VALUE ENGINEERING REPORT

Back River Bridge Replacement
Project No. NH-009-2(93) Chatham County
PI No.: 522920

November 2, 2007

OWNER:

Georgia Department of Transportation
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(404.651.7468)

VALUE ENGINEERING CONSULTANT:

MACTEC

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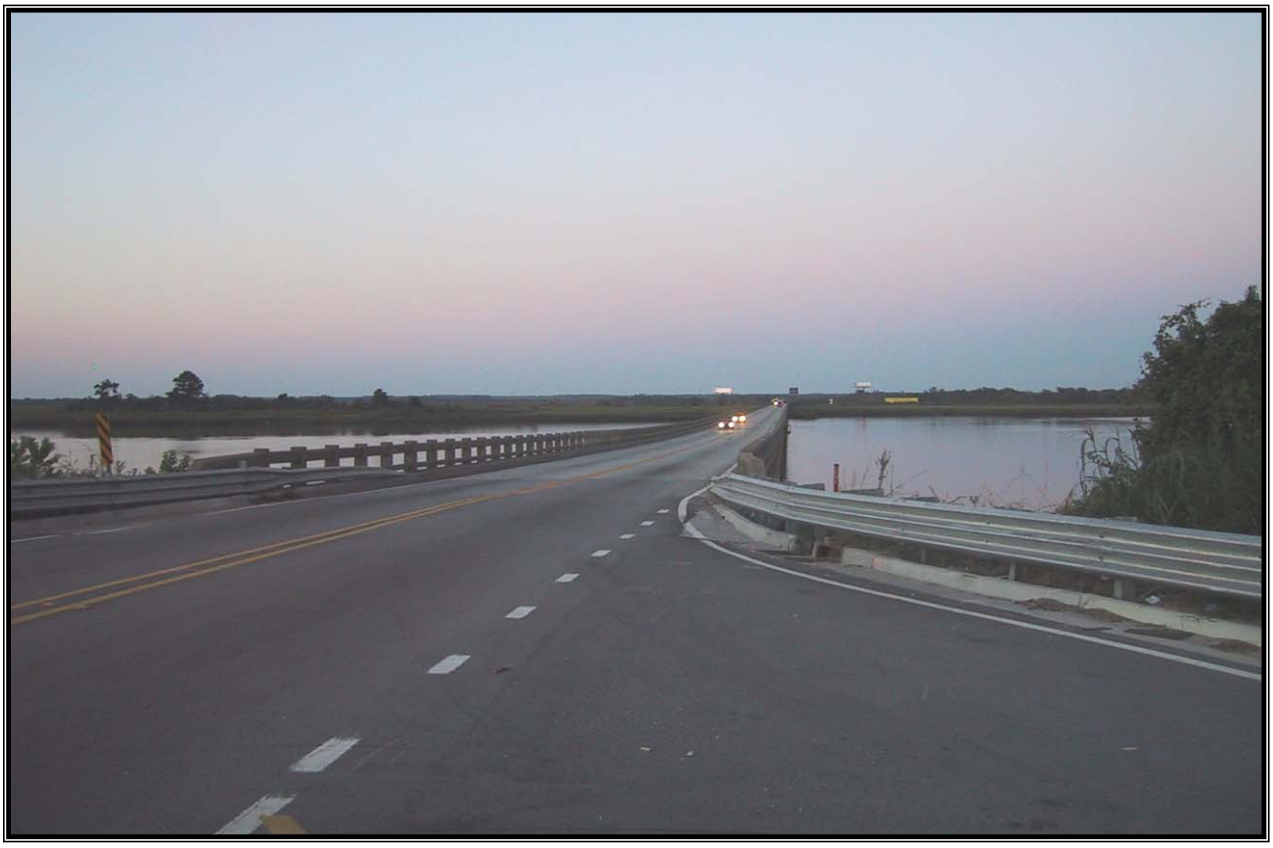
Introduction

This report summarizes the results of a value engineering (VE) study conducted on the Back River Bridge replacement located just north of Savannah in southeast Georgia. The project consists of a new 3,200 ft. two lane bridge on SR 404 Spur / US 17 connecting Hutchinson Island with South Carolina. The ultimate plan is to include a parallel, two lane bridge when South Carolina has funds to expand the route to four lanes. The bridge needs to be replaced due to structural deficiencies and the current construction cost estimate is $21,287,000. The project is being designed by GDOT's Consultant, QK4 of Norcross, GA. The VE study was conducted October 15-19, 2007 at the GDOT offices in Atlanta using a four person VE team.



This report presents the VE Team's recommendations and all back-up information, for consideration by the decision-makers. This **Executive Summary** includes a brief description of

each recommendation. The **Study Identification** section contains information about the project and the team. The **Recommendations** section presents a more detailed description and support information about each recommendation. Lastly, the **Appendix** includes a complete record of the Team's activities and findings as well as the meeting attendees sign in sheet. The reader is encouraged to review all sections of the report in order to obtain a complete understanding of the VE process.

Considerations

This project contains one sunken ship that will be impacted by the proposed improvements. The Georgia SHPO has requested the site be documented only, and then proceed with the project.

The VE team was instructed that one constraint exists, specifically that the existing bridge would be replaced rather than rebuilt due to the numerous deficiencies that exist.

Results Obtained

The VE Team generated nine ideas and presented six recommendations for consideration by GDOT. The recommendations involve changes to span length, reduced shoulder sizing for the initial phase, reduced length of deceleration lane, reduced travel lane width, use of the existing bridge for recreational purposes, and reduced design speed. These have the potential to reduce the project costs by as much as $5.67 Million while continuing to provide the required functionality.

A brief presentation of these recommendations was conducted on October 19, 2007, with the following in attendance: GDOT representatives, Brian Summers, Lisa Myers, Ron Wishon, Andy Ballerstedt of QK4 and the VE Team: Dave Wohlscheid, Lori Kennedy for Dan Cogan, Alan Hunley and Greg Grant.

Recommendation Highlights

A-1 Increase span lengths to reduce the amount of substructure

This idea is to evaluate the cost effectiveness of increasing the span length versus the increased beam size. The hope was to be able to minimize the number of foundation systems. The concept evaluated numerous system combinations and determined it was slightly more cost effective to use a 75 foot span length in lieu of the 70 foot contained in the existing design.

Potential savings is $219,700

A-3 Reduce the shoulder width for the entire length of the bridge

This idea was to use the ultimate roadway width required for a multilane rural classification (the classification used when the parallel bridge span is built). This amounts to a bridge width clear distance of 38 feet (2-12 foot lanes, a 10 foot outside shoulder and a 4 foot inside shoulder). Temporary striping would be used (2-12 foot lanes with 2-7 foot shoulders, or 2-11 foot lanes with 2-8 foot shoulders) until the second span is completed.

Potential savings for this option is $1,950,000

A-4 Reduce the length of the deceleration lane

The current westbound lane is 500 feet long with a 180 foot taper for right turn movement onto Hutchinson Island. The proposed concept reduces these lengths based on entry into a 25 mph free flow curve per Exhibit 10-73. The proposed lane becomes 410 feet with a 100 foot taper.

Potential savings is $154,400.

A-6 Reduce travel lane widths through the entire project to 11 feet

Reducing the section across the bridge substantially reduces the project cost. This could also be more attractive if the posted speed was reduced to 45 at the end of the project for the total length of the bridge. (See Idea C-1).

Potential savings is $680,000.

B-1 Do not demolish the existing bridge at this time

The current design proposes to remove the existing bridge structure after completing the new structure. This concept proposes to leave the bridge in place until such time as the second span is needed and convert it to pedestrian only traffic for fishing, biking, etc. (Costs for adding fence/handrails are included in the net savings below.) Future demolition would occur prior to the construction of the second span, but that may not happen for 10+ years, and in the meantime the facility would have recreational value while deferring capital costs.

Potential savings from this contract is $2,532,900

C-1 Reduce posted and design speed to 45 mph from the beginning of the project to 1,000 feet from the shore line

The speed limit on the Savannah portion of the Talmadge Bridge is 45 mph. Reducing the speed on this project would allow a reduction in the length of the deceleration lane to 295 feet with a 100 foot taper. The design vertical curve at the beginning of the project would also be improved.

