VALUE ENGINEERING REPORT

Cable Barrier Installation

P.I. Nos. 0009619, 0009818, 0009819, 0009820, 0009821, and 0009822

Meriwether / Coweta / Haralson / Carroll / Douglas / Clayton / Peach / Bibb / Twiggs / Bleckley / Laurens / Dawson and Lumpkin Counties

December 21, 2010

OWNER AND DESIGN TEAM:

Georgia Department of Transportation
600 West Peachtree Street
Atlanta, GA 30308

VALUE ENGINEERING CONSULTANT:

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Cable Barrier Installation

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Executive Summary

Value Engineering Study

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Meriwether / Coweta / Haralson / Carroll / Douglas / Clayton / Peach / Bibb / Twiggs / Bleckley / Laurens / Dawson and Lumpkin Counties

Introduction

This report presents the results of a value engineering (VE) study conducted on the concept level design for six projects relating to the installation of high-tension cable barriers at various locations throughout the state. The projects were selected based on a study conducted by GDOT that required a 34 foot or greater median, and a history of a minimum of 5 traffic cross over accidents per three mile stretch over the past three years. The six projects include a total of 544,122 feet of 4 strand cable barrier and 113 cable terminals. The total estimated construction cost at this stage is $24.4 million and does not include markups for E&I or contingencies.

The study took place December 6-9, 2010, at the Georgia DOT General Office in Atlanta using a four person VE team. It was conducted at the preliminary design level design of these safety related improvements.

This report presents the 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. The Appendix includes a complete record of the Team's activities and findings. The reader is encouraged to review all sections of the report in order to obtain a complete understanding of the VE process.

Results Obtained

The VE team focused their efforts on the high cost items of the project. Through the use of function analysis and "brain storming" techniques, the team generated 14 ideas with 13 being identified for additional evaluation as possible recommendations or design suggestions. The VE team developed 13 recommendations for consideration by the design team. Neglecting the overlapping nature of the recommendations as much as possible, the net total of all the recommendations have the potential to reduce project costs by as much as $15,930,000 in capital cost savings while continuing to provide the required functionality. A negative of $399,000 was realized in the present worth of future costs (cost increase) for a total life cycle potential cost

improvement of $15,531,000. This is shown in the last column of the Summary Tables that follows the summary description below.

A brief presentation of these recommendations was conducted on December 9th at GDOT offices. See Appendix C for a listing of those in attendance. A summary of the recommendations follows.

Recommendation Highlights

A: Class A Concrete Mow Strip

A-1: Use sidewalk concrete in lieu of Class A concrete. This recommendation proposes to use a lower grade of concrete for the mow strip than the Class A shown in the current design. There are no loads on this material and sidewalk type should suffice for the intent of providing a mow strip the contractor can use as well as block plant growth and therefore reduce maintenance.

The total potential savings is $5,240,000

A-2: Use asphalt in lieu of Class A concrete proposed under the current design for the mow strip. Asphalt paving will provide the same function as concrete in this application. However, there will be two steps in lieu of the current single placing of the footings and mow strip. Material savings are substantial.

The total potential savings is $8,110,000

A-3: Eliminate mowing strip completely. This recommendation suggests not using a mowing strip at all. Manufacturers do not have a problem with it except in the area of the terminals where some suppliers suggest the strip be included to help anchor the system. Additional costs have been included for additional maintenance associated with vegetation control.

The total potential savings is $12,301,000

A-4: Design Consideration: Use an alternate barrier for weed / plant growth. This proposal is to consider an alternate to paving for vegetation control. Almost 60% of the cost of the project is contained in the mow strip, so alternates should be evaluated.

The total potential savings is N/A

A-5: Drive posts and or sleeves and eliminate concrete foundation. This option may not be available from all manufacturers but a substantial savings would result.

The total potential savings is $1,223,700

B: Cable Barrier Systems

B-1: Use a three cable system in lieu of a four cable system. The existing design proposes a 4 cable system. Based on conversations with several manufacturers, 50% of the cost for the system is for the cable itself. The difference between the three and four cable system is the spacing of the cables, and manufacturers themselves question the need for the fourth cable, stating that three will function and catch just as many vehicles as the four cable system. The first cable in both systems is about 27 inches off the ground. The important criteria is to meet the TL-4 test criteria and the maximum allowable deflection.

The total potential savings is $910,000

B-2: Shift the location of the barrier to the edge of the shoulder where the shoulders are at least 12 feet wide. The current design shows the system several feet from the edge of the paved shoulder. This proposed concept would eliminate the need for the mow strip and still allow 12 feet for a disabled vehicle to pull off the mainline.

The total potential savings is $1,090,000

B-4: Use dual faced guardrail in lieu of cable system. The cost of guard rail is greater per linear foot than cable barrier, but it does not require a mow strip, thus showing a capital cost advantage. It could however cause more property damage and potential injuries than the cable barrier in this use.

The total potential savings is $3,174,000

B-5: Design consideration: Provide soil boring data of the terminal areas to the contractors prior to bid. The current plan is to have the contractors obtain soil data to properly design their foundation system. Providing them soil data prior to bid will allow for a properly designed foundation at the appropriate cost when the bids are received. The increased cost to the State should be offset by lower bids.

The total potential savings is N/A

B-6: Develop a performance based specification. The current design is restrictive, stating number of cables, maximum spacing of posts, etc. The proposed concept is to state the important criteria, such as meeting the TL-4 test criteria with a certain maximum deflection, and let the individual suppliers design their system to comply with the criteria. This would result in systems that are not overdesigned and would therefore result in savings.

The total potential savings is $1,820,000

B-7: Verify conformance of projects with AASHTO median barrier installation guidelines and develop a GDOT implementation plan. Traffic crash data for certain median widths was analyzed to determine the location of where the proposed improvements would occur. The projects were then identified by an unknown priority system. The proposed change is to revisit the priority implementation system and document how the projects were selected and the order

of construction priority that actually occurred. The savings shown reflect the project segments included in the current designs that were not included in the GDOT 50 project list of priority projects.

The total potential savings is $18,276,000

B-8: Combine projects for bid purposes. The original concept presented 6 projects that are currently planned to be let separately. The proposed plan would be to combine several or all 6 into one bid package. This would result in reduced bid prices due to reduced overhead necessary for 6 separate projects. For a contract such as this, the projects could be grouped geographically, but it is not really necessary to do even that. Combining the projects results in a greater amount of cable being purchased and would result in a more cost effective unit cost.

The total potential savings is $1,218,000

B-8.1: Design consideration: Pre-purchase materials on an annual or semi-annual basis. This idea proposes that GDOT pre-purchase the cable and posts on an annual basis directly from the manufacturer. The quantity can be based on estimated or programmed quantities planned for say one year. The materials could be stored at GDOT facilities, at manufacturer facilities or a combination of the two. The contractor would bid the job as a GDOT supplied equipment, contractor installed. This type of contract is let quite frequently on a federal contract level and results in substantial savings in contractor markup on manufacturer materials. The large quantities bid will also result in very favorable pricing.

Potential savings TBD

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Meriwether / Coweta / Haralson / Carroll / Douglas / Clayton / Peach / Bibb / Twiggs / Bleckley / Laurens / Dawson and Lumpkin Counties

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	**Class A Concrete**						
A-1	Use sidewalk concrete for the mowing strip in lieu of Class A concrete	14,020,000	8,780,000	5,240,000	-0-	5,240,000	-0-
A-2	Use an asphalt mowing strip in lieu of concrete	14,020,000	5,910,000	8,110,000	-0-	8,110,000	-0-
A-3	Eliminate mowing strip entirely	14,020,000	1,320,000	12,700,000	(399,000)	12,301,000	12,301,000
A-4	Use an alternate barrier for weed/plant growth	Design Consideration				N/A	N/A
A-5	Drive the posts and/or sleeves and eliminate the foundation	1,260,000	36,300	1,223,700	-0-	1,223,700	-0-

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
B	**Cable Barrier**						
B-1	Use three cable in lieu of four cable system	7,330,000	6,420,000	910,000	-0-	910,000	910,000
B-2	Relocate posts to the edge of shoulder where the shoulders are at least 12 feet	1,090,000	-0-	1,090,000	-0-	1,090,000	-0-
B-4	Use double faced guardrail in lieu of cable	18,500,000	15,240,000	3,260,000	(86,000)	3,174,000	-0-
B-5	Provide soil boring information at terminal locations to the bidders	Design Consideration				N/A	N/A
B-6	Use performance specification for selecting low bidder	10,960,000	9,140,000	1,820,000	-0-	1,820,000	1,820,000
B-7	Verify conformance with AASHTO criteria and develop a GDOT implementation plan	24,368,000	6,092,000	18,276,000	-0-	18,276,000	-0-
B-8	Combine projects for bid purposes	24,368,000	23,150,000	1,218,000	-0-	1,218,000	500,000
B-8.1	Have GDOT pre-purchase materials thru an annual contract	Design Consideration				TBD	TBD
	TOTAL POTENTIAL SAVINGS						**15,531,000**

Study Identification

Project: Cable Barrier Installation	**Date:** December 6-9, 2010
Location: Meriwether / Coweta / Haralson / Carroll / Douglas / Clayton / Peach / Bibb / Twiggs / Bleckley / Laurens / Dawson and Lumpkin Counties	

VE Team Members

Name:	Title:	Organization:	Telephone:
George Obaranec	Construction	MACTEC	770-421-3346
Lenor Bromberg	Highway Design	KEA	678-904-8591
Stephen Gaines	Highway Design	Wolverton Associates	770-447-8999
David Wohlscheid	VE Team Facilitator	MACTEC	571-217-0808

Project Description

The study took place December 6-9, 2010, at the Georgia DOT General Office in Atlanta using a four person VE team. It was conducted at the preliminary design level of these safety related improvements. Included were six projects relating to the installation of high-tension cable barriers at various locations around the state. The projects were selected based on a study conducted by GDOT that required a 34 foot or greater median, and a history of a minimum of five traffic cross over accidents per three mile stretch over the past three years. The six projects include a total of 544,122 feet of 4 strand cable barrier with post spacing of 15 feet maximum and 113 cable terminals. The total estimated construction cost at this stage is $24.4 million and does not include markups for E&I or contingencies.

Project Constraints:

The only constraints placed upon the VE team are shown below:

- A four cable system will be used
- The mow strip must be a 4 foot width and have a 4 inch depth
- Post spacing no greater than 15 feet

Project Briefing:

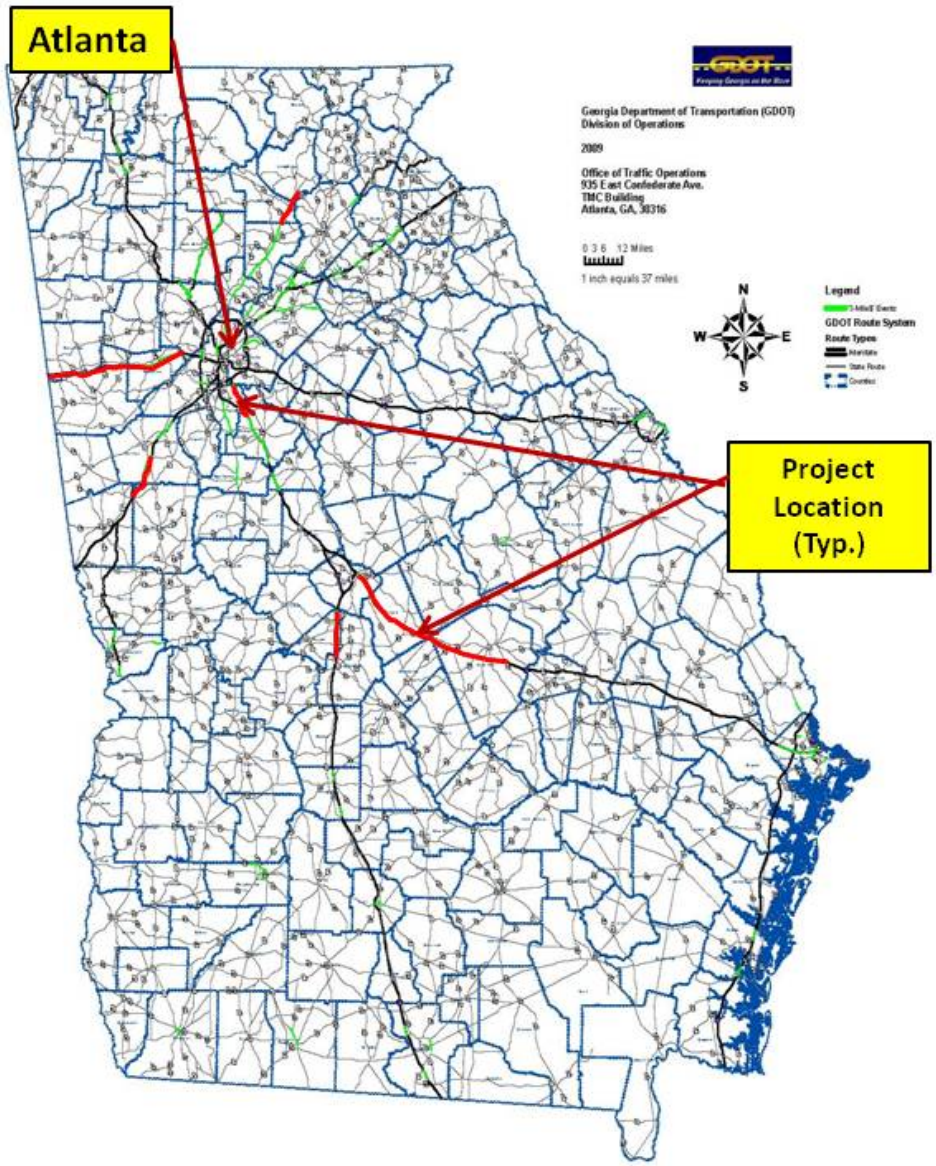
The VE team was given a design briefing on the current status of the project by GDOT representatives Charity Belford and Lakeshia Osburn. In addition to the above constraints, the following items were discussed:

- GDOT has selected a list of 50 high priority projects
    - Selections made based on median width, traffic volumes, crossover history based on a study of the number of crossovers per 3 mile section, and the severity of the incidents
    - Current 6 projects presented for this VE effort were from that list
- 200 (+/-) miles of cable barrier already in place
- These projects add 100 (+/-) additional miles
- There are no environmental impacts associated with these projects (except some stormwater management)
- There are no right of way purchases associated with these projects
- Contacts were given to manufacturer's representatives to contact if the VE team had questions
- Contacts were also given to District maintenance and construction staff to discuss existing systems already in service

The remainder of this section shows where the six projects included in this study were located as well as the cost estimate sheets furnished by GDOT to give the reader a better understanding of the projects.

