

VALUE ENGINEERING STUDY

I-20 AT SAVANNAH RIVER Richmond County, Georgia

Project # IM000-0020-02(117) PI No. 210327-

Prepared for:



One Georgia Center
600 West Peachtree NW
Atlanta, Georgia 30308

05 May 2011



1200 Abernathy Road, Building 600, Suite 950
Atlanta, Georgia 30328
770-481-1600 Fax 770-481-1640

13 May 2011

Mr. Matt Sanders, AVS
Value Engineering Specialist
GDOT - Engineering Services
One Georgia Center - 5th Floor
600 W. Peachtree Street NW
Atlanta, GA 30308

Re: V.E. Workshop on I-20 at Savannah River Improvements, Richmond County, GA & Aiken County, SC
Project #: IM000-0020-02(117) - PI#: 210327-

Dear Mr. Sanders:

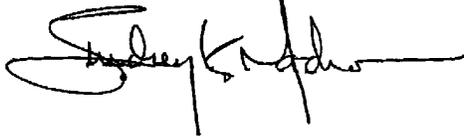
U.S. Cost, Inc. is pleased to submit two (2) hard copies and one (1) CD of the Value Engineering Study Report on the above referenced project. We appreciate the assistance and participation of the GDOT personnel as well as the Hatch Mott MacDonald design team.

This Workshop resulted in the development of seventeen (17) value- enhancing proposals. We hope that incorporation of some of these value improvement alternatives provided herein results in an enhanced project in relation to cost, constructability and long-term performance of the project features.

Please feel free to contact either myself or Tom Orr to discuss any information within this report. We look forward to the next opportunity to be of service to the Georgia Department of Transportation.

Sincerely,

U.S. COST INCORPORATED



Lindsey Gardner, P.E., CVS-Life, FSAVE
V.E. Team Leader

CC: L. Myers, GDOT

VALUE ENGINEERING TEAM STUDY

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VALUE ENGINEERING STUDY

PROJECT DESCRIPTION

This I-20 Savannah River Improvements project involves enhancements to a 1.76-mile corridor of Interstate 20 in both Richmond County, Georgia and Aiken County, South Carolina. The improvements involve lane widening, pavement replacement and replacement of bridges over 2 waterways.

The beginning of the project ties to project IM-20-2(145), at the entrance ramp to the Georgia Welcome Center, which is near construction completion. The proposed typical section (6 travel lanes with a 28' paved median matches that of IM-20-2(145). Moving eastward, the project involves replacement of two bridge sites, the existing Augusta Canal bridges and the existing bridges over Savannah River are to be replaced. The bridges have been maintained by GDOT and are considered to be Georgia structures. Proceeding to the east, the project crosses into the state of South Carolina with the same typical section. The widening stops just west of SC 230/Martintown Road. Minor modifications to ramps at the Georgia Welcome Center and the South Carolina Welcome Center and on the west side of the SC 230/Martintown Road interchange are included.

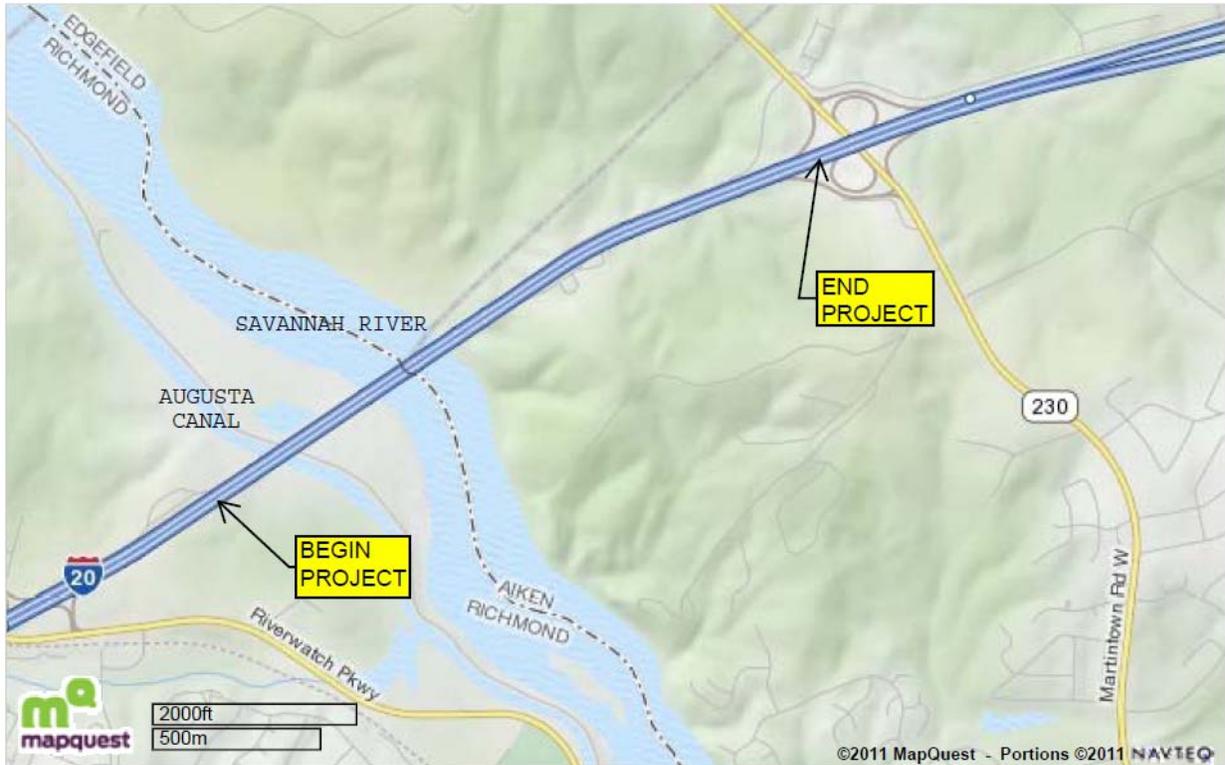
The project will be constructed under a bi-state agreement between Georgia and South Carolina. Project components include:

- Replace 4-lane Georgia section of I-20 with 6 lanes and paved inside and outside shoulders
- Augusta Canal Bridge Replacement
- Savannah River Bridge Replacement
- Replace 4 lane South Carolina section of I-20 with 6 lanes and paved inside and outside shoulders
- Median Barrier (Type "S") along the entire route

VALUE ENGINEERING STUDY

PROJECT MAP

The project begins at the entrance ramp to the Georgia Welcome Center and proceeds to the east for 1.76 miles, crossing into the state of South Carolina, and ending just west of SC 230/Martintown Road.



VALUE ENGINEERING STUDY

KEY INFORMATION/NOTES

Introduction

U.S. Cost conducted the Value Engineering Team Study on I-20 Savannah River Improvements, Richmond County Georgia, and Aiken County, South Carolina. The V.E. study was conducted for four (4) days, 2 – 5 May 2011, at the Georgia Department of Transportation 5th floor Conference Room, in Atlanta, GA. The study team was furnished with the Schematic data dated April 2011. The following individuals were members of the V.E. team:

Name	Firm	Discipline
Lindsey Gardner, P.E., CVS	U.S. Cost, Inc.	VE Team Leader (VETL)
Tom Orr, P.E.	U.S. Cost, Inc.	Assistant VETL
Al Bowman, P.E.	LPA Group, Inc.	Bridge Engineer
Jerry Brooks, P.E.	Kimley-Horn	Roadway Engineer
Lori Kennedy	KEA Group	Construction

Value Engineering Study Process

The four (4) day Value Engineering Study followed the Value Engineering Job Plan as certified by SAVE International as follows:

- Information Phase (Monday)
- Function Analysis Phase (Monday)
- Creative Phase (Monday)
- Evaluation Phase (Tuesday)
- Development Phase (Tuesday - Wednesday)
- Presentation Phase (Thursday AM)

VALUE ENGINEERING STUDY

KEY INFORMATION/NOTES

Information Phase and Site Visit

The V.E. team was first briefed on the project design by Hatch Mott MacDonald and Georgia DOT representatives in a Design Presentation the morning of the first day of the V.E. Study. The briefing included a review of the design requirements and rationale for the selection and arrangement of the major project features. Discussions regarding alternatives considered, adjacent properties/facilities, and project criteria and constraints were also discussed during the design presentation. Project issues that were observed by the team from the design briefing are as follows:

Observations

- Deceleration lane may be too short going into Georgia Welcome Center
- Grade changes will not be a problem
- May add extra lane on Augusta Canal bridge
- Rating of 2020 Level “D” with contract
- Pavement sections and bridges will be reinforced concrete
- Outside shoulder in concrete will be full depth pavement section
- Inside 28’ wide asphalt shoulders with barrier will be full depth as the roadway
- South Carolina funding is in progress
- Savannah River bridge cannot be built by barge (River is too shallow)
- Island is controlled by Augusta Canal Authority and National Park Service
- Extremely difficult to construct bridges between lanes
- 11% of traffic is trucking and requires a wider shoulder

Function Analysis

As a basic part of the V.E. process, the team conducted a Function Analysis session on the I-20 Savannah River Improvements project to identify the needs and goals of the project and facilitate the creative idea session, by addressing functions as opposed to the specific design elements.

The Basic Function of the project is to *Upgrade Corridor*. A strong secondary function is to *Enhance Safety* by replacing the deficient bridges in Richmond County, Georgia & Aiken County, South Carolina. A detailed project function analysis of the characteristics of the project and the project features is presented in Appendix A.

VALUE ENGINEERING STUDY

KEY INFORMATION/NOTES

Project Design Criteria/Constraints

During the meeting, project design criteria and constraints were also identified. The following listing identifies the design criteria with which the project must comply. Constraints are also included for those actions or work requirements which must be included in the project.

Project Criteria and Constraints

- SCDOT & GDOT Design Policies
- FHWA Design Policies
- Environmental Restrictions (EA Requirements)
- NOAA Requirements
- FEMA Requirements
- ROW money is limited
- Potential Wetland problems on Island

Alternative Idea Evaluation Criteria

The session participants identified the characteristics for evaluating the V.E. ideas for which alternatives would be the most acceptable for incorporation in the project. The highest ranked ideas would satisfy several of these criteria. The subjective evaluation criteria for V.E. ideas are as follows:

V.E. Idea Evaluation Criteria

- Reduces Cost
- Reduces Construction Time
- Improves Constructability
- Enhances Driver Expectancy

VALUE ENGINEERING STUDY

KEY INFORMATION/NOTES

Risk Analysis

The group identified the following project risk elements, which may impact the I-20 Savannah River Improvements project. This exercise served as a catalyst for the Creative Phase of the study when several ideas were suggested which would mitigate these project construction risks.

Risk Elements

- Funding Problems
- Impact to Traffic
- Impact to existing bridges during construction
- Construction of bridges in a timely fashion
- High repair cost of bridges before replacement
- Underground unknowns/historic preservation
- NEPA problems
- Traffic control during construction
- Construction delays
- Historic classification of bridges
- Wetlands on Island
- Impact to new bridges during demolition of existing
- Approval to use island for construction
- State protection of vegetation on Island
- Federal protection of vegetation
- Difficult exit (weave) from visitor center (SC)
- May involve National Park Service approval

VALUE ENGINEERING STUDY

KEY INFORMATION/NOTES

Creative Phase

The Creative Phase of the V.E. study was initiated the morning of the second day of the study. A total of twenty four (24) creative ideas were generated for further investigation by the team. Many of the creative ideas focused on reducing lengths of bridges, limiting impacts on adjacent areas, minimization of earthwork, optimizing bridge design components, optimum construction phasing, plus various other design elements of the project. Additional ideas were generated reflecting alternative project components based on an understanding of local construction products and materials and the relative costs of installing them.

A listing of all creative ideas on I-20 Savannah River Improvements project is included in Appendix A.

Evaluation Phase

The ideas generated during the Creative Phase were reviewed and evaluated by the VE session participants during a session held on the afternoon of the first study day and morning of the second day. The intent of the meeting was to allow the participants an opportunity to discuss and evaluate the ideas. A few of the V.E. ideas were dropped at that time as being conceptually unacceptable, or in conflict with previous agreements or agency policies. The ranking system consisted of session participants assigning a 2-phase ranking for acceptability and cost impact to each idea. The Acceptability ranking was based on how each idea improves the value of the project when considered against the evaluation criteria listed previously. Those ideas, which the V.E. Team felt had the most promise, were given a designation of 1-5 on acceptability and 0-5 on cost impact, for a maximum rating of 10 points. This is a time management tool to identify those proposals that have the greatest potential. Approximately seventeen (17) out of the original twenty four (24) creative ideas were deemed promising for further investigation and analysis by the V.E. team.

VALUE ENGINEERING STUDY

KEY INFORMATION/NOTES

The time management ranking system used by the VE team is as follows:

ACCEPTABILITY OF IDEA

- 5 points - Excellent Idea
- 4 points - Good Idea
- 3 points - Fair Idea
- 2 points - Marginal Idea
- 1 point - Do Not Develop

COST IMPACT

- 5 points - > \$ 1,000,000 cost savings
- 4 points - \$750,000 to 999,999 cost savings
- 3 points - \$500,000 to 749,000 cost savings
- 2 points - \$250,000 to 499,000 cost savings
- 1 point - \$0 to 249,000 cost savings
- 0 points – Cost Add

Development Phase

The specific proposals found in the body of this report represent the positive results of investigations by the V.E. team on the I-20 Savannah River Improvements project. Each proposal represents a quality enhancing or cost saving alternative, which is documented by words, drawings and numbers. The proposal format presents the idea, describes the original design element proposed for change and the proposed change, lists the perceived advantages and disadvantages of the proposed change and supports the idea with a detailed cost estimate for the original and proposed design. Where necessary for clarity, the proposal also includes thumbnail design drawings and supporting engineering calculations.