Potential savings is $291,000

Back River Bridge Replacement

SUMMARY OF POTENTIAL COST SAVINGS

ITEM No.	CREATIVE IDEA DESCRIPTION	ORIGINAL INITIAL COST	PROPOSED INITIAL COST	INITIAL COST SAVINGS	FUTURE SAVINGS	TOTAL PRESENT WORTH SAVINGS	Maximum Savings in Combination with other VE proposals
A	**New Bridge**						
A-1	Increase span lengths to reduce the amount of substructure	13,752,900	13,533,200	219,700	-0-	219,700	219,700
A-3	Reduce shoulder width for entire 3,290 length of bridge	15,390,000	13,440,000	1,950,000	-0-	1,950,000	1,950,000
A-4	Reduce length of deceleration lane	700,900	546,500	154,400	-0-	154,400	154,400
A-6	Reduce travel lane widths to 11 feet through the entire project limits	8,154,000	7,474,000	680,000	-0-	680,000	680,000
B	**Demolition and Staging**						
B-1	Do not demolish existing bridge at this time	2,864,000	331,100	2,532,900	-0-	2,532,900	2,532,900
C	**Approaches**						
C-1	Reduce design speed to 45 mph	700,900	409,900	291,000	-0-	291,000	130,000
	TOTAL POTENTIAL SAVINGS						**5,667,000**

STUDY IDENTIFICATION

STUDY IDENTIFICATION

Project: Back River Bridge Replacement	**Dates: October 15-19, 2007**
Location: GDOT HQ - Atlanta	

VE Team Members

Name:	Discipline:	Organization:	Telephone:
David Wohlscheid	VE Team Leader	MACTEC	703-471-8383
Alan Hunley	Highway Design	Parsons Transportation Group	678-969-2304
Greg Grant	Structural – Bridges	Wolverton & Associates	770-447-8999
Dan Cogan	Construction	Kennedy Engineering & Associates	678-904-8591

Project Description

This project will replace the structurally deficient bridge located on State Route 404 Spur / US 17, over Back River one mile north of Savannah. The bridge is located in Chatham County and connects Hutchinson Island with South Carolina. The project extends for 0.8 mile at road inventory milepost 2.60. The project will be completed in conjunction with South Carolina DOT and will widen US 17 to a logical terminus. The final design could put the Hutchinson Island ramps on structure if needed.

The project consists of the replacement of the 3,200 foot Back River Bridge and roadway construction on each approach in order to tie the new bridge into the existing roadway. The proposed roadway on the north bank in South Carolina will continue the two lane facility and will tie into the existing roadway 820 feet north of the bridge via a 2,500 foot horizontal curve.

The proposed bridge will tie in on the Georgia side on the south bank and the north shore of Hutchinson Island. On the southbound side of the bridge, a 455 foot southbound deceleration lane will be provided to exit onto the island. The northbound access from the island will remain stop controlled. The two thru lanes will tie into the existing roadway on Hutchinson Island approximately 500 feet south of the end of the bridge. This roadway then ties directly into the Talmadge Memorial Bridge which crosses Front River into mainland Georgia.

The new bridge itself will be a parallel structure constructed on the west side of the existing bridge. The bridge will be 47.25 feet wide including two 12-foot thru lanes with 10-foot outside shoulders along with appropriate barriers. The 10 foot shoulders on the bridge deck will be bicycle friendly to accommodate the East Coast Greenway bicycle trail.

The existing bridge was constructed in 1954 and has a current sufficiency rating of 40. The office of Bridge Maintenance has determined that any bridge with a bridge sufficiency below 50 should be replaced. Ultimate plans for SR 404 Spur / US 17 include the replacement of the existing two lane bridge with a four lane structure. This project will replace the existing two lane bridge with a structurally adequate two lane bridge to the west and demolish the existing bridge. A future project will construct a new two lane bridge to the west on the site of the existing bridge, thus ultimately providing the required four lane facility. An urgent rehabilitation was performed in 2006 as a temporary solution until the bridge can be replaced in 2010.

State Route 404 Spur / US 17 is functionally classified as a rural principal arterial. It lies just beyond the Urban Area Boundaries of the Chatham Urban Transportation Study. It is on the National Highway System and is not a Truck Route. It is also not part of the Statewide Bicycle Plan but is a designated bikeway known as the East Coast Greenway. Sidewalks are not planned at this time.

The Average Annual Daily Traffic (AADT) along this section of roadway was 17,500 in 2000 at Traffic Count 169 on the bridge; 16,300 at TC 167 just south of the bridge and is projected to be 19,050 in 2022 and 32,900 in 2025. Truck traffic is estimated at 10%. Qk4 show a 2006 ADT of 17,600 vehicles per day, 2010 of 19,800 and 2030 of 35,900.

The current project construction cost estimate is $21.29 million. Please refer to the Cost Distribution Model in the Appendix for more detailed information.

Kick off Meeting/Design Presentation

In addition to the VE Team, the following personnel attended this meeting which was held at the outset of the VE study:

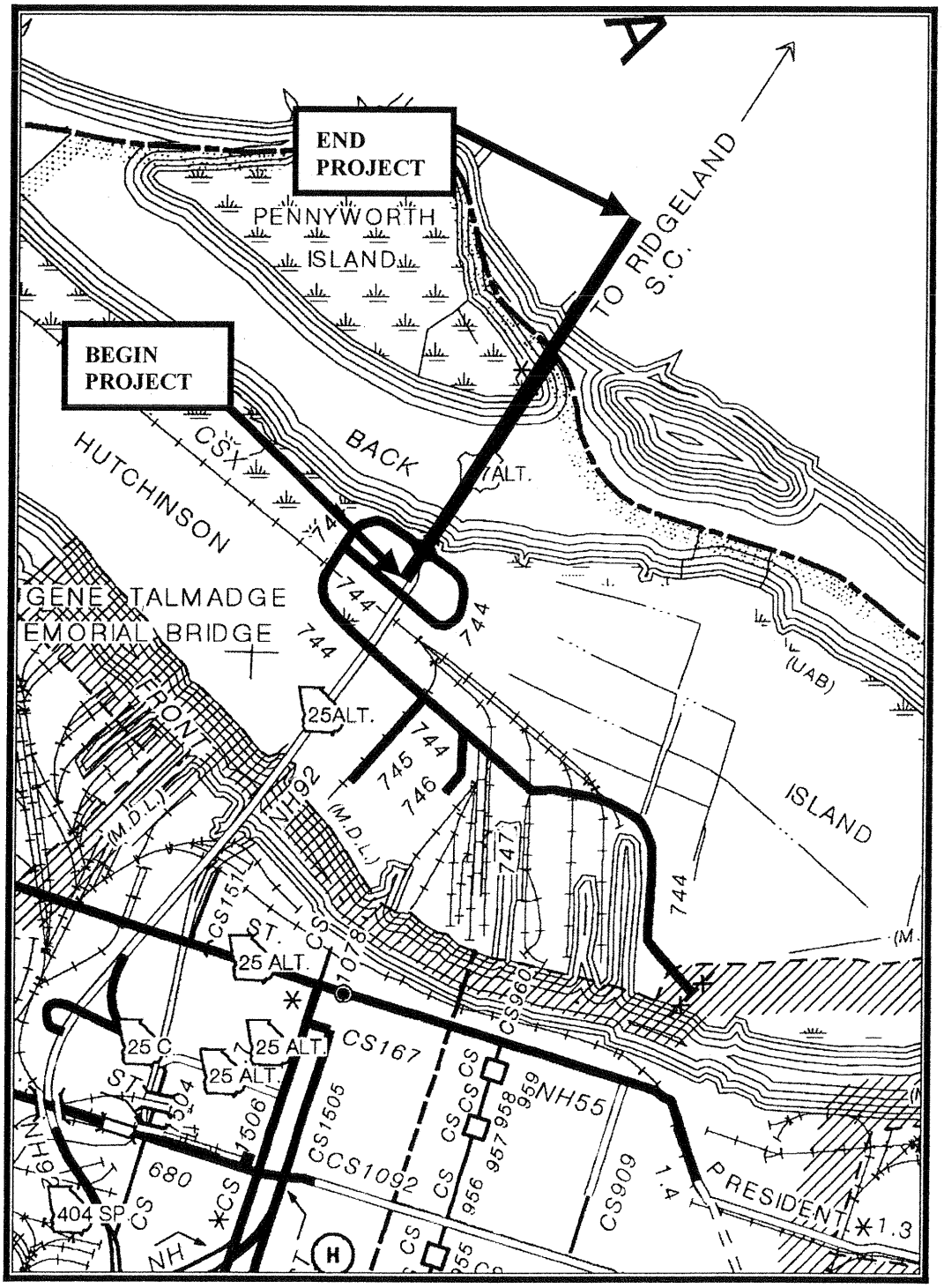
Lisa Myers	GDOT Engineering Services
Ron Wishon	GDOT Engineering Services
G.Slade Cole	GDOT Savannah Construction
Ken Werho	GDOT Traffic Safety Design (TSD)
Marcela Cole	GDOT Urban Design
Robert Uzzell	GDOT Bridge Design
Mike Clements	GDOT Bridge Design
Darrell Richardson	GDOT Urban Design
Jerry Milligan	GDOT Right of Way
Butch Welch	GDOT Urban Design Project Manager