Figure 1
Project Location Map

County Map of Georgia



JOB ESTIMATE REPORT

JOB NUMBER : 0009619-COWETA SPEC YEAR: 01
DESCRIPTION: I-85 FM FORREST RD TO N OF BETHLEHEM CHURCH RD-CABLE BARRIER
MERIWETHER/COWETA COUNTY

ITEMS FOR JOB 0009619-COWETA

LINE	ITEM	ALT	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
0005	163-0240		TN	MULCH	38.000	261.90	9952.52
0009	150-1000		LS	TRAFFIC CONTROL - 0009619	1.000	40000.00	40000.00
0015	163-0550		EA	CONS & REM INLET SEDIMENT TRAP	79.000	173.88	13737.08
0020	165-0105		EA	MAINT OF INLET SEDIMENT TRAP	79.000	59.72	4717.90
0025	167-1000		EA	WATER QUALITY MONITORING AND SAMPLING	2.000	367.33	734.67
0030	167-1500		MO	WATER QUALITY INSPECTIONS	12.000	1051.66	12620.00
0035	210-0100		LS	GRADING COMPLETE - 0009619	1.000	50000.00	50000.00
0040	500-3101		CY	CLASS A CONCRETE	2996.000	364.05	1090714.59
0044	641-1200		LF	GUARDRAIL, TP W	100.000	27.70	2770.35
0045	641-2200		LF	DBL FACED GUARDRAIL, TP W	15000.000	21.17	317696.70
0050	641-5001		EA	GUARDRAIL ANCHORAGE, TP 1	5.000	622.69	3113.50
0055	641-5012		EA	GUARDRAIL ANCHORAGE, TP 12	5.000	1887.13	9435.70
0060	642-0100		LF	CABLE BARRIER	20300.000	13.48	273731.09
0065	642-0300		EA	CABLE TERMINAL (NCHRP 350 TL-3	4.000	2987.28	11949.15
0070	700-6910		AC	PERMANENT GRASSING	5.000	623.42	3117.14
0075	700-7000		TN	AGRICULTURAL LIME	5.000	52.85	264.29
0080	700-7010		GL	LIQUID LIME	13.000	12.31	160.06
0085	700-8000		TN	FERTILIZER MIXED GRADE	1.000	376.88	376.88
0090	700-8100		LB	FERTILIZER NITROGEN CONTENT	250.000	1.83	459.91
0095	713-3001		SY	WOOD FIBER BLANKET,TP I,SLOPES	27691.000	0.61	17071.50

ITEM TOTAL	1862623.03
INFLATED ITEM TOTAL	1862623.03

TOTALS FOR JOB 0009619-COWETA

ESTIMATED COST:	1862623.03
CONTINGENCY PERCENT (0.0):	0.00
ESTIMATED TOTAL:	1862623.03

STATE HIGHWAY AGENCY

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JOB ESTIMATE REPORT

JOB NUMBER : 0009818 SPEC YEAR: 01
DESCRIPTION: CABLE BARRIER PROJECT FOR HARALSON/CARROLL/DOUGLAS COUNTY

ITEMS FOR JOB 0009818

LINE	ITEM	ALT	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
0005	150-1000		LS	TRAFFIC CONTROL - 0009818	1.000	170000.00	170000.00
0010	163-0240		TN	MULCH	93.000	183.19	17037.40
0015	163-0550		EA	CONS & REM INLET SEDIMENT TRAP	219.000	127.38	27897.35
0020	165-0105		EA	MAINT OF INLET SEDIMENT TRAP	219.000	70.51	15443.26
0024	167-1500		MO	WATER QUALITY INSPECTIONS	12.000	821.05	9852.60
0025	167-1000		EA	WATER QUALITY MONITORING AND SAMPLING	5.000	496.19	2480.97
0035	210-0100		LS	GRADING COMPLETE - 0009818	1.000	250000.00	250000.00
0040	500-3101		CY	CLASS A CONCRETE	17131.000	367.51	6295939.72
0045	610-1055		LF	REM GUARDRAIL	1610.000	2.60	4189.40
0050	610-1075		EA	REM GUARDRAIL ANCH, ALL TYPES	18.000	190.02	3420.40
0055	641-1200		LF	GUARDRAIL, TP W	1750.000	14.80	25913.60
0060	641-5001		EA	GUARDRAIL ANCHORAGE, TP 1	9.000	622.22	5600.06
0065	641-5012		EA	GUARDRAIL ANCHORAGE, TP 12	9.000	1762.19	15859.71
0070	642-0100		LF	CABLE BARRIER	115632.000	13.48	1559215.42
0075	642-0300		EA	CABLE TERMINAL (NCHRP 350 TL-3 COMPLIANT)	18.000	2987.28	53771.16
0080	700-6910		AC	PERMANENT GRASSING	23.000	695.54	15997.60
0085	700-7010		GL	LIQUID LIME	58.000	18.36	1064.92
0089	700-7000		TN	AGRICULTURAL LIME	46.000	101.10	4650.70
0090	700-8000		TN	FERTILIZER MIXED GRADE	14.000	372.18	5210.65
0095	700-8100		LB	FERTILIZER NITROGEN CONTENT	1150.000	1.65	1898.33
0100	713-3001		SY	WOOD FIBER BLANKET,TP I,SLOPES	51392.000	0.61	31683.17
ITEM TOTAL						8517126.41	
INFLATED ITEM TOTAL						8517126.41	

TOTALS FOR JOB 0009818

ESTIMATED COST:	8517126.42
CONTINGENCY PERCENT (0.0):	0.00
ESTIMATED TOTAL:	8517126.42

JOB ESTIMATE REPORT

JOB NUMBER : 0009819 SPEC YEAR: 01
DESCRIPTION: CABLE BARRIERS-I-675 DEKALB CO. TO HENRY CO

ITEMS FOR JOB 0009819

LINE	ITEM	ALT	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
0005	150-1000		LS	TRAFFIC CONTROL - P.I. 0009821	1.000	50000.00	50000.00
0010	210-0100		LS	GRADING COMPLETE - P.I. 0009821	1.000	100000.00	100000.00
0015	500-3101		CY	CLASS A CONCRETE	2171.000	393.10	853435.58
0030	632-0003		EA	CHANGEABLE MESS SIGN,PORT,TP 3	2.000	11372.10	22744.21
0050	642-0100		LF	CABLE BARRIER	43982.000	13.48	593066.04
0055	642-0300		EA	CABLE TERMINAL (NCHRP 350 TL-3 COMPLIAN)	12.000	2987.28	35847.44
0060	163-0240		TN	MULCH	102.000	291.26	29709.10
0070	163-0550		EA	CONS & REM INLET SEDIMENT TRAP	42.000	162.62	6830.14
0080	165-0105		EA	MAINT OF INLET SEDIMENT TRAP	21.000	45.88	963.50
0085	167-1000		EA	WATER QUALITY MONITORING AND SAMPLING	2.000	367.33	734.67
0090	167-1500		MO	WATER QUALITY INSPECTIONS	2.000	957.45	1914.91
0095	700-6910		AC	PERMANENT GRASSING	5.000	758.39	3791.95
0100	700-7000		TN	AGRICULTURAL LIME	18.000	60.89	1096.15
0105	700-7010		GL	LIQUID LIME	23.000	21.73	499.98
0110	700-8000		TN	FERTILIZER MIXED GRADE	6.000	451.09	2706.57
0115	700-8100		LB	FERTILIZER NITROGEN CONTENT	450.000	2.79	1255.97
0120	713-3001		SY	WOOD FIBER BLANKET,TP I,SLOPES	55000.000	0.61	33907.50

ITEM TOTAL	1738503.70
INFLATED ITEM TOTAL	1738503.70

TOTALS FOR JOB 0009819

ESTIMATED COST:	1738503.71
CONTINGENCY PERCENT (0.0):	0.00
ESTIMATED TOTAL:	1738503.71

STATE HIGHWAY AGENCY

DATE : 11/17/2010
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JOB ESTIMATE REPORT

JOB NUMBER : 0009820 SPEC YEAR: 01
DESCRIPTION: CABLE BARRIER I-75 PEACH COUNTY
PEACH COUNTY CABLE BARRIER

ITEMS FOR JOB 0009820

LINE	ITEM	ALT	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
0005	700-7010		GL	LIQUID LIME	9.000	12.50	112.50
0010	163-0240		TN	MULCH	12.000	318.30	3819.67
0015	700-6910		AC	PERMANENT GRASSING	4.000	632.39	2529.56
0020	700-8100		LB	FERTILIZER NITROGEN CONTENT	200.000	1.87	374.85
0025	150-1000		LS	TRAFFIC CONTROL - IS YET TO BE DETERMINED	1.000		
0030	167-1000		EA	WATER QUALITY MONITORING AND SAMPLING	2.000	367.33	734.67
0035	642-0100		LF	CABLE BARRIER	18480.000	13.48	249189.68
0040	210-0100		LS	GRADING COMPLETE - IS YET TO BE DETERMINED	1.000		
0045	500-3101		CY	CLASS A CONCRETE	913.000	346.56	316414.89
0050	642-0300		EA	CABLE TERMINAL (NCHRP 350 TL-3 COMPLIANT)	4.000	2987.28	11949.15
0055	641-5012		EA	GUARDRAIL ANCHORAGE, TP 12	1.000	1887.13	1887.14
0060	167-1500		MO	WATER QUALITY INSPECTIONS	3.000	954.55	2863.65
0065	700-8000		TN	FERTILIZER MIXED GRADE	1.000	376.88	376.88
0070	700-7000		TN	AGRICULTURAL LIME	8.000	51.85	414.82
0075	641-5001		EA	GUARDRAIL ANCHORAGE, TP 1	1.000	647.48	647.49
0080	163-0550		EA	CONS & REM INLET SEDIMENT TRAP	25.000	180.24	4506.07
0085	165-0105		EA	MAINT OF INLET SEDIMENT TRAP	25.000	58.81	1470.28
ITEM TOTAL						597291.30	
INFLATED ITEM TOTAL						597291.30	

TOTALS FOR JOB 0009820

ESTIMATED COST:	597291.30
CONTINGENCY PERCENT (0.0):	0.00
ESTIMATED TOTAL:	597291.30

JOB ESTIMATE REPORT

JOB NUMBER : 0009821 SPEC YEAR: 01
DESCRIPTION: CABLE BARRIERS-I-16 BIBB CO. FROM SR 87 TO LAURENS CO.

ITEMS FOR JOB 0009821

LINE	ITEM	ALT	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
0005	150-1000		LS	TRAFFIC CONTROL - P.I. 0009821	1.000	340000.00	340000.00
0010	210-0100		LS	GRADING COMPLETE - P.I. 0009821	1.000	500000.00	500000.00
0015	500-3101		CY	CLASS A CONCRETE	14275.000	349.95	4995613.91
0020	610-1075		EA	REM GUARDRAIL ANCH, ALL TYPES	10.000	160.13	1601.36
0025	610-1055		LF	REM GUARDRAIL	725.000	1.75	1270.13
0030	632-0003		EA	CHANGEABLE MESS SIGN,PORT,TP 3	2.000	11372.10	22744.21
0035	641-1200		LF	GUARDRAIL, TP W	1600.000	21.39	34224.86
0040	641-5001		EA	GUARDRAIL ANCHORAGE, TP 1	4.000	729.60	2918.43
0045	641-5012		EA	GUARDRAIL ANCHORAGE, TP 12	4.000	1887.13	7548.56
0050	642-0100		LF	CABLE BARRIER	318800.000	13.48	4298791.65
0055	642-0300		EA	CABLE TERMINAL (NCHRP 350 TL-3 COMPLIAN)	41.000	2987.28	122478.75
0060	163-0240		TN	MULCH	702.000	159.90	112254.48
0065	163-0503		EA	CONSTR AND REMOVE SILT CONTROL GATE,TP 3	90.000	312.88	28159.55
0070	163-0550		EA	CONS & REM INLET SEDIMENT TRAP	268.000	191.83	51411.33
0075	165-0087		EA	MAINT OF SILT CONTROL GATE, TP 3	90.000	105.79	9521.89
0080	165-0105		EA	MAINT OF INLET SEDIMENT TRAP	268.000	64.72	17346.65
0085	167-1000		EA	WATER QUALITY MONITORING AND SAMPLING	2.000	367.33	734.67
0090	167-1500		MO	WATER QUALITY INSPECTIONS	2.000	957.45	1914.91
0095	700-6910		AC	PERMANENT GRASSING	54.000	542.37	29288.25
0100	700-7000		TN	AGRICULTURAL LIME	54.000	43.12	2328.72
0105	700-7010		GL	LIQUID LIME	135.000	14.92	2015.53
0110	700-8000		TN	FERTILIZER MIXED GRADE	33.000	449.78	14842.87
0115	700-8100		LB	FERTILIZER NITROGEN CONTENT	2700.000	1.92	5208.73
0120	713-3001		SY	WOOD FIBER BLANKET,TP I,SLOPES	129771.000	0.61	80003.82
ITEM TOTAL						10682223.27	
INFLATED ITEM TOTAL						10682223.27	

TOTALS FOR JOB 0009821

ESTIMATED COST:	10682223.26
CONTINGENCY PERCENT (0.0):	0.00
ESTIMATED TOTAL:	10682223.26

STATE HIGHWAY AGENCY

JOB ESTIMATE REPORT

JOB NUMBER : 0009822 SPEC YEAR: 01
DESCRIPTION: DAWSON /LUMPKIN COUNTY CABLE BARRIER SR 400

ITEMS FOR JOB 0009822

LINE	ITEM	ALT	UNITS	DESCRIPTION	QUANTITY	PRICE	AMOUNT
0005	700-7010		GL	LIQUID LIME	13.000	14.19	184.53
0010	163-0240		TN	MULCH	15.000	306.51	4597.69
0015	700-8000		TN	FERTILIZER MIXED GRADE	1.000	415.45	415.45
0020	700-7000		TN	AGRICULTURAL LIME	10.000	57.44	574.46
0025	700-8100		LB	FERTILIZER NITROGEN CONTENT	250.000	1.78	447.07
0030	700-6910		AC	PERMANENT GRASSING	5.000	565.70	2828.54
0035	642-0300		EA	CABLE TERMINAL (NCHRP 350 TL-3 COMPLIAN)	34.000	2987.28	101567.75
0040	642-0100		LF	CABLE BARRIER	26928.000	13.48	363104.96
0045	500-3101		CY	CLASS A CONCRETE	1330.000	354.01	470844.15
0050	150-1000		LS	TRAFFIC CONTROL - IS YET TO BE DETERMINED	1.000		
0055	167-1500		MO	WATER QUALITY INSPECTIONS	6.000	1051.66	6310.00
0060	210-0100		LS	GRADING COMPLETE - IS YET TO BE DETERMINED	1.000		
0065	167-1000		EA	WATER QUALITY MONITORING AND SAMPLING	2.000	367.33	734.6
0070	163-0550		EA	CONS & REM INLET SEDIMENT TRAP	77.000	191.83	14771.1
0075	165-0105		EA	MAINT OF INLET SEDIMENT TRAP	77.000	53.05	4085.14
ITEM TOTAL						970465.57	
INFLATED ITEM TOTAL						970465.57	

TOTALS FOR JOB 0009822

ESTIMATED COST:	970465.58
CONTINGENCY PERCENT (0.0):	0.00
ESTIMATED TOTAL:	970465.58

VE RECOMMENDATIONS

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
A-1	1 of 4	Use sidewalk concrete in lieu of Class "A" concrete for mowing strip

Comp By: SWG Date: 12/9/10 Checked By: DCW Date: 12/9/10

Original Concept:

The original concept proposes to install Class A concrete for the mow strip and post foundations.

