less than 400 ft. from Pine Grove Drive.

**ALTERNATIVE:** (Sketch attached)

Merge Highland Gate Drive with Lexington Lane. This will create one street intersection with SR 9 which will be about 700 ft. farther away from Pine Grove Drive intersection.

**ADVANTAGES:**

- Improves traffic flow
- Safer conditions

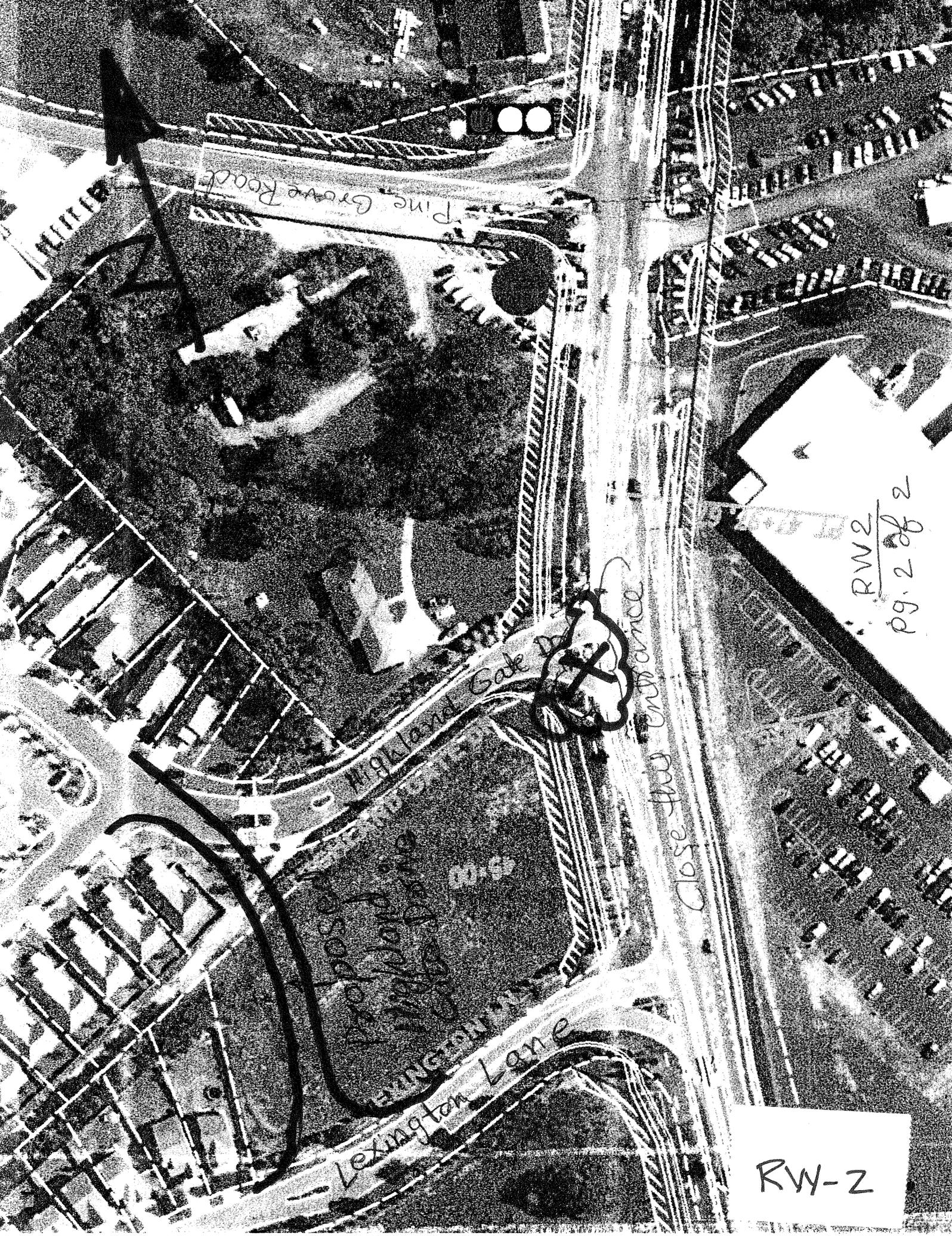
**DISADVANTAGES:**

- Only one entrance for the big subdivision
- Increases cost

**DISCUSSION:**

Combining the two roads is needed to improve the safety along SR 9.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE			<b>DESIGN SUGGESTION</b>
SAVINGS (Original minus Alternative)			



Pine Grove Road

Highland Gate Dr

Lexington Lane

Close this entrance

RW2  
pg. 2 of 2

RW-2

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **RW-3**

DESCRIPTION: **TO CONTROL ACCESS, ELIMINATE THE FOUR  
 DRIVEWAY ENTRANCES FOR THE SINGLE PARCEL  
 COMMUNITY NORTH OF REDI ROAD**

SHEET NO.: **1 of 2**

**ORIGINAL DESIGN:** (Sketch attached)

There are four driveway entrances for one parcel, all within 600 ft. of Redi Road's intersection with SR 9.

**ALTERNATIVE:** (Sketch attached)

Eliminate three of the four entrances to the parcel.

**ADVANTAGES:**

- Improves safety
- Improves traffic flow
- Saves money by not improving three of the four driveways

**DISADVANTAGES:**

- Slight inconvenience to the parcel owner

**DISCUSSION:**

The parcel has three entrances off of SR 9 and safety is being compromised.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	<b>DESIGN SUGGESTION</b>		
SAVINGS (Original minus Alternative)			

Close these 3 driveway entrances



RW-3  
pg. 2 of 2

SR400

RW-3

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **RW-4**

DESCRIPTION: **COMBINE TWO DRIVEWAY ENTRANCES AT STA 35+00  
 AND ONE DRIVEWAY ENTRANCE OPPOSITE HOLLY  
 PARK DRIVE**

SHEET NO.: **1 of 2**

**ORIGINAL DESIGN:** (Sketch attached)

Across busy Pendley Road at 35+00, there are three driveway entrances for one parcel, all within a 400-ft. distance.

There are two driveway entrances next to Park Place and across from Holly Park Drive. These entrances for the same parcel are within 300 ft. of street intersection.

**ALTERNATIVE:** (Sketch attached)

At STA 35+00, combine three driveway entrances into one right across from Pendley Road.

For the parcel north of Park Place, eliminate the driveway closest to the intersection.

**ADVANTAGES:**

- Substantially increases safety
- Vastly improves traffic flow

**DISADVANTAGES:**

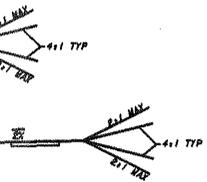
- Inconvenience to the property owners and users
- Driveway to the historic property will need to be kept open at all times

**DISCUSSION:**

Combining these entrances will help reduce accidents.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	<b>DESIGN SUGGESTION</b>		
SAVINGS (Original minus Alternative)			