Mike Davis	JB Trimble, Structural Design
Andy Ballerstedt	QK4

The VE Team appreciated the project overview given by Andy Ballerstedt and Mike Davis. Highlights included:

- The existing bridge will be demolished after the new structure is opened.
- This project contains one sunken ship that will be impacted by the proposed design. Direction has been given to document the structure and then remove it.
- The goal of the design is to replace the bridge in one phase of construction.
- The bridge will be replaced. Upgrading the facility is not an option.
- The bridge had a sufficiency rating in the 20s before a major rehabilitation was performed. It is now rated at 40 which is still within the range of replacement.
- Foundation material in the area is not good. Long piles will be required, although the soil information for this structure has not been obtained.
- Fish and Wildlife have sent a letter indicating the no build option is their preferred option.

Project Location



8/22/07

VE RECOMMENDATIONS

DEVELOPMENT AND RECOMMENDATION PHASE

Back River Bridge Replacement

IDEA No.:	PAGE No.:	CREATIVE IDEA:
A-1	1 of 8	Increase span lengths to reduce amount of substructure

Comp By: GG Date: 10/15/07 Checked By: DCW Date: 10/16/07

Original Concept:

Original concept is a 3290 foot long prestressed beam bridge comprised of 47 (FORTY-SEVEN) – 70 foot spans of AASHTO PSC beams on PSC pile bents with spill through end bents.

Proposed Change:

Proposed concept is to increase the span length slightly to eliminate substructure bents.

Proposed bridge would be a 3290 foot long prestressed beam bridge comprised of 44 (FORTY-FOUR) 74.8 foot long spans of AASHTO PSC beams on PSC pile bents with spill through end bents.

Justification:

Based on experience and a conversation with the designer, Mike Davis (J.B. Trimble), the most economical bridge for a long, low level water crossing is a PSC beam superstructure on pile bents.

Trimble's calculation (attached) indicated that the 70 foot span was more economical than the 140 ft or the 40 foot span. The 70 foot span was chosen because of the limitation placed on PSC beam bridge span lengths founded on pile bents found in the April 2007 revision of the October 2005 GDOT Bridge and Structural Design Policy Manual.

This limitation is Department imposed. While the limitation is conservative and reasonable, if the maximum span length is increased to 75 feet, there are minor savings that could be realized for this project.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	13,752,900		
- Proposed	13,533,200		
- Savings	219,700		219,700
FUTURE COST - Savings		N/A	-0-
TOTAL PRESENT WORTH SAVINGS			**219,700**

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NH-009.2(93)
Chatham Co.
US 17 & over Back River
4-25-07

140' SPAN

ITEM NUMBER	ITEM DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	COST
500-1006	SUPERSTR CONCRETE, CL AA, BR NO -	LS	$1,122.40	157	$176,441.28
500-3002	CLASS AA CONCRETE	CY	$692.53	61	$42,521.34
507-9032	PSC BEAMS, AASHTO, BULB TEE, 72 IN, BR NO -	LF	$227.53	980	$222,979.40
511-1000	BAR REINF STEEL	LB	$0.96	12280	$11,788.80
511-3000	SUPERSTR REINF STEEL, BR NO -	LS	$0.95	35725	$33,938.75
520-2224	PILING, PSC, 24 IN SQ	LF	$80.44	600	$48,264.00
					$535,933.57

340 191,125

70' SPAN

ITEM NUMBER	ITEM DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	COST
500-1006	SUPERSTR CONCRETE, CL AA, BR NO -	LS	$1,122.40	139	$156,238.08
500-3002	CLASS AA CONCRETE	CY	$692.53	23	$15,789.68
507-9003	PSC BEAMS, AASHTO TYPE III, BR NO -	LF	$145.81	840	$122,480.40
511-1000	BAR REINF STEEL	LB	$0.96	4560	$4,377.60
511-3000	SUPERSTR REINF STEEL, BR NO -	LS	$0.95	34800	$33,060.00
520-2224	PILING, PSC, 24 IN SQ	LF	$80.44	890	$71,591.60
					$403,537.36

40' SPAN

ITEM NUMBER	ITEM DESCRIPTION	UNITS	UNIT PRICE	QUANTITY	COST
500-1006	SUPERSTR CONCRETE, CL AA, BR NO -	LS	$1,122.40	168	$189,012.16
500-3002	CLASS AA CONCRETE	CY	$692.53	40	$27,631.95
507-9001	PSC BEAMS, AASHTO TYPE I, BR NO -	LF	$110.00	840	$92,400.00
511-1000	BAR REINF STEEL	LB	$0.96	7980	$7,660.80
511-3000	SUPERSTR REINF STEEL, BR NO -	LS	$0.95	42109	$40,003.55
520-2224	PILING, PSC, 24 IN SQ	LF	$80.44	1733	$139,402.52
					$496,110.98

IDEA A-1 **INCREASE SPAN LENGTH TO REDUCE AMOUNT OF SUBSTRUCTURE**

TYPICAL SECTION ANALYSIS

Bridge Width	47.25 ft	Effective Slab Width (FT)				Effective Slab Thickness (IN)				
		Beam Type								
		72" bulb	63" bulb	54" Bulb	Type 3					
No. of Beams	Beam Spacing	Top Flange Width				72" bulb T	63" bulb T	54" Bulb T	Type 3	Overhang
	(FT)	1.75	1.75	1.75	1.3333	1.75	1.75	1.75	1.33333	Spacing
6	7.500									4.88
6	7.750									4.25
6	8.000	6.250	6.250	6.250	6.667	7.375	7.375	7.375	7.500	3.63
6	8.250									3.00
6	8.500									2.38
6	8.750									1.75
7	6.250									4.88
7	6.500									4.13
7	6.750	5.000	5.000	5.000	5.417	7.000	7.000	7.000	7.125	3.38
7	7.000									2.63
7	7.250									1.88
7	7.500									1.13
8	5.500									4.38
8	5.750									3.50
8	6.000	4.250	4.250	4.250	4.667	7.000	7.000	7.000	7.000	2.63
8	6.250									1.75
8	6.500									0.88
										23.63
5	9.500									4.63
5	9.750									4.13
5	10.000	8.250	8.250	8.250	8.667	8.000	8.000	8.000	8.375	3.63
5	10.250									3.13
5	10.500									2.63
										23.63