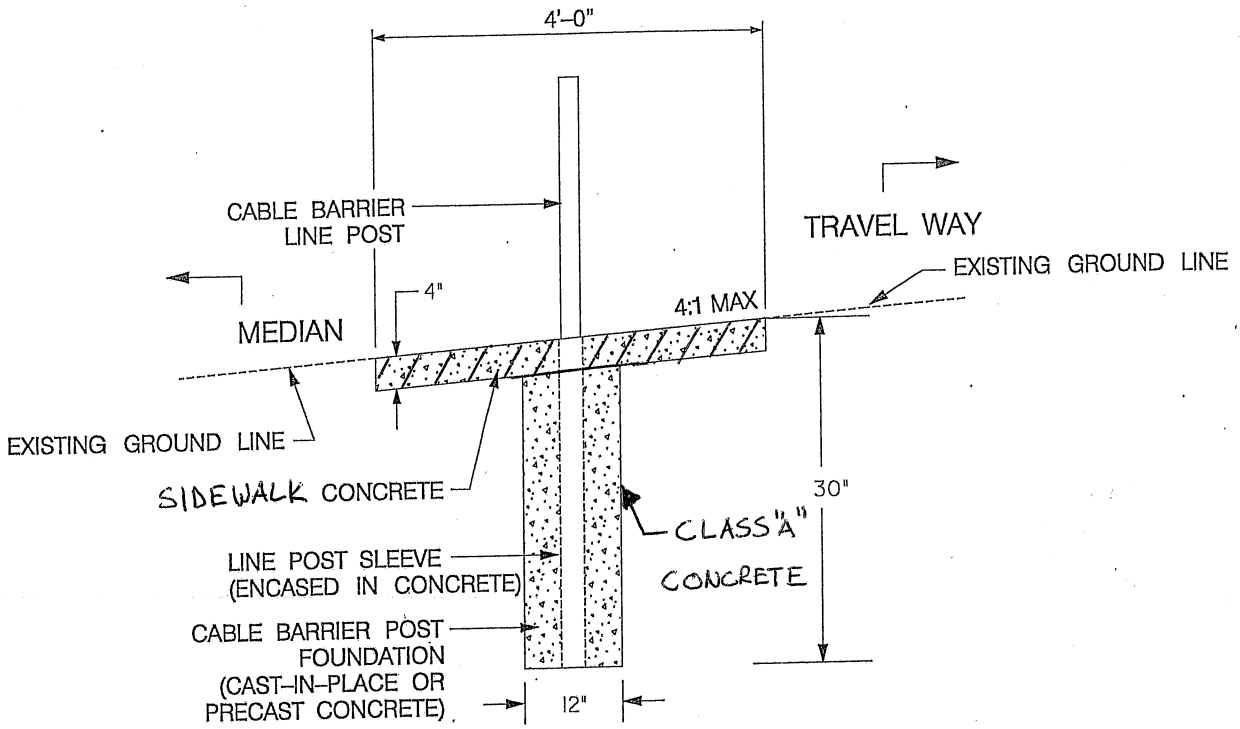
Proposed Change:

The revised concept proposes to install sidewalk concrete for the mow strip and Class A concrete for the post foundations.

Justification:

The primary function of the mow strip is to prevent the growth of vegetation around the cable barrier and prevent damage from mowing operations. This function can be addressed by the implementation of using sidewalk concrete and will result in significant cost savings. This idea will result in a two step construction process where the post foundations will be placed first and the mow strip second. Costs shown reflect concrete material costs savings only.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**PRESENT WORTH**
INITIAL COST - Original	14,020,000		
- Proposed	8,780,000		
- Savings	5,240,000		5,240,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**5,240,000**



EXISTING SLOPES THAT ARE 4:1 OR FLATTER

REVISED: 10-5-10

CABLE BARRIER DETAIL WITH CONCRETE STRIP

DGN

COST WORKSHEET							
PROJECT: **Cable Barrier Installation**					ITEM No: A-1 CLIENT: GDOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Class A concrete	CY	38,816	361	14,022,668	3,493	361	1,261,881
Sidewalk concrete	CY				35,323	213	7,518,501
SUBTOTAL				14,022,668			8,780,382
Markup 0%				0			0
TOTAL				14,022,668			8,780,382
TOTAL ROUNDED				14,020,000			8,780,000

CALCULATIONS	
Cable Barrier Installation	ITEM N^{O} : A-1 CLIENT: GDOT Sheet 4 of 4

Assumptions

15 ft post spacing
Foundation – 12" diameter / 30" height
Mow Strip – 4' width / 4" thickness

Determine % Mow Strip of all Class "A" Concrete

Volume (Post Foundation) = 3.1416 x 0.5 ft x 0.5 ft x 2.5 ft = 1.96 cf

Volume (15' mow strip) = 15 ft x 4 ft x 0.33 ft = 19.8 cf

% mow strip = (19.8 cf) ÷ (19.8 + 1.96) cf = 91 %

% post foundation = 100 – 91 = 9%

4" Sidewalk Concrete Unit Cost → $23.65/sy → $212.85/cy

Original Concept

Volume (Class "A" Concrete) = 38,816 cy

Volume (Sidewalk Concrete) = 0 cy

Revised Concept

Volume (Class "A" Concrete) = 0.09 x 38,816 cy = 3,493 cy

Volume (Sidewalk Concrete) = 0.91 x 38,816 cy = 35,323 cy

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA:
A-2	1 of 4	Use asphalt in lieu of Class "A" concrete for mowing strip

Comp By: SWG Date: 12/9/10 Checked By: DCW Date: 12/9/10

Original Concept:

The original concept proposes to install Class "A" concrete for the mowing strip and the post foundations.

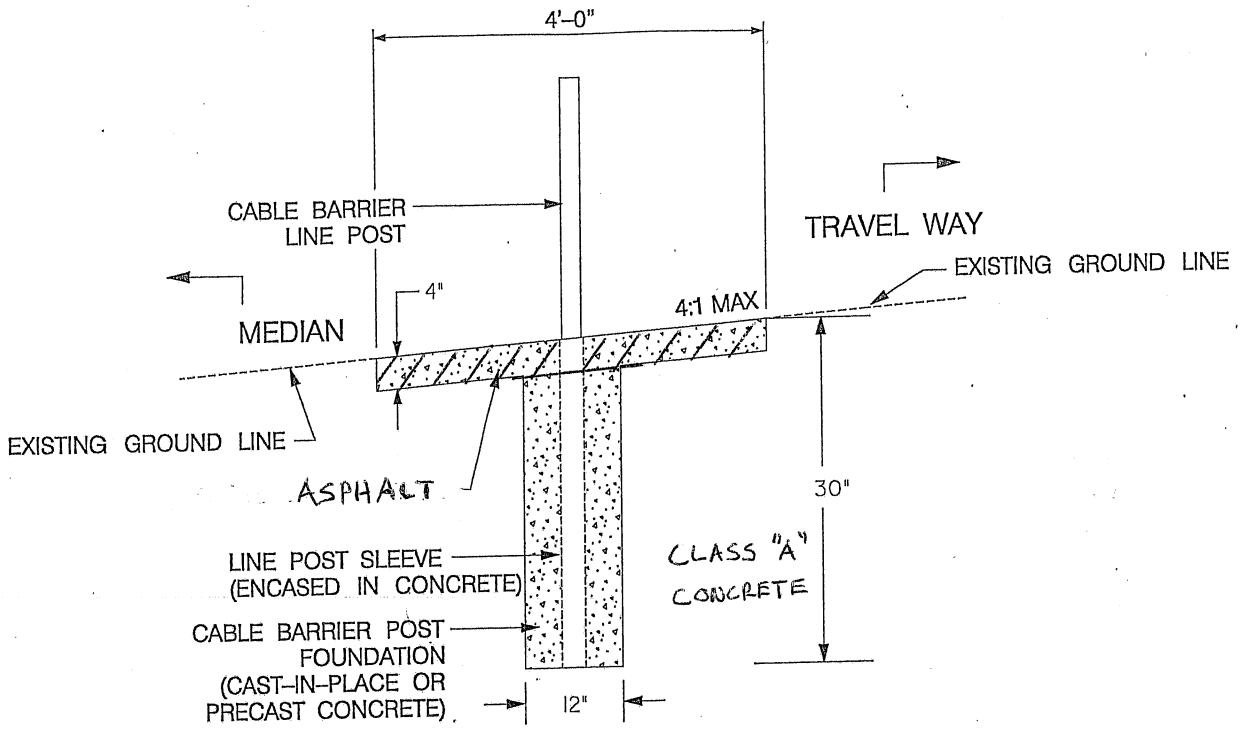
Proposed Change:

The revised concept proposes to implement asphalt for the mowing strip and Class "A" concrete for the post foundations.

Justification:

The primary function of the mowing strip is to prevent the growth of vegetation around the cable barrier and prevent damage from mowing operations. This function can be addressed by the implementation of asphalt and will results in significant cost savings.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	14,020,000		
- Proposed	5,910,000		
- Savings	8,110,000		8,110,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**8,110,000**



EXISTING SLOPES THAT ARE 4:1 OR FLATTER

REVISED: 10-5-10

CABLE BARRIER DETAIL WITH CONCRETE STRIP

DGN

COST WORKSHEET							
PROJECT: **Cable Barrier Installation**					ITEM No: A-2 CLIENT: GDOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Class A concrete	CY	38,816	361	14,022,668	3,493	361	1,261,881
19mm Superpave	TN				71,528	65	4,649,320
SUBTOTAL				14,022,668			5,911,201
Markup 0%				0			0
TOTAL				14,022,668			5,911,201
TOTAL ROUNDED				14,020,000			5,910,000

Cable Barrier Installation	ITEM N^{O} : A-2 CLIENT: GDOT Sheet 4 of 4

Assumptions

15 ft post spacing
Foundation – 12" diameter / 30" height
Mow Strip – 4' width / 4" thickness for concrete or asphalt

Determine % Mow Strip of all Class A Concrete

Volume (Post Foundation) = 3.1416 x 0.5 ft x 0.5 ft x 2.5 ft = 1.96 cf

Volume (15' mow strip) = 15 ft x 4 ft x 0.33 ft = 19.8 cf

% mow strip = (19.8 cf) ÷ (19.8 + 1.96) cf = 91 %

% post foundation = 100 – 91 = 9%

Asphalt Unit Cost → $65/ton

Original Concept

Volume (Class "A") = 38,816 cy

Wt Asphalt = 0 tn

Revised Concept

Volume (Class "A") = 0.09 x 38,816 cy = 3,493 cy

Wt Asphalt = 38,816 cy x 0.91 x 27 cf/cy x 150 lb/cf x 1 tn/ 2000 lb = 71,528 tn

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA:
A-3	1 of 5	Eliminate mowing strip

Comp By: SWG Date: 12/9/10 Checked By: DCW Date: 12/9/10

Original Concept:

The original concept proposes to install Class "A" concrete for the mowing strip and the post foundations.

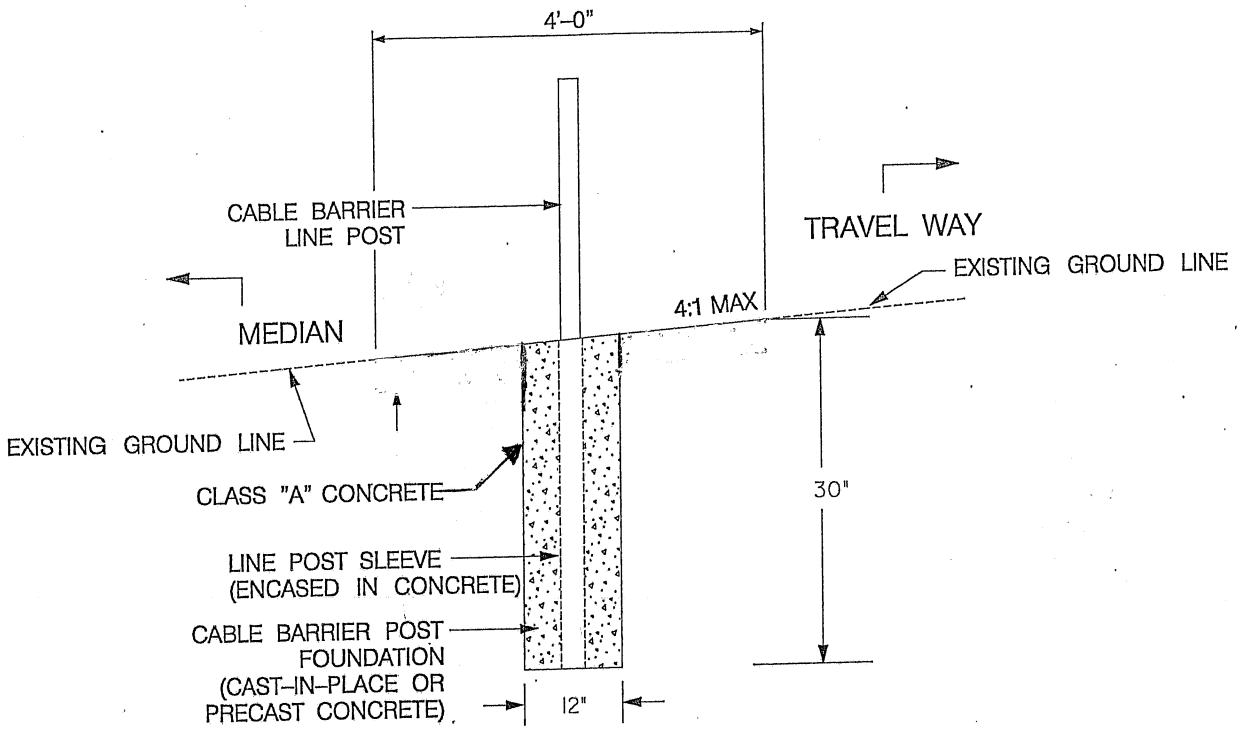
Proposed Change:

The revised concept proposes to eliminate the mowing strip and install Class "A" concrete for the post foundations.