Many of the V.E. proposals require some level of redesign on specific portions of the project to implement the modification. Further, several of the V.E. ideas may involve modifications to the Criteria, or current goals, to the project. These ideas are presented to initiate additional discussion and investigation during the next phase of design.

Presentation Phase

A presentation to GDOT and Hatch Mott & MacDonald representatives was conducted 5 May 2011 at 9AM.

VALUE ENGINEERING STUDY

KEY INFORMATION/NOTES

Basis of V.E. Cost Savings

The cost information for proposals in this report are based on the cost data prepared by the design team, GDOT bid tabs, VE Team member experience, and discussions with vendors/Contractors. Therefore, the savings presented in the proposals is a general order of magnitude (estimate of the potential savings) if the idea were to be accepted. These figures are solely intended to identify the most attractive design solution, and are not prepared to represent a net deduction to the overall project budget. The costs are in 2011 dollars, however they have not been escalated to mid point of construction. A four year contract duration is scheduled.

Sustainable/Green Design Proposals

Sustainable design incorporates energy conservation, increased use of renewable energy sources, the reduction or elimination of toxic and harmful substances in facilities, efficiency in resource and material utilization, recycling of building materials, the use of recycled material, the reduction of waste products during both the construction and operation of the facility, and facility maintenance practices that reduce or eliminate harmful effects on people and the natural environment. In keeping with the National Policy objective of building all new facilities with sustainable design features, the VE team proposed sustainable design elements and/or practices. This V.E. study includes the following proposals that enhance project sustainability:

- B-5.1: Reduces length of bridge and thereby reduces amount of material resources used
- R-2: Allows the use of recycled asphalt concrete for shoulders
- R-7: Allows maximum use of on-site recycled concrete aggregate and reduces truck hauling for project
- R-7: Allows use of recycled concrete for aggregate base
- R-11: Reduces width of road and thereby reduces amount of material resources

Evaluation of Alternatives

When reviewing the value engineering proposals, consider each part of an alternative on its own merit. There may be a tendency to disregard an entire alternative because of a concern about one aspect of it. We encourage partial acceptance of ideas; thus, each aspect of an alternative should be considered for incorporation into the design, even if the entire alternative is not implemented. Variations of these proposed alternatives are encouraged.

Several of these alternatives are either “mutually exclusive” or have overlapping cost savings with other alternatives. These are indicated in the Proposal Summary Table. Items indicated as mutually exclusive indicates that acceptance of one alternative, precludes acceptance of the related proposal. Decision-makers are encouraged to evaluate these alternatives carefully in order to select the combination of alternatives that provide the greatest benefits to the project.

SUMMARY OF VALUE ENGINEERING PROPOSALS

**I-20 AT SAVANNAH RIVER
RICHMOND COUNTY, GEORGIA**

Project # IM000-0020-02(117) PI No. 210327-

IDEA NO.	PROPOSAL DESCRIPTION	CONSTRUCTION SAVINGS	RELATED PROPOSALS
	Note: Brackets mean additional cost		
	BRIDGES (B)		
1.0	Increase span lengths on Augusta Canal Bridge using BT-54 girders (112'-6" spans).	85,228	Mutually exclusive with B-1.1
1.1	Increase span lengths on Augusta Canal Bridge using BT-63 girders (112'-6" spans).	148,124	Mutually exclusive with B-1.0
2.0	Use alternate beam type selection on Savannah River Bridge and reduce number of beams.	26,455	
3.0	For Bridge Construction, build four (4) travel lanes (2 in each direction) to the north with staged construction to eliminate construction in the median.	2,781,027	
4.0	Use caisson foundations in lieu of spread footings/ cofferdams.	2,053,581	
5.0	Use vertical abutments for both bridges in lieu of sloped end paving.	2,230,607	Mutually exclusive with B-5.1
5.1	Shorten bridges with sloped embankments.	5,668,988	Mutually exclusive with B-5.0
7.0	Install high density concrete for all bridge wearing pavement.	(820,022)	
10.0	Set new Augusta Canal Bridge at same top of slab elevation as existing.	117,789	
12.0	Phase construction to allow bridge replacement as separate initial contract.	25,873,043	Cost savings overlap with all Roadway proposals

SUMMARY OF VALUE ENGINEERING PROPOSALS

**I-20 AT SAVANNAH RIVER
RICHMOND COUNTY, GEORGIA**

Project # IM000-0020-02(117) PI No. 210327-

IDEA NO.	PROPOSAL DESCRIPTION	CONSTRUCTION SAVINGS	RELATED PROPOSALS
	Note: Brackets mean additional cost		
	ROADWAY (R)		
1.0	Reduce inside paved shoulder width for the entire project from 12'-10" to 12'-0".	86,958	
2.0	Construct outside paved shoulder with asphalt in lieu of full depth PCC.	975,920	Mutually exclusive with R-8.0
4.0	Change cross slope to drain all lanes to outside in tangent sections in lieu of inside travel lane with cross slope draining to median.	280,562	
7.0	Allow concrete pavement to be crushed and used as aggregate base.	572,360	
8.0	Install roller compacted concrete shoulders in lieu of cast in place concrete.	1,513,000	Mutually exclusive with R-2.0
10.0	Locate eastbound lane drop at the entrance to the South Carolina Visitor Center.	900,000	Cost savings overlap with R-11.0
11.0	Eliminate widening of I-20 in South Carolina.	1,800,000	Cost savings overlap with R-10.0

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-1.0
PAGE NUMBER:	1 of 4

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: INCREASE SPAN LENGTHS ON AUGUSTA CANAL BRIDGE USING BT-54 GIRDERS (112'-6" SPANS)

ORIGINAL DESIGN: The current design of the 450' Augusta Canal Bridge consists of BT-54 prestressed girders spaced at 9'-3" typical with 90' spans (5 spans/6 bents).

PROPOSED CHANGE: It is proposed to utilize a design for the Augusta Canal Bridge of BT-54 prestressed girders spaced at 7'-6" typical with 112'-6" spans (4 spans/5 bents).

JUSTIFICATION: The change in increasing the span lengths of the currently specified BT-54 prestressed girders is justified by reducing the number of substructure units required. This reduces 1 bent at this bridge. This approach provides a structurally sound bridge, with fewer bents in the canal and also provides a cost savings to the project.

ADVANTAGES:

- Increasing spans reduces number of bents
- Shortens construction time.
- Cost reduction.

DISADVANTAGES:

- None apparent.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 1,975,786		\$ 1,975,786
PROPOSED CHANGE:	\$ 1,890,558		\$ 1,890,558
SAVINGS:	\$ 85,228		\$ 85,228

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-1.0
PAGE NUMBER:	2 of 4

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Class AA Concrete	7	CY	1,034	411.72	425,718
Bar Reinforcing Steel	7	Lbs	201,176	0.63	126,741
BT-54 Prestressed Girders	7	LF	6,072	142.24	863,327
Cofferdams	7	EA	28	20,000	560,000
SUBTOTAL – COST TO PRIME					1,975,786
MARKUP					Incl.
TOTAL CONTRACT COST					1,975,786

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Class AA Concrete	7	CY	802	411.72	330,199
Bar Reinforcing Steel	7	Lbs	143,176	.63	90,201
BT-54 Prestressed Girders	7	LF	7,383	142.24	1,050,158
Cofferdams	7	EA	21	20,000	420,000
SUBTOTAL – COST TO PRIME					1,890,558
MARKUP					Incl.
TOTAL CONTRACT COST					1,890,558

Difference [Original-Proposed] **\$85,228**

SOURCES

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ol style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other GDOT Item Mean Summary |
|---|---|

CALCULATIONS

PROPOSAL NUMBER:	B-1.0
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PAGE NUMBER:	3 of 4
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PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Class AA Concrete

Reduce concrete by one intermediate bent. Bent quantity from Bridge 2 estimate, because no breakout provided for Bridge 1 estimate.

Center Bent 103.2 CY

Left Bent 64.5 CY

Right Bent 64.5 CY

Summary= 232.2 CY, say 232.

Original Substructure Concrete 1034 CY

Reduce by 232 CY

New Substructure Concrete = 802 CY

Bar Reinforcing Steel

Use 250 LB/CY

$232 \text{ CY} \times 250 \text{ LB/CY} = 58,000 \text{ LB}$

Original Reinforcing Estimate 201,176 LB

Reduce by 58,000 LB

New Reinforcing steel = 143,176 LB

CALCULATIONS

PROPOSAL NUMBER:	B-1.0
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PAGE NUMBER:	4 of 4
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PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

BT-54 Prestressed Girders

Original Beam lengths 90 ft (span length) – 3.25 ft (bearing distances) = 86.75 ft/beam

New Beam Lengths 112.5 ft (span length) – 3.25 ft (bearing distances) = 109.25 ft/beam

Original design utilized 14 beams at 9'-3" spacing

Proposed design utilizes 17 beams at 7'-6" spacing

Net increase of 3 beam lines x 4 spans x 109.25 ft/span = 1311 LF

Original Beam Estimate = 6072 LF

Additional beams 1311 LF

Proposed Beam Estimate = 6072 + 1311 = 7383 LF

Cofferdams

Original Design = 28 cofferdams/4 intermediate bents OR 7 Cofferdams/Bent

Proposed Design = 3 intermediate bents x 7 Cofferdams/Bent = 21 Cofferdams

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-1.1
PAGE NUMBER:	1 of 4

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: INCREASE SPAN LENGTHS ON AUGUSTA CANAL BRIDGE USING BT-63 GIRDERS (112'-6" SPANS).

ORIGINAL DESIGN: The current design of the 450' Augusta Canal Bridge consists of BT-54 prestressed girders spaced at 9'-3" typical with 90' spans (5 spans/6 bents).

PROPOSED CHANGE: It is proposed to utilize a design for the Augusta Canal Bridge of BT-63 prestressed girders spaced at 9'-3" typical with 112'-6" spans (4 spans/5 bents).

JUSTIFICATION: The change in increasing the type and span lengths of prestressed girders is justified by reducing the number of substructure units required. This reduces 1 bent at this bridge. This approach provides a structurally sound bridge, with fewer bents in the canal and also provides a cost savings to the project.

ADVANTAGES:

- Increasing spans reduces number of bents
- Shortens construction time.
- Cost reduction.

DISADVANTAGES:

- May require slight increase in profile grade required to assure clearance over tow path.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 1,975,786		\$ 1,975,786
PROPOSED CHANGE:	\$ 1,827,662		\$ 1,827,662
SAVINGS:	\$ 148,124		\$ 148,124

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-1.1
PAGE NUMBER:	2 of 4

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Class AA Concrete	1	CY	1,034	411.72	425,718
Bar Reinforcing Steel	1	Lbs	201,176	0.63	126,741
BT-54 Prestressed Girders	1	LF	6,072	142.24	863,327
Cofferdams	1	EA	28	20,000	560,000
SUBTOTAL – COST TO PRIME					1,975,786
MARKUP					Incl.
TOTAL CONTRACT COST					1,975,786

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Class AA Concrete	7	CY	802	411.72	330,199
Bar Reinforcing Steel	7	Lbs	143,176	.63	90,201
BT-63 Prestressed Girders	7	LF	6,118	161.37	987,262
Cofferdams	7	EA	21	20,000	420,000
SUBTOTAL – COST TO PRIME					1,827,662
MARKUP					Incl.
TOTAL CONTRACT COST					1,827,662

Difference [Original-Proposed] **\$148,124**

SOURCES

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other GDOT Item Mean Summary |
|---|---|

CALCULATIONS

PROPOSAL NUMBER:	B-1.1
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PAGE NUMBER:	3 of 4
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PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Class AA Concrete

Reduce concrete by one intermediate bent. Bent quantity from Bridge 2 estimate, because no breakout provided for Bridge 1 estimate.

Center Bent 103.2 CY

Left Bent 64.5 CY

Right Bent 64.5 CY

Summary= 232.2 CY, say 232.

Original Substructure Concrete 1034 CY

Reduce by 232 CY

New Substructure Concrete = 802 CY

Bar Reinforcing Steel

Use 250 LB/CY

$232 \text{ CY} \times 250 \text{ LB/CY} = 58,000 \text{ LB}$

Original Reinforcing Estimate 201,176 LB

Reduce by 58,000 LB

New Reinforcing steel = 143,176 LB

CALCULATIONS

PROPOSAL NUMBER:	B-1.1
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PAGE NUMBER:	4 of 4
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PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

BT-63 Prestressed Girders

Original Beam lengths 90 ft (span length) – 3.25 ft (bearing distances) = 86.75 ft/beam

New Beam Lengths 112.5 ft (span length) – 3.25 ft (bearing distances) = 109.25 ft/beam

Original design utilized 14 beams at 9'-3" spacing

Proposed design utilizes 14 beams at 9'-3" spacing

Proposed Beam Estimate = 14 beams/span x 4 spans x 109.25 LF/beam = 6118 LF

Cofferdams

Original Design = 28 cofferdams/4 intermediate bents OR 7 Cofferdams/Bent

Proposed Design = 3 intermediate bents x 7 Cofferdams/Bent = 21 Cofferdams

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-2.0
PAGE NUMBER:	1 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: USE ALTERNATE BEAM TYPE SELECTION ON SAVANNAH RIVER BRIDGE AND REDUCE NUMBER OF BEAMS.