SLAB THICKNESS DETERMINED USING GDOT SLAB CHART

IDEA A-1 INCREASE SPAN LENGTH TO REDUCE AMOUNT OF SUBSTRUCTURE

DETERMINATION OF SPAN - SPAN LENGTH COMBINATIONS

Length 3,290.00 Ft

Spans	Span Length	Beam Type	No.	Beam Type	No.	Beam Type	No.	Beam Type	No.
22	149.55								
23	143.04	72" bulb T	8 beams						
24	137.08	72" bulb T	7 beams						
25	131.60	72" bulb T	6 beams	63" bulb T	8 beams				
26	126.54			63" bulb T	7 beams				
27	121.85								
28	117.50			63" bulb T	6 beams	54" Bulb T	8 beams		
29	113.45					54" Bulb T	7 beams		
30	109.67								
31	106.13					54" Bulb T	6 beams		
32	102.81								
33	99.70								
34	96.76								
35	94.00								
36	91.39							Type III	8 beams
37	88.92								
38	86.58							Type III	7 beams
39	84.36							Type III	6 beams
40	82.25							Type III	6 beams
41	80.24							Type III	6 beams
42	78.33							Type III	6 beams
43	76.51							Type III	6 beams
44	74.77							Type III	6 beams
45	73.11							Type III	6 beams
46	71.52							Type III	6 beams
47	70.00							Type III	6 beams
48	68.54								
49	67.14								
50	65.80								
51	64.51								

INCREASE SPAN LENGTH TO REDUCE AMOUNT OF SUBSTRUCTURE

SPAN LENGTH AND BEAM TYPE COST ANALYSIS

Notes:		
top concrete cover	2.25" clear	
Coping:	2	inch
Deck	47.25	ft wide

SUMMARY OF INPUT DATA

	Span Length	Flange Width Ft	Span	Beams	Beam Spacing Ft	Slab Thickness Inches
	131.60	3.5	131.60	6	8	7.375
	137.08	3.5	137.08	7	6.75	7.000
	143.04	3.5	143.04	8	6	7.000
	117.50	3.5	117.50	6	8	7.375
	126.54	3.5	126.54	7	6.75	7.000
	131.60	3.5	131.60	8	6	7.000
	106.13	3.5	106.13	6	8	7.375
	113.45	3.5	113.45	7	6.75	7.000
	117.50	3.5	117.50	8	6	7.000
	76.51	1.3333	76.51	6	8	7.500
	74.77	1.3333	74.77	5	10	8.375
	73.11	1.3333	73.11	5	10	8.375
	71.52	1.3333	71.52	5	10	8.375
JBT DESIGN	70.00	1.3333	70.00	5	10	8.375
	78.33	1.3333	78.33	6	8	7.500

SUPERSTRUCTURE COSTS - BEAM, SLAB & COPING CALCULATIONS

Overall Bridge Length **3290** **feet**

	Span Length	Beam Type	Beam $/ft	Beam Costs	Slab Volume Ft^3	Coping Volume Ft^3	Total Deck Conc Volume Ft^3	Total Deck Conc Volume yd^3	Class AA Super Concrete $ 1,072.54 per Yard	Super Rebar $ 1.07 Per LB 250 #/yd^3	Total Superstructure Cost
	131.60	72" Bulb T	$ 210.62	$ 4,157,639	95539	11,515	107,054	3965	$ 4,252,562	$ 1,060,623	$ 9,470,824
	137.08	72" Bulb T	$ 210.62	$ 4,850,579	90681	13,434	104,115	3856	$ 4,135,825	$ 1,031,508	$ 10,017,911
	143.04	72" Bulb T	$ 210.62	$ 5,543,518	90681	15,353	106,034	3927	$ 4,212,062	$ 1,050,522	$ 10,806,102
	117.50	63" Bulb T	$ 193.02	$ 3,810,215	95539	11,515	107,054	3965	$ 4,252,562	$ 1,060,623	$ 9,123,400
	126.54	63" Bulb T	$ 193.02	$ 4,445,251	90681	13,434	104,115	3856	$ 4,135,825	$ 1,031,508	$ 9,612,583
	131.60	63" Bulb T	$ 193.02	$ 5,080,286	90681	15,353	106,034	3927	$ 4,212,062	$ 1,050,522	$ 10,342,870
	106.13	54" Bulb T	$ 221.98	$ 4,381,885	95539	11,515	107,054	3965	$ 4,252,562	$ 1,060,623	$ 9,695,070
	113.45	54" Bulb T	$ 221.98	$ 5,112,199	90681	13,434	104,115	3856	$ 4,135,825	$ 1,031,508	$ 10,279,532
	117.50	54" Bulb T	$ 221.98	$ 5,842,514	90681	15,353	106,034	3927	$ 4,212,062	$ 1,050,522	$ 11,105,097
	76.51	Type III	$ 136.70	$ 2,698,458	97158	4,387	101,544	3761	$ 4,033,718	$ 1,006,041	$ 7,738,218
	74.77	Type III	$ 136.70	$ 2,248,715	108493	3,655	112,148	4154	$ 4,454,948	$ 1,111,099	$ 7,814,762
	73.11	Type III	$ 136.70	$ 2,248,715	108493	3,655	112,148	4154	$ 4,454,948	$ 1,111,099	$ 7,814,762
	71.52	Type III	$ 136.70	$ 2,248,715	108493	3,655	112,148	4154	$ 4,454,948	$ 1,111,099	$ 7,814,762
JBT DESIGN	70.00	Type III	$ 136.70	$ 2,248,715	108493	3,655	112,148	4154	$ 4,454,948	$ 1,111,099	$ 7,814,762
	78.33	Type III	$ 136.70	$ 2,698,458	97158	4,387	101,544	3761	$ 4,033,718	$ 1,006,041	$ 7,738,218

IDEA A-1 **INCREASE SPAN LENGTH TO REDUCE AMOUNT OF SUBSTRUCTURE**

SUBSTRUCTURE COSTS - CAP CALCULATIONS

	Span Length	Number Of Spans	Number Of Bents	Cap Length Beam Sp + 3 ft	Cap Depth	Cap Width FT	Cap Volume yd^3	Total Cap Volume yd^3	Cost Class A $ 574.82 per Yd^3	Sub Rebar $ 0.97 per LB 180 LB/yd^3	Total Caps Cost
	131.60	25	26	40.00	3.00	3.50	15.56	404	$ 232,483	$ 70,616	$ 303,099
	137.08	24	25	40.50	3.00	3.50	15.75	394	$ 226,335	$ 68,749	$ 295,084
	143.04	23	24	42.00	3.00	3.50	16.33	392	$ 225,329	$ 68,443	$ 293,773
	117.50	28	29	40.00	3.00	3.50	15.56	451	$ 259,308	$ 78,764	$ 338,072
	126.54	26	27	40.50	3.00	3.50	15.75	425	$ 244,442	$ 74,249	$ 318,691
	131.60	25	26	42.00	3.00	3.50	16.33	425	$ 244,107	$ 74,147	$ 318,254
	106.13	31	32	40.00	3.00	3.50	15.56	498	$ 286,133	$ 86,912	$ 373,045
	113.45	29	30	40.50	3.00	3.50	15.75	473	$ 271,602	$ 82,499	$ 354,101
	117.50	28	29	42.00	3.00	3.50	16.33	474	$ 272,273	$ 82,702	$ 354,975
	76.51	43	44	40.00	3.00	3.50	15.56	684	$ 393,432	$ 119,504	$ 512,936
	74.77	44	45	40.00	3.00	3.50	15.56	700	$ 402,374	$ 122,220	$ 524,594
	73.11	45	46	40.00	3.00	3.50	15.56	716	$ 411,316	$ 124,936	$ 536,252
	71.52	46	47	40.00	3.00	3.50	15.56	731	$ 420,257	$ 127,652	$ 547,909
JBT DESIGN	70.00	47	48	40.00	3.00	3.50	15.56	747	$ 429,199	$ 130,368	$ 559,567
	78.33	42	43	40.00	3.00	3.50	15.56	669	$ 384,491	$ 116,788	$ 501,279

