VALUE ENGINEERING STUDY

Project # BRF00-0012-01(080) PI No. 122012-

S.R. 369 Over Chattahoochee River (Lake Lanier) Bridge Replacement

Forsyth/Hall County, Georgia

Prepared for:

Georgia Department of Transportation

One Georgia Center
600 West Peachtree NW
Atlanta, Georgia 30308

4 October 2012

U.S. COST

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

4 October 2012

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 – S.R. 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall County, GA
Project #: BRF00-0012-01(080) - PI#: 122012-

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 management personnel as well as the design team.

This Workshop resulted in the development of nine (9) 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 me 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

Tom Orr, P.E., CVS
V.E. Team Leader

CC: L. Myers, GDOT

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PROJECT DESCRIPTION

This S.R. 369 at Chattahoochee River project involves construction of a new two-lane bridge in Forsyth and Hall Counties in Georgia. The project will replace the existing steel truss bridge that currently exists at this location. The improvements involve construction of a new bridge and construction of new roadway sections and tie-ins.

The proposed project involves work along a 0.79 mile section of S.R. 369 for replacement of a structurally deficient bridge over the Chattahoochee River. The proposed concept for the project includes constructing the new bridge and roadway approaches as an offset to the South of the existing bridge and roadway and utilizing the existing roadway corridor as the on-site detour during construction. The new roadway consists of a two-lane roadway with 12’ travel lanes and 10’ shoulders (4’ paved) along the roadway approaches. The right-of-way width varies as needed for earthwork tie-ins throughout the corridor.

A new 1,430-foot long bridge over the Chattahoochee River is included South of the existing bridge. The current bridge design includes a 4-span main central section with 2-span sections on each end, for a total of 8 spans. The bridge contains two 12’ travel lanes and 8’ shoulders on each side.

Project components include:

- A new 8-span, 1,430’ long bridge.
- New 2-lane (12’ travel lanes) roadway with tie-ins East and West of the new bridge
- A 920’ long tie-back wall along the Southern side of the Western end of the project

KEY INFORMATION/NOTES

Introduction

U.S. Cost conducted the Value Engineering Team Study on S.R. 369 Over Chattahoochee River Bridge Replacement. The V.E. study was conducted for three and ½ days, 1 - 4 October 2012, at the Georgia Department of Transportation 5th floor Conference Room in Atlanta, GA. The study team was furnished with draft project concept report documents for use in conducting the VE workshop. The following individuals were members of the V.E. team:

Name	Firm	Discipline
Tom Orr, P.E., CVS	U.S. Cost, Inc.	VE Team Leader (VETL)
Greg Grant, P.E.	RS&H	Bridge/Structures
Jerry Brooks, P.E.	Kimley-Horn	Roadway Engineer
Chris Haggard, P.E.	Wolverton	Construction

Value Engineering Study Process

The 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 (Monday)
- Development Phase (Tuesday - Wednesday)
- Presentation Phase (Thursday AM)

Information Phase

The V.E. team was first briefed on the project design by Georgia DOT management and design team 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 included in the design presentation.

KEY INFORMATION/NOTES

Project Design Criteria

During the meeting, project design criteria were identified. The following listing identifies the design criteria with which the project must comply:

AASHTO Design Policies
FHWA Design Policies
U.S. Army Corps of Engineers' agreements
Other Environmental Restrictions (EA Requirements TBD)

Project Constraints

Project constraints were discussed; however, at the time of the V.E. workshop agreements had not been reached with the U.S. Army Corps of Engineers or any other stakeholders, thus it was determined that the project approach did not contain any constraints that could not be altered.

Function Analysis

As a basic part of the V.E. process, the team conducted a Function Analysis session on the S.R. 369 Over Chattahoochee River Bridge Replacement 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 ***"****Replace (Deficient) Bridge"*. A detailed project function analysis of the characteristics of the project and the project features is presented in the Appendix.

KEY INFORMATION/NOTES

Risk Analysis

The group identified the following project risk elements, which may impact the S.R. 369 Over Chattahoochee River Bridge Replacement project. This exercise served as a catalyst for the Creative Phase of the study when several ideas were suggested which would mitigate these project risks.

Risk Elements/Concerns

- Permit Approval Constraints or Delays
- Future Expansion Needs
- Impacts to Traffic at Tie-ins
- Impacts to Property Owners
- Construction Traffic
- Adverse Recreational Impacts
- Adverse Environmental Impacts
- Impacts to Existing Bridge During Construction of New
- Work Area Limitations
- Bridge Construction and Demolition with Environmental Restrictions
- Depth of Water (130’) and Difficulty of Installing Substructure
- Public Resistance to Project

KEY INFORMATION/NOTES

Creative Phase

The Creative Phase of the V.E. study was initiated the afternoon of the first day of the study. A total of twenty-eight (28) creative ideas were generated for further investigation by the team. The creative ideas focused on areas of the project which the VE Team felt had the most opportunity for value improvement, including:

- Adjusting tie-in locations and shortening the project length
- Minimizing the amount of tie-back wall required
- Eliminating the design variance for the sight distance at Brown Bridge Drive
- Reducing cost and construction time of new bridge
- Reducing Right-of-way acquisition required
- Improving traffic control operations and costs

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 this project is included in the Appendix.

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 evaluation criteria for V.E. ideas are as follows:

V.E. Idea Evaluation Criteria

Reduces Construction Time
Improves Constructability
Reduces Impacts
Improves Traffic Control During Construction
Reduces Costs
Improves Service Life/Reduces Maintenance
Allows for Future Widening

KEY INFORMATION/NOTES

Evaluation Phase

The ideas generated during the Creative Phase were reviewed and evaluated by the VE session participants during an Analysis/Judgment Phase session at the end of the first study 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. The ranking session consisted of the VE team members assigning a ranking for 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. This is a time management tool to identify those proposals that have the greatest potential. Approximately nine (9) out of the original twenty-eight (28) creative ideas were deemed promising for further investigation and analysis by the V.E. team.

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

ACCEPTABILITY OF IDEA

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

KEY INFORMATION/NOTES

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 S.R. 369 Over Chattahoochee River Bridge Replacement 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.

Presentation Phase

A presentation to the GDOT representatives was conducted 4 October 2012 at 9 AM.

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 Item Mean Summary (Jan. 9, 2012), VE Team member experience, and discussions with vendors/Contractors. Overhead and profit are included in the project cost estimate and the GDOT Item Mean. Therefore, no additional markups are applied. 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 2012 dollars.

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 provides the greatest benefits to the project.

VALUE ENGINEERING RESULTS

It is important to note on this study that several creative ideas were researched and shown to either be a higher cost alternative or shown to not provide a significant benefit when considered against the current design. Specifically with regard to the bridge design, with the exception of V.E. proposal B-4.0, the VE Team's efforts largely confirmed the current design as being the most effective design given the bridge parameters. The Structure Study developed by the design team was shown to be very beneficial by the V.E. Team in analyzing alternatives for this project – these Structure Studies are most beneficial in unique projects such as this when a bridge has unique parameters such as deep water and a need for minimizing the number of piers.

The VE Team generated 28 creative ideas and developed 9 proposals for consideration by GDOT. Brief outlines of the VE proposals are as follows:

Proposal Highlights

B-4.0 – Reduce Number of Beams in End Spans from Seven (7) BT-74's to Six (6). The current design uses simple span approaches with two 145' end spans at each end of the bridge – each of these simple spans utilizes seven (7) BT-74's. Bridge Proposal B-4.0 proposes to use 6 – BT-74 beams in the simple span approaches in lieu of the 7 beams as currently designed. This alternative will save $69,000 in construction costs and provide sufficient support according to the design charts in the GDOT Bridge Design Manual.

R-1.0 - Shorten Approach Roadway on West Side of Project to Tie into S.R. 369 East of Brown Bridge Drive (New Bridge Remains on South Side of Existing Bridge). In the current design the approach roadway on the West side goes from Sta 301+50 to Sta 314+70 (1,320 LF) using a horizontal curve with a radius of 1074 feet, a superelevation rate of 6% and includes improvements at the intersection of Brown Bridge Drive. Also, a design variance is required for intersection sight distance at Brown Bridge Drive due to stopping sight distance. Proposal R-1.0 uses a 940 foot radius curve with a superelevation rate of 6% meeting the 45 mph speed design for the West side approach roadway which reduces the approach length to 800 feet and eliminates the improvements to Brown Bridge Drive. The proposed retaining wall will be offset an additional 2 feet to maintain a stopping sight distance of 360 feet. This proposal eliminates the design variance, minimizes impacts to properties, and results in a savings of $638,000.

R-1.4 – Construct New Bridge on North Side of Existing in lieu of South Side and Shorten Approach Length on West Side of Bridge. In the current design, the new bridge is to be constructed on the South side of the existing bridge. As an alternative to R-1.0, proposal R-1.4 proposes to construct the new bridge on the North side of the existing bridge. Locating the new bridge on the North side allows for quicker tie-ins to the existing roadway and shortens the project length by approximately 850 feet (project can begin at Sta 310+00 in lieu of current Sta 301+50). This proposal eliminates the design variance, minimizes impacts to properties, and results in a savings of $1,906,000.

VALUE ENGINEERING RESULTS

R-5.0 - Construct Retaining Wall from Sta 341+00 Left to Sta 343+50 Left to Reduce Right of Way Impacts to Parcel 7. The current typical section from Sta 341+00 Left to Sta 343+50 Left shows a widened shoulder with guardrail and 2:1 fill slopes. In R-5.0, it is proposed to construct a wall at the shoulder break point to reduce right of way impacts on Parcel 7. This alternative would reduce right-of-way acquisition and save approximately $170,000.

R-7.0 - Reduce Width of Shoulder from 10' to 8'. The current design of S.R. 369 includes two 12' wide travel lanes with a 10' shoulder with 4' paved. In R-7.0, it is proposed to reduce the width of the full shoulder from 10' to 8'. The paved portion remains as 4' wide. This alternative results in reduced clearing & grubbing and right-of-way acquisition, and provides a project cost savings of $42,000.

R-8.0 - Split Traffic During Construction to Reduce or Eliminate Temporary Shoring. An unspecified amount of temporary shoring estimated at $195,000 is included in the project concept report cost estimate. This shoring is to be used to keep new fill from the existing roadway during construction. In R-8.0, it is proposed to build the entire bridge and then to split the traffic with one lane on the new bridge and maintain one lane on the existing roadway. This proposal provides for adequate traffic control and simplifies construction staging, while saving an estimated $97,000 in construction costs.

R-9.0 - Utilize Permanent Easement in lieu of Right-of-Way Wherever Possible. The current design approach obtains commercial right-of-way for all areas required for constructing the project. In R-9.0, it is proposed to establish an 80' Right-of-way width for the roadway and only purchase Right-of-way within the 80' corridor. Areas required for construction outside of the 80' corridor would be designated as permanent easement. This is a common practice on GDOT projects and reduces project costs by approximately $358,000.

R-11.0 - Reduce Project Length on East Approach Roadway by 100 LF to Eliminate Right-of-Way Acquisition Parcel. Currently, the project ends at Sta 343+00 and encroaches on Parcel 8 requiring 0.035 Acres of right-of-way acquisition. It is proposed to end the project at Sta 342+00 and eliminate the final 100 feet of new pavement and the need for right-of-way acquisition from Parcel 8. The proposed alignment is matching the existing alignment both horizontally and vertically at Sta 342+00; thus ending the project at this point eliminates what appears to be unnecessary work and results in a cost savings of approximately $17,000.

R-12.0 - Use Reduced Depth Asphalt Shoulders in lieu of Full Depth. The current typical pavement section is designed with a 4' wide paved shoulder and it is a full-depth pavement section to match the adjacent road section. In R-12.0, it is proposed to reduce the depth of the paved shoulder to a section of 6" GAB, 4" asphalt base, and 1-1/2" surface course. This alternative provides a savings of approximately $35,000.

SUMMARY OF VALUE ENGINEERING PROPOSALS

Project # BRF00-0012-01(080) PI No. 122012-
SR 369 Over CHATTAHOOCHEE RIVER BRIDGE REPLACEMENT
FORSYTH/HALL COUNTY, GEORGIA

IDEA NO.	PROPOSAL DESCRIPTION	CONSTRUCTION SAVINGS	RELATED PROPOSALS
	Note: Brackets mean additional cost		
	BRIDGES/STRUCTURES (B)		
4.0	Reduce Number of Beams in End Spans from Seven (7) BT-74's to Six (6)	69,263	
	ROADWAY (R) .		
1.0	Shorten Approach Roadway on West Side of Project to Tie into S.R. 369 East of Brown Bridge Drive (New Bridge Remains on South Side of Existing Bridge)	638,069	Mutually exclusive with R-1.4
1.4	Construct New Bridge on North Side of Existing in lieu of South Side and Shorten Approach Length on West Side of Bridge	1,906,311	Mutually exclusive with R-1.0
5.0	Construct Retaining Wall from Sta 341+00 LT to Sta 343+50 LT to Reduce Right-of-Way Acquisition for Parcel 7	172,737	
7.0	Reduce Shoulder Width from 10' to 8'	42,359	
8.0	Split Traffic During Construction to Reduce Shoring	97,500	
9.0	Utilize Permanent Easement in lieu of Right-of-Way Wherever Possible	358,875	
11.0	Reduce Project Length on East Approach Roadway by 100 LF to Eliminate Right of Way Acquisition Parcel.	17,057	
12.0	Use Reduced Depth Asphalt Shoulders in lieu of Full-Depth	35,191	

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	B-4.0	PAGE NUMBER:	1 of 7

PROJECT #/PI #:	**BRF00-0012-01(080) / 122012-**
PROJECT TITLE:	**SR 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall Counties**

PROPOSAL DESCRIPTION: REDUCE NUMBERS OF BEAMS IN THE END SPANS FROM SEVEN (7) BT-74'S TO SIX (6).

ORIGINAL DESIGN: The original design uses continuous spliced Bulb-T girders; identified as Alternate B in the Structure Type Study (STS) with simple span approaches.

The span lengths proposed (and beam type) are as follows:
Spans 1 & 2 = 145' (7 - BT-74 beams)
Span 3 – 6 = 4 span continuous unit 185'-240'-240'-185' (continuous spliced Bulb-T girders, composed of BT-74 and variable depth (12-12.5 ft max) haunched sections over bents 4-6.
Span 7 & 8 = 145' (7 - BT-74 beams)
Length of bridge = 4 x 145 + 2 x 185 + 2 x 240 = 1430 ft

PROPOSED CHANGE: It is proposed to use 6 – BT-74 beams in the simple span approaches in lieu of the 7 beams as currently designed.

JUSTIFICATION: The fewer beams work according to the design charts in the GDOT Bridge Design Manual and provide a cost savings to the project.

ADVANTAGES:
- Saves beam placement time
- Saves Cost

DISADVANTAGES:
- None apparent

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 98,146		$ 98,146
PROPOSED CHANGE:	$ 28,883		$ 28,883
SAVINGS:	$ 69,263		$ 69,263

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	B-4.0	PAGE NUMBER:	2 of 7

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ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
AASHTO BT-74	1	ft	577.33	$ 170	$98,146
SUBTOTAL – COST TO PRIME					$98,146
MARKUP					Included
TOTAL CONTRACT COST					$98,146

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Deck Concrete	1	YD3	38.7	$ 600	$23,330
Reinforcing Steel	1	LBS	7,933	$ 0.70	$5,553
SUBTOTAL – COST TO PRIME					$28,883
MARKUP					Included
TOTAL CONTRACT COST					$28,883

Difference [Original-Proposed] **$69,263**

SOURCES

1. Project Cost Estimate
2. USC Estimate Database
3. GDOT Item Mean Summary
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER:	B-4.0	PAGE NUMBER:	3 of 7

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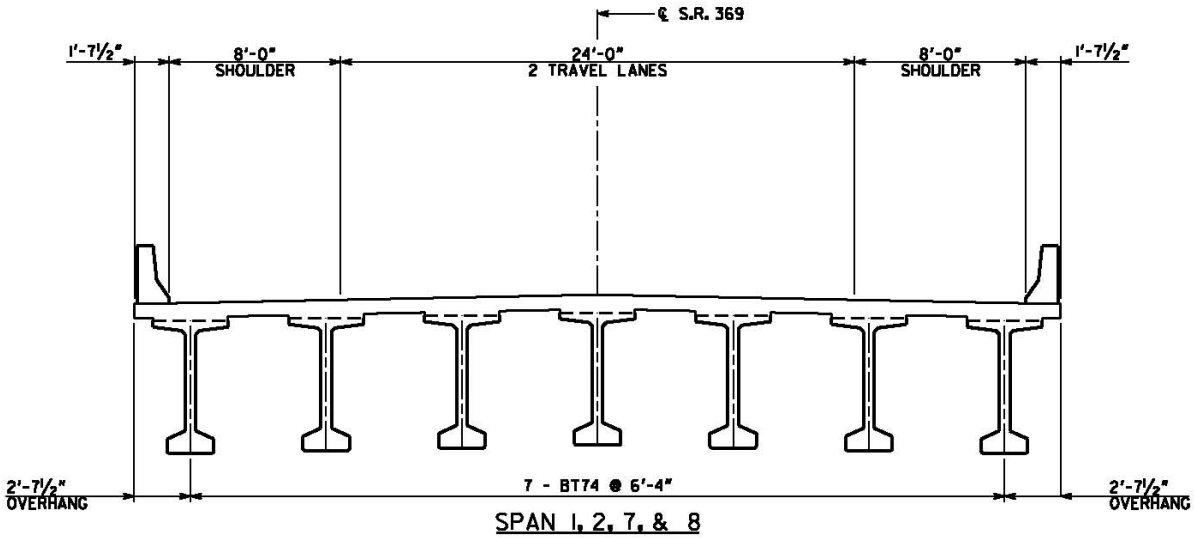

From:
Structures Type Study:
Substructure Alternates

PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER:	B-4.0	PAGE NUMBER:	4 of 7