ORIGINAL DESIGN: The current design of the 1,540' Savannah River Bridge consists of BT-74 prestressed girders spaced at 9'-3" typical with 140' spans (11 spans/12 bents).

PROPOSED CHANGE: It is proposed to utilize a design for the Savannah River Bridge of FBT-78 prestressed girders spaced at 9'-10" typical with 140'-0" spans (11 spans/12 bents).

JUSTIFICATION: The change in the type of prestressed girder is justified by reducing the number of beam lines required. This reduces 1 beam line at this bridge. This alternative provides a structurally sound bridge at a cost savings to the project.

ADVANTAGES:

- Saves costs by reducing amount of superstructure elements to construct.

DISADVANTAGES:

- None apparent.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 3,585,465		\$ 3,585,465
PROPOSED CHANGE:	\$ 3,559,010		\$ 3,559,010
SAVINGS:	\$ 26,455		\$ 26,455

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-2.0
PAGE NUMBER:	2 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER
PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
BT-74 Prestressed Girders	1	LF	21,060	170.25	3,585,465
SUBTOTAL – COST TO PRIME					3,585,465
MARKUP					Incl.
TOTAL CONTRACT COST					3,585,465

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
FBT-78 Prestressed Girders	7	LF	19,555	182.00	3,559,010
SUBTOTAL – COST TO PRIME					3,559,010
MARKUP					Incl.
TOTAL CONTRACT COST					3,559,010

Difference [Original-Proposed] **\$26,455**

SOURCES

- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other GDOT Item Mean Summary |
|---|---|

CALCULATIONS

PROPOSAL NUMBER:	B-2.0
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PAGE NUMBER:	3 of 3
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PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

FBT-78 Prestressed Girders

Original Beam lengths 140 ft (span length) – 3.25 ft (bearing distances) = 136.75 ft/beam

New Beam Lengths (same as original)

Original design utilized 14 beams at 9'-3" spacing

Proposed design utilizes 13 beams at 9'-10" spacing

Original Beam Estimate = 136.75 LF/beam x 14 beams/span x 11 spans = 21,060 LF

Proposed Beam Estimate = 136.75 LF/beam x 13 beams/span x 11 spans = 19,555 LF

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-3.0
PAGE NUMBER:	1 of 4

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: FOR BRIDGE CONSTRUCTION, BUILD 4 TRAVEL LANES (2 IN EACH DIRECTION) TO THE NORTH WITH STAGED CONSTRUCTION TO ELIMINATE CONSTRUCTION IN THE MEDIAN.

ORIGINAL DESIGN: Bridge replacements propose staged construction widening in the median to accomplish construction in two stages. Stage One will build center of new bridges in between 56-foot existing medians, while maintaining traffic on existing bridges. Stage Two will move traffic to center of new bridges and demolish existing bridges and widen accordingly to each side and shift traffic again to final location.

PROPOSED CHANGE: Recommend replacing bridges with staged construction by building first half to centerline of the proposed bridges (2-travel lanes in each direction) to the north in Stage One. Stage Two would demolish the existing bridges, widen the new bridges and shift traffic to final location.

JUSTIFICATION: Proposed change would reduce the number of traffic shifts by one and simplify construction staging. Construction of the bridges outside of the existing structures would be easier than constructing between the 2 existing bridges.

ADVANTAGES:

- Traffic shifts reduced to one.
- Cost savings in traffic control, and staging of construction.
- Do not have to build substructure (cofferdams, etc.) under existing bridge superstructure.

DISADVANTAGES:

- Potential R/W impacts, but not anticipated

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 21,677,027		\$ 21,677,027
PROPOSED CHANGE:	\$ 18,896,000		\$ 18,896,000
SAVINGS:	\$ 2,781,027		\$ 2,781,027

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-3.0
PAGE NUMBER:	2 of 4

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Full Bridge Replacement Cost – Augusta Canal Bridge (\$90/sq ft)	1	LS	1	\$5,584,041	5,584,041
Full Bridge Replacement Cost – Savannah River Bridge (\$90/sq ft)	1	LS	1	\$15,514,986	15,514,986
Contract savings based on time – 6 months @ \$2,100/day	7	day	180	\$2,100	378,000
Traffic Shifts (2)	4	LS	2	\$100,000	200,000
SUBTOTAL – COST TO PRIME					21,677,027
MARKUP					Incl.
TOTAL CONTRACT COST					21,677,027

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Full Bridge Replacement Cost – Augusta Canal Bridge (\$80/sq ft)	1	LS	1	\$4,572,000	4,572,000
Full Bridge Replacement Cost – Savannah River Bridge (\$80/sq ft)	1	LS	1	\$14,224,000	14,224,000
Traffic Shift (1)	4	LS	1	\$100,000	100,000
SUBTOTAL – COST TO PRIME					18,896,000
MARKUP					Incl.
TOTAL CONTRACT COST					18,896,000

Difference [Original-Proposed] **\$2,781,027**

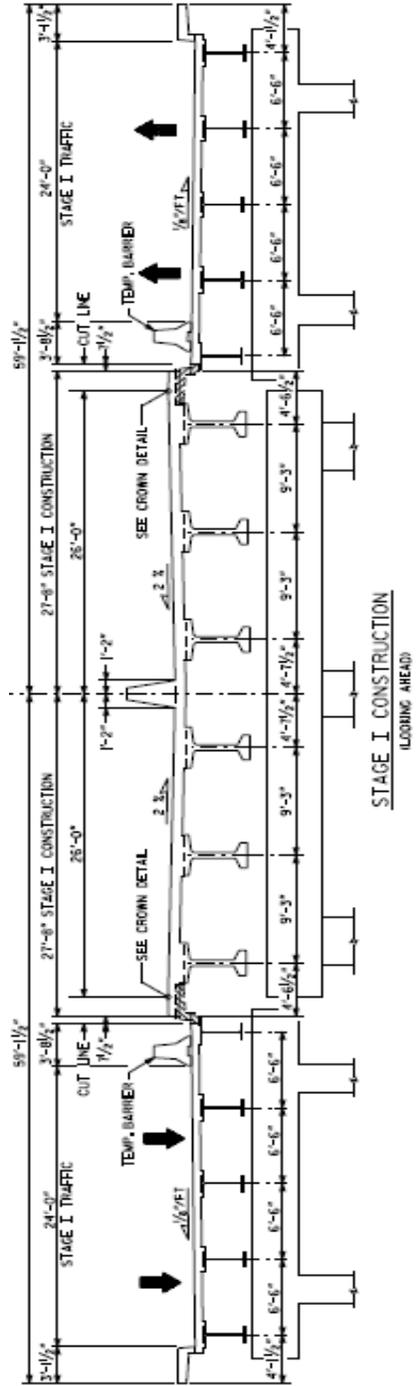
SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

SKETCH/DETAIL

PROPOSAL NUMBER:	B-3.0
PAGE NUMBER:	3 of 4

Proposed Change: build initial structure to North (outside existing bridges) for 4 lanes of traffic, shift traffic to new bridge, demolish existing bridges and widen new structure.



Current Design

CALCULATIONS

PROPOSAL NUMBER:	B-3.0
PAGE NUMBER:	4 of 4

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Proposed Bridges with Widening to the Median:

Augusta Canal – 450 ft x 127 ft = 57,150 square feet

Savannah River – 1400 ft x 127 ft = 177,800 square feet

57,150 sq ft + 177,800 sq ft = 234,950 square feet

Proposed Total Cost of Bridge Replacements in Full - \$21,099,027/234,950 sq ft = \$90/sq ft

Assuming Widening to the North would be less expensive: \$80/sq ft

Cost Savings Widening to the North:

\$80/sq ft x 234,950 square feet = \$18,796,000

\$80/sq ft x 57,150 square feet = \$4,572,000

\$80/sq ft x 177,800 square feet = \$14,224,000

\$21,099,027 - \$18,796,000 = **\$2,303,027 savings**

Time Savings to Construct:

Assume construction to the north will save 6 months construction time.

Assume value based on liquidated damages of \$2,100/day.

Cost Savings (user cost) – 30 days/month x 6 months x \$2,100/day = \$378,000 savings

Traffic Shifts:

Assume \$100,000 for one traffic shift.

Cost Savings for only One (1) Traffic Shift = \$100,000 savings

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-4.0
PAGE NUMBER:	1 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: USE CAISSON FOUNDATIONS IN LIEU OF SPREAD FOOTINGS/COFFERDAMS.

ORIGINAL DESIGN: The current design requires Cofferdams in order to construct the bridge foundations in water.

PROPOSED CHANGE: The proposed recommendation is to use Caisson foundations in lieu of Spread Footings/Cofferdams for the new bridges.

JUSTIFICATION: The use of caisson foundations would simplify construction and reduce the time required for construction. The simplified construction approach and reduced construction schedule will result in a reduction in construction costs. This alternative is a common approach and provides significant cost savings.

ADVANTAGES:

- Faster construction.
- Significant cost savings

DISADVANTAGES:

- Special equipment required

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 2,575,581		\$ 2,575,581
PROPOSED CHANGE:	\$ 522,000		\$ 522,000
SAVINGS:	\$ 2,053,581		\$ 2,053,581

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-4.0
PAGE NUMBER:	2 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER
PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Augusta Canal Bridge Cofferdam	1	EA	1	560,000	560,000
Savannah River Bridge Cofferdam	1	EA	1	1,548,000	1,548,000
Augusta Canal Seal Concrete	1	CY	486	195.00	94,770
Savannah River Seal Concrete	1	CY	1256	195.00	244,920
Augusta Canal Bridge Excavation	1	CY	1176	29.55	34,750
Savannah River Bridge Excavation	1	CY	3152	29.55	93,141
SUBTOTAL – COST TO PRIME					2,575,581
MARKUP					Incl.
TOTAL CONTRACT COST					2,575,581

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Augusta Canal Bridge Caissons	7	LF	476	750.00	357,000
Savannah River Bridge Caissons	7	EA	220	750.00	165,000
SUBTOTAL – COST TO PRIME					522,000
MARKUP					Incl.
TOTAL CONTRACT COST					522,000

Difference [Original-Proposed] **\$2,053,581**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

CALCULATIONS

PROPOSAL NUMBER:	B-4.0
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PAGE NUMBER:	3 of 3
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PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Caissons for Canal Bridge

Per original BFI, average bottom of foundation = approximately elev. 133.00

Per original BFI, average ground elevation = approximately elev. 150.00

Caisson length = ground elev. – bottom elev.

Caisson length = 150 – 133 = 17 ft.

Total Length of Caisson = 17 ft x 28 columns = 476 LF

Caissons for Savannah River Bridge

Per original BFI, average bottom of foundation = approximately elev. 128.00

Per original BFI, average ground elevation = approximately elev. 131.00

Caisson length = ground elev. – bottom elev.

Caisson length = 131 – 128 = 3 ft.; however use 5 ft minimum embedment.

Total Length of Caisson = 5 ft x 44 columns = 220 LF.

Estimate cost of 5 ft diameter Caisson constructed in water with permanent casing \$750/LF (FDOT)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-5.0
PAGE NUMBER:	1 of 6

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: USE VERTICAL ABUTMENTS FOR BOTH BRIDGES IN LIEU OF SLOPED END PAVING.

ORIGINAL DESIGN: The current design of the replacement bridges includes sloped end embankments with slope paving or rip rap.

PROPOSED CHANGE: It is proposed to utilize vertical bridge abutments for both bridges.

JUSTIFICATION: This recommendation provides a cost savings to construct as well as a savings in maintenance costs. This alternative is a common feature on many bridge structures in Georgia and would result in a significant cost savings to the project.

ADVANTAGE:

- Initial construction cost savings
- Ongoing maintenance savings.

