



SR 92 Improvements from US 41/SR 3/Cobb Parkway to Glade Road

Project Numbers: CSSTP-0006-00(862) and BRST0-0213-01(005)

P.I. Nos.: 0006862 and 731865

Cobb County

Value Engineering Study Report Design Development Stage

March 2009

Design Consultant



Value Engineering Consultant



Lewis & Zimmerman Associates, Inc.



Lewis & Zimmerman Associates, Inc.

Taking the Chance out of Change

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March 5, 2009

Ms. Lisa L. Myers
Design Review Engineering Manager/VE Coordinator
GA DOT - Engineering Services
One Georgia Center – 5th Floor
Atlanta, Georgia 30308

Re: Project Numbers: CSSTP-0006-00(862) and BRST0-0213-01(005)
SR 92 Improvements from US 41/SR 3/Cobb Parkway to Glade Road
Value Engineering Study Report

Dear Ms. Myers:

Lewis & Zimmerman Associates, Inc. is pleased to submit two hard copies and one electronic copy of the referenced value engineering study report that took place on February 17 - 20, 2009. The objective of the VE effort was to identify opportunities to reduce costs and enhance the value of the project.

This VE workshop identified and developed several ideas which provide opportunities to improve the value of the project to GDOT. Of particular interest are those alternatives related to the roadway design, the 1330-ft long bridge, and right-of-way requirements as detailed in the Study Results Section of this report.

We thank you for your assistance during the course of the VE team's work. Please do not hesitate to call upon us if you or any of the reviewers have any questions regarding the information presented in this report.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.

A handwritten signature in black ink that reads "Stephen G. Havens".

Stephen Havens, PE, PMP, CVS
Sr. Project Manager

Attachment

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EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents 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 is Project Numbers CSSTP-0006-00(862) and BRST0-0213-01(005), SR 92 Improvements from US 41/SR 3/Cobb Parkway to Glade Road, Cobb County, Georgia. The project is being planned for GDOT by a team led by URS, Corp.

The VE workshop was conducted February 17- 20, 2009 at GDOT's Atlanta Headquarters, One Georgia Center and followed the six-phase VE Job Plan:

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

PROJECT DESCRIPTION

This project, located in Cobb County, proposes to widen SR 92/Lake Acworth Drive from US 41/SR 3/Cobb Parkway to Glade Road. Total length of the project is approximately 2.8 miles. The new, divided 4-lane facility will include:

- 11-foot lanes on the inside and 12-foot lanes on the outside.
- A raised concrete median varying from 8 to 20 feet in width.
- 16-foot shoulders with curb and gutter.
- A 10-foot multi-use trail on the east side of the roadway; 12-foot shoulders with curb and gutter and 5-foot sidewalk on the west side of the roadway.
- The proposed right-of-way varies from 100 to 135 feet.

Three new bridge structures will be constructed including:

- A new bridge over Lake Allatoona will be approximately 1400 ft long and have a clear width of 68 ft. This bridge will be constructed on a new location.
- A new bridge over SR 293/Main Street and the CSX Railroad in the city of Acworth will be approximately 260 feet long and have a clear width of 68 ft.
- A new bridge over Tanyard Creek will be approximately 510 feet long and have a clear width of 80 ft.

The project will be staged to allow for a minimum of two lanes of traffic to remain open during all stages of construction.

The posted speed limit will remain 45 mph.

CONSTRUCTION COSTS

The estimated total cost of construction for P.I. Numbers 0006862 and 731865 is \$29,618,127 as of January 14, 2009. The estimated right-of-way cost is \$9,823,000.00. There were no utilities observed that could potentially have prior rights. Therefore, there are no reimbursable utilities at this time.

CONCERNS AND OBJECTIVES

Concerns

The project team summarized the following key design issues to the VE Team during the design overview:

- Acworth Park and Overlook Park at Lake Allatoona are situated in the vicinity of the Subdam and are likely to be affected by the proposed project. As such, they should be evaluated as Section 4(f) protected resources.
- Discharges of water from the bridge over Lake Allatoona and other sections of the 2.8 miles of roadway will require treatment including filtration to remove sediment.
- USACE has a policy of no net loss of storage capacity. Both the normal pool and flood elevations are included in this policy. Any storage loss at either elevation would require a reallocation study to be completed. A reallocation study would be time consuming and difficult. No storage loss due to bridge replacement is overwhelmingly preferred. As such, it will be necessary to provide the volume of the actual bridge piers being placed below elevation 863.
- A design exception for superelevation transition rates may be required. There are multiple curves with short tangent sections between successive curves which may require a design exception for transition rates.
- A design exception for vertical grades may be required at the bridge over the CSX Railroad. Coordination is ongoing with CSX to determine if an additional track or additional vertical clearance is required.

Objectives

The VE team was tasked with the following key objectives:

- Recommend cost reduction ideas
- Recommend ideas to add value by improving roadway and bridge design

To meet these objectives, the VE team focused on the key functions associated with the project, paying particular attention to roadway and bridge design including typical sections, right-of-way requirements, stormwater management, and retaining wall requirements.

RESULTS

The VE team developed 16 cost-saving alternatives and 7 design suggestions for consideration by GDOT and the design team. If the following list of recommended VE alternatives are accepted, a total present worth cost savings of approximately \$4.8 million could be realized.

- Add a second right turn from southbound Glade Road to westbound SR 92 to improve traffic flow for an additional cost of \$11,309 (Alt. No. R-1).
- Make all inside lanes 11-foot-wide in lieu of 12-foot-wide to save \$980,804 (Alt. No. R-3).
- Use 24-inch-wide curb and gutter in lieu of 30-inch-wide curb and gutter to save \$442,344 (Alt. No. R-4).
- Make the raised medians 18-foot-wide in lieu of 20-foot-wide to save \$268,356 (Alt. No. R-5).
- Make the roadway medians 6-foot-wide including 24-inch-wide curb and gutter in lieu of 8-foot-wide including 30-inch-wide curb and gutter to save \$846,066 (Alt. No. R-6).
- Eliminate sidewalks from the left side of SR 92 except in busy commercial areas to save \$202,909 (Alt. No. R-7).
- Add a second left-turn-lane from westbound SR 92 to southbound US 41 to improve vehicle movement for an additional cost of \$33,598 (Alt. No. R-9).
- Convert the old roadway alignment into a multi-use trail in lieu of providing a new multi-use trail from Sta 523+00 to Sta 555+00 (RT) to save \$733,791 (Alt. No. R-12).
- Use HDPE pipe in lieu of RCP pipe for the SR 92 longitudinal stormwater drainage system to save \$120,396 (Alt. No. R-14).
- Realign Orr Road with Kemp Road at the median opening to improve traffic flow for an additional \$354,966 (Alt. No. R-15).
- Shift the right turn onto North Main Street to the east to eliminate the need for a fifth lane on the bridge over the CSX Railroad and save \$73,401 (Alt. No. R-16).
- Use Geogrid to reduce pavement section requirements and save \$508,200 (Alt. No. R-17).
- Provide 6-foot-wide medians in lieu of 8-foot-wide medians on the 1330-foot bridge to save \$305,900 (Alt. No. B-1).
- Increase abutment and wing wall height to reduce the length of the 1330-foot bridge and save \$439,415 (Alt. No. B-6).
- Use an MSE wall from Sta 612+00 to Sta 623+00 (LT) to reduce commercial right-of-way requirements and save \$343,600 (Alt. No. W-4).

IMPLEMENTATION

This VE report is a formalization of the draft materials provided to the project team during the out-briefing discussion which occurred on February 20, 2009. The Summary of VE Alternatives worksheet following this narrative outlines all of the alternatives and the design suggestions developed by the VE team. Some of the alternatives are mutually exclusive or interrelated, so that addition of all project cost savings does not equal total savings for the project. A full listing of all of the ideas considered by the VE team can be found on the Creative Idea Listing in the Value Analysis and Conclusions section of the report.



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

SR 92 Improvements- US 41/SR 3/Cobb Pkwy to Glade Rd.
PROJECT: P.I. Nos. 0006862 and 731865
Cobb County, Georgia, GDOT District 7
Design Development Phase

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
	ROADWAY (R)					
R-1	Add a second right turn from southbound Glade Road to westbound SR 92 to improve traffic flow.	\$0	\$11,309	(\$11,309)		(\$11,309)
R-2	Add a right-in/right-out at Sta 618+00 (RT) to accommodate access to local businesses.					
R-3	Make all inside lanes 11-foot-wide in lieu of 12-foot-wide.	\$980,804	\$0	\$980,804		\$980,804
R-4	Use 24-inch-wide curb and gutter in lieu of 30-inch-wide curb and gutter.	\$617,577	\$175,233	\$442,344		\$442,344
R-5	Make the raised medians 18-foot-wide in lieu of 20-foot-wide.	\$268,356	\$0	\$268,356		\$268,356
R-6	Make the roadway medians 6-foot-wide including 24-inch-wide curb and gutter in lieu of 8-foot-wide including 30-inch-wide curb and gutter.	\$926,076	\$80,010	\$846,066		\$846,066
R-7	Eliminate sidewalks from the left side of SR 92 except in busy commercial areas.	\$202,909	\$0	\$202,909		\$202,909
R-9	Add a second left-turn-lane from westbound SR 92 to southbound US 41 to improve vehicle movement.	\$0	\$33,598	(\$33,598)		(\$33,598)
R-10	Locate the high point of the vertical curve at the center of the new 1330-foot bridge to improve drainage.					
R-12	Convert the old roadway alignment into a multi-use trail in lieu of providing a new multi-use trail from Sta 523+00 to Sta 555+00 (RT).	\$733,791	\$0	\$733,791		\$733,791
R-13	Stripe out the U-turn "eye-brow" lanes to improve safety.					
R-14	Use HDPE pipe in lieu of RCP pipe for the SR 92 longitudinal stormwater drainage system.	\$364,622	\$244,226	\$120,396		\$120,396
R-15	Realign Orr Road with Kemp Road at the median opening.	\$0	\$354,966	(\$354,966)		(\$354,966)



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

SR 92 Improvements- US 41/SR 3/Cobb Pkwy to Glade Rd.
P.I. Nos. 0006862 and 731865
Cobb County, Georgia, GDOT District 7
Design Development Phase

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
	ROADWAY (R) Continued					
R-16	Shift the right turn onto North Main Street to the east to eliminate the need for a fifth lane on the bridge over the CSX Railroad.	\$333,775	\$260,374	\$73,401		\$73,401
R-17	Use Geogrid to reduce pavement section requirements.	\$798,600	\$290,400	\$508,200		\$508,200
	BRIDGES (B)					
B-1	Provide 6-foot-wide medians in lieu of 8-foot-wide medians on the 1330-foot bridge.	\$305,900	\$0	\$305,900		\$305,900
B-3	Use a storm water filtering system on the project to improve water quality.				DESIGN SUGGESTION	
B-5	Use 280-foot-long steel through girder spans in lieu of 140-foot-long bulb tees to minimize storage loss due to bridge piers.				DESIGN SUGGESTION	
B-6	Increase abutment and wing wall height to reduce the length of the 1330-foot bridge.	\$439,415	\$0	\$439,415		\$439,415
B-7	Use cast-in-drill-hole (CIDH) piles on the 1330-foot bridge.				DESIGN SUGGESTION	
	WALLS (W)					
W-2	Use a soil nail wall in lieu of Class A Concrete from Sta 556+00 to Sta 565+30 (RT).				DESIGN SUGGESTION	
W-3	Use an MSE wall in lieu of Class A Concrete from Sta 569+00 to Sta 576+00 (LT).				DESIGN SUGGESTION	
W-4	Use an MSE wall from Sta 612+00 to Sta 623+00 (LT) to reduce commercial right-of-way requirements.	\$1,718,600	\$1,375,000	\$343,600		\$343,600

STUDY RESULTS

INTRODUCTION

The results are the major feature of this value engineering study conducted on P.I. Numbers 0006862 and 731865, SR 92 Improvements from US 41/SR 3/Cobb Parkway to Glade Road, since they portray the benefits that can be realized by GDOT, District 7, and Cobb County. The results will directly affect the project design and will require careful coordination between GDOT and URS to determine the disposition of each alternative.

During the course of the study, many ideas for potential value enhancement were conceived and evaluated by the team for technical feasibility, applicability to the project, and the ability to meet the owner's project value objectives. Research performed on those ideas considered to have potential to enhance the value of the project resulted in the development of individual alternatives identifying specific changes to the project as a whole, or individual elements that comprise the project. These may be in the form of VE alternatives (accompanied by cost estimates) or design suggestions (without cost estimates). For each alternative developed the following information has been provided:

- A summary of the original design;
- A description of the proposed change to the project;
- Sketches and design calculations, if appropriate;
- A capital cost comparison and life cycle discounted present worth cost comparison of the alternative and original design, if appropriate;
- A descriptive evaluation of the advantages and disadvantages of selecting the alternative; and
- A brief narrative to compare the original design and the proposed change and provide a rationale for implementing the change into the project.

The capital cost comparisons for each alternative use unit quantities from the Estimate Report for file "0006862_2009-01-14" and Estimate Report for file "731865_2009-01-14", prepared by District 7, State of Georgia Department of Transportation, dated 1/14/2009. If unit quantities were not available, GDOT databases were consulted.

Each design suggestion contains the same information as the VE alternatives, except that no cost information is included. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed for reasons other than cost. Examples of these reasons may include improve circulation, reduce maintenance, improve constructability, improve safety, and reduce project risk. In addition, some ideas cannot be quantified in terms of cost with the design information provided; these are also presented as design suggestions and are intended to improve the quality of the project.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) that can be tracked through the value analysis process and facilitate referencing between the Creative Idea Listing and Evaluation worksheets, the alternatives, and the Summary of Value Engineering Alternatives table. The Alt. No. includes a prefix that refers to one of the major project elements:

PROJECT ELEMENT	TRIPPL
Roadway	R
Bridges	B
Walls	W

Summaries of the alternatives are provided on the Summary of Value Engineering Alternatives table. The table is divided into project elements for the reviewer's convenience and is used to divide the results section. The complete documentation of the developed alternatives and design suggestions follows the Summary of Value Engineering Alternatives tables.

KEY ISSUES

The project team summarized the following key design issues to the VE Team during the design overview:

- Acworth Park and Overlook Park at Lake Allatoona are situated in the vicinity of the Subdam and are likely to be affected by the proposed project. As such, they should be evaluated as Section 4(f) protected resources.
- Stormwater management remains to be addressed fully and will be discussed further with USACE as design progresses. Discharges of water from the bridge over Lake Allatoona will require treatment including possibly filtration to remove sediment.
- USACE has a policy of no net loss of storage capacity. Both the normal pool and flood elevations are included in this policy. Any storage loss at either elevation would require a reallocation study to be completed. A reallocation study would be time consuming and difficult. No storage loss due to bridge replacement is overwhelmingly preferred. As such, it will be necessary to provide the volume of the actual bridge piers being placed below elevation 863.
- A design exception for shoulder width and horizontal clearance may be required for the 12-foot shoulder on the west side of the roadway.
- A design exception for superelevation transition rates may be required. There are multiple curves with short tangent sections between successive curves which may require a design exception for transition rates.
- A design exception for vertical grades may be required at the bridge over the CSX Railroad. Coordination is ongoing with CSX to determine if an additional track or additional vertical clearance is required.

STUDY OBJECTIVES

The VE team was tasked with the following key objectives:

- Recommend cost reduction ideas
- Recommend ideas to add value by improving bridge and roadway design

To meet these objectives, the VE team focused on the key functions associated with the project, paying particular attention to roadway and bridge design including typical sections, right-of-way requirements, stormwater management, and retaining wall requirements.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of 16 VE alternatives and 7 design suggestions for consideration by the project team. Several of the design suggestions have cost savings potential which should be easy to quantify as the project development effort progresses. The greatest opportunity for cost reduction and added value centered on ramp and turning lanes design, and bridge width requirements.

Each of the aforementioned alternatives should be given careful consideration for the potential cost savings and/or value improvement that they offer compared to the tradeoffs.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

When reviewing the study results, the project team 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 a concern about one part of it. Each area within an alternative or design suggestion that is acceptable should be considered for use in the final design, even if the entire alternative or design suggestion is not implemented. Variations of these alternatives and design suggestions by the owner or designer are encouraged.

All alternatives and design suggestions were developed independently of each other to provide a broad range of options to consider for implementation. Therefore, some of them are “mutually exclusive,” so acceptance of one may preclude the acceptance of another. In addition, some of the alternatives may be interrelated, so acceptance of one or more may not yield the total of the cost savings shown for each alternative. Design suggestions could also be interrelated thus precluding a part of one or more suggestions from being implemented if another design suggestion is also implemented.

GDOT and URS should evaluate all alternatives carefully in order to select the combination of ideas with the greatest beneficial impact on the project. Once this has been accomplished, the total cost savings resulting from the VE study can be calculated based on implementing a revised, all-inclusive design solution.



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

SR 92 Improvements- US 41/SR 3/Cobb Pkwy to Glade Rd.
P.I. Nos. 0006862 and 731865
Cobb County, Georgia, GDOT District 7
Design Development Phase

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
ROADWAY (R)						
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R-2	Add a right-in/right-out at Sta 618+00 (RT) to accommodate access to local businesses.					
R-3	Make all inside lanes 11-foot-wide in lieu of 12-foot-wide.	\$980,804	\$0	\$980,804		\$980,804
R-4	Use 24-inch-wide curb and gutter in lieu of 30-inch-wide curb and gutter.	\$617,577	\$175,233	\$442,344		\$442,344
R-5	Make the raised medians 18-foot-wide in lieu of 20-foot-wide.	\$268,356	\$0	\$268,356		\$268,356
R-6	Make the roadway medians 6-foot-wide including 24-inch-wide curb and gutter in lieu of 8-foot-wide including 30-inch-wide curb and gutter.	\$926,076	\$80,010	\$846,066		\$846,066
R-7	Eliminate sidewalks from the left side of SR 92 except in busy commercial areas.	\$202,909	\$0	\$202,909		\$202,909
R-9	Add a second left-turn-lane from westbound SR 92 to southbound US 41 to improve vehicle movement.	\$0	\$33,598	(\$33,598)		(\$33,598)
R-10	Locate the high point of the vertical curve at the center of the new 1330-foot bridge to improve drainage.					
R-12	Convert the old roadway alignment into a multi-use trail in lieu of providing a new multi-use trail from Sta 523+00 to Sta 555+00 (RT).	\$733,791	\$0	\$733,791		\$733,791
R-13	Stripe out the U-turn "eye-brow" lanes to improve safety.					
R-14	Use HDPE pipe in lieu of RCP pipe for the SR 92 longitudinal stormwater drainage system.	\$364,622	\$244,226	\$120,396		\$120,396
R-15	Realign Orr Road with Kemp Road at the median opening.	\$0	\$354,966	(\$354,966)		(\$354,966)

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT, District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	R-1
DESCRIPTION:	ADD A SECOND RIGHT TURN FROM SOUTHBOUND GLADE ROAD TO WESTBOUND SR 92 TO IMPROVE TRAFFIC FLOW	SHEET NO.:	1 of 4

ORIGINAL DESIGN:

The current design includes a single right turn from southbound Glade Road to westbound SR 92.

ALTERNATIVE:

Provide two right turn lanes from Glade Road to westbound SR 92.

ADVANTAGES:

- Smooths and expedites traffic flow
- Less delay time

DISADVANTAGES:

- Increases cost
- Slight increase in construction time

DISCUSSION:

Glade Road intersects I-75. The 2007 ADT shows that 5,300 vehicles currently make a right turn from Glade Road to SR-92. This heavy traffic is expected to rise to 7,890 in the year 2032.

Two right turn lanes will significantly improve traffic flow from southbound Glade Road to westbound SR 92 which is currently operating at LOS 'D' and is expected to operate at LOS 'F' in 2032.

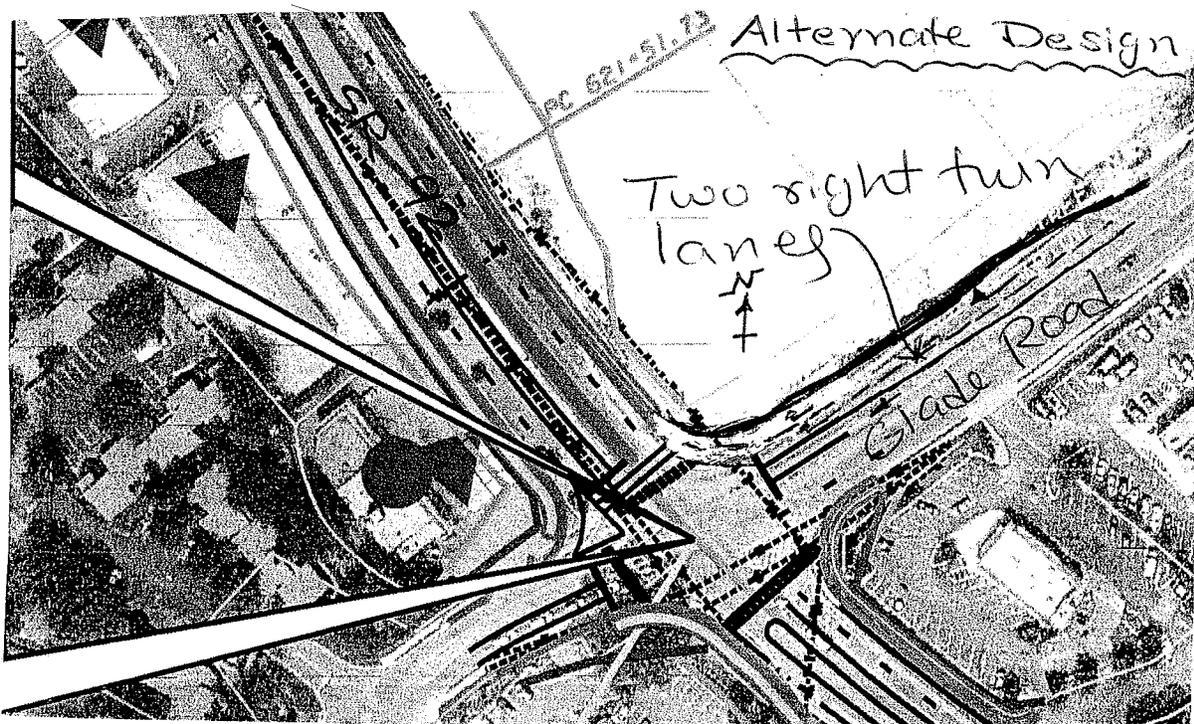
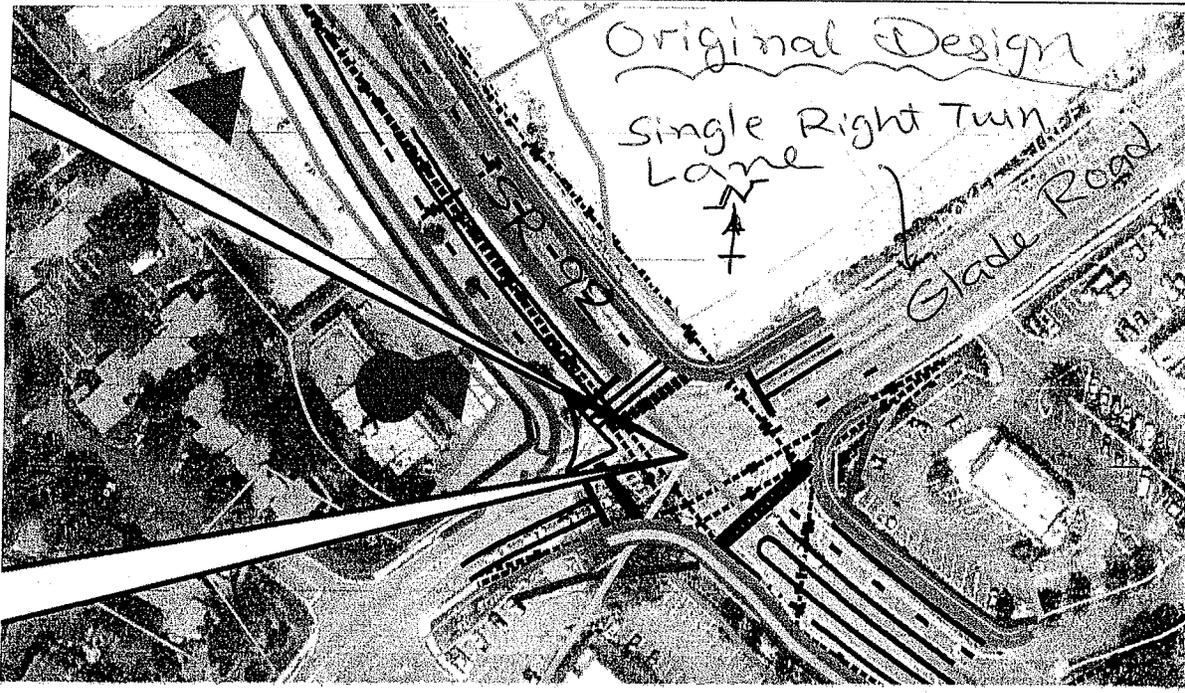
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 11,309	—	\$ 11,309
SAVINGS (Original minus Alternative)	\$ (11,309)	—	\$ (11,309)

PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.:
R-1

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 2 of 4



CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-1

SHEET NO.: 3 of 4

S.Y. Cost of full depth Pavement Section:

$$\left(1\frac{1}{2}'' \text{Asphaltic Conc.}\right)_{12.5\text{mm}} : 165 \text{ lbs/sy} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$64.62}{T} = \frac{\$5,33}{\text{sy}}$$

$$\left[2'' \text{ (Asph. Conc.) } 19\text{mm}\right] : 220 \text{ lbs/sy} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$67.66}{T} = \frac{\$7,45}{\text{sy}}$$

$$3'' \text{ Asph. Conc. } 25\text{mm} : 330 \text{ lbs/sy} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$62.61}{T} = \frac{\$10,33}{\text{sy}}$$

$$12'' \text{ GAB} = \frac{.075T}{\text{cf}} \times \left(\frac{9 \text{ sf.} \times 1 \text{ ft.}}{\text{sy}}\right) \times \frac{\$18.12}{T} = \frac{\$12,23}{\text{sy}}$$

Total : \$ 35,34/sy

Additional pavement due to 2nd right turn lane;

$$\frac{240' \times 12'}{9} = 320 \text{ sy}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	R-2
DESCRIPTION:	ADD A RIGHT-IN/RIGHT-OUT AT STA 628+00 (RT) TO ACCOMMODATE ACCESS TO LOCAL BUSINESSES	SHEET NO.:	1 of 2

ORIGINAL DESIGN:

The original design eliminates access to SR 92 for local businesses near Glade Rd.