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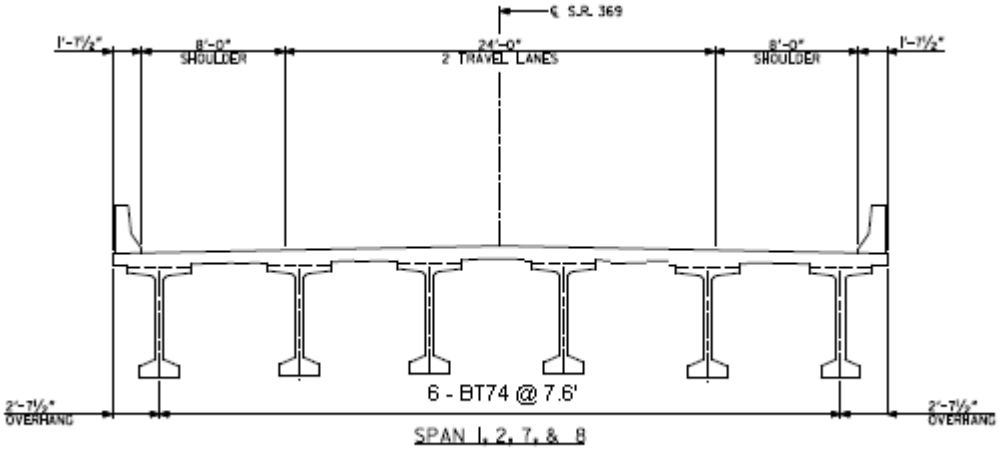
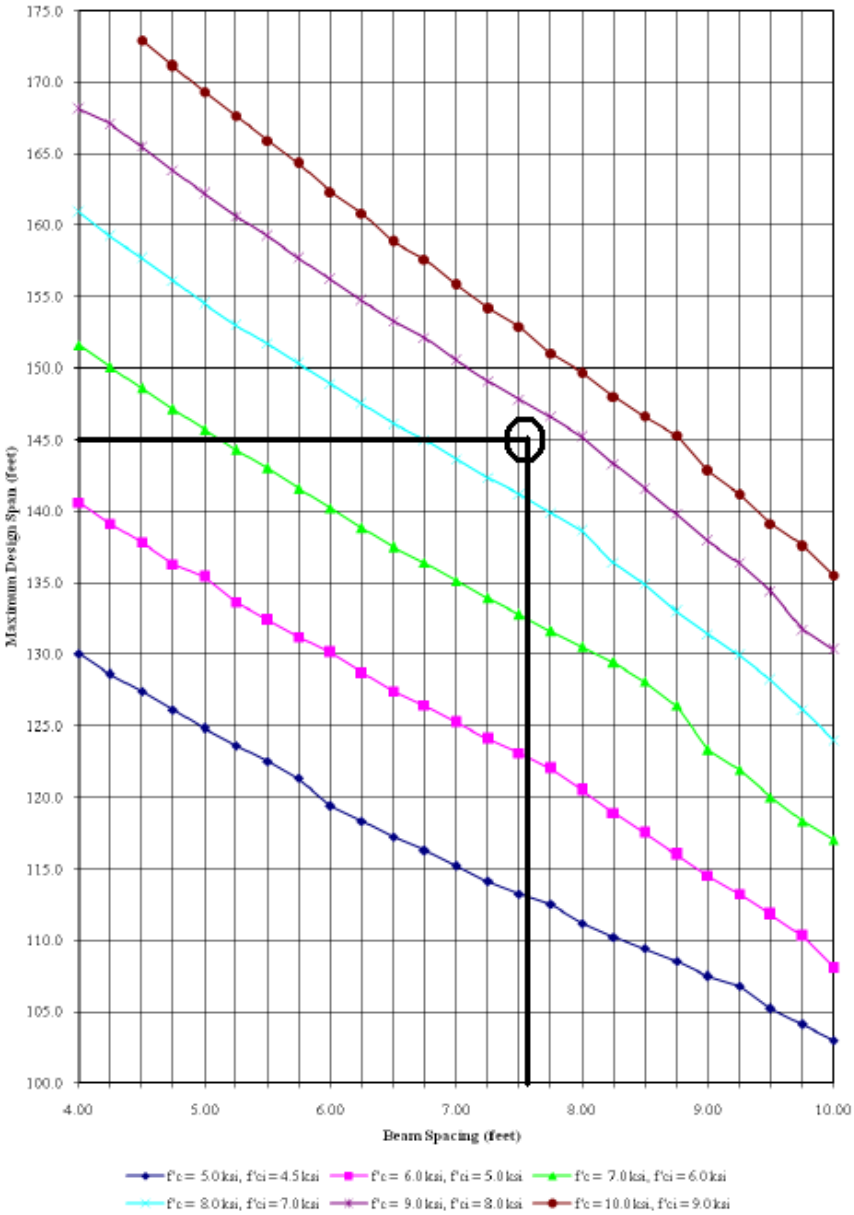


CALCULATIONS

PROPOSAL NUMBER:	B-4.0	PAGE NUMBER:	5 of 7

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

74" Bulb Tee Beam



From:
GDOT Bridge
Design Manual

Figure 3-11

All strands are .6" diameter low relaxation strands. The 4 top flange strands are stressed to 10,000 pounds each and all remaining strands are stressed to 43,943 pounds each.

CALCULATIONS

PROPOSAL NUMBER:	B-4.0	PAGE NUMBER:	6 of 7

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

From:
GDOT Bridge
Design Manual

Original Concept

Beam spacing = 6.333’ = 7 beams
Top flange of 74” BT = 3.5 ft

Slab thickness:
6.333-3.5/2 = 4.583’ effective slab

Slab Depth = 7.25”

Proposed Change

Beam spacing = 7.6’ = 6 beams
Top flange of 74” BT = 3.5 ft

Slab thickness:
7.6-3.5/2 = 5.85’ effective slab

Slab Depth = 7.75”

SERVICE LOAD DESIGN OF BRIDGE SLAB
Minimum slab thickness is 7"
Maximum main reinforcement spacing is 9"

Georgia Department of Transportation 19-OCT-07
Office of Bridge and Structural Design 16:53:08
May 2007

WHEEL LOAD (Kips)	fc (ksi)	fs (ksi)	n	SLAB COVER (in)	FUTURE PAVING (kips/ft^2)	CONTINUITY FACTOR
16.00	1.400	24.000	9	2.750	0.030	0.8

EFFECTIVE SPAN LENGTH (ft-in)	SLAB THICKNESS MINIMUM (in)	SLAB THICKNESS ACTUAL (in)	SIZE AND SPACING OF MAIN REINFORCEMENT (in)	DISTRIBUTION REINFORCEMENT MIDDLE HALF	DISTRIBUTION REINFORCEMENT OUTER QUARTERS
3- 6	6.8150	7.000	# 5 at 8.625	3-# 4	2-# 4
3- 7	6.8463	7.000	# 5 at 8.375	3-# 4	2-# 4
3- 8	6.8774	7.000	# 5 at 8.250	3-# 4	2-# 4
3- 9	6.9083	7.000	# 5 at 8.125	3-# 4	2-# 4
3-10	6.9391	7.000	# 5 at 8.000	3-# 4	2-# 4
3-11	6.9698	7.000	# 5 at 7.875	4-# 4	2-# 4
4- 0	7.0018	7.125	# 5 at 8.000	4-# 4	2-# 4
4- 1	7.0323	7.125	# 5 at 7.875	4-# 4	2-# 4
4- 2	7.0626	7.125	# 5 at 7.750	4-# 4	2-# 4
4- 3	7.0927	7.125	# 5 at 7.625	4-# 4	2-# 4
4- 4	7.1228	7.125	# 5 at 7.500	4-# 4	2-# 4
4- 5	7.1544	7.250	# 5 at 7.625	4-# 4	2-# 4
4- 6	7.1843	7.250	# 5 at 7.500	4-# 4	2-# 4
4- 7	7.2140	7.250	# 5 at 7.500	4-# 4	2-# 4
4- 8	7.2436	7.250	# 5 at 7.375	4-# 4	2-# 4
4- 9	7.2751	7.375	# 5 at 7.500	4-# 4	2-# 4
4-10	7.3045	7.375	# 5 at 7.375	5-# 4	4-# 4
4-11	7.3338	7.375	# 5 at 7.250	5-# 4	4-# 4
5- 0	7.3630	7.375	# 5 at 7.125	5-# 4	4-# 4
5- 1	7.3943	7.500	# 5 at 7.250	5-# 4	4-# 4
5- 2	7.4234	7.500	# 5 at 7.125	5-# 4	4-# 4
5- 3	7.4524	7.500	# 5 at 7.000	5-# 4	4-# 4
5- 4	7.4812	7.500	# 5 at 7.000	5-# 4	4-# 4
5- 5	7.5124	7.625	# 5 at 7.000	5-# 4	4-# 4
5- 6	7.5412	7.625	# 5 at 7.000	5-# 4	4-# 4
5- 7	7.5698	7.625	# 5 at 6.875	6-# 4	4-# 4
5- 8	7.5984	7.625	# 5 at 6.750	6-# 4	4-# 4
5- 9	7.6295	7.750	# 5 at 6.875	6-# 4	4-# 4
5-10	7.6579	7.750	# 5 at 6.750	6-# 4	4-# 4
5-11	7.6863	7.750	# 5 at 6.750	6-# 4	4-# 4
6- 0	7.7145	7.750	# 5 at 6.625	6-# 4	4-# 4
6- 1	7.7427	7.750	# 5 at 6.500	6-# 4	4-# 4
6- 2	7.7738	7.875	# 5 at 6.625	6-# 4	4-# 4
6- 3	7.8019	7.875	# 5 at 6.500	6-# 4	4-# 4
6- 4	7.8299	7.875	# 5 at 6.500	7-# 4	4-# 4
6- 5	7.8578	7.875	# 5 at 6.375	7-# 4	4-# 4

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CALCULATIONS

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From the Cost estimate backup for Alternate B:

205#/yd3 was used for pounds of reinforcing steel per cubic yard of superstructure concrete

Unit Pricing for the following items:

Deck Concrete = $600/yd3
Reinforcing Steel = $0.70/pound

AASHTO BT74 = $170/ft

Additional Concrete and Rebar Calculations:

Difference in thickness = 0.5”

Volume of additional deck = 4 spans x 145 ft long x 43.25 ft wide x 0.5”/12
= 1045.2 ft3
= 38.7 yd3

Additional rebar = 38.7 yd3 x 205 #/yd3 = 7,933 #

Beam length Reduction

Say 145 ft span – 2*(1 ft offset to cl bearing) + 2 *8”/12 for cl bearing to end of beam = 144.33 ft

144.33 ft/beam x 1 beam /span x 4 spans = 577.33 ft

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-1.0	PAGE NUMBER:	1 of 6

PROJECT #/PI #:	**BRF00-0012-01(080) / 122012-**
PROJECT TITLE:	**SR 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall Counties**

PROPOSAL DESCRIPTION:	SHORTEN APPROACH ROADWAY ON WEST SIDE OF PROJECT TO TIE INTO S.R. 369 EAST OF BROWN BRIDGE DRIVE.

ORIGINAL DESIGN: In the current design, the approach roadway on West side goes from Sta 301+50 to Sta 314+70 (1,320 LF) using a horizontal curve with a radius of 1074 feet, a superelevation rate of 6% and includes improvements at the intersection of Brown Bridge Drive. A design variance is required for intersection sight distance at Brown Bridge Drive due to the proposed retaining wall on the right side of S.R. 369. Stopping sight distance is 360 feet (minimum required for 45 mph) with the proposed wall on the right side of the roadway.

PROPOSED CHANGE: It is proposed to use a 940 foot radius curve with a superelevation rate of 6% meeting the required 45 mph speed design for the West side approach roadway and reduce the approach length to 800 LF and eliminate the improvements to the intersection at Brown Bridge Drive. The proposed wall will be offset an additional 2 feet to maintain a stopping sight distance of 360 feet.

JUSTIFICATION: As referenced in the project draft Concept Report, AASHTO allows a curve radius of 643 feet using a superelevation rate of 6% for a 45 mph speed design. A curve with a radius of 940 feet exceeds the AASHTO requirements.

ADVANTAGES:

- Reduces roadway paving cost
- Reduces wall cost
- Reduces earthwork cost
- Reduces right of way cost
- Variance for intersection sight distance is not required
- Less disruption to property owners on Brown Bridge Drive

DISADVANTAGES:

- None apparent

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 1,070,506		$ 1,070,506
PROPOSED CHANGE:	$ 432,437		$ 432,437
SAVINGS:	$ 638,069		$ 638,069

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-1.0	PAGE NUMBER:	2 of 6

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Sta 301+50 to Sta 306+70 Asphalt Pavement	7	SY	1,849	$41.51	$76,752
Brown Bridge Dr Pavement	1/7	SY	560	$41.51	$23,246
Sta 301+50 to Sta 306+70 Tie Back Wall	1	SF	2500	$100.00	$250,000
Sta 301+50 to Sta 306+70 Right of Way	1/7	AC	See Calc Sheet	See Calc Sheet	$183,320
Grading Complete	1	LS	LS	$537,188	$537,188
SUBTOTAL – COST TO PRIME					$1,070,506
MARKUP					--
TOTAL CONTRACT COST					**$1,070,506**

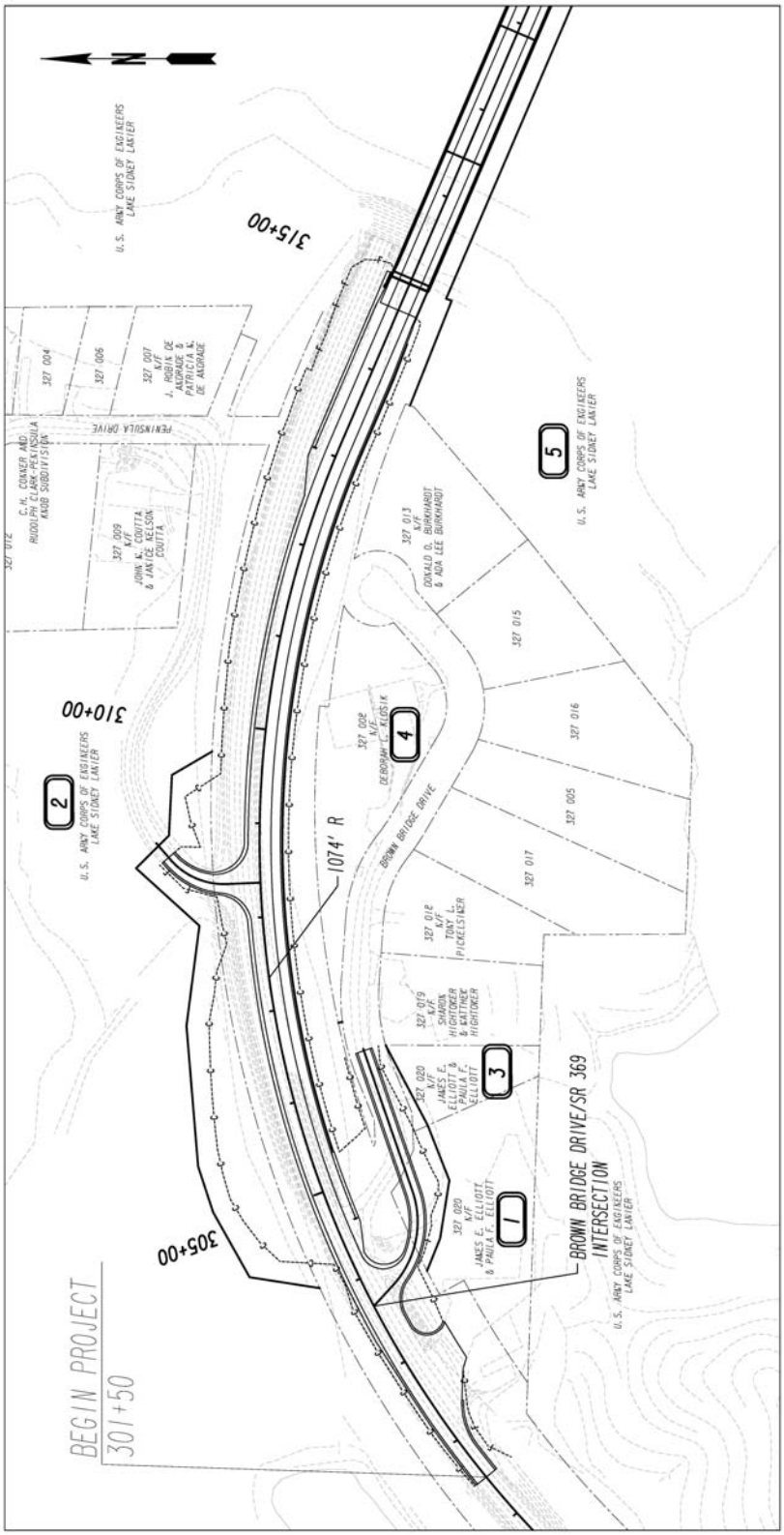
PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Sta 301+50 to Sta 306+70 Asphalt Pavement	7	SY	0	$41.51	$0
Brown Bridge Dr Pavement	1/7	SY	0	$41.51	$0
Sta 301+50 to Sta 306+70 Tie Back Wall	1	SF	0	$100.00	$0
Sta 301+50 to Sta 306+70 Right of Way	1/7	AC	0	See Calc Sheet	$0
Grading Complete	1	LS	LS	$432,437	$432,437
SUBTOTAL – COST TO PRIME					$432,437
MARKUP					--
TOTAL CONTRACT COST					$432,437

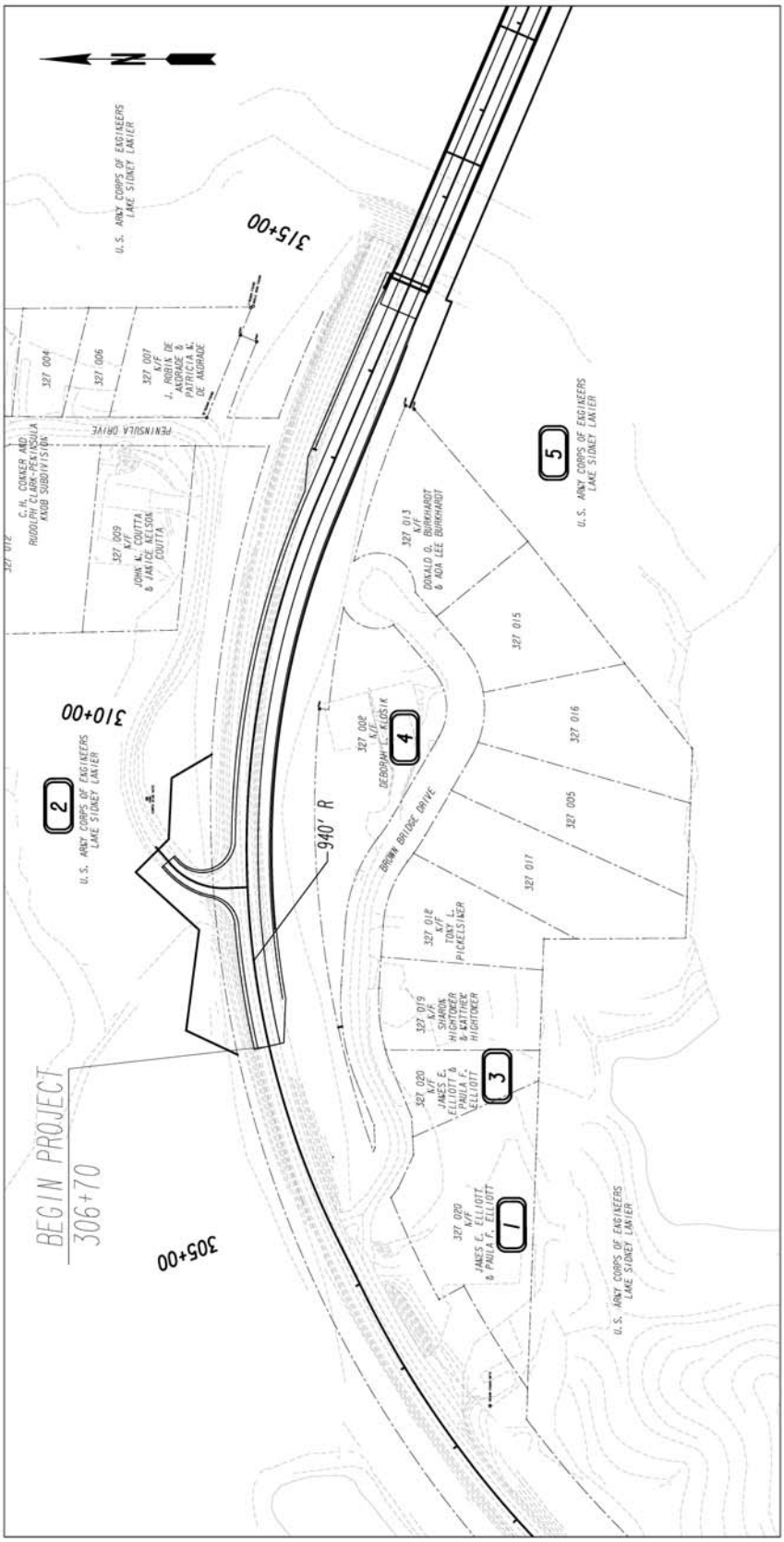
Difference [Original-Proposed] **$638,069**