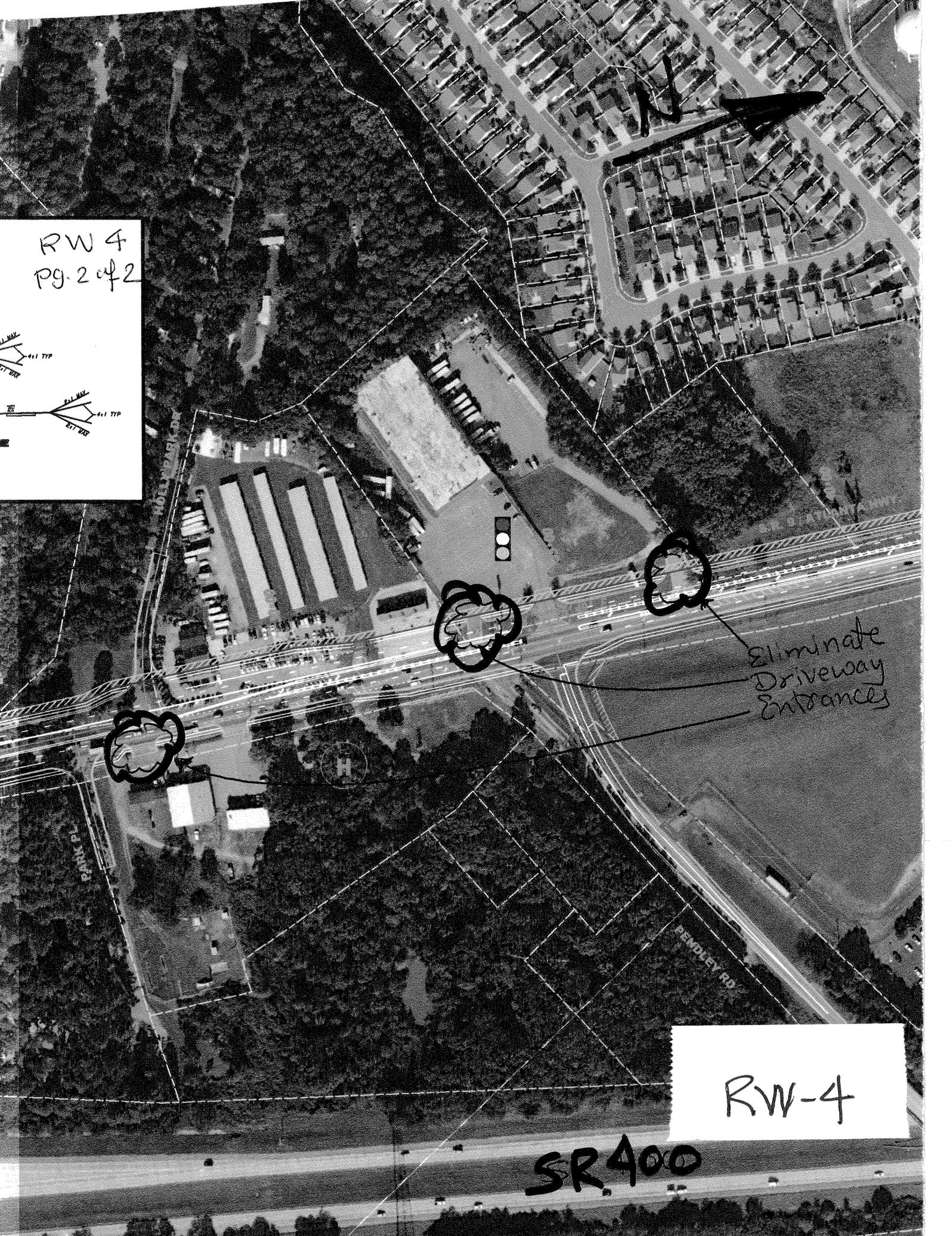
RW 4  
Pg. 2 of 2



Eliminate  
Driveway  
Entrances

RW-4

SR 400



# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **RW-5**

DESCRIPTION: **IDENTIFY POSSIBLE LOCATIONS FOR STORM WATER  
 DETENTION PONDS AND NEW DRAINAGE FACILITIES**

SHEET NO.: **1 of 1**

**ORIGINAL DESIGN:**

Construction of SR 9 will result in a substantial increase of impervious surface in the area. The concept presented does not identify any location for storm water detention ponds.

**ALTERNATIVE:**

The lake to the right of Valley Circle Road can be easily turned into a detention pond with a new outlet control structure.

**ADVANTAGES:**

- Negligible R/W cost
- Location is approximately mid-way of SR 9

**DISADVANTAGES:**

- Increase in the cost of pipes to bring all related storm water to the lake
- Extra cost to monitor water quality in a live stream

**DISCUSSION:**

Even though formal storm detention is not needed at this time, evaluation for future facilities should be made.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	<b>DESIGN SUGGESTION</b>		
SAVINGS (Original minus Alternative)			

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **CM-1**

DESCRIPTION: **REQUIRE CONTRACTOR TO RECYCLE EXISTING PAVEMENT**

SHEET NO.: **1 of 1**

**ORIGINAL DESIGN:**

Three miles of roadway will be constructed with new materials.

**ALTERNATIVE:**

Rubblize and recycle the existing pavement as much as possible for the three miles of roadway.

**ADVANTAGES:**

- Reduces costs

**DISADVANTAGES:**

- By mixing new with recycled pavement, inconsistency in quality can occur

**DISCUSSION:**

Recycling the existing pavement is the environmentally friendly solution.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	<b>DESIGN SUGGESTION</b>		
SAVINGS (Original minus Alternative)			

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **CM-2**

DESCRIPTION: **TO MINIMIZE THROUGH TRAFFIC DURING  
 CONSTRUCTION ON SR 9, DETOUR TRAFFIC TO GA 400  
 DURING CONSTRUCTION**

SHEET NO.: **1 of 1**

**ORIGINAL DESIGN:**

Traffic flows continuously during construction.

**ALTERNATIVE:**

To relieve congestion during construction, through traffic should be detoured to GA 400 and signs posted at SR 9/SR 141 and SR 9/SR 20 intersections.

**ADVANTAGES:**

- Less hazardous during construction
- Less traffic for residents and business on SR 9

**DISADVANTAGES:**

- By mixing new with recycled pavement, inconsistency in quality can occur
- Difficult to implement; drivers may not follow the 'thru traffic detours' signage

**DISCUSSION:**

Plans should be made to detour as much through traffic as possible to GA 400. This will minimize construction impacts and potentially reduce the amount of temporary pavement.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	<b>DESIGN SUGGESTION</b>		
SAVINGS (Original minus Alternative)			

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **CM-3**

DESCRIPTION: **TO MINIMIZE THE RISK TO THE CONTRACTOR,  
 IDENTIFY AND NEGOTIATE TEMPORARY EASEMENTS  
 FOR CONTRACTOR LAY DOWN AREAS**

SHEET NO.: **1 of 4**

**ORIGINAL DESIGN:** (Sketch attached)

No location is identified for the contractor to lay down equipment and materials. A temporary easement will need to be acquired at a rate of \$0.91 per sq.-ft. This rate is half the rate of permanent easement of large commercial property.

**ALTERNATIVE:** (Sketch attached)

Option #1: Southeast corner of SR 9/Pendley Road intersection  
 Area: 225,000 sq.-ft. cost for 2-year temporary easement = \$202,475

Option #2: South of Valley Circle Road behind the flea market  
 Area: 200,000 sq.-ft. cost for 2-year temporary easement = \$182,000

Option #3: Opposite Greenfield Road to STA 135+00  
 Area: 150,000 sq.-ft. cost for 2-year temporary easement = \$136,500

**ADVANTAGES:**

- Easier for the contractor to lay down and move employees, equipment and materials

**DISADVANTAGES:**

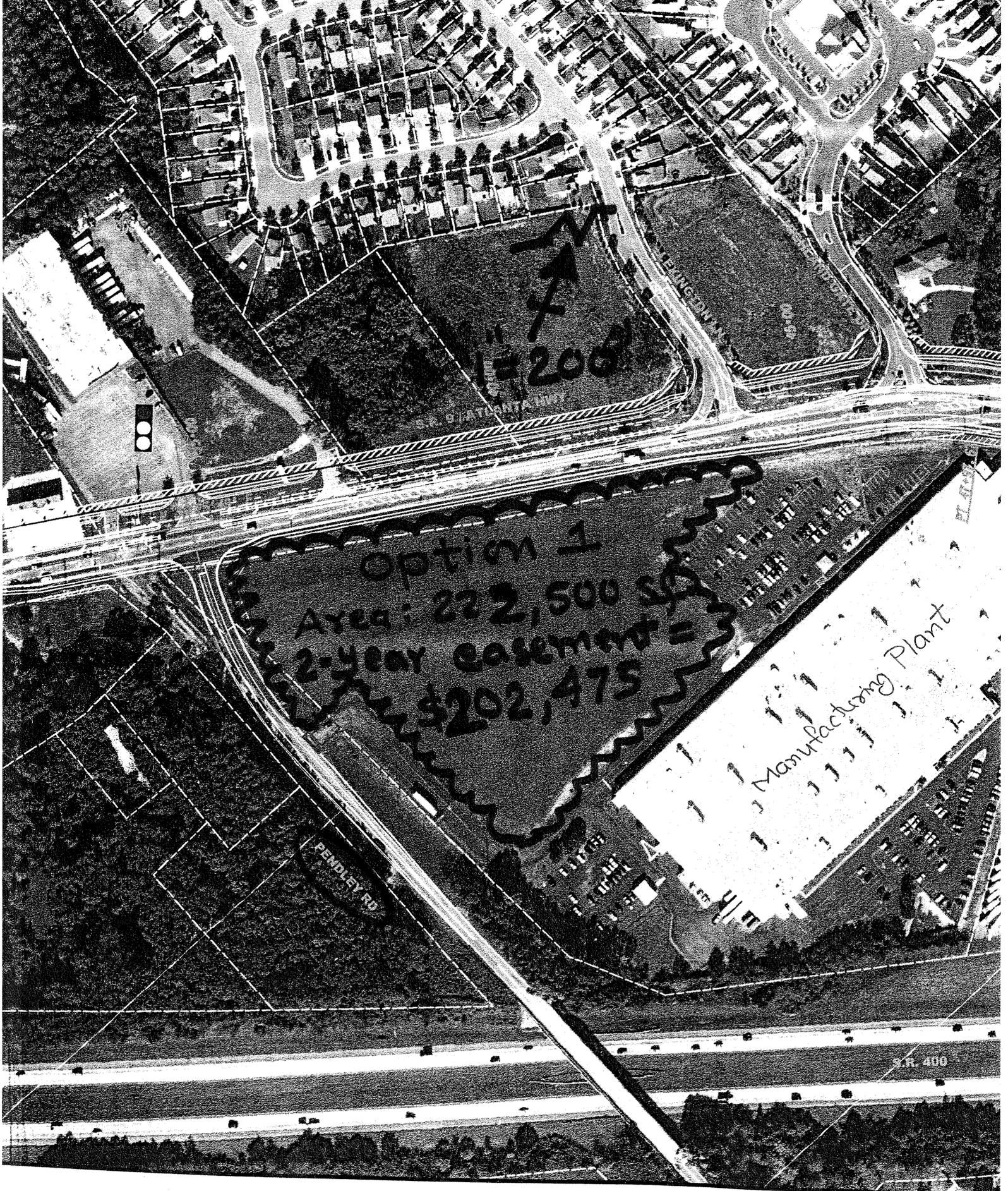
- Increases costs
- Inconvenience to adjacent property owners

