



GEORGIA DEPARTMENT OF TRANSPORTATION

SR 32 @ Flint River and Overflow

Lee/ Worth Counties

BRSTO-0031-01(042) PI# 432092-

VALUE ENGINEERING REPORT



MARCH 2011

Submitted by:





March 31, 2011

Ms. Lisa Myers, AVS
Design Review Engineer Manager/VE Coordinator
Georgia Department of Transportation-Engineering Services
One Georgia Center
600 W. Peachtree Street NW
Atlanta, GA 30308

RE: Value Engineering Report
Project No: BRSTO-0031-01(042)
PI No: 432092-
SR 32 @ Flint River and Overflow
Lee/ Worth Counties

Dear Ms. Myers:

Please find enclosed two (2) hard copies and one (1) CD of our Value Engineering Report for the proposed SR 32 @ Flint River and Overflow bridge replacements. Using the Value Engineering "Job Plan" – Investigation, Analysis (*Function*), Speculation, Evaluation & Development, the VE Team identified:

Six (6) Alternatives recommended for improving the project value.

We trust that you will find this report to be in proper order. It should be noted that the results of this workshop are volatile in that they can be overcome by the events that accompany the expeditious continuance of the design process. Accordingly, we encourage an equally expeditious implementation meeting to design the disposition of the contents of this report.

Please contact me at 678-677-6420 should you have any questions regarding this submittal.

On behalf of our company and our VE Team, we thank you and Matt for your assistance over these past four years and best wishes for your future successes in serving the people of Georgia.

Yours truly,

A handwritten signature in black ink that reads "Les M. Thomas". The signature is written in a cursive style with a stylized initial "L".

Les M. Thomas, P.E., CVS-Life
VE Team Leader

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1 EXECUTIVE SUMMARY

1.1 INTRODUCTION

The primary purpose of the proposed project is to bring the existing bridges into compliance with the recommended minimum standards per the Georgia MOG 4265-10 for the roadway classification and usage for the design period. This necessitates the replacement of the existing bridges where SR 32 crosses the Flint River and the Overflow of the Flint River. The existing bridges were constructed in 1955. Project documents were prepared by HNTB.

1.2 PROJECT DESCRIPTION

Project No: BRSTO-0031-01(042); PI No: 432092-; is proposed to widen and strengthen the existing SR 22 roadway bridges where crossing the existing Flint River and Overflow. To achieve this objective the existing bridges must be replaced. The project is in Lee and Worth Counties.

The existing bridge over the Overflow branch of the Flint River is a 2-lane bridge, approximately 135 feet long, 27.7 feet wide, and has 5 spans each 27 feet long. It has a structural load rating of HS15. The proposed new bridge with a load rating of HS20 will be 160 long, 44 feet wide, consisting of two 12-foot travel lanes and two 10-foot shoulders.

The existing bridge over the Flint River is a 2-lane bridge, approximately 855 feet long, 27.7 feet wide, and has 5 spans each 27 feet long, and 9 spans each approximately 80 feet long. It has a structural load rating of HS15. The proposed new bridge with a load rating of HS20 will be 44 feet wide, consisting of two 12-foot travel lanes and two 10-foot shoulders and approximately 880 feet long.

The proposed roadway associated with these two bridges will consist of two 12-foot lanes with 10-foot shoulders, 6.5-foot of which would be paved. Total length of the project is 1.17 miles. The roadway is classified as a Rural Minor Arterial.



Figure 1-1: Overflow and Flint River Bridges

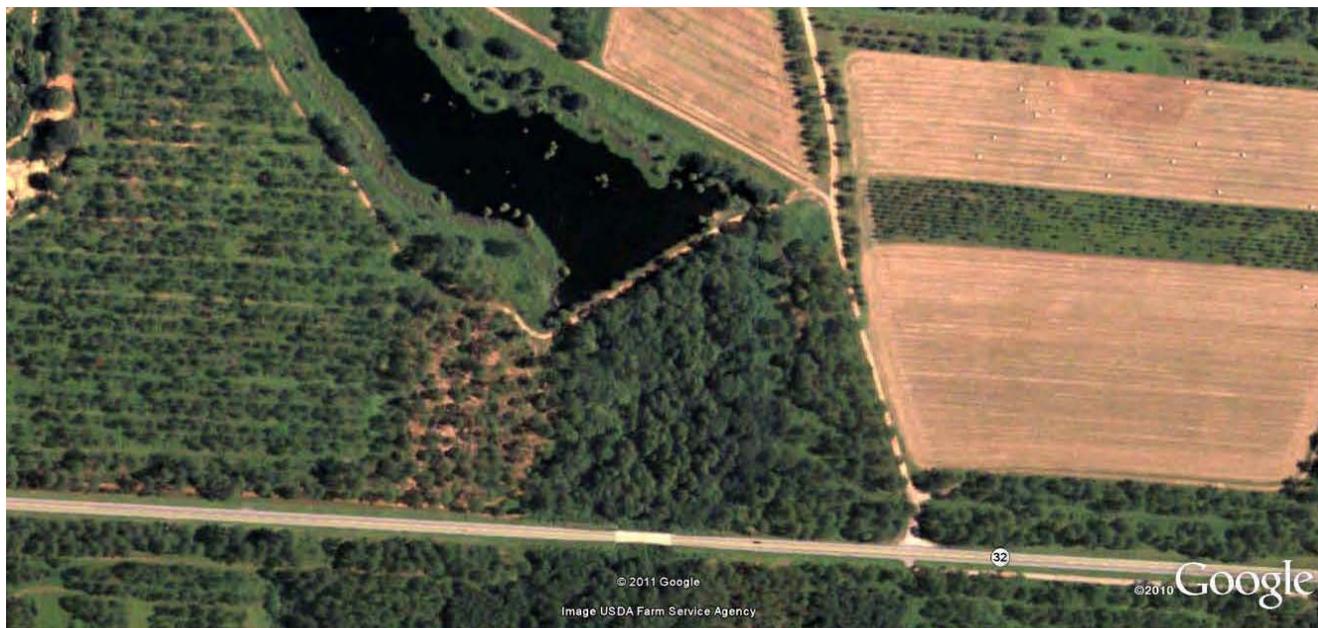


Figure 1-2: Overflow Bridge (existing)



Figure 1-2: Flint River Bridge (existing)

1.3 VALUE ENGINEERING PROCESS

The Value Engineering (VE) team followed the seven step Value Engineering job plan as promulgated by SAVE International. Refer to Section 4.2 of this report for additional information on the VE process. The seven step Job Plan includes the following:

Information Phase – during this phase of the VE Team’s work, the team received a briefing from the design team. This briefing included discussions of the design intent behind the project, the cost concerns, and the physical project limitations. In the working session that followed, the VE team developed cost models from the cost data provided by the designers and familiarized themselves with the construction drawings and other data that was made available to the team.

Function Analysis Phase – during this phase the VE Team determined the “**Functions**” of the project. This was accompanied by reviewing the project by asking the questions of “What is the project supposed to do?”, and “How is it supposed to accomplish this purpose?” In the Value Engineering vernacular, the answers to these questions are cast in the form of active verbs and measurable nouns. These verb/noun pairs form the basis of the function analysis which distinguishes a Value Engineering effort from a potentially damaging cost cutting exercise. A FAST diagram was prepared highlighting the project’s required functions.

Speculation/Creative Phase – The VE Team performed a brainstorming session to identify ideas that might help meet the project objectives. These ideas fell into the following major headings:

- Roadway**
- Grading**
- Bridge #1 - Overflow Bridge**
- Bridge #2 - Flint River Bridge**

The brainstorming session identified twenty-seven (27) ideas, which is presented in section 4.0.

Evaluation Phase – During this phase, the VE Team determines which of the creative ideas offer the best opportunity to improve the value of the project for further development. The first step is to determine the criteria that the ideas should be evaluated against. The VE Team reflected back on the project constraints and objectives shared with the team by the Owner’s representatives and the design team members and listed the following:

- First Costs**
- Impact on access to the river**
- Impact on traffic during construction**
- Impact on mussels and or wetlands**
- Operational and Maintenance Costs**

Development Phase – During this phase, the VE Team developed each of the selected alternatives whose score was 4 or greater because of time constraints. This effort included a detailed explanation of the idea with sketches as appropriate to clarify the idea from the original concept, advantages and disadvantages, a technical explanation and an estimation of the cost and resultant cost savings if implemented.

Recommendation Phase – During this phase the VE Team reviews the alternative ideas to confirm which ones are appropriate for the project, provide an opportunity for success and which will improve the value of the project if implemented.

Presentation Phase – the team made a presentation to the Georgia Department of Transportation on the last day of the workshop. This presentation was designed to express the intent and clarify each of the recommended alternatives. This report is intended to formalize those findings.

