

VALUE ENGINEERING STUDY

**PI No. 621340-
SR 5 from SR 2 to Proposed McCaysville Bypass**

**PI No. 620490-
McCaysville Bypass from SR 5 to Tennessee State Line
Fannin County, Georgia**

Prepared for:



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Sept. 1, 2016





September 1, 2016

GDOT - Engineering Services
One Georgia Center - 5th Floor
600 W. Peachtree Street NW
Atlanta, GA 30308

Attention: Matt Sanders, AVS
Value Engineering Specialist

Reference: VE Workshop – SR 5 from SR 2 to Proposed McCaysville Bypass, McCaysville Bypass
from SR 5 to Tennessee State Line
Fannin County, GA
PI#: 621340-; 620490-

Dear Mr. Sanders,

McDonough Bolyard Peck, Inc. is pleased to submit two (2) hard copies and one (1) CD of the Value Engineering Study Report on the above referenced project. We appreciate the assistance and participation of the GDOT management personnel as well as the design team.

This Workshop resulted in the development of fourteen (14) value-enhancing proposals. We hope that incorporation of some of these value improvement alternatives provided herein results in an enhanced project in relation to cost, constructibility and long-term performance of the project features.

Please feel free to contact me at 404-414-9951 or torr@mbpce.com to discuss any information within this report. We look forward to the next opportunity to be of service to the Georgia Department of Transportation.

Sincerely,

A handwritten signature in blue ink that reads "Tom Orr".

Tom Orr, PE, CVS
VE Team Leader

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PROJECT DESCRIPTION AND BACKGROUND

This workshop involved evaluating two projects along the SR 5 corridor in North Georgia at the Tennessee border. The projects consist of widening and reconstruction of SR 5 and the construction of a new truck bypass at McCaysville in Fannin County, GA. Additional information on the two projects follows.

PI #621340- SR 5 from SR 2 to Proposed McCaysville Bypass (SR 5 Widening)

The PI #621340- project begins just north of SR 2/SR 515 in Blue Ridge and continues north for 8.14 miles to a point just north of Spring Hill Circle, approximately 0.85 miles south of McCaysville city limits. The proposed project consists of four 12' lanes with a 14' flush median running to the point of beginning to the north for 6.81 miles. At this point, the project will consist of two 12' lanes with a 14' flush median. The outside shoulders are 10' wide with 6.5' paved for both sections. Two bridge culverts are expected to be widened at Spirit Creek and Little Spirit Creek. The right-of-way is 150' wide for the 5-lane section and 120' wide for the 3-lane section throughout the corridor. At the current time, the design speed is intended to be 55 MPH.

Project components include:

- Widening to 4-lane (two 12' travel lanes) roadway with 14' wide flush median
- Reconstruction of 2-lane (12' travel lanes) roadway with 14' wide flush median
- Outside shoulders of 10' width (6.5' paved)
- Two signals
- Extension of culverts at creeks

PI #620490- McCaysville Bypass from SR 5 to Tennessee State Line (McCaysville Truck Bypass)

The PI #620490- project begins just north of Spring Hill Circle, approximately 0.85 miles south of McCaysville city limits, and continues north for 3.06 miles into Tennessee, ending at SR 68. The proposed project consists of two 12' travel lanes with a 4' flush median. The outside shoulders are 12' wide with 10' paved. Four bridges are proposed as part of the bypass, over Old Epworth Road, the Ocoee River in Tennessee, Fightingtown Creek in Georgia, and at an access road between Fightingtown Creek and the Ocoee River. The right-of-way is 150' throughout the corridor. The design speed is 55 MPH along the majority of the route and reducing to 45 MPH prior to the connection with SR 68.

Project components include:

- New 2-lane (12' travel lanes) truck bypass roadway with 4' wide flush median
- Outside shoulders of 12' width (10' paved)
- Four new bridges
- One signal
- Tie-in to SR 68 in Tennessee

KEY INFORMATION/NOTES

Introduction

MBP conducted the Value Engineering Team Study on SR 5 from SR 2/Blue Ridge Drive North to proposed McCaysville Bypass near CR 138 (SR 5 Widening) and McCaysville Bypass from SR 5 to Tennessee State Line (McCaysville Truck Bypass) in Fannin County. The VE study was conducted for three and ½ days, 29 August thru 1 September, 2016, at the Georgia Department of Transportation, 5th floor Conference Room, in Atlanta, GA. The study team was furnished with a Draft concept report and preliminary construction plans for use in conducting the VE workshop.

The following individuals were members of the VE team:

Name	Firm	Discipline
Tom Orr, PE, CVS	MBP	VE Team Leader (VETL)
Buffy Campbell, CCP, AVS	MBP	VE Team Assistant
Gary Newton, PE	Kimley-Horn	Roadway Engineer
Johnny Lee, PE	RS&H	Roadway Engineer
Mike Rushing, PE	Kimley-Horn	Bridge Engineer
Scott Jordan, PE	Southeastern Engineering	Construction

Value Engineering Job Plan

The Value Engineering Study followed the Value Engineering Job Plan as certified by SAVE International as follows:

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

Information Phase

The VE team was first briefed on the project design by Georgia DOT project management and Jacobs Engineering design team representatives in a Design Presentation the morning of the first day of the VE Study. The briefing included a review of the design requirements and rationale for the selection and arrangement of the major project features. Discussions regarding alternatives considered, adjacent properties/facilities, and project criteria and constraints were included in the design presentation.

Function Analysis

As a basic part of the VE process, the team conducted a Function Analysis session on the project to identify the needs and goals of the project and facilitate the creative idea session, by addressing functions as opposed to the specific design elements.

The Basic Function of both projects is to *“Improve Operations”*. A detailed project function analysis of the characteristics of the project and the project features is presented in the Appendix.

Creative Phase

The Creative Phase of the VE study was initiated the afternoon of the first day of the study. A total of twenty-two (22) creative ideas were generated for further investigation by the team; ten (10) for SR 5 Widening, six (6) for McCaysville Truck Bypass Roadway, and six (6) for McCaysville Truck Bypass Bridges. The creative ideas focused on areas of the project which the VE Team felt had the most opportunity for value improvement, including:

- Providing the appropriate roadway section as required for the traffic volume
- Setting design and posted speeds as appropriate for traffic flow and minimizing vertical elevation differentials
- Minimizing bridge widths to those required by design policy
- Identifying bridge designs that will minimize costs and construction efforts
- Reducing impacts to adjacent property owners
- Reducing right-of-way acquisition required for projects
- Combining projects for economies of scale and simplifying coordination

A listing of all creative ideas on this project is included in the Appendix.

Alternative Idea Evaluation Criteria

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

VE Idea Evaluation Criteria

- Improves Operations
- Reduces Costs
- Reduces Impacts – Property/Business/Environmental
- Reduces Schedule
- Improves Constructibility
- Reduces R/W Acquisition
- Acceptability – GDOT/Stakeholder

Evaluation Phase

The ideas generated during the Creative Phase were reviewed and evaluated by the VE session participants during an Analysis/Judgment Phase session. The intent of the session was to allow the participants an opportunity to discuss and evaluate the ideas. A few of the VE ideas were dropped at that time as being conceptually unacceptable. The ranking session consisted of the VE Team members assigning a ranking for each idea. The ranking was based on how each idea improves the value of the project when considered against the evaluation criteria listed previously. All ideas were given a designation of 1 to 5, with a 5 being those ideas that brought the most added value to the project. This is a time management tool to identify those proposals that have the greatest potential. Approximately fourteen (14) out of the original twenty-two (22) creative ideas were deemed promising for further investigation and analysis by the VE Team.

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

Value Improvement Ranking of Idea

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

Development Phase

The specific proposals found in the body of this report represent the positive results of investigations by the VE team on the SR 5 Widening and McCaysville Truck Bypass projects. Each proposal represents a quality enhancing and/or cost saving alternative, which is documented by words, drawings, estimates and calculations. The proposal format presents the idea, describes the original design element proposed for change and the proposed change, lists the perceived advantages and disadvantages of the proposed change and supports the idea with a detailed cost estimate for the original and proposed design. Where necessary for clarity, the proposal also includes thumbnail design drawings and supporting engineering calculations.

Presentation Phase

A presentation to the GDOT and design team representatives was conducted on September 1, 2016 at 9:00 am.

Basis of VE Cost Savings

The cost information for proposals in this report is based on the cost data prepared by the design team, GDOT Item Mean Summary (with cost data for prior 4 years), VE Team member experience, and discussions with vendors/Contractors. Overhead and profit are included in the project cost estimate and the GDOT Item Mean. Therefore, no additional markups are applied. The savings presented in the proposals is a general order of magnitude (estimate of the potential savings) if the idea were to be accepted. These figures are solely intended to identify the most attractive design solution, and are not prepared to represent a net deduction to the overall project budget. The costs are in 2016 dollars.

Evaluation of Alternatives

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

VALUE ENGINEERING RESULTS

The VE Team generated 22 creative ideas and developed 14 proposals for consideration by GDOT. Brief outlines of the VE proposals are as follows:

Proposal Highlights for PI #621340- SR 5 Widening:

R-1.0 – Construct 5-lane from Beginning of Project to Sta 235+00 (Tom Boyd Road/Scenic Drive) then 3-Lanes with Passing Lanes at Various Locations to Sta 465+00 (Old Hwy 5). In the current design, SR 5 is widened to a proposed 5-Lane Section with two 12-foot Lanes in each direction with 14-foot flush median from Beginning of project to Sta 465+00. In R-1.0, it is proposed to construct a 5-lane section with two 12-foot lanes and 14-foot flush median from Beginning of project to Sta 235+00, then transition to a 3-Lane section with one 12-foot travel lane each direction and 14-foot flush median from Sta 235+00 to 465+00. Addition of Passing Lanes are proposed at four up grade locations for the proposed 3 Lane Section from Sta 235+00 to 465+00. This alternative results in reduced right of way acquisitions, reduced impacts to property owners and provides a project cost savings of \$5,413,683.

R-2.1 – For 5-Lane Section, Use 11 Foot Inside Lane Width and 12 Foot Outside Lane. In the current design, the proposed typical section consists of two 12-foot lanes in each direction, a 14-foot flush median two-way-left-turning lane and a 10 foot graded shoulder with 6.5 feet paved. In R-2.1, it is proposed to reduce the inside 12-foot-wide travel lane in each direction to an 11-foot-wide travel lane in each direction. GDOT Design Criteria for Arterial Roadways allows 11 foot lanes for 4-lane roadway sections at 55 MPH design speed with ADT's over 2,000. This alternative minimizes property impacts, reduces schedule, minimizes impervious area, and provides a project cost savings of \$382,445.

R-3.0 – Reduce Partial Depth Paved Shoulder Width from 6.5 Feet to 4 Feet. In the current design, the proposed typical section includes a 10-foot-wide graded shoulder with 6.5 feet paved. In R-3.0, it is proposed to reduce the paved shoulder width to 4 feet. Since this corridor is not a designated bike route, a 4-foot-wide shoulder is acceptable. This alternative minimizes impervious area, reduces schedule and provides a project cost savings of \$478,889.

R-4.0 – Reduce Design and Posted Speed from 55 MPH to 45 MPH from Beginning of Project to Sta 235+00 (Tom Boyd Road/Scenic Drive). In the current design, the vertical profile in this section meets 45 MPH, however the sag vertical curves, as designed, are less than 45 MPH. The Concept Report states the corridor will be designed and posted at 55 MPH. In R-4.0, it is proposed to adjust the vertical profile to provide for a 45 MPH design from beginning of project to Sta 235+00. This section of the roadway would also be posted as 45 MPH. Recent developments and higher traffic volumes in this section justify a 45 MPH operating speed. This alternative will simplify construction staging, reduces earthwork required and provides a project cost savings of \$1,004,112.

R-6.0 – Adjust Horizontal Alignments and Right of Way Widths at Specific Locations Along 5-Lane Section to Reduce Property Displacements. The current design includes a 150-foot right-of-way corridor width within the 5-lane section and 120-foot right of way corridor width within the 3-lane section. In R-6.0, at 10 locations along the corridor it is proposed to either reduce right of way widths from 150 feet to 120 feet, construct retaining walls at the right-of-way lines, or adjust the horizontal alignment of the road. These adjustments allow for avoiding business or residential displacements, reduce the right-of-way acquisition efforts and result in a project cost savings of \$2,297,500.

R-7.0 – Combine SR 5 Widening Project and McCaysville Truck Bypass Project into a Single Bid. In the current design documents (estimate/schedule), the SR 5 Widening project and the McCaysville Truck Bypass project are planned to be bid as separate projects. In R-7.0, it is proposed to combine the widening and truck bypass projects into a single bid with the same Right of Way Authorization and Let to Construction date. This proposal reduces schedule for total completion of both projects, eliminates tie-in coordination between two contractors and results in a project cost savings on this SR 5 Widening project of \$2,356,594.

Proposal Highlights for PI #620490- McCaysville Truck Bypass:

R-1.0 – Eliminate 4 Foot Flush Median. The current design includes a proposed typical section consisting of a 4-foot asphalt median in the 2-lane section of the truck bypass. The current design also proposes 48'-0" clear bridge width between barriers for Bridges 1 thru 4. In R-1.0, it is proposed to eliminate the 4-foot-wide flush asphalt median for the 2 lane section of the truck bypass. It is also proposed to reduce the clear bridge width by 4 feet for Bridges 1 thru 4. This alternative reduces impervious area, reduces schedule, reduces impacts and provides a project cost savings of \$870,203.

R-2.1 – Reduce Paved Shoulder from 10-Foot-Wide Partial Depth to 4-Foot-Wide Full Depth. In the current design, the proposed typical section consists of a 10-foot asphalt partial depth shoulder for the truck bypass route. In R-2.1, it is proposed to reduce the 10-foot partial depth asphalt shoulder to 4-foot full depth asphalt shoulder in the 2-lane section of the truck bypass. This alternative eliminates impervious area, reduces schedule, and provides a project cost savings of \$30,410.

R-4.0 – Combine SR 5 Widening Project and McCaysville Truck Bypass Project into a Single Bid. In the current design documents (estimate/schedule), the SR 5 Widening project and the McCaysville Truck Bypass project are planned to be bid as separate projects. In R-4.0, it is proposed to combine the widening and truck bypass projects into a single bid with the same Right of Way Authorization and Let to Construction date. This proposal reduces schedule for total completion of both projects, eliminates tie-in coordination between two contractors and results in a project cost savings on this McCaysville Truck Bypass project of \$1,071,828.

R-5.0 – Reduce Tie-In Length at End of Project. In the current design, the proposed project ends at station 721+58 with four 12 foot lanes and 6.5 feet of paved outside shoulder. In R-5.0, it is proposed to adjust the end of project to approximate station 715+00, where it appears that the project is back to existing alignment, resulting in a reduction of 658 feet of road work. This proposed change eliminates unnecessary construction, reduces schedule and results in a project cost savings of \$187,811.

Bridge (B), B-1.0 – Reduce the Clear Bridge Width for Bridges 1 thru 4 on the Truck Bypass from 48 feet to 44 feet. The current design proposes a 48'-0" clear bridge width between barriers for Bridges 1 thru 4. In B-1.0, it is proposed to reduce the clear bridge width between barriers to 44'-0" for Bridges 1 thru 4. This width is based on two 12-foot travel lanes, a 4-foot flush median and 8 foot shoulders on each side. This proposal meets GDOT Bridge Policy for total bridge width on rural state routes for ADT>2,000. This proposed change reduces schedule and results in a project cost savings of \$549,720.