DISADVANTAGES:

- Global stability must be checked. Shortening of bridges needs verification by hydraulic engineer. Future widening of bridges could be challenging.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 2,840,207		\$ 2,840,207
PROPOSED CHANGE:	\$ 609,600		\$ 609,600
SAVINGS:	\$ 2,230,607		\$ 2,230,607

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: B-5.0

PAGE NUMBER: 2 of 6

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
208-0100 Augusta Canal East Abutment (In Place Embankment)	1	CY	2,024	\$5.52	\$11,173
208-0100 Augusta Canal West Abutment (In Place Embankment)	1	CY	1,747	\$5.52	\$9,643
208-100 Savannah River East Abutment (In Place Embankment)	1	CY	10,893	\$5.52	\$60,129
208-100 Savannah River West Abutment (In Place Embankment)	1	CY	2,059	\$5.52	\$11,366
603-2024 Augusta Canal East Abutment (Rip Rap)	1	SY	768	\$52.77	\$40,527
603-2024 Augusta Canal West Abutment (Rip Rap)	1	SY	631	\$52.77	\$33,299
603-2024 Savannah River East Abutment (Rip Rap)	1	SY	1,511	\$52.77	\$79,735
603-2024 Savannah River West Abutment (Rip Rap)	1	SY	1,511	\$52.77	\$79,735
Augusta Canal East Abutment – Bridge Savings	7	LS	1	\$571,500	\$571,500
August Canal West Abutment – Bridge Savings	7	LS	1	\$434,340	\$434,340
Savannah River East Abutment – Bridge Savings	7	LS	1	\$1,051,560	\$1,051,560
Savannah River West Abutment – Bridge Savings	7	LS	1	\$457,200	\$457,200
SUBTOTAL – COST TO PRIME					2,840,207
MARKUP					Incl.
TOTAL CONTRACT COST					2,840,207

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-5.0
PAGE NUMBER:	3 of 6

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Cost of Vertical Wall – Augusta Canal East Abutment	7	LS	1	\$95,250	\$95,250
Cost of Vertical Wall – Augusta Canal West Abutment	7	LS	1	\$95,250	\$95,250
Cost of Vertical Wall – Savannah River East Abutment	7	LS	1	\$292,100	\$292,100
Cost of Vertical Wall – Savannah River West Abutment	7	LS	1	\$127,000	\$127,000
SUBTOTAL – COST TO PRIME					609,600
MARKUP					Incl.
TOTAL CONTRACT COST					609,600

Difference [Original-Proposed] **\$2,230,607**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

CALCULATIONS

PROPOSAL NUMBER:

B-5.0

4 of 6

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Augusta Canal East Abutment (In Place Embankment):

End Embankment -

$$17 \text{ ft} \times 50 \text{ ft} = 850 \text{ sq ft}/2 = 425 \text{ sq ft}$$

$$425 \text{ sq ft} \times 127 \text{ ft} = 53,975 \text{ cu ft}$$

$$53,975 \text{ cu ft}/27 = \underline{1,999.07 \text{ cy}}$$

Side Embankment -

$$7.5 \text{ ft} \times 15 \text{ ft} = 112.50 \text{ sq ft}/2 = 56.25 \text{ sq ft}$$

$$56.25 \text{ sq ft} \times 6 \text{ ft} = 337.50 \text{ cu ft}$$

$$337.50 \text{ cu ft}/27 = 12.5 \text{ cy} \times 2 \text{ sides} = \underline{25 \text{ cy}}$$

Total Embankment - **2,024 cy**

Augusta Canal West Abutment (In Place Embankment):

End Embankment -

$$19 \text{ ft} \times 38 \text{ ft} = 722 \text{ sq ft}/2 = 361 \text{ sq ft}$$

$$361 \text{ sq ft} \times 127 \text{ ft} = 45,847 \text{ cu ft}$$

$$45,847 \text{ cu ft}/27 = \underline{1,698.04 \text{ cy}}$$

Side Embankment -

$$10.5 \text{ ft} \times 21 \text{ ft} = 220.50 \text{ sq ft}/2 = 110.25 \text{ sq ft}$$

$$110.25 \text{ sq ft} \times 6 \text{ ft} = 661.50 \text{ cu ft}$$

$$661.50 \text{ cu ft}/27 = 24.50 \text{ cy} \times 2 \text{ sides} = \underline{49 \text{ cy}}$$

Total Embankment - **1,747 cy**

Savannah River East Abutment (In Place Embankment):

End Embankment -

$$46 \text{ ft} \times 92 \text{ ft} = 4,232 \text{ sq ft}/2 = 2,116 \text{ sq ft}$$

$$2,116 \text{ sq ft} \times 127 \text{ ft} = 268,732 \text{ cu ft}$$

$$268,732 \text{ cu ft}/27 = \underline{9,953.04 \text{ cy}}$$

Side Embankment -

$$46 \text{ ft} \times 92 \text{ ft} = 4,232 \text{ sq ft}/2 = 2,116 \text{ sq ft}$$

$$2,116 \text{ sq ft} \times 6 \text{ ft} = 12,696 \text{ cu ft}$$

$$12,696 \text{ cu ft}/27 = 470.22 \text{ cy} \times 2 \text{ sides} = \underline{940.44 \text{ cy}}$$

Total Embankment - **10,893 cy**

CALCULATIONS

PROPOSAL NUMBER:

B-5.0

5 of 6

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Savannah River West Abutment (In Place Embankment):

End Embankment –

$$20 \text{ ft} \times 40 \text{ ft} = 800 \text{ sq ft} / 2 = 400 \text{ sq ft}$$

$$400 \text{ sq ft} \times 127 \text{ ft} = 50,800 \text{ cu ft}$$

$$50,800 \text{ cu ft} / 27 = \underline{1,881.48 \text{ cy}}$$

Side Embankment -

$$20 \text{ ft} \times 40 \text{ ft} = 800 \text{ sq ft} / 2 = 400 \text{ sq ft}$$

$$400 \text{ sq ft} \times 6 \text{ ft} = 2,400 \text{ cu ft}$$

$$2,400 \text{ cu ft} / 27 = 88.89 \text{ cy} \times 2 \text{ sides} = \underline{177.78 \text{ cy}}$$

Total Embankment – **2,059 cy**

Augusta Canal East Abutment (Rip Rap):

End Embankment –

$$52.81 \text{ ft} \times 127 \text{ ft} = 6,706.87 \text{ sq ft} / 9 = \underline{745.21 \text{ sy}}$$

Side Embankment -

$$16.77 \text{ ft} \times 6 \text{ ft} = 100.62 \text{ sq ft} / 9 = 11.18 \text{ sy} \times 2 \text{ sides} = \underline{22.36 \text{ sy}}$$

Total Slope Paving – **768 sy**

Augusta Canal West Abutment (Rip Rap):

End Embankment –

$$42.49 \text{ ft} \times 127 \text{ ft} = 5,396.23 \text{ sq ft} / 9 = \underline{599.58 \text{ sy}}$$

Side Embankment -

$$23.48 \text{ ft} \times 6 \text{ ft} = 140.88 \text{ sq ft} / 9 = 15.65 \text{ sy} \times 2 \text{ sides} = \underline{31.31 \text{ sy}}$$

Total Slope Paving – **631 sy**

Savannah River East Abutment (Rip Rap):

End Embankment –

$$102.86 \text{ ft} \times 127 \text{ ft} = 13,063.22 \text{ sq ft} / 9 = \underline{1,451.47 \text{ sy}}$$

Side Embankment –

$$44.72 \text{ ft} \times 6 \text{ ft} = 268.32 \text{ sq ft} / 9 = 29.81 \text{ sy} \times 2 \text{ sides} = \underline{59.63 \text{ sy}}$$

Total Slope Paving – **1,511 sy**

Savannah River West Abutment (Rip Rap):

End Embankment –

$$102.86 \text{ ft} \times 127 \text{ ft} = 13,063.22 \text{ sq ft} / 9 = \underline{1,451.47 \text{ sy}}$$

Side Embankment –

$$44.72 \text{ ft} \times 6 \text{ ft} = 268.32 \text{ sq ft} / 9 = 29.81 \text{ sy} \times 2 \text{ sides} = \underline{59.63 \text{ sy}}$$

Total Slope Paving – **1,511 sy**

CALCULATIONS

PROPOSAL NUMBER:

B-5.0

6 of 6

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Augusta Canal East Abutment – Bridge Savings

50 ft x 127 ft = 6,350 sq ft x \$90/sq ft = **\$571,500**

August Canal West Abutment – Bridge Savings

38 ft x 127 ft = 4,826 sq ft x \$90/sq ft = **\$434,340**

Savannah River East Abutment – Bridge Savings

92 ft x 127 ft = 11,684 sq ft x \$90/sq ft = **\$1,051,560**

Savannah River West Abutment – Bridge Savings

40 ft x 127 ft = 5,080 sq ft x \$90/sq ft = **\$457,200**

Cost of Vertical Wall – Augusta Canal East Abutment

15 ft x 127 ft = 1,905 sq ft x \$50/sq ft = **\$95,250**

Cost of Vertical Wall – Augusta Canal West Abutment

15 ft x 127 ft = 1,905 sq ft x \$50/sq ft = **\$95,250**

Cost of Vertical Wall – Savannah River East Abutment

46 ft x 127 ft = 5,842 sq ft x \$50/sq ft = **\$292,100**

Cost of Vertical Wall – Savannah River West Abutment

20 ft x 127 ft = 2,540 sq ft x \$50/sq ft = **\$127,000**

CALCULATIONS

PROPOSAL NUMBER:

B-5.0

4 of 6

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Augusta Canal East Abutment (In Place Embankment):

End Embankment -

$$17 \text{ ft} \times 50 \text{ ft} = 850 \text{ sq ft}/2 = 425 \text{ sq ft}$$

$$425 \text{ sq ft} \times 127 \text{ ft} = 53,975 \text{ cu ft}$$

$$53,975 \text{ cu ft}/27 = \underline{1,999.07 \text{ cy}}$$

Side Embankment -

$$7.5 \text{ ft} \times 15 \text{ ft} = 112.50 \text{ sq ft}/2 = 56.25 \text{ sq ft}$$

$$56.25 \text{ sq ft} \times 6 \text{ ft} = 337.50 \text{ cu ft}$$

$$337.50 \text{ cu ft}/27 = 12.5 \text{ cy} \times 2 \text{ sides} = \underline{25 \text{ cy}}$$

Total Embankment - **2,024 cy**

Augusta Canal West Abutment (In Place Embankment):

End Embankment -

$$19 \text{ ft} \times 38 \text{ ft} = 722 \text{ sq ft}/2 = 361 \text{ sq ft}$$

$$361 \text{ sq ft} \times 127 \text{ ft} = 45,847 \text{ cu ft}$$

$$45,847 \text{ cu ft}/27 = \underline{1,698.04 \text{ cy}}$$

Side Embankment -

$$10.5 \text{ ft} \times 21 \text{ ft} = 220.50 \text{ sq ft}/2 = 110.25 \text{ sq ft}$$

$$110.25 \text{ sq ft} \times 6 \text{ ft} = 661.50 \text{ cu ft}$$

$$661.50 \text{ cu ft}/27 = 24.50 \text{ cy} \times 2 \text{ sides} = \underline{49 \text{ cy}}$$

Total Embankment - **1,747 cy**

Savannah River East Abutment (In Place Embankment):

End Embankment -

$$46 \text{ ft} \times 92 \text{ ft} = 4,232 \text{ sq ft}/2 = 2,116 \text{ sq ft}$$

$$2,116 \text{ sq ft} \times 127 \text{ ft} = 268,732 \text{ cu ft}$$

$$268,732 \text{ cu ft}/27 = \underline{9,953.04 \text{ cy}}$$

Side Embankment -

$$46 \text{ ft} \times 92 \text{ ft} = 4,232 \text{ sq ft}/2 = 2,116 \text{ sq ft}$$

$$2,116 \text{ sq ft} \times 6 \text{ ft} = 12,696 \text{ cu ft}$$

$$12,696 \text{ cu ft}/27 = 470.22 \text{ cy} \times 2 \text{ sides} = \underline{940.44 \text{ cy}}$$

Total Embankment - **10,893 cy**

CALCULATIONS

PROPOSAL NUMBER:

B-5.0

5 of 6

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Savannah River West Abutment (In Place Embankment):

End Embankment –

$$20 \text{ ft} \times 40 \text{ ft} = 800 \text{ sq ft} / 2 = 400 \text{ sq ft}$$

$$400 \text{ sq ft} \times 127 \text{ ft} = 50,800 \text{ cu ft}$$

$$50,800 \text{ cu ft} / 27 = \underline{1,881.48 \text{ cy}}$$

Side Embankment -

$$20 \text{ ft} \times 40 \text{ ft} = 800 \text{ sq ft} / 2 = 400 \text{ sq ft}$$

$$400 \text{ sq ft} \times 6 \text{ ft} = 2,400 \text{ cu ft}$$

$$2,400 \text{ cu ft} / 27 = 88.89 \text{ cy} \times 2 \text{ sides} = \underline{177.78 \text{ cy}}$$

Total Embankment – **2,059 cy**

Augusta Canal East Abutment (Slope Paving):

End Embankment –

$$52.81 \text{ ft} \times 127 \text{ ft} = 6,706.87 \text{ sq ft} / 9 = \underline{745.21 \text{ sy}}$$

Side Embankment -

$$16.77 \text{ ft} \times 6 \text{ ft} = 100.62 \text{ sq ft} / 9 = 11.18 \text{ sy} \times 2 \text{ sides} = \underline{22.36 \text{ sy}}$$

Total Slope Paving – **768 sy**

Augusta Canal West Abutment (Slope Paving):

End Embankment –

$$42.49 \text{ ft} \times 127 \text{ ft} = 5,396.23 \text{ sq ft} / 9 = \underline{599.58 \text{ sy}}$$

Side Embankment -

$$23.48 \text{ ft} \times 6 \text{ ft} = 140.88 \text{ sq ft} / 9 = 15.65 \text{ sy} \times 2 \text{ sides} = \underline{31.31 \text{ sy}}$$

Total Slope Paving – **631 sy**

Savannah River East Abutment (Slope Paving):

End Embankment –

$$102.86 \text{ ft} \times 127 \text{ ft} = 13,063.22 \text{ sq ft} / 9 = \underline{1,451.47 \text{ sy}}$$

Side Embankment –

$$44.72 \text{ ft} \times 6 \text{ ft} = 268.32 \text{ sq ft} / 9 = 29.81 \text{ sy} \times 2 \text{ sides} = \underline{59.63 \text{ sy}}$$

Total Slope Paving – **1,511 sy**

Savannah River West Abutment (Slope Paving):

End Embankment –

$$102.86 \text{ ft} \times 127 \text{ ft} = 13,063.22 \text{ sq ft} / 9 = \underline{1,451.47 \text{ sy}}$$

Side Embankment –

$$44.72 \text{ ft} \times 6 \text{ ft} = 268.32 \text{ sq ft} / 9 = 29.81 \text{ sy} \times 2 \text{ sides} = \underline{59.63 \text{ sy}}$$

Total Slope Paving – **1,511 sy**

CALCULATIONS

PROPOSAL NUMBER:

B-5.0

6 of 6

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Augusta Canal East Abutment – Bridge Savings

50 ft x 127 ft = 6,350 sq ft x \$90/sq ft = **\$571,500**

August Canal West Abutment – Bridge Savings

38 ft x 127 ft = 4,826 sq ft x \$90/sq ft = **\$434,340**

Savannah River East Abutment – Bridge Savings

92 ft x 127 ft = 11,684 sq ft x \$90/sq ft = **\$1,051,560**

Savannah River West Abutment – Bridge Savings

40 ft x 127 ft = 5,080 sq ft x \$90/sq ft = **\$457,200**

Cost of Vertical Wall – Augusta Canal East Abutment

15 ft x 127 ft = 1,905 sq ft x \$50/sq ft = **\$95,250**

Cost of Vertical Wall – Augusta Canal West Abutment

15 ft x 127 ft = 1,905 sq ft x \$50/sq ft = **\$95,250**

Cost of Vertical Wall – Savannah River East Abutment

46 ft x 127 ft = 5,842 sq ft x \$50/sq ft = **\$292,100**

Cost of Vertical Wall – Savannah River West Abutment

20 ft x 127 ft = 2,540 sq ft x \$50/sq ft = **\$127,000**

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-5.1
PAGE NUMBER:	1 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: SHORTEN BRIDGES WITH SLOPED EMBANKMENTS.