1.4 OBSERVATIONS

The VE team noted the following which might be considered:

- Increase boat ramp radius for boat trailers
- Add east and west bound turn lanes for boat ramp access road

1.5 CONCLUSIONS AND RECOMMENDATIONS

The VE Team identified, developed, and recommends *Six design alternatives* for implementation:

Summary of Alternatives & Design Suggestions

PROJECT: Georgia Department of Transportation Project No: BRSTO-0031-01(042)PI No: 432092- SR 32 @ Flint River and Overflow Lee/ Worth Counties		SHEET NO.: 1 of 1
ALTERNATIVE NUMBER	DESCRIPTION OF ALTERNATIVE	INITIAL COST SAVINGS
	Grading (GR)	
GR-2	Adjust proposed slopes to avoid cutting existing roadway	\$ 62,578
	Bridge # 1 - Overflow Branch to the Flint River	
BR #1-4	Use special design "rails" in-lieu of "jersey Barriers"	\$ 44,000
BR #1-5	Use an 8' in-lieu of 10' shoulder per MOG 4265-10	\$ 61,600
	Bridge # 2 - Flint River	
BR #2-2	Maximize capacity utilization of BT-74 to reduce number of spans	\$ 153,422
BR #2-4	Use special design "rails" in-lieu of "jersey Barriers"	\$ 165,000
BR #2-5	Use an 8' in-lieu of 10' shoulder per MOG 4265-10	\$ 440,000

2 STUDY RESULTS

2.1 INTRODUCTION

This section includes the study results presented in the form of fully developed value engineering alternatives that include: descriptions of the original design; description of the alternative design; opportunities and risks; technical discussions; sketches; calculations; and a cost estimate of the impact of the alternative.

It should be noted that the estimated cost/savings calculated for these alternatives are very preliminary and are only presented to indicate a probable magnitude of cost impact on the project.

Also, these alternatives are "stand alone" ideas. In some cases they may be "added" to another alternative, or in other cases they may present a different method of constructing the same elements and are therefore not additive. A summary is provided in Section 1-4 - Conclusions and Recommendations.

Therefore the users of this report are asked to consider these alternatives as a smorgasbord of choices for selection and use as appropriate as the project progresses.

2.2 COST CALCULATIONS

The cost calculations are intended only as an indicator to the approximate results that might be expected from implementation of the alternatives. They should be helpful in making clear choices as to the pursuit of individual alternatives.

2.3 ALTERNATIVES AND DESIGN SUGGESTIONS

Following are the ***six design alternatives*** for implementation to improve the value of the project:

2.3.1 ALTERNATIVE NUMBER GR-2

Value Analysis Design Alternative

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.:
		GR-2
DESCRIPTION:	Adjust proposed slopes to avoid cutting existing roadway	SHEET NO.: 1 of 4

Original Design:

The original design calls for removal of most of the existing roadway, constructing a 4:1 shoulder front slope through most of the project.

Alternative:

The alternative would obliterate the existing pavement on the old roadway and thence re-grade the existing roadbed in-lieu of "wasting" the material, resulting in a final side slope of something less than the 4:1 proposed.

Opportunities:

- Reduction in unclassified excavation
- Reduction in construction time

Risks:

- None apparent

Technical Discussion:

The alternative seeks to minimize the amount of unclassified excavation required to provide drainage for the new roadway by minimizing removal of the existing roadway. The original design would create 4:1 front slopes of the new roadway requiring removal of a substantial portion of the old roadway. The alternative would obliterate the old pavement, and grade to drain. It is noted that the original design does not have unclassified excavation included in the summary of quantities provided. Using the staging as planned would not allow incorporation of the unclassified excavation of the old roadway to be utilized as borrow for fill for the new roadway.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 62,578	\$ 0	\$ 62,578
ALTERNATIVE	0	\$ 0	0
SAVINGS	\$ 62,578	\$ 0	\$ 62,578

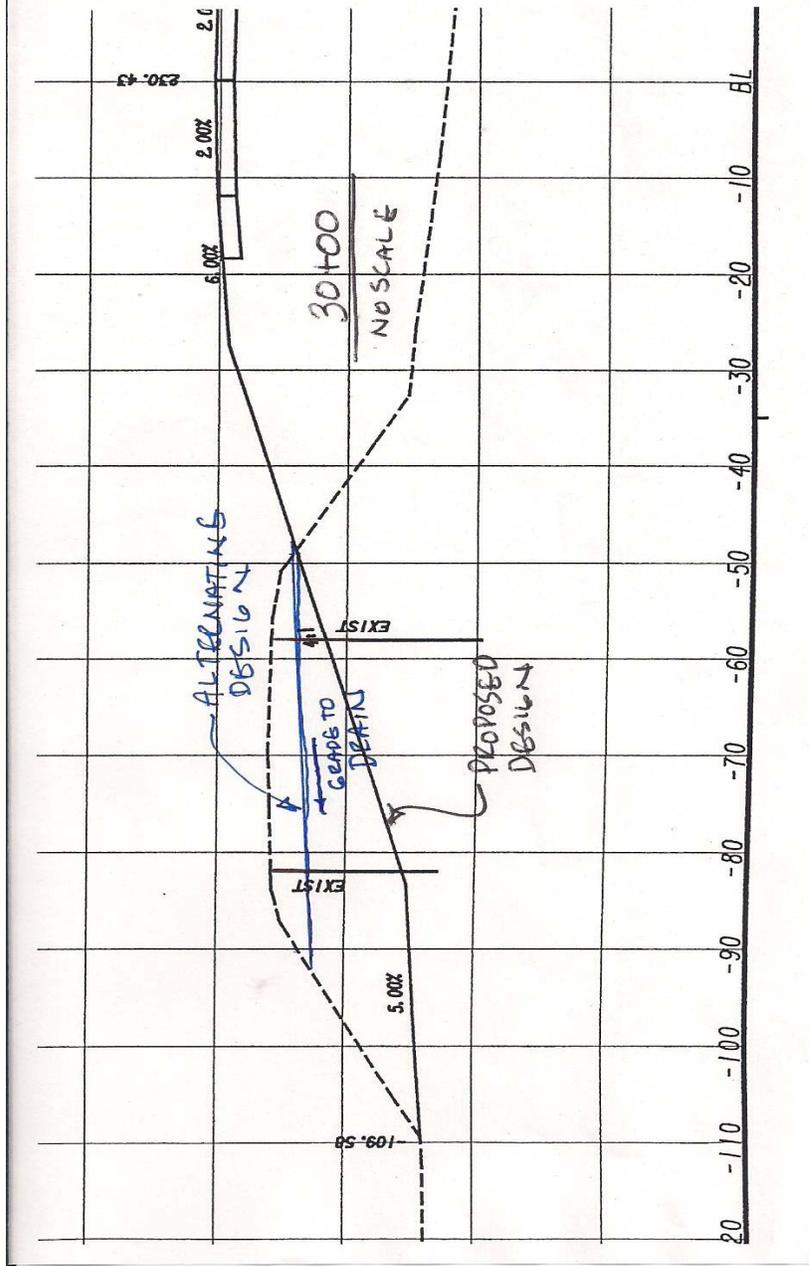
Illustrations

PROJECT: Georgia Department of Transportation
 Project No: BRSTO-0031-01(042)
 PI No: 432092-
 SR 32 @ Flint River and Overflow, bridge replacements
 Lee/ Worth Counties

ALTERNATIVE NO.:
GR-2

DESCRIPTION: **Adjust proposed slopes to avoid cutting existing roadway**

SHEET NO.: 2 of 4



Calculations

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: GR-2
DESCRIPTION:	Adjust proposed slopes to avoid cutting existing roadway	SHEET NO.: 3 of 4

Grade existing roadway to drain in lieu of removing existing roadway from :

STA 21+00-STA 27+30=> 630'

STA 28+70-STA 45+80=> 1710'

STA 55+80-STA 58+00=> 220'

Total length= 2,560LF

Assume the reduced area of cut is 50' wide and averages 4' depth.

$2560' \times 50' \times 4' / 27 = 18,963$ CY not removed

18,963 CY at average \$3.00/CY cost for Unclassified Excavation= \$56,889

Cost Worksheet

PROJECT:	Georgia Department of Transportation BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge Lee/ Worth Counties	ALTERNATIVE NO.:	GR-2
DESCRIPTION:	Adjust proposed slopes to avoid cutting existing roadway	SHEET NO.:	4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Unclassified Excavation	CY	18,963	\$ 3.00	\$ 56,889	0	\$ 3.00	\$ -
Sub-total				\$ 56,889			\$ -
Const Mark-up 10.00%				\$ 5,689			\$ -
TOTAL				\$ 62,578			\$ -
Estimated Savings:							\$62,578



2.3.2 ALTERNATIVE NUMBER BR 1-4

Value Analysis Design Alternative

PROJECT: Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: BR#1-4
DESCRIPTION: Use Special Design Rails in-lieu of Jersey Rails	SHEET NO.: 1 of 5

Original Design:

The original design proposes the construction of a 140' bridge across the Overflow to the south of the existing bridge. The single span arrangement comprises of BT-72 Girders. The bridge is 47'-11" wide to accommodate two 12' lanes, two 10' bikeable shoulders, and jersey barriers with aluminum rails.