SUBSTRUCTURE COSTS - PILING CALCULATIONS

	Span Length	Piles Per Bent	Total Piles	Pile Length	24" Pile Cost Cost Per Ft	Piling cost	Total Substructure Cost	Total Superstructure Cost	Subtotal Total Cost
	131.60	6	156	75	$ 80.44	$ 941,148.00	1,244,246.76	$ 9,470,824	$ 10,715,070.48
	137.08	7	175	75	$ 80.44	$ 1,055,775.00	1,350,859.13	$ 10,017,911	$ 11,368,770.52
	143.04	8	192	75	$ 80.44	$ 1,158,336.00	1,452,108.64	$ 10,806,102	$ 12,258,210.21
	117.50	6	174	75	$ 80.44	$ 1,049,742.00	1,387,813.69	$ 9,123,400	$ 10,511,213.42
	126.54	7	189	75	$ 80.44	$ 1,140,237.00	1,458,927.86	$ 9,612,583	$ 11,071,511.25
	131.60	8	208	75	$ 80.44	$ 1,254,864.00	1,573,117.69	$ 10,342,870	$ 11,915,987.26
	106.13	6	192	75	$ 80.44	$ 1,158,336.00	1,531,380.62	$ 9,695,070	$ 11,226,450.75
	113.45	7	210	75	$ 80.44	$ 1,266,930.00	1,621,030.95	$ 10,279,532	$ 11,900,563.14
	117.50	8	232	75	$ 80.44	$ 1,399,656.00	1,754,631.27	$ 11,105,097	$ 12,859,728.04
	76.51	6	264	75	$ 80.44	$ 1,592,712.00	2,105,648.36	$ 7,738,218	$ 9,843,866.24
	74.77	5	225	75	$ 80.44	$ 1,357,425.00	1,882,019.00	$ 7,814,762	$ 9,696,781.46
	73.11	5	230	75	$ 80.44	$ 1,387,590.00	1,923,841.64	$ 7,814,762	$ 9,738,604.10
	71.52	5	235	75	$ 80.44	$ 1,417,755.00	1,965,664.29	$ 7,814,762	$ 9,780,426.75
JBT DESIGN	70.00	5	240	75	$ 80.44	$ 1,447,920.00	2,007,486.93	$ 7,814,762	$ 9,822,249.39
	78.33	6	258	75	$ 80.44	$ 1,556,514.00	2,057,792.71	$ 7,738,218	$ 9,796,010.60

ADDITIONAL SUPERSTRUCTURE COSTS - Diaphragms, Edgebeams & Endwalls

		Diaphragms			Edgebeams			Endwalls			Total Concrete Volume for Diaph, Edgebeams & Endwalls (yd^3)	# Rebar for Diaph, edgebm & Endwall @200 /lb
	Span Length	Number of Diaphragms	Volume of Diaphragms	Cost of Diaphragms	Number of Edgebeams	Volume of Edgebeams	Cost of Edgebeams	Number of Endwalls	Volume of Endwalls	Cost of Endwalls		
	131.60	125	135.38	$ 145,198	248	135.38	$ 145,198	2	243.69	$ 261,367	514.45	102,889.06
	137.08	144	128.84	$ 138,187	286	128.84	$ 138,187	2	231.92	$ 248,746	489.60	97,920.66
	143.04	161	125.86	$ 134,991	320	125.86	$ 134,991	2	226.56	$ 242,994	478.28	95,656.52
	117.50	140	132.67	$ 142,294	278	132.67	$ 142,294	2	238.82	$ 256,140	504.16	100,831.28
	126.54	156	122.13	$ 130,989	310	122.13	$ 130,989	2	219.84	$ 235,790	464.10	92,820.63
	131.60	175	119.71	$ 128,389	348	119.71	$ 128,389	2	215.48	$ 231,109	454.89	90,977.66
	106.13	155	125.90	$ 135,034	308	125.90	$ 135,034	2	226.63	$ 243,071	478.43	95,686.83
	113.45	174	116.76	$ 125,232	346	116.76	$ 125,232	2	210.18	$ 225,426	443.70	88,740.60
	117.50	196	114.92	$ 123,253	390	114.92	$ 123,253	2	206.86	$ 221,864	436.69	87,338.56
	76.51	215	145.53	$ 156,088	428	145.53	$ 156,088	2	261.97	$ 280,970	553.03	110,605.74
	74.77	176	152.27	$ 163,318	350	152.27	$ 163,318	2	274.10	$ 293,985	578.65	115,729.36
	73.11	180	155.73	$ 167,030	358	155.73	$ 167,030	2	280.33	$ 300,666	591.80	118,359.58
	71.52	184	159.19	$ 170,742	366	159.19	$ 170,742	2	286.56	$ 307,348	604.95	120,989.79
JBT DESIGN	70.00	188	162.65	$ 174,454	374	162.65	$ 174,454	2	292.79	$ 314,029	618.10	123,620.00
	78.33	210	142.15	$ 152,458	418	142.15	$ 152,458	2	255.87	$ 274,435	540.17	108,033.51

ADDITIONAL SUPERSTRUCTURE COSTS - Diaphragms, Edgebeams & Endwalls

Span Length	Total Concrete Volume for Diaph, Edgebeams & Endwalls (yd^3)	Cost of Concrete	# Rebar for Diaph, edgebm & Endwall @200 /lb	Cost of Rebar	Total Cost of Edgebeams Diaphragms & Endwalls
131.60	514.45	$ 551,763.17	102,889.06	$ 110,091.29	$ 661,854
137.08	489.60	$ 525,119.13	97,920.66	$ 104,775.11	$ 629,894
143.04	478.28	$ 512,977.20	95,656.52	$ 102,352.47	$ 615,330
117.50	504.16	$ 540,727.90	100,831.28	$ 107,889.47	$ 648,617
126.54	464.10	$ 497,769.17	92,820.63	$ 99,318.07	$ 597,087
131.60	454.89	$ 487,885.92	90,977.66	$ 97,346.10	$ 585,232
106.13	478.43	$ 513,139.74	95,686.83	$ 102,384.90	$ 615,525
113.45	443.70	$ 475,889.21	88,740.60	$ 94,952.44	$ 570,842
117.50	436.69	$ 468,370.48	87,338.56	$ 93,452.26	$ 561,823
76.51	553.03	$ 593,145.40	110,605.74	$ 118,348.14	$ 711,494
74.77	578.65	$ 620,621.86	115,729.36	$ 123,830.42	$ 744,452
73.11	591.80	$ 634,726.90	118,359.58	$ 126,644.75	$ 761,372
71.52	604.95	$ 648,831.94	120,989.79	$ 129,459.07	$ 778,291
70.00	618.10	$ 662,936.98	123,620.00	$ 132,273.40	$ 795,210
78.33	540.17	$ 579,351.32	108,033.51	$ 115,595.86	$ 694,947

IDEA A-1

INCREASE SPAN LENGTH TO REDUCE AMOUNT OF SUBSTRUCTURE

ADDITIONAL SUPERSTRUCTURE COSTS, TOTAL BRIDGE COSTS & POTENTIAL SAVINGS

	Span Length	Total Cost of Edgebeams Diaphragms & Endwalls	Barrier $ 50.29 per foot	Grooving $ 4.85 16816	Total Bridge Cost prior to	Cost Adjustment ADD 24.69%	Total Bridge Cost with adjustment	Savings	
	131.60	$ 661,854	$ 330,908.20	$ 81,555.44	$ 11,789,389	$ 2,910,467	$ 14,699,855	$ (946,956)	
	137.08	$ 629,894	$ 330,908.20	$ 81,555.44	$ 12,411,128	$ 3,063,957	$ 15,475,085	$ (1,722,185)	
	143.04	$ 615,330	$ 330,908.20	$ 81,555.44	$ 13,286,004	$ 3,279,939	$ 16,565,942	$ (2,813,042)	
	117.50	$ 648,617	$ 330,908.20	$ 81,555.44	$ 11,572,294	$ 2,856,872	$ 14,429,167	$ (676,267)	
	126.54	$ 597,087	$ 330,908.20	$ 81,555.44	$ 12,081,062	$ 2,982,473	$ 15,063,535	$ (1,310,635)	
	131.60	$ 585,232	$ 330,908.20	$ 81,555.44	$ 12,913,683	$ 3,188,023	$ 16,101,706	$ (2,348,806)	
	106.13	$ 615,525	$ 330,908.20	$ 81,555.44	$ 12,254,439	$ 3,025,274	$ 15,279,713	$ (1,526,814)	
	113.45	$ 570,842	$ 330,908.20	$ 81,555.44	$ 12,883,868	$ 3,180,663	$ 16,064,531	$ (2,311,632)	
	117.50	$ 561,823	$ 330,908.20	$ 81,555.44	$ 13,834,014	$ 3,415,227	$ 17,249,241	$ (3,496,342)	
	76.51	$ 711,494	$ 330,908.20	$ 81,555.44	$ 10,967,823	$ 2,707,645	$ 13,675,469	$ 77,431	Most Cost Effective
	74.77	$ 744,452	$ 330,908.20	$ 81,555.44	$ 10,853,697	$ 2,679,471	$ 13,533,168	$ 219,731	
	73.11	$ 761,372	$ 330,908.20	$ 81,555.44	$ 10,912,439	$ 2,693,973	$ 13,606,412	$ 146,488	
	71.52	$ 778,291	$ 330,908.20	$ 81,555.44	$ 10,971,181	$ 2,708,474	$ 13,679,656	$ 73,244	
JBT DESIGN	70.00	$ 795,210	$ 330,908.20	$ 81,555.44	$ 11,029,923	$ 2,722,976	$ 13,752,900	$ -	
	78.33	$ 694,947	$ 330,908.20	$ 81,555.44	$ 10,903,421	$ 2,691,746	$ 13,595,168	$ 157,732	