ORIGINAL DESIGN: The current design proposes the Augusta Canal bridge to be 450 ft in length, an increase over the existing bridge by 40 ft. The proposed Savannah River Bridge is 1540 ft in length, an increase over the existing bridge by 330 ft.

PROPOSED CHANGE: The proposed recommendation is to use the minimum bridge length required, which is 375 feet for the Augusta Canal and 1,120 feet for the Savannah River Bridges (see calculations for the determination of minimum bridge length).

JUSTIFICATION: The use of sloped embankments are a commonly used approach and provide significant savings in initial construction cost and reduced time to construct the project.

ADVANTAGES:

- Lower cost
- Reduced construction time.

DISADVANTAGES:

- None apparent, subject to hydraulic requirements.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 842,000		\$ 842,000
PROPOSED CHANGE:	\$ (5,668,988)		\$ (5,668,988)
SAVINGS:	\$ 4,826,988		\$ 4,826,988

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-5.1
PAGE NUMBER:	2 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
PCC Pavement	1	SY	7,000	107.00	749,000
Fill	1	CY	16,723	5.52	93,000
SUBTOTAL – COST TO PRIME					842,000
MARKUP					Incl.
TOTAL CONTRACT COST					842,000

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Shorten Augusta Canal Bridge	7	SF	9543.75	90.00	(858,938)
Shorten Savannah River Bridge	7	SF	53445	90.00	(4,810,050)
SUBTOTAL – COST TO PRIME					(5,668,988)
MARKUP					Incl.
TOTAL CONTRACT COST					(5,668,988)

Difference [Original-Proposed] **\$4,826,988**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Internal Estimate |
|---|--|

CALCULATIONS

PROPOSAL NUMBER:	B-5.1
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PAGE NUMBER:	3 of 3
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PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Minimum Length for Canal Bridge

By setting the toe of slopes at the required minimum 10 ft back from the edge of bank on the West side and at the edge of tow path for the East side the apparent minimum bridge length is about 375 ft, 75 ft shorter than the current design. Ultimately, the bridge opening will be determined through hydraulic requirements, but since no hydraulic information was provided to the VE team, we must assume this minimum length is valid.

Proposed reduction of bridge area, $127.25 \text{ ft} \times 75 \text{ ft} = 9,543.75 \text{ SF}$

Minimum Length for Savannah River Bridge

By setting the toe of slopes at the required minimum 10 ft back from the edge of bank on both sides the apparent minimum bridge length is about 1120 ft, 420 ft shorter than the current design. Ultimately, the bridge opening will be determined through hydraulic requirements, but since no hydraulic information was provided to the VE team, we must assume this minimum length is valid.

Proposed reduction of bridge area, $127.25 \text{ ft} \times 420 \text{ ft} = 53,445 \text{ SF}$

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-7.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: INSTALL HIGH DENSITY CONCRETE FOR ALL BRIDGE WEARING PAVEMENT.

ORIGINAL DESIGN: The current bridge concrete slab is approximately eight inches (8”) thick of Class “AA” concrete. (3500 psi)

PROPOSED CHANGE: The proposed recommendation for the bridge deck concrete pavement is to install high density concrete: aggregate and cement; have the same specific gravity of ± 2.85 . Long lasting, denser, stronger and prevents spalls. Has been used successfully in the Midwest. Normally, the cost for high density concrete is an additional 15% for the stone.

JUSTIFICATION: This additional cost is justified for the Augusta Canal and Savannah bridge replacements. The proposed recommendation will extend the life of the bridge deck and reduce repair and rehabilitation costs.

Note: Quantities from GDOT estimate may be high; if so the delta for added cost will be reduced.

ADVANTAGES:

- More durable
- Longer life and lower overall LCC
- Georgia has lots of quarries with excellent stone and availability

DISADVANTAGES:

- Requires GDOT to identify a quarry with aggregate with a specific gravity of 2.85
- Slightly higher initial cost can be justified by longer life.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 5,407,498		\$ 5,407,498
PROPOSED CHANGE:	\$ 6,227,520		\$ 6,227,520
SAVINGS:	\$ (820,022)	Lower LCC	\$ (820,022)

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-7.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Superstructure AA concrete – Augusta Canal Bridge	1	LS	1581	833.50	1,318,014
Superstructure AA concrete – Savannah River Bridge	1	LS	4906	833.50	4,089,484
SUBTOTAL – COST TO PRIME					5,407,498
MARKUP					Incl.
TOTAL CONTRACT COST					5,407,498

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Superstructure AA concrete – Augusta Canal Bridge	1	LS	1581	960.00	1,517,760
Superstructure AA concrete – Savannah River Bridge	1	LS	4906	960.00	4,709,760
SUBTOTAL – COST TO PRIME					6,227,520
MARKUP					Incl.
TOTAL CONTRACT COST					6,227,520

Difference [Original-Proposed] **(\$820,022)**

SOURCES

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ol style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-10.0
PAGE NUMBER:	1 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: SET NEW AUGUSTA CANAL BRIDGE AT SAME TOP OF SLAB ELEVATION AS EXISTING.

ORIGINAL DESIGN: In the current design approach, the deck elevation of the proposed Augusta Canal bridge is approximately 9 inches higher than the existing bridges because of the proposed increased depth of beams and the desire to maintain the existing vertical clearance over the Tow Path along the eastern side of the Augusta Canal.

PROPOSED CHANGE: AASHTO's 1999 Guide for the Development of Bicycle Facilities states the vertical clearance to obstructions should be a minimum of 8-feet. With the acceptance by the Augusta Canal Authority, it is recommended that the proposed bridge over the Augusta Canal and Tow Path be set at the same top of slab elevation as the existing bridge slab elevations; current photos indicate adequate vertical clearance to accomplish this.

JUSTIFICATION: This change results in a clearance under the bridge that is still adequate, while providing a savings in cost and construction time.

ADVANTAGES:

- Less fill material needed to transition to existing profiles on either end of bridge.
- Asphalt not needed to transition traffic to median once center of bridge built.

DISADVANTAGES:

- Less clearance under bridge, but still adequate

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 117,789		\$ 117,789
PROPOSED CHANGE:	\$ 0		\$ 0
SAVINGS:	\$ 117,789		\$ 117,789

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-10.0
PAGE NUMBER:	2 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER
PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
208-0100 - In Place Embankment – East of Augusta Canal	1	CY	141.20	\$5.52	\$779.42
402-1811 – Recycles Asphalt Concrete Leveling for Traffic Shift to Median	4	TN	1037.00	\$66.06	\$68,504
208-0100 - In Place Embankment – West of Augusta Canal	1	CY	98.84	\$5.52	\$545.61
402-1811 – Recycles Asphalt Concrete Leveling for Traffic Shift to Median	4	TN	726.00	\$66.06	\$47,960
SUBTOTAL – COST TO PRIME					117,789
MARKUP					Incl.
TOTAL CONTRACT COST					117,789

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
SUBTOTAL – COST TO PRIME					
MARKUP					
TOTAL CONTRACT COST					

Difference [Original-Proposed] **\$117,789**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

CALCULATIONS

PROPOSAL NUMBER:	B-10.0
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PAGE NUMBER:	3 of 3
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PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Embankment Fill East of Canal:

$250 \text{ square feet} \times 15.25 \text{ feet} = 3,812.50 \text{ cubic feet} / 27 = 141.20 \text{ cubic yards}$

Embankment Fill West of Canal:

$175 \text{ square feet} \times 15.25 \text{ feet} = 2,668.75 \text{ cubic feet} / 27 = 98.84 \text{ cubic yards}$

Asphalt East of Canal for Traffic Shift:

$250 \text{ square feet} \times 56 \text{ feet} = 14,000 \text{ cubic feet} / 27 = 518.52 \text{ cubic yards} \times 2\text{T}/\text{cubic yards} = 1037 \text{ T}$

Asphalt West of Canal for Traffic Shift:

$175 \text{ square feet} \times 56 \text{ feet} = 9,800 \text{ cubic feet} / 27 = 362.96 \text{ cubic yards} \times 2\text{T}/\text{cubic yards} = 726 \text{ T}$

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-12.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: PHASE CONSTRUCTION TO ALLOW BRIDGE REPLACEMENTS AS SEPARATE INITIAL CONTRACT.

ORIGINAL DESIGN: Project IM000-0020-02(117), P.I. No. 210327, begins at the end of project NH-IM-20-2(145), PI No. 210570 which is presently under construction and continues the widening of I-20 from 2 travel lanes in each direction to the proposed typical section that matches NH-IM-20-2(145) of 6 travel lanes with a 28-foot paved median. Moving eastward the project replaces the bridges over the Augusta Canal and the Savannah River and widens I-20 into the state of South Carolina and ends just west of the Martintown Road Interchange. The existing bridges have been repaired many times and have had a history of weld problems, with the bridge decks needing repair.

PROPOSED CHANGE: A NEPA document was approved for IM-20-2(145), and NH-520-1(15), P.I. Nos. 210570, 210450, and 0008219 on 4/11/2002; this document included the widening of I-20 from Belair Road to Martintown Road Interchange. With the disrepair of the bridge decks to the existing bridges over the Augusta Canal and the Savannah River and the funding shortfalls of South Carolina DOT for this project, recommend replacing these bridges first through a reevaluation of the original NEPA document.

JUSTIFICATION: Replaces bridges in a more timely fashion whose decks are in disrepair, and attempts to avoid the possibility of bridge deficiencies requiring traffic disruptions on I-20.

ADVANTAGES:

- Addresses major need of the project in light of funding shortfalls with SCDOT.

DISADVANTAGES:

- May not address Logical Termini issues of NEPA document until a future date.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 46,972,070		\$ 46,972,070
PROPOSED CHANGE:	\$ 21,599,027		\$ 21,599,027
SAVINGS:	\$ 25,373,043		\$ 25,373,043

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-12.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER
PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
IM-20-2(117) – Total Project Cost					\$46,972,070
SUBTOTAL – COST TO PRIME					\$46,972,070
MARKUP					Incl.
TOTAL CONTRACT COST					\$46,972,070

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
BR 1 – Augusta Canal – Full Replacement					\$5,584,041
BR 2 – Savannah – Full Replacement					\$15,514,986
Add back in 50% of traffic control	1	LS	1	400,000	400,000
Add back in 33% of erosion control	1	LS	1	100,000	100,000
SUBTOTAL – COST TO PRIME					\$21,599,027
MARKUP					Incl.
TOTAL CONTRACT COST					\$21,599,027

Difference [Original-Proposed] **\$25,373,043**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-1.0
PAGE NUMBER:	1 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: REDUCE INSIDE PAVED SHOULDER WIDTH FOR THE ENTIRE PROJECT FROM 12'-10" TO 12'-0"

ORIGINAL DESIGN: Inside paved shoulder width is proposed at 12'-10" (14'0" less 1'2" for the concrete barrier) for roadway and bridge.

PROPOSED CHANGE: Change the inside paved shoulder width to 12'-0" (13'-2" less 1'-2" for concrete barrier).

JUSTIFICATION: This alternative is allowed by GDOT design policies and provides a cost savings to the project. GDOT Design Policy Manual Table 6.7 and Bridge Design Policy Manual section 2.9.1.3 allows inside paved shoulder width of 12' for freeways of 6 or more lanes and truck volumes greater than 250 vehicles/hour.