Alternative:

The alternative design proposes utilizing Special Design rails in-lieu of Jersey rails to reduce deck width requirement.

Opportunities:

- Savings in cost by reducing deck width
- More aesthetic

Risks:

- None apparent

Technical Discussion:

Special Design rails of 1'-1" can be used in-lieu of the Jersey Rails of 1'-10". The net reduction in deck width would be 18" (1'-6").

See the following pages for calculations of cost savings.
 (Note: Savings from Alternative = Cost for Current Design).

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 44,000	\$ 0	\$ 44,000
ALTERNATIVE	\$ 0	\$ 0	\$ 0
SAVINGS	\$ 44,000	\$ 0	\$ 44,000

Illustrations

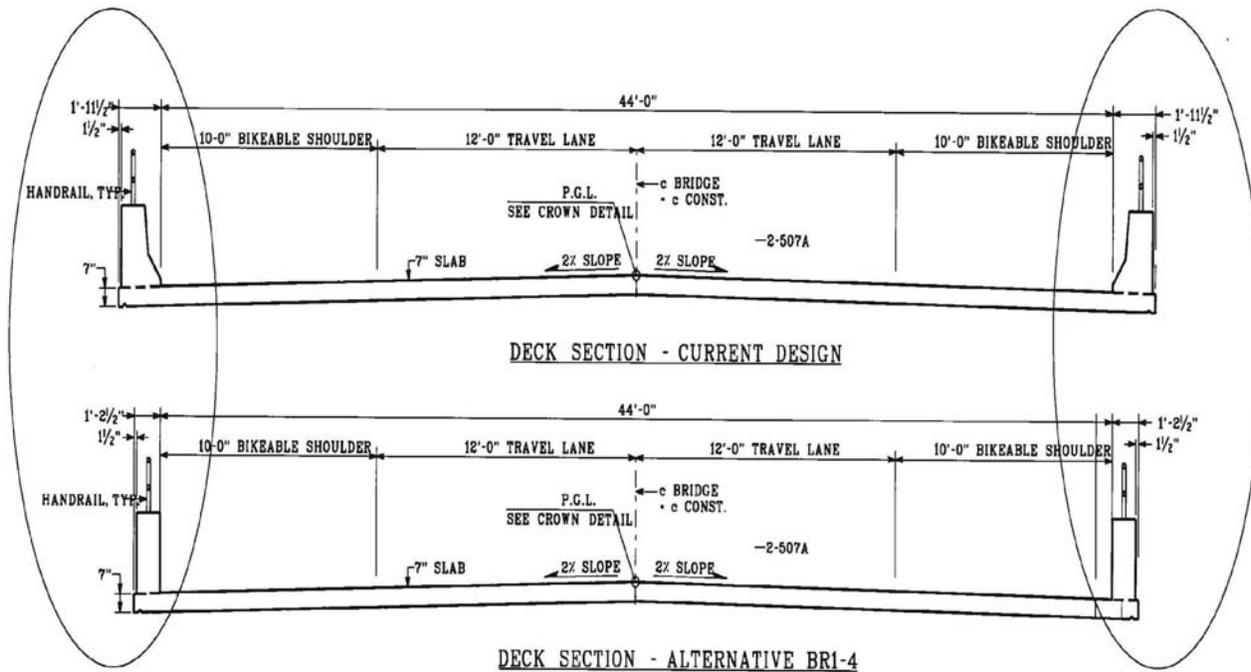
PROJECT: Georgia Department of Transportation
 Project No: BRSTO-0031-01(042)
 PI No: 432092-
 SR 32 @ Flint River and Overflow, bridge replacements
 Lee/ Worth Counties

ALTERNATIVE NO.:
BR#1-4

DESCRIPTION: **Use Special Design Rails in-lieu of Jersey Rails**

SHEET NO.: 2 of 5

Current Design: Total width 47'11"



Alternate Design: Total width 46' 5"

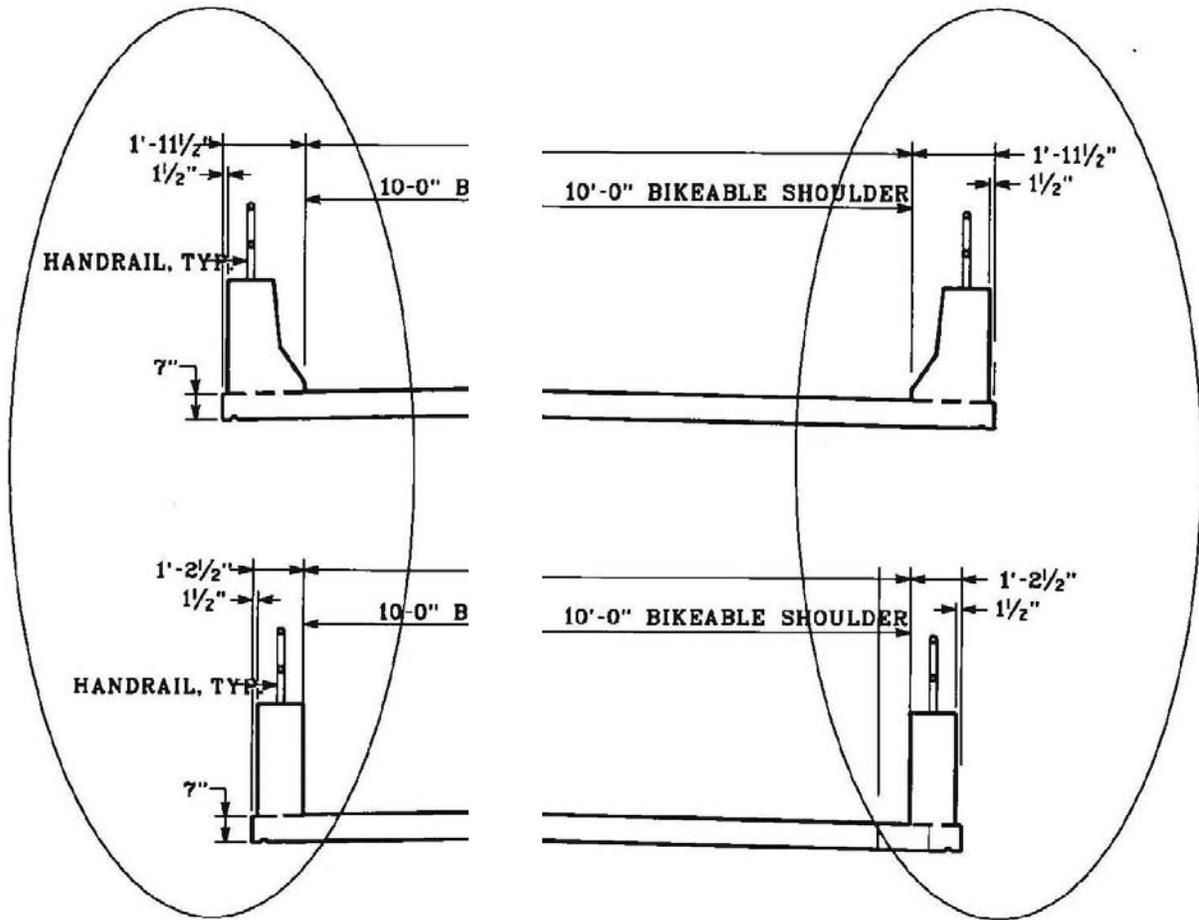
Illustrations

PROJECT: Georgia Department of Transportation
Project No: BRSTO-0031-01(042)
PI No: 432092-
SR 32 @ Flint River and Overflow, bridge replacements
Lee/ Worth Counties

ALTERNATIVE NO.:
BR#1-4

DESCRIPTION: **Use Special Design Rails in-lieu of Jersey Rails.**

SHEET NO.: 3 of 5



Calculations

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: BR #1-4
DESCRIPTION:	Use Special Design Rails in-lieu of Jersey Rails	SHEET NO.: 4 of 5

Note:

- Reduction from current design = savings for alternative
- Cost per SF of new construction (assumed) = \$100
- Although the cost for Current Design was provided to the VE Team at the time of the study, some discrepancies in the quantities and cost computations were observed. Therefore, the cost per SF of new construction is assumed at = \$100

Current Design (1 @ 140' = 140', BT-72).

Alternative Design (1 @ 140' = 140', BT-72).

Width of Current Barrier Rails (Jersey Type) = 1'-10"

Width of Barrier Rails of Special Design = 1'-1"

Total reduction in deck width = 1'-6".

Reduction in deck area = 1.5' X 140' = 210 SF

Other treatments (assumed same for current design & alternative, therefore, not considered).

NOTE:

- A more detailed cost analysis should be performed on sufficiently developed alternative bridge plans to be able to itemize major components (example: foundation dimensions, piles, bearings, diaphragms, reinforcement, etc) and realize greater cost savings than that shown in this study.