Calculated cost	$	13,752,900
From Cost Estimate	$	13,752,900
difference	$	0

Span Length	# Beams	Beam Sp
131.60	6	8.00
137.08	7	6.75
143.04	8	6.00
117.50	6	8.00
126.54	7	6.75
131.60	8	6.00
106.13	6	8.00
113.45	7	6.75
117.50	8	6.00
76.51	6	8.00
74.77	5	10.00
73.11	5	10.00
71.52	5	10.00
70.00	5	10.00
78.33	6	8.00

DEVELOPMENT AND RECOMMENDATION PHASE

Back River Bridge Replacement

IDEA No.:	PAGE No.:	CREATIVE IDEA:
A-3	1 of 5	Reduce shoulder widths for entire 3,290' length of bridge structure.

Comp By: DPC Date: 10/15/07 Checked By: DCW Date: 10/16/07

Original Concept:

The current design was based on bridge widths specified from chart 2.9.1.1 (GDOT Bridge and Structural Design Policy Manual - Revised April 2007) for a 2-lane rural roadway located on the State and Federal System (non-Interstate). For design speeds over 50 MPH and ADT over 4,000, the required bridge width clear distance should be 44 feet. Current proposed speed limit is 55 MPH with opening year (2010) ADT of 19,800 vehicles per day and a projected design year (2030) ADT of 35,900 vehicles per day. This equates to two 12-foot wide travel lanes and two 10-foot wide shoulders as shown on typical section sheet.

Proposed Change:

Current roadway characteristics classify SR 404 Spur/US 17 as a rural principal arterial. It is recommended that consideration be given to change roadway classification to a Multilane rural (divided) category. Utilizing chart 2.9.1.1 in the GDOT Bridge and Structural Design Policy Manual - Revised April 2007, the bridge width clear distance would be the proposed pavement width + 14 feet which equates to two 12-foot lanes, one 4-foot wide inside shoulder and one 10-foot outside shoulder for a revised 38-foot wide bridge (a total 6-foot width reduction).

Justification:

Once new northbound bridge structure is completed and functional, SR 404/US17 will be classified as a Multilane rural (divided) roadway. Until existing northbound structure is completed and opened to traffic, striping of the new southbound bridge travel lanes could be constructed as follows: Two 12-foot lanes and two 7-foot wide shoulders, or two 11 foot lanes and two 8 foot shoulders.

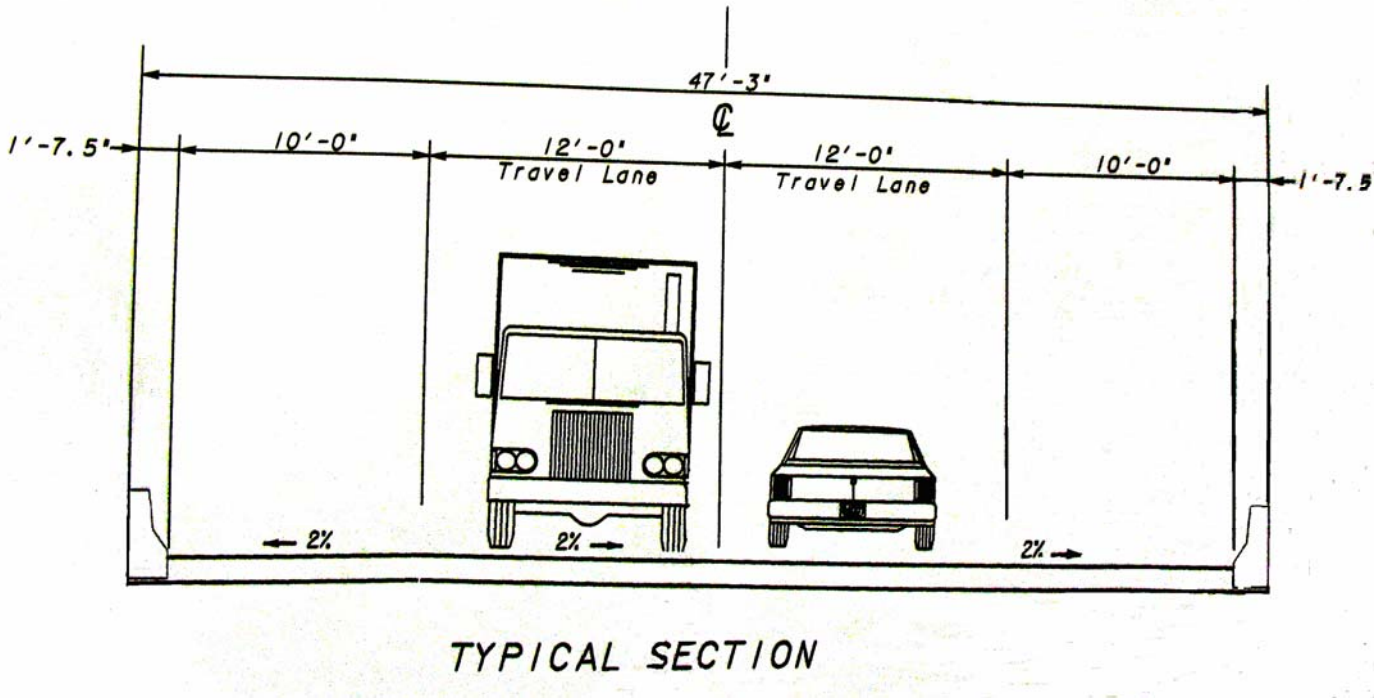
The cross slope should remain a constant 2% across the width of the bridge except at the super elevated section at the beginning of the project.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	15,390,000		
- Proposed	13,440,000		
- Savings	1,950,000		1,950,000
FUTURE COST - Savings		N/A	-0-
TOTAL PRESENT WORTH SAVINGS			**1,950,000**