B-2.0 – Extend Bridge 1 to 3-Span Arrangement and Eliminate Portions of Retaining Walls. In the current design, Bridge 1 consists of a 92'-0" single span bridge with 60 foot +/- tall MSE retaining wall end bents. In B-2.0, it is proposed to revise Bridge 1 to a 3-span, 346'-0" long bridge with 2:1 end slopes and pile supported end bents. The 3-span arrangement with end slopes eliminates the 60-foot-tall vertical face MSE walls and allows the side MSE walls to

follow the 2:1 slope. This alternative reduces long term maintenance of walls, improves constructibility, and provides a project cost savings of \$1,748,093.

B-4.0 – Combine Bridge 2 and Bridge 3 into a Single Bridge Structure. The current design proposes separate structures for Bridge 2 (270'-0") and Bridge 3 (70'-0"), separated by approximately 165 feet of roadway paving and embankment fill. In B-4.0, it is proposed to add 2 spans to bridge the 165-foot separation between bridges to form a single 505'-0" bridge and results in also eliminating the vertical MSE end bent wall at End Bent 1 of Bridge 3. The proposed change improves constructibility by removing the difficulty of compaction between the bridges and possibility of future settlement and a "dip" between two rigid bridge structures. While requiring additional expenditures of \$302,592, this alternative improves constructability, reduces long term maintenance of walls and improves long-term performance of this portion of the roadway.

B-4.1 – Eliminate Bridge 3 and Provide Driveway to East Side of Bypass. The current design proposes Bridge 3 (70'-0") to span an existing access road to the Copper Hill Wastewater treatment plant. In B-4.1, it is proposed to eliminate Bridge 3 and provide access to the treatment plant through a driveway connection to the east side of the truck bypass at approx. Sta 654+00. This alternative eliminates an unnecessary bridge structure and the related long-term maintenance, eliminates ongoing maintenance on the walls, and provides a project cost savings of \$501,132.

VALUE ENGINEERING TEAM STUDY

SUMMARY OF VALUE ENGINEERING PROPOSALS

PI No. 621340-
SR 5 from SR 2 to Proposed McCaysville Truck Bypass
Fannin County, Georgia

IDEA NO.	PROPOSAL DESCRIPTION	CONSTRUCTION SAVINGS	RELATED PROPOSALS
	ROADWAY (R)		
R-1.0	Construct 5-lane from Beginning of Project to Sta 235+00 (Tom Boyd Road/Scenic Drive) then 3-Lanes with Passing Lanes at Various Locations from Sta 235+00 to Sta 465+00 (Old Hwy 5)	\$5,413,683	Mutually exclusive with R-2.1
R-2.1	For 5-Lane Section, Use 11 Foot Inside Lane Width and 12 Foot Outside Lane	\$382,445	If R-1.0 accepted, can only implement this change in 5-lane section (savings reduced)
R-3.0	Reduce Partial Depth Paved Shoulder Width from 6.5 Feet to 4 Feet	\$478,889	
R-4.0	Reduce Design and Posted Speed from 55 MPH to 45 MPH from Beginning of Project to Sta 235+00 (Tom Boyd Road/Scenic Drive)	\$1,004,112	
R-6.0	Adjust Horizontal Alignments and Right of Way Widths at Specific Locations Along 5-Lane Section to Reduce Property Displacements	\$2,297,500	
R-7.0	Combine SR 5 Widening Project and McCaysville Truck Bypass Project into a Single Bid	\$2,356,594	Must also accept/reject R-4.0 on Bypass project

VALUE ENGINEERING TEAM STUDY

SUMMARY OF VALUE ENGINEERING PROPOSALS

**PI No. 620490-
McCaysville Truck Bypass from SR 5 to Tennessee State Line
Fannin County, Georgia**

IDEA NO.	PROPOSAL DESCRIPTION	CONSTRUCTION SAVINGS	RELATED PROPOSALS
ROADWAY (R)			
R-1.0	Eliminate 4 Foot Flush Median	\$870,203	
R-2.1	Reduce Paved Shoulder from 10-Foot-Wide Partial Depth to 4-Foot-Wide Full Depth	\$30,410	
R-4.0	Combine SR 5 Widening Project and McCaysville Truck Bypass Project into a Single Bid	\$1,071,828	Must also accept/reject R-7.0 on SR 5 Widening project
R-5.0	Reduce Tie-in Length at End of Project	\$187,811	
BRIDGE (B)			
B-1.0	Reduce the Clear Bridge Width for Bridges 1 thru 4 on the Truck Bypass from 48 Feet to 44 Feet	\$549,720	
B-2.0	Extend Bridge 1 to 3-Span Arrangement and Eliminate Portions of Retaining Walls	\$1,748,093	
B-4.0	Combine Bridge 2 and Bridge 3 into a Single Bridge Structure	(\$302,592)	Mutually exclusive with B-4.1
B-4.1	Eliminate Bridge 3 and Provide Driveway to East Side of Bypass	\$501,132	Mutually exclusive with B-4.0

PI #621340, SR 5 WIDENING - ROADWAY (R)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	SR5 R-1.0	PAGE NUMBER:	1 of 5
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PI #:	621340-
PROJECT TITLE:	SR 5 from SR 2 to Proposed McCaysville Bypass near CR 138 Fannin County

PROPOSAL DESCRIPTION:	Construct 5 Lane from Beginning of Project to Sta 235+00 (Tom Boyd Road/Scenic Drive) then 3-Lane with Passing Lanes at Various Locations from Sta 235+00 to Sta 465+00 (Old Hwy. 5)
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ORIGINAL DESIGN:	The current design includes a 5-Lane Section with two 12-foot Lanes in each direction with 14-foot flush median from beginning of project to Sta 465+00.
PROPOSED CHANGE:	It is proposed to construct a 5-lane section with two 12-foot lanes and 14-foot flush median from Beginning of project to Sta 235+00, then transition to a 3-Lane section with one 12-foot travel lane each direction and 14-foot flush median from Sta 235+00 to 465+00. Addition of Passing Lanes are proposed at the following up grade locations for the proposed 3-lane Section from Sta 235+00 to 465+00: <ul style="list-style-type: none"> • Northbound Sta 258+40 to 279+60 • Southbound Sta 298+90 to 320+00 • Northbound Sta 338+00 to 359+20 • Southbound Sta 356+80 to 378+00
JUSTIFICATION:	Traffic diagram provided shows Northbound reduction from 9,680 ADT to 8,540 ADT (2043 volumes) at Sta 235+00 to justify the drop from the 5-Lane Section to 3-Lane Section from Sta 235+00 (Tom Boyd Road/Scenic Drive) to Sta 465+00 (Old Hwy. 5). These volumes can adequately be served by a 3-lane section. Minimum Passing Lane Length of 800 feet using AASHTO Page 3-14 Table 3-5.
ADVANTAGES:	DISADVANTAGES:
<ul style="list-style-type: none"> • Reduces Costs • Reduces Impacts • Reduces R/W Acquisition 	<ul style="list-style-type: none"> • Reduces Capacity

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 22,717,938	\$	\$ 22,717,938
PROPOSED CHANGE:	\$17,304,255	\$	\$ 17,304,255
SAVINGS:	\$ 5,413,683	\$	\$ 5,413,683

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: R-1.0	PAGE NUMBER: 2 of 5
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PI #: 621340-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Pavement - Sta 107+30 to 465+00	7	SY	246,416	\$48.07	\$11,845,218
Earthwork –Unclass Excav.	1	CY	627,570	\$6.00	\$3,765,420
Earthwork – Rock	1	CY	209,190	\$30.00	\$6,275,700
Right-of-Way (Reduction)	1	acre	15.84	52,500	\$831,600
SUBTOTAL – COST TO PRIME					\$22,717,950
MARKUP					--
TOTAL CONTRACT COST					\$22,717,938

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Pavement Sta 107+30 to 235+00	7	SY	87,972	\$48.07	\$4,228,815
Pavement Sta 235+00 to 465+00	7	SY	97,112	\$48.07	\$4,668,174
Pavement - Passing Lane Locations from Sta 235+00 to 465+00	7	SY	7,788	\$48.07	\$374,370
Earthwork –Unclass Excav.	1	CY	502,056	\$6.00	\$3,012,336
Earthwork – Excavation, Rock	1	CY	167,352	\$30.00	\$5,020,560
SUBTOTAL – COST TO PRIME					\$17,304,255
MARKUP					--
TOTAL CONTRACT COST					\$17,304,255

Difference [Original-Proposed] **\$5,413,683**

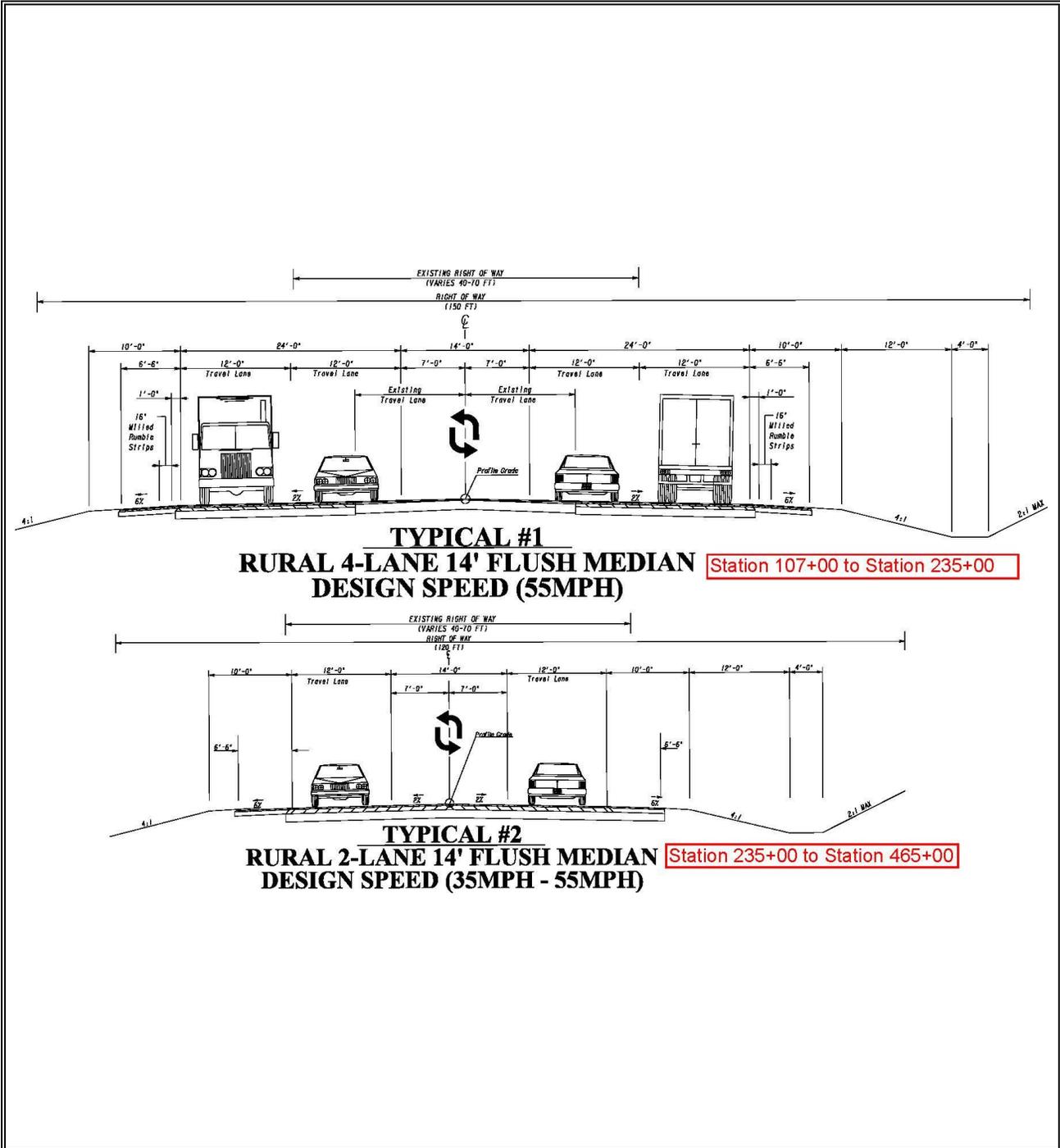
SOURCES

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

PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: R-1.0 **PAGE NUMBER:** 3 of 5

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CALCULATIONS

PROPOSAL NUMBER: R-1.0

PAGE NUMBER: 4 of 5

PI #: 621340-

Current Design

5 Lane Section from Sta 107+30.32 to 465+00 with 62 feet Width of Pavement

Length = 35,770 feet

Width = 62 feet

Area = $35,770 \times 62 = 2,217,740$ SF = 246,416 SY

Proposed Change

5 Lane Section Sta 107+30.32 to 235+00 with 62 feet Width of Pavement

Length = 12,770 feet

Width = 62 feet

Area = $12,770 \times 62 = 791,740$ SF = 87,972 SY

3 Lane Section Sta 235+00 to 465+00 with 38 feet Width of Pavement

Length = 23,000 feet

Width = 38 feet

Area = $23,000 \times 38 = 874,000$ SF = 97,112 SY

Passing Lane at 4 Locations for Northbound and Southbound

NB #1 Location from Sta 258+40 to 279+60

NB #2 Location from Sta 338+00 to 359+20

SB #1 Location from Sta 298+90 to 320+00

SB #2 Location from Sta 356+80 to 378+00

Length of Taper = 660 feet

Length of Passing Lane = 800 feet

Lane Width = 12 feet

Taper Area = $660 \times 12 = 7,920$ SF = 880 SY

Passing Lane Area = $800 \times 12 = 9,600$ SF = 1,067 SY

Total Area for 4 locations are = $(1,067+880) \times 4 = 7,788$ SY

CALCULATIONS

PROPOSAL NUMBER: R-1.0	PAGE NUMBER: 5 of 5
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Earthwork Reduction

With the reduction in pavement by 24 feet, the assumption was made to reduce earthwork by 20% for the following pay items:

205-0001 Unclassified Excavation from 627,570 CY to 502,056 CY

205-0210 Rock Excavation from 209,190 CY to 167,352 CY

R/W Reduction:

Assume R/W along 3-lane is reduced to 120' (from 150' for 5-lane):

23,000 LF x 30' width reduction = 690,000 SF/43,560 SF = 15.84-acre R/W reduction

Current Design Pavement Cost Calculations:

310-1101: 12" GAB = 0.68 tons/SY x \$19.83/ton = \$13.48/SY

402-3121: 660#/SY Asph 25MM = (660#/2,000#)(\$63.79/T) = \$21.05/SY

402-3190: 220#/SY Asph 19MM = (220#/2,000#)(\$68.25/T) = \$7.51/SY

402-3130: 165#/SY Asph 12.5MM = (165#/2,000#)(\$69.61/T) = \$5.74/SY

413-0750: 4 layers tack coat = 0.035 gals/SY/layer x 4 x \$2.09/gal = \$0.29

Total pavement cost = **\$48.07/SY**

Residential R/W Cost Calculations:

\$35,000/ac + 50% counter/condemn. = \$52,500/ac for partial property (Prelim. R/W Est)

\$20,000 per residential tenant displacement; \$40,000 per residential owner

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: SR5 R-2.1	PAGE NUMBER: 1 of 4
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PI #: 621340-	PROJECT TITLE: SR 5 from SR 2 to Proposed McCaysville Bypass near CR 138 Fannin County
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PROPOSAL DESCRIPTION: For 5-Lane Section, Use 11 Foot Inside Lane Width and 12 Foot Outside Lane

ORIGINAL DESIGN: In the current design, the proposed typical section consists of two 12-foot lanes in each direction, a 14-foot flush median two-way-left-turning lane and a 10 foot graded shoulder with 6.5 feet paved.