SOURCES

1. Project Cost Estimate
2. USC Estimate Database
3. GDOT Item Mean Summary
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Attached Calculation Sheet



R-1.0 Original Design
1 of 1



R-1.0 Proposed Change
1 of 1

CALCULATIONS

PROPOSAL NUMBER:	R-1.0	PAGE NUMBER:	5 of 6

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Current Design Pavement Cost Calculations:
310-1101: 12” GAB = 0.68 tons/SY x $20.56/ton = $13.98/SY
402-3121: 4” Asph 25MM = (4”)(110#sy-in/2000#)($64.09/T) = $14.10/SY
402-3190: 2” Asph 19MM = (2”)(110#sy-in/2000#)($70.80/T) = $7.79/SY
402-3113: 1.5” Asph 12.5MM = (1.5”)(110#sy-in/2000#)($65.98/T) = $5.44/SY
413-1000: 2 layers tack coat = $0.10/SY/layer x 2 = $0.20
Total pavement cost = **$41.51/SY**

Commercial R/W Cost Calculations:
$250,000/ac for property (Draft Concept Report ROW Estimate)
$432,000/ac if complete parcel is eliminated (ROW Cost Estimate Summary by VE Team based on 1 Ac @ $250,000)

Residential R/W Cost Calculations:
$100,000/ac for property (Draft Concept Report ROW Estimate)
$207,000 /ac if complete parcel is eliminated (ROW Cost Estimate Summary by VE Team based on 1 Ac @ $100,000)

S.R. 369 Pavement Costs:
Sta 306+70 – 301+50 = 520 LF less pavement
Two lane pavement width = 4+12+12+4 = 32 Ft
32’ x 520’ = 16640 SF / 9 = 1849 SY Reduction
1849SY x $41.51 = $76,752

Grading Complete:
Total roadway length = 2680 LF
Reduced roadway length = 520 LF reduction in roadway length
520/2680 = 19.5% reduction in grading complete
19.5% of $537,188 (Grading Complete)= $104,751
$537,188 - $104,751 = $432,437

Brown Bridge Drive Pavement Costs:
Assume 18’ wide
18’ x 280LF = 5040SF / 9 = 560SY Reduction
560SY x $41.51 = $23,246

CALCULATIONS

PROPOSAL NUMBER:	R-1.0	PAGE NUMBER:	6 of 6

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Wall Reduction:
Shorten by 250’ (Scaled)
Avg Height = 10’ (Assumed)
250LF x 10’ = 2500 SF Reduction
2500SF x $100/SF = $250,000

R/W Reductions/Eliminations:
Parcel 1 = 0.12 ac Comm eliminated
0.12 ac x $432,000 = $51,840

Parcel 2 = 0.41 ac Comm reduced
0.41 ac x $250,000 = $102,500

Parcel 3 = 0.14ac Residential eliminated
0.14 ac x $207,000 = $28,980

Total R/W reduction = $183,320

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-1.4	PAGE NUMBER:	1 of 8

PROJECT #/PI #:	**BRF00-0012-01(080) / 122012-**
PROJECT TITLE:	**SR 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall Counties**

PROPOSAL DESCRIPTION: CONSTRUCT NEW BRIDGE ON NORTH SIDE OF EXISTING IN LIEU OF SOUTH SIDE AND SHORTEN APPROACH LENGTH ON WEST SIDE OF BRIDGE.

ORIGINAL DESIGN: In the current design, the new bridge is to be constructed on the South side of the existing bridge.

PROPOSED CHANGE: It is proposed to construct the new bridge on the North side of the existing bridge.

JUSTIFICATION: Locating the new bridge on the North side allows for quicker tie-ins to the existing roadway and shortens the project length (project can begin at Sta 310+00 in lieu of current Sta 301+50). This design meets current GDOT and AASHTO policies, and does not preclude future widening of S.R. 369. Also, the design variance for intersection sight distance at Brown Bridge Drive is eliminated.

ADVANTAGES:

- Allows for quicker tie-ins and shortens project length
- Reduces required wall lengths
- Reduces Right of Way cost
- Design Variance for intersection sight distance is not required
- Less disruption to property owners on Brown Bridge Drive

DISADVANTAGES:

- None apparent

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 2,917,537		$ 2,917,537
PROPOSED CHANGE:	$ 1,011,226		$ 1,011,226
SAVINGS:	$ 1,906,311		$ 1,906,311

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-1.4	PAGE NUMBER:	2 of 8

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Sta 301+50 to Sta 310+00 Asphalt Pavement	7	SY	3022	$41.51	$125,443
Brown Bridge Dr Pavement	1/7	SY	560	$41.51	$23,246
Sta 305+40 to Sta 314+40 Right Retaining Wall	1	SF	17755	$100.00	$1,775,000
Sta 301+50 to Sta 310+00 Right of Way	1/7	AC	See Calc Sheet	See Calc Sheet	$456,660
Grading Complete	1	LS	LS	$537,188	$537,188
SUBTOTAL – COST TO PRIME					$2,917,537
MARKUP					--
TOTAL CONTRACT COST					$2,917,537

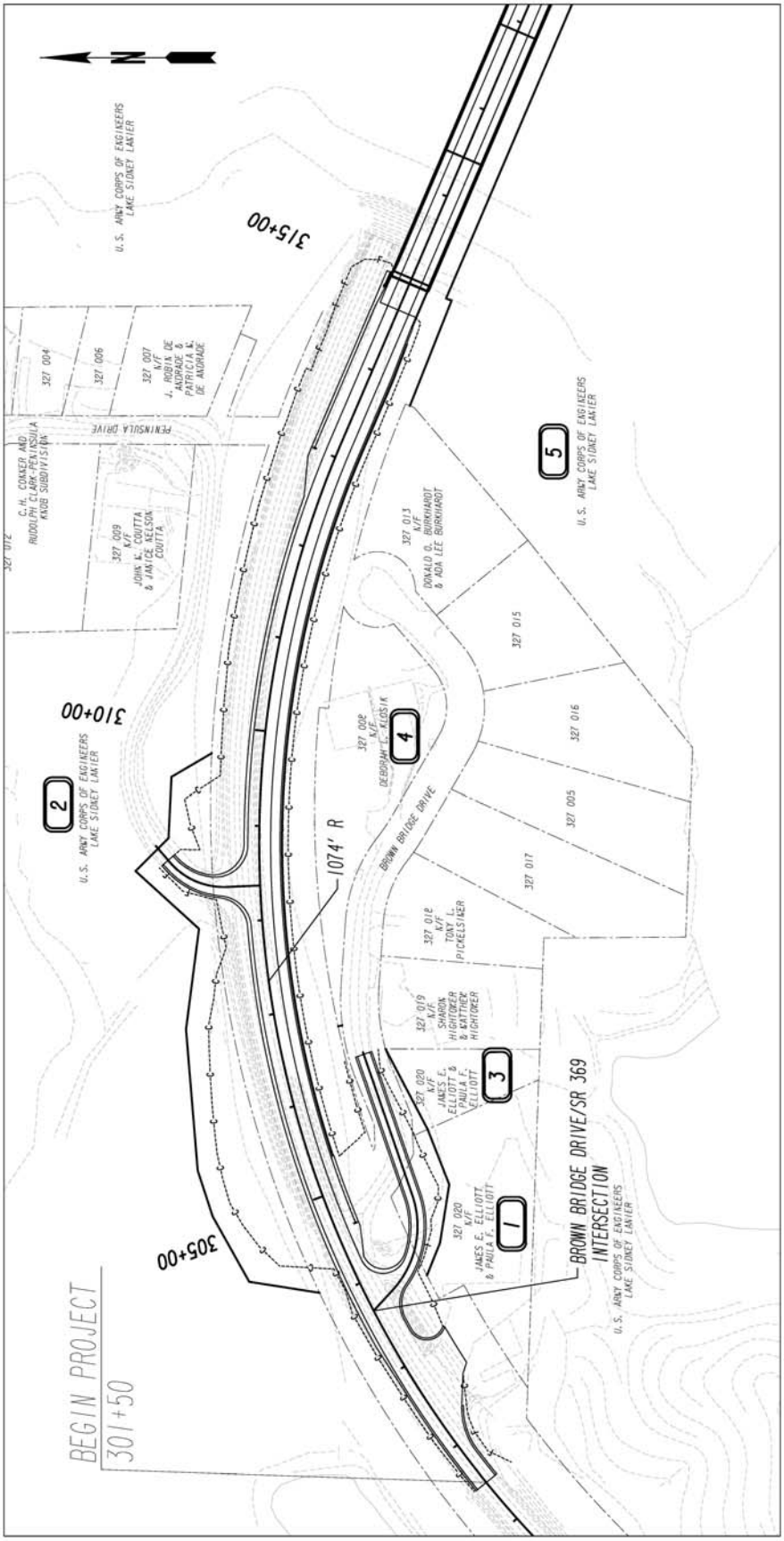
PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Sta 301+50 to Sta 310+00 Asphalt Pavement	7	SY	0	$41.51	$0
Brown Bridge Dr Pavement	1/7	SY	0	$41.51	$0
Sta 310+90 to Sta 314+40 Left Retaining Wall	1	SF	5250	$100.00	$525,000
Sta 301+50 to Sta 310+00 Right of Way	1/7	AC	See Calc Sheet	See Calc Sheet	$116,640
Grading Complete	1/7	LS	LS	$369,586	$369,586
SUBTOTAL – COST TO PRIME					$1,011,226
MARKUP					--
TOTAL CONTRACT COST					$1,011,226

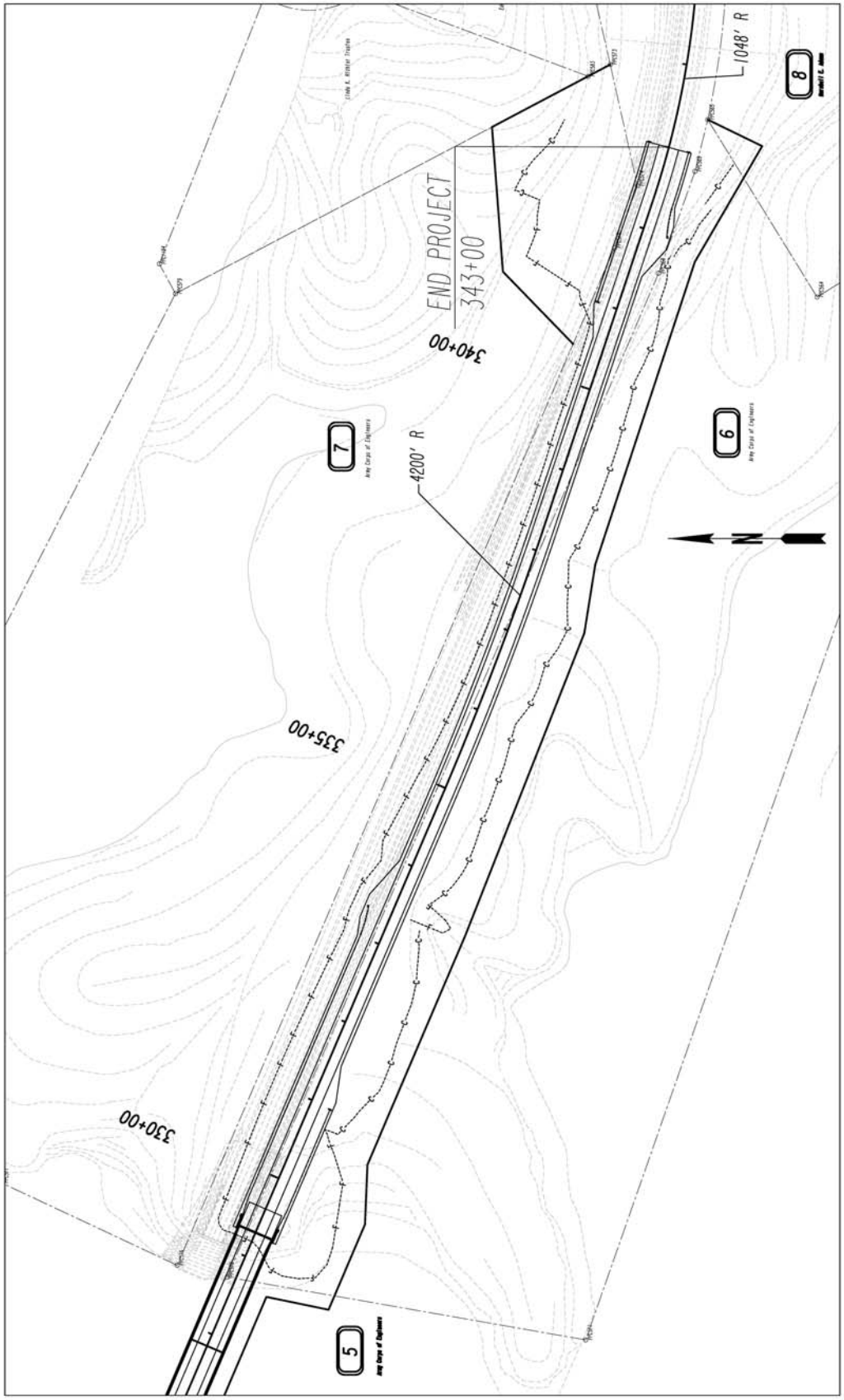
Difference [Original-Proposed] **$1,906,311**

SOURCES

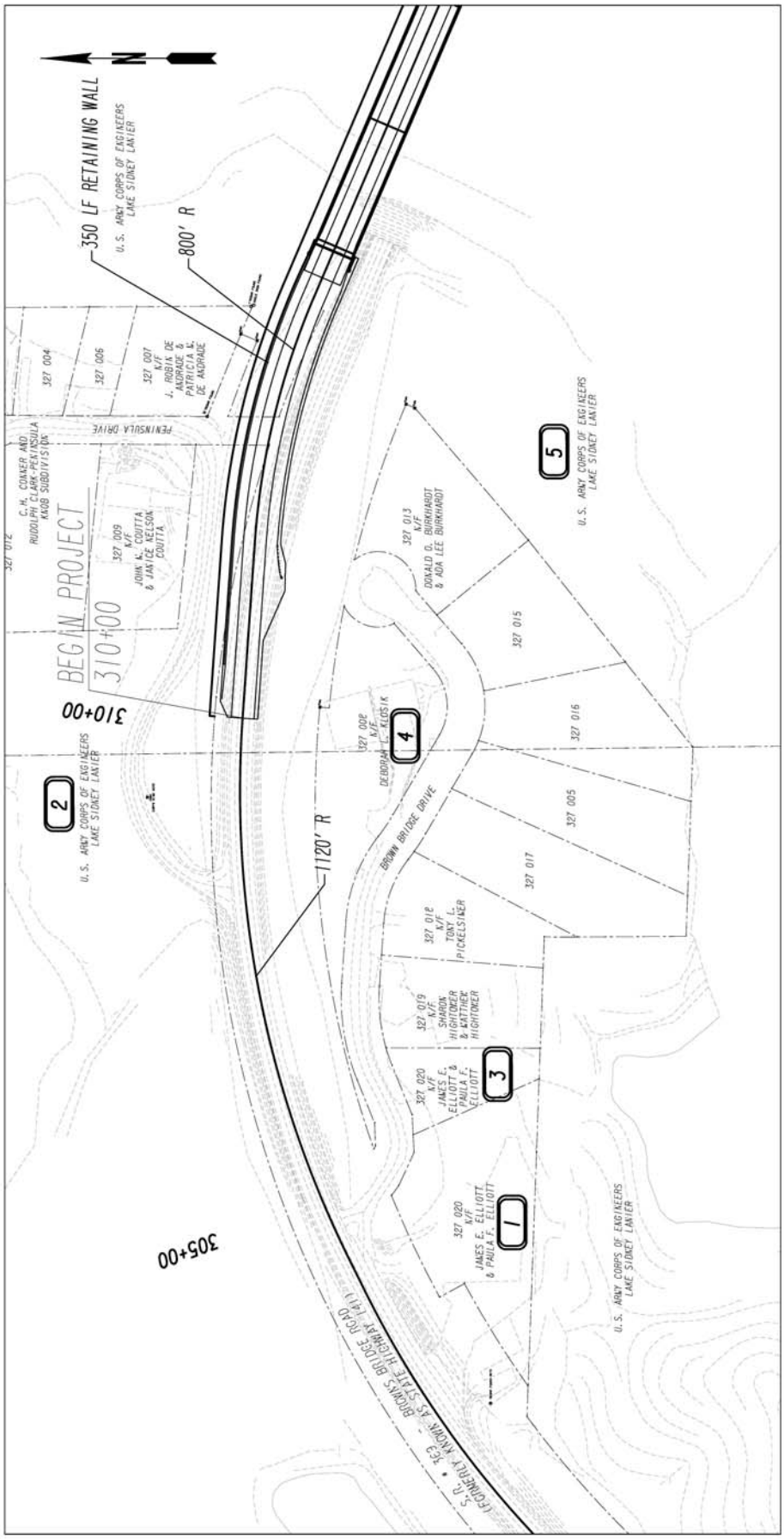
1. Project Cost Estimate
2. USC Estimate Database
3. GDOT Item Mean Summary
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Attached Calculation Sheet