ALTERNATIVE: (see attached sketch)

Keep the existing driveway at Sta 618+00 (RT) to accommodate access to local businesses. Additionally, provide handicapped ramps at both curb returns.

ADVANTAGES:

- Maintains access to SR 92 for local businesses

DISADVANTAGES:

- Increases chances of accidents and traffic slow down

DISCUSSION:

Blocking or eliminating the existing access driveway will eliminate access to local businesses from SR 92. Business users will be required to navigate through the local neighborhood.

The cost to tie in the current driveway is negligible.

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

R-2
 sheet 2 of 2

Provide
 Right In -
 Right Out
 opening
 here

	2032 NO-BUILD		2032 BUILD	
	AM	PM	AM	PM
NALIZED)	F	F	E	E

05	2006	TOTAL
1		3
		3
		2
		3
1		11

05	2006	TOTAL
3	8	55
1	3	8
9	15	89
3	1	13

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.** ALTERNATIVE NO.:
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7 **R-3**
Design Development Stage

DESCRIPTION: **MAKE ALL INSIDE LANES 11-FT-WIDE IN LIEU OF 12-FT-WIDE** SHEET NO.: **1 of 7**

ORIGINAL DESIGN:

The original design typical section includes four lanes with one 11-ft-wide lane and one 12-ft-wide lane in each direction.

ALTERNATIVE: (see attached sketch)

Use all 11-ft-wide lanes.

ADVANTAGES:

- Less construction cost
- Slightly less construction time
- Shorter pedestrian crossings

DISADVANTAGES:

- Narrower adjacent lanes

DISCUSSION:

AASHTO 2004 “Policy on Geometric Design”, page 473 addresses using lanes narrower than 12-ft-wide. At speeds of 45 mph or less, “11-ft-wide lanes are adequate for through lanes, continuous two-way left-turn lanes, and lanes adjacent to a painted median.”

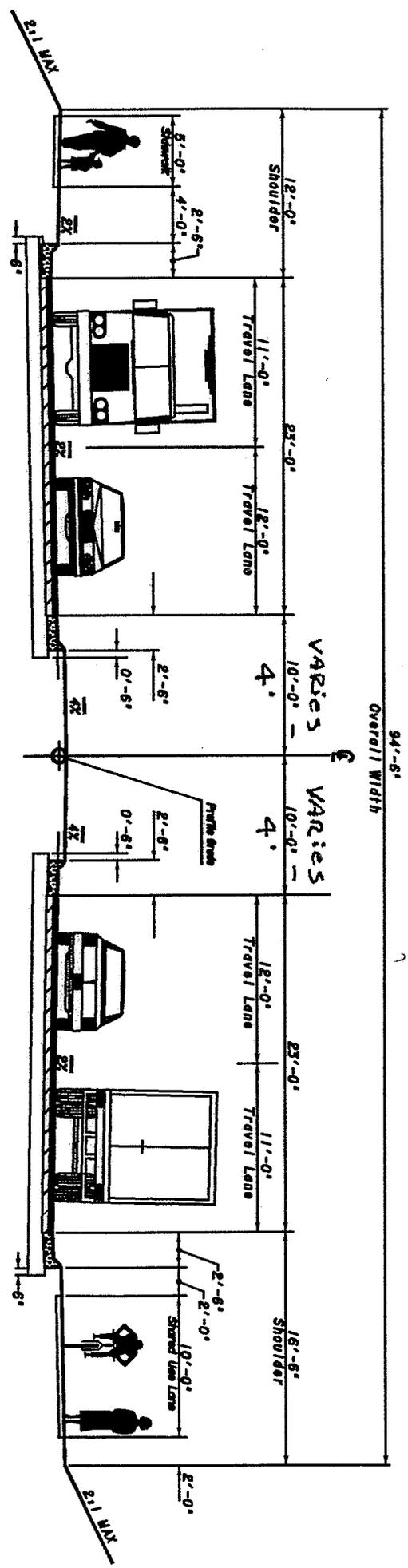
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 980,804	—	\$ 980,804
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 980,804	—	\$ 980,804

Sketch AH. R-3

217

Original 12' inside lanes

STATE ROUTE 92
TYPICAL TANGENT SECTION

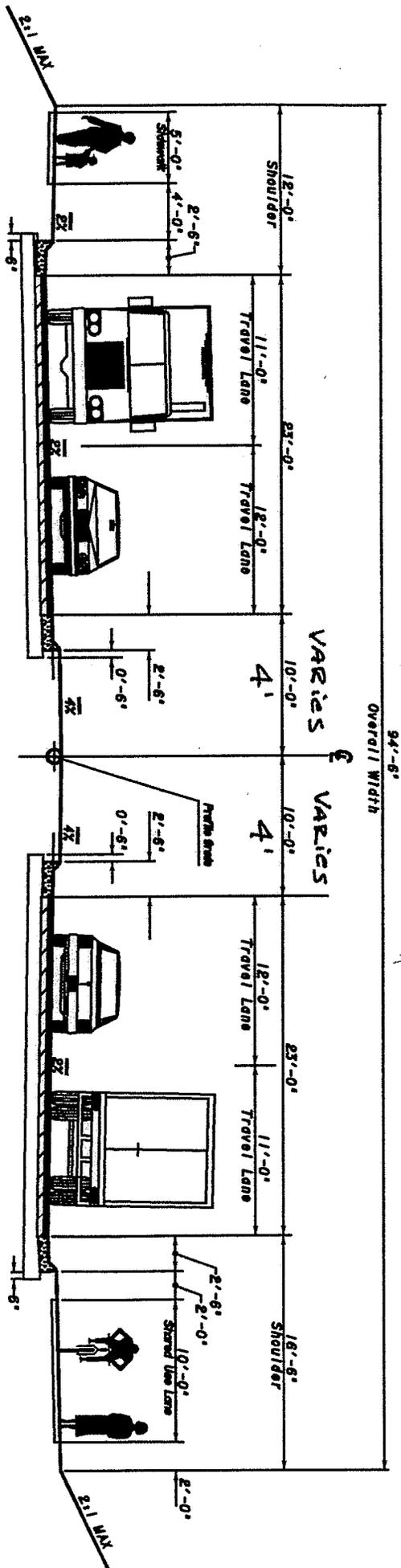


Sketch Alt. R-3

3/7

Alternate 11' inside Lanes

STATE ROUTE 92
TYPICAL TANGENT SECTION



CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-3

SHEET NO.: 4 of 7

Original Costs / Quantities saved

$$\rightarrow \frac{((2.8 \text{ mi} \times 5,280'_{\text{mi}}) - (1330' + 575' + 315'))}{9 \text{ sf/sy}} \times 2' = 2,792 \text{ s.y.}$$

R/W: Reduces Typical Section from outside slide point to Rt, outside point (total ^{Lt} Required width) by 2'. R/W is only being acquired for slide to slide with slopes being built on easements

$$\rightarrow \text{R/W saved} = (2.8 \text{ miles} \times 5,280') - 1330' = 26,908 \text{ sf}$$

$$\rightarrow \text{EARTHWORK} = \frac{2'}{94'} = 2\% \text{ of total earth work.}$$

→ use \$10,000 for misc. incidental costs to include drainage (shooper x-drawings), erosion control (less area or "footprint"), less striping, etc.

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.:

R-3

SHEET NO.: 5 of 7

S.Y. Cost of full depth Pavement Section:

$$(1\frac{1}{2}'' \text{Asphaltic Conc.}) : 165 \frac{\text{Lbs}}{\text{sy}} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$64.62}{T} = \frac{\$5,33}{\text{sy}}$$

12.5mm

$$[2'' \text{ (Asph. Conc.) } 19\text{mm}] : 220 \frac{\text{Lbs}}{\text{sy}} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$67.66}{T} = \frac{\$7,45}{\text{sy}}$$

$$3'' \text{ Asph. Conc. } 25\text{mm} : 330 \frac{\text{Lbs}}{\text{sy}} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$62.61}{T} = \frac{\$10,33}{\text{sy}}$$

$$12'' \text{ GAB} = \frac{.075T}{\text{cf}} \times \frac{(9 \text{ sf.} \times 1 \text{ ft.})}{\text{sy}} \times \frac{\$18.12}{T} = \frac{\$12,23}{\text{sy}}$$

$$\text{Total : } \$ \frac{35,34}{\text{sy}}$$

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-3

SHEET NO.: 6 of 7

BRIDGE SQ FT UNIT COSTS.

BRIDGE 1

→ \$ 11,704,000 LS COST.

BRIDGE AREA 1330' x 76'-5"

(over LAKE) UNIT COST = \$ 115 / SF

BRIDGE 2

→ \$ 2,167,800 LS COST.

(over CSX) BRIDGE AREA 315' x (76'-5" + 11')

UNIT COST = \$ 80 / SF

BRIDGE 3

→ \$ 4,921,900 LS COST.

(over TANYARD CRK) BRIDGE AREA. 575' x 76'-5"

UNIT COST = \$ 112 / SF

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT District 7
Design Development Stage

ALTERNATIVE NO.:
R-4

DESCRIPTION: **USE 24-IN-WIDE CURB AND GUTTER IN LIEU OF 30-IN-WIDE CURB AND GUTTER**

SHEET NO.: **1 of 2**

ORIGINAL DESIGN:

The original design includes 30-in-wide curb and gutter throughout the project.

ALTERNATIVE:

Use 24-in-wide curb and gutter throughout the project.

ADVANTAGES:

- Reduces impervious area
- Reduces material cost

DISADVANTAGES:

- May require additional drainage piping due to increased gutter spread

DISCUSSION:

The use of 24-in-wide curb and gutter will result in reduced impervious area requiring drainage at a lower material cost.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 617,577	—	\$ 617,577
ALTERNATIVE	\$ 175,233	—	\$ 175,233
SAVINGS (Original minus Alternative)	\$ 442,344	—	\$ 442,344

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT District 7
Design Development Stage

ALTERNATIVE NO.:
R-5

DESCRIPTION: **MAKE THE RAISED MEDIANS 18-FT-WIDE IN LIEU OF 20-FT-WIDE**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The current design includes 20-ft-wide raised medians at intersections and 8-ft-wide raised medians elsewhere along SR 92.

ALTERNATIVE:

Use 18-ft-wide in lieu of 20-ft-wide raised medians at intersections.

ADVANTAGES:

- Reduces construction costs
- Reduces right-of-way costs

DISADVANTAGES:

- Less separation between opposing traffic

DISCUSSION:

18-ft-wide medians are acceptable for intersections in accordance with AASHTO 2004, chapter 7, page 474 (18-25 feet for left turns).

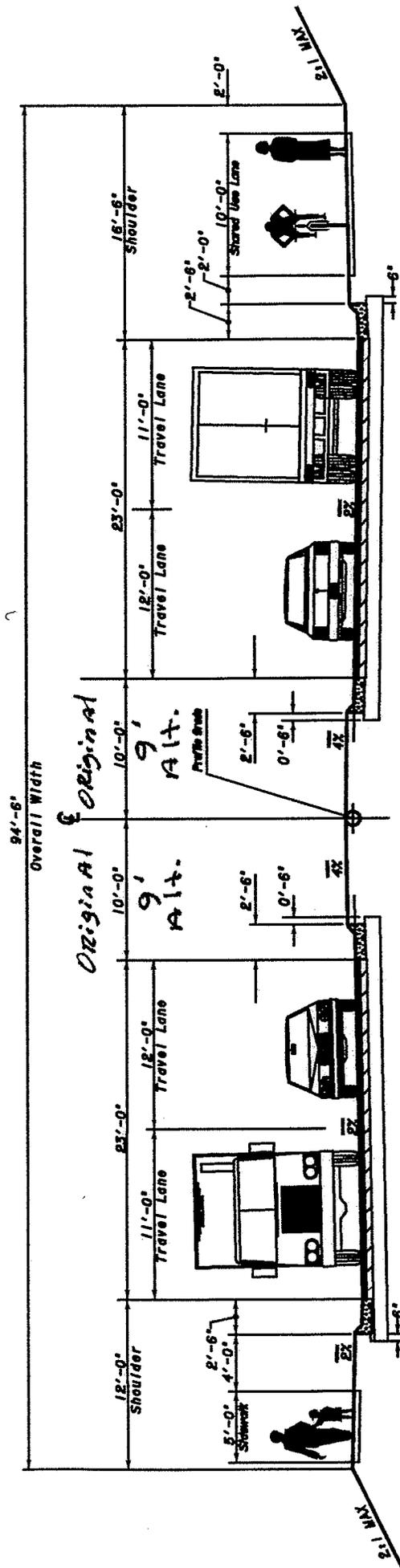
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 268,356	—	\$ 268,356
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 268,356	—	\$ 268,356

Sketch

AH.R-5

Sheet 2 of 4

Original & Alternate
(20') (18')



STATE ROUTE 92
TYPICAL TANGENT SECTION

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-5

Reduce 20' Raised median to 18'

SHEET NO.:

3 of 4

Length of Projects with 20' raised median to be reduced to 18'.

$$(2.8 \text{ mi.} \times 5,280) - 7,000' (8' \text{ median}) - 2,220' = 5,560'$$

$$5,560' \times 2' = 11,120 \text{ SF}^* (\text{"foot print saved"})$$

$$\rightarrow \frac{11,120 \text{ SF}}{9 \text{ SF/Sy}} = 1,236 \text{ S.Y. (for conc. median paving)}$$

→ Earthwork approximately 2% of total.

→ Reduce 2' of PAVEMENT through median openings

$$\frac{84' \times 5 \text{ intersections} \times 2'}{9 \text{ SF/Sy}} = 93.33$$

→ conc. median saved:

$$\frac{2' \times 5,560'}{9 \text{ SF/Sy}} = 1,236 \text{ S.Y.}$$

$$* \text{E/W saved} = 11,120 \text{ SF}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	R-6
DESCRIPTION:	MAKE THE ROADWAY MEDIANS 6-FT-WIDE WITH 24-IN-WIDE CURB AND GUTTER IN LIEU OF 8-FT-WIDE WITH 30-IN-WIDE CURB AND GUTTER	SHEET NO.:	1 of 7

ORIGINAL DESIGN:

The current design includes 8-ft-wide raised medians with 30-in-wide curb and gutter except at intersections along SR 92.

ALTERNATIVE:

Use 6-ft-wide in lieu of 8-ft-wide raised medians with 24-in-wide curb and gutter along SR 92 except at intersections.

ADVANTAGES:

- Reduces construction costs
- Reduces right-of-way costs

DISADVANTAGES:

- Less separation between opposing traffic

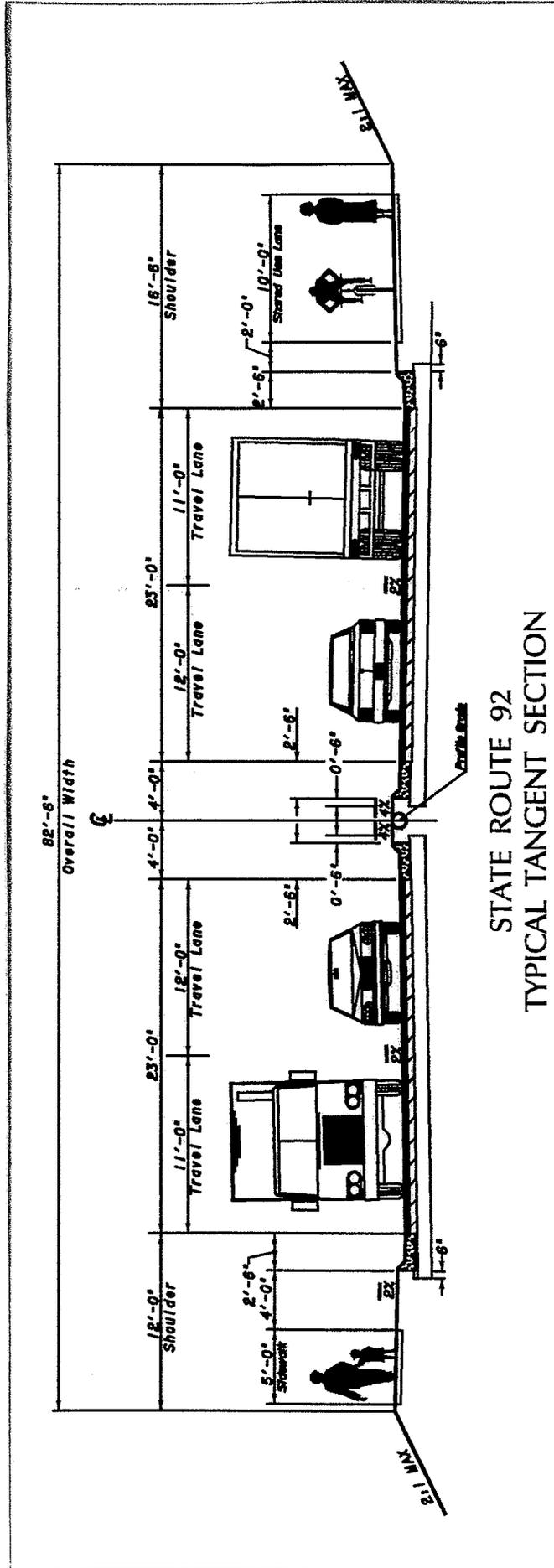
DISCUSSION:

6-ft-wide medians are acceptable for roadways in accordance with AASHTO 2004, chapter 7, page 474.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 926,076	—	\$ 926,076
ALTERNATIVE	\$ 80,010	—	\$ 80,010
SAVINGS (Original minus Alternative)	\$ 846,066	—	\$ 846,066

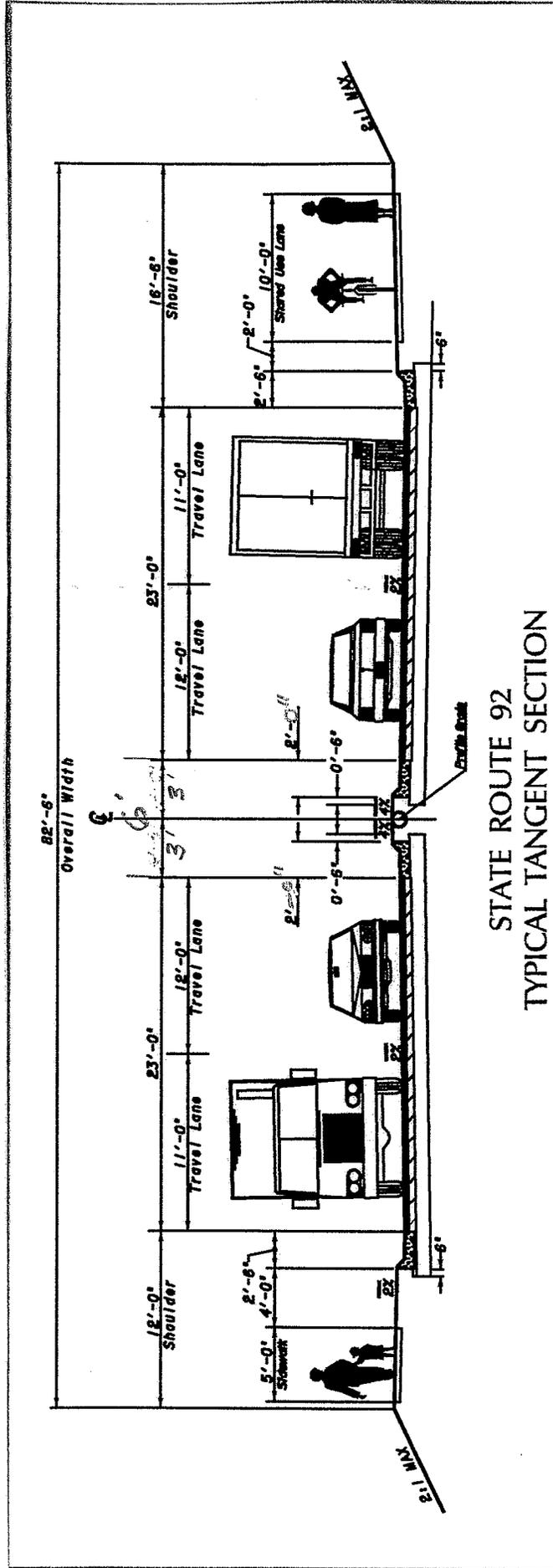
Sketch Alt. R-6

Original 2/7
8' median



Sketch Alt. R-6

Alternate: 3/7
6' median



STATE ROUTE 92
TYPICAL TANGENT SECTION

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-6

SHEET NO.: 4 of 7

S.Y. Cost of full depth Pavement Section:

$$\left(1\frac{1}{2}'' \text{Asphaltic Conc.}\right)_{12.5\text{mm}} : 165 \text{Lbs/sy} \times \frac{1}{2000\text{lbs}} \times \frac{\$64.62}{1} = \frac{\$5,33}{\text{sy}}$$

$$[2'' \text{(Asph. Conc.) } 19\text{mm}] : 220 \text{Lbs/sy} \times \frac{1}{2000\text{lbs}} \times \frac{\$67.66}{1} = \frac{\$7.45}{\text{sy}}$$

$$3'' \text{Asph. Conc. } 25\text{mm} : 330 \text{Lbs/sy} \times \frac{1}{2000\text{lbs}} \times \frac{\$62.61}{1} = \frac{\$10.33}{\text{sy}}$$

$$12'' \text{GAB} = \frac{.075T}{\text{cf}} \times (9\text{sf.} \times 1\text{ft.}) \times \frac{\$18.12}{1} = \frac{\$12.23}{\text{sy}}$$

$$\text{Total : } \$ \frac{35.34}{\text{sy}}$$

Cost of bridge Savings:
 8' to 6' median - see Alt. B-1 for
 Bridges 1, 2, & 3 unit price (\$/sf).