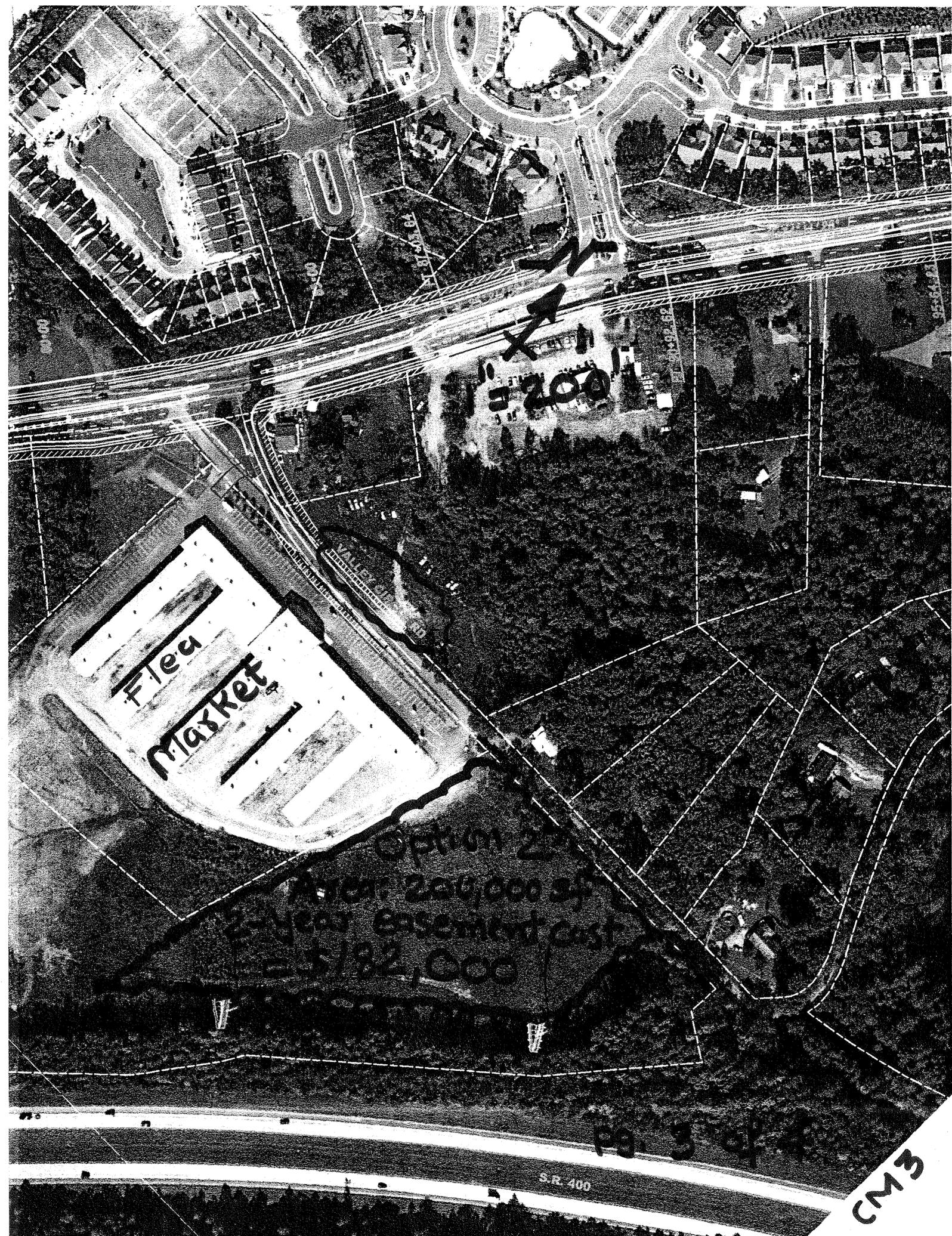
**DISCUSSION:**

Option #2 is the most logical place to stage construction materials and equipment and employees for two reasons:

- (i) The lay-down area is midway of SR 9.
- (ii) It is also away from the road, behind a flea market that operates mostly on weekends and is hidden from GA 400 by the trees.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	—	—	—
ALTERNATIVE	\$ 200,000	—	\$ 200,000
SAVINGS (Original minus Alternative)	\$ (200,000)	—	\$ (200,000)