ADVANTAGES:

- Meets GDOT and AASHTO policy.
- Cost savings.
- Less impervious surface

DISADVANTAGES:

- None apparent.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 1,337,812		\$ 1,337,812
PROPOSED CHANGE:	\$ 1,250,854		\$ 1,250,854
SAVINGS:	\$ 86,958		\$ 86,958

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-1.0
PAGE NUMBER:	2 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER
PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
12mm asph	1	TN	1728	\$78.00	\$134,784
19mm asph	1	TN	4608	\$65.16	\$300,257
25mm asph	1	TN	6912	\$60.71	\$419,628
16" GAB	1	SY	20,944	\$22.88	\$479,199
Tack	1	Gal	1466	\$2.69	\$3,944
SUBTOTAL – COST TO PRIME					\$1,337,812
MARKUP					Incl.
TOTAL CONTRACT COST					\$1,337,812

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
12' / 12.83' = 93.5%					\$1,250,854
SUBTOTAL – COST TO PRIME					\$1,250,854
MARKUP					Incl.
TOTAL CONTRACT COST					\$1,250,854

Difference [Original-Proposed] **\$86,958**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

PROPOSED CHANGE SKETCH/DETAIL

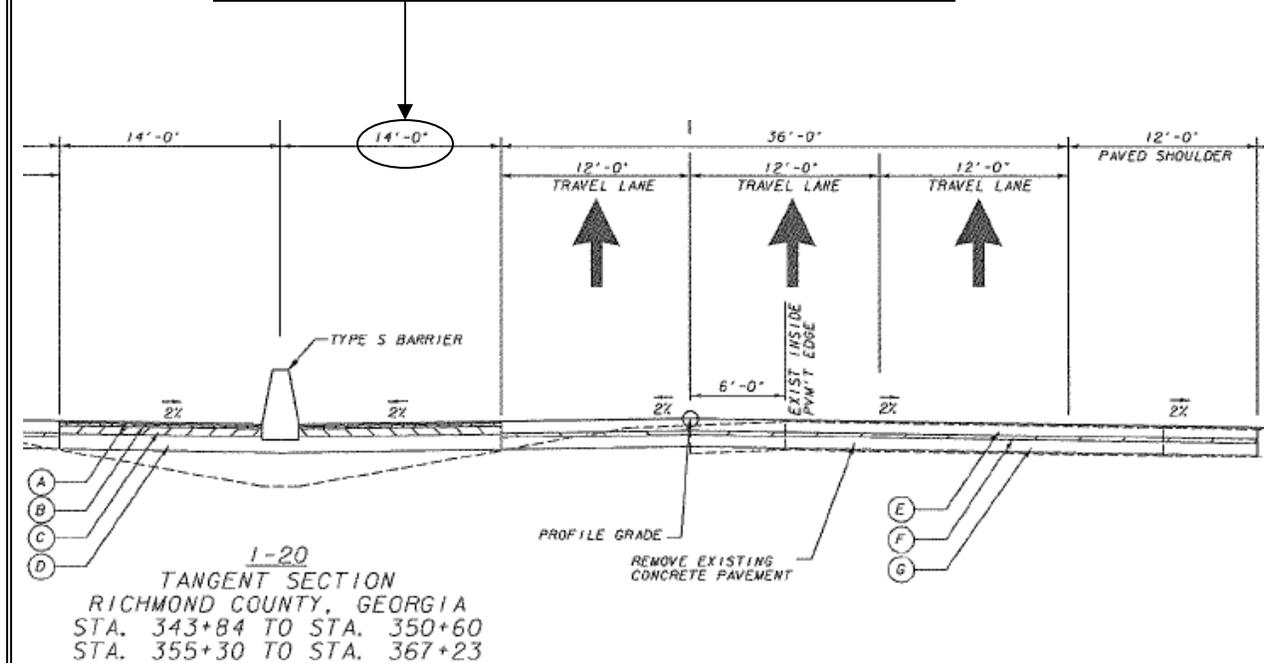
PROPOSAL NUMBER: R-1.0

PAGE NUMBER: 3 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Proposed Change: Revise 14'0" inside dimension to 13'2", with 1'2" barrier half width results in 12'-0" inside shoulder pavement width.



VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-2.0
PAGE NUMBER:	1 of 5

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: CONSTRUCT OUTSIDE PAVED SHOULDER WITH ASPHALT IN LIEU OF FULL DEPTH PCC.

ORIGINAL DESIGN: The current design has the outside paved shoulder on roadway as full depth PCC.

PROPOSED CHANGE: The proposed recommendation is to construct the outside paved shoulder with asphalt.

JUSTIFICATION: Due to the traffic volumes in this corridor, the outside shoulder is not expected to become a travel lane in the near future and will not require the same structure as the mainline.

ADVANTAGES:

- Cost savings.
- Contrast to travel lane.
- Typical shoulder design.

DISADVANTAGES:

- Could not be used as a travel lane in the future without rework.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 2,309,723		\$ 2,309,723
PROPOSED CHANGE:	\$ 1,333,803		\$ 1,333,803
SAVINGS:	\$ 975,920		\$ 975,920

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-2.0
PAGE NUMBER:	2 of 5

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
PCC HES 12"	1	SY	20944	68.94	1,443,879
25mm asph	1	T	3456	78.00	269,568
12" GAB	1	SY	20944	28.47	596,276
SUBTOTAL – COST TO PRIME					2,309,723
MARKUP					Incl.
TOTAL CONTRACT COST					2,309,723

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
12.5 mm asph	1	T	1728	78.00	134,784
19 mm asph	1	T	4607	65.16	300,192
25 mm asph	1	T	6912	60.71	419,628
16" GAB	1	SY	20944	22.88	479,199
SUBTOTAL – COST TO PRIME					1,333,803
MARKUP					Incl.
TOTAL CONTRACT COST					1,333,803

Difference [Original-Proposed] **\$975,920**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

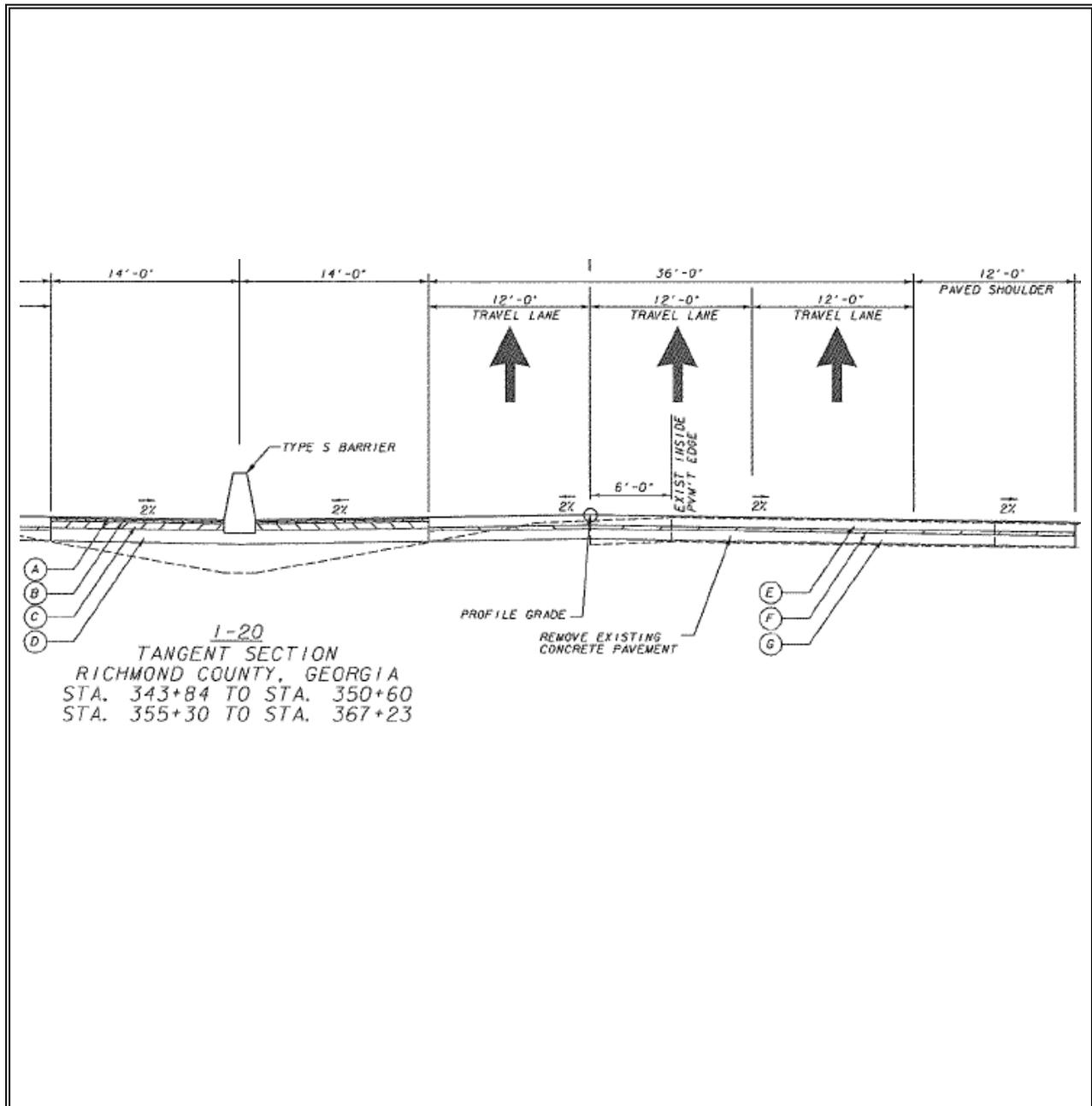
ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER: R-2.0

PAGE NUMBER: 3 of 5

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA



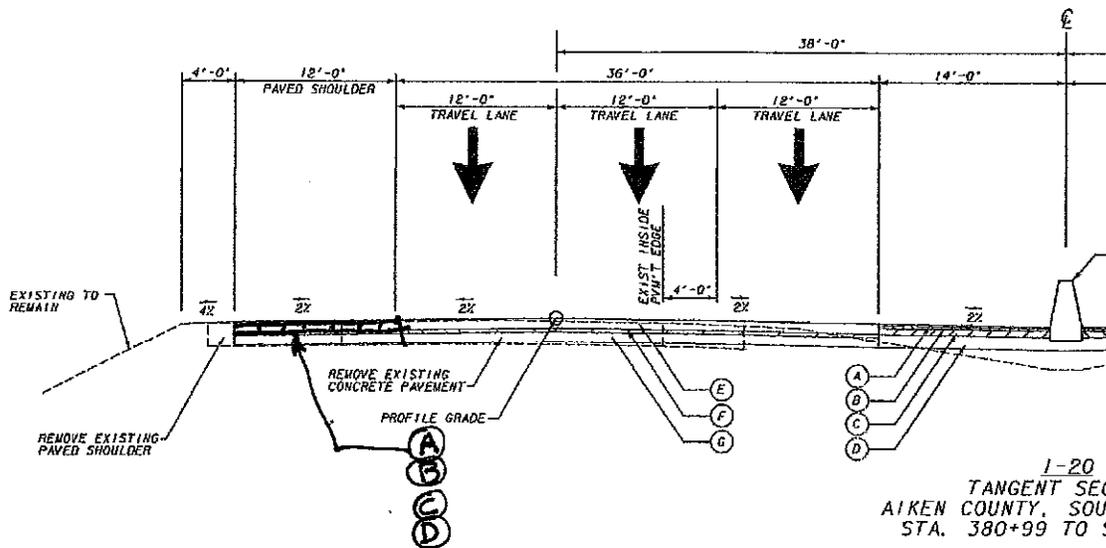
PROPOSED CHANGED SKETCH/DETAIL

PROPOSAL NUMBER: R-2.0

PAGE NUMBER: 4 of 5

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA



REQUIRED PAVEMENT

- Ⓐ 165 LBS/SY RECYCLED ASPH CONC 12.5 MM SUPERPAVE, GP 2 ONLY, INCL BITUM & H LIME
- Ⓑ 440 LBS/SY RECYCLED ASPH CONC 19 MM SUPERPAVE, GP 1 OR 2, INCL BITUM & H LIME
- Ⓒ 660 LBS/SY RECYCLED ASPH CONC BASE 25 MM SUPERPAVE
- Ⓓ GRADED AGGREGATE BASE, 15.5"
- Ⓔ PLAIN PC CONCRETE PAVEMENT - 12"
- Ⓕ 330 LBS/SY RECYCLED ASPH CONC 25 MM SUPERPAVE
- Ⓖ GRADED AGGREGATE BASE, 12"

CALCULATIONS

PROPOSAL NUMBER:	R-2.0
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PAGE NUMBER:	5 of 5
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PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

Project roadway length = 7346 LF

Paved inside shoulder width = 12'10" (14' – 1'2" barrier)

7346 LF x 12.83' = 94249 SF / 9 = 10472 SY each side

10472 SY x 2EA = 20944 SY total inside median area

165# = .0825T/SY

330# = 0.165T/SY

440# = 0.22T/SY

660# = 0.33T/SY

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-4.0
PAGE NUMBER:	1 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: CHANGE CROSS SLOPE TO DRAIN ALL LANES TO OUTSIDE IN TANGENT SECTIONS IN LIEU OF INSIDE TRAVEL LANE WITH CROSS SLOPE DRAINING TO MEDIAN.

ORIGINAL DESIGN: Inside travel lane in tangent (straight) sections slopes toward the median, outside travel lanes slope toward outside. This requires drainage structures to be installed in the median adjacent to the barrier.

PROPOSED CHANGE: Slope all pavement in the tangent (straight) sections toward the outside and eliminate the drainage adjacent to the median barrier. Drainage on bridges (1970 LF) and horizontal curve (1290 LF) will not require change. Project (9316 LF) minus bridges and curve results in a 65% reduction in drainage items.

JUSTIFICATION: Super elevated sections of all roadways slope in one direction by default. GDOT and AASHTO suggest, but do not require, that the crown on wider roadways be sloped to drain in two directions. This proposal saves construction costs.

ADVANTAGES:

- Cost reduction.
- Reduced amount of structures.
- Eliminates clogging points.