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-6

SHEET NO.: 5 of 7

Reduce Roadway foot print

$$7000' \text{ of (3' median)} \times 2' = 14,000 \text{ sf}$$

→ Earthwork (savings): $\frac{2'}{82'} = .0243$ (2.43%)
 (of total earthwork)

→ estimate of R/W savings = 26,928 SF

conc. median pavement (saved):

$$\rightarrow \frac{2' \times (7,000')}{9 \text{ sf/sy}} = 1,556 \text{ sy}$$

Weight R/W cost for whole project:

$$\frac{\$11.50 \times (.4)}{\text{sf}} + (.6) \times \frac{\$1.75}{\text{sf}} = \$5.65/\text{sf}$$

(weighted)

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.:

R-6

SHEET NO.: 6 of 7

Alt. use 24" curb & gutter in lieu
of 30" curb & gutter.
(from Item mean Summary)

Alt. unit cost: (8" x 24") = \$ 11.43/L.F.

Original unit cost: (8" x 30") = \$ 15.69/L.F.

Savings (^{\$}15.69 - ^{\$}11.43)/L.F. = \$4.26

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	R-7
DESCRIPTION:	ELIMINATE SIDEWALKS FROM THE LEFT SIDE OF SR 92 EXCEPT IN BUSY COMMERCIAL AREAS	SHEET NO.:	1 of 5

ORIGINAL DESIGN:

The current design includes a 5-ft-wide sidewalk along the entire left side of SR 92 from US 41/SR 3/Cobb Parkway to Glade Road.

ALTERNATIVE:

Remove the sidewalk from the left side of SR 92 except where necessary. The VE team estimated that a total of 1,500 LF of sidewalk on the left side should be sufficient in the busy commercial areas.

ADVANTAGES:

- Reduces construction costs
- Could still add sidewalks in the future

DISADVANTAGES:

- Pedestrians would be required to use the multi-use trail

DISCUSSION:

The VE team recommends grading a 12-ft-wide shoulder on the entire left side of the proposed new roadway for sidewalk if it is warranted in the future. An allowance for 1,500 linear ft of sidewalk should be included in the budget, which provides approximately 750 linear feet on each end of the proposed new roadway. Otherwise, local government and/or developers can pay for additional sidewalk as new development occurs in the future.

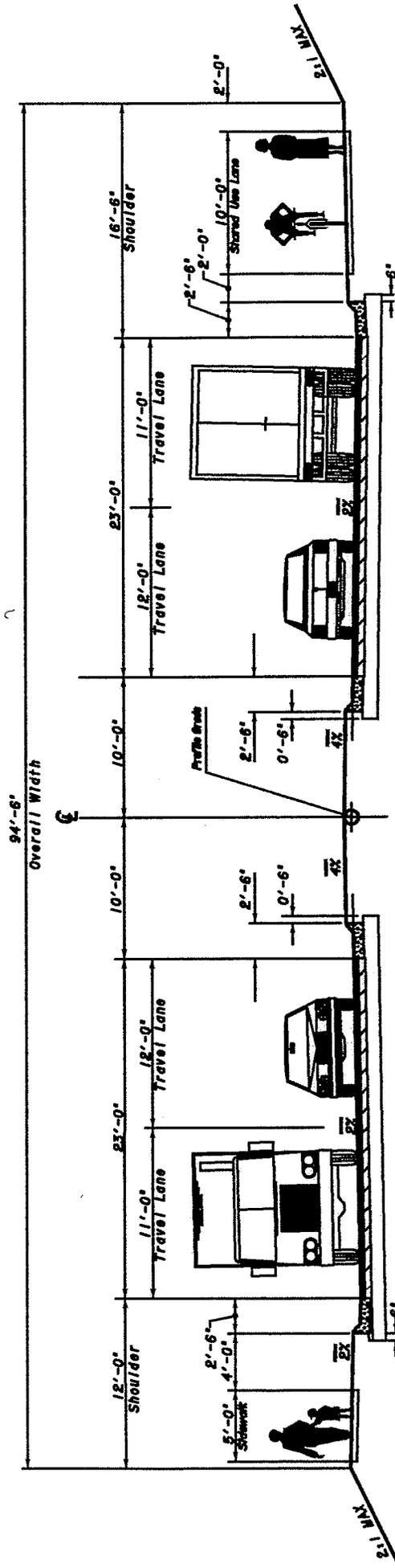
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 202,909	—	\$ 202,909
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 202,909	—	\$ 202,909

Sketch

ALT. R-7

SHEET 2 OF 5

Original Shoulder
with sidewalk



STATE ROUTE 92
TYPICAL TANGENT SECTION

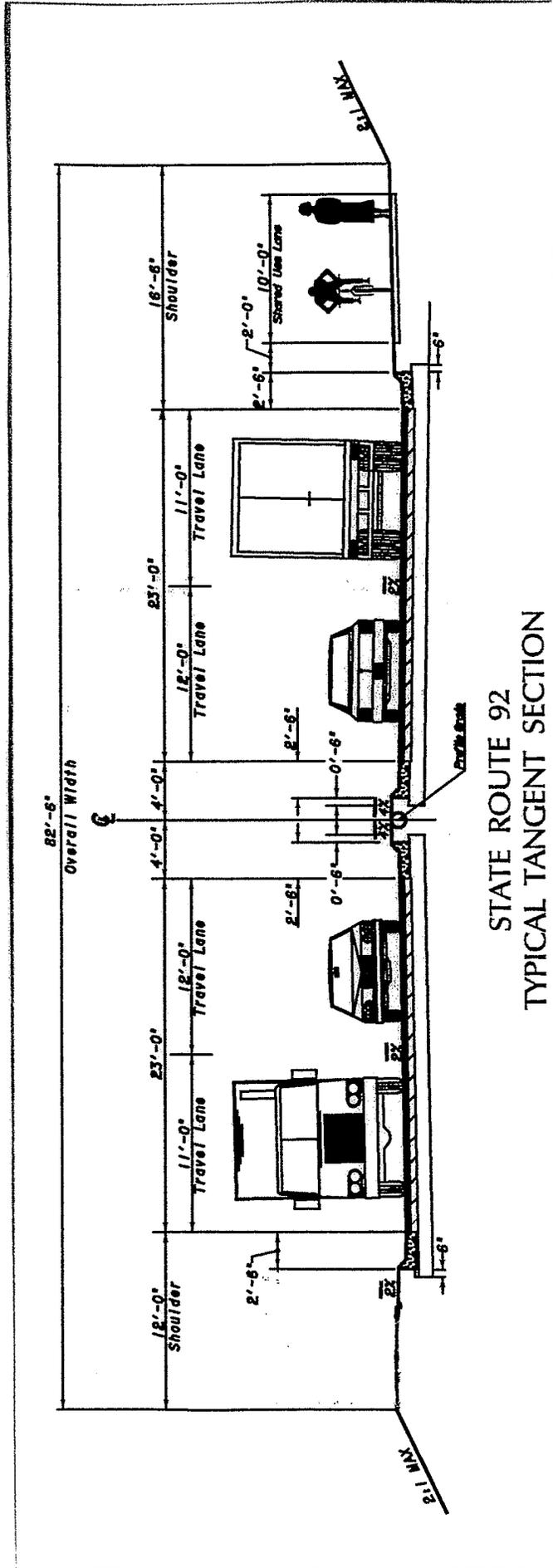
Sketch

Alt. R-7

SHEET 3 OF 5

Alternate

Shoulder w/o sidewalk



STATE ROUTE 92
TYPICAL TANGENT SECTION

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.:

R-7

SHEET NO.: 4 of 5

Length of sidewalk to be removed from (left shoulder) projects.

$$\left[14,780' - (1330' + 315' + 575') - (84' \times 5 \text{ in } 5 \text{ section}) \right] =$$

Bridges

$$= 12,144' \text{ of sidewalk (Roadway)}$$

Keep sidewalk at each end of project in commercial areas (1500')

$$12,144' - 1,500' = 10,644' \text{ (saved sidewalk)}$$

$$\frac{10,644' \times 5'}{9 \text{ sf/sy}} = 5,914 \text{ s.y. (saved sidewalk)}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.** ALTERNATIVE NO.:
P.I. Nos. 0006862 and 731865
Cobb County, GDOT District 7 **R-9**
Design Development Stage

DESCRIPTION: **ADD A SECOND LEFT-TURN-LANE FROM WESTBOUND SR 92 TO SOUTHBOUND US 41 TO IMPROVE VEHICLE MOVEMENT** SHEET NO.: **1 of 4**

ORIGINAL DESIGN:

The current design includes one left turn lane from westbound SR 92 to southbound US 41.

ALTERNATIVE:

Provide a second left turn lane from westbound SR 92 to southbound US 41.

ADVANTAGES:

- Faster vehicle movement

DISADVANTAGES:

- Additional pavement cost

DISCUSSION:

The 2007 ADT is 1,750. For the year 2032, the ADT jumps to 2,580. Adding a second left turn lane from SR 92 to US 41 will help this intersection that is already operating at level "F."

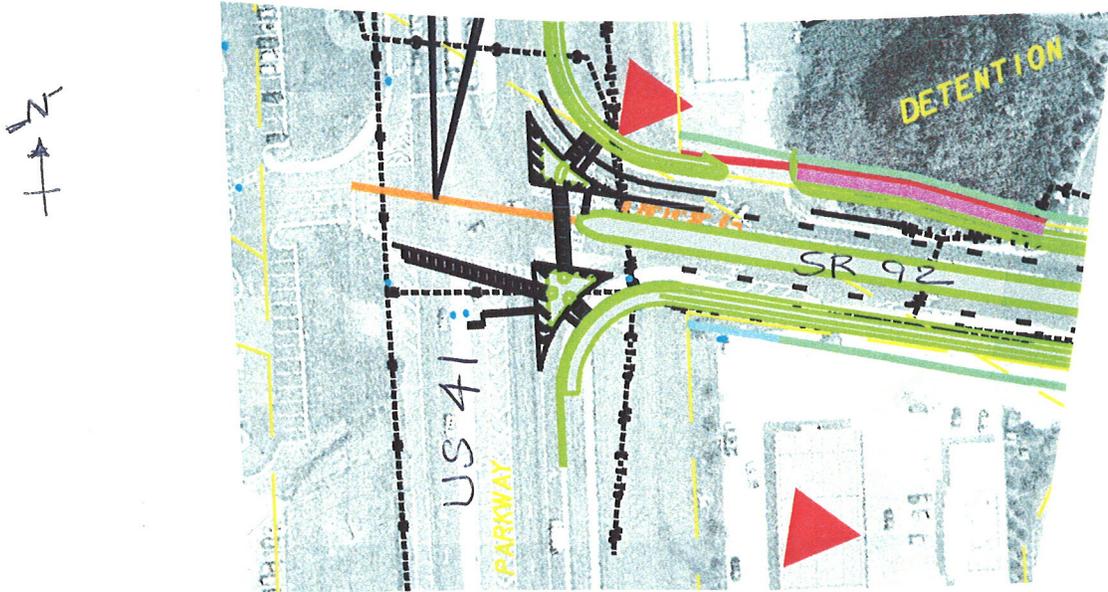
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 33,598	—	\$ 33,598
SAVINGS (Original minus Alternative)	\$ (33,598)	—	\$ (33,598)

PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

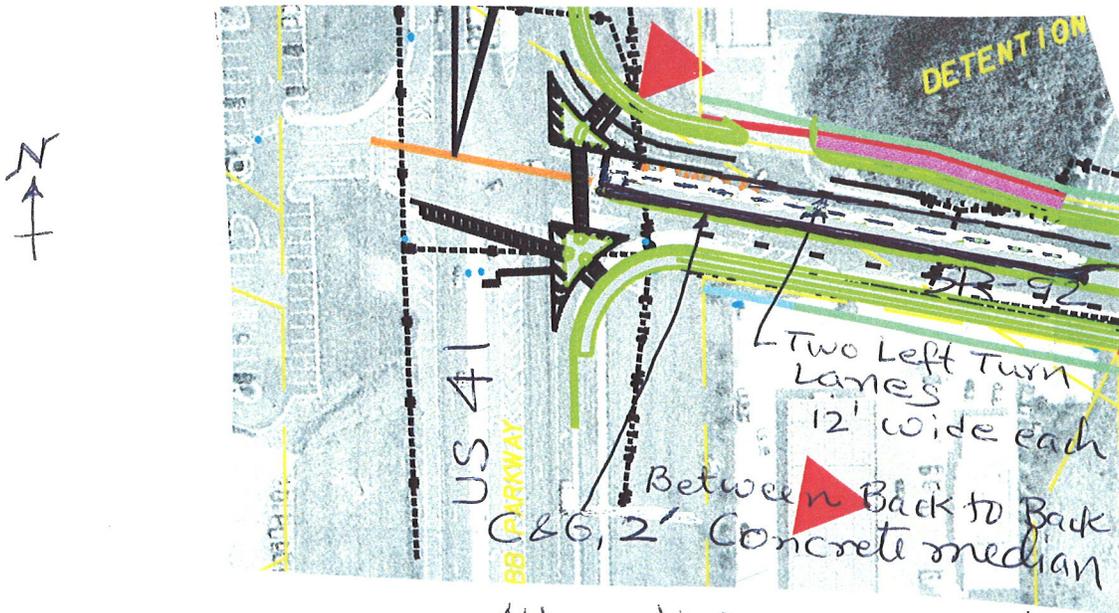
ALTERNATIVE NO.:
R-9

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: *2 of 4*



As - Designed



Alternative

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-9

SHEET NO.:

3 of 4

S.Y. Cost of full depth Pavement Section:

$$\left(1\frac{1}{2}'' \text{ Asphaltic Conc.} \right) : 165 \text{ lbs}_{\text{sy}} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$64.62}{T} = \frac{\$5,33}{\text{sy}}$$

12.5 mm

$$\left[2'' \text{ (Asph. Conc.) } 19 \text{ mm} \right] : 220 \text{ lbs}_{\text{sy}} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$67.66}{T} = \frac{\$7,45}{\text{sy}}$$

$$3'' \text{ Asph. Conc. } 25 \text{ mm} : 330 \text{ lbs}_{\text{sy}} \times \frac{T}{2000 \text{ lbs}} \times \frac{\$62.61}{T} = \frac{\$10,33}{\text{sy}}$$

$$12'' \text{ GAB} = \frac{.075T}{\text{cf}} \times \left(9 \text{ sf.} \times 1 \text{ ft.} \right) \times \frac{\$18.12}{T} = \frac{\$12,23}{\text{sy}}$$

$$\text{Total : } \$ \frac{35,34}{\text{sy}}$$

Additional square yard of pavement due to the
 240' of 2nd lane = $\frac{240 \times 12}{9} = 320$

Additional cubic yard of concrete = $\frac{240 \times 2}{9} = 53.3$
 in the median

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	R-10
DESCRIPTION:	LOCATE THE HIGH POINT OF THE VERTICAL CURVE AT THE CENTER OF THE NEW 1,330-FT BRIDGE TO IMPROVE DRAINAGE	SHEET NO.:	1 of 1

ORIGINAL DESIGN:

The original design shows the high point of the 1,330-foot bridge between bents 8 and 9 out of 11.

ALTERNATIVE: (see attached sketch)

Adjust the profile of the 1,330-foot bridge to position the high point near bent 5. This will allow storm water drainage to be balanced in each direction on the bridge.

ADVANTAGES:

- Less storm water to be transported in each direction
- Requires fewer inlets
- Requires less maintenance

DISADVANTAGES:

- Profiles may be impacted beyond the bridge limits
- Requires two locations to process storm water

DISCUSSION:

Adjusting the profile of the 1,330-foot bridge will equalize the amount of storm water to be transformed each direction thereby reducing pipe sizes and the number of inlets.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT District 7
Design Development Stage

ALTERNATIVE NO.:
R-12/B-2

DESCRIPTION: **CONVERT THE OLD ROADWAY ALIGNMENT INTO A
 MULTI-USE TRAIL IN LIEU OF PROVIDING A NEW MULTI-
 USE TRAIL FROM (RT) STA 523+00 TO STA 555+00**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The current design includes a 10-ft-wide multi-use trail (RT) for the entire length of the new construction on SR 92.

ALTERNATIVE:

Convert the old roadway alignment into a multi-use trail in lieu of providing a new 10-ft-wide multi-use trail from (RT) Sta 523+00 to Sta 555+00. Include a 6-ft-wide shoulder on the (RT) 1,330 ft bridge in lieu of a new 10-ft-wide multi-use trail.

ADVANTAGES:

- Reduces 1330-foot bridge width by 4 feet
- Less drainage width
- Reduces bridge cost

DISADVANTAGES:

- No vehicle access to the existing recreational area parking lot

DISCUSSION:

The current scope does not include the use of the old roadway alignment from Sta 523+00 to Sta 555+00. This would be an ideal location for a multi-use trail to access the existing recreational area.

Cobb County may wish to provide vehicle access to the existing recreational area by way of the United Methodist Church entry drive.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 733,791	—	\$ 733,791
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 733,791	—	\$ 733,791

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.:

R-12/B-2

SHEET NO.:

2 of 3

Bridge Savings:

$$1320' \times (10' - 6') = 5,320 \text{ sf}$$

concrete savings for multi-use path:

$$(555 + 100 - 523 + 100) \times 10' = 32,000 \text{ sf}$$

or 3,555.5 sy

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	
		R-13	
DESCRIPTION:	STRIPE OUT THE U-TURN “EYE-BROW” LANES TO IMPROVE SAFETY	SHEET NO.:	1 of 1

ORIGINAL DESIGN:

The current design proposes “eye-brow” lanes for U-turns.

ALTERNATIVE: (see attachments)

Stripe-out or mark the U-turn areas as shoulder to discourage drivers from using them as acceleration lanes.

ADVANTAGES:

- Improves safety

DISADVANTAGES:

- None identified

DISCUSSION:

The U-turn “eye-brow” areas at intersections adjacent to side streets are often misinterpreted by drivers as a short acceleration lanes. Striping out this area will discourage drivers from using these areas for accelerating onto US 92.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	R-14
DESCRIPTION:	USE HDPE PIPE IN LIEU OF RCP PIPE FOR THE LONGITUDINAL STORM WATER DRAINAGE SYSTEM	SHEET NO.:	1 of 5

ORIGINAL DESIGN:

The current design calls for reinforced concrete pipe (RCP) for the new SR 92 longitudinal storm water drainage system.

ALTERNATIVE:

Use high density polyethylene (HDPE) pipe in lieu of RCP for the new SR 92 longitudinal storm water drainage system.

ADVANTAGES:

- Reduces construction cost
- Improves constructability

DISADVANTAGES:

- None identified

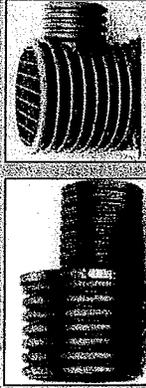
DISCUSSION:

Due to its light weight, convenient lengths, and flexibility, HDPE drainage pipe is much easier and quicker to install than RCP and delivers the same functionality.

The largest HDPE pipe diameter is 60-inches.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 364,622	—	\$ 364,622
ALTERNATIVE	\$ 244,226	—	\$ 244,226
SAVINGS (Original minus Alternative)	\$ 120,396	—	\$ 120,396

NFLOW HDPE

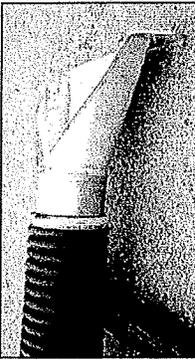
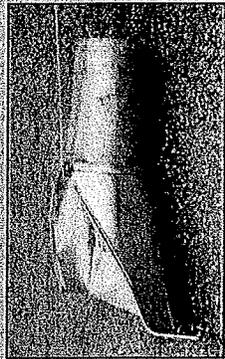
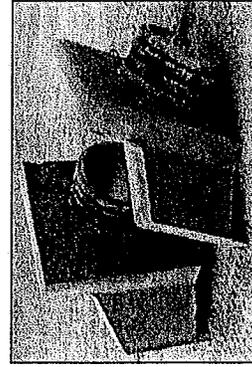


Specialty Fabrications

Southeast Culvert can provide a variety of specialty structures in HDPE. These structures are advantageous for complex systems such as roof drainage and underground detention in manifold inlets for yard or sports field drainage problems. Each inlet is supplied with a removable grate for maintenance purposes. Fabrications can be made to order. Contact SEC for more information.

End Treatments

A variety of end treatments can be utilized on HDPE pipe outlets. Flared end sections, steel and HDPE, are typical and cost-effective methods of spreading out flow and preventing scour. Safety flared end sections may also be used. Safety ends are typical for county and state right of ways. If steel end sections are used, a tapered sleeve will aid with ease of attachment. HDPE may also be beveled to match slopes on the jobsite. If a beveled end is chosen it is beneficial to pour a concrete collar to protect the pipe end. Concrete headwalls can be formed with a plastic stub so that HDPE may be joined with a split coupler. Functionality and aesthetics are important for choosing an end treatment. SEC, Inc. can provide further information concerning these issues.



NFLOW HDPE

Durability

HDPE is a tough material that can withstand handling and installation processes. Its superior chemical inert drainage product available NFLOW pipe is effective in a pH range from 2 to 14 and other drainage products can consistently perform in such a large pH range.

Abrasion can be the most destructive force that drainage pipes will endure, specifically the invert of the pipe. Abrasion is caused by bedload that is carried by high velocities. HDPE is highly resistant to abrasive wear due to its physical makeup and ductility.

The resistivity of soils does not effect the performance of HDPE. NFLOW pipe has an excellent record of success in both alkali and acid installations, and it exceeds expectations in harsh environments.

Structural Integrity

All flexible pipe develops structural strength through soil-pipe interaction. The soil provides the stiffness for the pipe. Flexible pipe will deflect until the soil halts deflection. The performance of the flexible pipe improves as the quality of the surrounding backfill improves.

Selection of backfill material is critical to pipe durability. Class I, II, and III are acceptable materials. Class III requires fill height limitations and care during installation. All materials should be compacted to 90% Standard Proctor Density.

Southeast Culvert, Inc. recommends following the practices of ASTM D2321 "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications" or contact your SEC representative for suggestions.

Applications

NFLOW pipe meets all governing specifications for AASHTO M 294 Type-S pipe. NFLOW is designated for storm sewer and culvert installations. It may also be utilized for underground detention. HDPE is ideal for roof drainage systems due to its versatility. This product may be specified as cross drain or storm drain for any type of private or public work.