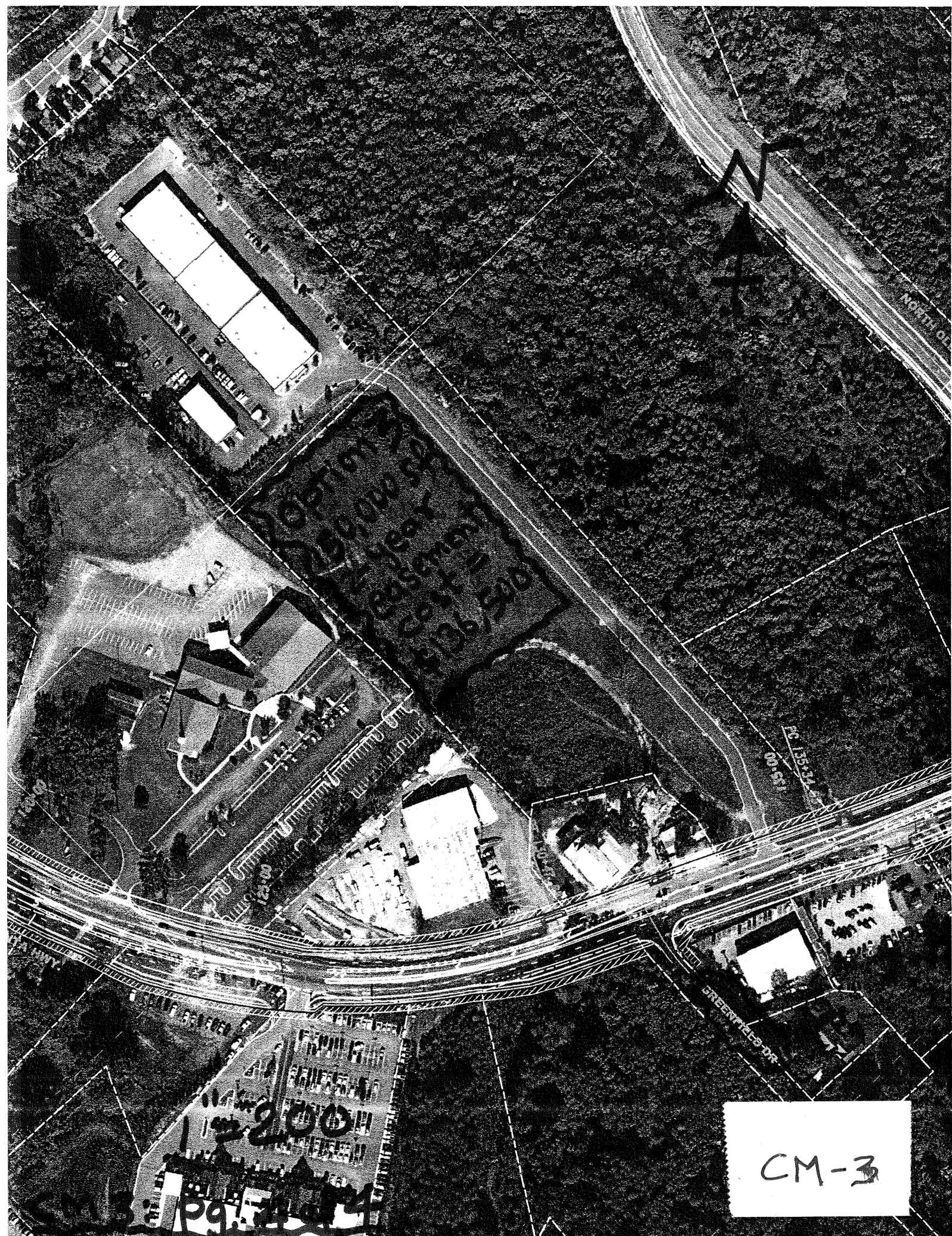
Flea  
Market

Option 2  
Area 200,000 sq ft  
2-year easement cost  
\$182,000

Pg. 3 of 4

S.R. 400

CM3



CM-3

# VALUE ENGINEERING ALTERNATIVE



PROJECT:	<b>SR 9 WIDENING FROM SR 141 TO SR 20</b> <i>Project No. STP-1336(11) Forsyth County, Georgia</i>	ALTERNATIVE NO.:	<b>CM-4</b>
DESCRIPTION:	<b>SPLIT THE PROJECT INTO TWO SEGMENTS; BUILD HIGH PRIORITY SEGMENTS NOW AND DEFER THE OTHER FOR FUTURE FUNDING ALLOCATIONS</b>	SHEET NO.:	<b>1 of 1</b>

**ORIGINAL DESIGN:**

The entire three-mile project will be constructed continuously, assuming funding is available.

**ALTERNATIVE:**

Split the project into two segments. The segment to be constructed now will be the busiest part of SR 9. One will be from the beginning of the project to Pine Grove Road for a total length of 2,640 ft. (0.5 mile). Another part to be built now is from North Old Atlanta Road to the end of the project for a total length of 3,140 ft. (0.6 mile). The middle portion from Pine Grove Road to North Old Atlanta Road would be constructed when money becomes available.

**ADVANTAGES:**

- Money crisis is averted while many of the constituents are still served

**DISADVANTAGES:**

- Inconvenience to thru traffic which will converge from 4 to 2 lanes in the middle of the road
- In the future, costs to widen two lanes will be higher

**DISCUSSION:**

The total construction cost for the SR 9 3-mile construction project in 2012 is \$50,206,950. The cost to construct just the busiest section of SR 9 is \$20,082,780, less than half of the entire three-mile project

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 51,855,287	—	\$ 51,855,287
ALTERNATIVE	\$ 20,742,115	—	\$ 20,742,115
SAVINGS (Original minus Alternative)	\$ 30,113,172	—	\$ 30,113,172

# VALUE ENGINEERING ALTERNATIVE



**PROJECT: SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **CM-5**

**DESCRIPTION: TO MINIMIZE THROUGH TRAFFIC ON SR 9 DURING CONSTRUCTION, USE PENDLEY AND NORTH OLD ATLANTA ROADS AS DETOURS**

SHEET NO.: **1 of 1**

**ORIGINAL DESIGN:**

Construction is staged such that traffic flows continuously both ways on SR 9.

**ALTERNATIVE:**

Two big shopping centers exist between North Old Atlanta Road and Buford Highway. A subdivision, manufacturing plant and car dealership exist between Pine Grove and Pendley Road. To reduce traffic, route through traffic on Pendley and North Old Atlanta Road. These two roads cross GA 400 and intersect one mile to the southeast.

**ADVANTAGES:**

- Reduces construction hazards
- Reduces traffic for residents and businesses between Pine Grove Road and North Old Atlanta Road

**DISADVANTAGES:**

- Driver inconvenience
- Implementation is difficult; drivers are unlikely to heed detour signs

**DISCUSSION:**

Planning for detours at this time is recommended since public input should be obtained on these routes early in the design process.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	<b>DESIGN SUGGESTION</b>		
SAVINGS (Original minus Alternative)			

# VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20**  
*Project No. STP-1336(11) Forsyth County, Georgia*

ALTERNATIVE NO.: **CM-6**

DESCRIPTION: **TO ACCOMMODATE PHASING, INCREASE THE COST ESTIMATE LINE ITEM FOR TRAFFIC CONTROL FROM \$150,000 TO \$500,000**

SHEET NO.: **1 of 1**

**ORIGINAL DESIGN:**

The estimate calls out \$150,000 for traffic control during the widening of SR 9.

**ALTERNATIVE:**

For a two-year construction period and a length of almost three miles, this estimate is low. Increase the budget for traffic control to \$500,000.

**ADVANTAGES:**

- More accurate projection of costs

**DISADVANTAGES:**

- Cost escalation

**DISCUSSION:**

Increasing the budget for traffic control will allow for better cost management.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 150,000		\$ 150,000
ALTERNATIVE	\$ 500,000		\$ 500,000
SAVINGS (Original minus Alternative)	\$ (350,000)		\$ (350,000)

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## **PROJECT DESCRIPTION**

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### **PURPOSE AND NEED**

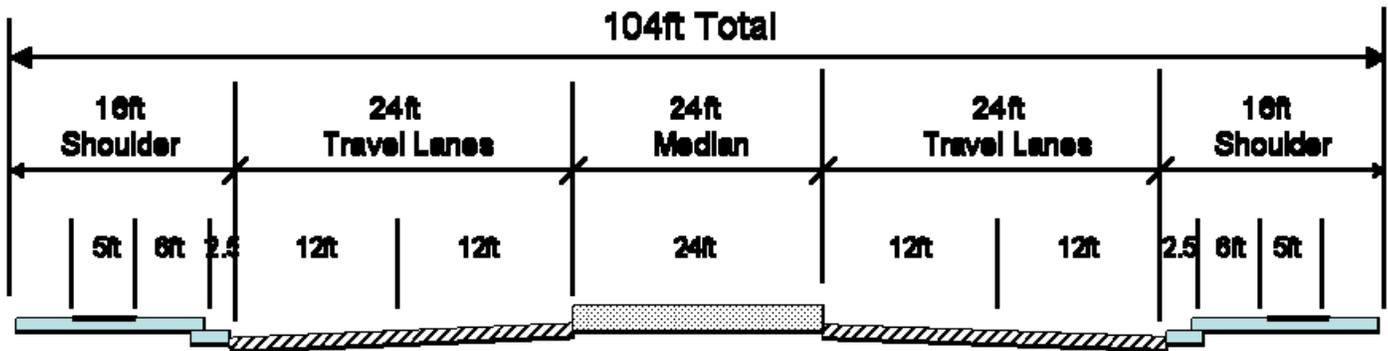
The purpose of this project is to reduce congestion, improve safety, increase capacity, and upgrade substandard conditions along the SR 9 segment which is located immediately West of GA 400 and south of the City of Cumming. To accomplish the project goals, the alignment will be reconstructed and a median and sidewalks added. A bicycle lane may be added.

### **PROJECT DESCRIPTION**

Rapid growth in and around the City of Cumming is generating increasing volume along SR 9 between SR 141 and SR 20. The intersection of SR 20 and SR 9 has become the primary commercial node serving residents of Forsyth County. This intersection is the location of four shopping centers. The development of this commercial area has contributed to the increasing traffic volume along SR 9. The purpose of this project is to provide increased capacity along SR 9 from SR 141 to SR 20. Current volumes (AADT) on SR 9 are 19,500 in 2007, with design year projections of 37,500 in 2032. Eight existing intersections along the project length were analyzed under design year 2032 traffic conditions to determine laneage, storage lengths, and potential signalization needs and upgrades on Pendley Road, Piney Grove Road, Redi Road, Valley Hill Circle South, Valley Hill Circle North, Old Atlanta Road, Hutchinson, Road, and SR 20. As a result of the additional recommended laneage and phasing improvements, all signalized intersections were projected to operate at LOS D or better under design year 2032 traffic conditions.