DISADVANTAGES:

- More water on travelway during heavy rainfall.
- Small amount of additional fill required in the median.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 432,442		\$ 432,442
PROPOSED CHANGE:	\$ 151,880		\$ 151,880
SAVINGS:	\$ 280,562		\$ 280,562

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-4.0
PAGE NUMBER:	2 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER
PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
24" storm drain pipes	1	LF	9120	\$35.52	\$323,942
Drop Inlet M-3	1	EA	31	\$3,500	\$108,500
SUBTOTAL – COST TO PRIME					\$432,442
MARKUP					Incl.
TOTAL CONTRACT COST					\$432,442

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
35% 24" storm drain pipe	1	LF	3192	\$35.52	\$113,380
35% Drop Inlet M-3	1	EA	11	\$3,500	\$38,500
SUBTOTAL – COST TO PRIME					\$151,880
MARKUP					Incl.
TOTAL CONTRACT COST					\$151,880

Difference [Original-Proposed] **\$280,562**

SOURCES

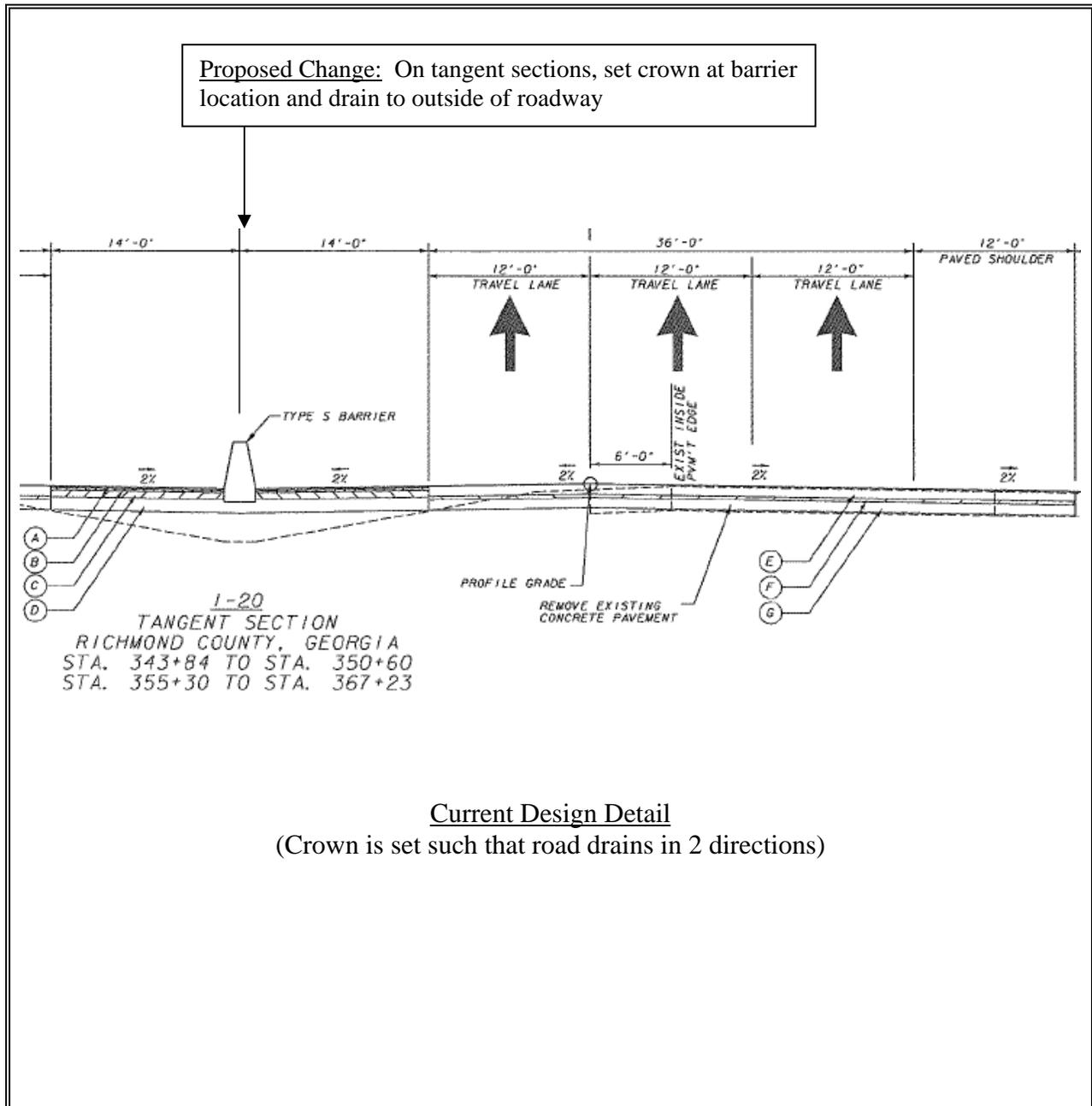
- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

SKETCH/DETAIL

PROPOSAL NUMBER:	R-4.0
PAGE NUMBER:	3 of 3

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA



Current Design Detail

(Crown is set such that road drains in 2 directions)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-7.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: ALLOW CONCRETE PAVEMENT TO BE CRUSHED AND USED AS AGGREGATE BASE.

ORIGINAL DESIGN: The current GDOT policy does not allow crushed concrete to be used as an aggregate base replace. Currently 145,196 SY all new aggregate will be installed.

PROPOSED CHANGE: The proposed recommendation is to allow the contractor to crush the existing concrete pavement being demolished and re-use (30 - 50%) as aggregate base course. (68,000 SY to be demolished)

JUSTIFICATION: Crushed concrete as an aggregate base normally/historically exceeds 92 CBR and higher. This is a sustainable design recommendation and eliminates major hauling activities and saves construction costs.

ADVANTAGES:

- Capital cost reduction.
- Sustainable design initiative(LEED).
- Reduced hauling.

DISADVANTAGES:

- GDOT has difficulty in estimating savings.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 3,965,760		\$ 3,965,760
PROPOSED CHANGE:	\$ 3,393,400		\$ 3,393,400
SAVINGS:	\$ 572,360		\$ 572,360

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-7.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER
PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
New Crushed Stone	1	SY	145,199	27.13	3,965,760
SUBTOTAL – COST TO PRIME					3,965,760
MARKUP					Incl.
TOTAL CONTRACT COST					3,965,760

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Re-cycle concrete as base course (No hauling required for removal from site & reduced hauling of new	7	SY	45,000	15.00	675,000
New Crushed Stone	1	SY	100,199	27.13	2,718,400
SUBTOTAL – COST TO PRIME					3,393,400
MARKUP					Incl.
TOTAL CONTRACT COST					3,393,400

Difference [Original-Proposed] **\$572,360**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-8.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: INSTALL ROLLER COMPACTED CONCRETE SHOULDERS IN LIEU OF CIP CONCRETE

ORIGINAL DESIGN: The current design of I -20 includes outside twelve foot wide shoulders as a full depth (12”/3”/12”) Cast In Place concrete section, which is the same depth of the roadway section.

PROPOSED CHANGE: The proposed recommendation is to design the twelve foot wide (12’) outside shoulders with a 10-inch deep non-reinforced roller compacted concrete section, on adequate base course. The smoothness should be adequate for shoulders.

JUSTIFICATION: Roller compacted concrete (RCC) has been successfully installed by GDOT on I-285, and the recent Aiken Road replacement. Placement production is extremely fast and can be put into service immediately.

ADVANTAGES:

- Cost savings.
- More durable and stronger.
- Can be driven on immediately.
- Can be placed with a std. paving machine like asphalt.
- Steel reinforcement is not needed.

DISADVANTAGES:

- None apparent since GDOT has previously installed this type of shoulder on I-285.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 2,100,000		\$ 2,100,000
PROPOSED CHANGE:	\$ 587,700		\$ 587,000
SAVINGS:	\$ 1,513,000		\$ 1,513,000

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-8.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER
PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
12' wide concrete shoulder (12x3x12)	1	SY	19,590	107.20	2,100,000
SUBTOTAL – COST TO PRIME					2,100,000
MARKUP					Incl.
TOTAL CONTRACT COST					2,100,000

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
12' wide RCC shoulder	7	LF	19,590	30.00	587,700
SUBTOTAL – COST TO PRIME					587,700
MARKUP					Incl.
TOTAL CONTRACT COST					587,700

Difference [Original-Proposed] **\$1,513,000**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-10.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: LOCATE EASTBOUND LANE DROP AT THE ENTRANCE TO THE SOUTH CAROLINA VISITOR CENTER.

ORIGINAL DESIGN: Eastbound lane drop is shown in the weaving section between the exit from the Visitor Center and the exit from I-20 to Ramp D at the West Martintown Road Interchange

PROPOSED CHANGE: It is proposed to relocate the lane drop away from the weaving section and drop the right lane into the Visitor Center.

JUSTIFICATION: Lane drop is currently shown along the travelway and is located prior to an exit point. Moving the lane drop 2500' +/- west would still serve the need of the project.

ADVANTAGES:

- Improve driver expectancy.
- Reduced construction cost

DISADVANTAGES:

- Could affect the logical termini.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 900,000		\$ 900,000
PROPOSED CHANGE:	\$ 0		\$ 0
SAVINGS:	\$ 900,000		\$ 900,000

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-10.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
1 lane on SC side	1	LS	1	900,000	900,000
SUBTOTAL – COST TO PRIME					900,000
MARKUP					Incl.
TOTAL CONTRACT COST					900,000

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
No 3 rd lane					0
SUBTOTAL – COST TO PRIME					0
MARKUP					--
TOTAL CONTRACT COST					0

Difference [Original-Proposed] **\$900,000**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-11.0
PAGE NUMBER:	1 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

PROPOSAL DESCRIPTION: ELIMINATE WIDENING OF I-20 IN SOUTH CAROLINA.

ORIGINAL DESIGN: The current project includes the replacement and widening of Interstate 20 (I-20) to the East of Savannah River Bridge from two (2) lanes to three (3) lanes.

PROPOSED CHANGE: The proposed recommendation is to delete the widening from two lane cross section into a four lanes cross section on the South Carolina side of the new Savannah River Bridge. The deteriorated two lane road will be replaced as currently located.

JUSTIFICATION: Allows the bridges to be replaced and the roads on the Georgia side to be widened to complete the Final phase of the Georgia project, and the South Carolina widening can be performed when additional funds become available. Replacement of bridges is the critical components/justification for the project.

ADVANTAGES:

- Capital cost reduction.
- Improves access and exiting of visitor center.
- The weave of lanes remains the same.
- Still replacing deteriorated lanes in SC.

DISADVANTAGES:

- SCDOT may object.
- FHWA request a new documental to justify termination of work at W. Martintown Rd. interchange.
- Some days will be one lane traffic during construction.

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 5,400,000		\$ 5,400,000
PROPOSED CHANGE:	\$ 3,600,000		\$ 3,600,000
SAVINGS:	\$ 1,800,000		\$ 1,800,000

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-11.0
PAGE NUMBER:	2 of 2

PROJECT TITLE: I-20 AT SAVANNAH RIVER
PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
I-20 four lane (3) widening from station 380+00 to station 437+00 (5700 LF)	1	6	lanes	900,000	5,400,000
SUBTOTAL – COST TO PRIME					5,400,000
MARKUP					Incl.
TOTAL CONTRACT COST					5,400,000

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Two lane replacement (same) from station 380+00 to station 437+00 (distance of 5700 LF)	1	4	lanes	900,000	3,600,000
SUBTOTAL – COST TO PRIME					3,600,000
MARKUP					Incl.
TOTAL CONTRACT COST					3,600,000

Difference [Original-Proposed] **\$1,800,000**

SOURCES

- | | |
|---|--|
| <ul style="list-style-type: none"> 1. Project Cost Estimate 2. USC Estimate Database 3. UPB Database 4. Means Estimating Manual | <ul style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (Specify) |
|---|--|

VE STUDY SIGN-IN SHEET

Project No.: IM000-0020-02(117)

County: Richmond

PI No.: 210327-

Date: May 2-5, 2011

Days

FIRST	LAST	NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	✓	Lisa L. Myers		Engineering Services	404-631-1770	lmyers@dot.ga.gov
✓	✓	Matt Sanders		Engineering Services	404-631-1752	msanders@dot.ga.gov
○	○					
✓	○	Ken Werho		Traffic Operations	404-635-8144	kwerho@dot.ga.gov
✓	✓	Ron Wishon		Engineering Services	404-631-1753	rwishon@dot.ga.gov
○	✓	Bill DuVall		Bridge Design	404-631-1883	bduvall@dot.ga.gov
✓	✓	Tom ORR		U.S. Cost	770-481-1638	torr@uscost.com
✓	✓	LINDSEY GARDNER		US COST VE	757-496-3055	L.GARDNER@USCOST.COM
✓	✓	AL BOWMAN		LPA GROUP	770-263-9118	ABowman@LPAgroup.com
✓	✓	JERRY BROOKS		KIMLEY-HORN	678-502-1864	jerry.brooks@kimley-horn.com
✓	✓	Lori Kennedy		KEA GROUP	678.904.859(x22)	lkennedy@keagroup.com
✓	✓	Sharon Aiken		U.S. Cost	770-481-1605	saiken@uscost.com
✓	○	LARRY COOK		HMM	(770) 200-1729	LARRY.COOK@HATCHMOTT.COM
✓	✓	Jim NAVIS		HMM	(770) 200-1742	james.navis@hatchmott.com
✓	○	Sean Garland		HMM	(770) 200-1716	sean.garland@hatchmott.com
✓	○	Stanley Hill		OPP	(404) 631-1560	shill@dot.ga.gov
✓	○	Jonathan Cox		OFF. Env. Services	4) 631-1197	jcoxx@dot.ga.gov
✓	○	Christy Pan Atkins		FKWA	404 512 3638	Christy.PanAtkins@dot.ga.gov
✓	✓	DAVID MOYER		GDOT PROGRAM DELIVERY	404) 291-5880	dmoyer@dot.ga.gov
✓	✓	BRYAN GIBBS		GDOT 2 AREA ENGINEER	706) 343-5836	bgibbs@dot.ga.gov
✓	○	LYNN BEAN		GDOT. D2-CONST.	478) 553-2331	lbean@dot.ga.gov

VIA VIDEO

✓ Check all that attended.