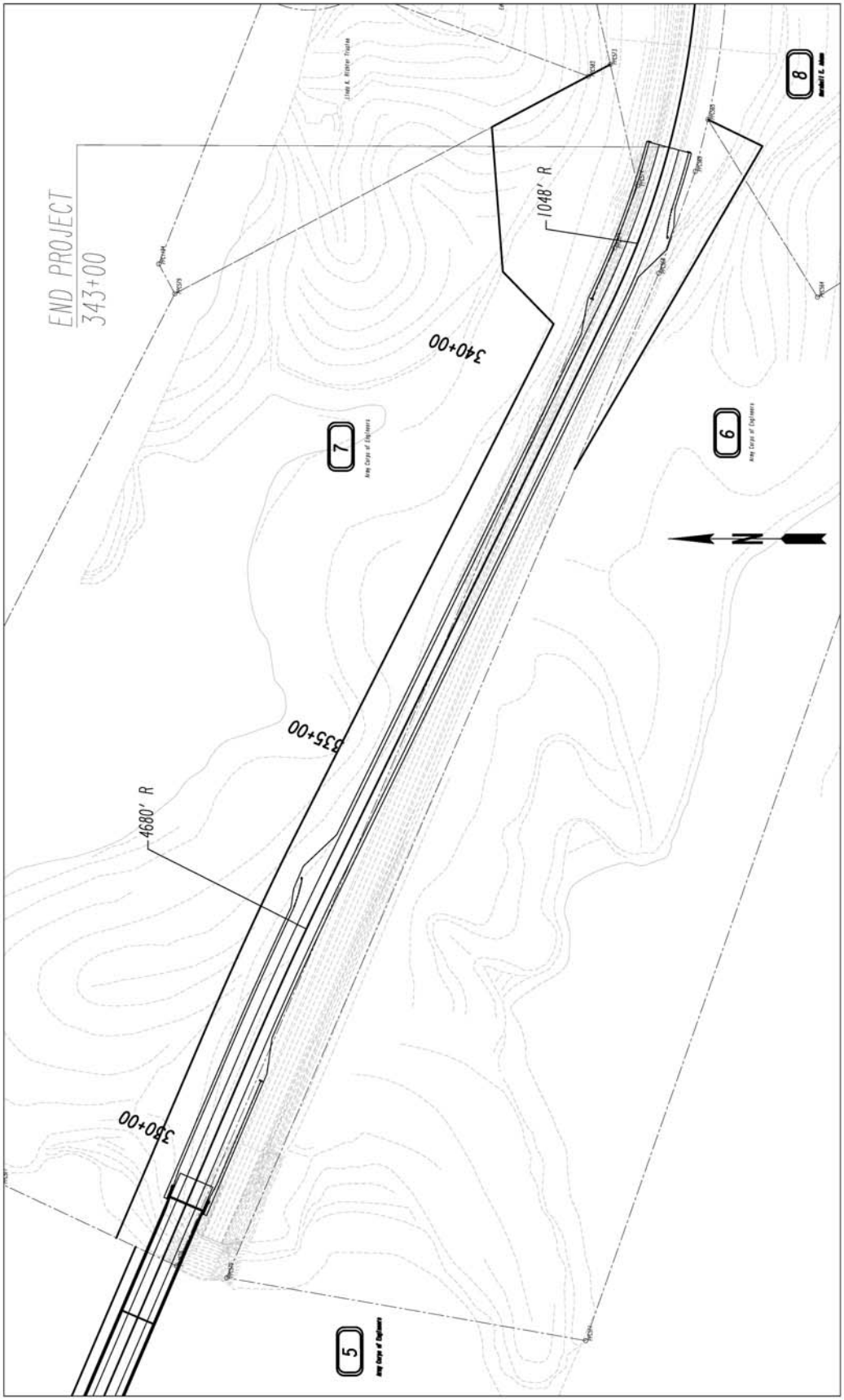
R-1.4 Original Design
1 of 2



R-1.4 Original Design
2 of 2



R-1.4 Proposed Change
1 of 2



R-1.4 Proposed Change
2 of 2

CALCULATIONS

PROPOSAL NUMBER:	R-1.4	PAGE NUMBER:	7 of 8

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Current Design Pavement Cost Calculations:
310-1101: 12” GAB = 0.68 tons/SY x $20.56/ton = $13.98/SY
402-3121: 4” Asph 25MM = (4”)(110#sy-in/2000#)($64.09/T) = $14.10/SY
402-3190: 2” Asph 19MM = (2”)(110#sy-in/2000#)($70.80/T) = $7.79/SY
402-3113: 1.5” Asph 12.5MM = (1.5”)(110#sy-in/2000#)($65.98/T) = $5.44/SY
413-1000: 2 layers tack coat = $0.10/SY/layer x 2 = $0.20
Total pavement cost = **$41.51/SY**

Commercial R/W Cost Calculations:
$250,000/ac for property (Draft Concept Report ROW Estimate)
$432,000/ac if complete parcel is eliminated (ROW Cost Estimate Summary by VE Team based on 1 Ac @ $250,000)

Residential R/W Cost Calculations:
$100,000/ac for property (Draft Concept Report ROW Estimate)
$207,000 /ac if complete parcel is eliminated (ROW Cost Estimate Summary by VE Team based on 1 Ac @ $100,000)

SR 369 Pavement Cost Reduction:
Sta 310+00 – 301+50 = 850 LF less pavement
Two lane pavement width = 4+12+12+4 = 32 Ft
32’ x 850’ = 27200 SF / 9 = 3022 SY Reduction
3022 SY x $41.51 = $125,443

Grading Complete – Proposed Change:
Total roadway length = 2680 LF
Reduced roadway length = 850 LF reduction in roadway length
850/2680 = 31.2% reduction in grading complete
31.2% of $537,188 (Grading Complete)= $167,602
$537,188 - $167,602 = $369,586

(Note: Approach pavement on east side with bridge constructed on the north side is approximately equal to approach pavement with bridge constructed on the south side and therefore no adjustments were made)

CALCULATIONS

PROPOSAL NUMBER:	R-1.4	PAGE NUMBER:	8 of 8

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Brown Bridge Drive Pavement Reductions:
Assume 18' wide
18' x 280LF = 5040SF / 9 = 560SY Reduction
560SY x $41.51 = $23,246

Proposed Change Wall Quantity (between S.R. 369 and Peninsula Drive):
Sta 310+90 left, to 314+40 left = 350 LF, Avg height = 15'
350 LF x 15' = 5250 SF
5250 SF x $100/SF = $525,000

ROW Reductions/Eliminations:
Parcel 1 = 0.12 ac Comm eliminated
0.12 ac x $432,000 = $51,840

Parcel 2 = 0.70 ac Comm eliminated
0.70 ac x $432,000 = $302,400

Parcel 3 = 0.14ac Res eliminated
0.14 ac x $207,000 = $28,980

Parcel 4 = 0.17ac Comm eliminated
0.17 ac x $432,000 = $73,400

Total R/W reduction = $456,660

Parcel 2 = 0.27 ac Comm added
0.27 ac x $432,000 = $116,640

Total R/W addition = $116,640

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-5.0	PAGE NUMBER:	1 of 11

PROJECT #/PI #:	**BRF00-0012-01(080) / 122012-**
PROJECT TITLE:	**SR 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall Counties**

PROPOSAL DESCRIPTION: CONSTRUCT RETAINING WALL FROM STA 341+00 LEFT TO STA 343+50 LEFT TO REDUCE RIGHT OF WAY IMPACTS TO PARCEL 7, U.S. ARMY CORPS OF ENGINEERS.

ORIGINAL DESIGN: The current typical section from Sta 341+00 Left to Sta 343+50 Left shows a widened shoulder with guardrail and 2:1 fill slopes.

PROPOSED CHANGE: It is proposed to construct a wall at the shoulder break point to reduce right of way impacts on Parcel 7.

JUSTIFICATION: Proposed change meets current GDOT and AASHTO policies while also providing a cost savings to the project.

ADVANTAGES:
- Reduces right of way cost
- Reduces earthwork cost
- Reduces clearing area

DISADVANTAGES:
- Increases wall cost

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 900,068		$ 900,068
PROPOSED CHANGE:	$ 727,331		$ 727,331
SAVINGS:	$ 172,737		$ 172,737

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-5.0	PAGE NUMBER:	2 of 11

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Sta 341+00 to Sta 343+50 Right of Way, Parcel 7	1/7	AC	See Calc Sheet	See Calc Sheet	$362,880
210-0100 Grading Complete	1	LS	LS	$537,188	$537,188
SUBTOTAL – COST TO PRIME					$900,068
MARKUP					--
TOTAL CONTRACT COST					**$900,068**

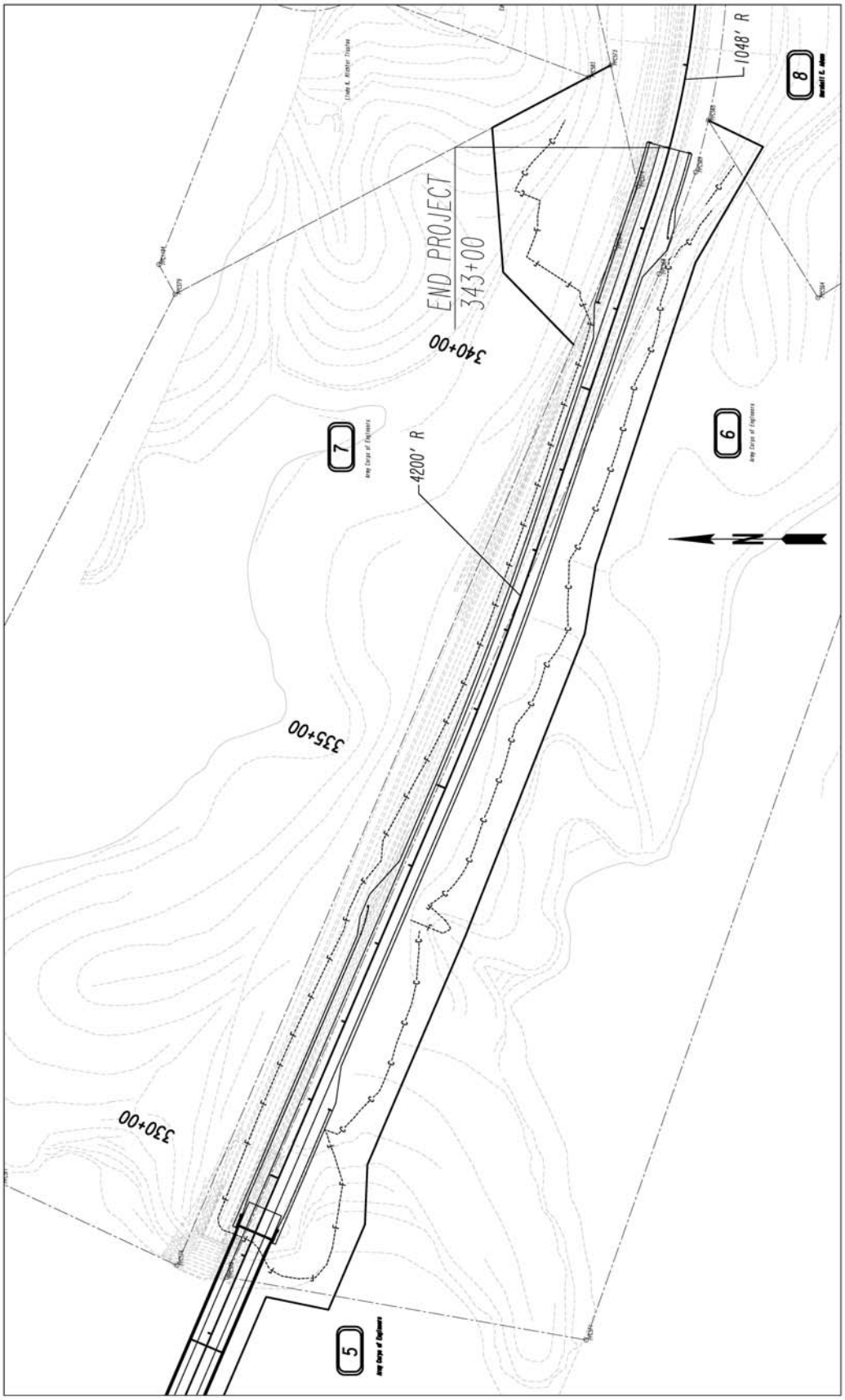
PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Sta 341+00 to Sta 343+50 Right of Way, Parcel 7	1/7	AC	See Calc Sheet	See Calc Sheet	$170,380
210-0100 Grading Complete	1	LS	LS		$521,202
Sta 341+00 to Sta 343+50 500-3200 Class B Conc	3/7	CY	85	$420.58	$35,749
SUBTOTAL – COST TO PRIME					$727,331
MARKUP					--
TOTAL CONTRACT COST					**$727,331**

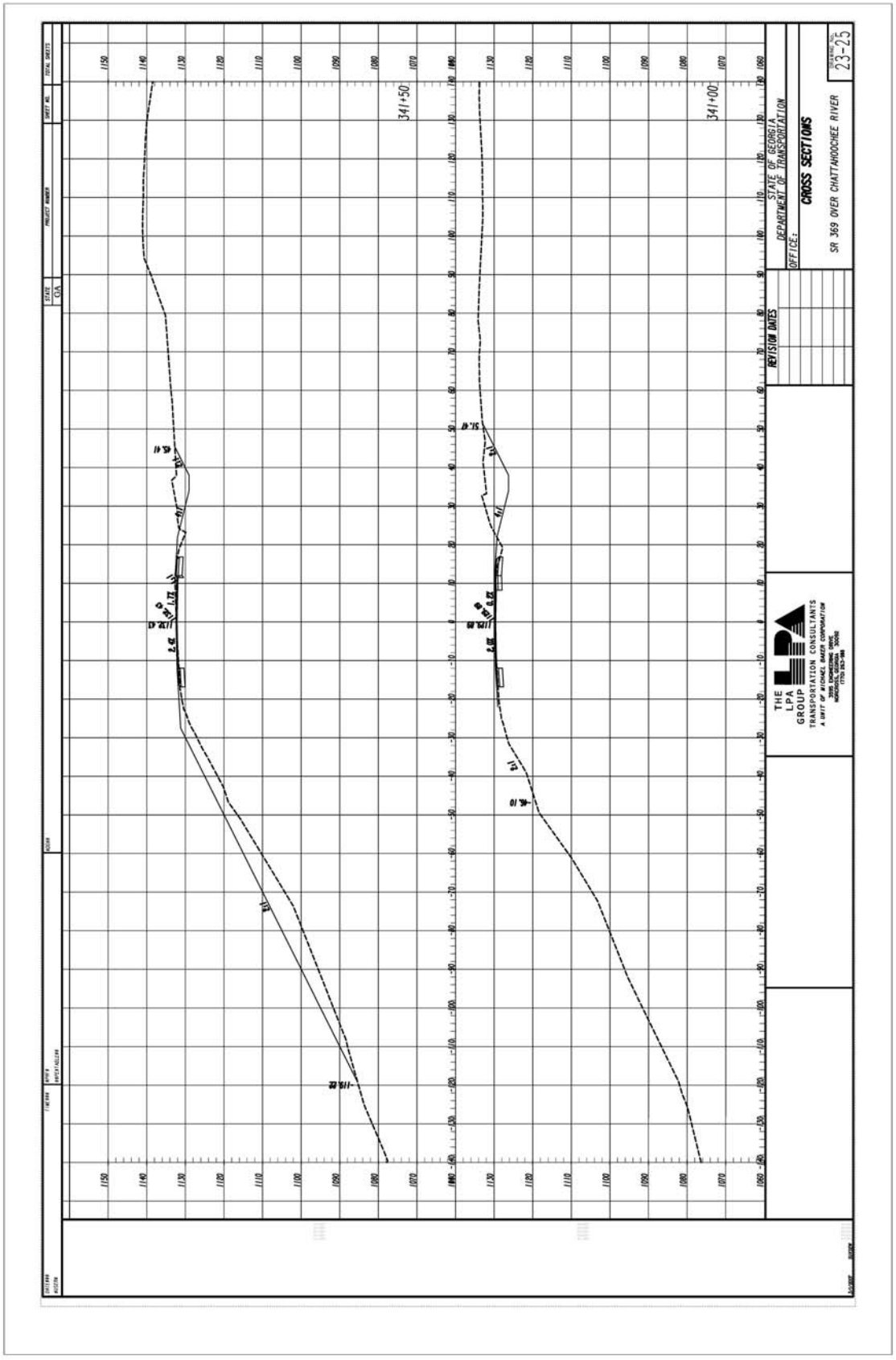
Difference [Original-Proposed] **$172,737**

SOURCES

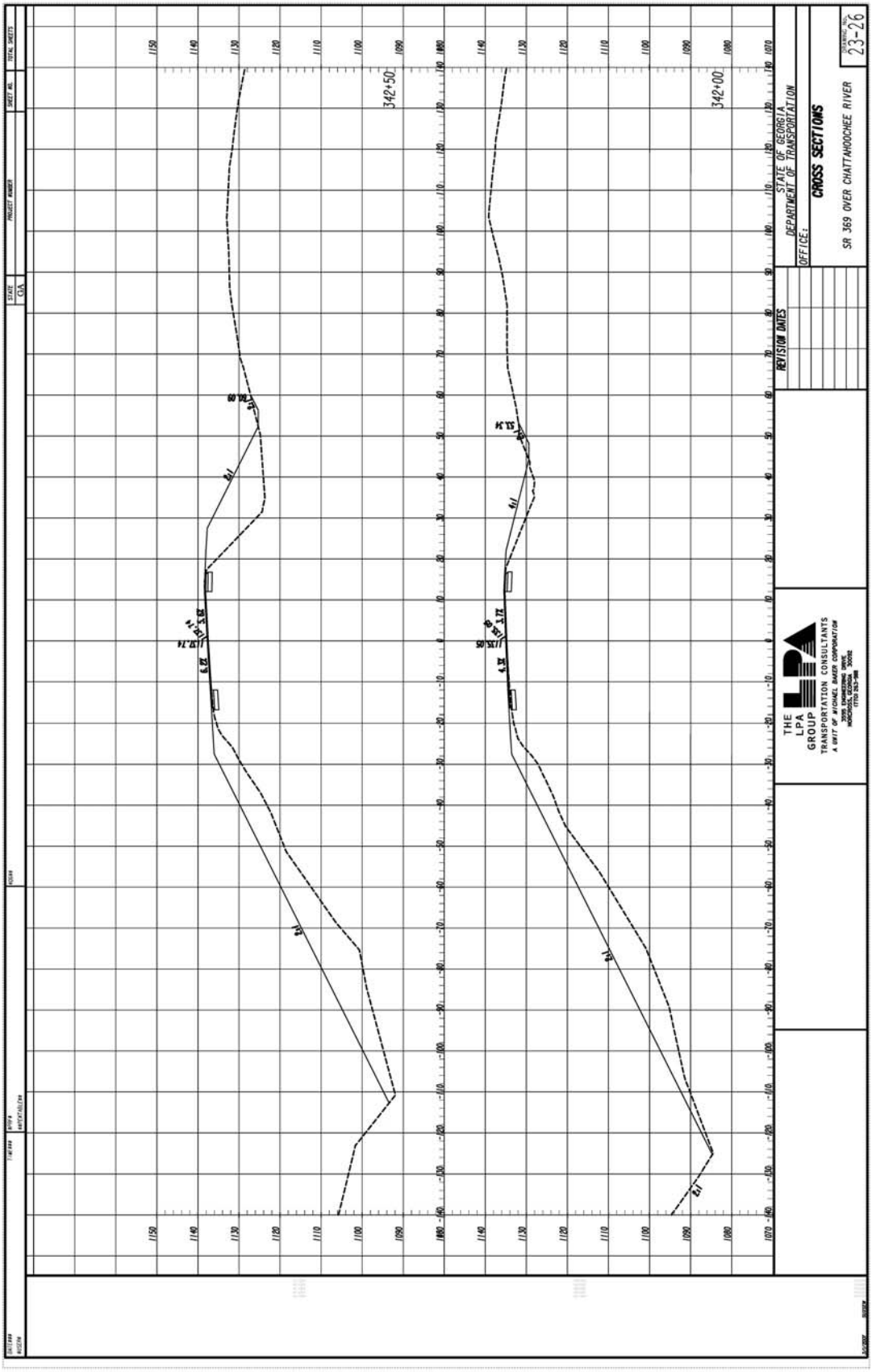
1. Project Cost Estimate
2. USC Estimate Database
3. GDOT Item Mean Summary
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Attached Calculation Sheet