Project STP-1336(11) consists of widening and reconstruction of SR 9 (Atlanta Highway) from 1,000 feet north of SR 141 (Pendley Road) to SR 20 (Buford Highway) in Forsyth County. The existing two lanes of SR 9 will be retained and reconstructed except where horizontal and vertical geometry does not meet current design criteria. The proposed section will be two 12-foot travel lanes in each direction separated by a 24-foot raised median, with a 16-foot shoulder on each side incorporating curb and gutter and a 5-foot sidewalk. Horizontal and vertical geometry will meet a 45-mph design speed, and required right-of-way will be set at the shoulder break for a 104-foot minimum. Bicycle lanes may be added to the project; a final decision is pending. A new traffic signal will be added to the intersection of SR 9 and Piney Grove Road.

Minor improvements will be made to the side roads. Where appropriate, side road intersections will be revised to intersect SR 9 at or near 90 degrees. In addition, turn lanes, where necessary, will be added to the side roads to accommodate the projected traffic volumes. The reconstruction of side roads will typically require the acquisition of new right-of-way.



**AS-DESIGNED TYPICAL SECTION**  
***(w/o Bike Lane)***

**Base Design per Kimley-Horn Concept Report**

**Cost including RAW: \$50M**

***Advantages:***

**24ft Median**

**Relatively low cost**

***Disadvantages:***

**Does not include bike lane**

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## **VALUE ANALYSIS AND CONCLUSION**

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### **GENERAL**

This section describes the procedures used during the value engineering study on the SR 9 Widening Project. It is followed by separate narratives and conclusions concerning:

- Value Engineering Study Agenda
- Value Engineering Workshop Participants
- Economic Data
- Function Analysis (Project Purpose and Need)
- Creative Idea Listing and Judgment of Ideas

A systematic approach was used in the VE study and the key procedures involved were organized into three distinct parts: 1) pre-study, 2) VE orientation meeting and workshop, and 3) post-study. A Task Flow Diagram outlining each of the procedures included in the VE study is attached for reference.

### **PREPARATION EFFORT**

Pre-study preparation for the VE effort consisted of scheduling study participants and tasks and gathering necessary project documents from the Kimley-Horn design team. Information relating to alternative analysis and phasing is also very important, as it tends to drive the construction methods. The preliminary cost estimate prepared by Kimley-Horn was used as the basis for comparison/analysis during the VE study.

### **VALUE ENGINEERING WORKSHOP EFFORT**

The VE workshop effort consisted of a 30-hour workshop beginning with an orientation meeting on April 2, 2007 and the final VE Presentation on April 5, 2007. During the workshop, the VE job plan was followed in compliance with FHWA and GDOT guidelines for the conduct of VE studies. The job plan guided the search for alternatives to mitigate or eliminate high cost drivers and potential risk elements. It included six phases:

- Information Phase
- Function Identification and Analysis Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

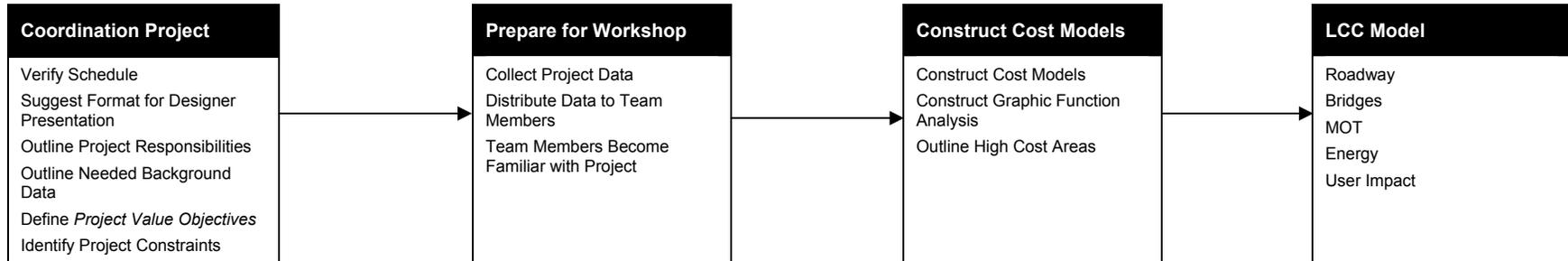
#### **Information Phase**

At the beginning of the study, the decisions that have influenced the project design and proposed construction methods had to be reviewed and understood. For this reason, the Kimley-Horn design team

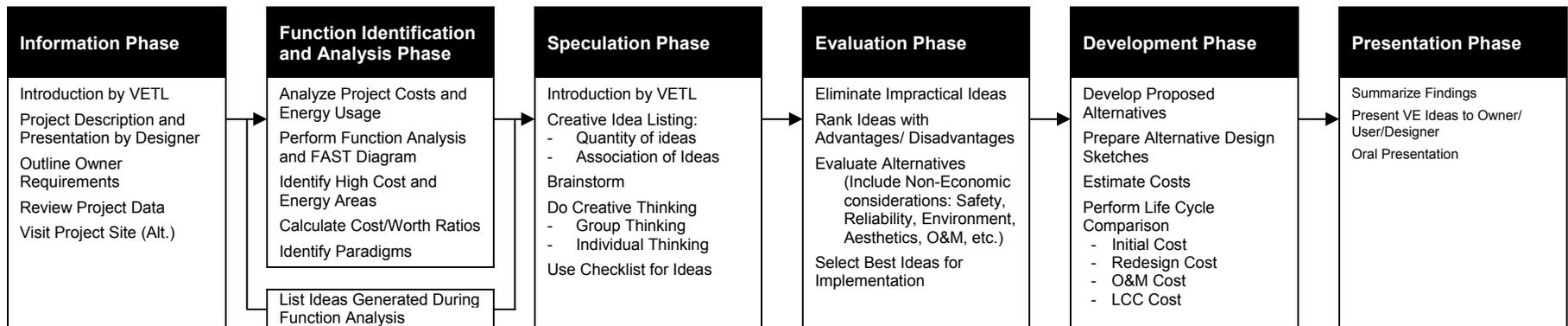


# Value Engineering Study Task Flow Diagram

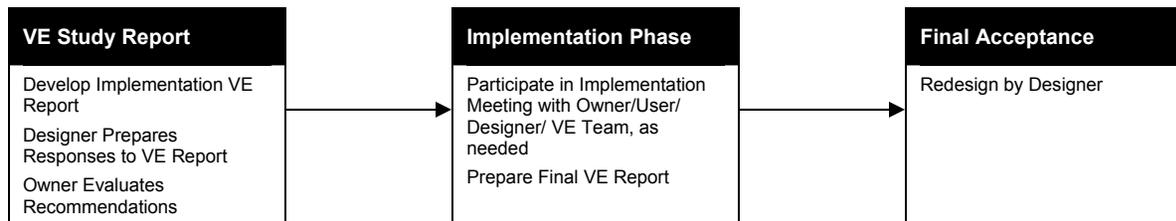
## Preparation Effort



## Workshop Effort



## Post-Workshop Effort



presented information about the project to the VE team on the first day of the VE workshop. Following the presentation meeting, the VE team spent the remainder of the first day reviewing the project documents, discussing the project purpose and need, and identifying the key elements of the project. Throughout the study, the following documents were utilized to establish guidelines for action and for determining cost implications for the various alternatives:

- Value Engineering Concept Submittal including alignment and typical sections, dated March 2007, prepared by Kimley-Horn and Associates, Inc.
- Preliminary Right of Way Cost Estimate, Project STP-1336(11), P.I. No.: 121690, dated March 2007, prepared by Georgia Department of Transportation
- Miscellaneous maps, aerial photos, and exhibits

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

This VE study phase involved the analysis of the project's functions and the creation and listing of ideas. 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. This creates a high cost-to-worth ratio and the VE team targets these areas for value improvement. GDOT design criteria was compared to the as-designed drawings for general conformance of the typical section.

### **Creative Phase**

The VE team generated as many ideas as possible to provide the necessary functions within the highway project at a lower total life cycle cost, or to improve the quality of the project. Methods to improve on maintenance of traffic plan were also discussed. Judgment of the ideas was restricted at this point. The VE team was looking for a large quantity of ideas and free association of ideas. Creative idea worksheets were organized by project elements.

### **Evaluation Phase**

During this phase of the workshop, the VE team judged the ideas generated during the Creative Phase in comparison to project objectives established by GDOT. The team evaluated each of the VE ideas for feasibility and incorporation into the project. 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 which represented the greatest potential for cost savings or improvement to the project were developed further to be presented during the Presentation Phase.

To assist the team in ranking the creative ideas, each of the criteria were discussed, and the following criteria definitions were developed in the project purpose and need.