(Alternate) Sketch Alt. R-14

SHEET 2/5

Calculations Alt. 3/5
R-14



SOUTHEAST CULVERT, INC.

DATE 1/22/2009
 JOB NAME MARTA
 LOCATION
 CUSTOMER
 ATTN:

FOOTAGE	SIZE	GAGE	DESCRIPTION	UNIT \$	TOTAL
1	18"		HDPE Pipe	\$6.95	\$6.95
					\$0.00
1	24"		HDPE Pipe	\$11.20	\$11.20
					\$0.00
1	30"		HDPE Pipe	\$16.02	\$16.02
					\$0.00
1	36"		HDPE Pipe	\$21.50	\$21.50
					\$0.00
1	42"		HDPE Pipe	27.95	\$0.00
					\$0.00
					\$0.00
					\$0.00
					\$0.00
					\$0.00
					\$0.00
					\$0.00
					\$0.00
					\$0.00
					\$0.00

- *This quotation is good for 30 days
- *Sales tax not included
- *Southeast Culvert, Inc accepts no responsibility for the accuracy of these quantities
- *Please contact Mark McCord with questions - 770.963.5041

Installation \$ $\frac{0.50}{(\text{in-Dia})} \cdot \text{L.F. (min)}$ ←
 $\frac{1}{(\text{in-Dia})} \cdot \text{L.F. (MAX)}$ ←

(20 ft. / concrete)

depending on pipe size and depth.
 Use $\frac{1}{67}$ to $\frac{1}{1}$ L.F.

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-14

SHEET NO.: 4 of 5

Amount of Storm Pipe to be HDPE:
 (90% of pipe for longitudinal system)

$$18'' (9,930' \times .90) = 8,940 \text{ L.F.}$$

$$24'' (322' \times .90) = 290 \text{ L.F.}$$

$$36'' (100\%) \times 26' = 26 \text{ L.F.}$$

$$42'' (.75\%) \times 200' = 150 \text{ L.F.}$$

The unit prices for HDPE pipe
 use: $\frac{\$1 - \text{dia of pipe in inches}}{\text{LF}}$ for installation

$$18'' = \$6.95 (\text{materials}) + \frac{\$18}{\text{LF}} = \$24.95/\text{LF} (\text{HDPE})$$

$$24'' = \$11.20 (\text{materials}) + \frac{\$24}{\text{LF}} = \$35.20/\text{LF} (\text{HDPE})$$

$$36'' = \$16.02 (\text{materials}) + \frac{\$36}{\text{L.F.}} = \$52.02/\text{LF} (\text{HDPE})$$

$$42'' = \$27.95 (\text{materials}) + \frac{\$42}{\text{L.F.}} = \$69.95/\text{LF} (\text{HDPE})$$

6" GAT under HDPE pipe:

$$\text{Avg. width } (2.5') \times (9,400') \times (.5') \times \frac{.073 \text{ T}}{\text{CF}} = 858 \text{ TU}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	R-15
DESCRIPTION:	REALIGN ORR ROAD WITH KEMP ROAD AT THE MEDIAN OPENING	SHEET NO.:	1 of 4

ORIGINAL DESIGN:

The current design shows Orr Road and Kemp Road intersecting SR 92 at different locations.

ALTERNATIVE:

Close the north portion of the current Orr Road intersection with SR 92 and realign the north portion of Orr Road to intersect with Kemp Road near the entry to Wal-Mart.

ADVANTAGES:

- Improves traffic flow
- Reduces congestion
- Improves safety

DISADVANTAGES:

- Requires additional right-of-way
- Requires additional roadway construction
- Requires abandonment of existing Kemp Road to the north

DISCUSSION:

Realignment of Orr Road with the median opening to the Wal-Mart at Kemp Road will reduce congestion, improve traffic flow, and improve safety.

The majority of the cost is for right-of-way.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 0	—	\$ 0
ALTERNATIVE	\$ 354,966	—	\$ 354,966
SAVINGS (Original minus Alternative)	\$ (354,966)	—	\$ (354,966)

SKETCH



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.:

R-15

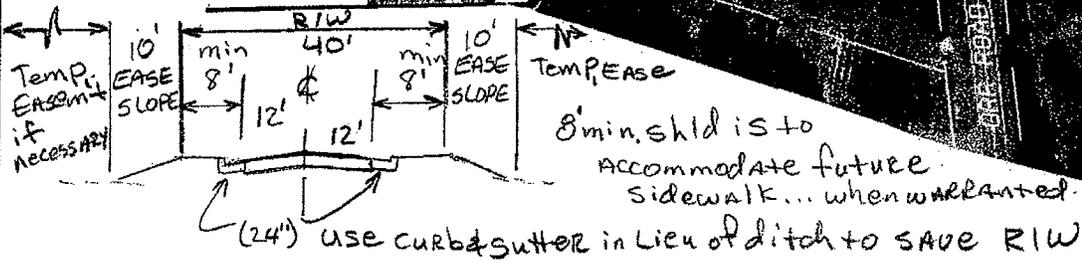
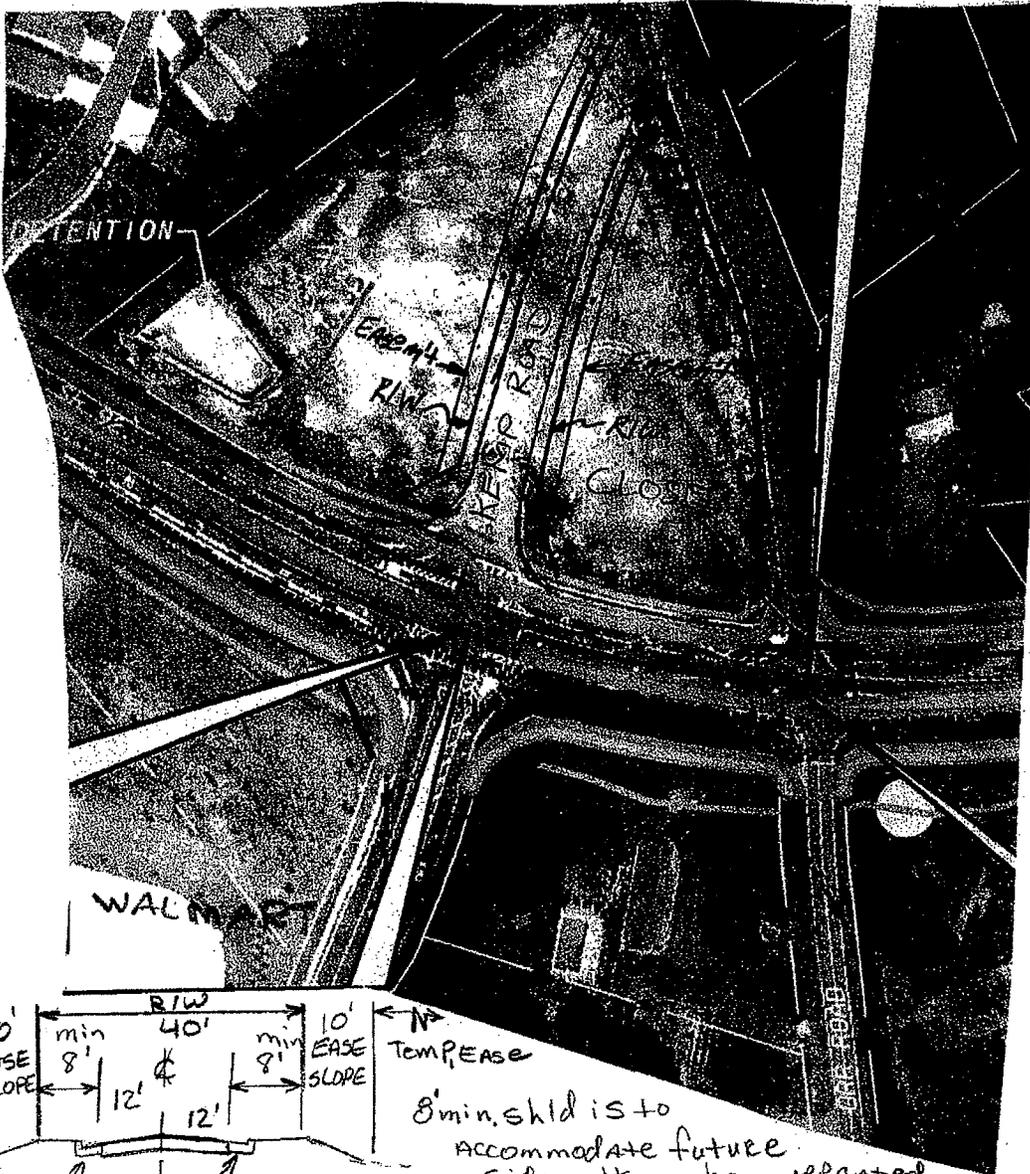
ORIGINAL DESIGN

ALTERNATIVE DESIGN

BOTH

SHEET NO.:

2 of 4



CALCULATIONS



PROJECT: SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.
 P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-15

SHEET NO.:

3 of 4

S.Y. Cost of full depth Pavement Section:

$$(1\frac{1}{2}'' \text{ Asphaltic Conc.}) : 165 \text{ lbs}_{\text{sy}} \times \frac{1}{2000 \text{ lbs}} \times \frac{\$64.62}{\text{T}} = \frac{\$5.33}{\text{sy}}$$

12.5mm

$$[2'' \text{ (Asph. Conc.) } 19\text{mm}] : 220 \text{ lbs}_{\text{sy}} \times \frac{1}{2000 \text{ lbs}} \times \frac{\$67.66}{\text{T}} = \frac{\$7.45}{\text{sy}}$$

$$3'' \text{ Asph. Conc. } 25\text{mm} : 330 \text{ lbs}_{\text{sy}} \times \frac{1}{2000 \text{ lbs}} \times \frac{\$62.61}{\text{T}} = \frac{\$10.33}{\text{sy}}$$

$$12'' \text{ GAB} = \frac{.075 \text{ T}}{\text{cf}} \times (9 \text{ sf} \times 1 \text{ ft}) \times \frac{\$18.12}{\text{T}} = \frac{\$12.23}{\text{sy}}$$

$$\text{Total} : \$ \frac{35.34}{\text{sy}}$$

$$\text{R/W weighted "Avg" SF} = \$5.65/\text{sy} \text{ (includes both Res. \& Comm.)}$$

Realigned Kemp Road length : 360', width : 24'

$$\rightarrow \text{Total square yard of new pavement} = \frac{360' \times 24'}{9 \text{ sf/sy}} = 960_{\text{sy}}$$

$$\rightarrow \text{R/W square footage} : 360' \times 40' = 14,400 \text{ sf.}$$

$$\rightarrow \text{Easement (slope)} 360' \times 2 \text{ sides} \times 10' = 7,200 \text{ sf}$$

$$\rightarrow \text{Earthwork} \approx \frac{40' \times 360' \times 4' (\text{Avg.})}{27 \text{ cf/cy}} = 2,140 \text{ c.y.}$$

$$\rightarrow (24'') \text{ curb \& gutter} = 720 \text{ L.F. ; Drainage estimated:}$$

→ 4 catch basins; 400 L.F. 18" Pipe



SUMMARY OF VALUE ENGINEERING ALTERNATIVES

SR 92 Improvements- US 41/SR 3/Cobb Pkwy to Glade Rd.

PROJECT: P.I. Nos. 0006862 and 731865

Cobb County, Georgia, GDOT District 7

Design Development Phase

PRESENT WORTH OF COST SAVINGS

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
ROADWAY (R) Continued						
R-16	Shift the right turn onto North Main Street to the east to eliminate the need for a fifth lane on the bridge over the CSX Railroad.	\$333,775	\$260,374	\$73,401		\$73,401
R-17	Use Geogrid to reduce pavement section requirements.	\$798,600	\$290,400	\$508,200		\$508,200
BRIDGES (B)						
B-1	Provide 6-foot-wide medians in lieu of 8-foot-wide medians on the 1330-foot bridge.	\$305,900	\$0	\$305,900		\$305,900
B-3	Use a storm water filtering system on the project to improve water quality.					
DESIGN SUGGESTION						
B-5	Use 280-foot-long steel through girder spans in lieu of 140-foot-long bulb tees to minimize storage loss due to bridge piers.					
DESIGN SUGGESTION						
B-6	Increase abutment and wing wall height to reduce the length of the 1330-foot bridge.	\$439,415	\$0	\$439,415		\$439,415
B-7	Use cast-in-drill-hole (CIDH) piles on the 1330-foot bridge.					
DESIGN SUGGESTION						
WALLS (W)						
W-2	Use a soil nail wall in lieu of Class A Concrete from Sta 556+00 to Sta 565+30 (RT).					
DESIGN SUGGESTION						
W-3	Use an MSE wall in lieu of Class A Concrete from Sta 569+00 to Sta 576+00 (LT).					
DESIGN SUGGESTION						
W-4	Use an MSE wall from Sta 612+00 to Sta 623+00 (LT) to reduce commercial right-of-way requirements.	\$1,718,600	\$1,375,000	\$343,600		\$343,600

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	R-16
DESCRIPTION:	SHIFT THE RIGHT TURN ONTO NORTH MAIN STREET TO THE EAST TO ELIMINATE THE NEED FOR A FIFTH LANE ON THE BRIDGE OVER THE CSX RAILROAD	SHEET NO.:	1 of 5

ORIGINAL DESIGN:

The current design includes an exit/deceleration lane to North Main Street on the Proposed Bridge over the CSX Railroad.

ALTERNATIVE: (see attachments)

Shift the SR 92 exit/deceleration lane to the east to eliminate the need for a fifth lane on the bridge over the CSX Railroad.

ADVANTAGES:

- Reduces construction cost
- Reduces construction time

DISADVANTAGES:

- Requires additional right-of-way
- More complex MOT during staged construction

DISCUSSION:

Shifting the SR 92 exit/deceleration lane to the east will shorten construction time and reduce construction cost. This alternative will require additional right-of-way to the east of the current exit lane.

Since staged construction is proposed for this bridge, it is unclear how reducing the width of the bridge will affect construction and MOT.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 333,775	—	\$ 333,775
ALTERNATIVE	\$ 260,374		\$ 260,374
SAVINGS (Original minus Alternative)	\$ 73,401	—	\$ 73,401

SKETCH



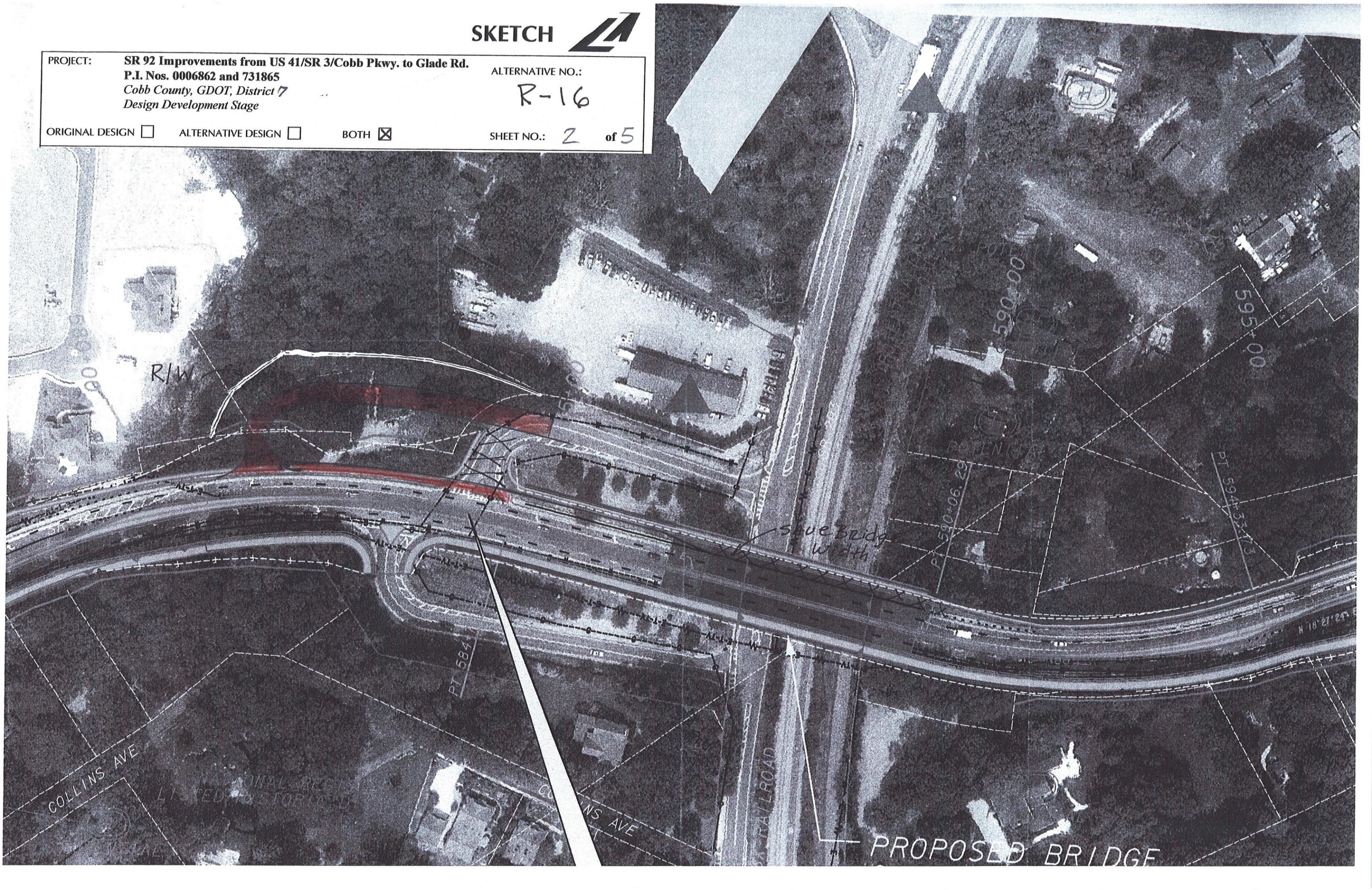
PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.:

R-16

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 2 of 5



CALCULATIONS



PROJECT: SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.
 P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-16

SHEET NO.: 3 of 5

S.Y. Cost of full depth Pavement Section:

$$\left(1\frac{1}{2}'' \text{Asphaltic Conc.}\right)_{12.5\text{mm}} : 165 \frac{\text{Lbs}}{\text{sy}} \times \frac{T}{2000\text{Lbs}} \times \$64.62 = \$5.33 \frac{\text{sy}}{\text{sy}}$$

$$\left[2'' \text{(Asph. Conc.) } 19\text{mm}\right] : 220 \frac{\text{Lbs}}{\text{sy}} \times \frac{T}{2000\text{Lbs}} \times \$67.66 = \$7.45 \frac{\text{sy}}{\text{sy}}$$

$$3'' \text{Asph. Conc. } 25\text{mm} : 330 \frac{\text{Lbs}}{\text{sy}} \times \frac{T}{2000\text{Lbs}} \times \$62.61 = \$10.33 \frac{\text{sy}}{\text{sy}}$$

$$12'' \text{GAB} = \frac{.075T}{\text{cf}} \times \left(9\text{sf.} \times 1\text{ft.}\right) \times \$18.12 = \$12.23 \frac{\text{sy}}{\text{sy}}$$

$$\text{Total : } \$35.34 \frac{\text{sy}}{\text{sy}}$$

Shldr on "Ramp" use $\left(1\frac{1}{2}'' + 2''\right)$ Asph. Conc.
 with 6" GAB.

$$\text{Unit price : } \$5.33/\text{sy} + \$7.45/\text{sy} + \$6.12/\text{sy} =$$

$$\$18.90/\text{sy}$$

$$\text{Earthwork Add'l} = \frac{(24' \times 340' \times 10') + (24' \times 8' \times 435' \times 10')}{2' \text{ of } 1\text{cv}}$$

$$= 8,200 \text{ c.y.}$$

$$\text{Add'l RIW} = 110' \times 300' = 33,000 \text{ SF}$$

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.:

R-16

SHEET NO.: 4 of 5

Original Bridge #2 AREA SAVED:

Bridge #2 is the Bridge over N. Main St. & use #80/SF for Bridge from B-1. CSX R/R.

→ Area saved $12' \times 315' = 3,780 \text{ s.f.}$

SAVE 12' on one APPROACH SLAB & 6' other APPROACH SLAB.

→ Appr. slab saved: $\frac{(12' + 6') \times 30'}{9 \text{ sf/sy}} = 60 \text{ s.y.}$

→ Less slope Paving: $\frac{(12' \times 2 \text{ EA.} \times 56')}{9 \text{ sf/sy}} = 150 \text{ s.y.}$

Alt. costs / Quantities to extend Exit Lane:

$\frac{12' \times (340')}{9 \text{ sf/sy}} = 454 \text{ s.y. of full depth decel Lane}$

$\frac{24' \times (435')}{9 \text{ sf/sy}} = 1160 \text{ s.y. of full depth two-way "Ramp"}$
 → 1,614 s.y. (total full depth)

shldrs 4' paved on both sides of Ramp

$\frac{(4' + 4') \times 435'}{9 \text{ sf/sy}} = 387 \text{ s.y. (shldr pavement)}$
 $1\frac{1}{2}'' + 2'' = 3\frac{1}{2}'' \text{ Asph CONC.}$
 on 6" GAB

Use shldr pavement: $\$5.33/\text{sy} + \$7.45/\text{sy} + \$6.12/\text{sy}$
 = $\$18.90/\text{sy}$

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT District 7
Design Development Stage

ALTERNATIVE NO.:
R-17

DESCRIPTION: **USE GEOGRID TO REDUCE PAVEMENT SECTION REQUIREMENTS**

SHEET NO.: **1 of 3**

ORIGINAL DESIGN:

The pavement analysis and design was currently in progress as of the start of the workshop.

ALTERNATIVE:

Use a pavement section that incorporates Geogrid material to reduce the overall pavement section material requirements.

ADVANTAGES:

- Reduces cost
- Reduces material lay down and construction time
- Reduces excavation depth due to shallower pavement section

DISADVANTAGES:

- None identified

DISCUSSION:

Geogrid materials are proven to strengthen pavement sections, particularly in areas like Cobb County which are known to have a poor soil support value.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 798,600	—	\$ 798,600
ALTERNATIVE	\$ 290,400	—	\$ 290,400
SAVINGS (Original minus Alternative)	\$ 508,200	—	\$ 508,200

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.: R-17

SHEET NO.: 2 of 3

GEOGRID UNIT COSTS (IN PLACE):

\$3 /SYD SINGLE DIRECTIONAL

\$5 /SYD BY-DIRECTIONAL

USE AVERAGE OF \$4 /SYD.

$$\text{LENGTH} = 2.8 \text{ MILES} \approx 14,800' - [(1330)(575) + (330)]$$

$$\text{WIDTH} = (12' + 11' + 12' + 11') + (12' \times 0.5)$$

TURN ←
LANES.

$$= 52'$$

$$\text{AREA} = 653,380 \text{ SF} \approx 77,600 \text{ SY}$$

$$\text{ASPHALT} = \frac{(\$65)(3'' = 330 \text{ lbs/SY})}{2000} = \$10.72/\text{SY}$$

USE \$11/SY

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.** ALTERNATIVE NO.:
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7 **B-1**
Design Development Stage

DESCRIPTION: **PROVIDE 6-FT-WIDE MEDIANS IN LIEU OF 8-FT-WIDE** SHEET NO.: **1 of 5**
MEDIANS ON THE 1,330-FT LONG BRIDGE

ORIGINAL DESIGN:

The current design includes an 8-ft-wide median edge of travel way (ETW) to ETW on the 1,330-ft long bridge to match the proposed median.