○ = Did Not Attend

19 Attended Project Overview (Day 1)
3 were V.C.

13 Attended Project Presentation (Day 4)
2 were V.C.

VALUE ENGINEERING STUDY

FUNCTION ANALYSIS

The following functions for the I-20 Savannah River Improvements project were identified during discussions with the VE participants on the first day of the study. These two-word functions consist of an active verb, and a quantifiable (measurable) noun. The functions represent the proposed capital improvement expenditures of the project, and assist the V.E. team in becoming familiar with the needs and long-term goals for the project. The Basic Function of the project is to “Upgrade Corridor”. The following are considered by the V.E. team to be Secondary and Supporting Functions.

Verb	Noun	Verb	Noun
Replace	Bridges	Stage	Construction
Widen	Bridges	Temporary	Haul Roads
Increase	Capacity	Re-establish	Vegetation
Control	Traffic	Control	Costs
Establish	Staging	Support	Commerce
Maintain	Passage	Award	Contract
Span	Water	Excavate	Earth
Maintain	Tow Path	Widen	Median
Connect	Centers	Install	Signage
Separate	Lanes	Control	Erosion
Maintain	Traffic	Drain	Site
Demolish	Structures		

VALUE ENGINEERING STUDY

COST MODEL/DISTRIBUTION

**I-20 AT SAVANNAH RIVER
SAVANNAH BRIDGE FULL REPLACEMENT
GEORGIA - SOUTH CAROLINA**

ITEM	COST \$	% OF TOTAL
TOTAL PROJECT		
-		
SUPER CON., CL AA BR NO-	4,089,484	26.36%
PSC BEAMS, AASHTO, BULB TEE, 54 IN BR NO-	2,838,200	18.29%
DEMO-REMOVAL OF EXISTING BRIDGE	2,082,400	13.42%
COFFER DAM	1,584,000	10.21%
10% CONTINGENCY	1,410,453	9.09%
SUPER REINF STEEL , BR NO-	1,091,674	7.04%
CLASS A CONCRETE	998,528	6.44%
BAR REINF STEEL	446,556	2.88%
SEAL CONCRETE	314,111	2.02%
TEMP BARRIER	173,147	1.12%
CONCRETE BARRIER	150,515	0.97%
MISC OTHERS	115,240	0.74%
PILING IN PLACE, STRRL H,HP14X73	103,097	0.66%
GROOVED CONCRETE	64,811	0.42%
STN DUMPED RIP RAP	52,770	0.34%
TOTAL	15,514,986	100.00%
NO ESCALATION INCLUDED		

VALUE ENGINEERING STUDY

COST MODEL/DISTRIBUTION

**I-20 AT SAVANNAH RIVER
AUGUSTA CANAL BRIDGE FULL REPLACEMENT
GEORGIA - SOUTH CAROLINA**

TOTAL PROJECT	ITEM	COST \$	% OF TOTAL
-			
	STR STEEL, BR NO-	1,350,832	28.26%
	SUPER CON., CL AA BR NO-	1,147,146	24.00%
	10% CONTINGENCY	434,632	9.09%
	COFFER DAM	400,000	8.37%
	SUPER REINF STEEL , BR NO-	306,227	6.41%
	DEMO-REMOVAL OF EXISTING BRIDGE	280,850	5.87%
	CLASS A CONCRETE	219,425	4.59%
	PILING IN PLACE, STRRL H,HP14X73	204,921	4.29%
	BAR REINF STEEL	96,605	2.02%
	STN DUMPED RIP RAP	92,875	1.94%
	SEAL CONCRETE	80,801	1.69%
	TEMP BARRIER	58,000	1.21%
	CONCRETE BARRIER	50,418	1.05%
	MISC OTHERS	36,000	0.75%
	GROOVED CONCRETE	21,710	0.45%
TOTAL - PROJECT		4,780,442	100.00%
NO ESCALATION INCLUDED			

VALUE ENGINEERING STUDY

COST MODEL/DISTRIBUTION

**I-20 AT SAVANNAH RIVER
TOTAL ROAD PROJECT & BRIDGES VIA CES ESTIMATE
GEORGIA - SOUTH CAROLINA**

ITEM	COST \$	% OF TOTAL
TOTAL PROJECT		
-		
BRIDGES - AUGUSTA CANAL AND SAVANNAH RIVER BRIDGES	21,099,000	45.97%
PLAIN PC CONCRETE PAVEMENT CL HES 12' THICK	7,294,472	15.89%
Gr Aggr BS CRS 12" & 16" incl material (145,196 sy)	3,965,760	8.64%
CONTINGENCY 5%	2,236,765	4.87%
REMOVE ROADWAY SLAB (68,000 SFY)	1,910,806	4.16%
RECYCLE AC 25MM& 12.5MM (30,763 sy)	1,909,145	4.16%
RECYCLE AC 19MM SP, GP, I OR 2, INCL BM&HL	1,909,145	4.16%
GRASS, LIME, FERTILIZER, NITROGEN, LIQUID LINE	1,545,339	3.37%
TRAFFIC CONTROL	800,000	1.74%
CONCRETE BARRIER TP S-2 (7500LF)	800,000	1.74%
STORM DRAINAGE PIPE - 24"	323,975	0.71%
REM/RST EX SP GS, GM, C-IN-PLC	300,000	0.65%
SEC652 PAINT TRAFFIC STRIPE	300,000	0.65%
REINFORCED CONCRETE APPROACH SLAB	260,873	0.57%
GUARD RAILS % ANCHORAGE	203,589	0.44%
TEMP GRASS, MULCH, TEMP SEDIMENT BAR & CONST EXIT	203,386	0.44%
IN PLACE EMBANKMENT	154,567	0.34%
STD. DUMP RIP RAP, TP1 - 24"	136,262	0.30%
DROP INLETS TP1 & TP3	116,070	0.25%
WATER QUALITY INSPEC & TEMPORARY SILT FENCE TYPE "C"	110,877	0.24%
FIELD ENGINEERS OFFICE TP 3	83,410	0.18%
STR SUPPORT OVERHEAD SIGN, TP I, STA	80,000	0.17%
HIGHWAY SIGNS, TP 1 MAT, REFL SH TP 9	67,913	0.15%
CLEARING AND GRUBBING	17,000	0.04%
MAINT. OF INLET TRAP, TEMP FENCE, SEDIMENT BARRIER	14,584	0.03%
PLAIN PC CONCRETE DITCH 4"	13,532	0.03%
CONCRETE SPILLWAY - TP - 1 (8)	13,532	0.03%
BITUM TACK COAT	12,333	0.03%
EROSION CONTROL MATS, SLOPES	11,053	0.02%
TOTAL - PROJECT	45,893,388	100.00%
NO ESCALATION INCLUDED		

VALUE ENGINEERING STUDY

BRAINSTORMING OR SPECULATION IDEAS

PROJECT TITLE: I-20 AT SAVANNAH RIVER

PROJECT LOCATION: RICHMOND COUNTY, GEORGIA

NO.	IDEA	RANK
BRIDGES (B)		
1.0	Increase span lengths – Augusta Canal.	5/1
2.0	Increase span lengths – Savannah River	5/1
3.0	Build 2 bridges with staged construction to eliminate construction in middle; build 2-lane travel width to north first.	4/5
3.1	Realign bridge to north-entire corridor of I-20.	Drop
4.0	Install caissons in lieu of coffer.	3/3
5.0	Use vertical abutment on both ends.	4/2
6.0	Reduce bridge width I-20.	w/B-1.0
7.0	Install high density concrete for all deck pavement (specific gravity > 3.0).	4/0
8.0	Install/evaluate alternate beam choice.	See B-1.0
9.0	Install steel girders in lieu of cast in place.	2/1
10.0	Set new bridges at same top of slab elevation as existing.	4/1
11.0	Construct single bridge to replace both bridges (spanning over island).	Drop
12.0	Phase construction – initially replace deficient bridges	2/4
ROADWAY (R)		
1.0	Reduce median width entire project.	4/5
2.0	Pave outside shoulders with asphalt in lieu of concrete.	5/5
3.0	Reduce width of outside shoulder (maybe 2.0')	Drop
4.0	Change cross slope to drain to outside in lieu of both ways.	2/2
5.0	Reduce pavement coming off of ramp “E”.	Comment
6.0	Add extra lane thru interchange for a total of three (3) lanes.	2/0
7.0	Allow in project recycled concrete as base course material.	4/3
8.0	Install roller compacted concrete pavement and bump grind high spots.	2/4
9.0	Relocate lane drops to eliminate 2 lane drops in same area/location.	Drop
10.0	In Eastern direction transition to 2 lanes at entrance to Visitor Center.	4/4
11.0	Eliminate widening I-20 road on South Carolina side of bridge.	3/5

VALUE ENGINEERING WORKSHOP AGENDA

For
GEORGIA DEPARTMENT OF TRANSPORTATION

Project #: IM000-0020-02(117) - PI#: 210327

I-20 AT SAVANNAH RIVER

(0.5 miles)

RICHMOND COUNTY, GEORGIA

28 HOUR - V.E. STUDY

2-5 May 2011

The value engineering workshop for the subject project will be conducted for 3-1/2 days from 2-5 May 2011, **in the Engineering Services Conference Room (5CR1L2) on the 5th floor of the GDOT General Office Facility located at 600 W. Peachtree Street NW, Atlanta GA 30308; POC – Matt Sanders @ (404)631-1752 voice**

Pre-workshop Activities

The V.E. Team Leader coordinates logistics with the Owner, and confirms project objectives and any unique requests, and develops a cost model for the project. The V.E. Team receives and reviews all project documents.

MONDAY

0800 - 0900

V.E. Team Introduction Phase

Lindsey Gardner, P.E., CVS
Team Leader, U.S. Cost, Inc.
(V.E. Team Only)

The VETL will review previous events along with activities planned for the week and outline several areas which may be investigated by the V.E. team.

The team members will discuss their initial impression and understanding of the project with other team members based on their pre-study review of the project plans, cost estimates, and available calculations. The V.E. Team Leader will provide cost models, and cost bar graphs to help the team identify the high-cost features of the project.

0900 - 1100

Project Design Briefing

V.E. Team; A/E, GDOT

The A/E project design manager will discuss the project constraints/requirements and the proposed design solution(s) in detail. The V.E. team members will ask questions as appropriate to completely understand the project requirements and the proposed design solution (both alternatives considered and those recommended by the design team).

MONDAY (CONTINUED)

1100 - 1200 **Function Analysis Phase** V.E. Team

The V.E. team will discuss the required functions of the project. The project cost model will be analyzed to identify functions provided by all project features.

1200 - 1300 **Lunch**

1300 - 1600 **Creative Phase** V.E. Team

The V.E. team will creatively review, Brainstorm, and tabulate possible design alternatives for the project. While the designer's solution will serve as the "baseline", the team will identify alternatives not in the recommended solution, but deserving of further investigation. Each project feature will be carefully analyzed with the basic questions in mind:

What is the system/item?

What does it do(what is its basic function)?

What must it do?

What does it cost?

What is the item worth?

What else will do the same, or a better job?

What does that alternative cost?

During the creative phase, the team will not judge the ideas. The essential requirements for the project, however, must always be considered.

1600 - 1700 **Analysis Phase** V.E. Team

During this phase, all of the ideas or alternatives will be ranked according to their potential for life-cycle (25-year) cost reduction and the potential for acceptance by GDOT, Engineering Designers, and other appropriate parties.

TUESDAY

0800 - 1700 **Development Phase** V.E. Team

During the development phase, each team member will gather information and prepare written proposals for those ideas assigned to him/her. These may require additional discussions with the designer, GDOT representatives, outside contractors and suppliers, and other specialists to fully define the alternative. The team members will prepare sketches, perform calculations and develop other data to support each proposal. In addition, each team

member will prepare estimates of costs for each alternative as originally designed, and as proposed by the V.E. team.

WEDNESDAY

0800 - 1200 **Development Phase** V.E. Team

1200 - 1300 Lunch

1300 - 1500 **Development Phase & Quality Review** V.E. Team

THURSDAY

8:00 – 9:00 **Prepare for Presentation** V.E. Team

9:00 – 10:00 **V.E. Presentation** V.E. Team Members, Design Team & GDOT Reps

The Value Engineering Team will present the proposals developed in the course of the study to the design team representatives and any participating stakeholders. The intent of the presentation is to give a clear understanding of the basis of the proposals rather than to reach a conclusion as to their acceptability. A summary table of results will be distributed at the presentation. The formal V.E. Reports will be issued within 8 business days of the workshop conclusion.

NOTES: LAPTOP COMPUTERS ARE REQUIRED FOR VE DEVELOPMENT

1. V.E. team members should bring to the workshop any technical and pricing reference manuals which may be used during the study. These may include design handbooks, code documents, estimating price guides, and related documents. Calculators, pencils, sketch paper, scales, and other similar items will also be useful.
2. It is critical that outside telephone calls and other interruptions of the study team members be held to an absolute minimum during the week to allow for efficient, uninterrupted concentration on the Value Engineering Study.
3. Questions concerning the proposed study should be directed to Lindsey Gardner at (757) 496-3055 (lgardner@uscost.com) or;

U.S. Cost Incorporated
Mr. Tom Orr, P.E.
1200 Abernathy Road
Atlanta, GA 30328
(770) 481-1600
e-mail: torr@uscost.com