- **Construction Cost** – The initial cost of the material is important and should be considered.
- **Safety** – Safety is very important and must control in all decision making.
- **Level of Service** – The projected LOS must be achieved to meet the purpose and need.
- **Impact Upon Trucks** – There is a high percentage of trucks in the area.
- **Life Cycle Costs** – The costs of operating and maintaining the highway is extremely important. These costs would include labor and materials over the next 30 years.
- **Right-of-Way Cost** – It is important to minimize R/W purchase if possible.
- **Accommodate Bicycles** – Including a bike path is advantageous, but not a requirement at this time.

The VE team would have liked to have developed all the ideas that were generated, but time constraints limited the number of ideas that could be developed. Therefore, each idea was compared with the present design concept in terms of how well it met the design criteria. Advantages and disadvantages were discussed and the ideas were rated on a scale of 1 to 5, with the best ideas rated 5. Ideas rated 4 or higher were generally developed into written VE alternatives.

### **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. Analysis also compared each new alternative with others presented in the design report. The VE alternatives and comparisons are included in the Study Results section.

### **Presentation Phase**

The last phase of the VE team's workshop was to present the recommendations. The presentation was held on April 5, 2007 and included personnel from GDOT and representatives from the design consultant team. During the meeting, a handout was distributed that included a summary listing of the VE study Alternatives and Design Suggestions. These documents were presented to give the attendees an executive summary of the proposals and the key findings of the VE team.

## **POST STUDY PROCEDURES**

The post-study portion of the VE study includes the preparation of this Value Engineering Study Report. Personnel from GDOT and the design team 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. LZA 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.

### **Implementation Phase**

Following distribution of the VE report and collection of written comments from all parties, a VE implementation phase meeting is typically scheduled. At this time, each VE alternative will be considered and discussed, and a final disposition made. During this process, a VE alternative may be accepted as written, rejected for cause, modified to improve the idea, or in some cases, the idea may need further study to establish its merits.

# **VALUE ENGINEERING STUDY AGENDA**

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Lewis & Zimmerman Associates, Inc. (LZA) will facilitate a 30-hour value engineering (VE) study on the **SR 9 Widening and Reconstruction from SR 141 to SR 20 located in Forsyth County, Georgia**. The Georgia Department of Transportation (GDOT) and the Kimley-Horn and Associates design team will be available to formally present the project at the beginning of the workshop; attend a presentation of the VE alternatives at the conclusion of the VE study; and be available to answer questions during the VE study effort.

The VE study will follow the outline described below and be conducted April 2 – 5, 2007 at:

GDOT  
2 Capital Square, SW  
Atlanta, Georgia 30334-9003  
Conference Room 444

The point-of-contact is Ms. Lisa Meyers, GDOT Value Engineering Coordinator, who may be reached at 404-651-7468.

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## **VE STUDY AGENDA**

### **Monday, April 2, 2007**

8:00 am - 9:00 am                      **General Introduction of all Parties and review of the VE Process**

9:00 am – 12:00 noon                **Owner's/Designer's Presentation**

GDOT and the design consultants will present information concerning the project including, but not limited to: the Purpose and Need for the project, rationale for design; criteria for specific areas of study, project constraints and the reasons for design decisions.

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

1:00 pm - 2:00 pm                    **Information Phase**

The VE team will continue their familiarization with the cost models and project data for each area of study. The cost models will be refined, as necessary. The VE team will 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 projects' Purpose and Need.

2:00 pm – 3:00 pm                    **Function Analysis**

The team will identify all project functions required to meet the established purpose and need. Functions will be identified as to basic, required secondary, secondary, or project goals.

3:00 pm - 5:00 pm                      **Speculation 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.

**Tuesday, April 3, 2007**

8:00 am - 10:00 am                      **Speculation Phase (cont.)**

The VE team will continue the brainstorming exercise to capture ideas to improve the project in terms of initial and life cycle cost, technical aspects, schedule, and constructibility issues.

10:00 am – 12:00 noon                      **Analysis Phase**

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

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

1:00 pm - 5:00 pm                      **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.

**Wednesday, April 4, 2007**

8:00 am – 12:00 noon                      **Development Phase (cont.)**

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

1:00 pm - 5:00 pm                      **Development Phase (cont.)**

Upon completion of the Development Phase, the VE team leader will prepare the summary worksheets based on the alternatives developed by the VE team. The summary worksheets form the basis of the informal oral presentation to be made to GDOT, local representatives, and the Kimley-Horn design team representatives. The team will review all documentation and prepare for the presentation.

**Thursday, April 5, 2007**

8:00 am - 9:00 am                      **Development Phase (cont.)**

9:00 am – 12:00 noon                **Presentation Phase**

Upon completion of the Development Phase, the VE team leader will prepare the summary worksheets based on the alternatives developed by the VE team. The summary worksheets form the basis of the informal oral presentation to be made to GDOT, local representatives, and the Kimley-Horn design team representatives. The team will review all documentation and prepare for the presentation.

**POST-STUDY PHASE**

Upon completion of the value engineering study, the VE team leader will prepare the Value Engineering Study Report and submit it to GDOT. The report will include the following material:

- Project description and design concept of project
- Cost models and graphic function analysis worksheets
- Value engineering alternatives: original design and proposed alternatives, including sketches, design calculations and initial and life cycle estimates
- Potential contract savings (capital construction and life cycle costs)

GDOT and the design team will independently review the VE alternatives and classify them as accepted, accepted with modifications, needs further study, or rejected—accompanied by the reasons for rejection. A meeting with all stakeholders will then be convened to decide which VE alternatives to implement.

**VE TEAM MEMBERS**

David Hamilton, PE, CVS, CCE, LEED <sup>AP</sup>	VE Team Leader/Civil	Lewis & Zimmerman Assoc.
Joe Leoni, PE	Highway Engineer	ARCADIS
Paresh Parikh, PE	Construction Engineer	Delon Hampton

## **VALUE ENGINEERING WORKSHOP PARTICIPANTS**

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The VE team was organized by GDOT and Lewis & Zimmerman Associates, Inc. to provide specific expertise on the unique project elements involved. Team members consisted of a multi-disciplined group with professional design experience and a working knowledge of highway and bridge design, construction, environmental permitting, and VE procedures. Members of the team consisted of the following professionals:

### **VE Team**

David A. Hamilton, PE, CVS, CCE	VE Team Leader/Civil	Lewis & Zimmerman Assoc., Inc.
Joe Leoni, PE	Highway Design Engineer	ARCADIS
Paresh Parikh, PE	Construction Engineer	Delon Hampton

### **Project Designer**

Bryon Letourneau, PE	Project Manager	Kimley-Horn and Associates, Inc.
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### **GDOT**

Lisa Myers	VE Coordinator	GDOT
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## **DESIGNER PRESENTATION**

An overview of the project was presented on April 2, 2007, by the Kimley-Horn design team. 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” on the overall project specifics including traffic projections, accident history, bridge design elements, construction phasing, local permitting issues, and estimated project cost. Additionally, the meeting afforded the design staff the opportunity to highlight in greater detail those areas of the project requiring additional or special attention. An attendance list for the meeting is attached.

## **VALUE ENGINEERING TEAM PRESENTATION**

A VE presentation was conducted on Thursday, April 4, 2007 to review the VE alternatives with GDOT staff and the Kimley-Horn design team. The attendees received a copy of the Presentation Outline and Summary of Potential Cost Savings. An attendance list for the meeting is attached.