2.3.3 ALTERNATIVE NUMBER BR 1-5

Value Analysis Design Alternative

<p>PROJECT: Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties</p>	<p>ALTERNATIVE NO.: BR #1-5</p>
<p>DESCRIPTION: Provide 8' shoulders in-lieu of 10' shoulders</p>	<p>SHEET NO.: 1 of 4</p>

Original Design:

The original design proposes the construction of a 140' bridge across the Overflow to the south of the existing bridge. The single span arrangement comprises of BT-72 Girders. The bridge is 47'-11" wide to accommodate two 12' lanes, two 10' bikeable shoulders, and jersey barriers with aluminum rails.

Alternative:

The alternative design proposes 8' shoulders in-lieu of 10' shoulders to reduce the deck width by 4'.

Opportunities:

- Savings in cost by reducing deck width
- Reduced dead load on bridge
- Savings in paving costs on roadway

Risks:

- None apparent

Technical Discussion:

Per Page 425 of AASHTO's "A Policy on Geometric Design of Highways and Streets" and as quoted in GDOT MOG 4265-10 8' shoulders are adequate on a rural arterial with ADT over 2000. 8' shoulders on the bridge will also accommodate a bicycle path.

See the following pages for calculations of cost savings.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 61,600	\$ 0	\$ 61,600
ALTERNATIVE	\$ 0	\$ 0	\$ 0
SAVINGS	\$ 61,600	\$ 0	\$ 61,600

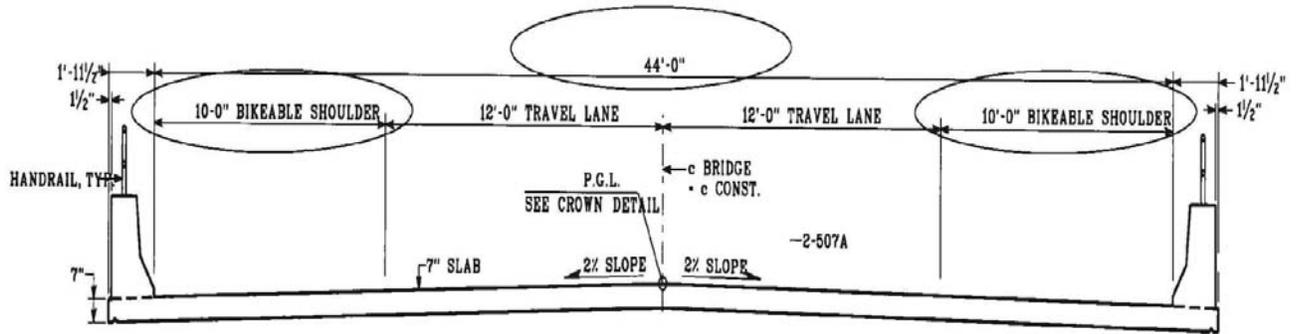
Illustrations

PROJECT: Georgia Department of Transportation
 Project No: BRSTO-0031-01(042)
 PI No: 432092-
 SR 32 @ Flint River and Overflow, bridge replacements
 Lee/ Worth Counties

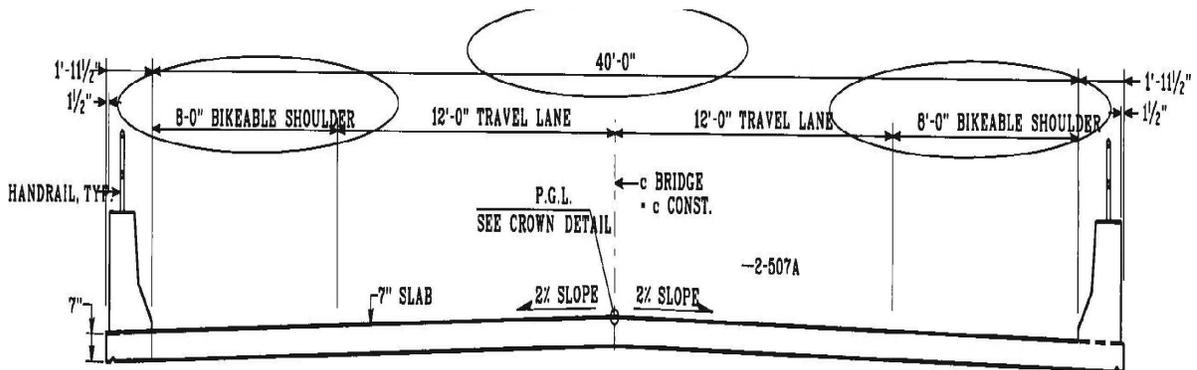
ALTERNATIVE NO.:
BR #1-5

DESCRIPTION: **Provide 8' shoulders in-lieu of 10' shoulders**

SHEET NO.: 2 of 4



DECK SECTION - CURRENT DESIGN



DECK SECTION - ALTERNATIVE BR1-5

Calculations

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: BR #1-5
DESCRIPTION:	Provide 8' shoulders in-lieu of 10' shoulders	SHEET NO.: 3 of 4

Note:

- Reduction from current design = savings for alternative
- Cost per SF of new construction (assumed) = \$100
- Although the cost for Current Design was provided to the VE Team at the time of the study, some discrepancies in the quantities and cost computations were observed. Therefore, the cost per SF of new construction is assumed at = \$100

Current Design (1 @ 140' = 140', BT-72).

Alternative Design (1 @ 140' = 140', BT-72).

Width of Current Shoulder = 10'

Width of Alternate Shoulder = 8'

Total reduction in deck width = 4'

Reduction in deck area = 4' X 140' = 560 SF

Other treatments (assumed same for current design & alternative, therefore, not considered).

NOTE:

- **A more detailed cost analysis may be performed on sufficiently developed alternative bridge plans to be able to itemize major components (example: roadway shoulder paving, foundation dimensions, piles, bearings, diaphragms, reinforcement, etc) and realize greater cost savings than that shown in this study.**

2.3.4 ALTERNATIVE NUMBER BR 2-2

Value Analysis Design Alternative

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: BR #2-2
DESCRIPTION:	Maximize capacity utilization of BT-74 to reduce number of spans on Bridge No. 2	SHEET NO.: 1 of 4

Original Design:

The original design proposes the construction of a 1000' bridge across the Flint River to the south of the existing bridge. The 8 span arrangement includes 6 @ 130' = 780', BT-72 and 2 @ 110' = 220', BT-63. The bridge is 47'-11" wide to accommodate two 12' lanes, two 10' bikeable shoulders, and jersey barriers with aluminum rails.

Alternative Design:

The alternative design proposes utilizing the optimum capacity of BT-74 Girders to provide 150' span lengths resulting in the elimination of one span, and therefore, one interior bent and associated cofferdam. The span arrangement in this alternative provides 7 spans.

Opportunities:

- Savings in cost by eliminating one span
- Savings in substructure by eliminating one bents
- Reduction in construction time
- Reduced wetland impacts
- BT-74 Girder is common in Georgia

Risks:

- None Apparent

Technical Discussion:

Maximum span lengths of 166' can be achieved by using BT-74 Girders made of higher strength concrete ($f'c = 8$ to 10 ksi). The revised span configuration can be 2 @ 125' = 250', BT-74; 5 @ 150' = 750', BT-74. In order to center the main span over the navigation channel while maintaining the 1000' length, the Begin and End Stations of bridge may have to be adjusted slightly.

Note: Savings in not having to provide one cofferdam is considered but savings from reduction in concrete diaphragms, etc., have not been considered in determining the approximate cost savings.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 153,422	\$ 0	\$ 153,422
ALTERNATIVE	\$ 0	\$ 0	\$ 0
SAVINGS	\$ 153,422	\$ 0	\$ 153,422

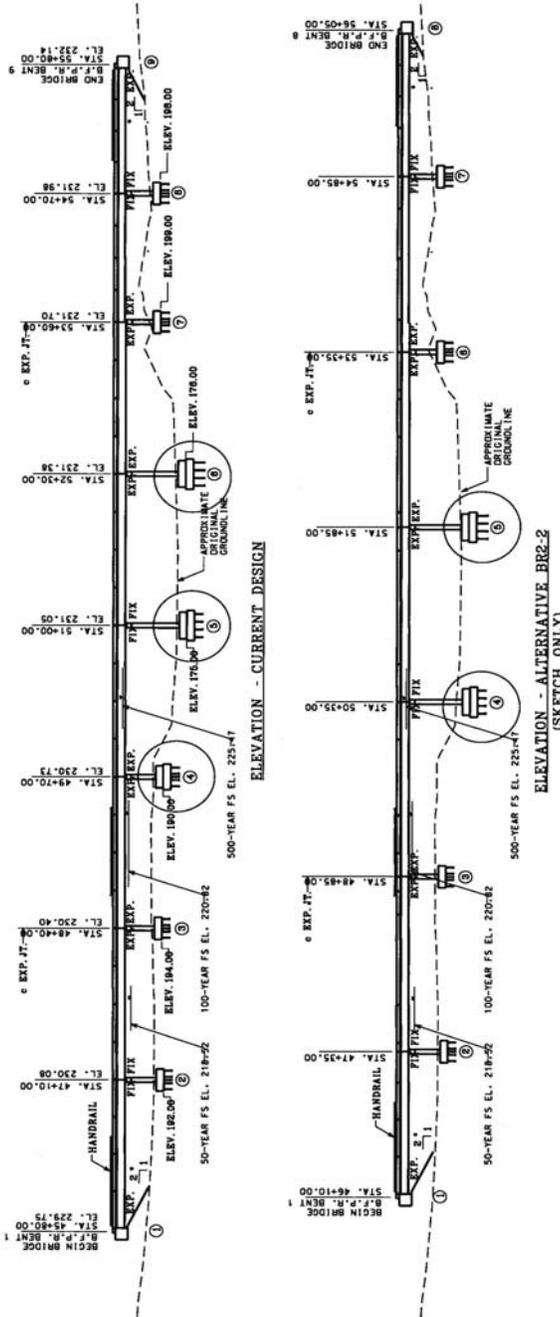
Illustrations

PROJECT: Georgia Department of Transportation
 Project No: BRSTO-0031-01(042)
 PI No: 432092-
 SR 32 @ Flint River and Overflow, bridge replacements
 Lee/ Worth Counties