PROPOSED CHANGE: The proposed change is to reduce the inside 12-foot-wide travel lane in each direction to an 11-foot-wide travel lane in each direction. No other width changes are proposed for the remaining lanes to the proposed typical section.

JUSTIFICATION: GDOT routinely accepts 11-foot travel lanes in Arterial designed roadways. Per the latest GDOT Design Policy Manual Table 6.6, Design Criteria for Arterial Roadways, 11 foot lanes are allowed for 4-lane roadway sections at 55 MPH design speed with ADT's over 2,000. A Design Variance or a Design Exception will not be required for this change. With 9% truck volume projected on this project, it was decided by the VE Team to not reduce the outside lane width to 11 feet.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Reduces Costs • Reduces Impacts • Reduces Schedule 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Narrower Lanes
--	---

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 382,445	\$	\$ 382,445
PROPOSED CHANGE:	\$ 0	\$	\$ 0
SAVINGS:	\$ 382,445	\$	\$ 382,445

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: R-2.1	PAGE NUMBER: 2 of 4
-------------------------------	----------------------------

PI #: 621340-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Asphalt Pavement (Reduction)	7	SY	7,956 SY	\$48.07	\$382,445
SUBTOTAL – COST TO PRIME					\$382,445
MARKUP					--
TOTAL CONTRACT COST					\$382,445

PROPOSED CHANGE

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

Difference [Original-Proposed] **\$382,445**

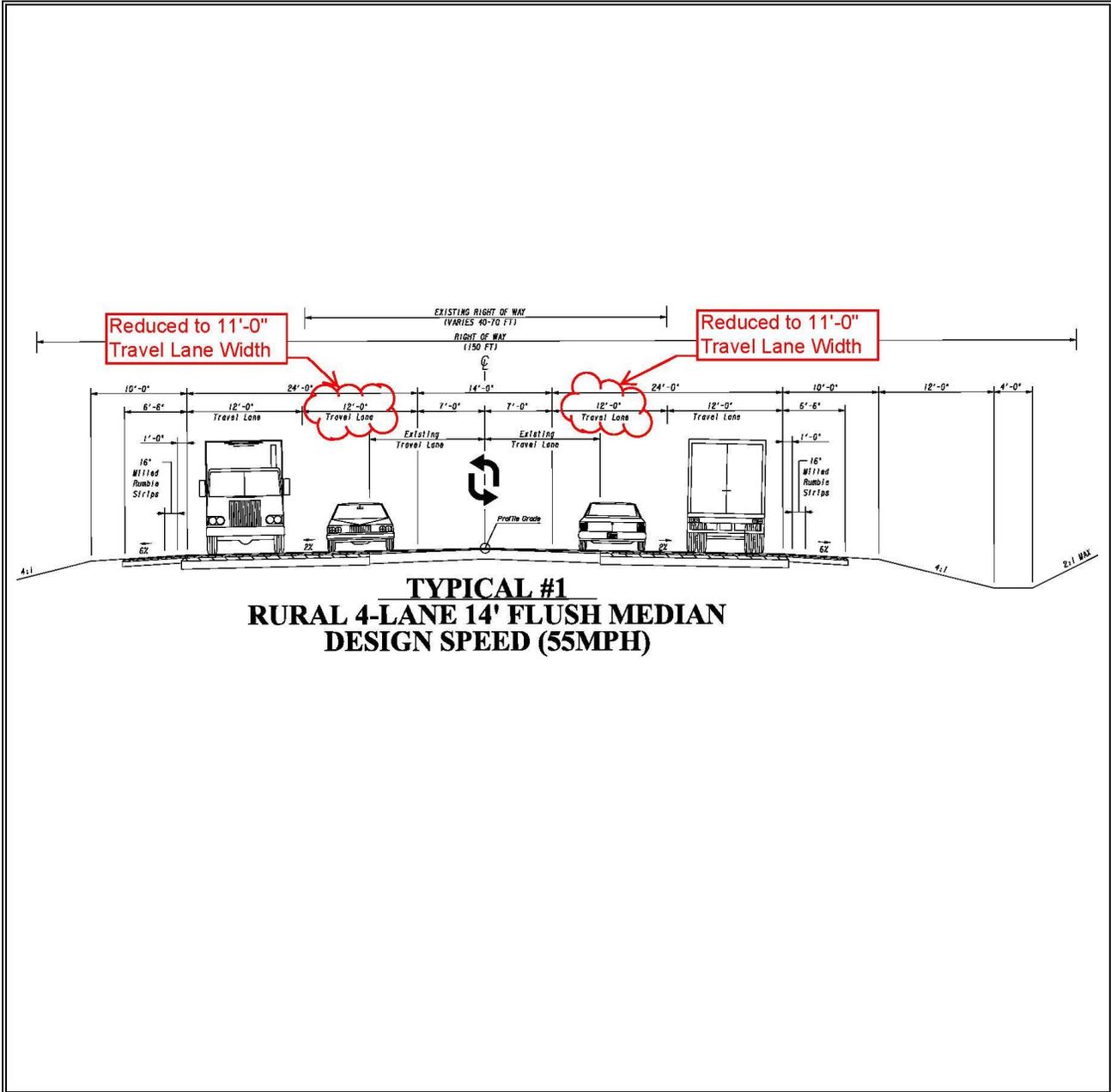
SOURCES

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

PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: R-2.1 **PAGE NUMBER:** 3 of 4

PI #: 621340-



CALCULATIONS

PROPOSAL NUMBER: R-2.1

PAGE NUMBER: 4 of 4

PI #: 621340-

Current Design Pavement Cost Calculations:

310-1101: 12" GAB = 0.68 tons/SY x \$19.83/ton = \$13.48/SY

402-3121: 660#/SY Asph 25MM = (660#/2,000#)(\$63.79/T) = \$21.05/SY

402-3190: 220#/SY Asph 19MM = (220#/2,000#)(\$68.25/T) = \$7.51/SY

402-3130: 165#/SY Asph 12.5MM = (165#/2,000#)(\$69.61/T) = \$5.74/SY

413-0750: 4 layers tack coat = 0.035 gals/SY/layer x 4 x \$2.09/gal = \$0.29

Total pavement cost = **\$48.07/SY**

Station 107+00 (Begin Project) to Station 465+00 (End of 5 lane Section) = 35,800 LF

35,800 LF X 2 LF= 71,600 SF/9 = 7,956 SY

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: SR5 R-3.0	PAGE NUMBER: 1 of 5
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PI #: 621340-	PROJECT TITLE: SR 5 from SR 2 to Proposed McCaysville Bypass near CR 138 Fannin County
----------------------	--

PROPOSAL DESCRIPTION: Reduce Partial Depth Paved Shoulder Width from 6.5 Feet to 4 Feet

ORIGINAL DESIGN: The current design of the proposed typical section includes a 10-foot-wide graded shoulder with 6.5 feet partial depth paved.

PROPOSED CHANGE: The proposed change is to reduce the paved shoulder width to 4 feet. The shoulder section will remain as partial depth.

JUSTIFICATION: The GDOT Design Policy Manual Table 6.6, Design Criteria for Arterial Roadways, states that 6.5-foot paved shoulder should be used for 4-lane roadway sections at 55 MPH design speed with ADT's over 2,000. Note 4 in that table states that Bike Lane is incorporated into the overall width of a 6.5-foot paved shoulder to include a 16-inch rumble strip and total 12-inch buffer area (refer to Ga. Construction Detail S-8). However, AASHTO's Policy of Geometric Design of Highways and Streets, 2011-6th Edition section 7.2.3 states, as a minimum, 0.6 m [2 feet] of shoulder width should be paved to provide for pavement support, wide vehicles, and collision avoidance. As shown on GDOT Construction Detail S-8, Milled Rumble Strips and Bicycle Accommodation Details, the 6.5-foot paved shoulder appears to be used where 4-foot-wide bike lanes are required on paved shoulders with rumble strips. As stated in the concept report SR 5 is not a designated bike route in the Statewide Bicycle Plan, nor did it meet any of the Complete Street Warrants, thus bike lanes are not being required. Since the proposed paved shoulder widths meet AASHTO but not GDOT Design Policy, a Design Variance will be required for this change.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Reduces Costs • Reduces Schedule • Reduces Impervious Area 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Narrower Paved Shoulder
--	--

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 478,889	\$	\$ 478,889
PROPOSED CHANGE:	\$ 0	\$	\$
SAVINGS:	\$ 478,889	\$	\$ 478,889

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: R-3.0	PAGE NUMBER: 2 of 5
-------------------------------	----------------------------

PI #: 621340-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Asphalt Shoulder (Reduction)	7	SY	23,778 SY	\$20.14	\$478,889
SUBTOTAL – COST TO PRIME					\$478,889
MARKUP					--
TOTAL CONTRACT COST					\$478,889

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
SUBTOTAL – COST TO PRIME					0.00
MARKUP					--
TOTAL CONTRACT COST					0.00

Difference [Original-Proposed] **\$478,889**

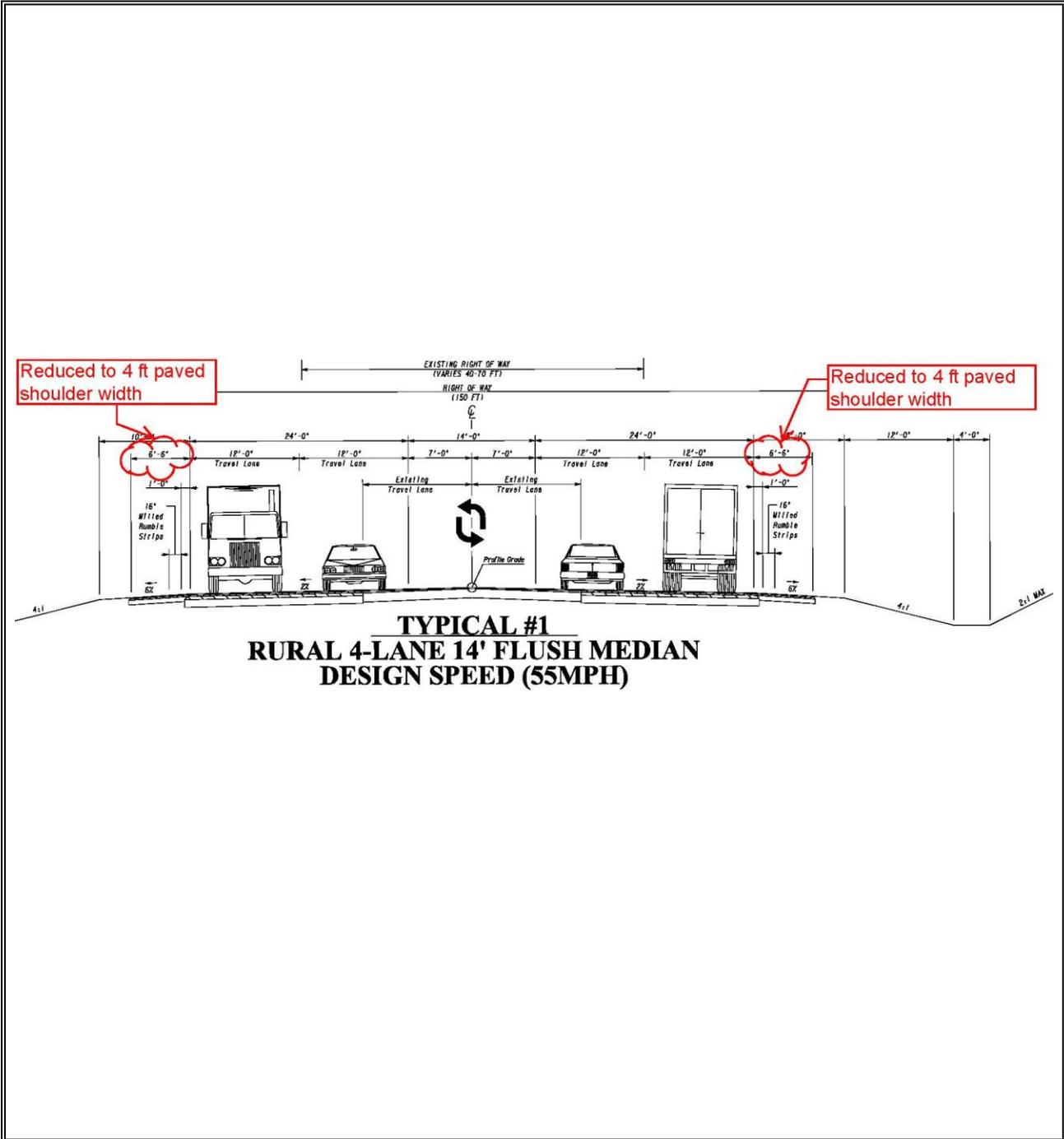
SOURCES

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

PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: R-3.0 **PAGE NUMBER:** 3 of 5

PI #: 621340-



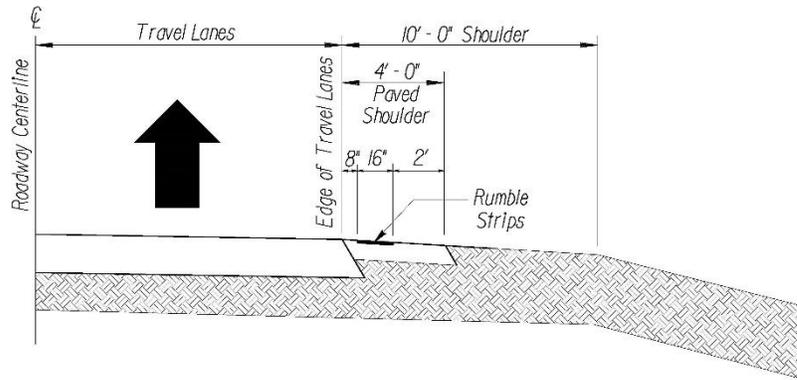
PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: R-3.0

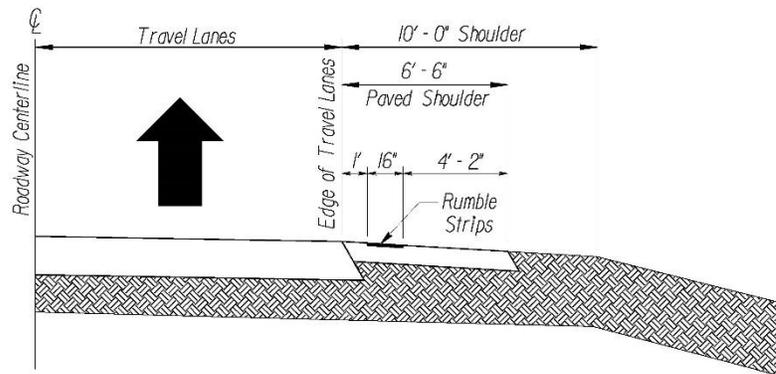
PAGE NUMBER: 4 of 5

PI #: 621340-

*4' PAVED SHOULDER WITH
16" MILLED RUMBLE STRIPS*



*6' - 6" PAVED SHOULDER WITH
16" MILLED RUMBLE STRIPS*



CALCULATIONS

PROPOSAL NUMBER: R-3.0

PAGE NUMBER: 5 of 5

PI #: 621340-

Current Design Pavement for Paved Shoulder Only Cost Calculations:

310-1101: 6" GAB = 0.34 tons/SY x \$19.83/ton = \$6.74/SY

402-3190: 220#/SY Asph 19MM = (220#/2,000#) (\$68.25/T) = \$7.51/SY

402-3130: 165#/SY Asph 12.5MM = (165#/2,000#) (\$69.61/T) = \$5.74/SY

413-0750: 2 layers tack coat = 0.035 gals/SY/layer x 2 x \$2.09/gal = \$0.15

Total pavement cost = **\$20.14/SY**

Station 107+00 (Begin Project) to Station 535+00 (End of 3-lane Section) = 42,800 LF

42,800 LF X 5 LF= 214,000 SF/9 = 23,778 SY

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: SR5 R-4.0	PAGE NUMBER: 1 of 3
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PI #: 621340-	PROJECT TITLE: SR 5 from SR 2 to Proposed McCaysville Bypass near CR 138 Fannin County
----------------------	--

PROPOSAL DESCRIPTION: Reduce Design and Posted Speed from 55 MPH to 45 MPH from Beginning of Project to Sta 235+00 (Tom Boyd Road/Scenic Drive)

ORIGINAL DESIGN: In the current design, the vertical profile in this section meets 45 MPH, however the sag vertical curves, as designed, are less than 45 MPH. The Concept Report states the corridor will be designed and posted at 55 MPH.