Justification:

The primary function of the mowing strip is to prevent the growth of vegetation around the cable barrier and prevent damage from mowing operations. This function can be addressed by the implementation of additional maintenance with small equipment and will result in significant cost savings.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	14,020,000		
- Proposed	1,320,000		
- Savings	12,700,000		12,700,000
FUTURE COST - Savings		(399,000)	(399,000)
TOTAL PRESENT WORTH SAVINGS			**12,301,000**



EXISTING SLOPES THAT ARE 4:1 OR FLATTER

REVISED: 10-5-10

CABLE BARRIER DETAIL WITH CONCRETE STRIP

DGN

COST WORKSHEET							
PROJECT: **Cable Barrier Installation**					ITEM No: A-3 CLIENT: GDOT Sheet 3 of 5		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Class A Concrete	CY	38,816	361	14,022,668	3,659	361	1,321,850
SUBTOTAL				14,022,668			1,321,850
Markup 0%				0			0
TOTAL				14,022,668			1,321,850
TOTAL ROUNDED				14,020,000			1,320,000

Life Cycle Cost Analysis – Present Worth Method
Future Cost Calculation

Cable Barrier Installation

Creative Idea No. A-3 Eliminate Mowing Strip Sheet 4 of 5

Discount Rate: 3.0% Economic Life: 20 Years

	A	B	C	D
	Original Design		**Alternate Design**	
	Cost	PW	Cost	PW
1. Single Expenditures: (i.e., stage Construction, Major Maintenance)				
a. Year ____ PWF _____				
b. Year ____ PWF _____				
c. Year ____ PWF _____				
d. Salvage / Unused Service Life Year ____ PWF _____				
1. Total Future Single Costs:				
2. Annual Costs:				
a. General Maintenance PWF' 14.877	-0-	-0-	26,794	398,614
b. Other Annual Costs PWF' 14.877				
2. Total Future Annual Costs		-0-		398,614
3. Total Future Costs: (1 + 2)		-0-		399,000
4. Total Future Cost Savings on a Present Worth Basis (3B-3D)				
5. Total Future Cost Savings on an Annual Basis (4B X crf 0.0672)				

Cable Barrier Installation	ITEM N^{O} : A-3 CLIENT: GDOT Sheet 5 of 5

General Assumptions

15 ft post spacing
Foundation – 12" diameter / 30" height
Mow Strip – 4' width / 4" thickness for concrete or asphalt

30' length of mow strip will be required for all cable terminals in revised concept
Volume of 30' length sections = 113 x 30 lf x 4 lf x 0.33 lf x 1 cy/ 27 lf = 166 cy

Annual Maintenance Assumptions

1 contract worker can maintain 2 miles of vegetation with weed-eater in one day
Contract worker labor rate = $30/hour → $240/day → $120/mile
$10/mile additional expenses
Perform maintenance twice a year

Annual Maintenance = 544,122 lf x 1 mile/5,280 lf x $130/mile x 2 = $26,794

Determine % Mow Strip of all Class A Concrete

Volume (Post Foundation) = 3.1416 x 0.5 ft x 0.5 ft x 2.5 ft = 1.96 cf
Volume (15' mow strip) = 15 ft x 4 ft x 0.33 ft = 19.8 cf
% mow strip = 19.8 cf ÷ (19.8 + 1.96) cf = 91 %
% post foundation = 100 – 91 = 9%

Original Concept

Volume (Class "A") = 38,816 cy
Wt Asphalt = 0 tn
Annual Maintenance Cost = $0

Revised Concept

Volume (Class "A") = 0.09 x 38,816 cy +166 cy = 3,659 cy
Wt Asphalt = 38,816 cy x 0.91 x 27 cf/cy x 150 lb/cf x 1tn/2000 lb = 71,528 tn
Annual Maintenance Costs = $26,794

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA: Design Consideration
A-4	1 of 1	Use an alternate barrier to weed / plant growth

Comp By: DCW Date: 12/10/10 Checked By: GAO Date: 12/10/10

Original Concept:

Class A concrete is used under the cable barrier for weed control and for partial anchoring support.

Proposed Change:

Use an alternate barrier for weed protection and retain concrete in vicinity of anchor area if desired by the manufacturer.

Justification:

There are several other methods of blocking weed growth such as matting or recycled rubber mulch which might serve the purpose in a more environmentally and financially improved fashion. Consideration should be given to presenting alternate solutions to this issue.

Design Consideration

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original			
- Proposed			
- Savings			
FUTURE COST - Savings			
TOTAL PRESENT WORTH SAVINGS			N/A

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA:
A-5	1 of 4	Drive posts and eliminate concrete foundation

Comp By: SWG Date: 12/9/10 Checked By: DCW Date: 12/9/10

Original Concept:

The original concept proposes to install posts in concrete foundations.

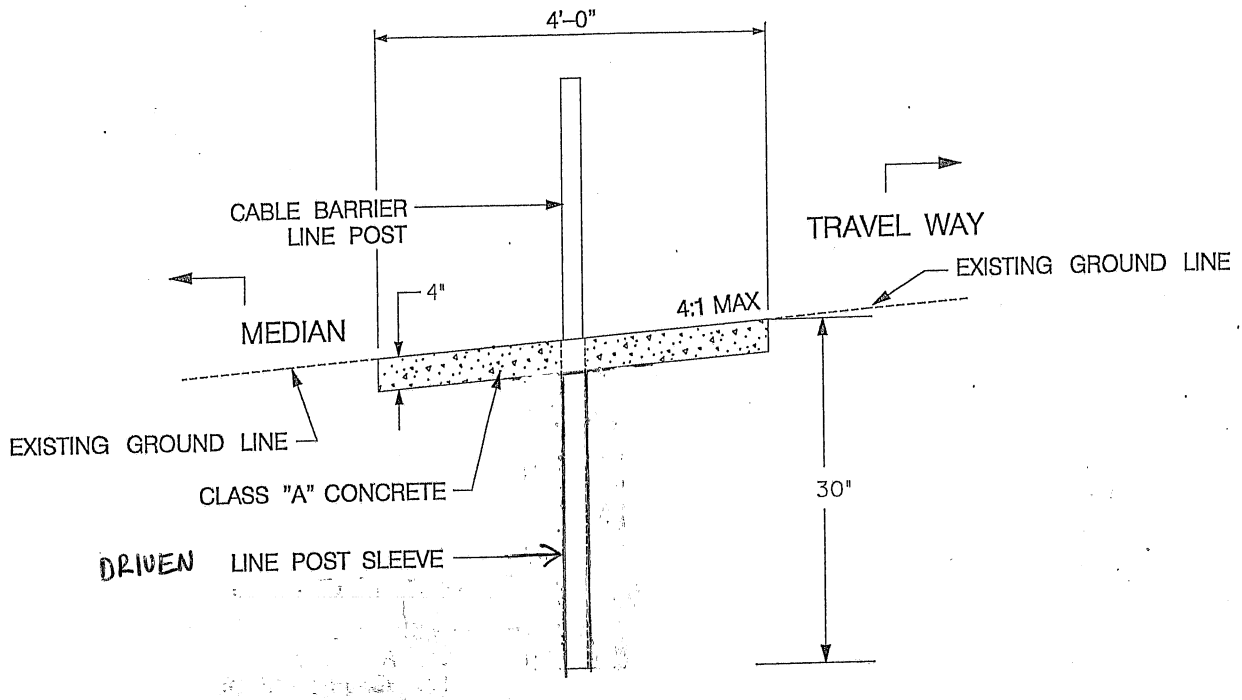
Proposed Change:

The revised concept proposes to install posts in driven sleeves without concrete foundations.

Justification:

The primary function of the concrete foundations is to stabilize the posts. This function can be accomplished by installing driven sleeves with a significant cost savings.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	1,260,000		
- Proposed	36,300		
- Savings	1,223,700		1,223,700
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**1,223,700**



EXISTING SLOPES THAT ARE 4:1 OR FLATTER

REVISED: 10-5-10

CABLE BARRIER DETAIL WITH CONCRETE STRIP

DGN

COST WORKSHEET

PROJECT:	Cable Barrier Installation	ITEM No: A-5 CLIENT: GDOT Sheet 3 of 4

CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			NEW ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Class A Concrete	CY	3,493	361	1,261,881			
Additional Steel	LB				36,275	1	36,275
SUBTOTAL				1,261,881			36,275
Markup 0%				0			0
TOTAL				1,261,881			36,275
TOTAL ROUNDED				1,260,000			36,300

CALCULATIONS	
Cable Barrier Installation	ITEM N^{O} : A-5 CLIENT: GDOT Sheet 4 of 4

Assumptions

Assume posts account for 50% of unit costs
Assume installation costs for the concrete foundations are the same as for the driven sleeves

Determine % Mow Strip of all Class A Concrete

Volume (Post Foundation) = 3.1416 x 0.5 ft x 0.5 ft x 2.5 ft = 1.96 cf

Volume (15' mow strip) = 15 ft x 4 ft x 0.33 ft = 19.8 cf

% Post Foundation = 1.96 cf ÷ (19.8 + 1.96) cf = 9 % of total Class "A"

Weight of Additional Steel for Driven Installation taken from Trinity Highway Products, LLC Drawing SS-740-4 for CASS-TL4 4-Cable Guardrail Safety System → 1 lb/post

Original Concept

Volume (Class "A") = 0.09 x 38,816 cy = 3,493 cy

Additional Steel for Driven Sleeve = 0 lb

Revised Concept

Volume (Class "A") = 0 cy

Additional Steel for Driven Sleeve = 544,122 lf x 1 post/15 lf x 1 lb/post = 36,275 lb

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-1	1 of 3	Use a 3 cable system in lieu of a 4 cable system

Comp By: GAO Date: 12/7/10 Checked By: DCW Date: 12/7/10

Original Concept:

Use a 4 cable barrier system, conforming to TL-4 test criteria.

Proposed Change:

Use a 3 cable system, conforming to a performance specification meeting TL-4 test criteria.

Justification:

Based on discussions with several manufacturers, the cost of the cables comprises approximately 50% of the per linear foot cost of the system. Reducing this cost while continuing to provide the test level (TL) 4 criteria will save money and reduce long term maintenance costs, depending on the specific manufacturer and system selected. Some manufactures even propose this as a cost saving recommendation if conformance to a performance specification can be achieved. The advantage of a 4 cable system is that it allows less deflection and therefore would be appropriate where this is a concern. However, less deflection means less energy is dissipated by the cable system and more is absorbed by the vehicle which would probably result in more damage and possibly greater injuries.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	7,330,000		
- Proposed	6,420,000		
- Savings	910,000		910,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**910,000**

COST WORKSHEET							
PROJECT: **Cable Barrier Installation**					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
4-Strand cable barrier	LF	544,122	13.48	7,334,765			
3-Strand cable barrier	LF				544,122	11.80	6,420,640
SUBTOTAL				7,334,765			6,420,640
Markup 0.00%				0			0
TOTAL				7,334,765			6,420,640
TOTAL ROUNDED				7,330,000			6,420,000

Cable Barrier Installation	ITEM N^{O} : B-1 CLIENT: GDOT Sheet 3 of 3

Based on discussions with several manufacturers, the cost of the cables comprises approximately 50% of the per linear foot cost of the system.

Assume cost of cables will be reduced by 25 %

0.25 x 0.50 = 0.125

$13.48/ LF x (1 - 0.125) = $11.80/ LF

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	**PAGE No.:**	**CREATIVE IDEA:**
B-2	1 of 4	Shift the location of the barrier to the edge of the shoulder where the shoulders are at least 12 feet wide

Comp By: GAO Date: 12/7/10 Checked By: DCW Date: 12/8/10

Original Concept:

Construct the cable barrier several feet, usually a minimum of 4 feet, from the edge of the paved shoulder.

Proposed Change:

In areas where there is at least 12 feet of paved shoulder, move the barrier to the edge of the shoulder.

Justification:

Shifting the cable barrier to the edge of the paved shoulder, where there is at least a 12 foot shoulder, will eliminate the need for the concrete mowing strip by utilizing the paved shoulder as maintenance-free surfacing. Relocating the barrier with a minimum 12 foot area will still allow ample room for the 9 – 10 feet of deflection as well as a full 12 feet for disabled vehicles to pull off the mainline.

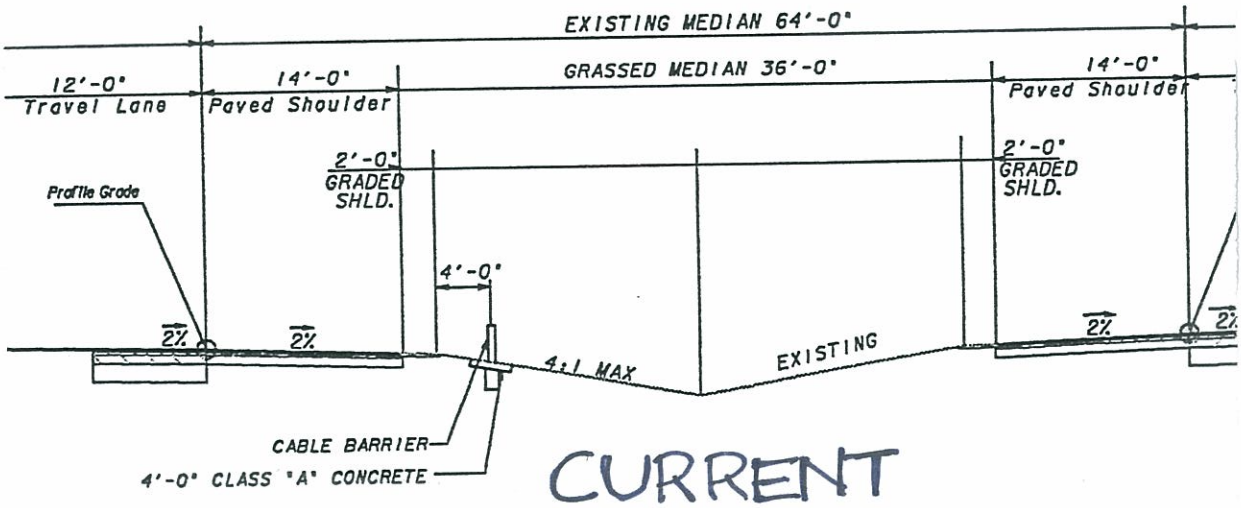
Based on discussions with the GDOT district representatives, the lack of a mowing strip did not reveal a significant maintenance problem. Even if some posts are occasionally damaged and need to be replaced, this is a minor cost.

Additionally, there will be some nominal savings by reducing the erosion control measures where the mowing strip is eliminated.