ALTERNATIVE:

Taper the median to 6-ft-wide edge of travelway to edge of travelway on the 1,330-ft long bridge only.

ADVANTAGES:

- Reduces bridge width
- Less drainage width
- Reduces bridge cost

DISADVANTAGES:

- Less separation between opposing traffic

DISCUSSION:

The 1,330-ft bridge is long enough that a taper can be justified and warranted.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 305,900	—	\$ 305,900
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 305,900	—	\$ 305,900

SKETCH

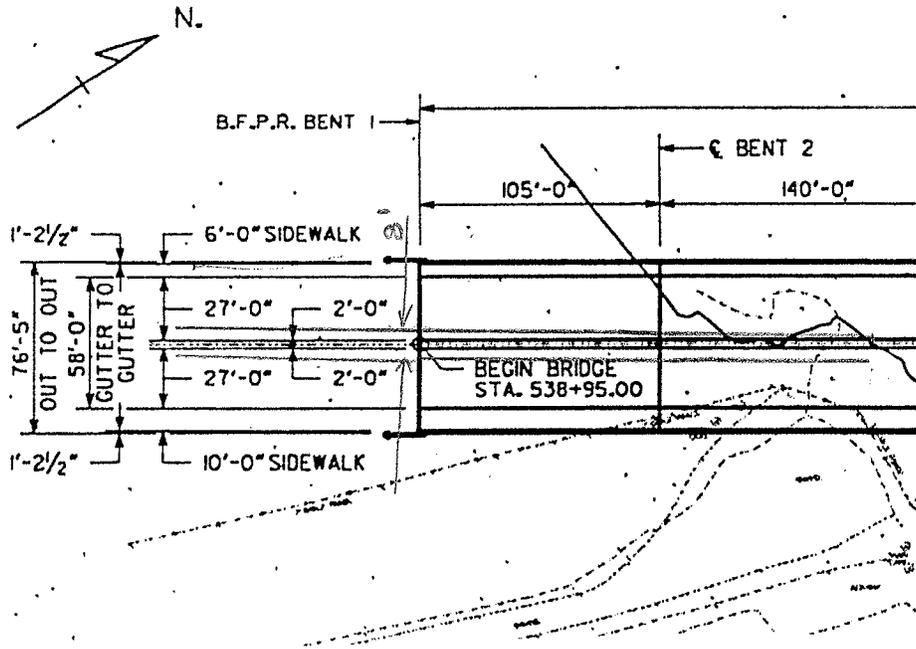


PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

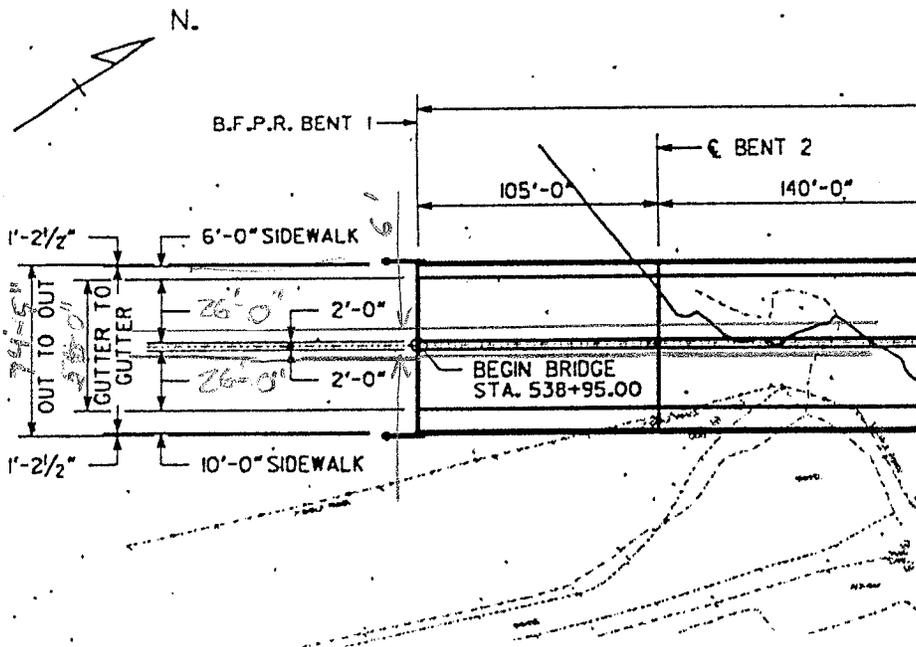
ALTERNATIVE NO.: *B-1*

ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: *2 of 5*



ORIGINAL



Proposed

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.: B-1

SHEET NO.: 3 of 5

BRIDGE SQ FT UNIT COSTS.

BRIDGE 1 OVER LAKE ALLATOONA

→ \$ 11,704,000 LS COST.

BRIDGE AREA 1330' x 76'-5"

UNIT COST = \$ 115 / SF

BRIDGE 2 OVER RAILROAD

→ \$ 2,167,800 LS COST

BRIDGE AREA 315' x (76'-5" + 11')

BRIDGE 3 OVER TANYARD CREEK

UNIT COST = \$ 80 / SF

→ \$ 4,921,900 LS COST

BRIDGE AREA 575' x 76'-5"

UNIT COST = \$ 112 / SF

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.: B-1

SHEET NO.:

4 of 5

BRIDGE COST SAVINGS:

$$2' \text{ WIDTH} \times 1330' \text{ LENGTH} = 2660 \text{ SF}$$

$$(2660 \text{ SF})(\$115/\text{SF}) = \underline{\underline{\$305,900}}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT, District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	B-3
DESCRIPTION:	USE A STORM WATER FILTERING SYSTEM ON THE PROJECT TO IMPROVE WATER QUALITY	SHEET NO.:	1 of 8

ORIGINAL DESIGN:

The current design does not discuss filtering of stormwater to improve water quality.

ALTERNATIVE: (see attachments)

Install various stormwater filtering systems based upon location within the project to improve water quality. The following systems have been included for your reference:

1. Ultra-HydroKleen Filtration System (www.Stormwater-Products.com)
2. The StormBasin (www.fabco-industries.com)
3. CrystalStream Technologies (www.crystalstream.com)
4. FloGard (www.kristar.com)
5. EcoStorm Plus (www.royalenterprises.net)
6. EcoSense Catch Basin Inserts (www.ipexinc.com)
7. The STORMTREAT System (www.biocleanenvironment.net)

ADVANTAGES:

- Improves water quality
- Meets USACE Design Standards

DISADVANTAGES:

- Increases initial cost
- Recurring maintenance cost to clean the debris and replace filter media at regular frequencies
- Increases complexity of design
- Increases construction time

DISCUSSION:

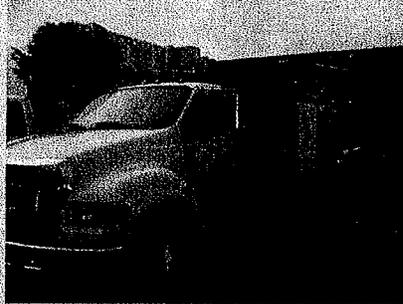
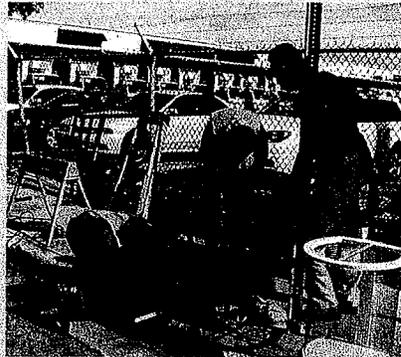
Lake Allatoona is owned and governed by the United States Army Corps of Engineers (USACE). One or more of the aforementioned stormwater filtering systems will be required to meet the USACE design standards.

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

Yeosock reports that the installation of the filters was easy. The contractor installed the first set, using the experience to train public works employees.

Most of the Norwalk area is built out, but any small developments are required to remove oil and grease, so Yeosock expects more of the inserts and filters to be applied in the future.

The Soundkeeper Filter Project is a study of catch basin insert effectiveness at Long Island Sound. The importance of the health of Long Island Sound can be seen in estimates that 10% of the American population lives within 50 miles of the Sound. Soundkeeper Terry Backer and officials from government entities and the Connecticut Department of Environmental Protection recently viewed catch basin inserts along the shoreline. The tour group inspected a catch basin insert manufactured by AbTech Industries at the Maritime Aquarium Center. The Smart Sponge used in the device has the capability of absorbing hydrocarbons and has an antimicrobial component. After seeing



City of Miami

Besides setting up routine maintenance to ensure your catch basin inserts are working properly, be sure you have a plan for emergency replacement in case of a spill.

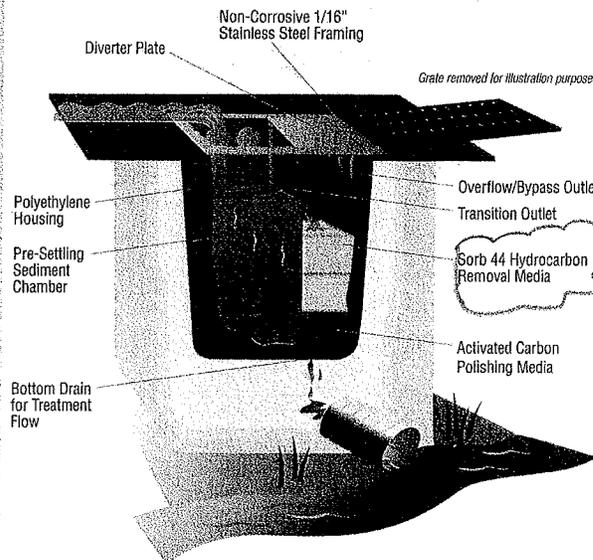
the food wrappers, debris, oil and grease, and sediment removed by the filters, the officials returned to the capital ready to write bills requiring use of catch basin inserts to protect fragile waterways of Connecticut.

Tests have confirmed that the Smart Sponge insert can absorb up to five times its own weight and removes 75% to 95% of the hydrocarbons present in stormwater runoff. The saturated product does not leach or leak contaminants, so it can be disposed of with solid waste.

California Development

When Lindsay Hubby of Covenant Development, based in Temecula, CA, needed a consultant for catch basin inserts for a project in Victorville, CA, he called Kip Searcy, stormwater management engineer for Katchall. Searcy had been advising the development company on stormwater pollution prevention plans for projects, writing manuals, filing notices of intent, and performing site visits. Katchall Filtration Systems LLC is based in Beaumont, CA.

Remove Concentrated Contaminants From Stormwater at "Hot Spot" Drains



- Removes hydrocarbons, organically bound metals, sediments and other organics from stormwater and industrial runoff
- Patented dual media filtration system provides consistent removal efficiencies
- By-pass system prevents flooding or ponding during high flow storm events
- Excellent post construction control for "hot spot" applications (drains that are more susceptible to large concentrations of contaminants)
- Units available for round or square catch basin grates. Custom sizes available.
- Helps comply with NPDES, 40 CFR 122.26 (1999) when used as Best Management Practice in Storm Water Pollution Prevention Plans



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Filtration System

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What to Expect

The IPCC (2007a, 2007b) has predicted the following impacts of global warming by the end of the 21st century

- It is "virtually certain" that there will be warmer and fewer cold days and nights and warmer and more frequent hot days and nights.
- It is "very likely" that there will be more frequent warm spells and heat waves and heavy precipitation with an increased frequency of large events.
- It is "likely" that droughts (areal) and tropical cyclones will increase and that sea level will rise.

The changes in stormwater that result from the climate shifts can be ascertained from the above set of IPCC findings. Table 1 summarizes the IPCC (2007a, 2007b) update, plus additional input from the Union of Concerned Scientists and the Ecological Society of America series on regional climate impacts (2003). Note that the impacts of climate change on biosystems, although of utmost concern, are not addressed because of the nature of this article. Details on the implications of changes listed in Table 1 follow the table.

Temperature

Article after article in professional journals and local papers reports that the last reporting period (whatever that time increment may be) was the hottest, warmest, or most severe since records have been kept. It seems that few months, years, or seasons go by without this new claim attached. As this seems to be accelerating, there does not seem to be an end in sight. The National Arbor Day Foundation has even redrawn its Hardiness Zone Map to reflect national changes of warmer conditions marching northward. Figure 1 shows the IPCC (2007a) outlook for the future temperature increases under various scenarios ranging from a minimum of 2.0°F to a maximum of about 11.5°F, depending on the level of remedial action taken. Clearly, the outlook is for continued change.

Increase in temperature has a number of impacts that stormwater managers must keep in mind. The increased evaporation of water and the atmosphere's ability to hold more water results in increased humidity, which

Keep the streets clear and the water clean

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NPDES II compliance

The StormBasin, simple, effective, low cost

- Kills bacteria on contact
- Large trash capacity
- Eliminates oils & hydrocarbons
- High flow rates, easy to maintain
- Guaranteed not to cause flooding

BREAKTHROUGH TECHNOLOGY
NEW Fabphos™ >40% reduction
of PHOSPHATES and NITROGEN compounds

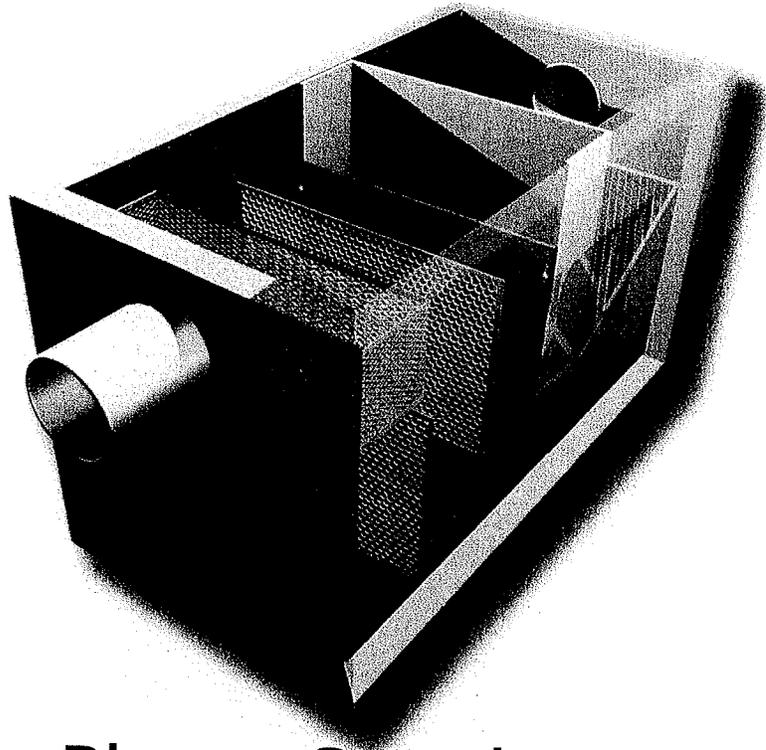


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Alt. B-3
Sheet 4 of 8

Will the Real Removal Rate Champion



Please Stand Up?

Do you measure removal of pollutants by a percentage of TSS captured or effluent concentration? Are these measurements a true indicator of pollutants being removed?

The fact is that, until a vacuum truck pumps the pollutants out of the device and transports them to the landfill, all you have is a pollutant relocation system.

CrystalStream Technologies forms a partnership with the engineer, contractor, owner and municipal agency to ensure there is an actual Removal Rate. We service what we sell and focus on long-term success.

Check out our 89% sediment removal at www.epa.gov/etv.

DESIGN



INSTALLATION



MAINTENANCE



2090 Sugarloaf Parkway Ste. 135

Lawrenceville, GA 30045

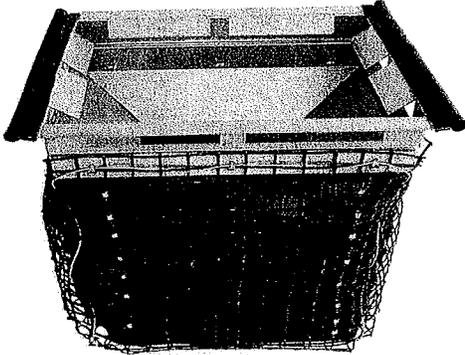
800-748-6954

www.crystalstream.com

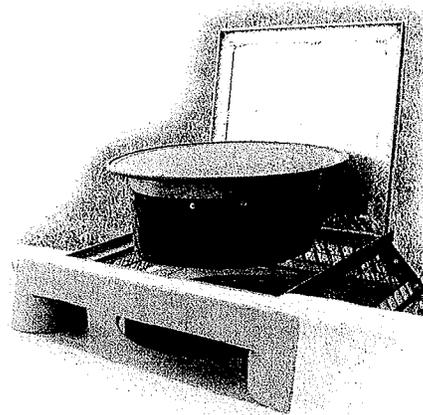
Innovative stormwater management products

Alt. B-3
Sheet 5 of 8

FloGard® +PLUS Catch Basin Insert Filter

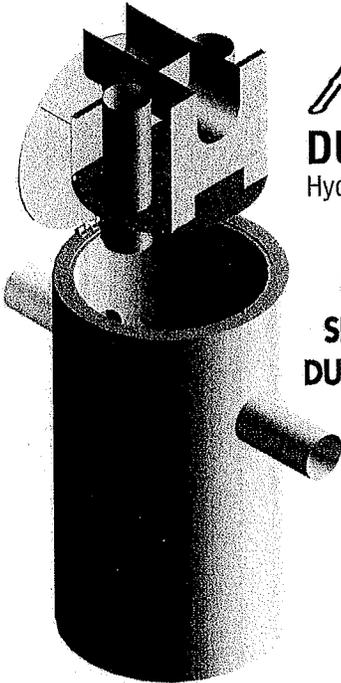


Lower installation, inspection
and maintenance costs in
new or retrofit applications.



SwaleGard™ GRASSY SWALE PRE-FILTER

Improves filtration
performance and extends
service life of
all vegetated (grassy)
swale drainage systems.



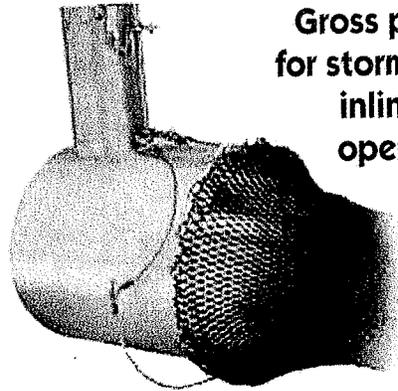
FloGard® DUAL-VORTEX Hydrodynamic Separator

THE ONLY
HYDRODYNAMIC
SEPARATOR WITH A
DUAL-VORTEX DESIGN



GROSS POLLUTANT TRAP A STORMWATER OUTLET INTERCEPTOR

U.S. PATENT NO. 6,358,405



Gross pollutant trap
for stormwater outlets,
inline pits and
open channels



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The most cost effective stormwater filtration system is setting new standards for stormwater regulatory requirements.

ecoStorm[®] plus

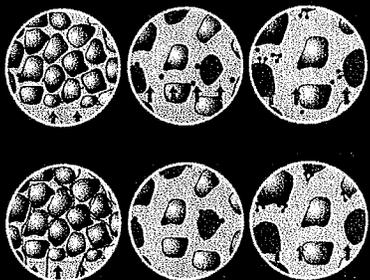
Stormwater

Filtration System

Alt. B-3 Sheet 6 of 8

PlusFilter

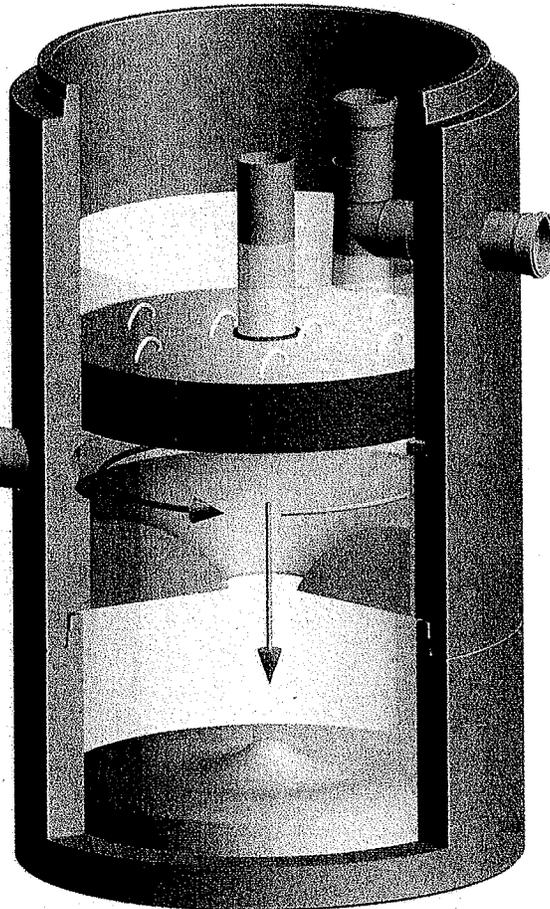
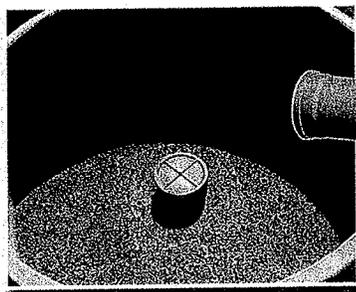
Filtration Adsorption Precipitation



Surface water runoff contains significant concentrations of heavy metals, nutrients and sediment. Current regulations will demand advanced technology to treat complex water conditions with minimal maintenance and cost.

By using various physical and chemical processes, the ecoStorm plus Stormwater Filtration System effectively AND affordably removes BOTH solids and dissolved substances, including:

- Heavy metals (zinc, copper, lead, cadmium, chromium, nickel)
- Hydrocarbons (mineral oils, polycyclic aromatic hydrocarbons)
- Nutrients such as phosphorous and nitrates



Additional Solutions:



ecoSep

Below-grade, high-efficiency oil/water separator



ecoTop

Above-grade, high-efficiency oil/water separator



ecoStop

Catastrophic spill control system



ecoStorm

Stormwater treatment system



ecoGrease

Grease Interceptor

For the removal of sediments, heavy metal and nutrients

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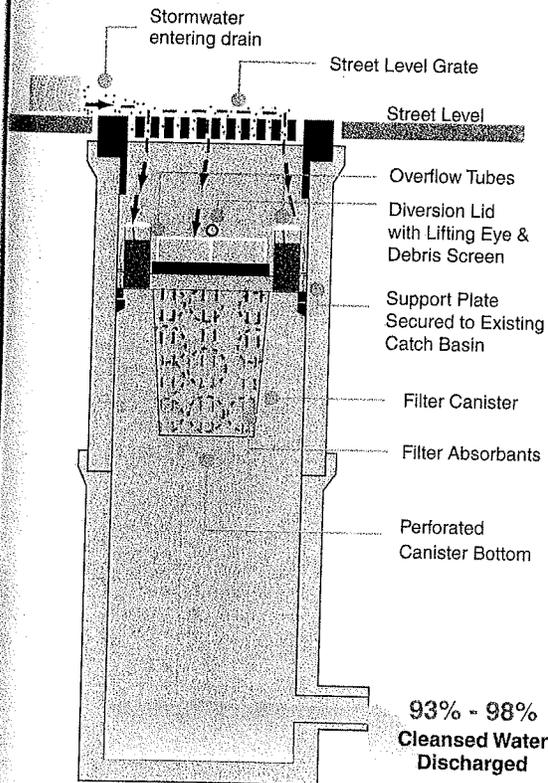
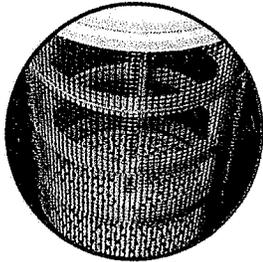
Visit Booth #716 at StormCon and see the EcoSense insert IN ACTION!