PROPOSED CHANGE: It is proposed to adjust the vertical profile to provide for a 45 MPH design from beginning of project to Sta 235+00. This section of the roadway would also be posted as 45 MPH.

JUSTIFICATION: Recent developments and higher traffic volumes in this section justify a 45 MPH operating speed. This would also provide a traffic calming for the southerly approach from SR 5 toward the intersection with SR 515.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Reduces earthwork costs • Construction staging minimized • Possibly eliminates need for on-site detours • Reduces property impacts 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Decreases sight distance for vertical curves
---	---

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 10,041,120	\$	\$ 10,041,120
PROPOSED CHANGE:	\$ 9,037,008	\$	\$ 9,037,008
SAVINGS:	\$ 1,004,112	\$	\$ 1,004,112

COST ESTIMATING WORKSHEET

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

PI #: 621340-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
205-0001 Unclass Excav	1	CY	627,570	\$6.00	\$3,765,420
205-0210 Excavation - Rock	1	CY	209,190	\$30.00	\$6,275,700
SUBTOTAL – COST TO PRIME					\$10,041,120
MARKUP					--
TOTAL CONTRACT COST					\$10,041,120

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
205-0001 Unclass Excav (10% red.)	1	CY	564,813	\$6.00	\$3,388,878
205-0210 Excavation – Rock (10% reduction)	1	CY	188,271	\$30.00	\$5,648,130
SUBTOTAL – COST TO PRIME					\$9,037,008
MARKUP					--
TOTAL CONTRACT COST					\$9,037,008

Difference [Original-Proposed] **\$1,004,112**

SOURCES

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

CALCULATIONS

PROPOSAL NUMBER: R-4.0

PAGE NUMBER: 3 of 3

PI #: 621340-

Vertical Curves designed for 45 MPH results in approximately 4' less cut and approximately 8' less fill when compared to vertical curves designed for 55 MPH.

Vertical curve lengths are generally 400' to 500' less than those designed for 55 MPH.

11 vertical curves at 500' = 5,500' (length of reduced earthwork)

Sta 100+00 to Sta 235+00 = 13,500' length of 45 MPH section (Length of reduced earthwork is 40% of the length of this section: $5,500/13,500 = 40\%$)

Earthwork reduced approximately 25% in the vertical curve sections.

Project length: Sta 100+00 to Sta 535+00 = 43,500 feet

Vertical curve length in proposed section is 12% of total length ($5,500 \text{ ft.}/43,500 \text{ ft.} = 12\%$).

Use 10% reduction for earthwork quantities as a conservative estimate.

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: SR5 R-6.0	PAGE NUMBER: 1 of 3
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PI #: 621340-	PROJECT TITLE: SR 5 from SR 2 to Proposed McCaysville Bypass near CR 138 Fannin County
----------------------	--

PROPOSAL DESCRIPTION:	Adjust Horizontal Alignments and Right of Way Widths at Specific Locations Along 5-Lane Section to Reduce Property Displacements
------------------------------	--

ORIGINAL DESIGN: The current design includes a 150 foot right of way corridor width within the 5-lane section and 120 foot right of way corridor width within the 3-lane section.

PROPOSED CHANGE: At specific locations along the 5-lane section, the following adjustments are proposed in order to avoid displacements:

- Reduce right of way widths to 120 feet (60 feet LT & RT)
- Construct retaining walls at proposed right of way lines and/or parking lot
- Adjust horizontal alignment of road

See calculations sheet within this proposal for the adjustments proposed at specific locations.

JUSTIFICATION: Adjustments to horizontal alignments, right of way widths and the addition of retaining walls can be made at specific locations to avoid business and residential displacements, and also provide a significant cost savings to the project.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Businesses allowed to remain • Residences allowed to remain • Less overall R/W costs • Less property impacts 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Future maintenance of retaining walls
---	--

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 2,720,000	\$	\$ 2,720,000
PROPOSED CHANGE:	\$ 422,500	\$	\$ 422,500
SAVINGS:	\$ 2,297,500	\$	\$ 2,297,500

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: R-6.0	PAGE NUMBER: 2 of 3
-------------------------------	----------------------------

PI #: 621340-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Displaced Properties	7	LS	1		\$2,720,000
SUBTOTAL – COST TO PRIME					\$2,720,000
MARKUP					--
TOTAL CONTRACT COST					\$2,720,000

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
500-3115 Class A Concrete, TYPE P2, Retaining Wall	1	LF	650	\$650	\$422,500
SUBTOTAL – COST TO PRIME					\$422,500
MARKUP					--
TOTAL CONTRACT COST					\$422,500

Difference [Original-Proposed] **\$2,297,500**

SOURCES

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

VALUE ENGINEERING TEAM STUDY

CALCULATIONS

PROPOSAL NUMBER: R-6.0 **PAGE NUMBER:** 3 of 3

PI #: 621340-

Displacements								
Location	Residential /Commercial	Realignment Required (Yes/No)	Wall Required (Yes/No)	Wall Length (FT)	Original R/W Width (FT)	Proposed R/W Width (FT)	Notes	Est. R/W Cost
Sta. 139+00 LT	Residential	No	No		150 ft	150 ft	House is 145' from proposed CL and const limit is approximately at 110'	\$ 40,000.00
Sta. 242+00 RT	Commercial/ Gas Station	No	Yes		150 ft (75' RT)	60 ft RT	Gravity wall along parking lot curb and gutter	\$ 1,500,000.00
Sta. 251+00 RT	Commercial	No	Yes	250	150 ft (75' RT)	60 ft RT	Wall along proposed R/W	
Sta. 253+00 LT	Commercial/ Gas	No	No		150 ft (75' RT)	60 ft LT		\$ 500,000.00
Sta. 256+50 RT	Commercial	No	No		150 ft (75' RT)	60 ft RT		\$ 150,000.00
Sta. 313+00 LT	Commercial	No	Yes	200				\$ 150,000.00
Sat 396+00 RT	Residential	YES /Hold Right EOP (shift 12' Lt)	Yes					\$ 40,000.00
Sta 401+50 RT	Commercial	YES /Hold Right EOP (shift 12' Lt)	No					\$ 150,000.00
Sta 403+50 RT	Residential	YES /Hold Right EOP (shift 12' Lt)	No					\$ 40,000.00
Sat 486+00 LT	Commercial	No	Yes	200			retaining wall at existng parking lot	\$ 150,000.00
TOTALS				650				\$ 2,720,000.00

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: SR5 R-7.0	PAGE NUMBER: 1 of 2
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PI #: 621340-	PROJECT TITLE: SR 5 from SR 2 to Proposed McCaysville Bypass near CR 138 Fannin County
----------------------	--

PROPOSAL DESCRIPTION: Combine SR 5 Widening Project and McCaysville Truck Bypass Project into a Single Bid

ORIGINAL DESIGN: As proposed, the SR 5 widening project consists of work along approximately 8 miles of roadway, and the McCaysville truck bypass project consists of approximately 4 miles of additional work along a new route tying in to Tennessee SR 68. The two projects are currently planned to be advertised as separate projects with separate Right of Way Authorization and Let to Construction dates.

PROPOSED CHANGE: It is proposed to combine the widening and truck bypass projects into a single bid with the same Right of Way Authorization and Let to Construction date.
Note: Proposal R-4.0 for the Truck Bypass project indicates an additional \$1,071,828 in savings attributed to PI #620490- for combining these 2 projects.

JUSTIFICATION: Combining the projects into one bid has the potential to reduce the overall cost of construction by at least 5%, and perhaps more, due to economies of scale.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Reduces costs • Reduces schedule • Eliminates coordination between two contractors on adjacent projects 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Combined project may slightly impact pool of bidders
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	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$47,131,874	\$ 0	\$47,131,874
PROPOSED CHANGE:	\$44,775,280	\$ 0	\$44,775,280
SAVINGS:	\$ 2,356,594	\$ 0	\$ 2,356,594

COST ESTIMATING WORKSHEET

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

PI #: 621340-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
SR5 Widening Cost of Construction	1	LS	1	\$47,131,874	\$47,131,874
SUBTOTAL – COST TO PRIME					\$47,131,874
MARKUP					--
TOTAL CONTRACT COST					\$47,131,874

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
SR5 Widening Cost of Construction	1	LS	1	\$47,131,874	\$47,131,874
Economies of Scale Reduction	2	LS	(5%)	(\$2,356,594)	(\$2,356,594)
SUBTOTAL – COST TO PRIME					\$44,775,280
MARKUP					--
TOTAL CONTRACT COST					\$44,775,280

Difference [Original-Proposed] **\$2,356,594**

SOURCES

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

PI #620490, McCAYSVILLE TRUCK BYPASS - ROADWAY (R)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: Bypass R-1.0	PAGE NUMBER: 1 of 4
--------------------------------------	----------------------------

PI #: 620490-	PROJECT TITLE: McCaysville Truck Bypass from SR 5 to Tennessee State Line Fannin County
----------------------	---

PROPOSAL DESCRIPTION: Eliminate 4-Foot Flush Median
--

ORIGINAL DESIGN: In the current design, the proposed typical section consists of a 4-foot asphalt median in the 2-lane section of the truck bypass. The current design also proposes 48'-0" clear bridge width between barriers for Bridges 1 thru 4.

PROPOSED CHANGE: It is proposed to eliminate the 4-foot wide flush asphalt median for the 2 lane section of the truck bypass. It is also proposed to reduce the clear bridge width by 4'-0" for Bridges 1 thru 4.

JUSTIFICATION: GDOT has not, to the VE Team's knowledge, ever used a Super 2-Lane road in the state prior to this one. With the 10 foot paved outside shoulders, an additional 4-foot paved median is excessive and not warranted. There is no discussion in the latest GDOT Design Policy Manual regarding a Super 2-Lane road.

ADVANTAGES:

- Reduces Costs
- Reduces Impacts
- Reduces Schedule

DISADVANTAGES:

- Eliminates Paved Median

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 7,363,909	\$	\$ 7,363,909
PROPOSED CHANGE:	\$ 6,493,706	\$	\$ 6,493,706
SAVINGS:	\$ 870,203	\$	\$ 870,203

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER:	R-1.0	PAGE NUMBER:	2 of 4
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PI #:	620490-
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ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Asphalt Pavement (Reduction)	7	SY	6,667	\$48.07	\$320,483
Bridge 1	7	SF	4,715	\$100.00	\$471,500
Bridge 2	1,7	SF	13,838	\$75.00	\$1,037,850
Bridge 3	7	SF	3,588	\$100.00	\$358,800
Bridge 4	1,7	SF	50,738	\$102.00	\$5,175,276
SUBTOTAL – COST TO PRIME					\$7,363,909
MARKUP					--
TOTAL CONTRACT COST					\$7,363,909

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Bridge 1 (reduced by 4' width)	7	SF	4,347	\$100.00	\$434,700
Bridge 2 (reduced by 4' width)	1,7	SF	12,758	\$75.00	\$956,850
Bridge 3 (reduced by 4' width)	7	SF	3,308	\$100.00	\$330,800
Bridge 4 (reduced by 4' width)	1,7	SF	46,778	\$102.00	\$4,771,356
SUBTOTAL – COST TO PRIME					\$6,493,706
MARKUP					--
TOTAL CONTRACT COST					\$6,493,706

Difference [Original-Proposed] **\$870,203**

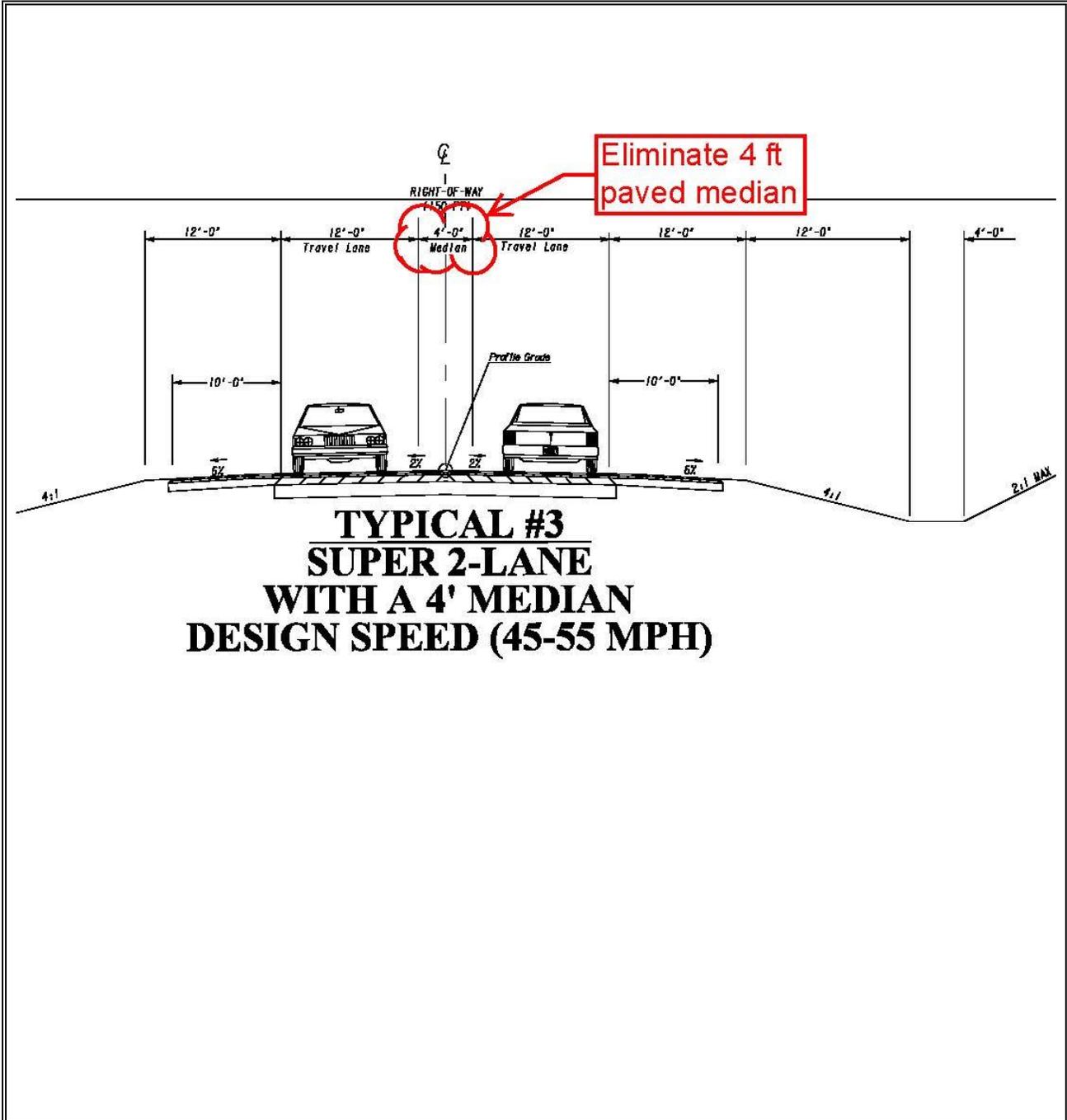
SOURCES

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

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER: R-1.0 PAGE NUMBER: 3 of 4