DESCRIPTION: **Maximize capacity utilization of BT-74 to reduce number of spans on Bridge No. 2**

ALTERNATIVE NO.:
BR #2-2

SHEET NO.: 2 of 4



Calculations

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: BR #2-2
DESCRIPTION:	Maximize capacity utilization of BT-74 to reduce number of spans on Bridge No. 2	SHEET NO.: 3 of 4

Note:

- **Reduction from current design = savings for alternative**
- **Cost of BT 74 assumed the same as that for BT 72**

Current Design (6 @ 130' = 780', BT-72 and 2 @ 110' = 220', BT-63).

Alternative Design (5 @ 150' = 750', BT-74 and 2 @ 125' = 250', BT-74).

Reduction in substructure quantities due to elimination of a one bent (quantities taken from Bridge Details provided to the VE Team):

Reduction in Class AA Concrete = 148.4 CY

Reduction in Bar Reinforcing Steel = 22217 LB

Reduction in HP 14 X73 piling (assume 20' piles) = 10 X 20 = 200 LF

Reduction in requirement of **one** Cofferdam

Other treatments (assumed same for current design & alternative, therefore, not considered).

NOTE:

- **A more detailed cost analysis may be performed on sufficiently developed alternative bridge plans to be able to itemize major components (example: foundation dimensions, piles, cap and column sizes, bearings, diaphragms, reinforcement, etc) and realize greater cost savings than that shown in this study.**

Cost Worksheet

PROJECT: Georgia Department of Transportation BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge Lee/ Worth Counties	ALTERNATIVE NO.: BR #2-2
DESCRIPTION: Maximize Capacity Utilization of BT-74 To Reduce Number Of Spans on Bridge No. 2	SHEET NO.: 4 of 4

CONSTRUCTION ITEM		ORIGINAL ESTIMATE			PROPOSED ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Class AA Concrete	SF	148	\$ 441.72	\$ 65,551	0	\$ 441.72	\$ -
Bar Reinforcing Steel	LB	22,217	\$ 0.63	\$ 13,997	0	\$ 0.63	\$ -
HP 14X73 Piles	LF	200	\$ 161.75	\$ 32,350	0	\$ 161.75	\$ -
Cofferdam	LS	1	\$ 27,576.40	\$ 27,576	0	\$ 27,576.40	\$ -
Sub-total				\$ 139,474			\$ -
Const Mark-up 10.00%				\$ 13,947			\$ -
TOTAL				\$ 153,422			\$ -
Estimated Savings:							\$153,422



2.3.5 ALTERNATIVE NUMBER BR 2-4

Value Analysis Design Alternative

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: BR #2-4
DESCRIPTION:	Use Special Design Rails in-lieu of Jersey Rails	SHEET NO.: 1 of 5

Original Design:

The original design proposes the construction of a 1000' bridge across the Flint River to the south of the existing bridge. The 8 span arrangement includes 6 @ 130' = 780', BT-72 and 2 @ 110' = 220', BT-63. The bridge is 47'-11" wide to accommodate two 12' lanes, two 10' bikeable shoulders, and jersey barriers with aluminum rails.

Alternative:

The alternative design proposes utilizing Special Design rails in-lieu of Jersey rails to reduce deck width requirement.

Opportunities:

- Savings in cost by reducing deck width
- More aesthetic

Risks:

- None apparent

Technical Discussion:

Special Design rails of 1'-1" can be used in-lieu of the Jersey Rails of 1'-10". The net reduction in deck width would be 18" (1'-6").

See the following pages for calculations of cost savings.
 (Note: Savings from Alternative = Cost for Current Design).

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 165,000	\$ 0	\$ 165,000
ALTERNATIVE	\$ 0	\$ 0	\$ 0
SAVINGS	\$ 165,000	\$ 0	\$ 165,000

Illustrations

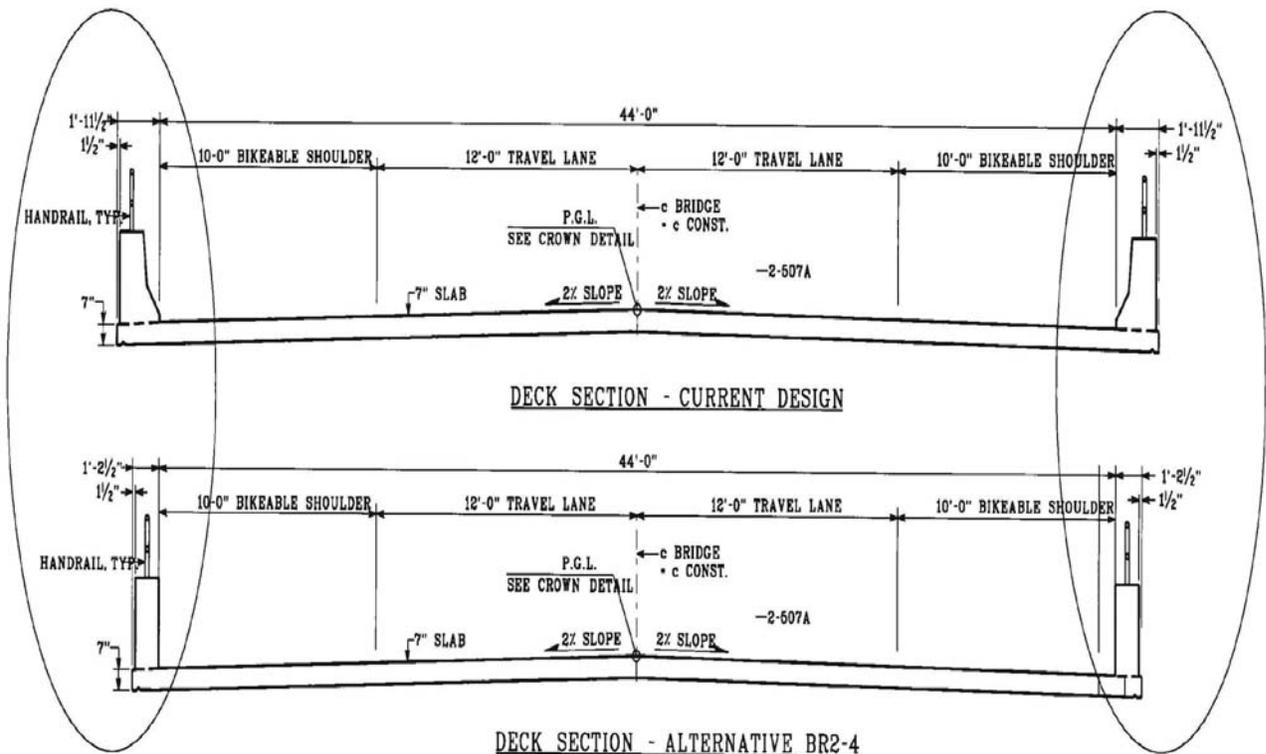
PROJECT: Georgia Department of Transportation
 Project No: BRSTO-0031-01(042)
 PI No: 432092-
 SR 32 @ Flint River and Overflow, bridge replacements
 Lee/ Worth Counties