SKETCH

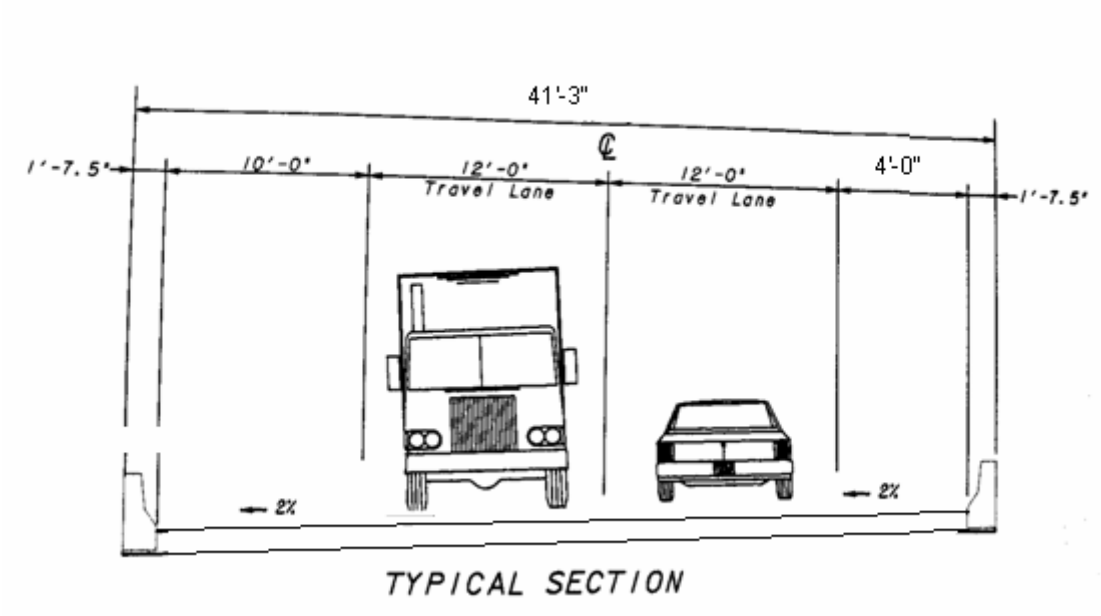
Back River Bridge Replacement	ITEM N^{O} : A-3 CLIENT: GDOT Sheet 2 of 5

Original Concept



TYPICAL SECTION

Back River Bridge Replacement	ITEM NO: A-3 CLIENT: GDOT Sheet 3 of 5



TYPICAL SECTION

PROPOSED CONCEPT

COST WORKSHEET							
PROJECT: **Back River Bridge Replacement**					ITEM No: A-3 CLIENT: GDOT Sheet 4 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Bridge Structure 47.25 ft. wide	SF	155,453	90	13,990,725			
by 3,290 feet long.							
Bridge Structure 41.25ft. wide	SF				135,713	90	12,214,125
by 3,290 feet long.							
SUBTOTAL				13,990,725			12,214,125
Markup @ 10.00%				1,399,073			1,221,413
TOTAL				15,389,798			13,435,538
TOTAL ROUNDED				15,390,000			13,440,000

6-foot wide reduction in bridge deck surface area:

3,290 feet in length x 6.0 feet wide = 19,740 SF of bridge deck elimination.

Unit price of bridge deck is estimated near $90.00 SF.

19,740 SF x $90.00 = $1,776,600 (without mark-up)

DEVELOPMENT AND RECOMMENDATION PHASE

Back River Bridge Replacement

IDEA No.:	PAGE No.:	CREATIVE IDEA:
A-4	1 of 3	Reduce Length of Deceleration Lane

Comp By: AEH Date: 10/15/07 Checked By: DCW Date: 10/16/07

Original Concept:

Provide Westbound deceleration lane 500 feet long with 180 foot taper for right turn movement onto Hutchinson Island.

Proposed Change:

Reduce ramp length from 500 feet to 410 feet, and reduce taper from 180 feet to 100 feet.

Justification:

Length provided appears to be based on Green Book page 714, desirable length of deceleration lane from a design speed of 55 mph to a stop condition is 485 feet.

However, this exit does not have a stop condition, but is a free flow lane into a 25 mph curve that leads to the island local roads. Traffic should not be an issue with the free flow condition of the ramp.

From Exhibit 10-73, Minimum Deceleration Lengths for Exit Terminals, with a main line design speed of 55 mph and an exit curve design speed of 25 mph, L=410 feet.

Green Book, page 715, common practice is to use a taper rate between 8:1 and 15:1. Original design uses 15:1. Green Book states that "…long tapers tend to entice some through drivers into the deceleration lane-especially when the taper is on a horizontal curve". That is the situation on this project. Reducing the taper length will provide cost savings as well as improved design.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	700,900		
- Proposed	546,500		
- Savings	154,400		154,400
FUTURE COST - Savings		N/A	-0-
TOTAL PRESENT WORTH SAVINGS			**154,400**

COST WORKSHEET

PROJECT: **Back River Bridge Replacement**

ITEM No: A-4
CLIENT: GDOT
Sheet 2 of 3

CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			NEW ESTIMATE		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Decel Lane on Bridge	SF	7080	90	637,200	5520	90	496,800
SUBTOTAL				637,200			496,800
Markup @ 10.00%				63,720			49,680
TOTAL				700,920			546,480
TOTAL ROUNDED				700,900			546,500

Since the decel lane is for a free flow ramp onto the island, length will be controlled by deceleration requirements rather than volumes.

Per Green Book page 714, required deceleration length for a design speed of 55 mph is 485 feet, 15 feet less than provided in the original design.

This distance will be enough to go from 55 mph to stop condition. However, speed only needs to be reduced to 25 mph, a difference of 30 mph.

Distance required to reduce speed from 55 mph to 25 mph: From Exhibit 10-73, (page 851) Minimum Deceleration Lengths for Exit Terminals, with a main line design speed of 55 mph and an exit curve design speed of 25 mph, L=410 feet.

Cost of decel. lane = 410 feet x 12 feet = 4920 sf x $90 per sf = $442,800.

Cost of taper = 100 feet x 12 feet x .5 = 600 sf x $90 per sf = $54,000.

Total cost of decel lane and taper without markup = $442,800 + $54,000 = $496,800.

DEVELOPMENT AND RECOMMENDATION PHASE

Back River Bridge Replacement

IDEA No.:	**PAGE No.:**	CREATIVE IDEA:
A-6	1 of 3	Reduce travel lane widths to 11 feet through entire project limits.

Comp By: DPC Date: 10/15/07 Checked By: DCW Date: 10/16/07

Original Concept:

The current design proposes to use 12-foot travel lanes throughout entire project limits.

Proposed Change:

It is recommended that consideration be given to reducing the proposed 12-foot travel lanes to 11-feet throughout entire project limits.

Justification:

Reducing the overall pavement section width on both the bridge structure and roadway approaches would result in a significant cost savings. Level of service should not be impacted on project.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**PRESENT WORTH**
INITIAL COST - Original	8,154,000		
- Proposed	7,474,000		
- Savings	680,000		680,000
FUTURE COST - Savings		N/A	-0-
TOTAL PRESENT WORTH SAVINGS			**680,000**

COST WORKSHEET

PROJECT: **Back River Bridge Replacement**

ITEM No: A-6

CLIENT: GDOT

Sheet 2 of 3

CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			NEW ESTIMATE		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Bridge (2) 12 foot lanes	SF	78,960	90.00	7,106,400			
at 3,290 l.f in length							
Roadway (2) 12-ft. lanes	SY	4,080	75.00	306,000			
at 1,530 l.f. in length							
Bridge (2) 11-ft. lanes	SF				72,380	90.00	6,514,200
at 3,290 l.f. in length							
Roadway (2) 11-foot lanes	SY				3,740	75.00	280,500
at 1,530 l.f. in length							
SUBTOTAL				7,412,400			6,794,700
Markup @ 10.00%				741,240			679,470
TOTAL				8,153,640			7,474,170
TOTAL ROUNDED				8,154,000			7,474,000

CALCULATIONS

Back River Bridge Replacement	ITEM $N^{\underline{O}}$: A-6 CLIENT: GDOT Sheet 3 of 3

Bridge Structure:
2-foot wide reduction in bridge deck surface area:

3,290 feet in length x 2.0 feet wide = 6,580 SF of bridge deck elimination.

Unit price of bridge deck is estimated at $90.00 SF.

6,580 SF x $90.00 SF = $592,200 without mark-up

Roadway:
2-foot wide reduction in roadway section from begin project station 100+80+/- to begin bridge structure at station 104+55+/- a distance of 375 feet.

2-foot wide reduction in roadway section from end bridge structure station 137+45+/- to end project at station 149+00+/- a distance of 1,155 feet.

Total 2-foot wide roadway reduction for a distance of 1,530 feet. Converting 1,530 feet x 2 feet = 3,060 SF into SY. (1 SY = 9 SF) 3,060 SF = 340 SY

Unit price of roadway construction at $75.00 SY

340 SY x $75.00 SY = $25,500 without mark-up

DEVELOPMENT AND RECOMMENDATION PHASE

Back River Bridge Replacement

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-1	1 of 3	Do not demolish existing bridge at this time

Comp By: DPC Date: 10/16/07 Checked By: DCW Date: 10/17/07

Original Concept:

The current design proposes to remove the existing 3,204 foot x 32.50 foot bridge structure (104,130 SF) at $25.00 SF.