PI #: 620490-



CALCULATIONS

PROPOSAL NUMBER: R-1.0

PAGE NUMBER: 4 of 4

PI #: 620490-

Current Design Pavement Cost Calculations:

310-1101: 12" GAB = 0.68 tons/SY x \$19.83/ton = \$13.48/SY
 402-3121: 660#/SY Asph 25MM = (660#/2,000#)(\$63.79/T) = \$21.05/SY
 402-3190: 220#/SY Asph 19MM = (220#/2,000#)(\$68.25/T) = \$7.51/SY
 402-3130: 165#/SY Asph 12.5MM = (165#/2,000#)(\$69.61/T) = \$5.74/SY
 413-0750: 4 layers tack coat = 0.035 gals/SY/layer x 4 x \$2.09/gal = \$0.29
 Total pavement cost = **\$48.07/SY**

Station 535+00 (Begin Bypass) to Station 685+00 (End of 3 Lane Section) = 15,000 LF
 15,000 LF X 4 LF= 60,000 SF/9 = 6,667 SY

Current Bridge Cost Calculations:

543-9000: \$1,035,000 LS / [(270' Length)(51.25' Wide)] = \$75/SF (Bridge 2) per concept CES
 543-9000: \$5,200,000 LS / [(990' Length)(51.25' Wide)] = \$102/SF (Bridge 4) per concept CES
 543-9000: Assume \$100/SF (Bridge 1)
 543-9000: Assume \$100/SF (Bridge 3)

Current Bridge Quantity Calculations:

543-9000: 92' x 47.25' = 4,347 SF (Bridge 1)
 543-9000: 270' x 47.25' = 12,758 SF (Bridge 2)
 543-9000: 70' x 47.25' = 3,308 SF (Bridge 3)
 543-9000: 990' x 47.25' = 46,778 SF (Bridge 4)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: Bypass R-2.1	PAGE NUMBER: 1 of 4
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PI #: 620490-	PROJECT TITLE: McCaysville Truck Bypass from SR 5 to Tennessee State Line Fannin County
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PROPOSAL DESCRIPTION: Reduce Paved Shoulder from 10-Foot-Wide Partial Depth to 4-Foot Wide Full Depth
--

ORIGINAL DESIGN: In the current design, the proposed typical section consists of a 10-foot asphalt partial depth shoulder for the truck bypass route.

PROPOSED CHANGE: The proposed change is to reduce the 10-foot partial depth asphalt shoulder to 4-foot full depth asphalt shoulder in the 2-lane section of the truck bypass.

JUSTIFICATION: The GDOT Design Policy Manual for Collector Roadways does not have a listing for 55 MPH 2-lane roadways in Table 6.5. Table 6.4 in the GDOT Design Policy Manual for Local Roadways at 55 MPH for 2-lane roadways, the graded shoulder is 10 feet wide with 2 feet paved. AASHTO’s Policy of Geometric Design of Highways and Streets, 2011-6th edition section 7.2.3 states, as a minimum, 0.6 m [2 feet] of shoulder width should be paved to provide for pavement support, wide vehicles, and collision avoidance.

Also as stated in the concept report, SR 5 is not listed as a designated bike route in the Statewide Bicycle Plan nor did it meet any of the Complete Street Warrants, thus bike lanes will not be required. Since bike lanes are not warranted, the VE Team believes that 4-foot full depth shoulders should be sufficient for the truck bypass route.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Reduces Costs • Reduces Schedule • Reduces Impervious Area 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Reduces Paved Shoulder Width
--	---

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 671,327	\$	\$ 671,327
PROPOSED CHANGE:	\$ 640,917	\$	\$ 640,917
SAVINGS:	\$ 30,410	\$	\$ 30,410

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: R-2.1 **PAGE NUMBER:** 2 of 4

PI #: 620490-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Asphalt Shoulder (Reduction)	7	SY	33,333	\$20.14	\$671,327
SUBTOTAL – COST TO PRIME					\$671,327
MARKUP					--
TOTAL CONTRACT COST					\$671,327

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Asphalt Pavement (Addition)	7	SY	13,333	\$48.07	\$640,917
SUBTOTAL – COST TO PRIME					\$640,917
MARKUP					--
TOTAL CONTRACT COST					\$640,917

Difference [Original-Proposed] **\$30,410**

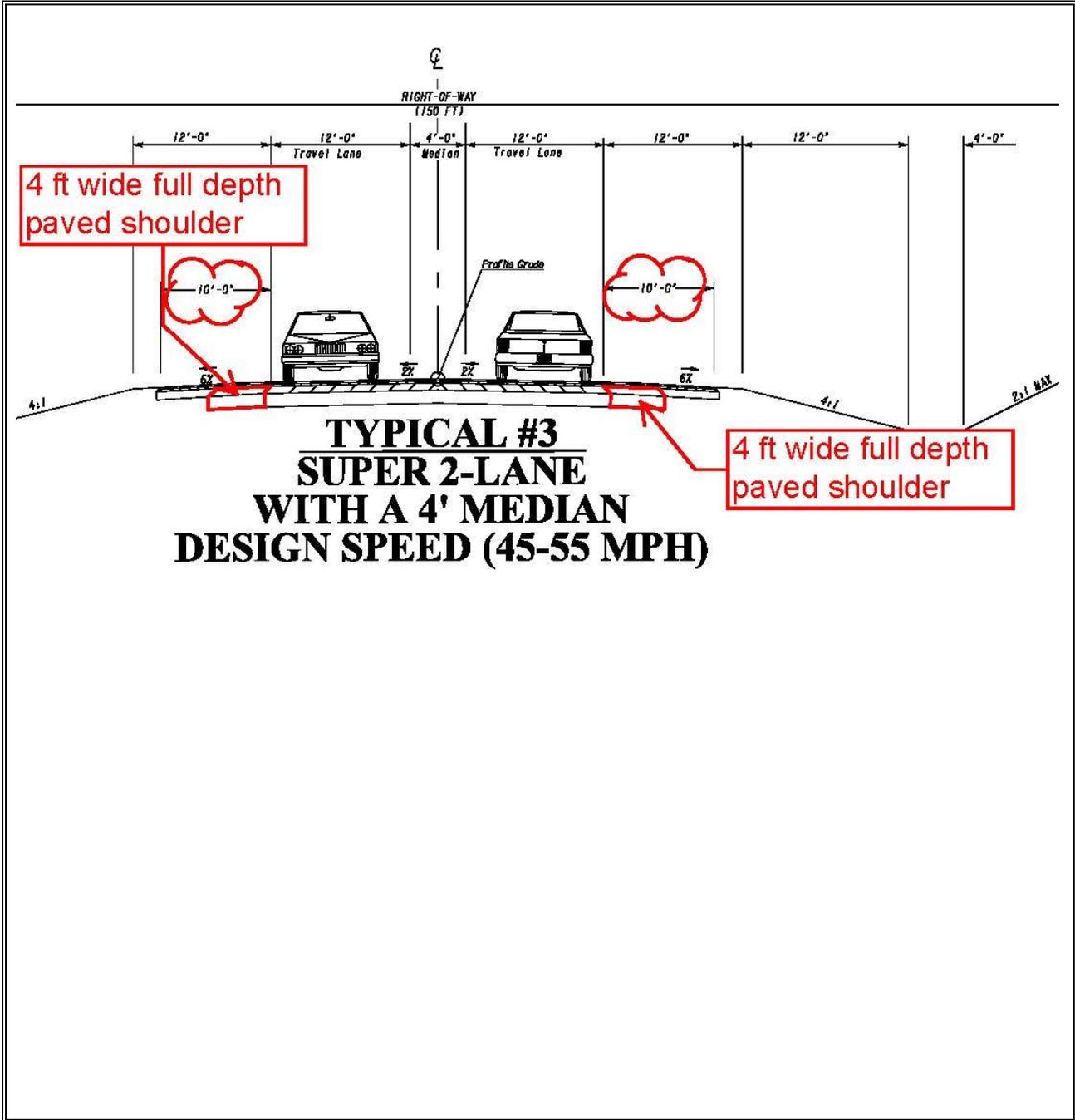
SOURCES

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

PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: R-2.1 PAGE NUMBER: 3 of 4

PI #: 620490-



CALCULATIONS

PROPOSAL NUMBER: R-2.1	PAGE NUMBER: 4 of 4
PI #: 620490-	

Current Design Pavement for Paved Shoulder Only Cost Calculations:

310-1101: 6" GAB = 0.34 tons/SY x \$19.83/ton = \$6.74/SY
 402-3190: 220#/SY Asph 19MM = (220#/2,000#) (\$68.25/T) = \$7.51/SY
 402-3130: 165#/SY Asph 12.5MM = (165#/2,000#) (\$69.61/T) = \$5.74/SY
 413-0750: 2 layers tack coat = 0.035 gals/SY/layer x 2 x \$2.09/gal = \$0.15
Total pavement cost = \$20.14/SY

Station 535+00 (Begin By-Pass) to Station 685+00 (End of 3 Lane Section) = 15,000 LF
 15,000 LF X 20 LF= 300,000 SF/9 = 33,333 SY

Current Design Pavement Cost Calculations:

310-1101: 12" GAB = 0.68 tons/SY x \$19.83/ton = \$13.48/SY
 402-3121: 660#/SY Asph 25MM = (660#/2,000#)(\$63.79/T) = \$21.05/SY
 402-3190: 220#/SY Asph 19MM = (220#/2,000#)(\$68.25/T) = \$7.51/SY
 402-3130: 165#/SY Asph 12.5MM = (165#/2,000#)(\$69.61/T) = \$5.74/SY
 413-0750: 4 layers tack coat = 0.035 gals/SY/layer x 4 x \$2.09/gal = \$0.29
Total pavement cost = \$48.07/SY

Station 535+00 (Begin By-Pass) to Station 685+00 (End of 3 Lane Section) = 15,000 LF
 15,000 LF X 8 LF= 120,000 SF/9 = 13,333 SY

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	Bypass R-4.0	PAGE NUMBER:	1 of 2
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PI #:	620490-
PROJECT TITLE:	McCaysville Truck Bypass from SR 5 to Tennessee State Line Fannin County

PROPOSAL DESCRIPTION: Combine SR 5 Widening Project and McCaysville Truck Bypass Project into a Single Bid

ORIGINAL DESIGN: As proposed, the SR 5 widening project consists of work along approximately 8 miles of roadway, and the McCaysville truck bypass project consists of approximately 4 miles of additional work along a new route tying in to Tennessee SR 68. The two projects are currently planned to be advertised as separate projects with separate Right of Way Authorization and Let to Construction dates.

PROPOSED CHANGE: It is proposed to combine the widening and truck bypass projects into a single bid with the same Right of Way Authorization and Let to Construction date.
Note: Proposal R-7.0 for the SR 5 Widening project indicates an additional \$2,356,594 in savings attributed to PI #621340- for combining these two projects.

JUSTIFICATION: Combining the projects into one bid has the potential to reduce the overall cost of construction by at least 5%, and perhaps more, due to economies of scale. The costs for the bridge construction is excluded in this proposal, as there is no bridge work in the widening project, providing no reduction due to economies of scale for that type of work.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Reduces costs • Reduces schedule • Eliminates coordination between two contractors on adjacent projects 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Combined project may slightly impact pool of bidders
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	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 21,436,554	\$	\$ 21,436,554
PROPOSED CHANGE:	\$ 20,364,726	\$	\$ 20,364,726
SAVINGS:	\$ 1,071,828	\$	\$ 1,071,828

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: R-4.0	PAGE NUMBER: 2 of 2
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PI #: 620490-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Truck Bypass Cost of Construction	1	LS	1	\$27,983,304	\$27,983,304
Truck Bypass Bridge Cost (deduct)	1	LS	1	(\$6,546,750)	(\$6,546,750)
SUBTOTAL – COST TO PRIME					\$21,436,554
MARKUP					--
TOTAL CONTRACT COST					\$21,436,554

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Truck Bypass minus Bridge Cost	1	LS	1	\$21,436,554	\$21,436,554
Economies of Scale Reduction	2	\$	(5%)	(\$1,071,828)	(\$1,071,828)
SUBTOTAL – COST TO PRIME					\$20,364,726
MARKUP					--
TOTAL CONTRACT COST					\$20,364,726

Difference [Original-Proposed] **\$1,071,828**

SOURCES

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

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	Bypass R-5.0	PAGE NUMBER:	1 of 4
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PI #:	620490-
PROJECT TITLE:	McCaysville Truck Bypass from SR 5 to Tennessee State Line Fannin County

PROPOSAL DESCRIPTION: Reduce Tie-In Length at End of Project

ORIGINAL DESIGN: In the current design, the proposed project ends at Sta 721+58 with four 12-foot lanes and 6.5 feet of paved outside shoulder.

PROPOSED CHANGE: It is proposed to adjust the end of project to approximate Sta 715+00, resulting in a reduction of 658 feet of road work.

JUSTIFICATION: The proposed project is back to existing alignment by approximate Sta 715+00. Extending the project to Sta 721+58 should only be considered if required for the proposed profile. Based on GIS profile data used during the VE Study, it does not appear that extending the project this far is required for profile tie-in.