ALTERNATIVE NO.:
BR #2-4

DESCRIPTION: **Use Special Design Rails in-lieu of Jersey Rails**

SHEET NO.: **2 of 5**

See next drawing for further clarification



Illustrations

PROJECT: Georgia Department of Transportation
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 SR 32 @ Flint River and Overflow, bridge replacements
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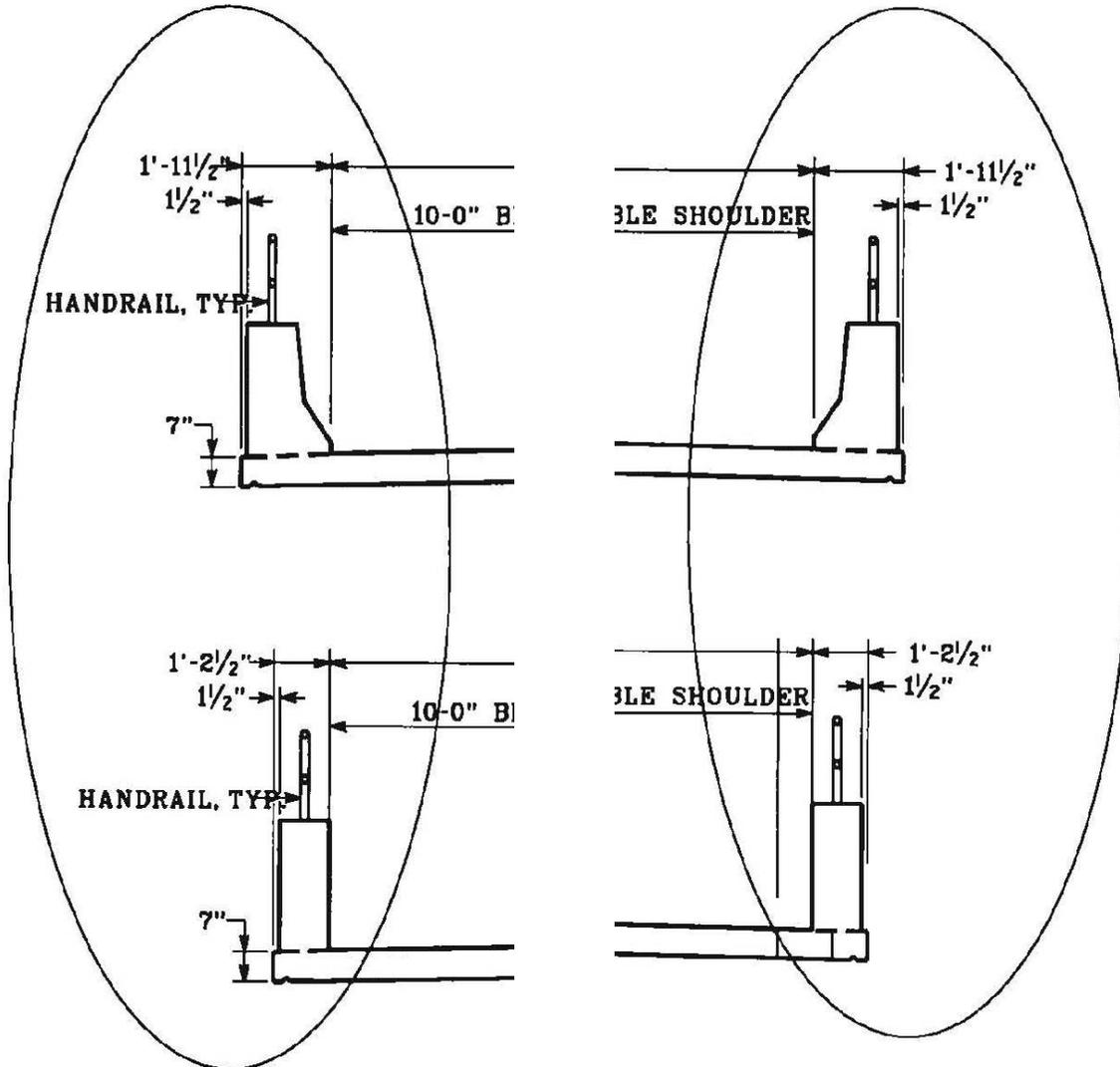
ALTERNATIVE NO.:
BR #2-4

DESCRIPTION: **Use Special Design Rails in-lieu of Jersey Rails**

SHEET NO.: **3 of 5**

End Sections shown for clarity reflecting a narrowing of the bridge overall width

Current Design



Alternative Design

Calculations

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: BR #2-4
DESCRIPTION:	Use Special Design Rails in-lieu of Jersey Rails	SHEET NO.: 4 of 5

Note:

- Reduction from current design = savings for alternative
- Cost per SF of new construction (assumed) = \$100
- Although the cost for Current Design was provided to the VE Team at the time of the study, some discrepancies in the quantities and cost computations were observed. Therefore, the cost per SF of new construction is assumed at = \$100

Current Design (6 @ 130' = 780', BT-72 and 2 @ 110' = 220', BT-63).

Alternative Design (5 @ 150' = 750', BT-74 and 2 @ 125' = 250', BT-74).

Width of Current Barrier Rails (Jersey Type) = 1'-10"

Width of Barrier Rails of Special Design = 1'-1"

Total reduction in deck width = 1'-6"

Reduction in deck area = 1.5' X 1000' = 1,500 SF

Other treatments (assumed same for current design & alternative, therefore, not considered).

NOTE:

- A more detailed cost analysis may be performed on sufficiently developed alternative bridge plans to be able to itemize major components (example: foundation dimensions, piles, cap and column sizes, bearings, diaphragms, reinforcement, etc) and realize greater cost savings than that shown in this study.

ALTERNATIVE NUMBER BR 2-5

Value Analysis Design Alternative

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: BR #2-5
DESCRIPTION:	Provide 8' shoulders in-lieu of 10' shoulders	SHEET NO.: 1 of 4

Original Design:

The original design proposes the construction of a 1000' bridge across the Flint River to the south of the existing bridge. The 8 span arrangement includes 6 @ 130' = 780', BT-72 and 2 @ 110' = 220', BT-63. The bridge is 47'-11" wide to accommodate two 12' lanes, two 10' bikeable shoulders, and jersey barriers with aluminum rails.

Alternative Design:

The alternative design proposes 8' shoulders in-lieu of 10' shoulders to reduce the deck width by 4'.

Opportunities:

- Savings in cost by reducing deck width
- Reduced dead load on bridge
- Savings in paving costs on roadway

Risks:

- None apparent

Technical Discussion:

Per Page 425 of AASHTO's "A Policy on Geometric Design of Highways and Streets" and as quoted in GDOT MOG 4265-10 8' shoulders are adequate on a rural arterial with ADT over 2000. 8' shoulders on the bridge will also accommodate a bicycle path.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	\$ 440,000	\$ 0	\$ 440,000
ALTERNATIVE	\$ 0	\$ 0	\$ 0
SAVINGS	\$ 440,000	\$ 0	\$ 440,000

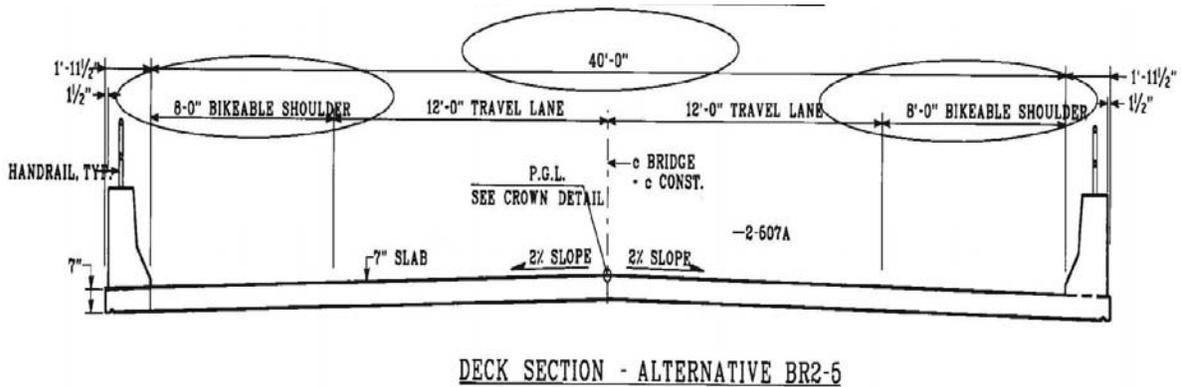
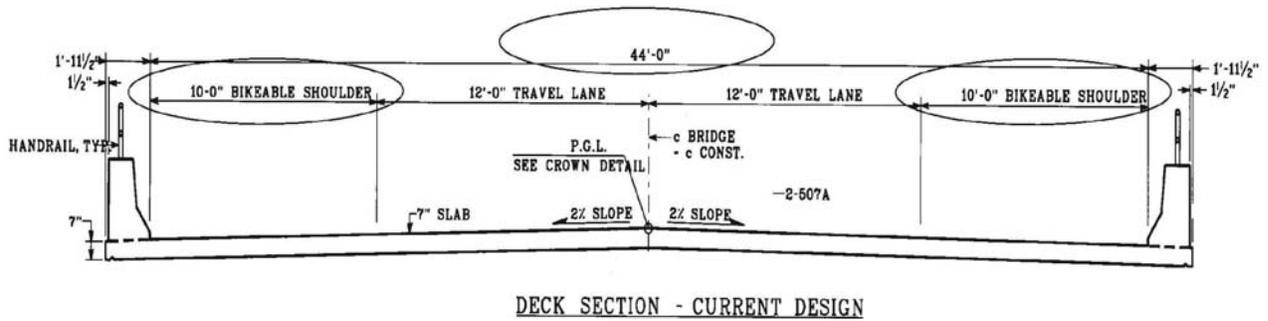
Illustrations