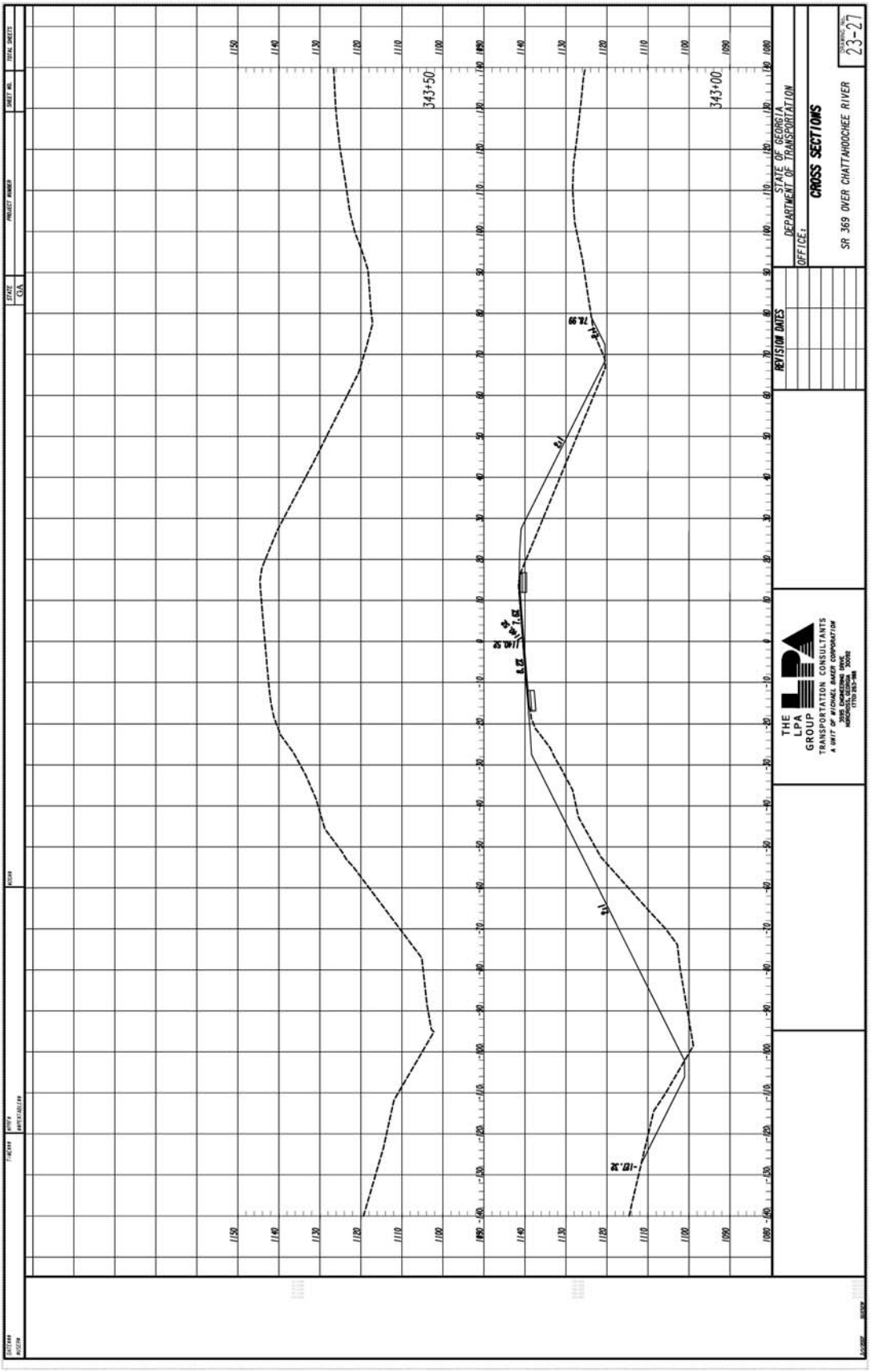
R-5.0 Original Design
1 of 4



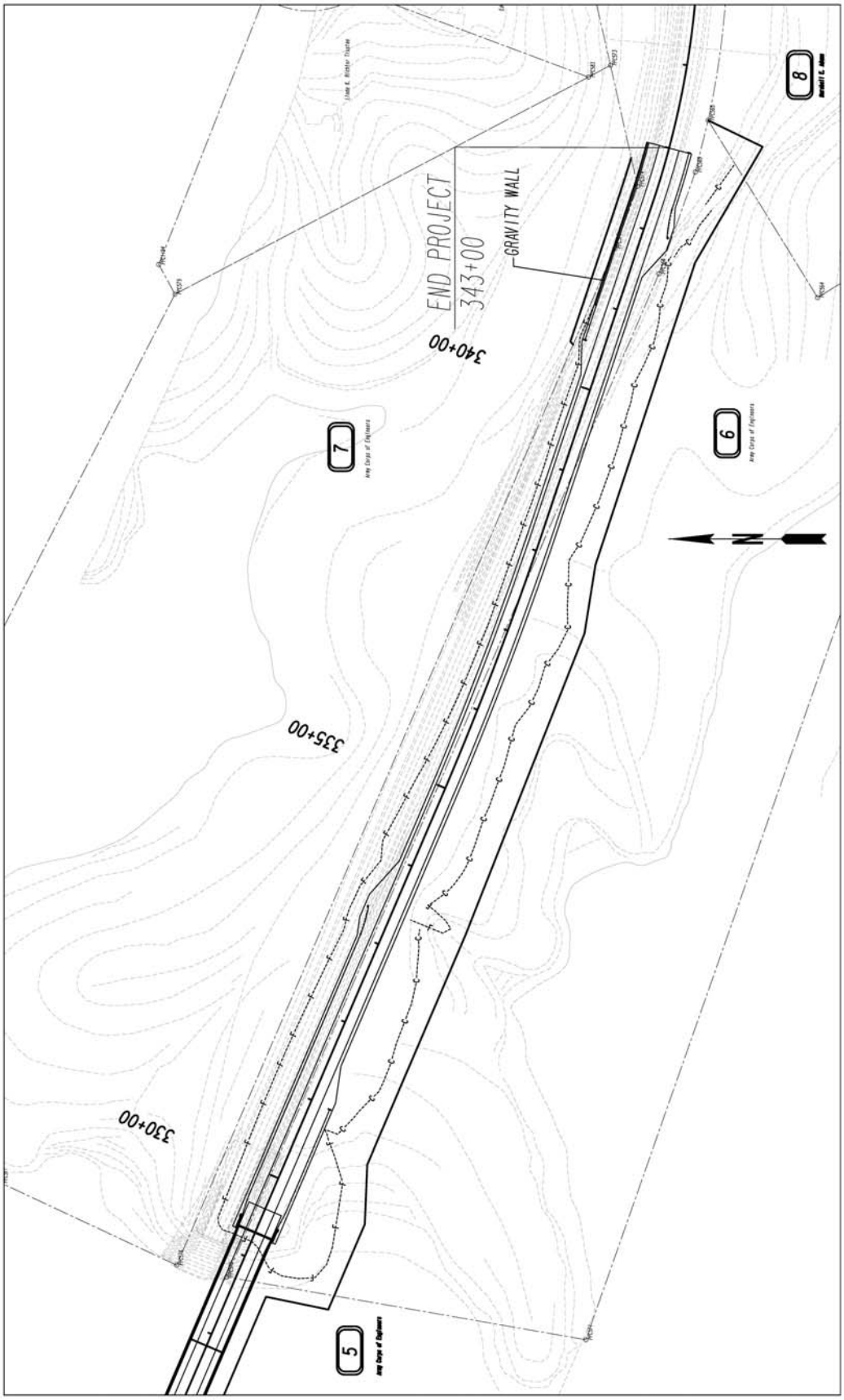
R-5.0 Original Design
2 of 4



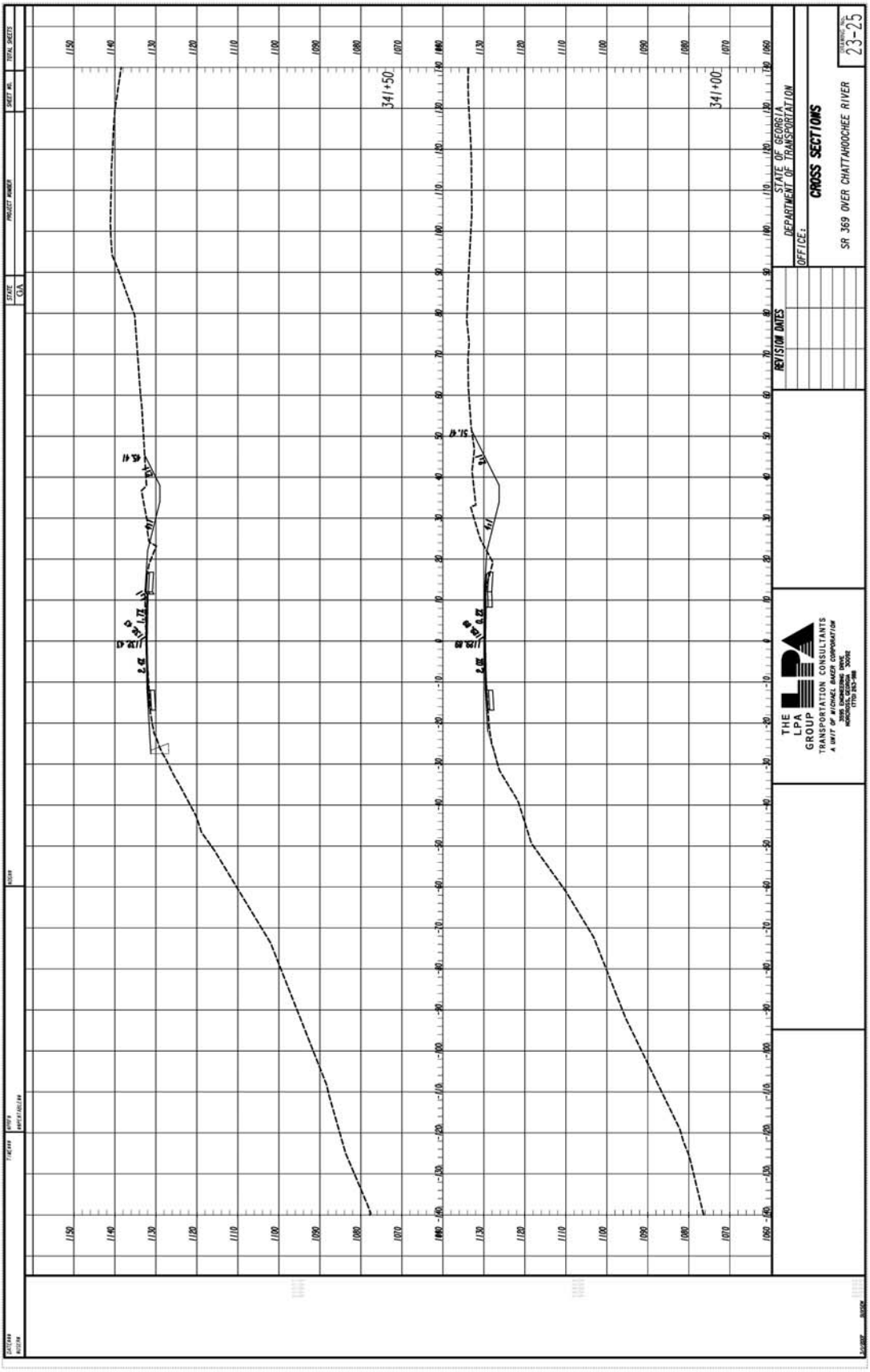
R-5.0 Original Design
3 of 4



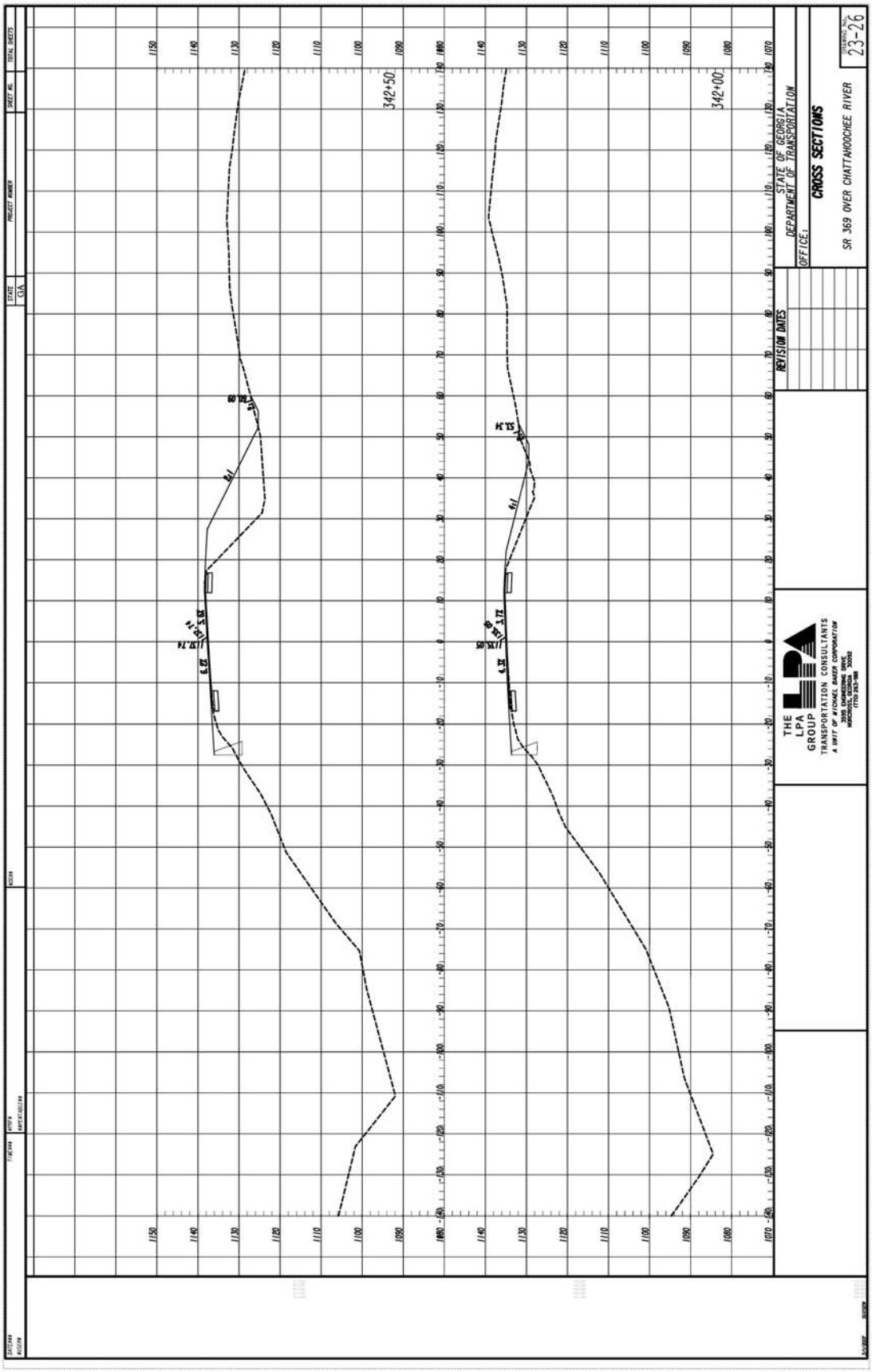
R-5.0 Original Design
4 of 4



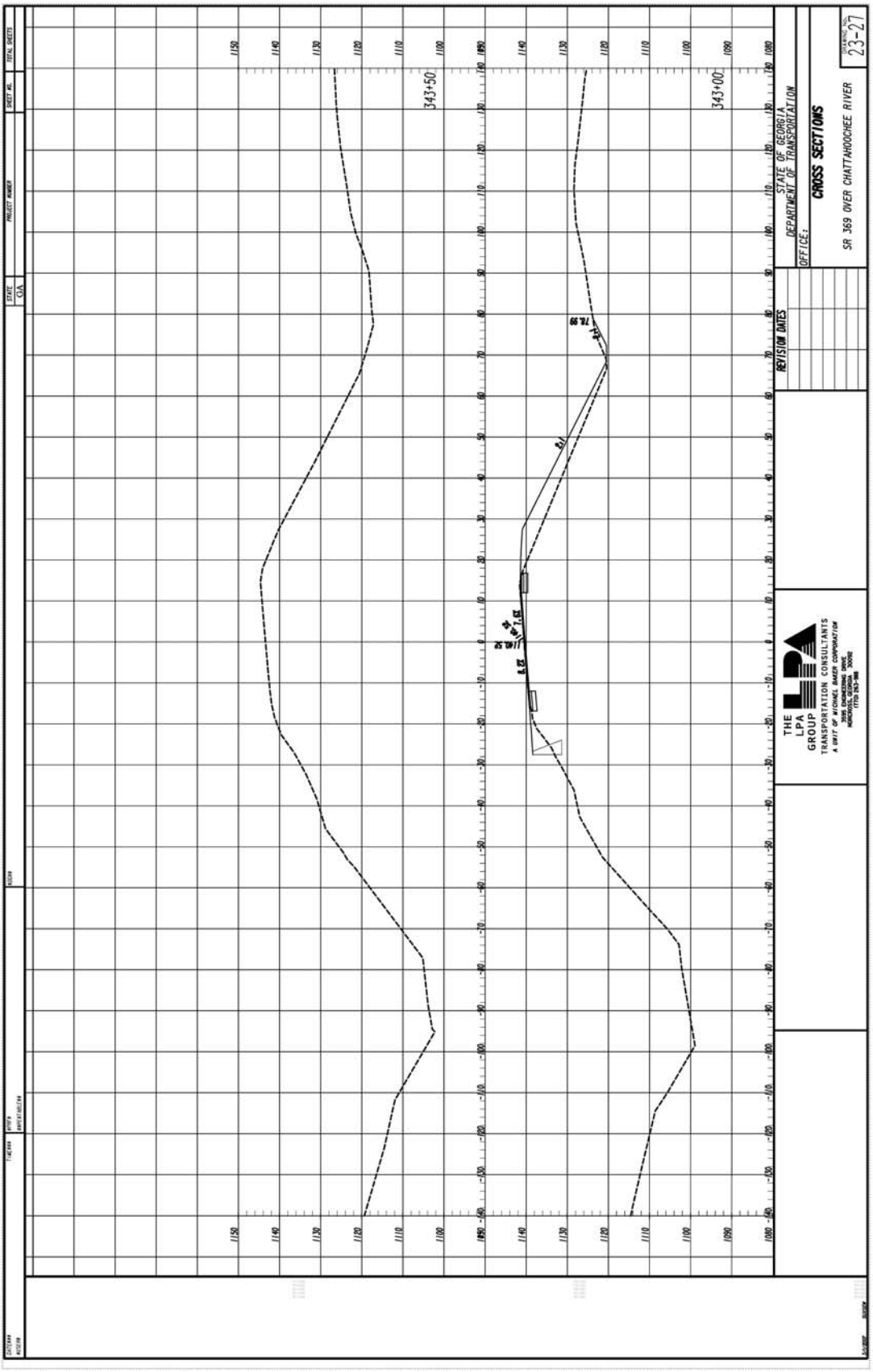
R-5.0 Proposed Change
1 of 4



R-5.0 Proposed Change
2 of 4



R-5.0 Proposed Change
3 of 4



R-5.0 Proposed Change
4 of 4

CALCULATIONS

PROPOSAL NUMBER:	R-5.0	PAGE NUMBER:	11 of 11

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Commercial ROW Cost Calculations:
$250,000/ac for property (Draft Concept Report ROW Estimate)
$432,000/ac if complete parcel is eliminated (ROW Cost Estimate Summary by VE Team based on 1 Ac @ $250,000)