ADVANTAGES:

- Reduces Costs
- Reduces Impacts
- Reduces Schedule

DISADVANTAGES:

- Reduces reconstruction of existing road

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 187,811	\$	\$ 187,811
PROPOSED CHANGE:	\$ 0	\$	\$
SAVINGS:	\$ 187,811	\$	\$ 187,811

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: R-5.0 **PAGE NUMBER:** 2 of 4

PI #: 620490-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Asphalt Travel Lane Pavement (Reduction)	7	SY	3,509	\$48.07	\$168,678
Asphalt Shoulder Pavement (Reduction)	7	SY	950	\$20.14	\$19,133
SUBTOTAL – COST TO PRIME					\$187,811
MARKUP					--
TOTAL CONTRACT COST					\$187,811

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
SUBTOTAL – COST TO PRIME					0.00
MARKUP					--
TOTAL CONTRACT COST					0.00

Difference [Original-Proposed] **\$187,811**

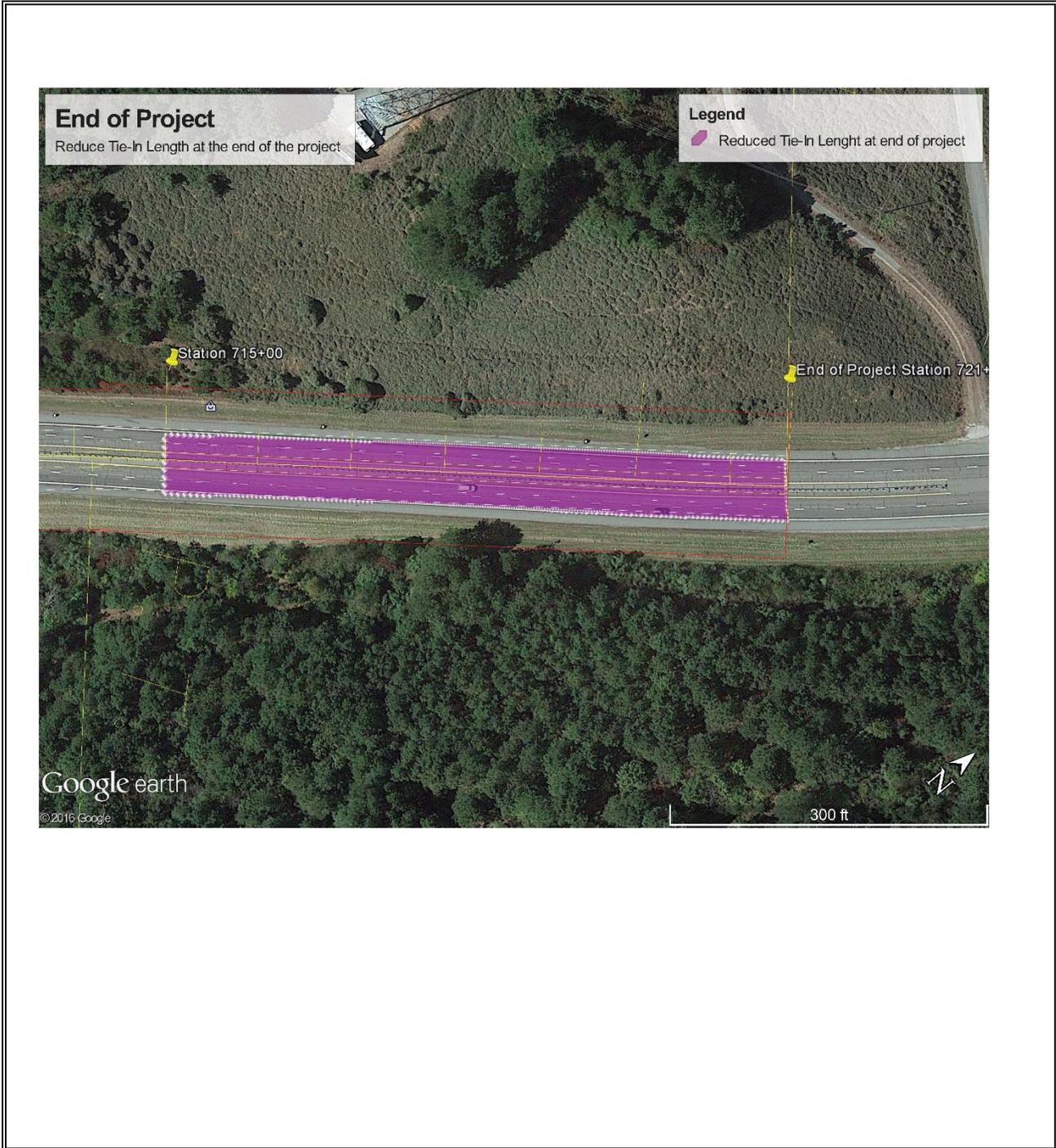
SOURCES

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

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER: R-5.0 **PAGE NUMBER:** 3 of 4

PI #: 620490-



CALCULATIONS

PROPOSAL NUMBER: R-5.0

PAGE NUMBER: 4 of 4

PI #: 620490-

Current Design Pavement Cost Calculations:

310-1101: 12" GAB = 0.68 tons/SY x \$19.83/ton = \$13.48/SY
 402-3121: 660#/SY Asph 25MM = (660#/2,000#)(\$63.79/T) = \$21.05/SY
 402-3190: 220#/SY Asph 19MM = (220#/2,000#)(\$68.25/T) = \$7.51/SY
 402-3130: 165#/SY Asph 12.5MM = (165#/2,000#)(\$69.61/T) = \$5.74/SY
 413-0750: 4 layers tack coat = 0.035 gals/SY/layer x 4 x \$2.09/gal = \$0.29
 Total pavement cost = **\$48.07/SY**

Station 715+00 to Station 721+58 = 658 LF
 658 LF X 48 LF= 31,584 SF/9 = 3,509 SY

Current Design Pavement for Paved Shoulder Only Cost Calculations:

310-1101: 6" GAB = 0.34 tons/SY x \$19.83/ton = \$6.74/SY
 402-3190: 220#/SY Asph 19MM = (220#/2,000#) (\$68.25/T) = \$7.51/SY
 402-3130: 165#/SY Asph 12.5MM = (165#/2,000#) (\$69.61/T) = \$5.74/SY
 413-0750: 2 layers tack coat = 0.035 gals/SY/layer x 2 x \$2.09/gal = \$0.15
 Total pavement cost = **\$20.14/SY**

Station 715+00 to Station 721+58 = 658 LF
 658 LF X 13 LF= 8,554 SF/9 = 950 SY

PI #620490, McCAYSVILLE TRUCK BYPASS – BRIDGE (B)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER:	Bypass B-1.0	PAGE NUMBER:	1 of 5
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PI #:	620490-
PROJECT TITLE:	McCaysville Truck Bypass from SR 5 to Tennessee State Line Fannin County

PROPOSAL DESCRIPTION:	Reduce the Clear Bridge Width for Bridges 1 thru 4 on the Truck Bypass from 48 Feet to 44 Feet
------------------------------	--

ORIGINAL DESIGN:	The current design proposes 48'-0" clear bridge width between barriers for Bridges 1 thru 4.
PROPOSED CHANGE:	It is proposed to reduce the clear bridge width between barriers to 44'-0" for Bridges 1 thru 4. This width is based on two 12-foot travel lanes, a 4-foot flush median and 8-foot shoulders on each side.
JUSTIFICATION:	The proposal meets GDOT Bridge Policy 2.9.2.1 for total bridge width on rural state routes for ADT > 2,000 (Travel Way + 16'). Bridges 1 thru 4 are located on the new location truck bypass segment; thus, there are no traffic maintenance or staging considerations to warrant the additional bridge width.
ADVANTAGES:	DISADVANTAGES:
<ul style="list-style-type: none"> • Reduces costs • Reduces schedule 	<ul style="list-style-type: none"> • Reduces available paved shoulder

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 7,043,426	\$	\$ 7,043,426
PROPOSED CHANGE:	\$ 6,493,706	\$	\$ 6,493,706
SAVINGS:	\$ 549,720	\$	\$ 549,720

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: B-1.0	PAGE NUMBER: 2 of 5
-------------------------------	----------------------------

PI #: 620490-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Bridge 1	7	SF	4,715	\$100.00	\$471,500
Bridge 2	1,7	SF	13,838	\$75.00	\$1,037,850
Bridge 3	7	SF	3,588	\$100.00	\$358,800
Bridge 4	1,7	SF	50,738	\$102.00	\$5,175,276
SUBTOTAL – COST TO PRIME					\$7,043,426
MARKUP					--
TOTAL CONTRACT COST					\$7,043,426

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
Bridge 1 (reduction)	7	SF	4,347	\$100.00	\$434,700
Bridge 2 (reduction)	1,7	SF	12,758	\$75.00	\$956,850
Bridge 3 (reduction)	7	SF	3,308	\$100.00	\$330,800
Bridge 4 (reduction)	1,7	SF	46,778	\$102.00	\$4,771,356
SUBTOTAL – COST TO PRIME					\$6,493,706
MARKUP					--
TOTAL CONTRACT COST					\$6,493,706

Difference [Original-Proposed] **\$549,720**

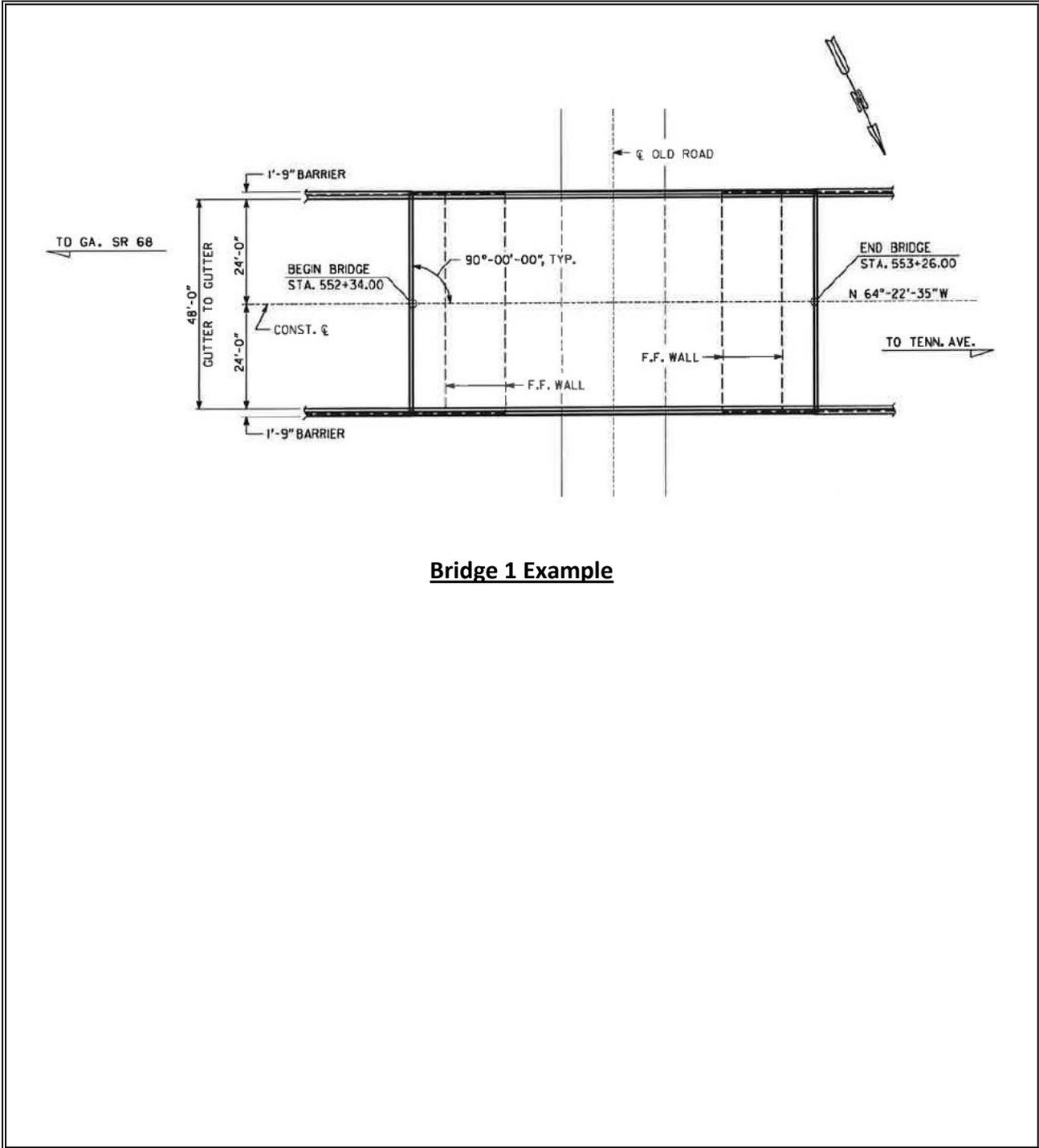
SOURCES

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

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER: B-1.0 PAGE NUMBER: 3 of 5

PI #: 620490-



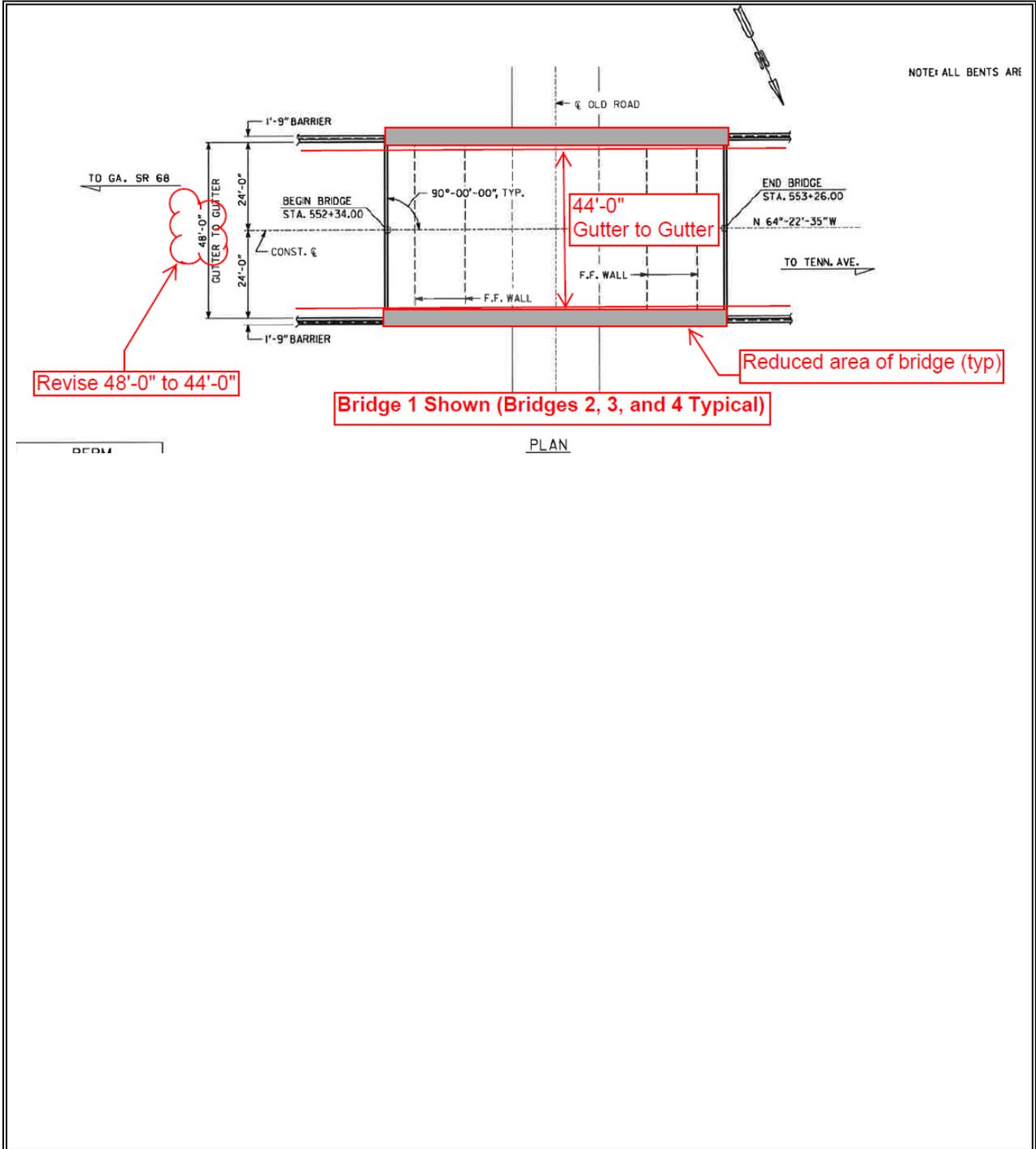
Bridge 1 Example

PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: B-1.0

PAGE NUMBER: 4 of 5

PI #: 620490-



CALCULATIONS

PROPOSAL NUMBER: B-1.0

PAGE NUMBER: 5 of 5

PI #: 620490-

Current Bridge Cost Calculations:

543-9000: $\$1,035,000 \text{ LS} / [(270' \text{ Length})(51.25' \text{ Wide})] = \$75/\text{SF}$ (Bridge 2) per concept CES

543-9000: $\$5,200,000 \text{ LS} / [(990' \text{ Length})(51.25' \text{ Wide})] = \$102/\text{SF}$ (Bridge 4) per concept CES

543-9000: Assume $\$100/\text{SF}$ (Bridge 1)

543-9000: Assume $\$100/\text{SF}$ (Bridge 3)

Current Bridge Quantity Calculations:

543-9000: $92' \times 47.25' = 4,347 \text{ SF}$ (Bridge 1)

543-9000: $270' \times 47.25' = 12,758 \text{ SF}$ (Bridge 2)

543-9000: $70' \times 47.25' = 3,308 \text{ SF}$ (Bridge 3)

543-9000: $990' \times 47.25' = 46,778 \text{ SF}$ (Bridge 4)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: Bypass B-2.0	PAGE NUMBER: 1 of 8
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PI #: 620490-	PROJECT TITLE: McCaysville Truck Bypass from SR 5 to Tennessee State Line Fannin County
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PROPOSAL DESCRIPTION: Extend Bridge 1 to 3-Span Arrangement and Eliminate Portions of Retaining Walls
--

ORIGINAL DESIGN: The current design of Bridge 1 consists of a 92'-0" single span bridge with 60 foot +/- tall MSE retaining wall end bents.