PROJECT: Georgia Department of Transportation
 Project No: BRSTO-0031-01(042)
 PI No: 432092-
 SR 32 @ Flint River and Overflow, bridge replacements
 Lee/ Worth Counties

ALTERNATIVE NO.:
BR #2-5

DESCRIPTION: **Provide 8' shoulders in-lieu of 10' shoulders**

SHEET NO.: 2 of 4



Calculations

PROJECT:	Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow, bridge replacements Lee/ Worth Counties	ALTERNATIVE NO.: BR #2-5
DESCRIPTION:	Provide 8' shoulders in-lieu of 10' shoulders	SHEET NO.: 3 of 4
<p><u>Notes:</u></p> <ul style="list-style-type: none"> ▪ Reduction from current design = savings for alternative ▪ Cost per SF of new construction (assumed) = \$100 ▪ Although the cost for Current Design was provided to the VE Team at the time of the study, some discrepancies in the quantities and cost computations were observed. Therefore, the cost per SF of new construction is assumed at = \$100 <p><u>Current Design (6 @ 130' = 780', BT-72 and 2 @ 110' = 220', BT-63).</u></p> <p><u>Alternative Design (5 @ 150' = 750', BT-74 and 2 @ 125' = 250', BT-74).</u></p> <p>Width of Current Shoulder = 10'</p> <p>Width of Alternate Shoulder = 8'</p> <p>Total reduction in deck width = 4'</p> <p>Reduction in deck area = 4' X 1000' = 4000 SF</p> <p>Other treatments (assumed same for current design & alternative, therefore, not considered).</p> <p>NOTE:</p> <ul style="list-style-type: none"> ▪ A more detailed cost analysis may be performed on sufficiently developed alternative bridge plans to be able to itemize major components (example: roadway shoulder paving, foundation dimensions, piles, cap and column sizes, bearings, diaphragms, reinforcement, etc) and realize greater cost savings than that shown in this study. 		

3 PROJECT DESCRIPTION

3.1 INTRODUCTION

Project BRSTO-0031-01(042) PI # 432092- is proposed to replace two existing bridges which cross the Flint River and Overflow in Lee/Worth Counties respectively. These existing bridges do not meet the current minimum width and load standards for the use intended.

3.2 NEED AND PURPOSE

The existing Flint River and Overflow bridges which were constructed in 1955 and do not meet the minimum standards as defined in the MOG 4265-10. That standard stipulates that the bridges must support an HS20 load and have minimum 8' shoulders. Additionally, the roadway is on the state's bicycle and pedestrian network and therefore must provide for bicyclists. The posted speed limit is 55 mph. The existing bridges are 27.7 feet wide; the suggested width is 44 feet.

4 VALUE ENGINEERING PROCESS

4.1 WORK SHOP TEAM

The Value Engineering (VE) team performed a VE study March 28-31, 2011 in the offices of Georgia Department of Transportation, Atlanta, Georgia. The team followed the SAVE International's seven-step Value Engineering job plan as outlined in this section. The VE Study team consisted of the following members:

Les Thomas, P.E., CVS	Team Leader
Luke Clarke, P.E., AVS	Team Highway Design Engineer
Ramesh Kalvakaalva, PE, AVS	Senior Bridge Engineer (CSI)
Kevin Martin, Esq., AVS	Team Construction Specialist
Randy Thomas, CVS	Assistant Team Leader

4.2 VE WORKSHOP AGENDA

VALUE ENGINEERING STUDY AGENDA

**Project No: BRSTO-0031-01(042), PI No: 432092-
SR 32 @ Flint River and Overflow, bridge replacements
Lee/ Worth Counties
March 28-31, 2011**

Pre-Workshop Activities VE team leader organizes study, coordinates with the Owner and Designer to attain the project objectives and materials necessary. The VE team receives and reviews all project documents. The team develops a Pareto chart and/or cost model for the project.

Day One

- 9:00-10:30** Design Team Presentation (Information Phase)
Introduction of participants, owner, designer, and VE team members
Presentation of the project by the design engineer including:
History and background
Design Criteria and Constraints
Special needs
Current Construction Completion Schedule
Project Cost Estimate if available and Budget Constraints
Owner Presentation – special requirements, definition of life-cycle period and interest rate for life-cycle costs
Discussion, questions and answers
Overview of the VE process and agenda – Workshop goals and project goals
- 10:30-12:00** VE Team reviews project (Information Phase)
Review design team’s presentation
Review agenda and goals of the study
- 1:00-2:30** Function Analysis Phase
Analyze Cost Model – Pareto
Identify basic and secondary functions
Complete Function Matrix/FAST diagram
- 2:30-5:00** Creative Phase
Brainstorming of alternative ideas

Day Two

- 8:00-10:00** Evaluation Phase
Establish criteria for evaluation
Rank ideas
Identify “best” ideas for development
Identify those ideas that will become design suggestions
Identify a “champion” for each idea to be developed
- 10:00-5:00** Development Phase
Develop alternative ideas design suggestions with assessment of original design and write up new alternatives including:
Opportunities and risks
Illustrations
Calculations

Cost worksheets
Life-cycle cost analysis

Day Three

8:00-5:00 Development Phase
Continue developing alternative ideas
Continue developing design suggestions
Prepare for presentation to Owners and Designers

Day Four

8:00-9:00 Prepare presentation
9:00-10:00 VE team presentation

4.3 SEVEN-STEP VALUE ENGINEERING JOB PLAN

The VE team followed the SAVE International’s Seven-step Value Engineering job plan:

- Information Phase**
- Function Analysis Phase**
- Speculation/Creative Phase**
- Evaluation Phase**
- Development Phase**
- Recommendation Phase**
- Presentation Phase**

Information Phase— during this phase of the VE Team’s work, the team received a briefing from the GDOT staff members and their design team. This briefing included discussions of the design intent behind the project, the cost concerns, and the physical project limitations. In the working session that followed, the VE team developed cost models from the cost data provided by the designers and familiarized themselves with the construction drawings and other data that was made available to the team.

Function Analysis Phase— during this phase the VE Team determined the “**Functions**” of the project. This was accompanied by reviewing the project by asking the questions such as: “*What is the project supposed to do?*”, and “*How is it supposed to accomplish this purpose?*”. In the Value Engineering vernacular, the answers to these questions are cast in the form of active verbs and measurable nouns. These verb/noun pairs form the basis of the function analysis that distinguishes a Value Engineering effort from a potentially damaging cost-cutting exercise. A Functional Analysis System Technique (FAST) diagram was prepared highlighting the projects required functions.

Speculation/Creative Phase — The VE Team performed a brainstorming session to identify ideas that might help meet the project objectives. These ideas fell into the following major headings:

- Roadway
- Grading
- Bridge #1
- Bridge #2

The brainstorming session identified twenty-seven (27) ideas:

CREATIVE IDEA LISTING



PROJECT: Georgia Department of Transportation Project No: BRSTO-0031-01(042) PI No: 432092- SR 32 @ Flint River and Overflow Lee/ Worth Counties		SHEET NO.: 1 of 2
NO.	IDEA DESCRIPTION	RATING
Roadway (RD)		
RD-1	Utilize existing roadway for boat ramp access	2
RD-2	Lower roadway profile	2
RD-3	Use a partial offset - construct so as o maintain current alignment at Bridge #1	2
RD-4	Split roadway by constructing new eastbound lane and reconstruction the existing bridges at current locations	1
RD-5	Begin boat ramp access road 400' to the east of the proposed	2
RD-6	Increase boat ramp radius for boat trailers	OBS
RD-7	Use an "eye brow" at boat ramp access road	2
RD-8	Utilize existing roadway for bike path	2
RD-9	Add turn lanes for boat ramp access road	OBS
RD-10	Modify spill ways and slope drains	OBS
RD-11	Purchase ROW for future widening	2
Grading (GR)		
GR-1	Use material from existing roadway to flatten proposed slopes	2
GR-2	Adjust proposed slopes to avoid cutting existing roadway	5
GR-3	Modify sequence of construction to utilize existing roadway soil	2
GR-4	Retain existing road bed for future road widening	2
GR-5	modify grading plan to delete need for guard rail	2
GR-6	modify grading plan to decrease earthwork by using more guardrail	2
GR-7	review cost estimate quantities	OBS
GR-8	Review superstructure cost estimate	OBS
GR-9	Increase 5% side slopes to a minimum of 6:1	OBS
Rating: 1→2 = Not to be Developed; 3 = Varying Degrees of Development Potential; 4→5 = Most likely to be Developed; DS = Design Suggestion; ABD = Already Being Done; OBS= Observation		

Evaluation Phase— Once the VE team identified the creative ideas, it was necessary to decide which alternatives should be carried forward. This is the work of the Evaluation or Judgment phase. The VE team reflected back on the project constraints and objectives shared with the team by the Owner’s representatives and the design team members. This guidance emerged on the first day of the study at the kick-off meeting. From that guidance, the team was able to select ideas that they believed would improve the project . The VE team used the following values as measures of whether or not an alternative had enough merit to be carried forward in the VE process:

- First Costs
- Constructability
- Impact on environment

Development Phase— During this phase, the VE team developed each of the selected alternatives whose score was 4 or higher because of time constraints. This effort included a detailed explanation of the idea with sketches as appropriate to clarify the idea from the original concept, advantages and disadvantages, a technical explanation and an estimation of the cost and resultant savings if implemented (see the tabbed section titled **Study Results**).