Residential ROW Cost Calculations:
$100,000/ac for property (Draft Concept Report ROW Estimate)
$207,000 /ac if complete parcel is eliminated (ROW Cost Estimate Summary by VE Team based on 1 Ac @ $100,000)

ROW Reductions:
Parcel 7 total = 0.84 ac x $432,000/ac = $362,880
Parcel 7 = 0.77 ac Comm reduced
0.77 ac x $250,000 = $192,500
Total R/W reduction = $192,500
Revised R/W cost = $362,880 – 192,500 = $170,380

Grading Complete Reductions:
Reduced 208-0100 - In Place Embankment = 3,957 CY
3,957 CY x $4.04 = $15,986 Reduction
$537,188 - $15,986 = $521,202

Gravity Wall Addition:
Add 500-3200 - Class B Concrete = 85 CY
85 CY x $420.58/CY = $35,749

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-7.0	PAGE NUMBER:	1 of 4

PROJECT #/PI #:	**BRF00-0012-01(080) / 122012-**
PROJECT TITLE:	**SR 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall Counties**

PROPOSAL DESCRIPTION: REDUCE WIDTH OF SHOULDER FROM 10' TO 8'.

ORIGINAL DESIGN: The current proposed design of SR 369 includes two 12' wide travel lanes with a 10' shoulder with 4' paved.

PROPOSED CHANGE: It is proposed to reduce the width of the full shoulder from 10' to 8'. The paved portion remains as 4' wide.

JUSTIFICATION: An 8' wide shoulder satisfies design policies for a 45 MPH design speed for a rural minor arterial. This change allows for a design appropriate shoulder while also providing a cost savings to the project.

ADVANTAGES:

- Reduction in construction cost
- Reduction in Right-of-way acquisition

DISADVANTAGES:

- None apparent

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 42,359		$ 42,359
PROPOSED CHANGE:	$ 0		$ 0
SAVINGS:	$ 42,359		$ 42,359

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-7.0	PAGE NUMBER:	2 of 4

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Right-of-way (reduction)	1/7	AC	0.062	250,000	$15,500
Grading complete (reduction)	1/7	LS	1	26,859	$26,859
SUBTOTAL – COST TO PRIME					$42,359
MARKUP				Incl.	--
TOTAL CONTRACT COST					**$42,359**

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
SUBTOTAL – COST TO PRIME					0
MARKUP				Incl.	--
TOTAL CONTRACT COST					**0**

Difference [Original-Proposed] **$42,359**

SOURCES

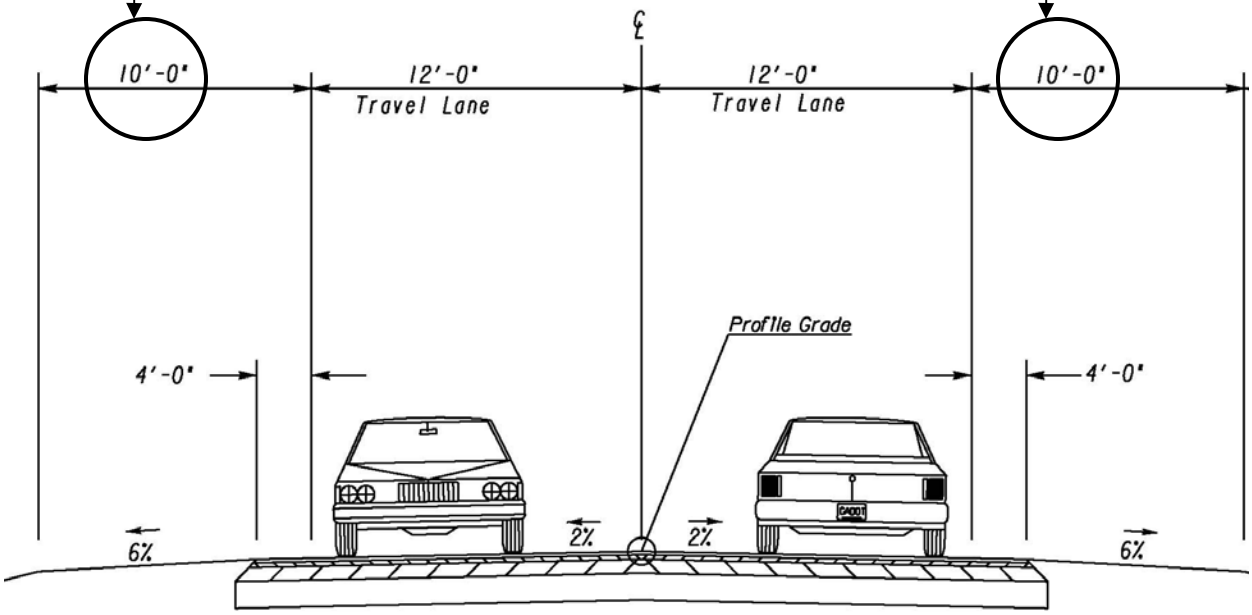
1. Project Cost Estimate
2. USC Estimate Database
3. GDOT Item Mean Summary
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)

PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER:	R-7.0	PAGE NUMBER:	3 of 4

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Proposed Change: Reduce 10' total shoulder width to 8'



TYPICAL SECTION

CALCULATIONS

PROPOSAL NUMBER:	R-7.0	PAGE NUMBER:	4 of 4

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Proposed Change Quantities:

Right of Way Reduction

2’ of Right-of Way saved from Sta 329+50 RT to Sta 343+00 RT:
1350’x2’ = 2,700 SF = 0.062 AC

Earthwork and Clear & Grubbing Reduction

Assume 5% reduction in Grading Complete:
.05 x $537,188 = $26,859

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-8.0	PAGE NUMBER:	1 of 5

PROJECT #/PI #:	**BRF00-0012-01(080) / 122012-**
PROJECT TITLE:	**SR 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall Counties**

PROPOSAL DESCRIPTION: SPLIT TRAFFIC DURING CONSTRUCTION TO REDUCE OR ELIMINATE TEMPORARY SHORING.

ORIGINAL DESIGN: An unspecified amount of temporary shoring estimated at $195,000 is included in the project concept report cost estimate. This shoring is to be used to keep new fill from the existing roadway during construction.

PROPOSED CHANGE: It is proposed to build the entire bridge and then to split the traffic with one lane on the new bridge and maintain one lane on the existing roadway.

JUSTIFICATION: Shoring is not required if traffic can be maintained during construction. This approach will provide for adequate traffic control and reduce project costs.

ADVANTAGES:

- Reduces construction cost
- Simplifies construction staging

DISADVANTAGES:

- None apparent

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 195,000		$ 195,000
PROPOSED CHANGE:	$ 97,500		$ 97,500
SAVINGS:	$ 97,500		$ 97,500

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-8.0	PAGE NUMBER:	2 of 5

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
522-1000 Shoring	1	LS	LS	$195,000	$195,000
SUBTOTAL – COST TO PRIME					$195,000
MARKUP					--
TOTAL CONTRACT COST					**$195,000**

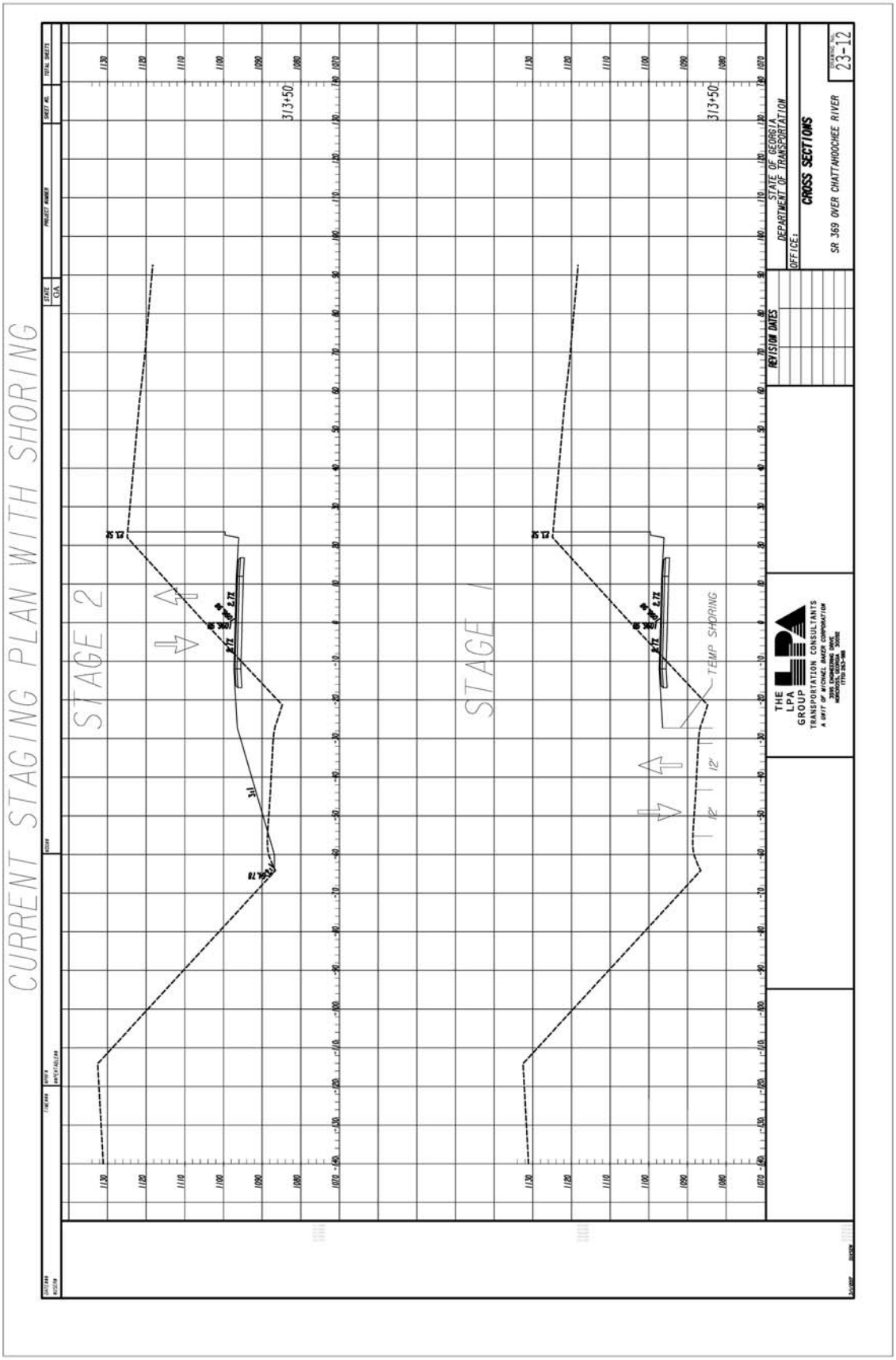
PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
522-1000 Shoring	1	LS	LS	$97,500	$97,500
SUBTOTAL – COST TO PRIME					$97,500
MARKUP					--
TOTAL CONTRACT COST					**$97,500**

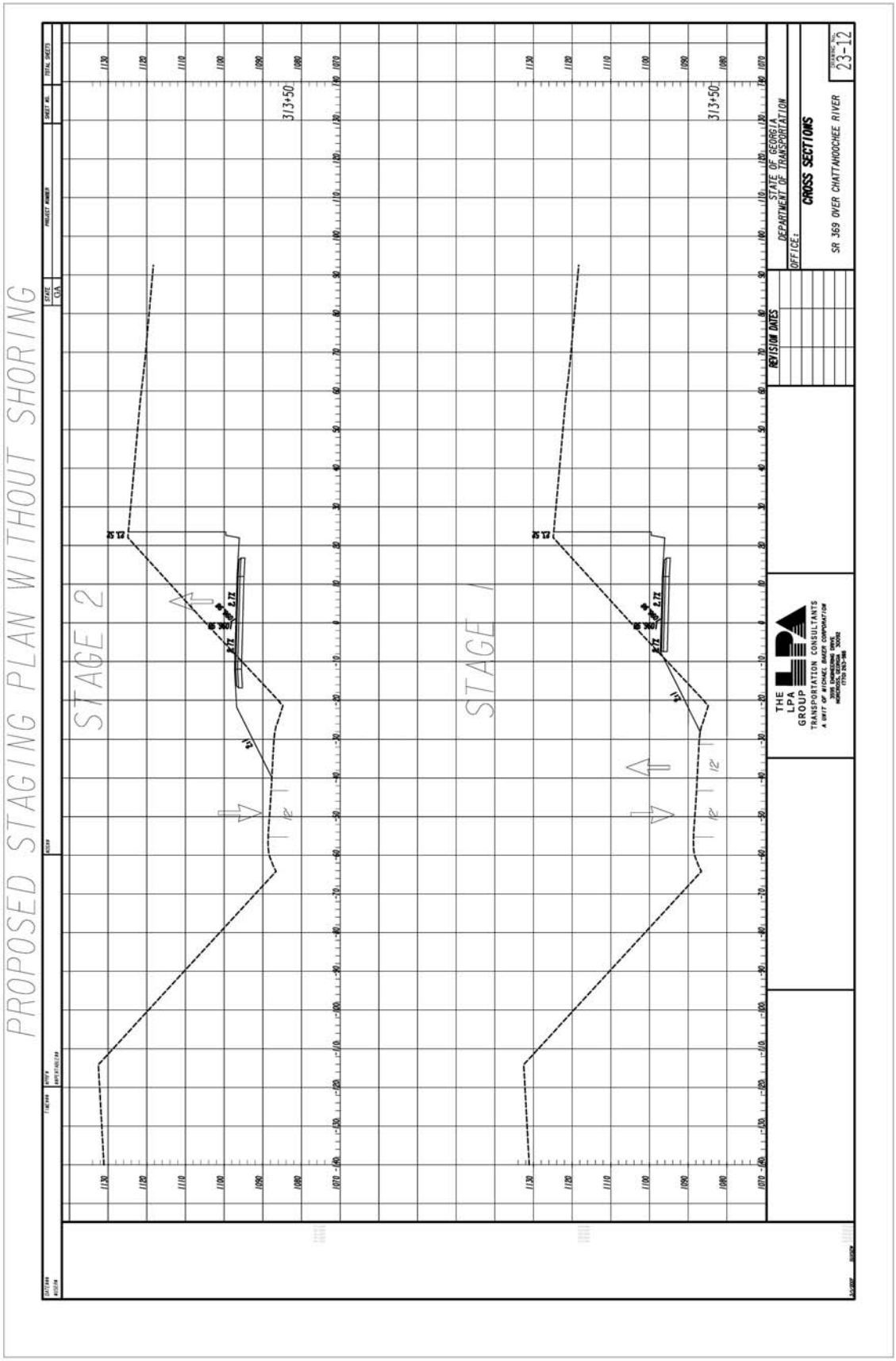
Difference [Original-Proposed] **$97,500**

SOURCES

1. Project Cost Estimate
2. USC Estimate Database
3. GDOT Item Mean Summary
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)



R-8.0 Original Design
1 of 1



R-8.0 Proposed Change
1 of 1

CALCULATIONS

PROPOSAL NUMBER:	R-8.0	PAGE NUMBER:	5 of 5

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

522-1000 Shoring Lump Sum = $195,000
Assume 50% can be eliminated by splitting traffic (Staging plans will indicate if all shoring can be eliminated)
50% x $195,000 = $97,500

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-9.0	PAGE NUMBER:	1 of 5

PROJECT #/PI #:	**BRF00-0012-01(080) / 122012-**
PROJECT TITLE:	**SR 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall Counties**

PROPOSAL DESCRIPTION: UTILIZE PERMANENT EASEMENT IN LIEU OF RIGHT-OF-WAY WHEREVER POSSIBLE.

ORIGINAL DESIGN: The current project approach obtains commercial right-of-way for all areas required for constructing the project.

PROPOSED CHANGE: It is proposed to establish an 80' Right-of-way width for the roadway and only purchase Right-of-way within the 80' corridor. Areas required for construction outside of the 80' corridor would be designated as permanent easement.

JUSTIFICATION: This revised approach for establishing a corridor for right-of-way and designating other areas as permanent easement is often done on DOT projects and result in a cost savings to the project. This is a common practice on GDOT projects. .