LIFE CYCLE COST SUMMARY	**CAPITAL COST**	**FUTURE COST**	**PRESENT WORTH**
INITIAL COST - Original	1,090,000		
- Proposed	-0-		
- Savings	1,090,000		1,090,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**1,090,000**

SKETCH

Cable Barrier Installation	ITEM N^{O} : B-2 CLIENT: GDOT Sheet 2 of 4



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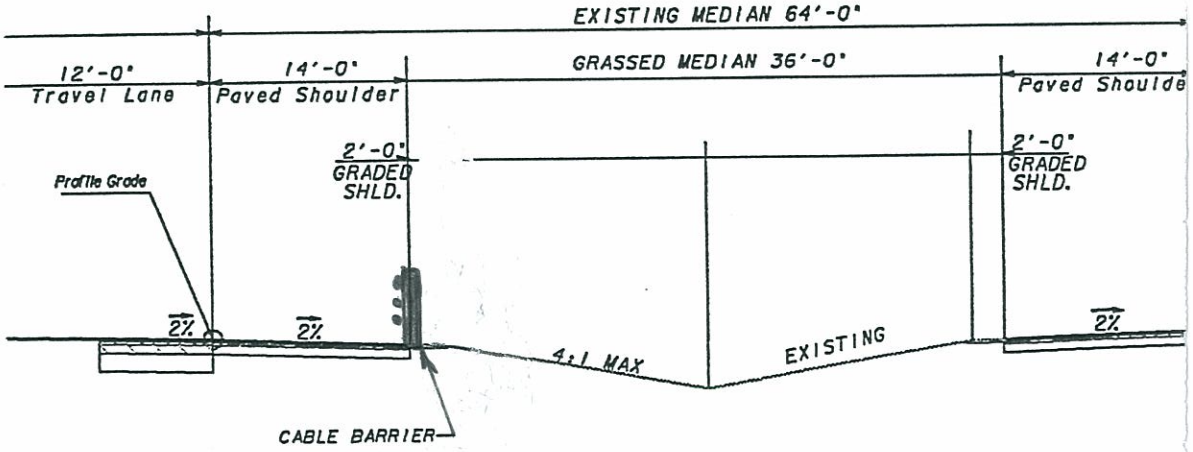

RECOMMENDED

COST WORKSHEET

PROJECT:	Cable Barrier Installation				ITEM No: B-2 CLIENT: GDOT Sheet 3 of 4		
CONSTRUCTION ELEMENT		**ORIGINAL ESTIMATE**			**NEW ESTIMATE**		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Class A concrete for mowstrip	CY	3,019	361	1,090,644			
SUBTOTAL				1,090,644			0
Markup 0.00%				0			0
TOTAL				1,090,644			0
TOTAL ROUNDED				1,090,000			0

Cable Barrier Installation	ITEM N^{O} : B-2 CLIENT: GDOT Sheet 4 of 4

Areas of 12 foot shoulder:

PI No. 0009819; I-675; Henry, Clayton Dekalb
- MP 5.00 to 6.15; 1.15 m; 6,072 ft
- MP 8.69 to 9.23; 0.54 m; 2,851 ft
- MP 6.43 to 8.52; 2.09 m; 11,035 ft
- MP 9.23 to 9.70; 0.47 m; 2,482 ft

PI No. 0009619; I-85; Meriwether Coweta
- MP 33.35 to 34.65; 1.30 m; 6,864 ft
- MP 34.60 to 35.33; 0.73 m; 3,854 ft
- MP 37.95 to 38.05; 0.10 m; 528 ft
- MP 38.55 to 40.25; 1.70 m; 8,976 ft

PI No. 0009820; I-75; Peach
- MP 145.57 to 145.87; 0.30 m; 1,584 ft
- MP 140.77 to 140.97; 0.20 m; 1,056 ft
- MP 142.57 to 145.57; 3.00 m; 15,840 ft

Total length: 61,142 ft

61,142 ft x 4 ft x 4/12 ft x 1 cy/27cf =
3,019 cy

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-4	1 of 4	Use dual faced guardrail in lieu of cable system

Comp By: GAO Date: 12/8/10 Checked By: DCW Date: 12/8/10

Original Concept:

Use cable barrier with concrete footings and a 4 foot wide concrete mow strip.

Proposed Change:

Use a different barrier system, double faced guard rail (DFGR) with no paving under the guardrail.

Justification:

Cable rail barriers are an efficient, cost effective, and low maintenance way of minimizing cross-over crashes. However, there are different barrier systems that also provide a similar function. This recommendation proposes to use conventional dual faced guard rail rather than cable systems.

Based on construction costs and life cycle analysis of maintenance costs, dual faced guard rail is less costly over a 20 year period if the mow strip is included as part of the cable barrier system. If it is not included, the construction costs are comparable. However, the life cycle maintenance costs are lower with the cable barrier system. DFGR requires more maintenance over the long run, especially if it is hit or damaged more than assumed.

Other barrier alternatives considered include concrete barrier which is very costly and could actually increase fatal incidents compared to cable rails; other types of metal/semi-rigid rails which are not as efficient as guard rail; and other lower level and performing barrier systems which do not provide any crashworthy or redirective capabilities.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	18,500,000		
- Proposed	15,240,000		
- Savings	3,260,000		3,260,000
FUTURE COST - Savings		(86,000)	(86,000)
TOTAL PRESENT WORTH SAVINGS			**3,174,000**

COST WORKSHEET

PROJECT: **Cable Barrier Installation**

ITEM No: B-4
CLIENT: GDOT
Sheet 2 of 4

CONSTRUCTION ELEMENT		ORIGINAL ESTIMATE			NEW ESTIMATE		
ITEM	Units	No. Units	Cost/ Unit	Total Cost	No. Units	Cost/ Unit	Total Cost
Cable barrier with mow strip	LF	544,122	34.00	18,500,148			
DFGR	LF				544,122	28.00	15,235,416
SUBTOTAL				18,500,148			15,235,416
Markup 0.00%				0			0
TOTAL				18,500,148			15,235,416
TOTAL ROUNDED				18,500,000			15,240,000

Life Cycle Cost Analysis – Present Worth Method

Future Cost Calculation on a Per Mile Basis

Cable Barrier Installation

Creative Idea No. B-4 Sheet 3 of 4

Discount Rate: 3.0% Economic Life: 20 Years

	A	B	C	D
	Cable Barrier		**DFGR**	
	Cost	PW	Cost	PW
1. Single Expenditures: (i.e., stage Construction, Major Maintenance)				
a. Year ____ PWF _____				
b. Year ____ PWF _____				
c. Year ____ PWF _____				
d. Salvage / Unused Service Life Year ____ PWF _____				
1. Total Future Single Costs:				
2. Annual Costs: Based on a per mile length				
a. General Maintenance PWF' 14.877	500	7,439	-0-	-0-
b. Other Annual Costs PWF' 14.877	104	1,547	660	9,819
2. Total Future Annual Costs		8,986		9,819
3. Total Future Costs: (1 + 2)		8,986		9,819
4. Total Future Cost Savings on a Present Worth Basis (3B-3D)		833		
5. Total Future Cost Savings on an Annual Basis (4B X crf 0.0672)				

Per linear foot costs:

Cable barrier:

13.48 per lf;
concrete mow strip, 4" x 4 ft = 0.049 cy/ lf @ $361.25/cy = $17.70 per lf
Concrete footings; 15 foot spacing
2.5 feet deep, 1 foot diameter: 3.14 x ½ x ½ x 2.5 = 1.96 cf = 0.0727 cy
0.0727 cy x $361.25 = $26.27/ 15 ft = $1.75 per foot
Erosion control: assume $1 per lf
Total; 13.48 + 17.70 + 1.75 + 1 = 33.93; USE $34 per lf

Dual Faced Guard Rail (DFGR):

$28 per lf

Annual inspections / maintenance:

Cable barrier: 2 times per year, spend 5 man-hours checking and adjusting tension in cables @ $50 per hour = (5 x 50) x 2 = $500

DFGR: inspections are incidental to normal operations, occasional visual, drive-by inspection.

Annual rehab and reconstruction costs: per mile analysis: assume 1 hit every 5 years
Cable hit destroys 200 ft; DFGR hit destroys 100 ft

Cable barrier: 200 ft; 13 posts damaged @ $40 per post to replace, includes labor
13 x 40 = 520 / 5 years = $104 per year

DFGR: use $33 per lf for rehab and replacement, includes labor.
100 ft x $33 per lf = 3,300 / 5 years = $660 per year

LCCA: from previous analysis, savings are $833 per mile.
544,122 ft = 103 miles x 833 = $85,799 USE $86,000

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA: Design Consideration
B-5	1 of 1	Provide soil boring data in the contract

Comp By: GAO Date: 12/8/10 Checked By: DCW Date: 12/8/10

Original Concept:

The specification for the cable barrier states that the contractor shall "Conduct soil analysis at each cable terminal to properly size each end terminal."

Proposed Change:

Provide the soil boring data for the contractor's use.

Justification:

Putting the onus on the contractor for the soil information could alter the bid since it will be difficult to design the footings without any soil information. Providing soil borings data as part of the contract will allow the manufacturer to design a footing more appropriate to the respective soil conditions and should minimize any costs associated with contract change orders due to unforeseen conditions.

Design Consideration

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original			
- Proposed			
- Savings			
FUTURE COST - Savings			
TOTAL PRESENT WORTH SAVINGS			N/A

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-6	1 of 3	Develop a performance-based specification

Comp By: GAO Date: 12/7/10 Checked By: DCW Date: 12/8/10

Original Concept:

Use the current design criteria, a 4-strand cable barrier system with 15 foot post spacing, conforming to TL-4 test criteria.

Proposed Change:

Develop and incorporate a performance-based specification, using a maximum allowable deflection (say 10 feet) and conforming to TL-4 test criteria.

Justification:

Each cable barrier system has a somewhat different design which results in differing mechanics and operating components. Since this is an item that does not have a specific state design, it could be advantageous to allow the responding manufacturers to adhere to a performance specification and not detail specific system elements such as number of strands, post spacing, and foundation type (concrete vs. driven). The important performance component is the TL-4 test criteria, and a maximum allowable deflection which accounts for the newer, heavier and larger design vehicles.

Reducing the cost while continuing to provide the test level 4 criteria will save money and reduce long term maintenance costs, depending on the specific manufacturer and system selected.

Allowing the specific approved manufacturers to showcase their respective systems and their respective strengths will provide GDOT with the most beneficial, efficient, and economic system.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	10,960,000		
- Proposed	9,140,000		
- Savings	1,820,000		1,820,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**1,820,000**

COST WORKSHEET							
PROJECT: **Cable Barrier Installation**					ITEM No: B-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
4-Strand cable barrier	LF	544,122	13	7,334,765			
3-Strand cable barrier	LF				544,122	12	6,420,640
Posts	EA	36,275	100	3,627,500	27,206	100	2,720,600
SUBTOTAL				10,962,265			9,141,240
Markup 0.00%				0			0
TOTAL				10,962,265			9,141,240
TOTAL ROUNDED				10,960,000			9,140,000

Certain manufacturers state their system can attain TL4 criteria using a 3-strand system and a post spacing of 20 feet. Potential savings based on this information is:

Based on discussions with several manufacturers, the cost of the cables comprises approximately 50% of the per linear foot cost of the system.

Assume cost of cables will be reduced 25 % by going from 4- to 3-strand:

0.25 x 0.50 = 0.125

$13.48 per lf x (1 - 0.125) = $11.80 per lf

Cost of posts:

Total project length: 544,122 feet @ 15 foot spacing = 36,275

Cost of barrier cable: $7,334,765 ÷ 2 = $3,667,383

$3,667,383 ÷ 36,275 = $ 101.01 per post; USE: $100

Use 20 foot post spacing: 544,122 lf / 20 = 27,206 posts

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-7	1 of 10	Verify conformance of projects with AASHTO median barrier installation criteria/guidelines and develop a GDOT implementation plan

Comp By: LB Date: 12/8/10 Checked By: DCW Date: 12/8/10

Original Concept:

A three year sampling of crash data (2006, 2007, 2008) was analyzed to identify 1- and 3-mile long sections of divided roadway with median widths (including inside shoulder) of greater than or equal to 34 feet that had a minimum of five (5) documented head-on and sideswipe opposite direction crashes. These 1- and 3-mile long segments were then sorted by severity level per crash to determine the highest priority crash locations to assess for possible installation of cable barrier.

Proposed Change:

Develop and document a more formal median barrier location, prioritization, and implementation plan that can be followed on all proposed median barrier installation projects. The plan should set forth criteria for identifying and prioritizing potential roadway segments that warrant median barrier installation, and also determine how projects will be selected and implemented.

Utilize data presented in Chapter 6 of the AASHTO Roadside Design Guide (2006), specifically Figure 1 and accompanying text found on page 6-2, which recommends installation of median barrier on "high-speed, fully controlled-access roadways for locations where the median is 30 feet in width or less and the average daily traffic (ADT) is greater than 20,000 vehicles per day" (vpd). This section goes on to recommend that median barrier installation be considered when the median width is between 30 and 50 feet and ADT is greater than 20,000. Installation is noted as optional where median widths are less than 50 feet and ADT is less than 20,000 vpd. In addition, this section notes that installation of median barrier is "not normally considered" for locations with median widths greater than 50 feet unless there are special circumstances, such as a history of significant cross-median crashes.

(CONTINUED)

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	24,368,000		
- Proposed	6,092,000		
- Savings	18,276,000		18,276,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**18,276,000**

Proposed Change (continued):

Complete a crash warrant analysis to identify roadway sections that may require median barrier installation in accordance with the above noted guidelines. An example provided in Chapter 6 of the AASHTO Roadside Design Guide (2006) is the warrant determination method utilized by California, which requires a minimum of 0.50 cross-median crash (of any severity) per mile per year, or 0.12 fatal crashes per mile per year. This method requires a minimum of three median cross-over crashes occurring within the one mile section within a five-year period. California completed a study that suggests that medians up to a 75-foot width with ADT greater than 60,000 would be considered for median barriers.

Once the roadway segment data has been analyzed and segments warranting median barrier have been identified, a prioritization criteria should be selected and utilized to rank roadway segments and generate projects that will address the roadway segments most needing improvement first.

Justification:

According to the data provided, the method utilized by GDOT used a minimum median width of 34 feet, but set no maximum width; therefore, a large number of roadway segments with median widths greater than the AASHTO breakpoint width of 50 feet were included in the data selection. According to the typical sections provided in the proposed plans, approximately 75 percent of the roadways included in the six proposed projects have median widths of 64 feet or greater, and would be considered optional installations unless warranted by high crash data. As noted in the calculations discussed on the following pages, some of these optional installation locations do warrant a median barrier based on the high crash rates. In addition, there is a question of whether or not those roadway segments with median widths less than 34 feet are being addressed.