# WORKSHOP PARTICIPANTS



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20 FY 07**  
*Project No. STP-1336(11) Forsyth County, Georgia*  
*Draft Concept - Value Engineering Study*

DATE: **2- 5 APRIL 2007**

NAME & E-MAIL (please print)	ORGANIZATION/TITLE	PHONE/FAX
David Hamilton, PE, CVS, CCE, LEED <sup>AP</sup> em dhamilton@lza.com	Lewis & Zimmerman Associates, Inc. VE Team Leader/Civil	ph 253-925-8741 mob 253-229-7703 fx 253-925-8791
Lisa Myers em lisa.myers@dot.state.ga.us	GDOT – Engineering Services Design Review Engineering Manager	ph 404-651-7468 mob fx 404-463-6131
Paresh J. Parikh, PE em pparikh@delonhampton.com	Delon Hampton & Associates Manager of Engineering Services	ph 404-419-8434 mob fx 404524-2575
Joe Leoni, PE em joe.leoni@arcadis-us.com	ARCADIS Roadway Engineer – QA/QC	ph 770-431-8666 mob fx 770-435-2666
Nabil Raad em m.nabilraad@dot.state.ga.us	GDOT – Office of Safety, Traffic & Design	ph 404-635-8126 mob fx
Stanley Hill em stanley.hill@dot.state.ga.us	GDOT - Office of Consultant Design Project Manager	ph 404-656-6109 mob fx
Ron Wishon em ron.wishon@dot.state.ga.us	GDOT – Engineering Services Assistant Project Review Engineer	ph 404-651-7470 mob fx 404-463-6131
Bryon Letourneau, PE em bryon.letourneau@kimley-horn.com	Kimley-Horn and Associates, Inc. Project Manager	ph 770-825-0744 mob 678-357-0463 fx 770-825-0074
em		ph mob fx
em		ph mob fx

## **ECONOMIC DATA**

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Economic criteria used for evaluation were developed by the VE team with information gathered from the Federal Office of Management & Budget. To express costs in a meaningful manner, the VE team alternatives are presented on the basis of discounted present worth. Criteria for the planning project period and interest rates are based on the following parameters:

Year of Analysis:	2007
Construction Dollars Based Upon:	2007
Economic Planning Life:	30 years starting in 2012
Bond (Discount) Rate:	3.1%
Inflation/Escalation Rate:	0.0%
Net Discount Rate:	3.1%
Uniform Present Worth (UPW) Factor:	19.3495
Cost of Power/Electricity (average without demand charge)	\$0.10/kwh
Cost of Labor (\$/hr)	\$60/hr

### **Schedule of Work**

The project is planned to begin construction in 2012 and be completed in 2014. However, the project could possibly be completed within three construction seasons depending upon award date, shop drawing approval, and material availability.

### **Total Present Worth**

Discussion during the VE study included impacts of the 30-year present worth cost for major elements.

### **VE Alternatives Mark-up**

Cost estimates were prepared for each of the VE alternatives using unit prices contained in the project cost estimate prepared by the Kimley-Horn design team. The unit prices contained in the estimate are considered to include all contractor mark-ups, mobilization, overhead, and profit.

## **COST MODEL**

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The SR 9 project will greatly improve capacity along the alignment south of the City of Cumming while improving safety and reducing accidents in the corridor. To achieve these benefits, a considerable investment in the infrastructure is required, including construction of the four-lane section. The total cost of the project, not including the bike lane option, is estimated at approximately \$50M including a substantial amount of right-of-way.

### **Project Cost**

The data used to analyze costs by design element is presented on the following cost histogram table. To gain an overview of the total project cost, a Pareto Analysis was prepared. This table presents total project costs by roadway segment.

From the cost models, the following areas showed potential for further discussion and value improvement.

#### ***Roadway Section***

- 12-ft. lanes to 11-ft. lanes
- Minimize R/W if possible
- 24-ft. median to 20-ft. or 16-ft.
- Sidewalk offset – 6 ft. median to 2 ft.
- Confirm need for bike lane – 8 ft.
- Asphalt bike path

#### ***Drainage/Environmental***

- Cost elements around existing dam
- Increase budget on hydraulics

#### ***Construction Management***

- Minimize temporary pavement
- Minimize R/W escalation

#### ***Maintenance of Traffic***

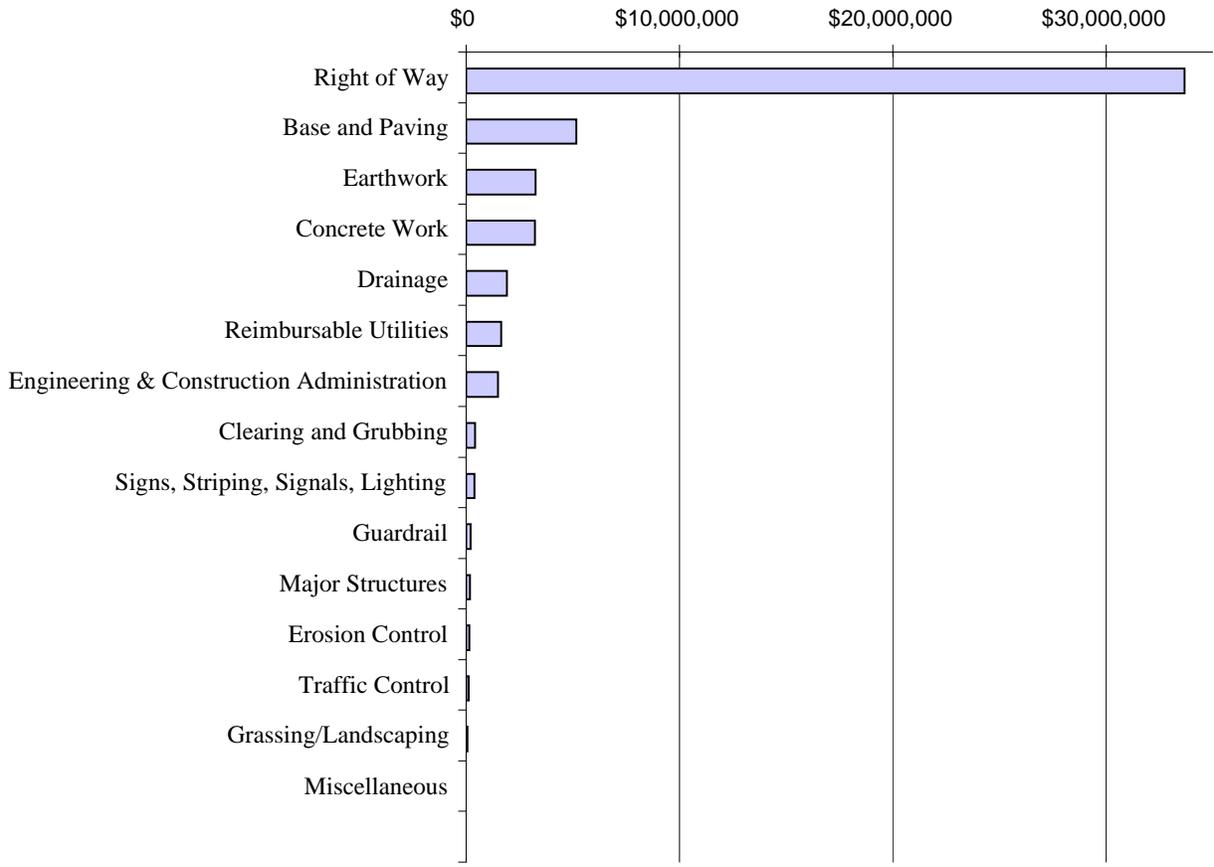
- Increase budget on MOT

# COST HISTOGRAM



PROJECT: **SR 9 WIDENING FROM SR 141 TO SR 20 FY 07**  
*Project No. STP-1336(11) Forsyth County, Georgia*

<b>TOTAL PROJECT</b>	COST	PERCENT	CUM. PERCENT
Right of Way	\$ 33,693,700	64.98%	64.98%
Base and Paving	5,158,700	9.95%	74.92%
Earthwork	3,250,000	6.27%	81.19%
Concrete Work	3,210,800	6.19%	87.38%
Drainage	1,904,220	3.67%	91.06%
Reimbursable Utilities	1,648,337	3.18%	94.23%
Engineering & Construction Administration	1,501,205	2.89%	97.13%
Clearing and Grubbing	408,000	0.79%	97.92%
Signs, Striping, Signals, Lighting	375,000	0.72%	98.64%
Guardrail	204,000	0.39%	99.03%
Major Structures	181,325	0.35%	99.38%
Erosion Control	150,000	0.29%	99.67%
Traffic Control	120,000	0.23%	99.90%
Grassing/Landscaping	50,000	0.10%	100.00%
Miscellaneous	0	0.00%	100.00%
<b>Construction and Right of Way Subtotal</b>		<b>\$ 51,855,287</b>	<b>100.00%</b>
		0	
<b>TOTAL CONSTRUCTION &amp; RIGHT OF WAY</b>		<b>\$ 51,855,287</b>	Comp Markup:



## **FUNCTION ANALYSIS**

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Function Analysis of the SR 9 project was prepared to: (1) understand the project purpose and need, (2) define the requirements for each project element, and (3) ensure a complete and thorough understanding by the VE team of the basic function(s) and identify other public goals through the corridor. Random Function Analysis worksheets for the project elements are attached. 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 support elements add cost to the final product but may have a relatively low worth to the basic function. This creates a high cost-to-worth ratio.