Alt. B-3
Sheet 7 of 9

An ounce of Prevention ...

EcoSense Catch Basin Inserts are simple drop-in structures designed to remove oil, grease, contaminated sediment and other environmentally harmful compounds from stormwater flows. Easily installed in new or retrofit applications, they are designed to fit any standard catch basin, drain or inlet and can be easily modified for odd sized catch basins.

EcoSense inserts incorporate a unique design that allows them to handle extremely high stormwater flows without clogging or backing up, while removing a much higher percentage of contaminants than competing technologies like hydrodynamic separators.



FEATURES & BENEFITS

- ✓ Effectively removes over 90% of oil and grease, as well as suspended solids and dissolved metals
- ✓ With flow rates of over 50gal/min, can easily handle the "first-flush" of any storm event
- ✓ Highly cost-efficient – proven to save thousands of dollars compared to oil and grit separators on storm sewers
- ✓ Easy to install and maintain – no special equipment needed and filters must only be changed every 8 to 10 months
- ✓ Saturation of the filtration medium does not reduce the flow rate
- ✓ Have an overflow protection system that prevents stormwater from backing-up and flooding the roadway
- ✓ Recognised by the EPA and NSF as a Best Management Practice (BMP) for stormwater management

Circle #122 on Reader Service Card



Toll Free US: 800 463-9572 | Toll Free Canada: 866 473-9462 | www.ipexinc.com

PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.:

B-3

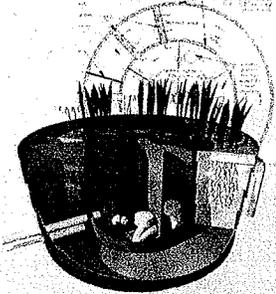
ORIGINAL DESIGN ALTERNATIVE DESIGN BOTH

SHEET NO.: 8 of 8

STRINGENT
COMPLY WITH STORMWATER REGULATIONS

Use:

- The STORMTREAT System



Advantages:

- **80% Plus Removal Efficiencies For -** Hydrocarbons, Heavy Metals, TSS
- **50% - 90% Removal Efficiencies For -** Bacteria, Phosphorus, Nitrogen
- **Long Maintenance Intervals -** 1 To 3 years between cleanings. Media life 10 plus years.
- **EPA Envirotechnology Award Winner -** In use since 1994 in over 20 states.
- **Designed For Treatment And Flow Control -** StormTreat is a complete stormwater compliance solution.

Bio Clean Environmental Services has a complete line of stormwater filtration systems that are simple, economic and easy to maintain.

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VALUE ENGINEERING ALTERNATIVE



PROJECT: SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT, District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.: B-5
DESCRIPTION: USE 280-FT-LONG STEEL THROUGH GIRDER SPANS IN LIEU OF 140-FT-LONG BULB TEES TO MINIMIZE STORAGE LOSS DUE TO BRIDGE PIERS	SHEET NO.: 1 of 4

ORIGINAL DESIGN:

The original design proposes 140-ft-long bulb tees for the 1,330-ft bridge.

ALTERNATIVE: (see attached sketch)

Use 280-ft-long steel through girder spans in lieu of 140-ft-long bulb tees to minimize storage loss due to bridge piers. This would likely include a structural depth of 10'-6" with a 9'-6" beam depth.

ADVANTAGES:

- Less environmental impacts
- Less storage loss
- Less "wet" sub-structure construction
- Reduces construction time

DISADVANTAGES:

- Cost not quantifiable at this time
- Pre-cast concrete is preferred
- Additional cost for construction approximately 7.5%

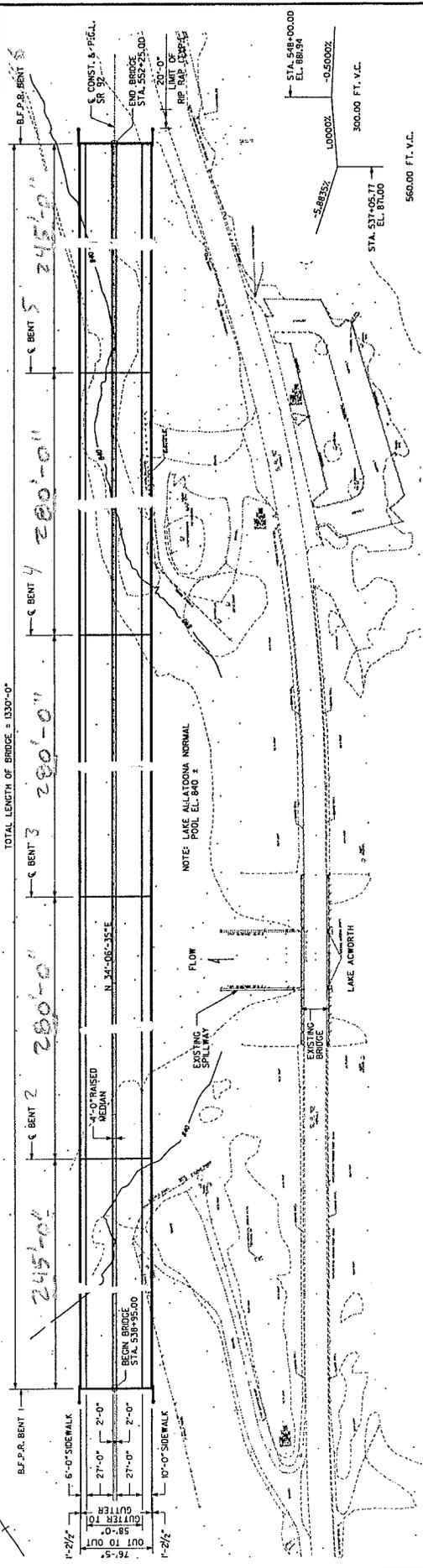
DISCUSSION:

USACE has a policy of no net loss of storage capacity when designing bridges over waterways. A 280-ft-long steel through girder span bridge will result in less volume displacement compared to 140-ft-long bulb tees. If a 280-ft-long steel through girder span design eliminates the need for a reallocation study, the additional material cost (7.5%) should be easily justified.

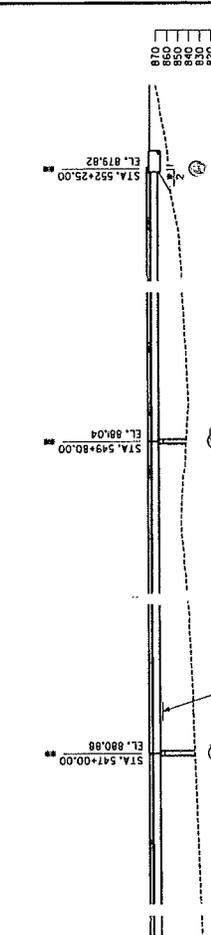
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS (Original minus Alternative)			

STATE	PROJECT NUMBER	DATE
GA.	BRST-203-MS	

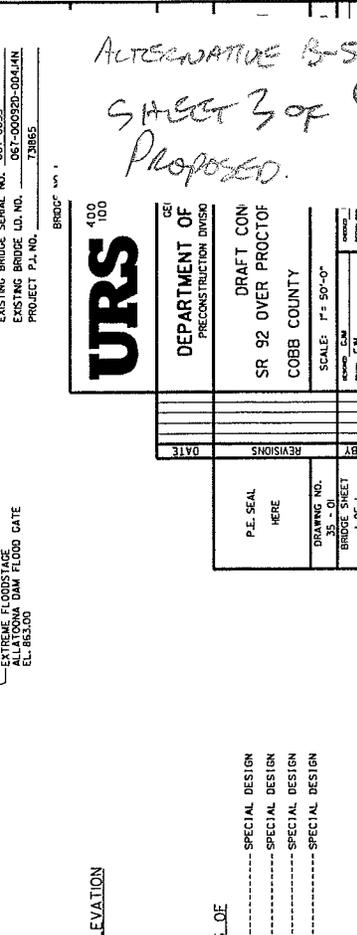
LAKE ALLATOONA
TOTAL LENGTH OF BRIDGE = 1330'-0"



VERTICAL CURVE DATA



ELEVATION



BRIDGE CONSISTS OF

- 2-105'-0", 72" BULB TEE, PSC BEAM SPANS
- 8-140'-0", 72" BULB TEE, PSC BEAM SPANS
- 9-CONCRETE INTERMEDIATE BENTS
- 2-PILE END BENTS
- 24" TYPE I RIP RAP

DESIGN DATA

- ASHTO 17TH EDITION - 2002
- DESIGN FOR SEISMIC PERFORMANCE CATEGORY A1
- TYPICAL K520-44 AND/OR MILITARY LOADING
- FUTURE PAYING ALLOWANCE - 30 PSF
- IMPACT ALLOWED

NOTES:

- PROPOSED ROADWAY PROFILE SUBJECT TO CHANGE BASED ON RESULTS OF HYDRAULIC STUDY.
- ALL BENTS ARE PARALLEL.
- PROPOSED BRIDGE DECK TO BE BUILT ON A NORMAL CROWN OF 2.00 X

URS
100
DEPARTMENT OF PRECONSTRUCTION DIVISION
DRAFT CONSTRUCTION DRAWING
SR 92 OVER PROCTOF
COBB COUNTY
SCALE: P = 50'-0"
BRIDGE SERIAL NO. 067-0035
EXISTING BRIDGE I.D. NO. 057-0002B-DUPLAN
PROJECT P.I. NO. 73865
BRIDGE SERIAL NO. 1

ALTERNATIVE B-5
SHEET 3 OF 9
Proposed.

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.: B-5

SHEET NO.: 4 of 4

STEEL BRIDGE IS BETWEEN 5% TO 10% HIGHER
USE 7.5%

$$(\$11,704,000)(1.075) = \$12,581,000$$

- ENVIRONMENTAL MITIGATION SAVINGS ARE NOT QUANTIFIABLE AT THIS TIME → LESS PILES IN THE WATER.
- RISK MANAGEMENT SAVINGS ARE NOT QUANTIFIABLE AT THIS TIME.
- CONSTRUCTION DURATION REDUCTION IS NOT QUANTIFIABLE AT THIS TIME. (SAVINGS).

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.** ALTERNATIVE NO.:
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage **B-6**

DESCRIPTION: **INCREASE ABUTMENT AND WING WALL HEIGHT TO** SHEET NO.: **1 of 8**
REDUCE THE LENGTH OF THE 1,330-FT BRIDGE

ORIGINAL DESIGN:

The current design includes standard 2:1 fill slope with short seat abutments for the 1,330-ft bridge.

ALTERNATIVE:

Move the abutment to the toe of the 2:1 fill slope and increase the height to reduce the length of the 1,330-ft bridge.

Scour limits are unknown at this time and may be an issue.

ADVANTAGES:

- Reducea bridge length
- Eases erosion control near an environmentally sensitive area

DISADVANTAGES:

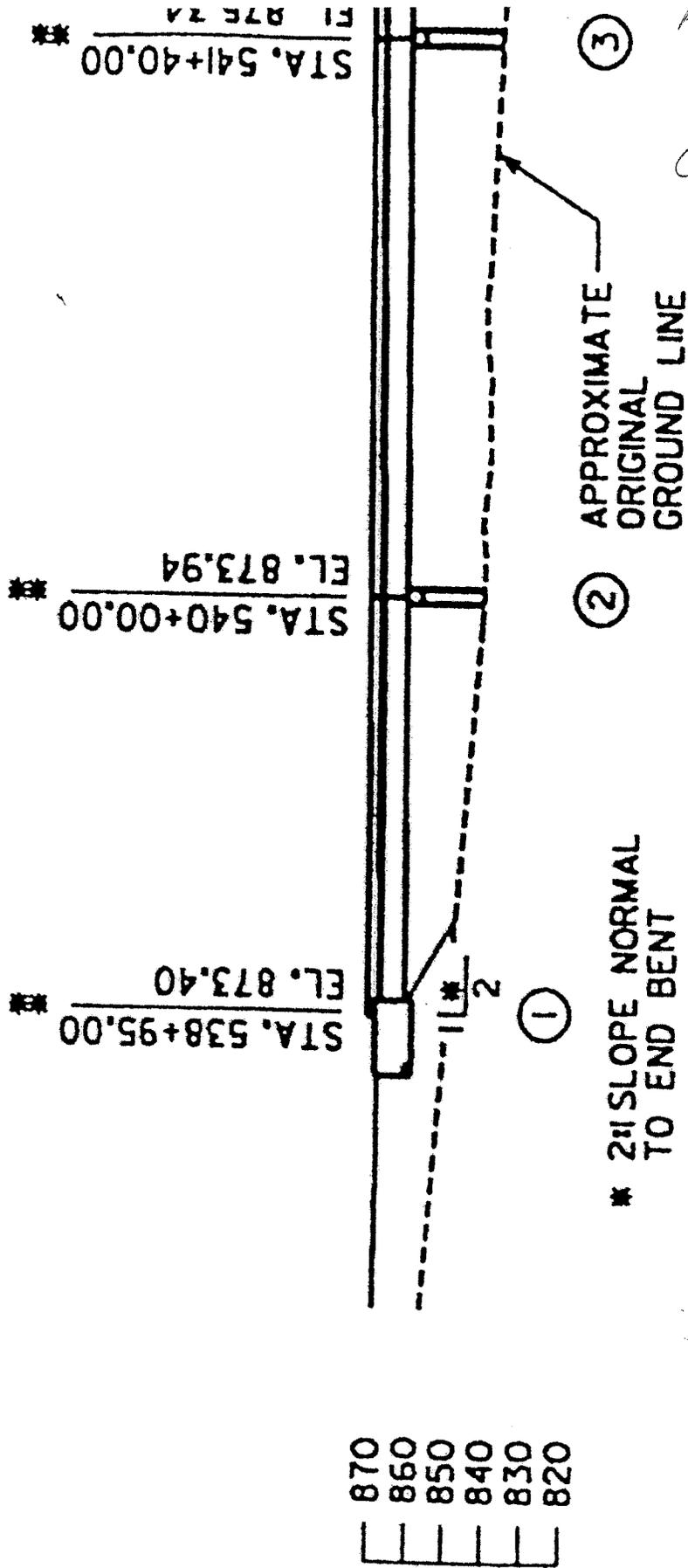
- Taller abutments

DISCUSSION:

Vertical abutments are acceptable in locations where future expansion is not anticipated.

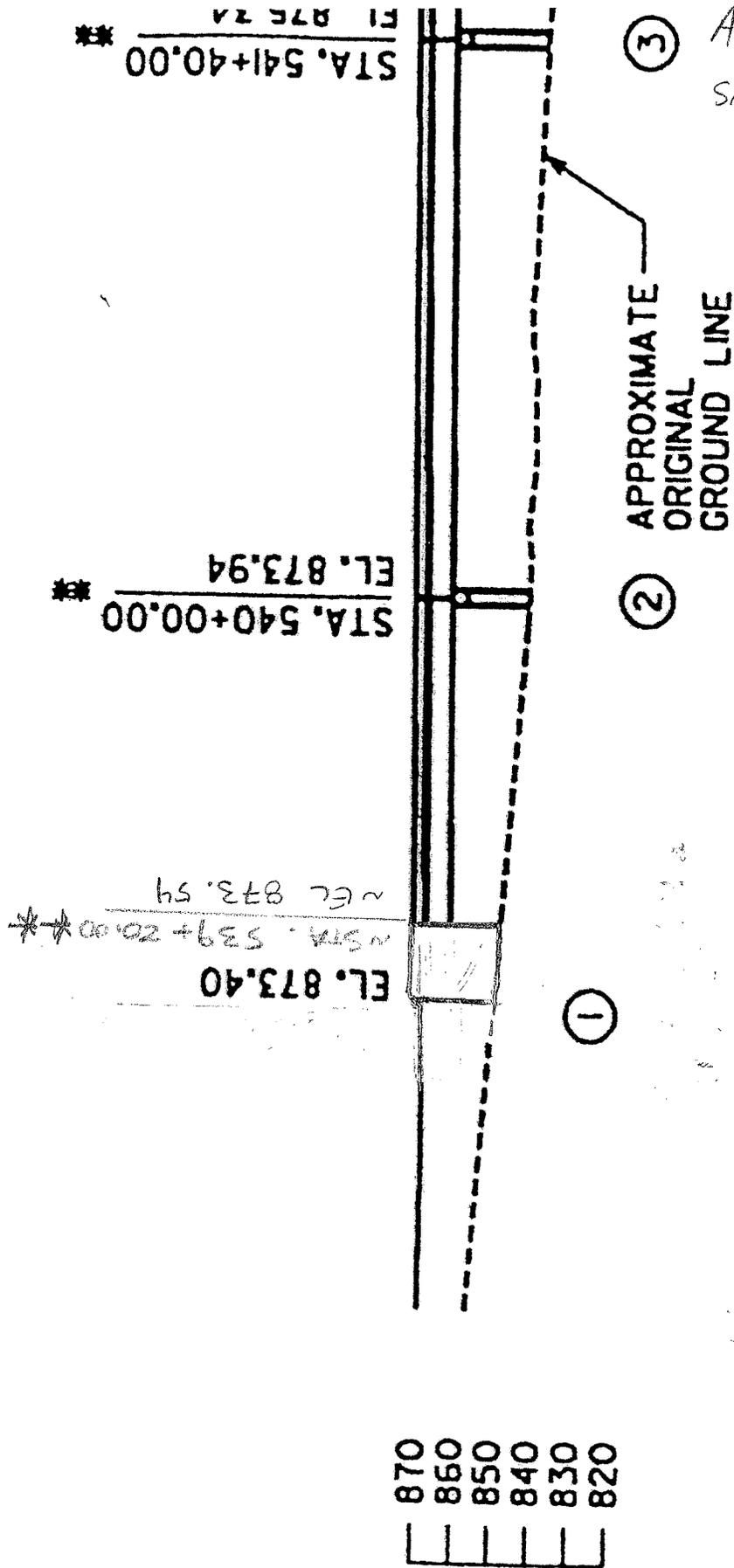
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 439,415	—	\$ 439,415
ALTERNATIVE	\$ 0	—	\$ 0
SAVINGS (Original minus Alternative)	\$ 439,415	—	\$ 439,415

STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR C BENTS.



ALTERNATIVE B-6
SHEET 2 of 8
ORIGINAL DESIGN

STATIONS AND ELEVATIONS ARE ALONG PROFILE GRADE LINE AT THE INTERSECTION OF PROFILE GRADE LINE AND B.F.P.R. OR C BENTS.

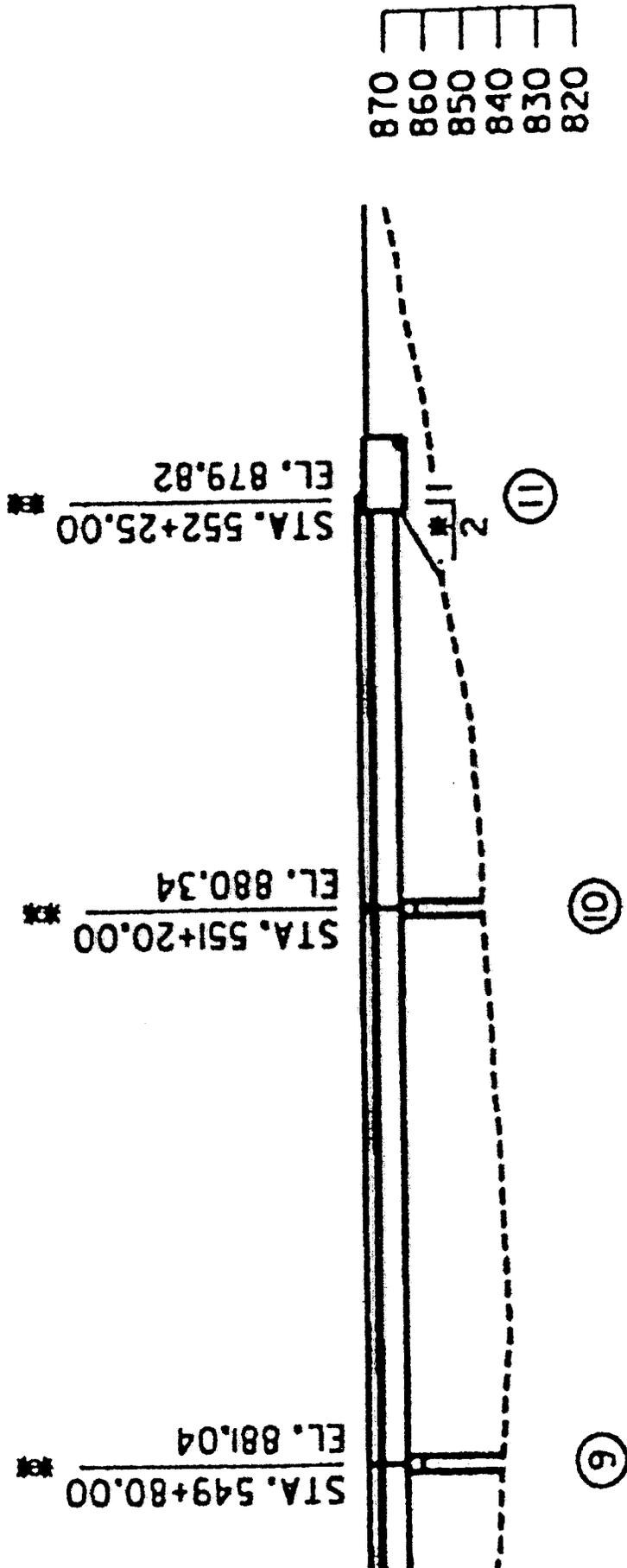


ALTERNATIVE B-6
SHEET 3 OF 8
PROPOSED DESIGN

ALTERNATIVE B-6

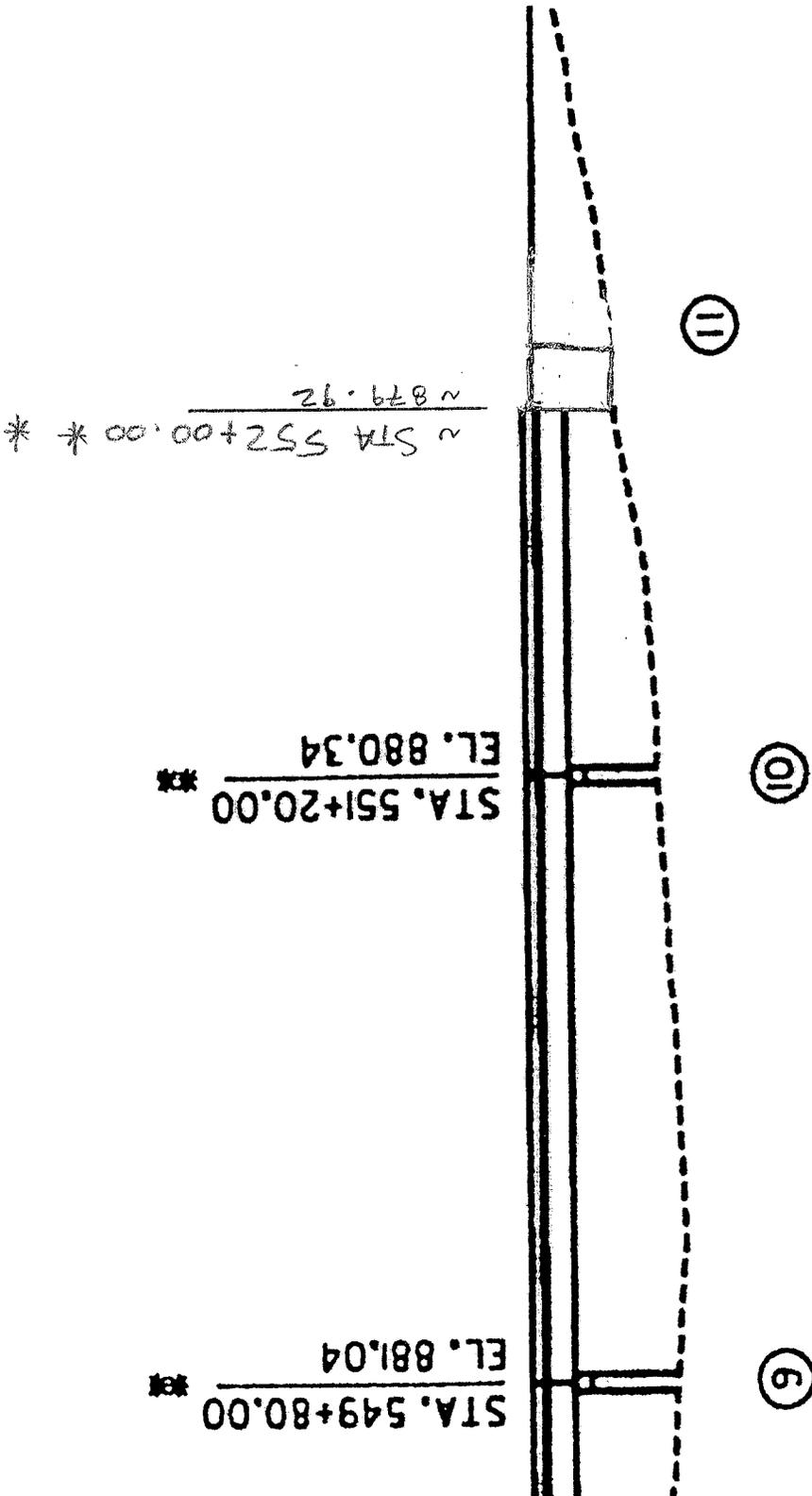
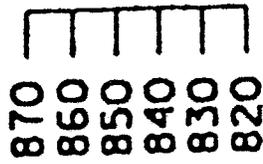
SHEET 4 OF 8

ORIGINAL
DESIGN



ALTERNATIVE B-6
SHEET 5 of 8

Proposed
DESIGN



CALCULATIONS



PROJECT: SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.: B-6

SHEET NO.: 6 of 8

BRIDGE SQ FT UNIT COSTS.