The crash analysis completed by GDOT utilized criteria similar to that used by California; once converted to the same units of measure, the GDOT analysis is actually slightly more conservative. However, since the crash severity ratings of the roadway segments selected range from 0 to 32, there is some question as to how roadway segments were prioritized and how projects were selected for implementation since there are numerous roadway segments with higher crash severity ratings that are not being addressed by the proposed projects.

As demonstrated in the calculations discussion on the following pages, the crash and project data provided indicates that approximately 25 percent of the roadway segments proposed for median cable barrier fully warrant implementation. A more detailed documentation of the project identification, prioritization and implementation would better assist in verifying conformance with AASHTO Criteria/Guidelines.

Crash data criteria utilized by GDOT:

- Crash data years 2006, 2007, 2008 (3 year timeframe)
- Median width greater than 34 feet
- Identify 1- and 3-mile long sections of divided roadway
- Minimum of five (5) documented head-on and sideswipe opposite direction crashes
- Sorted by severity level per crash

GDOT roadway segment selection criteria includes:

- Minimum 34-foot median width with minimum 5 crashes/3 years/1 mile

or

- Minimum 34-foot median width with minimum 5 crashes/3 years/3 miles.

GDOT chose to utilize the 3-mile segments for prioritization.

California roadway segment selection criteria includes:

- Maximum 75-foot wide median with minimum 0.5 crash/1 year/1 mile

or

- Maximum 75-foot wide median with minimum 0.12 fatal crash/1 year/1 mile;

and

- Maximum 75-foot wide median with minimum 3 crashes/5 years/1 mile.

For comparison between GDOT and California criteria:

California criteria converts to the following:

- 3 crashes/5 years/1 mile = 1.8 crashes/3 years/1 mile = 5.4 crashes/3 years/3 miles

Compared to GDOT criteria:

- 5 crashes/3 years/3 miles

Therefore, GDOT crash occurrence criteria are slightly more conservative.

The table on the following two pages is taken directly from the list of eligible roadway segments developed by GDOT using a minimum 34-foot median width with a minimum of 5 crashes/3 years/3 miles. Based on the mile post (MP) listed on the typical sections included with each proposed plan set, those roadway segments in the table that are included in the plan sets have been highlighted in yellow. All those roadway segments that are not highlighted in yellow are not included on GDOT's list, so no data is available to determine if crash rate occurrences warrant consideration for median barrier installation.

Two columns noted with red text have been added to show the number of crashes per year per mile and number of fatal crashes per year per mile to show that each of the listed roadway segments meets the California minimum criteria of 0.5 crash/year/mile, but due to the low number of fatalities on these roadway segments, none meet the 0.12 fatal crashes per year per mile.

Cable Barrier Installation

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Head-On/Sideswipe Opposite Direction Crashes - Median + Inside Shoulder GE 34 ft - 3 mi Sections (2006-08)

County	Route	Begin MP	End MP	Total Crashes	Crash/ mile/year	Fatal Crashes	Fatal/ mile/year	Sev per Crs	Crashes per 100MVM	MVM	ADT
Chatham	CR 1148	0.90	3.90	5	0.56	0	0.00	16.00	7.94	62.93	19,158
Chatham	CS 169207	0.90	2.00	9	2.73	0	0.00	8.89	59.76	15.06	12,504
Dawson	G-400	1.60	4.60	5	0.56	0	0.00	20.00	5.66	88.39	26,908
Forsyth	G-400	0.90	3.90	9	1.00	0	0.00	8.89	4.20	214.22	65,212
Forsyth	G-400	4.60	7.60	6	0.67	0	0.00	10.00	2.91	205.87	62,671
Forsyth	G-400	8.10	11.10	11	1.22	0	0.00	10.91	5.90	186.51	56,775
Forsyth	G-400	13.70	16.70	7	0.78	0	0.00	14.29	7.16	97.80	29,771
Fulton	G-400	0.60	3.60	5	0.56	0	0.00	4.00	1.22	410.65	125,008
Fulton	G-400	15.00	18.00	17	1.89	0	0.00	10.59	3.69	461.29	140,424
Bibb	I-16	1.00	4.00	6	0.67	0	0.00	20.00	3.23	185.87	56,581
Chatham	I-16	8.00	11.00	9	1.00	1	0.11	20.00	6.05	148.69	45,262
Chatham	I-16	11.00	14.00	6	0.67	0	0.00	26.67	3.62	165.60	50,410
Laurens	I-16	14.50	17.50	5	0.56	0	0.00	8.00	7.24	69.10	21,034
Muscogee	I-185	0.00	3.00	5	0.56	0	0.00	8.00	3.73	134.17	40,844
Carroll	I-20	13.60	16.60	6	0.67	1	0.11	26.67	2.90	206.74	62,936
Douglas	I-20	7.90	10.90	8	0.89	0	0.00	7.50	2.57	311.72	94,892
Douglas	I-20	11.00	14.00	7	0.78	0	0.00	2.86	2.04	343.58	104,590
Douglas	I-20	14.10	17.10	11	1.22	1	0.11	12.73	3.16	347.60	105,815
Douglas	I-20	18.30	20.00	5	0.98	0	0.00	0.00	2.51	199.04	106,922
Richmond	I-20	0.30	3.30	6	0.67	0	0.00	10.00	3.26	184.09	56,041
Fulton	I-285	9.30	12.30	7	0.78	0	0.00	8.57	1.47	477.46	145,347
Chatham	I-516	2.00	5.00	7	0.78	0	0.00	11.43	4.30	162.66	49,517
Cherokee	I-575	0.40	3.40	9	1.00	0	0.00	4.44	3.34	269.63	82,080
Cherokee	I-575	4.90	7.90	7	0.78	0	0.00	5.71	3.17	220.92	67,252
Cherokee	I-575	8.00	11.00	5	0.56	0	0.00	12.00	2.85	175.54	53,436
Cherokee	I-575	11.00	14.00	10	1.11	0	0.00	10.00	5.96	167.89	51,109
Cobb	I-575	1.00	4.00	17	1.89	0	0.00	9.41	6.53	260.49	79,297
Clayton	I-675	0.00	3.00	15	1.67	1	0.11	18.67	8.21	182.61	55,588
Clayton	I-675	4.40	7.40	6	0.67	0	0.00	26.67	2.72	220.98	67,270
Butts	I-75	0.10	3.10	7	0.78	0	0.00	14.29	2.85	245.98	74,880
Butts	I-75	3.50	6.00	7	0.93	0	0.00	8.57	3.29	212.70	77,700
Cobb	I-75	11.80	14.80	12	1.33	0	0.00	13.33	2.51	478.94	145,795
Cobb	I-75	15.00	18.00	15	1.67	0	0.00	12.00	3.11	482.64	146,923
Crisp	I-75	11.80	14.80	5	0.56	0	0.00	12.00	3.25	154.06	46,898
Gordon	I-75	9.50	12.50	8	0.89	0	0.00	12.50	3.71	215.67	65,653
Henry	I-75	6.80	9.80	14	1.56	0	0.00	8.57	3.89	359.82	109,535
Henry	I-75	9.80	12.80	11	1.22	0	0.00	3.64	2.66	413.91	125,999
Henry	I-75	13.20	16.20	20	2.22	0	0.00	12.00	4.26	469.70	142,983
Henry	I-75	16.20	19.20	12	1.33	0	0.00	5.00	2.46	486.96	148,237
Lowndes	I-75	21.60	24.60	5	0.56	0	0.00	8.00	3.52	142.12	43,262
Peach	I-75	2.50	5.50	9	1.00	0	0.00	0.00	4.41	203.89	62,068
Peach	I-75	8.60	11.60	7	0.78	0	0.00	22.86	2.87	243.75	74,201
Whitfield	I-75	15.60	18.60	5	0.56	0	0.00	8.00	2.11	237.38	72,262
Banks	I-85	0.10	3.10	8	0.89	0	0.00	7.50	5.12	156.31	47,583
Coweta	I-85	5.90	8.90	5	0.56	1	0.11	32.00	3.15	158.96	48,390
Coweta	I-85	14.70	17.70	5	0.56	0	0.00	4.00	2.03	246.48	75,032
Coweta	I-85	18.40	21.40	5	0.56	0	0.00	24.00	1.83	272.91	83,078
Gwinnett	I-85	14.00	17.00	7	0.78	0	0.00	2.86	1.46	478.12	145,547
Gwinnett	I-85	21.80	24.80	7	0.78	0	0.00	14.29	2.72	257.75	78,462
Jackson	I-85	1.90	4.90	6	0.67	1	0.11	26.67	3.12	192.08	58,471

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Head-On/Sideswipe Opposite Direction Crashes - Median + Inside Shoulder GE 34 ft - 3 mi Sections (2006-08)

County	Route	Begin MP	End MP	Total Crashes	Crash/ mile/year	Fatal Crashes	Fatal/ mile/year	Sev per Crs	Crashes per 100MVM	MVM	ADT
Jackson	I-85	9.10	12.10	6	0.67	1	0.11	16.67	3.43	174.90	53,243
Glynn	I-95	1.10	4.10	7	0.78	1	0.11	20.00	4.42	158.36	48,208
Gwinnett	I-985	1.70	4.70	9	1.00	0	0.00	11.11	4.69	191.76	58,373
Hall	I-985	0.20	3.20	5	0.56	0	0.00	8.00	2.69	186.15	56,668
Decatur	SR 1	19.40	22.40	6	0.67	0	0.00	6.67	12.86	46.66	14,205
Dougherty	SR 133	10.10	13.10	9	1.00	0	0.00	2.22	25.66	35.07	10,675
Gwinnett	SR 141	1.80	4.80	8	0.89	0	0.00	2.50	5.05	158.38	48,213
Gwinnett	SR 20	5.30	8.30	7	0.78	0	0.00	14.29	3.98	175.89	53,542
Effingham	SR 21	1.30	4.30	7	0.78	0	0.00	11.43	7.61	92.02	28,012
Muscogee	SR 22	1.60	4.60	5	0.56	0	0.00	12.00	3.77	132.72	40,402
Washington	SR 24	16.10	19.10	5	0.56	0	0.00	8.00	39.35	12.71	3,868
Richmond	SR 28	1.00	4.00	9	1.00	0	0.00	2.22	38.94	23.11	7,035
Richmond	SR 28	4.00	7.00	7	0.78	0	0.00	5.71	18.26	38.34	11,670
Clayton	SR 3	0.20	3.20	14	1.56	1	0.11	11.43	12.23	114.50	34,856
Clayton	SR 3	3.60	6.60	6	0.67	0	0.00	6.67	4.29	139.88	42,581
Fulton	SR 3	9.70	12.70	15	1.67	0	0.00	8.00	18.36	81.72	24,876
Spalding	SR 3	2.50	5.50	8	0.89	0	0.00	12.50	9.23	86.71	26,397
Thomas	SR 3	12.60	15.60	7	0.78	0	0.00	17.14	8.54	81.96	24,950
Gwinnett	SR 316	0.00	3.00	18	2.00	0	0.00	6.67	7.08	254.31	77,416
Gwinnett	SR 316	3.60	6.60	7	0.78	0	0.00	22.86	3.21	218.08	66,388
Dekalb	SR 410	0.40	3.40	6	0.67	0	0.00	10.00	1.75	342.31	104,205
Dekalb	SR 410	3.80	6.80	10	1.11	0	0.00	20.00	3.14	318.63	96,994
Dougherty	SR 520	1.50	4.50	5	0.56	0	0.00	0.00	4.25	117.53	35,778
Tift	SR 520	8.90	11.90	6	0.67	0	0.00	0.00	8.28	72.42	22,046
Fulton	SR 6	8.60	11.60	7	0.78	0	0.00	8.57	6.01	116.55	35,478
Lowndes	SR 7	16.20	19.20	13	1.44	0	0.00	9.23	18.97	68.54	20,866

Cable Barrier Installation	ITEM N^{O} : B-7 CLIENT: GDOT Sheet 6 of 10

Review of proposed plans:

The following table was developed from the proposed plans provided. The roadway segments included in each plan set are grouped by project and listed by county and begin and end mile posts. Per the information provided in the plans and on the typical sections, the traffic volume (in ADT) and median width (in feet) have been noted.

In accordance with AASHTO guidance, a review of the median width and traffic volumes was completed and a determination made as to whether installation of median barriers should be considered or if they are optional. A column titled "AASHTO installation guidance per ADT and width" is included to present this analysis.

A cross comparison of the roadway segments included in the proposed plans was made against the table of eligible roadway segments developed by GDOT using a minimum 34-foot median width with minimum 5 crashes/3 years/3 miles. Those roadway segments which were found to warrant median barrier based on the crash data are highlighted in yellow. All those roadway segments that are not highlighted in yellow are not included on GDOT's list of eligible roadway segments, so no data is available to determine if crash rate occurrences warrant consideration for median barrier installation.

Based on the high crash, median width, and traffic data available, a total of 18 of the listed 75 roadway segments should be included in the proposed plans for implementation. This reduction in number of eligible roadway segments could result in an approximate 75 percent cost savings over the total cost of implementation of the six projects.