Recommendation Phase - The VE team prepares its recommendations to be presented to the Georgia Department of Transportation. The recommendation includes the team’s estimate of the savings that might be realized if implemented.

Presentation Phase— As noted earlier, the team made an informal “out-briefing” on the last day of the workshop. This presentation was designed to inform the Owners and the Designers of the initial findings of the VE study. This written report is intended to formalize those findings.

The following is a flow chart that represents the work done prior to, during and after the VE workshop is completed on site:

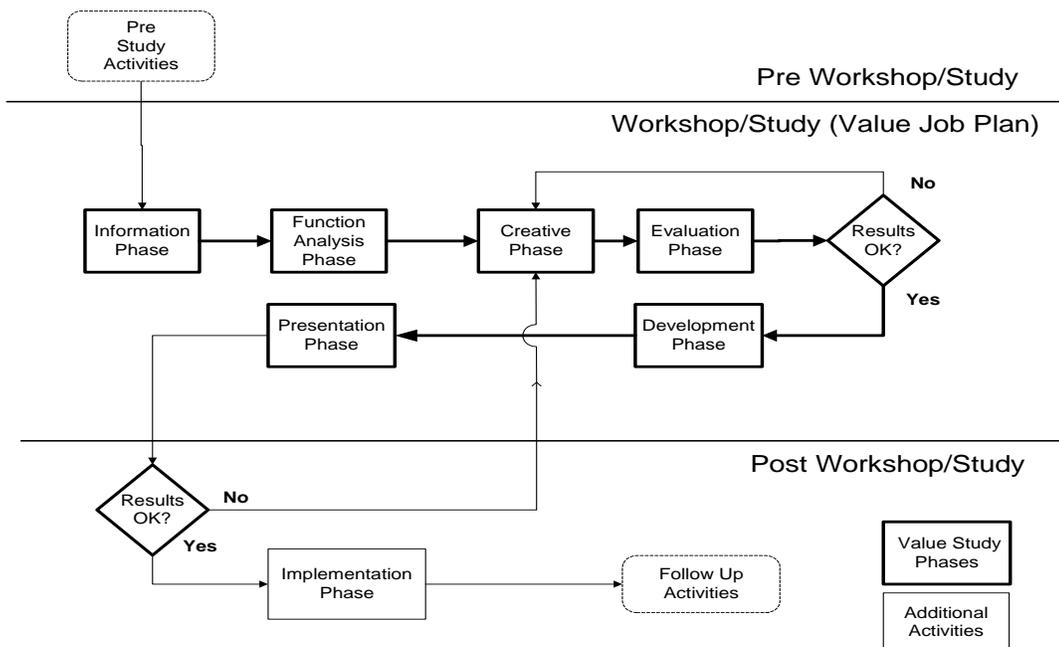
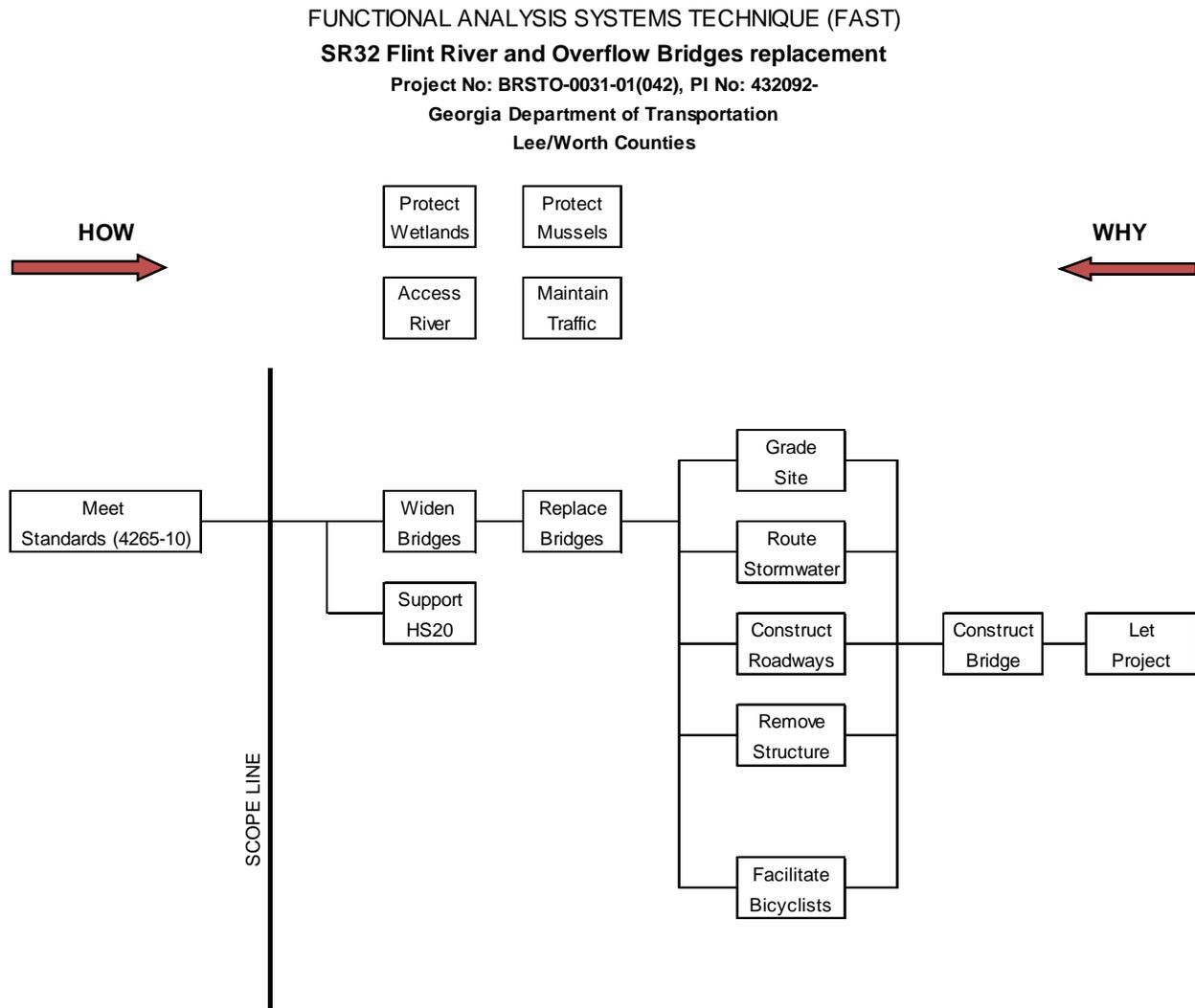


Figure 4-1 – Value Engineering Job Plan

4.4 CONSTRUCTION CAPITAL COST ESTIMATE

The VE Team was provided with a construction cost estimate . An estimate of the right of way acquisition cost was also given to the team . The team used this information to concentrate its efforts towards the area of the project having the least Value.

4.5 FUNCTIONAL ANALYSIS SYSTEM TECHNIQUE (FAST) DIAGRAM



4.6 ATTENDANCE SHEET FOR DESIGNERS AND VE TEAM PRESENTATIONS

**DESIGNER PRESENTATION
MEETING PARTICIPANTS**



Georgia Department of Transportation			March 28,2011
Project No.: BRSTO-00-0031-01(042) - P.I. No. 432092-			
SR 32 @ Flint River & Overflow @ Lee/Worth County Line			
Lee/Worth County			
NAME	ORGANIZATION & TITLE	E-MAIL	PHONE
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Ron Wishon	 GDOT-Engineering Services	rwishon@dot.ga.gov	404-631-1753
Ken Werho	 GDOT-Traffic Operations	kwerho@dot.ga.gov	404-635-8144
Bill DuVall	 GDOT-Bridge Design	bduvall@dot.ga.gov	404-631-1883
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Luke Clarke	 PBS&J	lwclarke@pbsj.com	205-969-3776
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J Sheffield	 GDOT district engineer	jsheffield@dot.ga.gov	229-386-3280



VE PRESENTATION MEETING PARTICIPANTS

Georgia Department of Transportation		March 31,2011	
Project No.: BRSTO-00-0031-01(042) - P.I. No. 432092-			
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Lee/Worth County			
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Derrick Brown	HNTB GDOT-Program Delivery	dbrown@dot.ga.gov	404-631-1571
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