BRIDGE 1 OVER ALLATOONA LAKE

→ \$ 11,704,000 LS COST.

BRIDGE AREA 1330' x 76'-5"

UNIT COST = \$ 115 / SF

BRIDGE 2 OVER RAILROAD

→ \$ 2,167,800 LS COST.

BRIDGE AREA 315' x (76'-5" + 11')

UNIT COST = \$ 80 / SF

BRIDGE 3 OVER TANYARD CREEK

→ \$ 4,921,900 LS COST.

BRIDGE AREA. 575' x 76'-5"

UNIT COST = \$ 112 / SF

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

ALTERNATIVE NO.: B-6

SHEET NO.: 7 of 8

$$\text{BRIDGE LENGTH SAVINGS} = 25' + 25' = 50'$$

$$\text{BRIDGE UNIT COST} = \$115/\text{SF}$$

$$\text{BRIDGE WIDTH} = 76' - 5" = 76.41'$$

$$\text{AREA} \approx 3821 \text{ SF}$$

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT, District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:	B-7
DESCRIPTION:	USE CAST-IN-DRILL-HOLE (CIDH) PILES ON THE 1,330-FT BRIDGE	SHEET NO.:	1 of 1

ORIGINAL DESIGN:

The original design does not discuss means and methods for construction of the 1,330-ft bridge piers.

ALTERNATIVE: (see attached sketch)

Use cast-in-drill-hole (CIDH) piles or cast-in-steel-shell piles to improve constructability and shorten construction duration within the flood/lake limits.

ADVANTAGES:

- Reduces construction time
- Improves constructability
- Less work in the “wet” area
- Acceptable method in Georgia

DISADVANTAGES:

- Pile depth is unknown
- Sandy soils may require steel shells to prevent collapse during installation.

DISCUSSION:

The allowable construction season within the lake/flood limits will be restricted and will likely extend construction beyond one season. Steel shells can be used if soils are prone to collapse or if scouring of concrete is a problem.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.** ALTERNATIVE NO.:
P.I. Nos. 0006862 and 731865
Cobb County, GDOT District 7 **W-2**
Design Development Stage

DESCRIPTION: **USE A SOIL NAIL WALL IN LIEU OF CLASS A CONCRETE** SHEET NO.: **1 of 1**
FROM (RT) STA 556+00 TO STA 565+30

ORIGINAL DESIGN:

The current design proposes a class A concrete retaining wall from (RT) sta 556+00 to sta 565+30. It is assumed that the wall will be cast-in-place.

ALTERNATIVE: (see attachments)

Use a soil nail wall in lieu of a cast-in place wall.

ADVANTAGES:

- Shorter installation time
- Allows top-down construction
- Eliminates any reconstruction requirements to the church parking lot
- Simplifies construction staging and MOT

DISADVANTAGES:

- Not as commonly used as cast-in-place

DISCUSSION:

Soil nail walls are becoming more widely used as they allow for less evasive construction, less complicated MOT, and a shorter construction duration.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT:	SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT, District 6, District 7</i> <i>Design Development Stage</i>	ALTERNATIVE NO.:
		W-3
DESCRIPTION:	USE AN MSE WALL IN LIEU OF CLASS A CONCRETE FROM (LT) STA 569+00 TO STA 576+00	SHEET NO.: 1 of 1

ORIGINAL DESIGN:

The current design proposes a class A concrete retaining wall from (LT) sta 569+00 to sta 576+00. It is assumed that the wall will be cast-in-place.

ALTERNATIVE: (see attachments)

Use an MSE wall in lieu of a cast-in-place wall from (LT) sta 569+00 to sta 576+00.

ADVANTAGES:

- Shorter installation time

DISADVANTAGES:

- None identified

DISCUSSION:

MSE walls offer a shorter construction duration.

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

VALUE ENGINEERING ALTERNATIVE



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy to Glade Rd.** ALTERNATIVE NO.:
P.I. Nos. 0006862 and 731865
Cobb County, GDOT District 7 **W-4**
Design Development Stage

DESCRIPTION: **USE AN MSE WALL FROM (LT) STA 612+00 TO STA 623+00** SHEET NO.: **1 of 5**
TO REDUCE COMMERCIAL RIGHT-OF-WAY
REQUIREMENTS

ORIGINAL DESIGN:

The original design typical section includes a 2:1 fill slope.

ALTERNATIVE: (see attached sketch)

Use an MSE wall from (LT) sta 612+00 to sta 623+00 on the north side only.

ADVANTAGES:

- Less commercial right-of-way required
- Reduces cost

DISADVANTAGES:

- Cut exceeds fill requiring haul-off
- Reduces future expansion ability
- Longer construction time

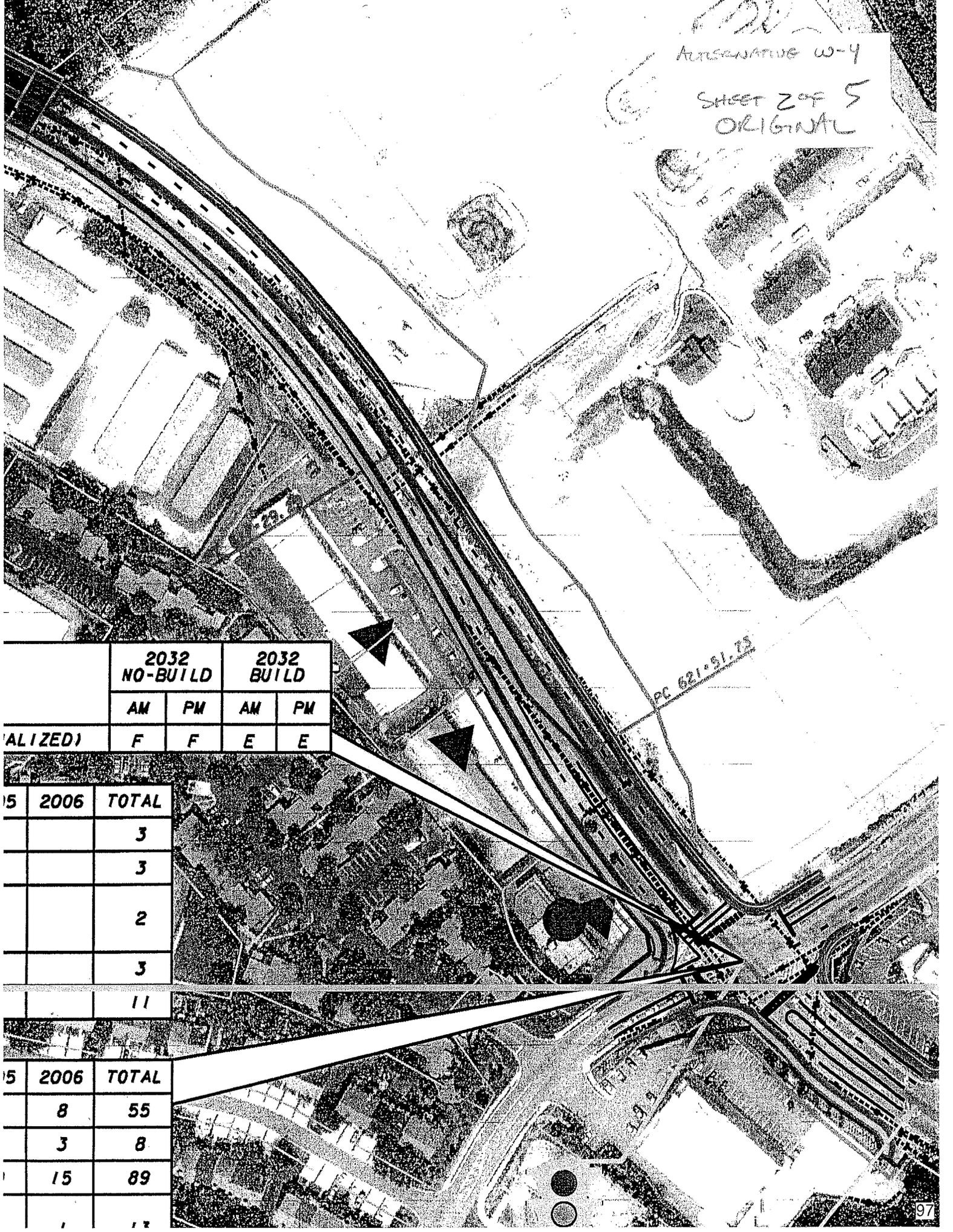
DISCUSSION:

Adding an MSE wall from (LT) sta 612+00 to sta 623+00 will reduce commercial right-of-way requirements resulting in a net savings to the project.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 1,718,600	—	\$ 1,718,600
ALTERNATIVE	\$ 1,375,000	—	\$ 1,375,000
SAVINGS (Original minus Alternative)	\$ 343,600	—	\$ 343,600

Alternative W-4

SHEET 2 OF 5
ORIGINAL



	2032 NO-BUILD		2032 BUILD	
	AM	PM	AM	PM
ALIZED)	F	F	E	E

5	2006	TOTAL
		3
		3
		2
		3
		11

5	2006	TOTAL
	8	55
	3	8
	15	89

STA. 612+00

ALTERNATIVE W-4
SHEET 3 OF 5
PROPOSED

RETAINING
WALL

PC 621+91.73

STA. 623+00

	2032 NO-BUILD		2032 BUILD	
	AM	PM	AM	PM
ALIZED)	F	F	E	E

5	2006	TOTAL
		3
		3
		2
		3
		11

5	2006	TOTAL
	8	55
	3	8
	15	89

CALCULATIONS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Pkwy. to Glade Rd.**
P.I. Nos. 0006862 and 731865
 Cobb County, GDOT, District 7
 Design Development Stage

ALTERNATIVE NO.: W-4

SHEET NO.: 4 of 5

AVERAGE SLOPE WIDTH 50' ±

AVERAGE RETAINING WALL HEIGHT = $\frac{50'}{2} = \underline{25' \pm}$

LENGTH OF WALL = 623+00 - 612+00 = 1100'

WALL UNIT COSTS ~ \$50/SF

WALL COSTS = (25')(1100')(\$50/SF) = \$1,375,000

FILL/EARTHWORK UNIT COSTS = (^{GRADING (average)} ~ 20% of Earthwork) (\$500,000)
 = \$150,000

SAVED R/W AREA (AVG) = (1100' x 50') = 55,000 SF

PROJECT DESCRIPTION

NEED AND PURPOSE

The purposes of the State Route 92 (SR 92) improvements proposed for P.I. Numbers 0006862 and 731865 extending from US 41/SR 3/Cobb Parkway to Glade Road are to:

- Alleviate traffic congestion, accommodate the need for mobility, access and goods movement, and accommodate future growing travel demands through the addition of travel lanes and auxiliary lanes.
- Facilitate more efficient and safer operation of SR 92 through the addition of a median, which will restrict left turn movements to median openings and improve traffic flow.
- Address unsafe driving conditions, such as inadequate stopping sight distances by correction of geometric deficiencies along SR 92 where appropriate and feasible.
- Provide improved transportation options for the traveling public through the addition of sidewalks and a multi-use path.

Currently, SR 92/Lake Acworth Drive between US 41/SR 3/Cobb Parkway and Glade road consists of two 12-foot lanes (one lane in each direction) with auxiliary left and right turn lanes and curb and gutter intermittently throughout the corridor. There are two existing bridges that require replacement within the project limits. The bridge over SR 293/Main Street and the CSX Railroad in the City of Acworth has a span of 241 feet and 48 feet of clear width with a current structural rating of 48.89 (based on a H-15 design live load). The bridge/dam over Lake Allatoona has a span of 185 feet and 24 feet of clear width with a structural rating of 44.53 (based on a H-15 design live load).

Design year 2032 average daily traffic (ADT) for the SR 92 corridor between US 41/SR 3/Cobb Parkway and Glade Road is projected to be 38,540 vehicles per day (vpd). This is an approximately 50 percent increase over the existing volumes of 25,160 vpd. Of these anticipated traffic volumes, 3.6 percent are expected to be trucks. The increased volumes and lack of passing opportunities will cause the level of service (LOS) along SR 92 to deteriorate to a LOS F without improvements.

PROPOSED CONCEPT

This project, located in Cobb County, proposes to widen SR 92/Lake Acworth Drive from US 41/SR 3/Cobb Parkway to Glade Road to a divided 4-lane facility with 11-foot lanes on the inside and 12-foot lanes on the outside. There will be a raised concrete median varying from 8 to 20 feet in width; 16-foot-wideshoulders with curb and gutter and a 10-foot-wide multi-use trail on the east side of the roadway; and 12-foot shoulders with curb and gutter and 5-foot sidewalk on the west side of the roadway. The proposed right-of-way varies from 100 to 135 feet. The posted speed limit will remain 45 mph. Total length of the project is approximately 2.8 miles.

The new bridge over Lake Allatoona will be approximately 1400 feet long and have a clear width of 68 feet. This bridge will be constructed on a new location. The new bridge over SR 293/Main Street and the CSX Railroad in the City of Acworth will be approximately 260 feet long and have a clear width of 68 feet. The new bridge over Tanyard Creek will be approximately 510 feet long and have a

clear width of 80 feet. The project will be staged to allow for a minimum of two lanes of traffic to remain open during all stages of construction.

The following design exceptions are anticipated:

- A design exception for shoulder width and horizontal clearance may be required for the 12-foot shoulder on the west side of the roadway.
- A design exception for superelevation transition rates may be required. There are multiple curves with short tangent sections between successive curves which may require a design exception for transition rates.
- A design exception for vertical grades may be required at the bridge over the CSX Railroad. Coordination is ongoing with CSX to determine if an additional track or additional vertical clearance is required.

The following environmental concerns have been identified:

- Collins Avenue Historic District – This is a National Register listed resource situated adjacent to SR 92 at SR 293.
- Wood Street Historic District – This is a National Register eligible district located along Wood Street between Main Street and West Lakeshore Drive.
- The Western & Atlantic Railroad – This is a National Register eligible resource located underneath Lake Acworth Drive/SR 92 Bridge west of downtown Acworth, GA.
- Several National Register eligible historic properties located at 4608 McLain Circle, 4732 Hillside Drive, 4772 Northside Drive, 4810 Northside Drive, and 4339 Collins Circle.
- GDOT Bridge # 067-0035-0 (Subdam) – This is a National Register eligible resource listed in the Georgia Historic Bridge Inventory.
- Acworth Park and Overlook Park at Lake Allatoona. These parks are situated in the vicinity of the Subdam and are likely to be affected by the proposed project. As such, they should be evaluated as Section 4(f) protected resources.
- U.S. Army Corps of Engineers Section 404 Permit. Surveys to characterize and identify the extent of Jurisdictional Waters of the U.S. within the area of potential effect resulted in the identification of seven streams, two ephemeral drainages, two wetlands, and one open water. Impacts to several of these resources are likely to occur.
- Section 7 Coordination for potential impacts to Cherokee darter (*Etheostoma scotti*), the Georgia aster (*Aster georgianus*), and Michaux's sumac (*Rhus michauxii*).
- Migratory Bird Treaty Act (MBTA) – Impacts to migratory bird species would be reduced by included Special Provision 107.23G for protection migratory birds.

CONSTRUCTION COSTS

The estimated total cost of construction for P.I. Numbers 0006862 and 731865 is \$29,618,127 as of January 14, 2009. The estimated right-of-of way cost is \$9,823,000. There were no utilities observed that could potentially have prior rights. Therefore, there are no reimbursable utilities at this time. The estimates include the following markups:

Construction:

- Zero Inflation (per GDOT)

Right-of-Way:

- Scheduling Contingency - 55.00%
- Administration/Court Costs - 60.00%
- Zero Inflation (per GDOT)

VALUE ANALYSIS AND CONCLUSIONS

INTRODUCTION

This section describes the procedures used during the VE study. It is followed by separate narratives and conclusions including:

- Value Engineering Study Agenda
- Value Engineering Workshop Participants
- Economic Data
- Cost Estimate Summary and Cost Model
- Function Analysis
- Creative Idea Listing and Evaluation of Ideas

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

PREPARATION EFFORT

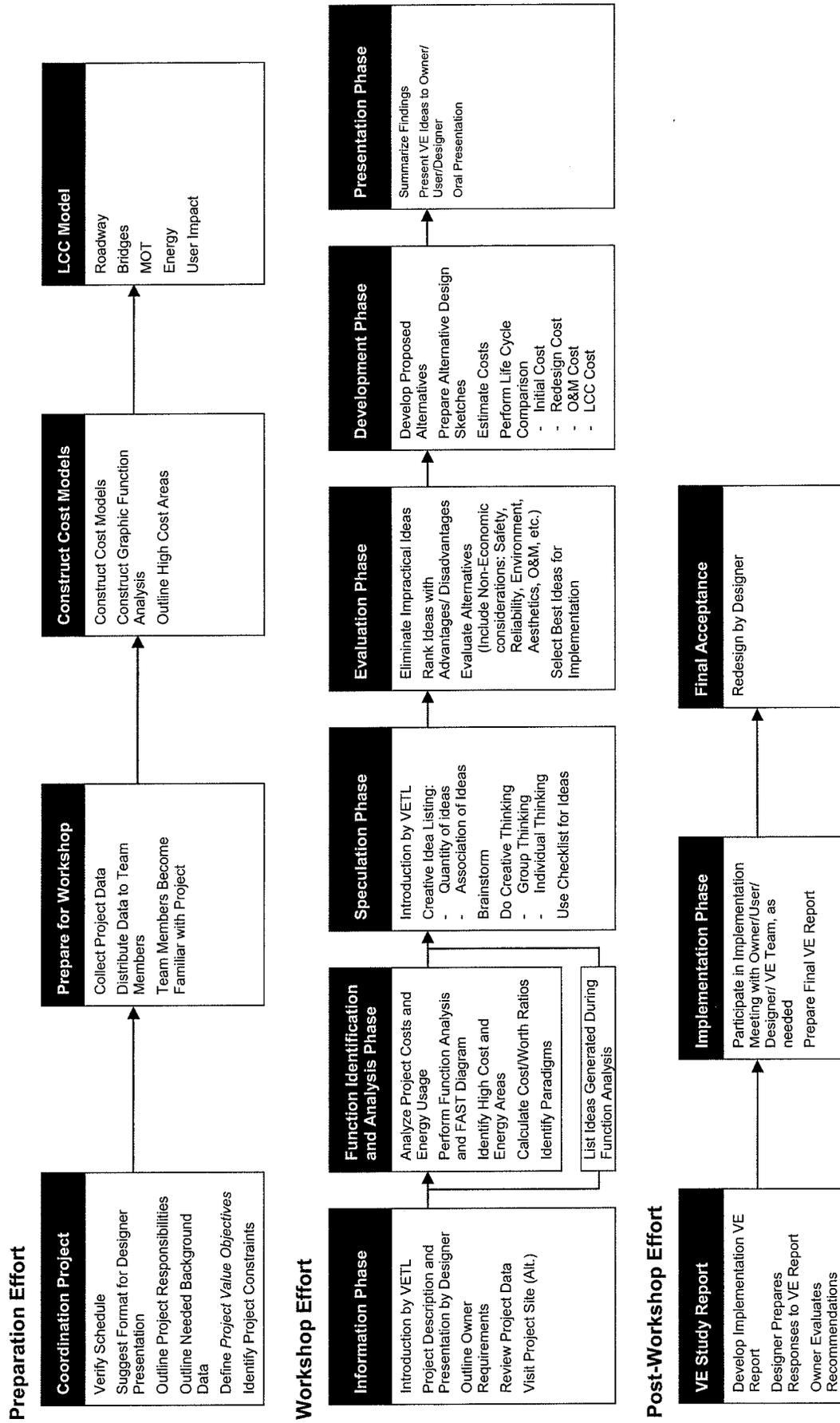
Pre-study preparation for the VE effort consisted of scheduling study participants and tasks, gathering necessary background information on the facility, and compiling project data into a cost model and graphic cost histogram. Information relating to the design, construction, and operation of the facility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

VALUE ENGINEERING WORKSHOP EFFORT

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

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

Value Engineering Study Task Flow Diagram



Information Phase

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

- Half size Concept Drawings entitled Preferred Alternative State Route 92 from US 41/Cobb Pkwy to Cowan Road, Project Numbers CSSTP-0006-00(862), BRST0-0213-01(005).
- Project Concept Report, Department of Transportation, State of Georgia, Office of Consultant Design and Program Delivery for Project Numbers CSSTP-0006-00(862) and BRST0-0213-01(005), Cobb County, P. I. Numbers: 0006862 and 731865, State Route Number 92, not dated;
- Estimate Report for file “731865_2009-01-14,” prepared by District 7, State of Georgia Department of Transportation; dated 1/14/2009;
- Estimate Report for file “0006862_2009-01-14,” prepared by District 7, State of Georgia Department of Transportation; dated 1/14/2009;
- Preliminary Right of Way Cost Estimate, Project: CSSTP-0006-00(862) Cobb, P.I. No.: 006862, Description: SR 92 Widening Project from SR 3 to Glade Road, from Phil Copeland, Right of Way Administrator, dated August 15, 2008.
- Preliminary Right of Way Cost Estimate, Project: BRST0-0213-01(005) Cobb, P.I. No.: 731865, Description: Bridge Replacement over Lake Allatoona, from Phil Copeland, Right of Way Administrator, dated August 15, 2008.
- Preliminary Utility Cost Estimate, Project: CSSTP-0006-00(862) Cobb, P.I. No.: 006862, Description: SR 92 from SR 3/US 41 to Cowan @ I-75, from Jonathan Walker, District Utilities Engineer, dated August 18, 2008.
- Preliminary Right of Way Cost Estimate, Project: BRST0-0213-01(005) Cobb, P.I. No.: 731865, SR 92 Over Proctor Creek/Lake Acworth, from Jonathan Walker, District Utilities Engineer, dated August 18, 2008.
- Summary of Meeting Minutes, April 8, 2008, ICTM for SR 92 from US 41 to Cowan Road in Cobb County, CSSTP-0006-00(862) and BRST0-0213-01(005).
- Proclamation from the Mayor and Board, City of Acworth in support of the State Route 92 improvements project, CSSTP-0006-00(862) and BRST0-0213-01(005), dated July 8, 2008.
- Summary of Meeting Minutes, March 10, 2008, @ USACE/Allatoona Project Management Office Cartersville, GA, Subject: SR 92 Widening and Bridge Replacement over Subdam, Cobb County, PIs 0006862 and 731865.
- Bridge and Structures Design Policy Manual, prepared by the Georgia Department of Transportation, Office of Bridge and Structural Design, dated October 2005, revised April 2007;
- Item Mean Summary for 07/2007 to 06/2008 compiled by the State of Georgia Department of Transportation; dated June 26, 2008;
- Standards and Construction Details Binder; prepared by the Department of Transportation, State of Georgia; undated;
- Standard Specifications Construction of Transportation Systems; prepared by the Department of Transportation, State of Georgia; 2001 Edition;
- Design Policy Manual; A Georgia Department of Transportation Publication; Version 2.0; revised June 1, 2007; and
- A Policy on Geometric Design of Highway and Streets; prepared by the American Association of State Highway and Transportation Officials; dated 2004.