Therefore:

Current cost =	$24,368,000
Less 75% =	$18,276,000
Proposed cost =	$ 6,092,000

Cable Barrier Installation

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Data from Project Plans										
PI	County	Fed Route	State Route	Begin MP	End MP	Side	Traffic (ADT)	Median Width (ft)	AASHTO installation guidance per ADT and width	Barrier Type Proposed in Plans
Notes: Roadway segments highlighted in yellow are included on the crash analysis list completed by GDOT and would appear to warrant median barrier consideration per the number of crash occurences; all those not highlighted are not included on the list. * PI 0009818 and PI 0009820 typical sections indicate minimum median width of 44 ft; a median width up to 50 ft wide would warrant consideration and median width greater than 50 ft would be optional unless a high crash area is identified.										
0009818	Haralson	I-20	402	0.00	1.80	RT	33,100 - 55,720	89	Optional	cable barrier
0009818	Haralson	I-20	402	1.80	2.80	LT	33,100 - 55,720	89	Optional	cable barrier
0009818	Haralson	I-20	402	8.10	9.32	RT	33,100 - 55,720	90	Optional	cable barrier
0009818	Carroll	I-20	402	9.33	10.40	RT	33,100 - 55,720	90	Optional	cable barrier
0009818	Carroll	I-20	402	10.40	11.00	LT	33,100 - 55,720	90	Optional	cable barrier
0009818	Carroll	I-20	402	11.10	14.20	LT	33,100 - 55,720	90	Optional	cable barrier
0009818	Carroll	I-20	402	16.80	20.30	RT	33,100 - 55,720	92	Optional	cable barrier
0009818	Carroll	I-20	402	20.50	23.50	LT	33,100 - 55,720	90	Optional	cable barrier
0009818	Carroll	I-20	402	23.50	24.13	LT	33,100 - 55,720	90	Optional	cable barrier
0009818	Carroll	I-20	402	24.13	25.38	LT	33,100 - 55,720	79	Optional	cable barrier
0009818	Douglas	I-20	402	25.38	26.60	LT	33,100 - 55,720	79	Optional	cable barrier
0009818	Douglas	I-20	402	29.10	31.60	LT	33,100 - 55,720	62	Optional	cable barrier
0009818	Douglas	I-20	402	32.80	33.80	LT	33,100 - 55,720	62	Optional	cable barrier
0009619	Meriwether	I-85	403	33.55	34.65	LT	43,630 - 54,550	44-64	**Consider***	cable barrier
0009619	Coweta	I-85	403	34.60	35.33	RT	43,630 - 54,550	44-64	**Consider***	cable barrier
0009619	Coweta	I-85	403	37.95	38.05	RT	43,630 - 54,550	44-64	**Consider***	cable barrier
0009619	Coweta	I-85	403	38.55	40.25	RT	43,630 - 54,550	44-64	**Consider***	cable barrier
0009619	Coweta	I-85	403	35.33	35.55	RT	43,630 - 54,550	44-64	**Consider***	double face guardrail
0009619	Coweta	I-85	403	35.65	37.95	RT	43,630 - 54,550	44-64	**Consider***	double face guardrail
0009619	Coweta	I-85	403	38.04	38.25	RT	43,630 - 54,550	44-64	**Consider***	double face guardrail
0009619	Coweta	I-85	403	38.25	38.55	RT	43,630 - 54,550	44-64	**Consider***	double face guardrail
0009619	Coweta	I-85	403	38.35	38.55	RT	43,630 - 54,550	44-64	**Consider***	double face guardrail
0009619	Coweta	I-85	403	33.33	33.55	LT	43,630 - 54,550	44-64	**Consider***	single face guardrail
0009819	Clayton	I-675	413	0.72	0.92	LT	43,220 - 76,120	101-152	Optional	cable barrier
0009819	Clayton	I-675	413	1.12	3.70	LT	43,220 - 76,120	101-152	Optional	cable barrier
0009819	Clayton	I-675	413	4.00	5.00	RT	43,220 - 76,120	82-100	Optional	cable barrier
0009819	Clayton	I-675	413	5.00	6.15	RT	43,220 - 76,120	74-84	Optional	cable barrier
0009819	Clayton	I-675	413	8.69	9.23	RT	43,220 - 76,120	74-84	Optional	cable barrier
0009819	Clayton	I-675	413	6.43	8.52	LT	43,220 - 76,120	74-84	Optional	cable barrier
0009819	Clayton	I-675	413	9.23	9.70	LT	43,220 - 76,120	74-84	Optional	cable barrier
0009820	Peach	I-75	401	145.57	145.87	LT	59,010 - 64,570	44-84	**Consider***	cable barrier
0009820	Peach	I-75	401	140.77	140.97	RT	59,010 - 64,570	48-110	**Consider***	cable barrier
0009820	Peach	I-75	401	142.57	145.57	RT	59,010 - 64,570	48-110	**Consider***	cable barrier

Cable Barrier Installation

ITEM N^{O} : B-7
CLIENT: GDOT
Sheet 8 of 10

Data from Project Plans

PI	County	Fed Route	State Route	Begin MP	End MP	Side	Traffic (ADT)	Median Width (ft)	AASHTO installation guidance per ADT and width	Barrier Type Proposed in Plans
Notes: Roadway segments highlighted in yellow are included on the crash analysis list completed by GDOT and would appear to warrant median barrier consideration per the number of crash occurences; all those not highlighted are not included on the list. * PI 0009818 and PI 0009820 typical sections indicate minimum median width of 44 ft; a median width up to 50 ft wide would warrant consideration and median width greater than 50 ft would be optional unless a high crash area is identified.										
0009821	Bibb	I-16	404	6.00	8.00	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Twiggs	I-16	404	14.00	15.20	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Twiggs	I-16	404	20.30	21.00	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Twiggs	I-16	404	24.60	28.00	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	33.00	37.00	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	47.30	50.00	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	53.60	54.60	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	55.07	53.57	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	55.44	55.86	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	56.00	56.40	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	56.50	57.10	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	57.18	59.40	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	59.41	61.50	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	61.51	65.50	RT	17,000 - 21,500	64	Optional	cable barrier
0009821	Bibb	I-16	404	8.50	8.70	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Twiggs	I-16	404	8.71	14.00	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Twiggs	I-16	404	15.20	16.40	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Twiggs	I-16	404	16.40	19.10	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Twiggs	I-16	404	21.00	24.10	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Bleckley	I-16	404	28.00	33.00	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	37.00	42.00	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	42.70	43.90	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	43.91	46.00	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	50.00	53.60	LT	17,000 - 21,500	64	Optional	cable barrier
0009821	Laurens	I-16	404	54.60	55.00	LT	17,000 - 21,500	64	Optional	cable barrier
0009822	Dawson	-	400	0.35	0.70	RT	18,220 - 28,840	64	Optional	cable barrier
0009822	Dawson	-	400	1.80	1.85	RT	18,220 - 28,840	64	Optional	cable barrier
0009822	Dawson	-	400	1.00	1.10	LT	18,220 - 28,840	64	Optional	cable barrier
0009822	Dawson	-	400	2.10	2.20	RT	18,220 - 28,840	64	Optional	cable barrier
0009822	Dawson	-	400	2.70	3.20	RT	18,220 - 28,840	40	**Consider**	cable barrier
0009822	Dawson	-	400	3.40	3.50	LT	18,220 - 28,840	44	**Consider**	cable barrier
0009822	Dawson	-	400	3.80	4.00	RT	18,220 - 28,840	40-42	**Consider**	cable barrier
0009822	Dawson	-	400	4.30	4.80	RT	18,220 - 28,840	40-42	**Consider**	cable barrier
0009822	Dawson	-	400	5.40	5.70	RT	18,220 - 28,840	40-42	**Consider**	cable barrier
0009822	Dawson	-	400	6.00	6.30	RT	18,220 - 28,840	40-42	**Consider**	cable barrier
0009822	Dawson	-	400	6.90	7.30	RT	18,220 - 28,840	40-42	**Consider**	cable barrier
0009822	Dawson	-	400	5.10	5.20	RT	18,220 - 28,840	40	**Consider**	cable barrier
0009822	Dawson	-	400	6.40	6.70	LT	18,220 - 28,840	40-42	**Consider**	cable barrier
0009822	Dawson	-	400	0.53	0.93	RT	18,220 - 28,840	40	**Consider**	cable barrier
0009822	Dawson	-	400	1.03	1.53	RT	18,220 - 28,840	40	**Consider**	cable barrier
0009822	Dawson	-	400	1.83	2.13	RT	18,220 - 28,840	40	**Consider**	cable barrier
0009822	Lumpkin	-	400	2.33	2.93	LT	18,220 - 28,840	40-42	**Consider**	cable barrier

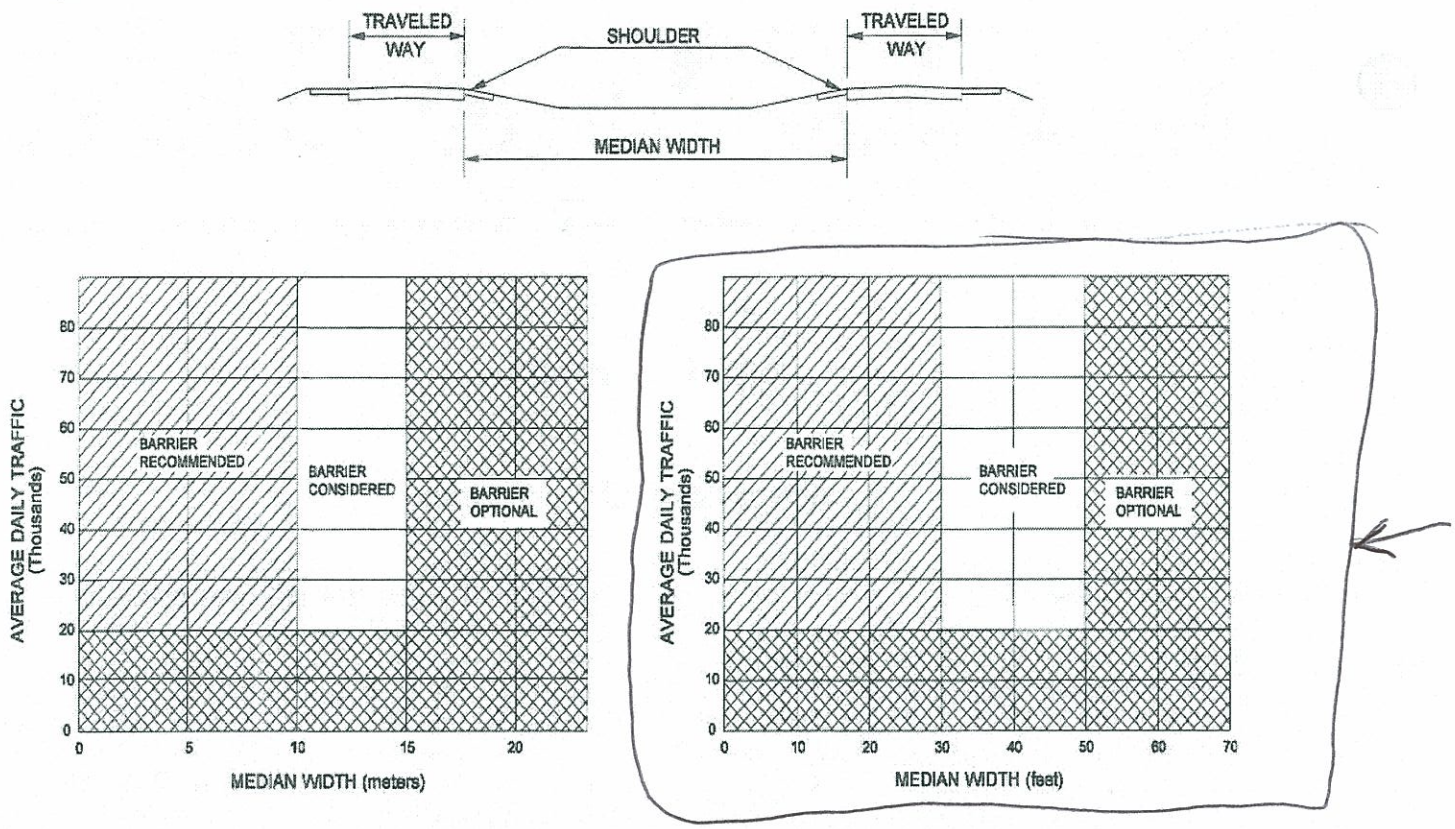

Figure 6.1 Guidelines for median barriers on high-speed, fully controlled-access roadways

crashes as it reduces the recovery area available. As a result, there could be increased maintenance costs to repair the barrier as well as increased exposure to the maintenance crews completing the repairs. Another concern associated with the installation of a median barrier is that it will limit the options of maintenance and emergency service vehicles to cross the median. In snowy climates, a median barrier may also affect the ability to store snow in the median. There may be other environmental impacts depending on the grading required to install the barrier. For these reasons, a one-size-fits-all recommendation for the use of median barrier is not appropriate.

Studies (6, 9) have shown that median barriers can significantly reduce the occurrence of cross-median crashes and the overall severity of median-related crashes. With the potential to reduce high-severity crashes, it is recommended that median barrier be considered for high-speed, fully controlled-access roadways that have traversable medians as shown in Figure 6.1.

Figure 6.1 recommends median barrier on high-speed, fully controlled-access roadways for locations where the median is 10 m [30 ft] in width or less and the average daily traffic (ADT) is greater than 20,000 vehicles per day. For locations with median widths less than 15 m [50 ft] and where the ADT is less than 20,000 vehicles per day, a median barrier is optional. However, the facility should be designed to facilitate future barrier placement if there are significant increases in average daily traffic and/or a history of cross-median crashes is experienced. For locations where median widths are greater than 10 m [30 ft] but less than 15 m [50 ft], and where the ADT is greater than 20,000 vehicles per day, a cost/benefit analysis or an engineering study evaluating such factors as traffic volumes, vehicle classifications, median crossover history, crash incidents, vertical and horizontal alignment relationships, and median/terrain configurations may be conducted at the discretion of the transportation agency to determine the appropriate application for median barrier installations. For locations with median widths equal to or greater than 15 m [50 ft], a barrier is not normally considered except in special circumstances such as a location with a significant history of cross-median crashes.

Each transportation agency has the flexibility to develop its particular median barrier guidelines. For example, California completed a detailed study in 1997 that suggested medians as wide as 23 m [75 ft] with traffic volumes in excess of 60,000 vehicles per day would be candidates for a median barrier study (3). California uses a crash study warrant to identify sections of freeways that may require the installation of a median barrier. This warrant

requires a minimum of 0.31 cross-median crashes per kilometer [0.50 cross-median crashes per mile] of any severity per year, or 0.075 fatal crashes per kilometer [0.12 fatal crashes per mile] per year. The rate calculation requires a minimum of three crashes occurring within a five-year period.

In some cases, it may be determined that a median barrier is only necessary at locations where there are concentrations of cross-median crashes. For example, the Florida Department of Transportation found that 62 percent of all cross-median crashes occurred within one-half mile and 82 percent occurred within one mile of interchange ramp termini (1).

Median barriers are sometimes used on high-volume facilities, which do not have fully controlled access. As indicated in Figure 6.1, these median barrier guidelines were developed for use on high-speed, fully controlled-access roadways. Utilizing these guidelines on roadways that do not have full access control requires the need for engineering analyses and judgment, taking into consideration such items as, right-of-way constraints, property access needs, number of intersections and driveway openings, adjacent commercial development, sight distance at intersections, barrier end termination, etc. Therefore, trying to apply these guidelines to roadways that do not have full access control can be rather complex in many locations.

Special consideration should be given to barrier needs for medians separating roadways at different elevations. The ability of an errant driver leaving the higher roadway to return to the road or to stop diminishes as the difference in elevation increases. Thus, the potential for cross-over crashes increases. For such sections, the clear-zone criteria given in Chapter 3 should be used as a guideline for establishing barrier need. Section 6.6.1 addresses the placement of barrier on sloped medians.

6.3 PERFORMANCE LEVEL SELECTION PROCEDURES

As with roadside barriers, most median barriers have been developed, tested, and installed with the intention of containing and redirecting passenger vehicles and pickup trucks. Some highway agencies have identified locations where heavy vehicle containment was considered necessary and have designed and installed high-performance median barriers having significantly greater capabilities than commonly used designs. Factors most often considered in reaching a decision on such barrier use include

- high percentage or large average daily number of heavy vehicles,
- adverse geometrics (horizontal curvature), and
- severe consequences of vehicular (or cargo) penetration into opposing traffic lanes.