The Function Analysis worksheets include a verb and noun function definition of the element and the VE team's identification of basic or secondary functions. This exercise stimulated the VE team members to think in terms of the areas in which to channel their creative idea development.

The key issues that evolved from the Function Analysis session were the concurrence of the project needs and purpose. The basic functions of the project are to "Reduce Accidents," "Increase LOS," and "Improve Safety." Eliminating the congested traffic conditions will greatly improve safety, reduce delays in the corridor, and help to meet other required project goals. Placing the median in the roadway will be a great help in reducing the many uncontrolled left turns which are currently taking place on the north end of the site near Buford Highway.

Other key functions are presented on the Random Function Analysis forms.

Since this project is part of a massive upgrade throughout the corridor, consistency in design, standards, and operating modes is extremely important. The goals as established for the project appear consistent with the functions identified by the VE team. Therefore, Function Analysis justifies the project need and purpose and will greatly improve driving conditions along this corridor. However, there are still a great many driveways fronting SR 9, and some reduction in these uncontrolled entrances is recommended.

# RANDOM FUNCTION ANALYSIS



PROJECT:	<b>SR 9 WIDENING FROM SR 141 TO SR 20</b> <i>Project No. STP-1336(11) Forsyth County, Georgia</i>	SHEET NO.: <b>1 of 1</b>	
DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
<b>Total Project Purpose and Need</b>	Improve	LOS	B
	Accommodate	Development	G
	Move	Cars	HO
	Reduce	Accidents	G
	Increase	Capacity	RS
	Allow	Movements	RS
	Meet	Standards	G
	Improve	Intersections	S
	Control	Traffic	RS
	Accommodate	Trucks	RS
	Minimize	Maintenance	G
	Control	Budget	G
	Meet	Schedule	G
	Protect	Environment	RS
	Minimize	R/W	G
	Manage	Drainage	RS
	Manage	Construction	RS
	Control	Traffic	RS

Function defined as:	Action Verb Measurable Noun	Kind:	B = Basic S = Secondary RS = Required Secondary	HO = Higher Order LO = Lower Order
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## CREATIVE IDEA LISTING AND JUDGMENT OF IDEAS

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During the Creative Phase, numerous ideas, alternative proposals and/or recommendations were generated for the SR 9 Widening Project using conventional brainstorming techniques as recorded on the following pages.

The creative session yielded a total of 37 ideas for further consideration by the team. These ideas were grouped into the following categories with letter prefixes to identify the area of study:

CATEGORY	PREFIX
Typical Section	S
Alignment	A
Traffic	T
Right-of-Way	RW
Construction Management	CM
Risk Reduction	RR

These ideas were discussed between the VE team members to identify the advantages and disadvantages of each. The VE team compared each of the ideas with the as-designed solution determining whether it improved value, was equal in value, or lessened the value of the presented solution in terms of capital cost, schedule, functionality/safety, maintainability, durability and, life cycle costs.

To assist the team in ranking the creative ideas, each of the criteria were discussed and the following criteria definitions developed from the statement of project need as presented by GDOT on the first day of the VE study:

- **Construction Cost** – The initial cost of the material is important and should be considered.
- **Safety** – Safety is very important and must control in all decision making.
- **Level of Service** – The projected LOS must be achieved to meet the purpose and need.
- **Impact Upon Trucks** – There is a high percentage of trucks in the area.
- **Life Cycle Costs** – The costs of operating and maintaining the highway is extremely important. These costs would include labor and materials over the next 30 years.
- **Right of Way Cost** – It is important to minimize R/W purchase if possible.
- **Accommodate Bicycles** – Including a bike path is a plus for the project but not required at this time.

### Creative Idea Ranking

The ideas were ranked on a qualitative scale of 1 to 5 on how well the VE team believed the idea met the project purpose and need criteria shown above. The higher rated ideas, with scores of 4 or 5, were developed into formal alternatives and included in the Study Report. Some ideas were judged to have minimal cost impacts on the project but provided enhancements in the form of improved safety, accident reduction, 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 increase cost resulting from improving the functionality of the project or system and is deemed by the VE team to be of significant value to the owner or designer.

Typically, all ideas rated 4 or 5 were developed by the VE team. When this was not the case, an idea was combined with another related idea or discarded as a result of additional research which indicated the concept as not being cost-effective or technically feasible. All readers are encouraged to review the attached Creative Idea Listing and Evaluation worksheets since they may suggest additional ideas that can be applied to the design.

# CREATIVE IDEA LISTING



PROJECT: <b>SR 9 WIDENING FROM SR 141 TO SR 20</b> <i>Project No. STP-1336(11) Forsyth County, Georgia</i>	SHEET NO.:	<b>1 of 2</b>
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NO.	IDEA DESCRIPTION	RATING
<b>TYPICAL SECTION (S)</b>		
S-1	Add two 4-ft. bike lanes to the roadway for a 112-ft. total width	5
S-2	Add a bike lane on one side for a 109-ft. total width	5
S-3	Add a bike lane on one side with 11-ft. lanes for a 105-ft. total width	5
S-4	Add bike lanes on both sides with 12-ft. lanes for a 110-ft. total width	5
S-5	Add bike lanes on both sides with 11-ft.lanes for a 102-ft. total width	5
S-6	Add bike lanes on both sides for a 101-ft. total width	5
S-7	Add bike lanes on both sides for a 97-ft. total width	5
S-8	Rural section with ditches, 6 lanes for a 132-ft. total width	5
S-9	Urban section with curbs 132-ft. total width	5
S-10	Use a 2-story viaduct to reduce the width of the required R/W	Drop
S-11	Reduce median to 16 ft. for a 96-ft. total width	5
S-12	Convert 6-ft. grass strip to a multi-use path	4
<b>ALIGNMENT (A)</b>		
A-1	Reduce the staking volumes in the turn lanes on select intersections	4
A-2	Reduce the staking volume at the Pendley intersection	See A-1
A-3	Build a collector lane on the west side of GA 400 to divert traffic from SR 9	Drop
A-4	In the median, use 8-in. x 24-in. Type II curb and gutter instead of 8-in. x 30-in. Type II	5
<b>TRAFFIC (T)</b>		
T-1	Loop signals together to improve traffic flow	DS
T-2	Establish a detour route using GA 400	See CM-2
<b>RIGHT OF WAY (RW)</b>		
RW-1	Change driveways and combine entrances across from Piney Grove Road	DS
RW-2	Combine Lexington and Highland at STA 45+00	See RW-1
RW-3	Eliminate 3 of the 4 entrances for the parcel immediately north of Redi Road	See RW-1

Rating: 1→2 = Not to be developed    3→4 = Varying degrees of development potential    5 = Most likely to be developed  
 DS = Design suggestion    ABD = Already being done

# CREATIVE IDEA LISTING



PROJECT: <b>SR 9 WIDENING FROM SR 141 TO SR 20</b> <i>Project No. STP-1336(11) Forsyth County, Georgia</i>	SHEET NO.:	<b>2 of 2</b>
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NO.	IDEA DESCRIPTION	RATING
<b>RIGHT OF WAY (RW) (Continued)</b>		
RW-4	Eliminate 2 entrances at STA 35+00 and one entrance opposite Holly Park Drive	See RW-1
RW-5	Identify possible locations for storm water retention ponds	DS
<b>CONSTRUCTION MANAGEMENT (CM)</b>		
CM-1	Require the contractor to recycle pavement	DS
CM-2	Detour traffic onto GA 400 during construction	DS
CM-3	Lease property for laydown areas for the contractor	3
CM-4	Break the project into two parts; build one half now, the other in several years	5
CM-5	Use Pendley and Old Atlanta Road as a detour route during construction	DS
CM-6	Increase budget allowance in the cost estimate for traffic control	DS
<b>RISK REDUCTION (RR)</b>		
RR-1	Clarify the amount of unsuitable soils on site through a soil boring program	DS
RR-2	Funds are limited; consider phasing the project	DS
RR-3	Further investigate construction impacts around the dam site	DS
RR-4	Clarify that there are no other historic properties along the alignment	DS
RR-5	Clarify the impact of retaining walls along the alignment	DS
RR-6	Prepare phasing concepts to identify the amount of temporary pavement necessary	DS
RR-7	Review vertical alignment and impact upon the net amount of borrow necessary	DS
RR-8	Perform earthwork analysis as soon as possible to clarify net import/export of soil	DS

Rating: 1→2 = Not to be developed      3→4 = Varying degrees of development potential      5 = Most likely to be developed DS = Design suggestion                  ABD = Already being done
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