Function Identification and Analysis Phase

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

Creative Phase

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

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

Evaluation Phase

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

Each idea was compared with the present schematic design concepts, in terms of how well it met the design intent. Advantages and disadvantages were discussed, and each team member rated the ideas on a scale of zero to five, with the best ideas rated 4 or 5. Only those ideas rated 4 or 5 were developed into alternatives. In cases where there was little cost impact but an improvement to the project was anticipated, the designation DS, for design suggestion, was used. The design team should review this listing for possible incorporation of ideas into the project.

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

Development Phase

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

Presentation Phase

The last phase of the VE study was the presentation of the findings. The VE alternatives were screened by the VE team before draft copies of the Summary of Potential Cost Savings worksheets were provided to GDOT and design team representatives during an informal presentation on the last day of the workshop. The VE alternatives were arranged in the same order as the idea listing sheets to facilitate cross-referencing.

POST-WORKSHOP EFFORT

The post-study portion of the VE study includes the preparation of this report. It is recommended that personnel from GDOT and the design team 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.



VALUE ENGINEERING WORKSHOP AGENDA

Lewis & Zimmerman Associates, Inc. (LZA) will conduct a 4-day Value Engineering (VE) workshop on Project Number CSSTP-0006-00(862), P.I. Number 0006862, and Project Number BRST0-0213-01(005), P.I. Number 731865, SR 92 Improvements from US 41/SR 3/Cobb Parkway to Glade Road. The projects are located 100% in Cobb County, Georgia. The workshop will be held February 17-20, 2008 at the following location:

Georgia Department of Transportation
One Georgia Center (OGC)
4th Floor, Room 406
600 West Peachtree Street
Atlanta, Georgia 30308

The point of contact is Ms. Lisa L. Myers, Design Review Engineer Manager, and Value Engineering Coordinator, who can be reached at 404-631-1770.

The design consultants from URS Corporation will provide an overview of the project at the beginning of the workshop and be available to answer questions during the VE study effort.

AGENDA

Tuesday, February 17, 2009

8:30 am - 9:00 am **VE Team Gathers for Introductions**

9:00 am - 9:15 am **Introduction to the Workshop**

- Welcome and opening remarks by GDOT and District 7
- Team member introductions and VE Team Leader comments
- VE process, workshop organization and agenda
- Objectives of the workshop

9:15 am - 11:00 am **Designer's Overview**

Representatives from the design team from URS Corporation will provide an overview of the project. After the overview, the design team will answer VE team questions.

11:00 am - 12:00 pm **Function Analysis Phase**

The VE team will perform function analysis by defining the function of each project element or system in the cost model, selecting the primary or basic functions, and determining the worth, or least cost, to provide the function. The goal is to identify those functions or project elements which offer the greatest opportunity for cost reduction or value improvement.



- 12:00 pm - 1:00 pm **Lunch**
- 1:00 pm - 2:00 pm **Conclude Function Analysis Phase**
- 2:00 pm – 5:00 pm **Creative Phase**

The 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. The VE Team Leader will be responsible for developing an idea listing for the team.

Wednesday, February 18, 2009

- 8:00 am – 10:00 am **Conclude Creative Phase**
- 10:00 am - 11:00 am **Evaluation Phase**

The VE team will analyze the ideas listed in the creative phase and select the best ideas based on project criteria obtained during the design overview and a discussion of the ideas advantages and disadvantages. This will be accomplished by assigning each idea a *Gut Feel Index* rating between 1 and 5, with 5 being the best, based on the team's consensus of how well the idea meets the noted criteria.

The team selects the highly rated ideas for research and development.

- 11:00 am - 12:00 pm **Development Phase**

The VE team will develop creative ideas into alternate designs. Initial and life cycle cost estimates comparing original and proposed alternatives will be prepared. Selected alternatives will be developed and supported with sketches, calculations and substantiation for change. Suppliers of materials and equipment will be contacted and specialists consulted.

- 12:00 noon - 1:00 pm **Lunch**
- 1:00 pm - 5:00 pm **Continue Development Phase**

Thursday, February 19, 2009

- 8:00 am - 8:30 am **Review Status and Progress of the Team**

The VE team will assess its status and plan for completion of the alternatives development.

- 8:30 am - 12:00 noon **Continue Development Phase**
- 12:00 noon - 1:00 pm **Lunch**
- 1:00 pm - 3:00 pm **Continue Development Phase**



3:00 pm - 5:00 pm

Completion of Development Phase

The VE team will wrap up and complete the development effort. The VE Team Leader will be responsible for reviewing each developed idea for completion and preparing a summary of the VE alternatives in preparation for the out-briefing presentation.

Friday, February 20, 2009-

8:00 am - 9:00 am

Preparation for Presentation Phase

The VE team will finalize a summary of the VE alternatives with descriptions and initial and life cycle costs for a verbal presentation to interested parties. Summary of Potential Cost Saving worksheets will be copied for distribution to VE presentation attendees.

9:00 am – 10:15 am

Presentation Phase

The VE team will present its alternatives to GDOT, District 7, and URS Corporation and is available to clarify any points. The process for accepting/rejecting VE alternatives is described and a target schedule for meeting to finalize implementation decisions is established.

10:15 am – 10:30 am

Workshop “Post Mortem” and Closing Remarks

10:30 am

Adjourn

VALUE ENGINEERING WORKSHOP PARTICIPANTS

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

Joseph A. Leoni, PE	Roadway QA/QC Manager	ARCADIS U.S., Inc.
J. Dan Hood, PE	Structural Engineer	HNTB
Paresh Parikh, PE	Construction/Civil Engineer	Delon Hampton & Associates
Stephen Havens, PE, PMP, CVS	VE Team Leader	Lewis & Zimmerman Associates

OWNER/DESIGNER PRESENTATION

Representatives from GDOT and URS presented an overview of the project on Tuesday, February 17, 2009. The purpose of this meeting, in addition to being an integral part of the Information Gathering Phase of the VE study, was to bring the VE team “up-to-speed” regarding the overall project. Additionally, the meeting afforded the design team the opportunity to highlight in greater detail, those areas of the project requiring additional or special attention.

VALUE ENGINEERING TEAM PRESENTATION

The VE team conducted an informal presentation on Friday, February 20, 2009 to GDOT and District 7. Copies of the draft Summary of Value Engineering Alternatives worksheets were provided for interim use.

A copy of the meeting participants is attached for reference.

VE STUDY SIGN-IN SHEET

Project No.: CCSTP-0006-00(862) BRSTO-0231-01(005) County: Cobb PI No.: 0006862 731865 Date: 2/17-20/09

NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS	In-briefing 2/17/10	Out-briefing 2/20/10
Lisa L. Myers	00244168	Engineering Services	404-631-1770	lmyers@dot.ga.gov	X	X
James K. Magnus	00208161	Construction	404-631-1971	jmagnus@dot.ga.gov	X	
Douglas Fadool	00928931	Engineering Services	404-631-1764	dfadool@dot.ga.gov	X	X
Ron Wishon	00208180	Engineering Services	404-631-1753	rwishon@dot.ga.gov	X	X
Joe Leoni		ARCADIS-US	770-431-8666	joe.leoni@arcadis-us.com	X	X
Steve Havens		Lewis & Zimmerman	608-438-8227	shavens@lza.com	X	X
Andre Netterville	00942481	District 7 - Preconstruction	678-557-2334	anetterville@dot.ga.gov	X	
Dale Ferris	00731411	District 7 - A2 Construction	770-528-3461	dferris@dot.ga.gov	X	
Sebastian O. Nesbitt	00307144	District 7 - A2 Construction	770-528-3238	snesitt@dot.ga.gov	X	
R. Scott Caples		URS	678-808-8815	scott_caples@urscorp.com	X	
Sean Pharr		URS	678-808-8839	sean_pharr@urscorp.com	X	
Jennifer Harper		URS	678-808-8978	Jennifer_Harper@urscorp.com	X	
Alexis John	00862199	OEL-NEPA	404-699-4409	ajohn@dot.ga.gov	X	
Nabil Raad	00729514	Traffic Operations	404-635-8126	nraad@dot.ga.gov	X	
Olivia Gauntner	00944647	Bridge Design			X	X
Taylor Hughes	00945452	Road (Trainee)			X	X
Andrew Farmer	00868042	Urban Design - TEA		afarmer@dot.ga.gov	X	X
Jennifer Harris-Dunham	00211803	Bridge Design	404-631-1897	jharris-dunham@dot.ga.gov	X	X
David Norwood	00327661	Program Delivery	404-631-1581	dnorwood@dot.ga.gov	X	X
Andrew Heath	00935705	Planning (Training)	404-631-1750	aheath@dot.ga.gov	X	X
Paresh J. Parikh		DHA	404-419-8434	pparikh@delonhampton.com	X	X
Dan Hood		HNTB	404-946-5734	jhood@hntb.com		X
Michael Haithcock	00229219	GDOT		mhaithcock@dot.ga.gov		X

ECONOMIC DATA

The VE team developed economic criteria used for evaluation with information gathered from the State of Georgia Department of Transportation, URS, Inc., and District 7 (D7). To express costs in a meaningful manner, the VE team alternatives are presented on the basis of discounted present worth. Criteria for planning project period interest rates are based on the following parameters:

Year of Analysis:	2009
Construction Start-Up:	Long Range
Construction Duration:	±36 Months (URS, Inc.)
Economic Planning Life:	30 years for Pavement
Economic Planning Life:	50 years for Bridges
Discount Rate/Interest:	0% (Per GDOT)
Inflation/Escalation Rate:	0.00% (Per GDOT)
Composite Construction Mark-Up	10.0% (1.10)

(Composed of: Engineering and Construction at 10.00%)

COST ESTIMATE SUMMARY AND COST MODEL

The VE team prepared the attached cost model for the project prior to the workshop. The cost model is arranged in the Pareto Charting/Cost Histogram format to aid in identifying high cost areas. As can be expected, judgments at this stage of the study are based on experience and intuition rather than facts, which are not uncovered until well along in the analysis of function. As a result of these qualified hypotheses, there appears to be a potential for initial savings in the following areas:

- Roadway
 - Lane widths
 - Medians
 - Curb and Gutter
 - Sidewalks
 - Drainage Piping Material
 - Right-of-Way Requirements
 - Stormwater Management
- Bridges
 - Typical Sections
 - Multi-use Trails
 - Storm Water Management
- Walls
 - Means and Methods
 - Constructability

In order to facilitate the cost developments of the selected ideas, the VE team generated numerous “unit” prices for specific roadway and bridge costs that are noted below:

Asphaltic Concrete (1 1/2") Per Square Yard \$5.33*	Asphaltic Concrete (2") Per Square Yard \$7.45*	Asphaltic Concrete (3") Per Square Yard \$10.33*	Graded Aggregate Base (12") Per Square Yard \$12.23*	Total Cost of Full Depth Pavement Section Per Square Yard \$35.34*
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Bridge 1 over Lake Allatoona:	\$115/Square Foot**
Bridge 2 over CSX Railroad:	\$80/Square Foot**
Bridge 3 over Tanyard Creek:	\$112/Square Foot**

*Reference Value Engineering Alternative R-1 for Roadway unit pricing calculations.

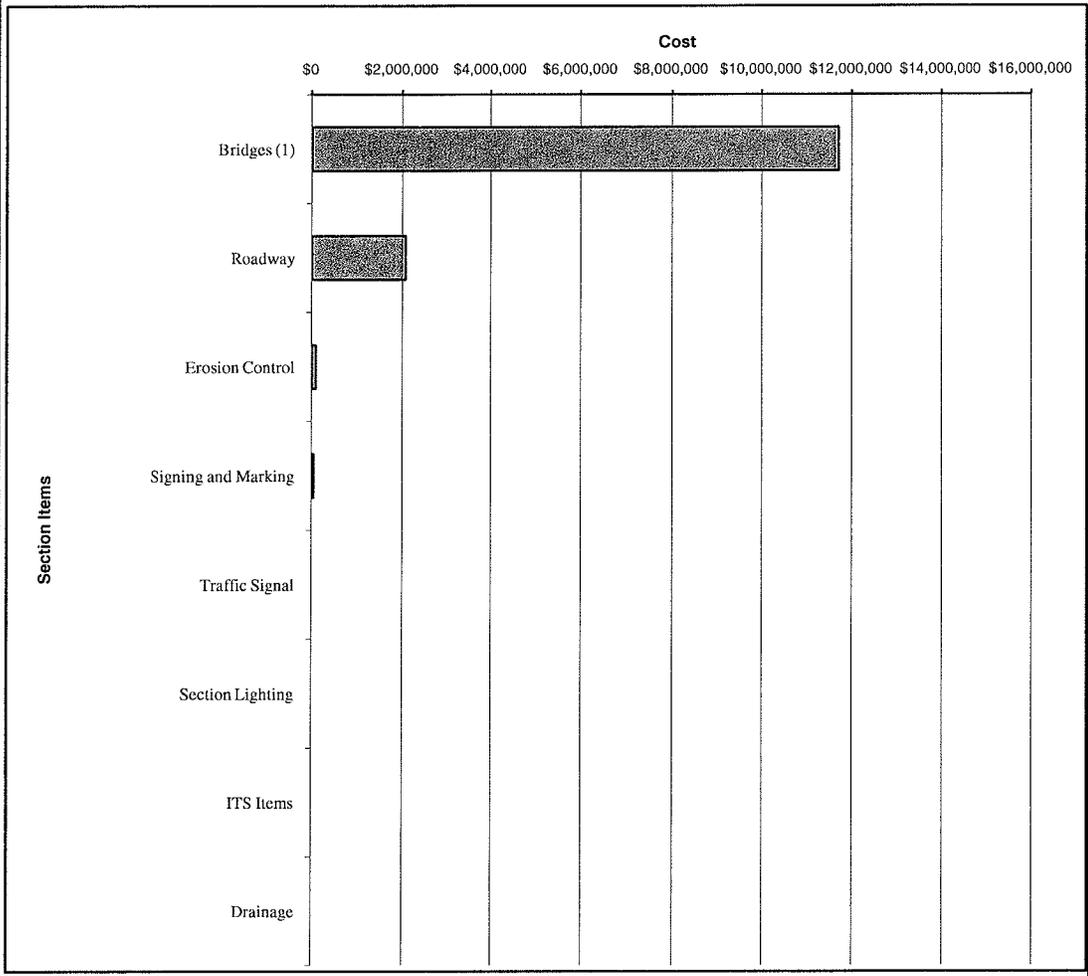
**Reference Value Engineering Alternative B-1 for Bridge Area unit pricing calculations.

COST HISTOGRAM



Project: SR 92 Improvements from US 41/SR 3/Cobb Parkway to Glade Road
 Cobb County, Georgia Department of Transportation, District 7
 Design Development Stage

Project No. BRST0-0213-01(005) P. I. No. 731865	COST	PERCENT	CUM. PERCENT
Bridges (1)	11,704,000	84.24%	84.24%
Roadway	2,065,658	14.87%	99.11%
Erosion Control	86,214	0.62%	99.73%
Signing and Marking	37,804	0.27%	100.00%
Traffic Signal		0.00%	100.00%
Section Lighting		0.00%	100.00%
ITS Items		0.00%	100.00%
Drainage		0.00%	100.00%
Construction Subtotal	\$ 13,893,676	100.00%	
Engineering and Construction at	0.00%	\$ -	
Inflation Based on 4.00% per annum for 5.00 Years	0.00%	\$ -	
Construction Total	\$ 13,893,676	Construction Mark-Up:	0.00%
Right-of-Way Costs: Land	\$ 351,260		
Right-of-Way Costs: Improvements	\$ 475,000		
Right-of-Way Costs: Relocation	\$ 80,000		
Right-of-Way Costs: Damage	\$ 25,000		
Right-of-Way Subtotal	\$ 931,260		
Scheduling Contingency	55.00%	\$ 512,193	
Administration / Court Costs	60.00%	\$ 866,072	
Inflation Factor	0.00%	\$ -	
Right-of-Way Total	\$ 2,309,500	ROW Mark-Up:	148.00%
Reimbursable Utilities Costs			
Reimbursable Utilities Subtotal	\$ -		
GRAND TOTAL	\$ 16,203,176		



Costs in graph are not marked-up.

FUNCTION ANALYSIS

A random function analysis was performed to (1) understand the project purpose and need, (2) define the requirements for each project element, (3) ensure a complete and thorough understanding by the VE team of the basic functions needed to attain the given project purpose and need, (4) identify other goals, and (5) identify secondary functions that should be addressed by the VE team. The Random Function Analysis worksheet completed by the team for the project in its entirety and the various elements follow.

The key opportunity areas for potential cost reduction and value improvement established during the function analysis session (including input from the design team during the design overview) includes the following:

- Roadway
 - Improve Geometry
 - Add Lanes
 - Accommodate Pedestrians and Bicyclists
 - Manage Stormwater
- Bridges
 - Span Waterways
 - Manage Stormwater
 - Accommodate Pedestrians and Bicyclists
- Walls
 - Retain Earth

RANDOM FUNCTION ANALYSIS



PROJECT: **SR 92 Improvements from US 41/SR 3/Cobb Parkway to Glade Rd.** SHEET NO.: 1 of 2
P.I. Nos. 0006862 and 731865
Cobb County, GDOT, District 7
Design Development Stage

DESCRIPTION	FUNCTION		
	VERB	NOUN	KIND
PROJECT	Alleviate	Congestion	B
	Accommodate	Mobility	B
	Improve	Safety	B
	Accommodate	Goods Movement	B
	Improve	Traffic Flow	RS
	Address	Unsafe Conditions	RS
	Improve	Travel Options	RS
	Increase	Sight Distance	RS
	Increase	Capacity	RS
	Improve	LOS	B
	Accommodate	Pedestrians	B
	Reduce	Delays	B
	Control	Access	RS
	Improve	Access	RS
ROADWAY (R)	Improve	Geometry	RS
	Add	Lanes	RS
	Acquire	Right-of-Way	RS
	Improve	Profile	RS
	Reduce	Turning Conflicts	RS
	Retain	Earth	RS
	Improve	Alignment	RS
	Move	Earth	RS
	Improve	Mobility	B

Function defined as: Action Verb	Kind: B = Basic	HO = Higher Order
Measurable Noun	S = Secondary	LO = Lower Order
	RS = Required Secondary	

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

During the Creativity Phase, numerous ideas were generated using conventional brainstorming techniques. These ideas were recorded and are shown with their corresponding ranking on the attached Creative Idea Listing Worksheets. For the convenience of tracking an idea through the VA process, the ideas were grouped according to the following categories and numbered in the order in which they were conceived. The following letter prefixes were used to identify the categories.

PROJECT ELEMENT	PREFIX
Roadway	R
Bridges	B
Walls	W

Creative Idea Evaluation

After discussing each idea, the team evaluated the ideas by consensus. This effort produced 16 ideas rated 4 or 5 to research and develop into formal VE alternatives and 7 ideas to develop as design suggestions to be included in the Study Results section of the report. Ideas that were not developed further may have been combined with another related idea or discarded as a result of additional research indicating the concept as not being cost effective or technically feasible. The project team is encouraged to review the Creative Idea Listing and Evaluation worksheet since it may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING



PROJECT: SR 92 Improvements from US 41/SR 3/Cobb Parkway to Glade Rd. P.I. Nos. 0006862 and 731865 <i>Cobb County, GDOT, District 7</i> <i>Design Development Stage</i>	SHEET NO.:	1 of 2
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NO.	IDEA DESCRIPTION	RATING
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	ROADWAY (R)	
R-1	Add a second right turn from southbound Glade Road to westbound SR 92 to improve traffic flow.	4
R-2	Add a right-in/right-out at (RT) Sta 618+00 to accommodate access to local businesses.	DS
R-3	Make all inside lanes 11-foot-wide in lieu of 12-foot-wide.	4
R-4	Use 24-inch-wide curb and gutter in lieu of 30-inch-wide curb and gutter.	4
R-5	Make the raised medians 18-feet-wide in lieu of 20-feet-wide.	4
R-6	Make the bridge medians 6-foot-wide including 24-inch-wide curb and gutter in lieu of 8-foot-wide including 30-inch-wide curb and gutter.	4
R-7	Eliminate sidewalks from the left side of SR 92 except in busy commercial areas.	4
R-8	Realign SR 92 between Sta 530+00 and Sta 535+00 to reduce the length of roadway required while fully utilizing total right-of-way takes.	2
R-9	Add a second left-turn-lane from WB SR 92 to SB US 41 to improve vehicle movement.	4
R-10	Locate the high point of the vertical curve at the center of the new 1330-foot bridge to improve drainage.	DS
R-11	Reduce excavation requirements by raising the grade between (LT) Sta 500+00 and Sta 540+00.	1
R-12	Convert the old roadway alignment into a multi-use trail in lieu of providing a new multi-use trail from (RT) Sta 523+00 to Sta 555+00.	5
R-13	Reduce the lengths and widths of the U-turn eyebrow combination acceleration lanes.	DS
R-14	Use HDPE pipe in lieu of RCP pipe for the longitudinal stormwater drainage system.	4
R-15	Realign Orr Road with Kemp Road at the median opening.	4
R-16	Shift the right turn onto North Main Street to the east to eliminate the need for a fifth lane on the bridge over the CSX Railroad.	4
R-17	Use Geogrid to reduce pavement section requirements.	4
	BRIDGES (B)	
B-1	Provide 6-foot-wide medians in lieu of 8-foot-wide medians on the 1,330-foot long bridge.	4
B-2	Replace the 10-foot-wide multi-use trail with a 5-foot-wide shoulder (RT) on the 1,330-foot long bridge.	Combine with R-12

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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