ADVANTAGES:

- Reduction in project cost
- Reduction in right-of-way acquisition

DISADVANTAGES:

- None apparent

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 1,103,750		$ 1,103,750
PROPOSED CHANGE:	$ 744,875		$ 744,875
SAVINGS:	$ 358,875		$ 358,875

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-9.0	PAGE NUMBER:	2 of 5

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Commercial Right-of Way	1/7	AC	4.415	250,000	$1,103,750
SUBTOTAL – COST TO PRIME					$1,103,750
MARKUP					Incl.
TOTAL CONTRACT COST					$1,103,750

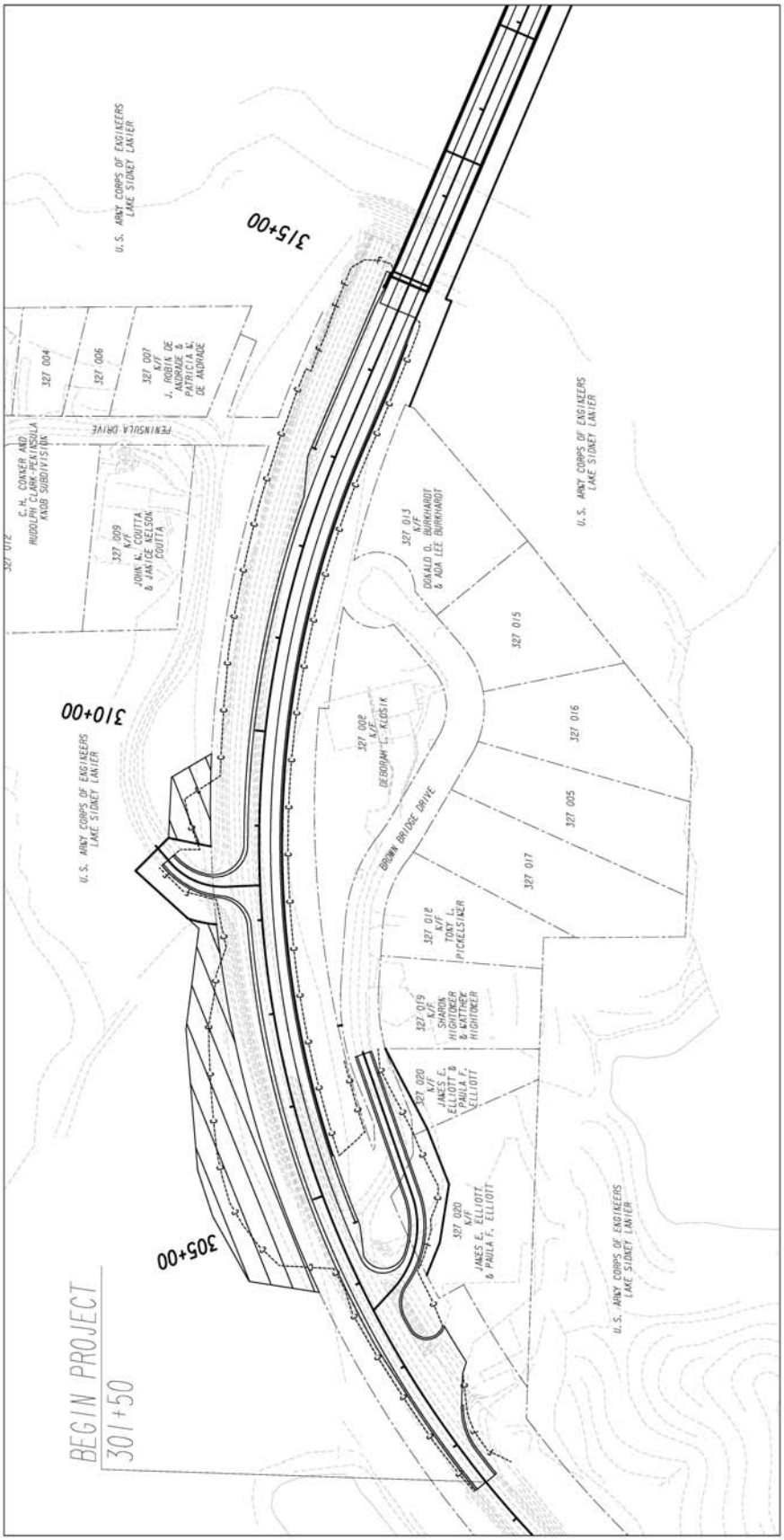
PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Commercial Right-of-Way	1/7	AC	1.544	$250,000	$386,000
Permanent Easement	7	AC	2.871	$125,000	$358,875
SUBTOTAL – COST TO PRIME					$744,875
MARKUP					Incl.
TOTAL CONTRACT COST					$744,875

Difference [Original-Proposed] **$358,875**

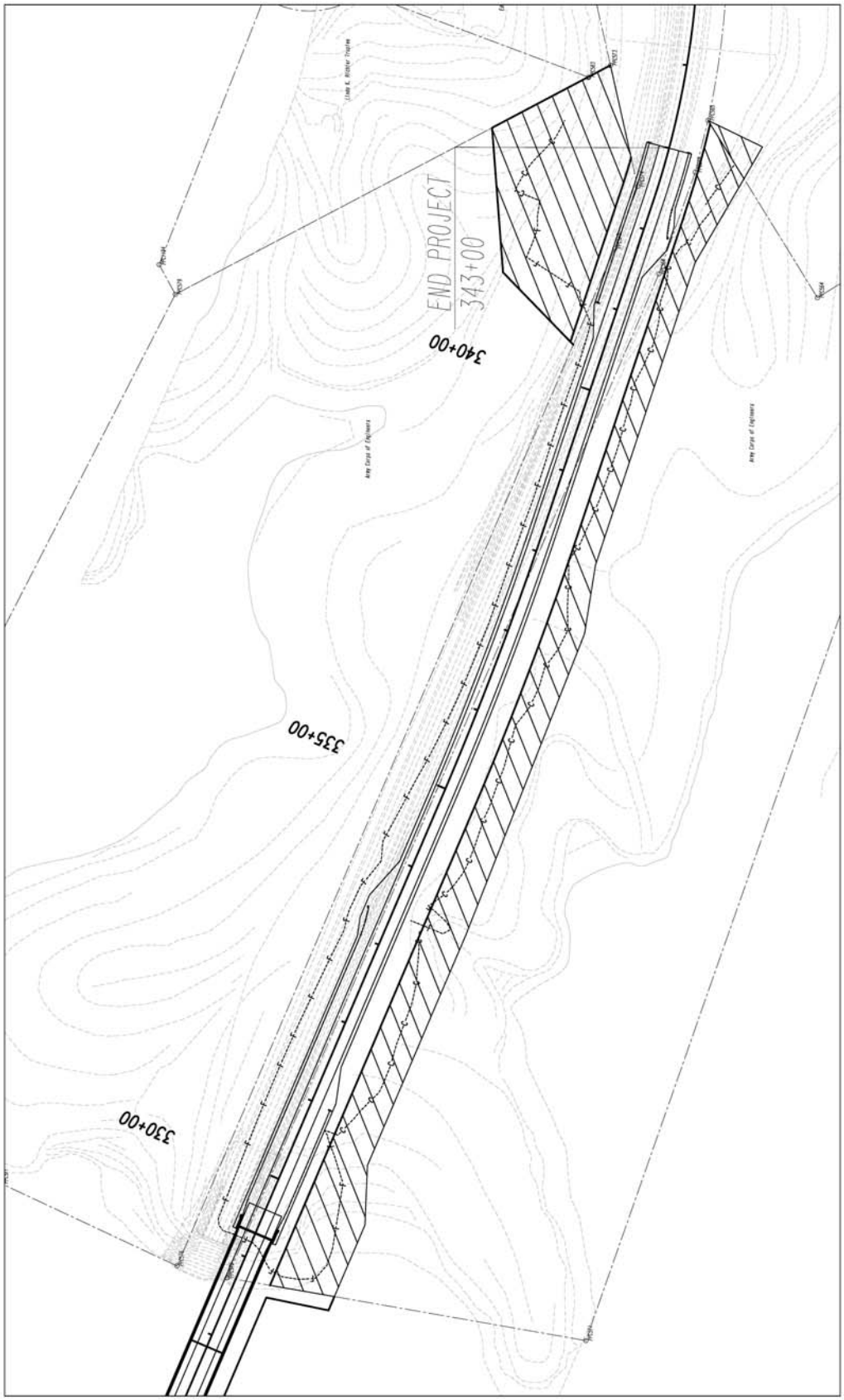
SOURCES

1. Project Cost Estimate
2. USC Estimate Database
3. GDOT Item Mean Summary
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Attached Calculation Sheet



Note: Cross-hatched areas indicate proposed permanent easement.

R-9.0 Proposed Change
1 of 2



Note: Cross-hatched areas indicate proposed permanent easement.

R-9.0 Proposed Change
2 of 2

CALCULATIONS

PROPOSAL NUMBER:	R-9.0	PAGE NUMBER:	5 of 5

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Current Right-of Way Acquisition

Parcel#	ROW (ac)
1	0.12
2	0.70
6	2.72
7	0.84
8	0.035
Total	4.415

From ROW estimate, commercial property ROW is $250,000 per acre.

Proposed Change Right-of Way & Easement

Based on establishing an 80' Right-of-Way

Parcel#	ROW (ac)	Easement (ac)
1	0.12	0.0
2	0.114	0.586
6	1.24	1.48
7	0.07	0.77
8	0.0	0.035
Totals	1.544	2.871

Assume Easement cost is 50% of Right-of-way cost =.5 x $250,000 = $125,000/acre

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-11.0	PAGE NUMBER:	1 of 5

PROJECT #/PI #:	**BRF00-0012-01(080) / 122012-**
PROJECT TITLE:	**SR 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall Counties**

PROPOSAL DESCRIPTION: REDUCE PROJECT LENGTH ON EAST APPROACH ROADWAY BY 100 LF TO ELIMINATE RIGHT OF WAY ACQUISITION PARCEL.

ORIGINAL DESIGN: Currently, the project ends at Sta 343+00 and encroaches on Parcel 8 owned by Marshall Adams requiring 1524 SF or 0.035 Acres of right-of-way.

PROPOSED CHANGE: It is proposed to end the project at Sta 342+00 and eliminate the final 100 feet of new pavement and the need for right-of-way acquisition from Parcel 8 owned by Marshall Adams.

JUSTIFICATION: According to the project cross sections, the proposed alignment is matching the existing alignment both horizontally and vertically at Sta 342+00**.** Thus, the end of project can be placed at this Station and eliminate unnecessary paving and Right-of-way costs.

ADVANTAGES:

- Eliminates unnecessary work
- Reduces right-of-way cost
- Reduces construction cost

DISADVANTAGES:

- None apparent

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 17,057		$ 17,057
PROPOSED CHANGE:	$ 0		$ 0
SAVINGS:	$ 17,057		$ 17,057

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-11.0	PAGE NUMBER:	2 of 5

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Sta 342+00 to Sta 343+00 Asphalt Pavement Surface Course	1	SY	356	$5.44	$1,937
Parcel 8 Right of Way	1	LS	LS	$15,120	$15,120
SUBTOTAL – COST TO PRIME					$17,057
MARKUP					--
TOTAL CONTRACT COST					**$17,057**

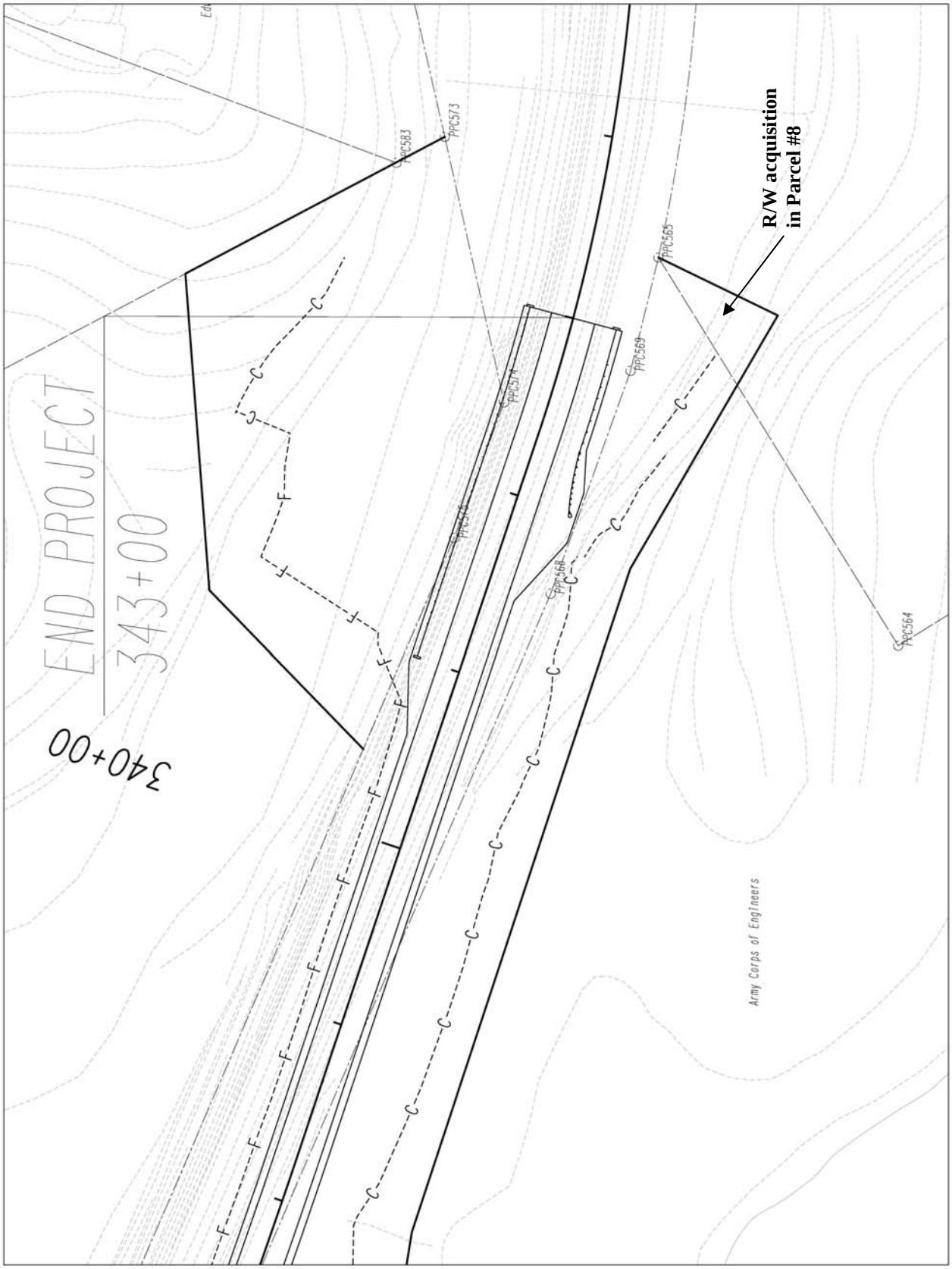
PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Sta 342+00 to Sta 343+00 Asphalt Pavement	1	SY	0	$5.44	$0
Parcel 8 Right of Way	1	LS	0	$0	$0
SUBTOTAL – COST TO PRIME					0.00
MARKUP					--
TOTAL CONTRACT COST					**0.00**

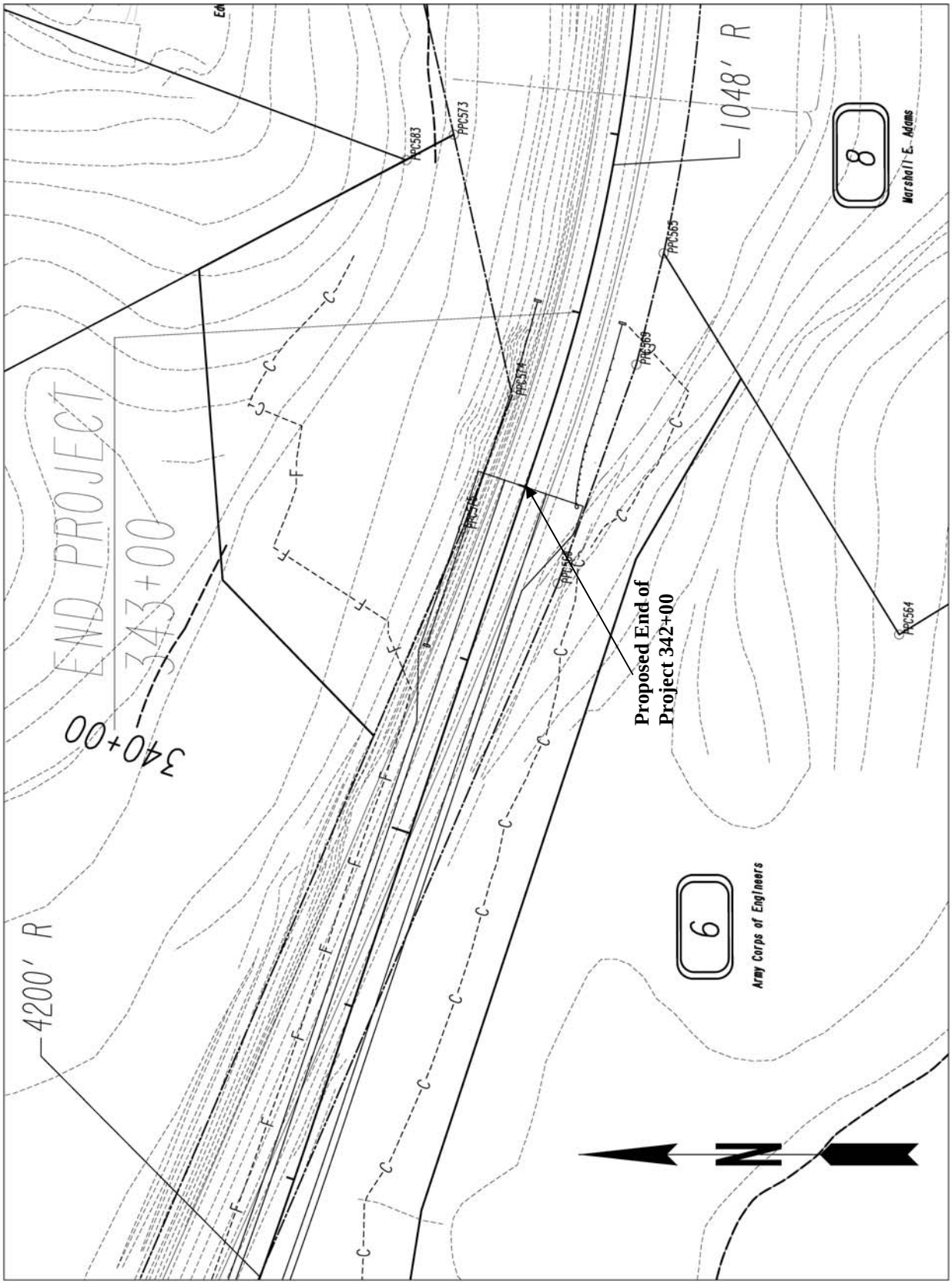
Difference [Original-Proposed] **$17,057**

SOURCES

1. Project Cost Estimate
2. USC Estimate Database
3. GDOT Item Mean Summary
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Other (Specify)



R-11.0 Original Design
1 of 1



R-11.0 Proposed Change
1 of 1

CALCULATIONS

PROPOSAL NUMBER:	R-11.0	PAGE NUMBER:	5 of 5

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Current Design Cost Calculations:
402-3113: 1.5" Asph 12.5MM = (1.5")(110#sy-in/2000#)($65.98/T) = $5.44/SY

Commercial R/W Cost Calculations:
$250,000/ac for property (Draft Concept Report ROW Estimate)
$432,000/ac if complete parcel is eliminated (ROW Cost Estimate Summary by VE Team based on 1 Ac @ $250,000)

Residential R/W Cost Calculations:
$100,000/ac for property (Draft Concept Report ROW Estimate)
$207,000 /ac if complete parcel is eliminated (ROW Cost Estimate Summary by VE Team based on 1 Ac @ $100,000)

Asphalt Pavement Cost Reductions
Sta 342+00 to Sta 343+00 = 100 LF
100 LF x 32' =3200 SF overlay
3200 SF / 9 = 356 SY
356 SY x $5.44/SY 12.5MM = $1,937

Right-of-Way Elimination
Parcel 8 Eliminated
Par 8 = 0.035 Ac Comm
0.035 Ac x $432,000 = $15,120

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	R-12.0	PAGE NUMBER:	1 of 5

PROJECT #/PI #:	**BRF00-0012-01(080) / 122012-**
PROJECT TITLE:	**SR 369 Over Chattahoochee River Bridge Replacement, Forsyth/Hall Counties**

PROPOSAL DESCRIPTION: USE REDUCED DEPTH ASPHALT SHOULDERS IN LIEU OF FULL DEPTH.