Proposed Change:

It is recommended that consideration be given to not remove bridge structure after new bridge structure is opened to traffic. Leave the structure in place for recreational use until such time as the second span is planned for construction. Demolish the structure at that time. Rectify bridge for bicycle and pedestrian safety by adding a 54 inch high galvanized steel pipe handrail to the entire length of bridge deck on both sides. Additionally, install steel bollards at each end of bridge deck to keep motor vehicles off deck area as well as miscellaneous signage and pedestrian / bicycle safety items.

Justification:

Leave structure in place (closed to vehicular traffic) and allow the local community to use the bridge as fishing pier, bicycle path, multi-purpose trail, or for other creative community value ideas. This alternative allows the burden of future design / construction costs of the second bridge as well as future demolition expenses to be equally shared or even transferred to SCDOT in future binding agreements. Conflicting pier structures from the new bridge and the existing bridge should not conflict greatly due to light navigational travel and smaller sized floating vehicles on Back River channel.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	2,864,000		
- Proposed	331,100		
- Savings	2,532,900		2,532,900
FUTURE COST - Savings		N/A	-0-
TOTAL PRESENT WORTH SAVINGS			**2,532,900**

COST WORKSHEET							
PROJECT: **Back River Bridge Replacement**					ITEM No: B-1		
					CLIENT: GDOT		
					Sheet 2 of 3		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Removal of existing bridge at	SF	104,130	25	2,603,250			
3,204 ft. x 32.50 ft.							
Do not remove existing bridge	SF				104,130	0.00	0
structure							
Galvanized Steel Pipe Handrail	LF				6,728	40.00	269,120
Bollards at bridge closing points	EA				10	684.32	6,843
Miscellaneous directional signs	LS				1	25,000	25,000
pedestrian / bicycle safety items							
SUBTOTAL				2,603,250			300,963
Markup @ 10.00%				260,325			30,096
TOTAL				2,863,575			331,060
TOTAL ROUNDED				2,864,000			331,100

Back River Bridge Replacement	ITEM N^{O} : B-1 CLIENT: GDOT Sheet 3 of 3

Handrail:

New 2 inch diameter galvanized steel pipe handrail placed on existing bridge at a minimum required height of 54 inches from walking / riding surface per bicycle safety standards.
Existing bridge length is 3,204 LF x 2 for each side = 6,408 LF x 1.05 = 6,728 LF
Use GDOT $40.00 LF unit cost.
6,728 LF x $40.00 LF = $269,120 (without mark-up)

Bollards:

Existing bridge width is 32.50 LF+/-. Placing bollards at 5 foot center to center across each end of bridge equates to approximately 5 bollards on each end or 10 bollards total.
Use GDOT $684.32 each x 10 EA = $6,843.20 (without mark-up)

DEVELOPMENT AND RECOMMENDATION PHASE

Back River Bridge Replacement

IDEA No.:	PAGE No.:	CREATIVE IDEA:
C-1	1 of 3	Reduce Design Speed to 45 mph

Comp By: AEH Date: 10/15/07 Checked By: DCW Date: 10/16/07

Original Concept:

Design based on speed of 55 mph.

Proposed Change:

Reduce the design speed of project to 45 mph from the beginning of the project to 1000 feet from the shore line. This will reduce the required length of the right turn lane on the bridge. It will also decrease the required length of the acceleration lane on the future bridge. (Savings not included below.)

Justification:

Posted speed on Talmadge Bridge as it approaches Savannah is 45 mph. The design vertical curve at the beginning of the project has a k value of 113.76, which is less than the required k value (115) for sag curves for a design speed of 55 mph.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	700,900		
- Proposed	409,900		
- Savings	291,000		291,000
FUTURE COST - Savings		N/A	-0-
TOTAL PRESENT WORTH SAVINGS			**291,000**

COST WORKSHEET

PROJECT: **Back River Bridge Replacement**

ITEM No: C-1
CLIENT: GDOT
Sheet 2 of 3

CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			NEW ESTIMATE		
ITEM	UNITS	No. UNITS	COST/ UNIT	TOTAL COST	No. UNITS	COST/ UNIT	TOTAL COST
Decel Lane on Bridge							
500' long with 180' taper	SF	7,080	90.00	637,200			
Decel lane on bridge							
295' long with 100' taper	SF				4,140	90.00	372,600
SUBTOTAL				637,200			372,600
Markup @ 10.00%				63,720			37,260
TOTAL				700,920			409,860
TOTAL ROUNDED				700,900			409,900

Deceleration lane is 100% on structure. Cost of 500 foot long decel lane and 180 foot taper per original proposal is $637,200.

****

Per Green Book page 714, required deceleration length for a design speed of 55 mph is 485 feet, 15 feet less than provided in the original design.

This distance will be enough to go from 55 mph to stop condition. However, speed only needs to be reduced to 25 mph. If design speed is reduced to 45 mph, this represents a difference of 20 mph.

Distance required to reduce speed from 45 mph to 25 mph: From Exhibit 10-73, (page 851) Minimum Deceleration Lengths for Exit Terminals, with a main line design speed of 45 mph and an exit curve design speed of 25 mph, L=295 feet.

Cost of decel. lane = 295 feet x 12 feet = 3540 sf x $90 per sf = $318,600.

Reduce taper length from 180 feet to 100 feet.

Cost of taper = 100 feet x 12 feet x 0.5 = 600 sf x $90 per sf = $54,000.

Total cost of decel lane and taper without markups = $318,600 + $54,000 = $372,600.

APPENDIX

COST MODEL

VALUE ENGINEERING

COST DISTRIBUTION

By

Decreasing Item Number

Back River Bridge Replacement
Project NH-009-2(93) Chatham
PI. No. 522920

Element ID.	Item Description	Cost x $1,000	%
A	New Bridge Construction	15,829	74
B	Bridge Demolition and Staging	3,194	15
	80% Cost Line		
C	Right of Way	812	4
D	Traffic Control	572	3
E	Grading	330	2
F	AC Pavement	210	1
G	Erosion Control	152	1
H	Aggregate Base	81	0
I	Concrete Approach Slab	52	0
J	Guardrail	39	0
K	Signing and Marking	16	0
	TOTAL	**$21,287**	**100.0%**

INFORMATION PHASE FUNCTION ANALYSIS

Back River Bridge Replacement

System: New Structure
Function: Improve Reliability

ITEM No.	DESCRIPTION	FUNCTION			INITIAL DOLLARS (x 1,000)		
		Verb	Noun	Kind*	Cost	% of Total	Worth
A	New Bridge	Cross	River	B	15,829	74	12,800
B	Demolition of existing bridge	Remove	Structure	S	3,194	15	3,194
		Protect	Environment				
C	Roadway Approaches						
C-1	Right of Way	Store	Project	S	812	4	800
C-2	Traffic Control	Direct	Traffic	S	572	3	500
C-3	Grading	Achieve	Grade	B	330	2	330
	TOTAL				**20,737**	**98**	**17,624**

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
Back River Bridge Replacement			
NO.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING**
A	**New Bridge**		
A-1	Increase span to reduce superstructure		✓
A-2	Use fixed piers to increase spans	Not cost effective.	**X**
A-3	Reduce shoulders to the ultimate of 10 ft. out and 4 ft. on the inside; stripe 11 ft lanes and two 8 ft shoulders for now		✓
A-4	Reduce the length of the deceleration lane		✓
A-5	Eliminate the gore	Needed for future and transition areas	**X**
A-6	Reduce lane widths to 11 feet		✓
B	**Demolition and Staging**		
B-1	Do not demolish the bridge at this time		✓
C	**Approaches**		
C-1	Reduce design speed to 45 mph		✓
C-2	Keep future bridge tight to existing		**DC**

VE STUDY SIGN-IN SHEET

Project No.: NH-00902(93) County: Chatham PI No.: 522920 Date: 10/15-18/07

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