Section 6.4 includes information on the maximum size of vehicle that has been successfully crash tested for each median barrier system described in that section.

6.4 STRUCTURAL AND SAFETY CHARACTERISTICS OF MEDIAN BARRIERS

This section identifies selected median barrier systems and summarizes the structural and safety characteristics of each. It is subdivided into length-of-need sections, transitions, and end treatments. Characteristics unique to each system are emphasized.

6.4.1 Crashworthy Median Barrier Systems

As with roadside barriers, median barriers can be categorized as flexible, semi-rigid, or rigid. This section includes descriptions and performance capabilities of crashworthy median barrier systems that have met the criteria of NCHRP Report 350 (10), beginning with flexible median barriers and ending with rigid systems. Also included is a discussion of a moveable barrier system that can be used for special traffic situations, such as reversible traffic lanes, where periodic relocation of the barrier is required. Some barriers that are designed to restrain and redirect large vehicles are also identified and included in this section. The barriers to be addressed and their corresponding test levels are:

- Weak-Post, W-Beam Guardrail TL-3
- 3-Strand Cable, Weak Post TL-3
- High-Tension Cable Barrier TL-3 *
- Box-Beam Barrier TL-3
- Blocked-Out W-Beam (Strong Post)
  - Steel or Wood Post with Wood or Plastic Block TL-3
  - Steel Post with Steel Block TL-2
- Blocked-Out Thrie-Beam (Strong Post)
  - Wood or Steel Post with Wood or Plastic Block TL-3

*Several of the High-Tension Cable Barriers have versions that were successfully tested at TL-4.

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA:
B-8	1 of 3	Combine projects for bid purposes

Comp By: SWG Date: 12/9/10 Checked By: DCW Date: 12/9/10

Original Concept:

The original concept proposes to let the cable barrier projects as six different contracts.

Proposed Change:

The revised concept proposes to let the cable barrier projects as one contract.

Justification:

The proposed design plans and specifications for the six projects are being developed simultaneously. All of the projects should be completed and ready for letting at the same time. By combining the projects into one contract, the total amount of cable barrier will be increased and therefore the unit price for all associated pay items should be reduced due to economy of scale. The costs from the selected cable barrier manufacturer will be reduced and the overhead cost for administering the project will be minimized.

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original	24,368,000		
- Proposed	23,150,000		
- Savings	1,218,000		1,218,000
FUTURE COST - Savings			-0-
TOTAL PRESENT WORTH SAVINGS			**1,218,000**

COST WORKSHEET							
PROJECT: **Cable Barrier Installation**					ITEM No: B-8 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
Total project cost	LS	1	24,368,000	24,368,000	1	23,149,600	23,149,600
SUBTOTAL				24,368,000			23,149,600
Markup 0.00%				0			0
TOTAL				24,368,000			23,149,600
TOTAL ROUNDED				24,368,000			23,150,000

Cable Barrier Installation	ITEM N^{O} : B-8 CLIENT: GDOT Sheet 3 of 3

Assume 5% in total cost of contract due to economy of scale and reduced administrative costs for GDOT and contractor.

Original Concept

Total Project Cost = $24,368,000

Revised Concept

Total Project Cost = 0.95 x $24,368,000 = $23,149,600

DEVELOPMENT AND RECOMMENDATION PHASE

Cable Barrier Installation

IDEA No.:	PAGE No.:	CREATIVE IDEA: Design Consideration
B-8.1	1 of 1	GDOT purchase materials on annual basis

Comp By: SWG Date: 12/9/10 Checked By: DCW Date: 12/9/10

Original Concept:

The original concept proposes to require contractors to purchase cable barrier materials (cable and post installations) from manufacturers on a contract-by-contract basis.

Proposed Change:

The revised concept proposes that GDOT will pre-purchase a predetermined amount of cable barrier materials (cable and post installations) from manufacturers on an annual basis. Contractors would be supplied these materials as needed for future cable barrier installation projects.

Justification:

GDOT has identified numerous areas throughout the state for future installation of cable barrier. The lowest unit cost for cable barrier materials (cable and post installations) will be realized when a large quantity is purchased due to economy of scale. The construction contracts would allow contractors to procure the cable barrier materials from GDOT or the manufacturer.

Design Consideration

LIFE CYCLE COST SUMMARY	CAPITAL COST	FUTURE COST	PRESENT WORTH
INITIAL COST - Original			
- Proposed			
- Savings			
FUTURE COST - Savings			
TOTAL PRESENT WORTH SAVINGS			N/A

Sources

Approving/Authorizing Persons

Name:	Position:	Telephone:
Gerald Ross	Deputy Commissioner & Chief Engineer	404-631-1004
Kathy Zahul	State Traffic Operations Engineer	404-635-8134
Greg Morris	FHWA	404-562-3619
Derrick Cameron	Project Manager	404-635-8153

Personal Contacts

Name:	Telephone:	Notes:
Charity Belford	404-635-8154	GDOT, Project design presentation
Patrick Bowers	770-387-3609	Dist. 6 Construction of cable barriers
Ken Howard	770-387-3605	Dist. 6 Maintenance of cable barriers
Ron Faulkenberry	800-495-8957	Gibraltar Sales Rep –cable information
Richard Figlewicz	847-638-4611	CASS (Trinity) cable information – Sales Rep.

Documents/Abstracts

Reference:	Reference:
Design package and estimate for 6 projects	
AASHTO Roadside Design Guide 2006	
GDOT design Policy Manual	
GDOT Item Mean Summary cost data	
GDOT Standard Detailed Drawings	

COST MODEL COMPOSITE

VALUE ENGINEERING

COST MODEL / DISTRIBUTION

By

Decreasing Item

All Guardrail and Cable Barrier Installation

PI No. N/A

All Counties

December 2010

Element ID.	Item Description	Cost x $1,000	%
A	Class A Concrete	14,023	58
B	Cable Barrier and Terminal	7,673	31
C	Grading	900	4
D	Traffic Control	646	3
E	Guardrail and Anchorage	438	2
F	Inlet Sediment Trap	200	1
G	Mulch	178	1
H	Wood Fiber Blanket	163	<1
I	Grassing, Lime and Fertilizers	105	<1
J	Water Quality Inspections and Monitoring	42	<1
	TOTAL	**24,368**	**100%**

COST MODEL #1

VALUE ENGINEERING

COST MODEL / DISTRIBUTION

By

Decreasing Item

I-85 Guardrail and Cable Barrier Installation

PI No. 0009619

Meriwether / Coweta Counties

December 2010

Element ID.	Item Description	Cost x $1,000	%
A	Class A Concrete	1,091	58
B	Dbl. Faced Guardrail and Anchorage	333	18
	76% Cost Line		
C	Cable Barrier and Terminal	286	15
D	Grading	50	3
E	Traffic Control	40	2
F	Inlet Sediment Trap	18	1
G	Wood Fiber Blanket	17	1
H	Water Quality Inspections and Monitoring	13	1
I	Mulch	10	1
J	Grassing, Lime and Fertilizers	5	<1
	TOTAL	**1,863**	**100%**

COST MODEL #2

VALUE ENGINEERING

COST MODEL / DISTRIBUTION

By

Decreasing Item

I-20 Guardrail and Cable Barrier Installation

PI No. 0009818

Haralson / Carroll / Douglas Counties

December 2010

Element ID.	Item Description	Cost x $1,000	%
A	Class A Concrete	6,296	74
B	Cable Barrier and Terminal	1,613	19
93% Cost Line			
C	Grading	250	3
D	Traffic Control	170	2
E	Guardrail and Anchorage	55	1
F	Inlet Sediment Trap	43	1
G	Wood Fiber Blanket	32	<1
H	Grassing, Lime and Fertilizers	29	<1
I	Mulch	17	<1
J	Water Quality Inspections and Monitoring	12	<1
	TOTAL	**8,517**	**100%**

COST MODEL #3

VALUE ENGINEERING

COST MODEL / DISTRIBUTION

By

Decreasing Item

SR 413 Guardrail and Cable Barrier Installation

PI No. 0009819

Clayton County

December 2010

Element ID.	Item Description	Cost x $1,000	%
A	Class A Concrete	853	49
B	Cable Barrier and Terminal	629	36
85% Cost Line			
C	Grading	100	6
D	Traffic Control	73	4
E	Wood Fiber Blanket	34	2
F	Mulch	30	2
G	Grassing, Lime and Fertilizers	9	1
H	Inlet Sediment Trap	8	<1
I	Water Quality Inspections and Monitoring	3	<1
	TOTAL	**1,739**	**100%**

COST MODEL #4

VALUE ENGINEERING

COST MODEL / DISTRIBUTION

By

Decreasing Item

I-75 Guardrail and Cable Barrier Installation

PI No. 0009820

Peach County

December 2010

Element ID.	Item Description	Cost x $1,000	%
A	Class A Concrete	317	53
53% Cost Line			
B	Cable Barrier and Terminal	261	43
C	Grading	TBD	
D	Traffic Control	TBD	
E	Inlet Sediment Trap	6	1
F	Mulch	4	1
G	Grassing, Lime and Fertilizers	4	1
H	Water Quality Inspections and Monitoring	4	1
I	Guard Rail Anchorage	3	<1
	TOTAL	**597**	**100%**

COST MODEL #5

VALUE ENGINEERING

COST MODEL / DISTRIBUTION

By

Decreasing Item

I-16 Guardrail and Cable Barrier Installation

PI No. 0009821

Bibb / Twiggs / Bleckley / and Laurens Counties

December 2010

Element ID.	Item Description	Cost x $1,000	%
A	Class A Concrete	4,996	47
B	Cable Barrier and Terminal	4,421	41
88% Cost Line			
C	Grading	500	5
D	Traffic Control	363	3
E	Mulch	112	1
F	Inlet Sediment Trap	106	1
G	Wood Fiber Blanket	80	1
H	Grassing, Lime and Fertilizers	54	1
I	Guardrail and Anchorage	47	<1
J	Water Quality Inspections and Monitoring	3	<1
	TOTAL	**10,682**	**100%**

COST MODEL #6

VALUE ENGINEERING

COST MODEL / DISTRIBUTION

By

Decreasing Item

SR 400 Guardrail and Cable Barrier Installation

PI No. 0009822

Dawson and Lumpkin Counties

December 2010

Element ID.	Item Description	Cost x $1,000	%
A	Class A Concrete	471	49
53% Cost Line			
B	Cable Barrier and Terminal	464	48
C	Grading	TBD	
D	Traffic Control	TBD	
E	Inlet Sediment Trap	19	2
F	Water Quality Inspections and Monitoring	7	1
G	Mulch	5	<1
H	Grassing, Lime and Fertilizers	4	<1
	TOTAL	**970**	**100%**

INFORMATION PHASE ------- FUNCTION ANALYSIS

Cable Barrier Installation

System: **Install median barrier**
Function: **Stop Vehicles**

ITEM No.	DESCRIPTION	FUNCTION			INITIAL DOLLARS (x 1,000)		
		Verb	Noun	Kind*	Cost	% of Total	Worth
A	Class A Concrete	Protect	Post	B	14,023	58	6,000
		Support	Post	S			
		Block	Vegetative Growth	S			
		Adds	Support (Anchor)	S			
		Anchor	System	S			
B	Cable barrier and terminal	Absorb	Energy	B	7,673	31	7,000
		Hold	Cable	S			
		Stop	Vehicles	S			
		Prevent	Crossovers	B			
C	Grading			S	900	4	700
TOTAL					**22,596**	**93**	**13,700**

* B = Basic, S = Secondary

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation	
Cable Barrier Installation			
NO.	**CREATIVE IDEA**	**COMMENTS**	**IDEA RATING ****
A	**Class A Concrete**		
A-1	Use a lower strength concrete for mowing strip		√
A-2	Use asphalt mowing strip		√
A-3	Eliminate mowing strip		√
A-4	Use alternate barrier for weed/plant growth		**X**
A-5	Allow driven posts and or sleeves, eliminate foundation		√
B	**Cable Barrier**		
B-1	Use 3 in lieu of 4 cable TL4 system with MASH criteria		√
B-2	Relocate to edge of shoulder		
B-3	Develop one standard for use statewide	Too restrictive on manufacturers	**X**
B-4	Use double faced guardrail in lieu of cable system		√
B-5	Provide soil boring information to contractor for bid information		**DC**
B-6	Use a performance specification in lieu of restrictive data		√
B-7	Verify conformance of selection criteria with AASHTO		√
B-8	Combine potential projects for annual statewide material bid.		√

** √ = Idea will be evaluated; X= idea will be dropped; DC = Design Consideration – presented for consideration by the design team

VE STUDY SIGN-IN SHEET

Counties: Coweta, Meriwether, Carroll, Douglas, Haralson, Clayton, Peach, Bibb, Bleckley, Laurens Twiggs, Dawson, Lumpkin

PI#'s : 0009619, 0009818 0009819, 0009820 0009821, 0009822

Date: December 6-9, 2010

Days

FIRST	LAST	NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
O	✓	Lisa L. Myers		Engineering Services	404-631-1770	lmyers@dot.ga.gov
✓	✓	Matt Sanders		Engineering Services	404-631-1752	msanders@dot.ga.gov
✓	O	James K. Magnus		Construction	404-631-1971	jmagnus@dot.ga.gov
✓	O	Ken Werho		Traffic Operations	404-635-8144	kwerho@dot.ga.gov
O	O	Ron Wishon		Engineering Services	404-631-1753	rwishon@dot.ga.gov
✓	✓	Steven Gaines	—	Wolverton + Assoc	678-405-3137	sgaines@wolverton-assoc.com
✓	✓	GEORGE OBARANIE	—	MACTEC	770-421-3346	GAOBARANIE@MACTEC.COM
✓	✓	DAVID WOHLSCHEID	—	MACTEC	571-217-0808	DCWOHLSCHEID@MACTEC.COM
✓	✓	Lenor Bromberg	—	KEA Group	678-904-8591 x27	lbromberg@keagroup.com
✓	O	LARRY BOWMAN		GDOT/OES	404-631-1362	lbowman@dot.ga.gov
✓	✓	Greg Morris	—	FHWA	404-562-3619	greg.morris@dot.gov
✓	✓	Charity Belford		GDOT	4)635-8154	cbelford@dot.ga.gov
✓	✓	LaKeshia Osborn		GDOT	4)635-8139	losborn@dot.ga.gov
	✓	PERRY BLACK		GDOT	4)635-8156	PEBLACK@dot.ga.gov

✓ Check all that attend

11 Attended Project Overview(Day 1)

10 Attended Project Presentation (Day 4)