ORIGINAL DESIGN: The current typical pavement section is designed with a 4' wide paved shoulder and it is a full-depth pavement section to match the adjacent road section (while not specified on the documents, the VE Team assumes a common section of 12"GAB, 4" asphalt base, 2" asphalt binder course and 1-1/2" surface course).

PROPOSED CHANGE: It is proposed to reduce the depth of the paved shoulder to a section of 6" GAB, 4" asphalt base, and 1-1/2" surface course.

JUSTIFICATION: This revision provides a reduced pavement section that would function adequately as a shoulder section and result in a cost savings to the project.

ADVANTAGES:
- Reduction in construction cost
- Acceptable design for paved shoulders

DISADVANTAGES:
- None apparent

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	$ 98,171		$ 98,171
PROPOSED CHANGE:	$ 62,980		$ 62,980
SAVINGS:	$ 35,191		$ 35,191

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-12.0	PAGE NUMBER:	2 of 5

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
4' wide Full-depth asphalt shoulder	7	SY	2365	$41.51	$98,171
SUBTOTAL – COST TO PRIME					$98,171
MARKUP					Incl.
TOTAL CONTRACT COST					$98,171

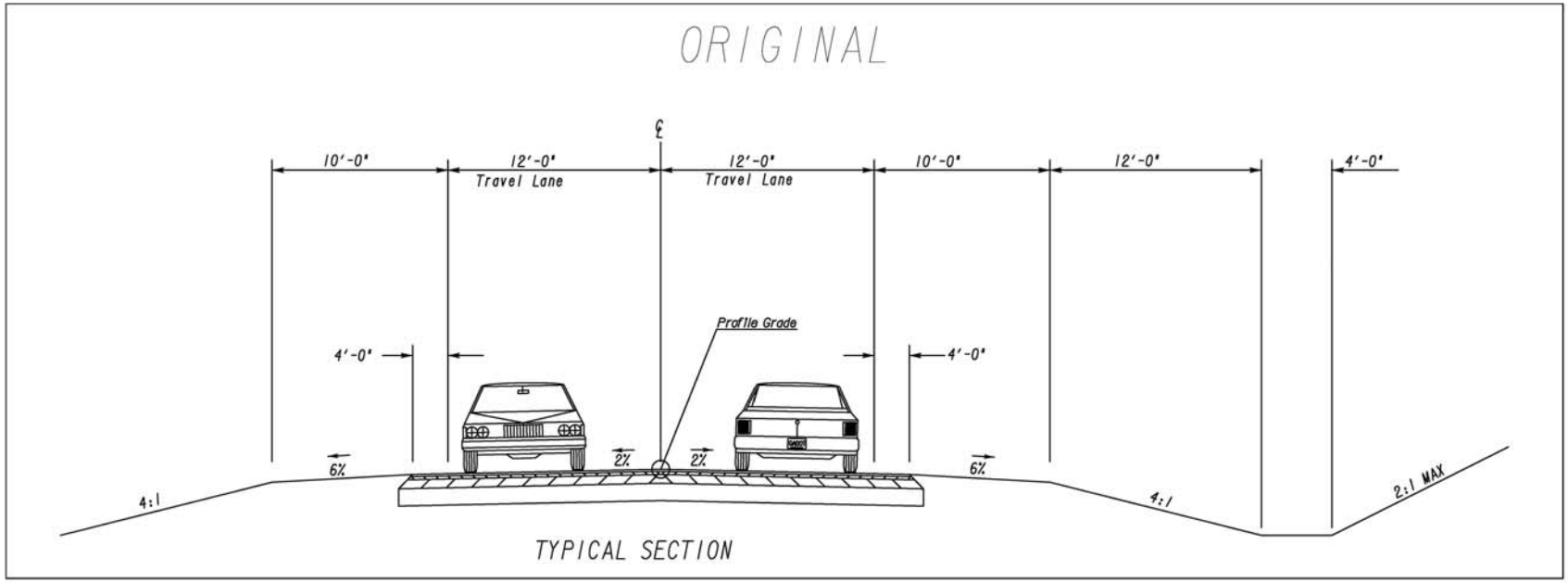
PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
4' wide Reduced depth Shoulder	7	SY	2365	$26.63	$62,980
SUBTOTAL – COST TO PRIME					$62,980
MARKUP					Incl.
TOTAL CONTRACT COST					$62,980

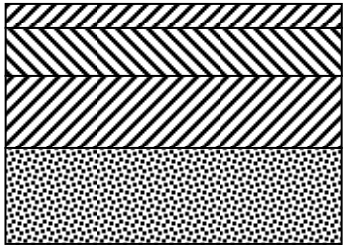
Difference [Original-Proposed] **$35,191**

SOURCES

1. Project Cost Estimate
2. USC Estimate Database
3. GDOT Item Mean Summary
4. Means Estimating Manual
5. Richardson's Estimating Manual
6. Vendor (Specify)
7. Attached Calculation Sheet



Current Design of Shoulder Section (Assumed)

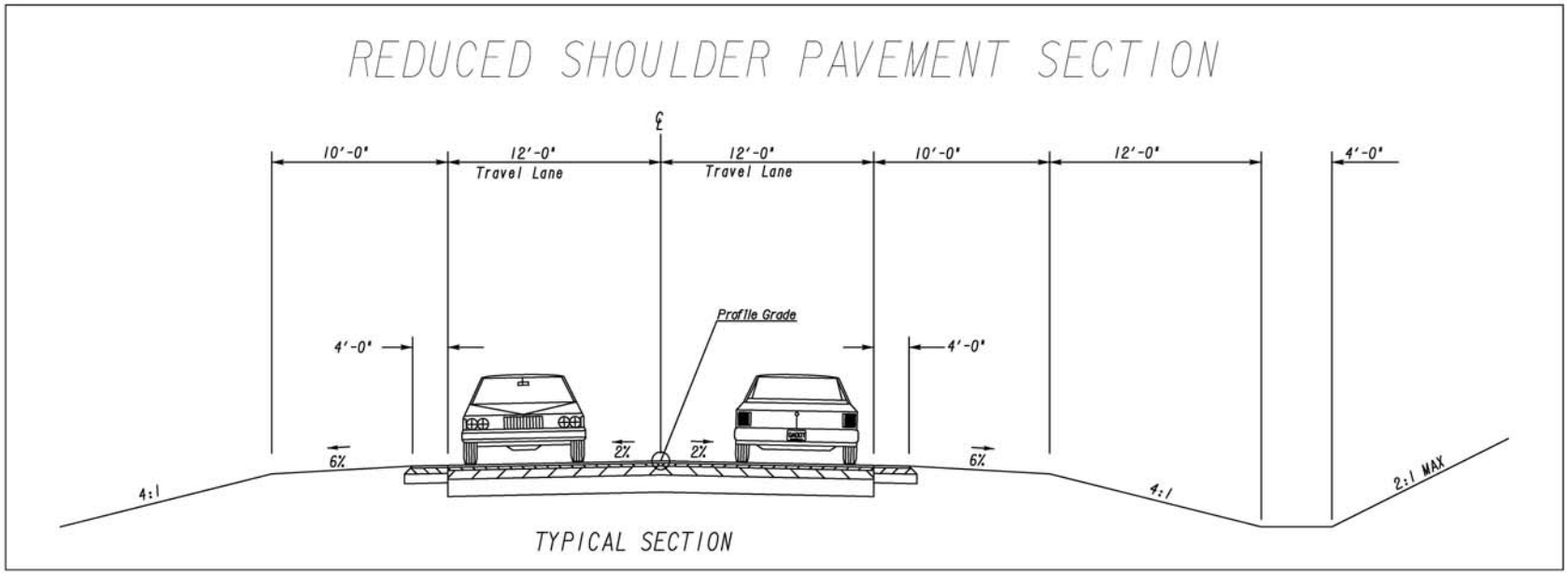


1-1/2" Asphalt Surface
2" Asphalt Binder

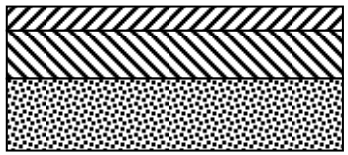
4" Asphalt Base

12" GAB

R-12.0 Original Design
1 of 1



Proposed Change for Shoulder Section



1-1/2" Asphalt Surface
4" Asphalt Base

6" GAB

R-12.0 Proposed Change
1 of 1

CALCULATIONS

PROPOSAL NUMBER:	R-12.0	PAGE NUMBER:	5 of 5

PROJECT #/PI #:	BRF00-0012-01(080) / 122012-

Current Design Pavement Cost Calculations
12” GAB = 0.68 tons/SY x $20.56/ton = $13.98/SY
4” Asph 25MM = (4”)(110#sy-in/2000#)($64.09/T) = $14.10/SY
2” Asph 19MM = (2”)(110#sy-in/2000#)($70.80/T) = $7.79/SY
1.5” Asph 12.5MM = (1.5”)(110#sy-in/2000#)($65.98/T) = $5.44/SY
2 layers tack coat = $0.10/SY/layer x 2 = $0.20

Total pavement cost = $41.51/SY

Road length = 2,660 LF

2,660 LF x 4’ x 2 sides = 21,280 SF / 9 = 2,365 SY

Proposed Change Pavement Cost Calculations
6” GAB = 0.34 tons/SY x $20.56/ton = $6.99/SY
4” Asph Base 25MM = (4.0”)(110#sy-in/2000#)($64.09/T) = $14.10/SY
1.5” Asph 12.5MM = (1.5”)(110#sy-in/2000#)($65.98/T) = $5.44/SY
1 layer tack coat = $0.10/SY/layer = $0.10

Total pavement cost = $26.63/SY

VE STUDY SIGN-IN SHEET

Project No.: BRF00-0012-01(080) County: Forsyth/Hall PI No.: 122012- Date: October 1-4, 2012

Days

FIRST	LAST	NAME	GDOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	✓	Matt Sanders	Engineering Services	404)631-1752	msanders@dot.ga.gov
✓	O	Ken Werho	Traffic Operations	404)635-8144	kwerho@dot.ga.gov
✓	✓	Steve Adewale	Program Delivery	404)631-1578	sadewale@dot.ga.gov
✓	✓	Ted Cashin	Bridge Design	404)631-1910	tcashin@dot.ga.gov
✓	✓	Tom Orr	U.S. Cost	770)481-1638	torr@uscost.com
✓	✓	Jerry Brooks	Kimley Horn	678)502-1864	jerry.brooks@kimley-horn.com
✓	✓	Chris Haggard	Wolverton & Associates	770)447-8999	chris.haggard@wolverton-assoc.com
✓	✓	Greg Grant	RS&H	678)528-7229	greg.grant@rsandh.com
✓	✓	Tyler McIntosh	LPA/Baker	770)263-9118	DTMcIntosh@mbakercorp.com
✓	✓	Ashley Zellner	LPA/Baker	770)263-9118	azellner@lpagroup.com
O	✓	Al Bowman	LPA/Baker	770)263-9118	abowman@mbakercorp.com
		Via Video Conference:			
✓	O	Matt Needham	D1 Area Engineer	770)535-5759	mneedham@dot.ga.gov
O	✓	Bruce Nicholson	KCI (D1 Construction)	770)550-1015	brnicholson@dot.ga.gov

✓ Check all that attend **O** Did Not Attend 11 Attended Project Overview (Day 1) 11 Attended Project Presentation (Day 4)

FUNCTION ANALYSIS

The following functions for the S.R. 369 Over Chattahoochee River Bridge Replacement 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 "Replace (Deficient) Bridge". The following are considered by the V.E. team to be Secondary and Supporting Functions.

Verb	Noun		Verb	Noun
Clear	Passage		Demolish	Roadway
Maximize	Opening		Re-establish	Vegetation
Support	Recreation		Clear	Trees
Maintain	Access		Support	Vehicles
Replace	Bridge		Award	Contract
Span	Water		Control	Erosion
Control	Traffic		Protect	Travelers
Remove	Bridge		Support	Roadway
Minimize	Impacts		Maintain	Sight Distance
Convey	Drainage		Maintain	Lake Volume
Maintain	Traffic		Inform	Traveler
Retain	Earth		Protect	User
Excavate	Earth		Protect	Property

COST MODEL/DISTRIBUTION

S.R. 369 Over Chattahoochee River
Forsyth/Hall County, Georgia

ITEM	COST $	% OF TOTAL
BRIDGES/STRUCTURES	7,964,487	58.55%
RIGHT-OF-WAY	2,018,305	14.84%
RETAINING WALLS AND SIDE BARRIERS	1,930,157	14.19%
EARTHWORK	537,188	3.95%
ASPHALT CONCRETE PAVING	367,746	2.70%
SHORING	195,000	1.43%
GRASSING/EROSION CONTROL	156,353	1.15%
AGGREGATE BASE COURSE	111,036	0.82%
TRAFFIC CONTROL	75,000	0.55%
DRAINAGE SYSTEM	61,934	0.46%
ENGINEERS OFFICE	56,882	0.42%
TEMPORARY BARRIER	41,612	0.31%
GUARDRAILS	32,026	0.24%
CONCRETE SLABS/APRONS	21,543	0.16%
ROCK EMBANKMENT	19,399	0.14%
SIGNAGE/MARKING	15,151	0.11%
DEMOLITION	0	0.00%
CURB & GUTTER	0	0.00%
CLEARING AND GRUBBING	0	0.00%
SIDEWALKS	0	0.00%
***TOTAL - PROJECT**	**13,603,819**	**100.00%**
*Does not include Engrg & Inspection, Fuel Adjustment or Liquid AC Adjustment		

BRAINSTORMING OR SPECULATION IDEAS

PROJECT TITLE: **S.R. 369 OVER CHATTAHOOCHEE RIVER**

PROJECT LOCATION: **FORSYTH/HALL COUNTY, GEORGIA**

NO.	IDEA	RANK
	ROADWAY (R)	
1.0	Shorten New Approach Length at West End of Project with Current Straight Bridge Design on South Side of Existing	5
1.1	Shorten New Approach Length at East End of Project with Current Straight Bridge Design on South Side of Existing	3
1.2	Utilize Curved Bridge on South Side to Shorten the Approaches	2
1.3	Utilize Curved Bridge on North Side to Shorten the Approaches	2
1.4	Construct New Straight Bridge on North Side of Existing in lieu of South Side	4
2.0	Flare Tie-back Wall Toward Brown Bridge Drive	Drop
3.0	Construct Retaining Wall from Sta 305+00 LT to Sta 307+00 LT to Reduce Right-of-Way Acquisition	Drop
4.0	Construct Retaining Wall from Sta 330+00 RT to Sta 342+00 RT to Reduce Earthwork and Right-of-Way Acquisition	Drop
5.0	Construct Retaining Wall from Sta 341+00 LT to Sta 343+50 LT to Reduce Right-of-Way Acquisition	4
6.0	Slope Pavement Section at 2% from Crown to Edge of Shoulder in lieu of Sloping Travel Lane at 2% and Shoulder at 6%	2
7.0	Reduce Shoulder Width from 10’ to 8’	4
8.0	Split Traffic During Construction to Reduce Shoring	4
9.0	Utilize Permanent Easement in lieu of Right-of-Way Wherever Possible	4
10.0	Change Maximum Superelevation Rate from 6% to 4%	2
11.0	Shorten End of Project by 100 Feet	5
12.0	Use Reduced Depth Asphalt Shoulders in lieu of Full-Depth	5

The rankings indicated as “Drop” were ideas that were investigated by the VE Team during the workshop but did not prove to be feasible for consideration.

BRAINSTORMING OR SPECULATION IDEAS

PROJECT TITLE: **S.R. 369 OVER CHATTAHOOCHEE RIVER**

PROJECT LOCATION: **FORSYTH/HALL COUNTY, GEORGIA**

NO.	IDEA	RANK
	BRIDGE (B)	
1.0	Use Simple-Span Beams in lieu of Precast Segmental Spliced Girders.	Drop
1.1	Use Long-Span Spliced Girders, Post-tensioned, in lieu of Precast Segmental Spliced Girders	Drop
1.2	Use 2-Span Continuous Unit in lieu of 4-Span Continuous Unit	3
1.3	Use Shallower Girders for End Spans	3
1.4	Use Steel Plate Girders in lieu of Precast	Drop
1.5	Use Constant Depth Spliced Girders (no Haunches)	Drop
2.0	Use 2-Caisson Bent in lieu of 4-Caisson Bent	Drop
3.0	Use Narrower Shoulder on Bridge	2
4.0	Reduce Number of Beams in End Spans	4
5.0	Preserve Existing Historical Bridge and Construct New Bridge with Matching Substructure	Drop
5.1	Preserve Existing Historical Bridge and Construct New Bridge with Matching Substructure Plus Additional Intermediate Piers	3
6.0	Install False Piers Under Existing Bridge at Locations of Piers for New Bridge	With 5.1

The rankings indicated as “Drop” were ideas that were investigated by the VE Team during the workshop but did not prove to be feasible for consideration.

VALUE ENGINEERING WORKSHOP AGENDA

For

GEORGIA DEPARTMENT OF TRANSPORTATION

Project #: BRF00-0012-01(080) - PI#: 122012-
SR 369 Over Chattahoochee Rover "Lake Lanier" Bridge Replacement

28 HOUR - V.E. STUDY
1-4 October 2012

The value engineering workshop for the subject project will be conducted for 3-1/2 days from 1-4 October 2012, **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 GDOT, 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** Tom Orr, 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 - 1700	**Development Phase & Quality Review**	V.E. Team
THURSDAY		
0800 – 0900	**Prepare for Presentation**	V.E. Team
0900 – 1000	**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.

1000 – 1200	**V.E. Team Wrap-up & Final QC/QA**	V.E. Team Members only

The Value Engineering Team will have a wrap-up session consisting of a final review of proposals to ensure consistency and clarity of content.