PROPOSED CHANGE: It is proposed to revise Bridge 1 to a 3-span, 346-foot long bridge with 2:1 end slopes and pile supported end bents. The 3-span arrangement with end slopes eliminates the vertical face MSE walls and allows the side MSE walls to follow the 2:1 slope.

JUSTIFICATION: The proposed change reduces the complexity and quantity of retaining wall construction at fill heights exceeding 60 feet by substituting it with a conventional PSC beam span. This proposal assumes the use of conventional pile-supported end bents and the extension of spans within current, typical PSC beam span ranges. The proposal continues to use MSE retaining walls along the sides of the roadway to maintain R/W impacts the same as the current design.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Reduces costs • Improves constructibility • Reduces long-term maintenance of walls 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Increases long-term maintenance of bridge
--	--

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 3,188,235	\$	\$ 3,188,235
PROPOSED CHANGE:	\$ 1,440,142	\$	\$ 1,440,142
SAVINGS:	\$ 1,748,093	\$	\$ 1,748,093

VALUE ENGINEERING TEAM STUDY

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: B-2.0

PAGE NUMBER: 2 of 8

PI #: 620490-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
MSE Wall Face, H = 30 Ft or Greater (add)	3	SF	22,647	\$100.00	\$2,264,700
Roadway Paving (add)	1,7	SY	1,355	\$48.07	\$65,135
627-1180 Additional MSE Backfill (add)	7	CY	15,316	\$50.00	\$756,800
627-1160 Traffic Barrier H (add)	3	LF	508	\$200.00	\$101,600
627-1100 Coping A	3	LF	0	\$93.00	0
Bridge 1	1,7	SF	0	\$100.00	0
441-0004 Conc Slope Pav, 4 in	3	SY	0	\$63.00	0
SUBTOTAL – COST TO PRIME					\$3,188,235
MARKUP					--
TOTAL CONTRACT COST					\$3,188,235

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
MSE Wall Face, H = 30 Ft or Greater	3	SF	0	\$100.00	0
Roadway Paving	1,7	SY	0	\$48.07	0
627-1180 Additional MSE Backfill	7	CY	0	\$50.00	0
627-1160 Traffic Barrier H	3	LF	0	\$200.00	0
627-1100 Coping A (add)	3	LF	508	\$93.00	\$47,244
Bridge 1 (add)	1,7	SF	13,018	\$100.00	\$1,301,800
441-0004 Conc Slope Pav, 4 in (add)	3	SY	1,446	\$63.00	\$91,098
SUBTOTAL – COST TO PRIME					\$1,440,142
MARKUP					--
TOTAL CONTRACT COST					\$1,440,142

Difference [Original-Proposed]

\$1,748,093

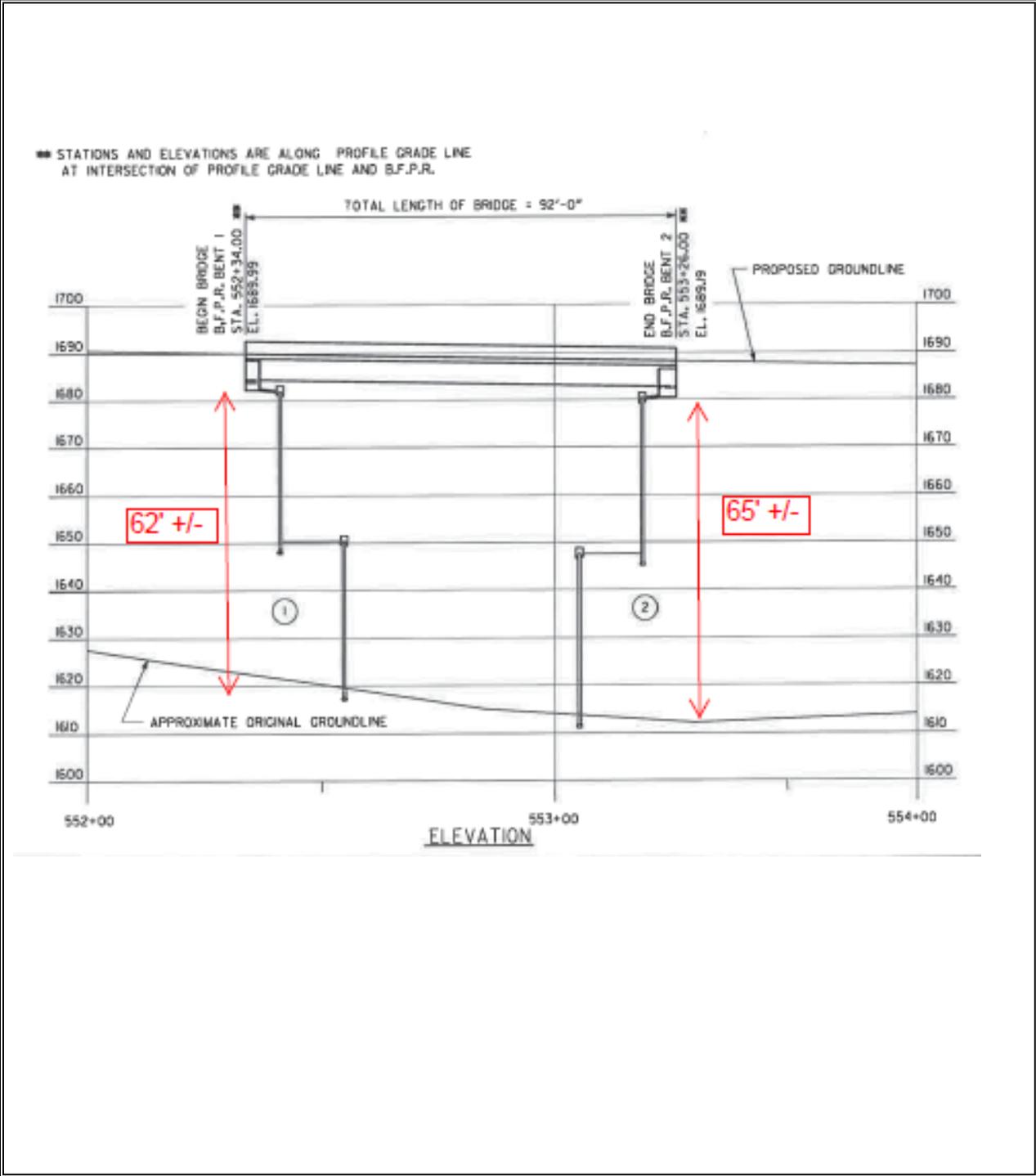
SOURCES

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

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER: B-2.0 **PAGE NUMBER:** 4 of 8

PI #: 620490-

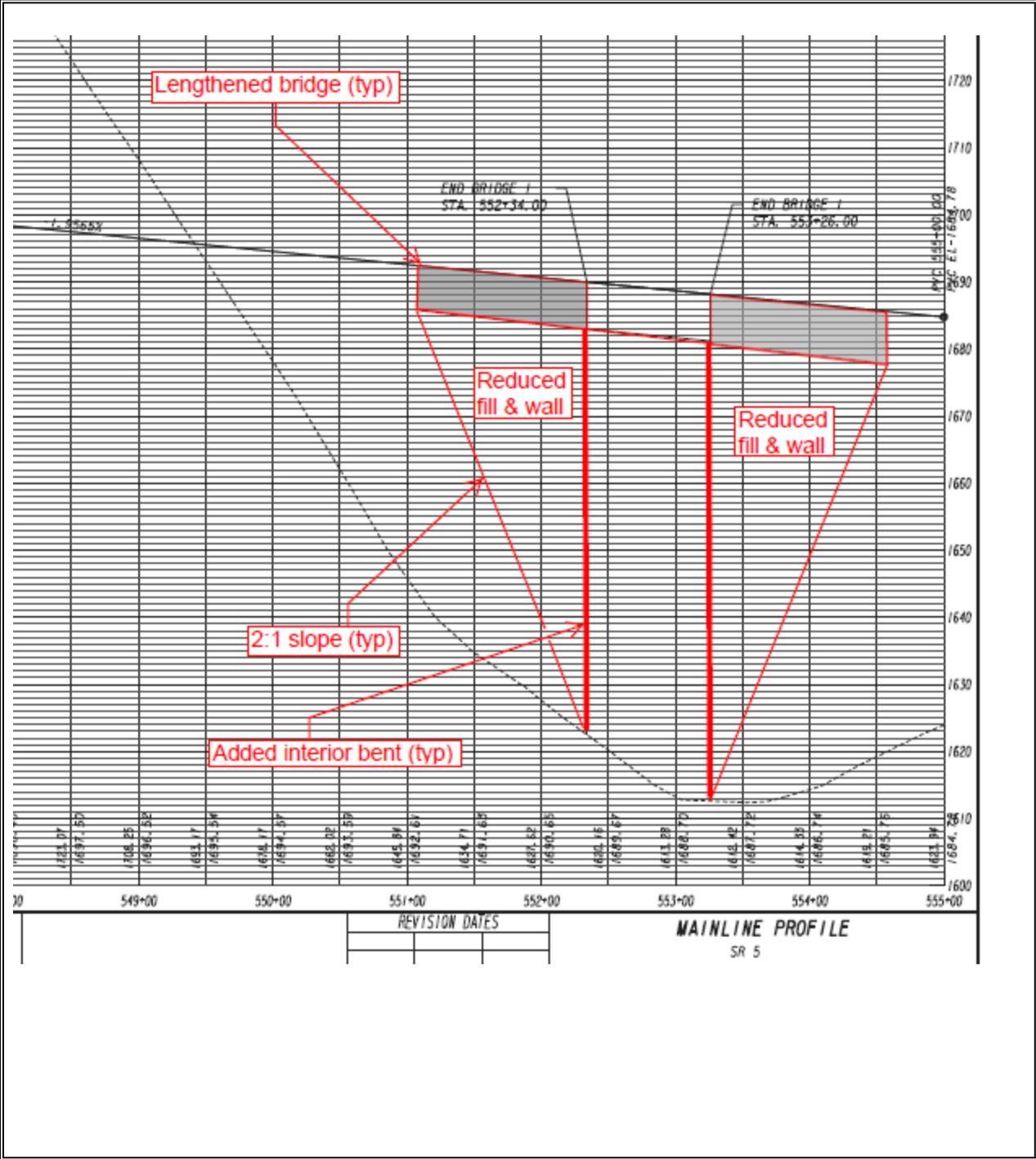


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: B-2.0

PAGE NUMBER: 5 of 8

PI #: 620490-

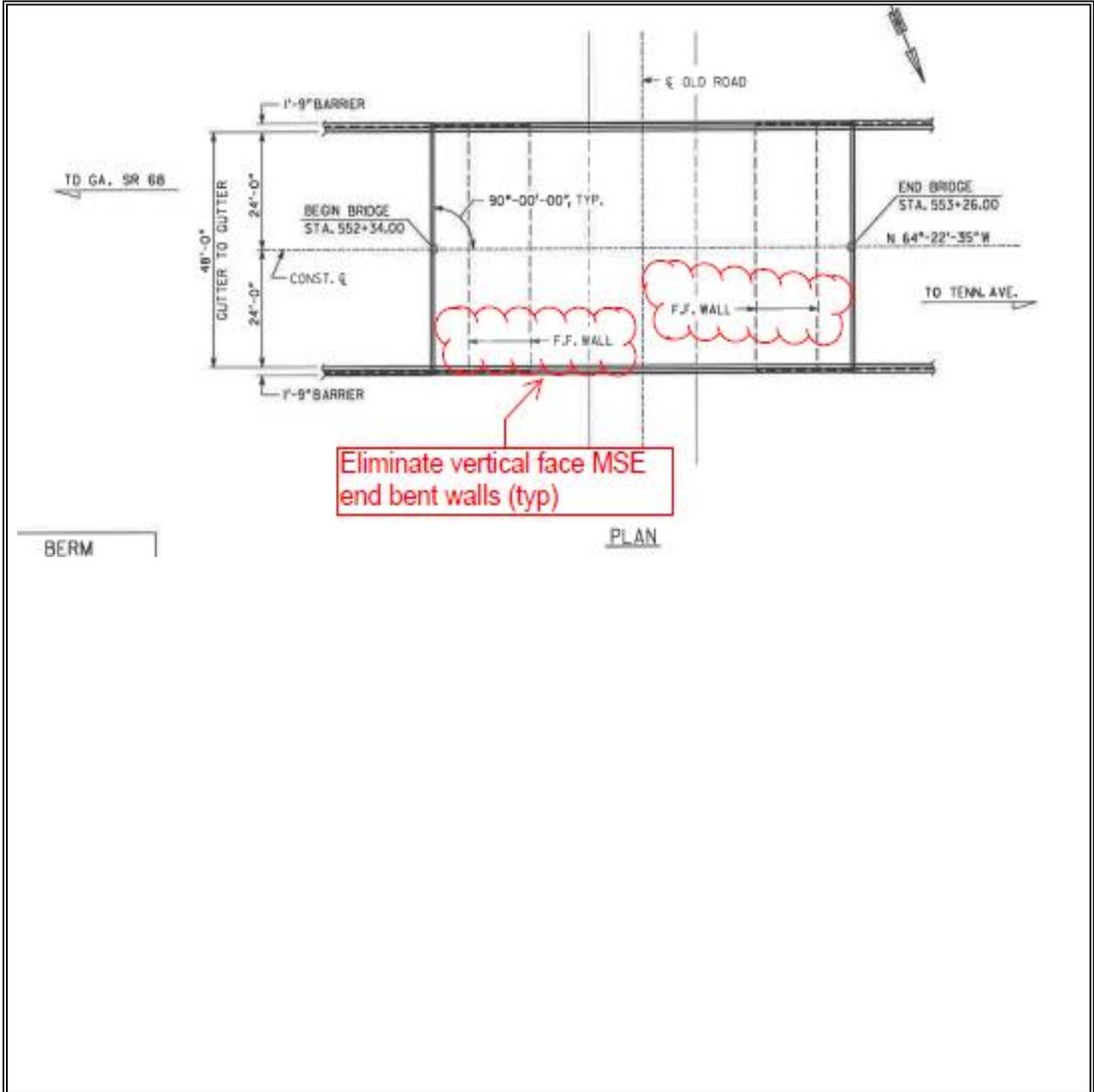


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: B-2.0

PAGE NUMBER: 6 of 8

PI #: 620490-



CALCULATIONS

PROPOSAL NUMBER: B-2.0

PAGE NUMBER: 7 of 8

PI #: 620490-

Current Bridge Quantity Calculations:

Additional Length (Span 1): (EL 1685 – EL 1623) = 62' Height =====> 62' x 2:1 = 124'

Additional Length (Span 3): (EL 1678 – EL 1613) = 65' Height =====> 65' x 2:1 = 130'

Additional Bridge Area: (124' + 130') x 51'-3" = 13,018 SF

Additional Slope Paving (Span 1): 124' x (51.25' width) = 6,355 SF

Additional Slope Paving (Span 1): 130' x (51.25' width) = 6,662 SF

Additional Slope Paving Area: 6,355 SF + 6,662 SF = 13,017 SF = 1,446 SY

Current Design Pavement Cost Calculations:

310-1101: 12" GAB = 0.68 tons/SY x \$19.83/ton = \$13.48/SY

402-3121: 660#/SY Asph 25MM = (660#/2,000#)(\$63.79/T) = \$21.05/SY

402-3190: 220#/SY Asph 19MM = (220#/2,000#)(\$68.25/T) = \$7.51/SY

402-3130: 165#/SY Asph 12.5MM = (165#/2,000#)(\$69.61/T) = \$5.74/SY

413-0750: 4 layers tack coat = 0.035 gals/SY/layer x 4 x \$2.09/gal = \$0.29

Total pavement cost = \$48.07/SY

Current Roadway Quantity Calculations:

Pavement Width = 24' + 4' + 10' + 10' = 48'

Reduced Pavement Length = 254' (see Bridge Quantity Calculations)

Reduced Pavement Area = 254' x 48' = 12,192 SF = 1,355 SY

MSE Wall Width at End Bent = 51.25' Bridge Width

(1) Reduced MSE Wall Face Area (End Bent 1): 62' Height x 51.25' Width = 3,178 SF

(2) Reduced MSE Wall Face Area (End Bent 2): 65' Height x 51.25' Width = 3,331 SF

(3) Reduced MSE Wall Face Area (End Bent 1, Each Side): [1/2(62')(124')] = 3,844 SF

(4) Reduced MSE Wall Face Area (End Bent 2, Each Side): [1/2(65')(130')] = 4,225 SF

Reduced MSE Wall Face Area = (1) + (2) + [(3) x 2 sides] + [(4) x 2 sides] = 22,647 SF

"Additional MSE Backfill" Volume ==> Reduced MSE Wall Face Area (1 side) x Width

1. (End Bent 1) = 3,844 SF x 51.25' = 197,005 CF = 7,296 CY

2. (End Bent 2) = 4,225 SF x 51.25' = 216,531 CF = 8,020 CY

Reduced "Additional MSE Backfill" Volume = 7,296 CY + 8,020 CY = 15,316 CY

(cont'd)

CALCULATIONS

PROPOSAL NUMBER: B-2.0

PAGE NUMBER: 8 of 8

PI #: 620490-

Coping with Traffic Barrier H ==> Reduction in LF is equal to the length of span added x 2 sides

1. (End Bent 1) = 124' x 2 sides = 248 LF
2. (End Bent 8) = 130' x 2 sides = 260 LF

Reduced Coping Traffic Barrier H = 508 LF

Coping Type A ==> Replaces Traffic Barrier H (see above calculations)

Additional Coping Type A = 508 LF

Current Bridge Cost Calculations:

543-9000: Assume \$100/SF (Bridge 1)

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: Bypass B-4.0	PAGE NUMBER: 1 of 7
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PI #: 620490-	PROJECT TITLE: McCaysville Truck Bypass from SR 5 to Tennessee State Line Fannin County
----------------------	---

PROPOSAL DESCRIPTION: Combine Bridge 2 and Bridge 3 into a Single Bridge Structure

ORIGINAL DESIGN: The current design proposes separate structures for Bridge 2 (270'-0") and Bridge 3 (70'-0"), separated by approximately 165 feet of roadway paving and embankment fill.

PROPOSED CHANGE: It is proposed to add 2 spans to bridge the 165-foot separation between bridges to form a single 505'-0" bridge and results in also eliminating the vertical MSE end bent wall at End Bent 1 of Bridge 3.

JUSTIFICATION: The proposed change improves constructibility by removing the difficulty of compaction between the bridges and possibility of future settlement and a "dip" between two rigid bridge structures. The proposed change results in no additional R/W impacts because the roadway is on structure.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Improves constructability • Reduces long-term maintenance of walls • Improves long-term performance 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Increases initial costs
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	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 331,608	\$	\$ 331,608
PROPOSED CHANGE:	\$ 634,200	\$	\$ 634,200
SAVINGS:	(\$ 302,592)	\$	(\$ 302,592)

VALUE ENGINEERING TEAM STUDY

COST ESTIMATING WORKSHEET

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

PI #: 620490-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
MSE Wall Face, H = 10-20 Ft (add)	3	SF	1,669	\$55.00	\$91,795
Roadway Paving (add)	1,7	SY	560	\$48.07	\$26,919
208-0100 In Place Embankment (add)	3	CY	17,908	\$6.00	\$107,448
627-1180 Additional MSE Backfill (add)	3	CY	427	\$50.00	\$21,350
627-1160 Traffic Barrier H (add)	3	LF	60	\$200.00	\$12,000
433-1300 Reinf Conc Appr Slab, Inc Barrier (add)	3	SY	337	\$150.00	\$50,550
Bridge 2	1,7	SF	0	\$75.00	\$0
441-0004 Conc Slope Pav, 4 in (add)	3	SY	342	\$63.00	\$21,546
SUBTOTAL – COST TO PRIME					331,608
MARKUP					--
TOTAL CONTRACT COST					\$331,608

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
MSE Wall Face, H = 30 Ft or Greater	3	SF	0	\$55.00	0
Roadway Paving	1,7	SY	0	\$48.07	0
208-0100 In Place Embankment	3	CY	0	\$6.00	0
627-1180 Additional MSE Backfill	3	CY	0	50.00	0
627-1160 Traffic Barrier H	3	LF	0	\$200.00	0
433-1300 Reinf Conc Appr Slab, Inc Barrier	3	LF	0	\$93.00	0
Bridge 2 (add)	1,7	SF	8,456	\$75.00	\$634,200
441-0004 Conc Slope Pav, 4 in	3	SY	0	\$63.00	0
SUBTOTAL – COST TO PRIME					\$634,200
MARKUP					--
TOTAL CONTRACT COST					\$634,200

Difference [Original-Proposed] **(\$302,592)**

SOURCES

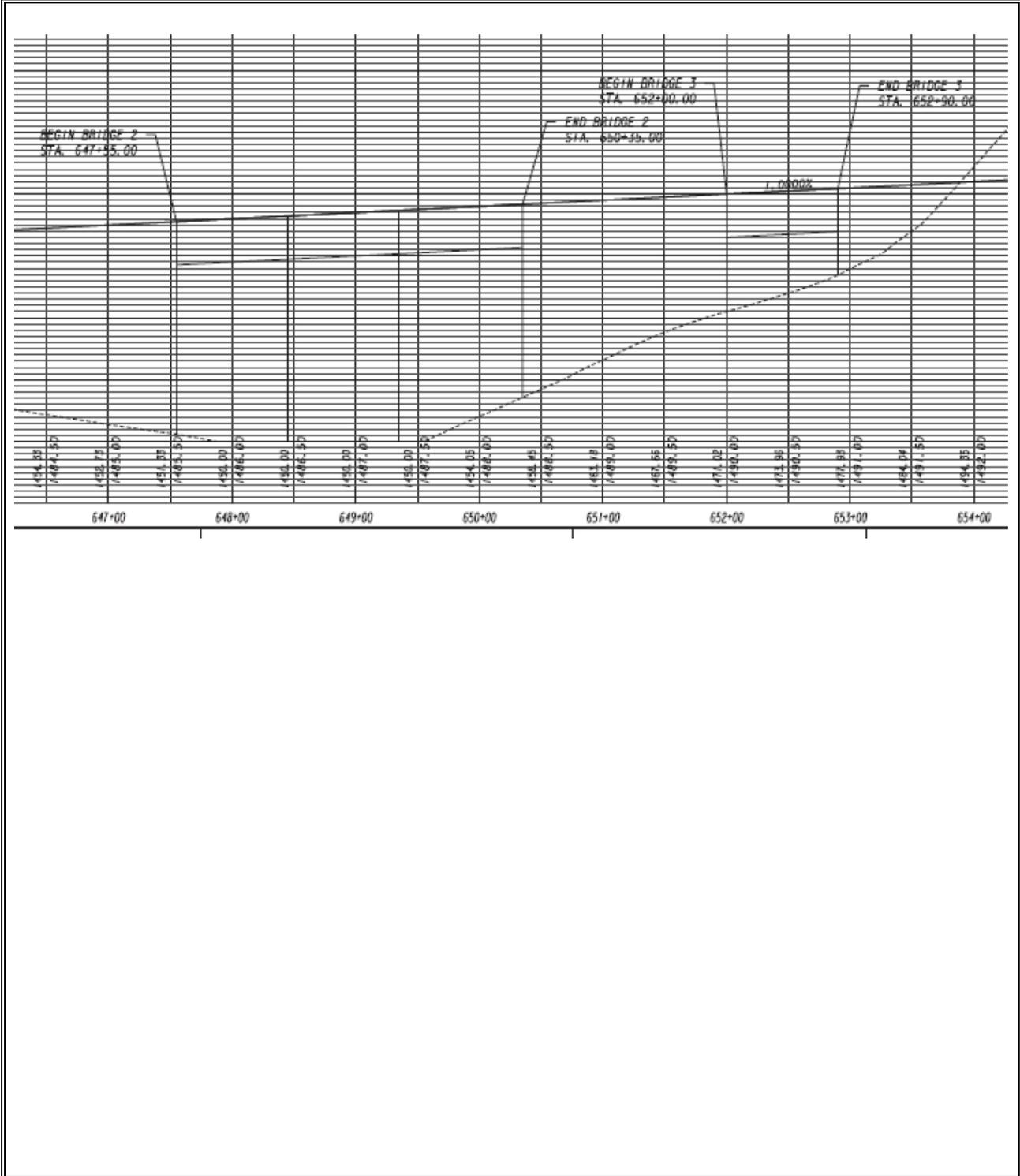
- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Project Cost Estimate 2. MBP Estimate Database 3. GDOT Item Mean Summary 4. Means Estimating Manual | <ol style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other (See attached calculations sheet) |
|---|--|

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER: B-4.0

PAGE NUMBER: 3 of 7

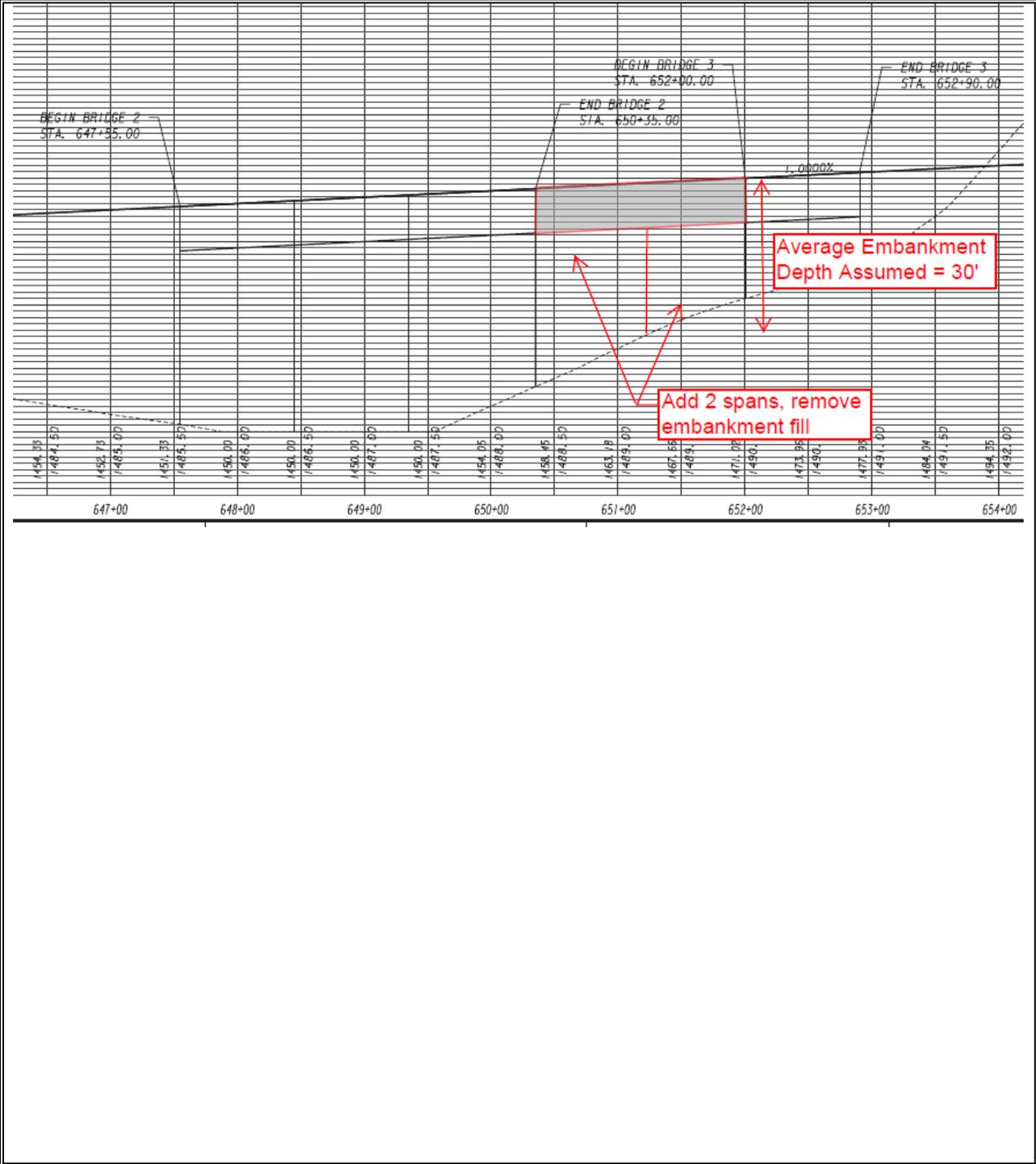
PI #: 620490-



PROPOSED CHANGE SKETCH/DETAIL

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

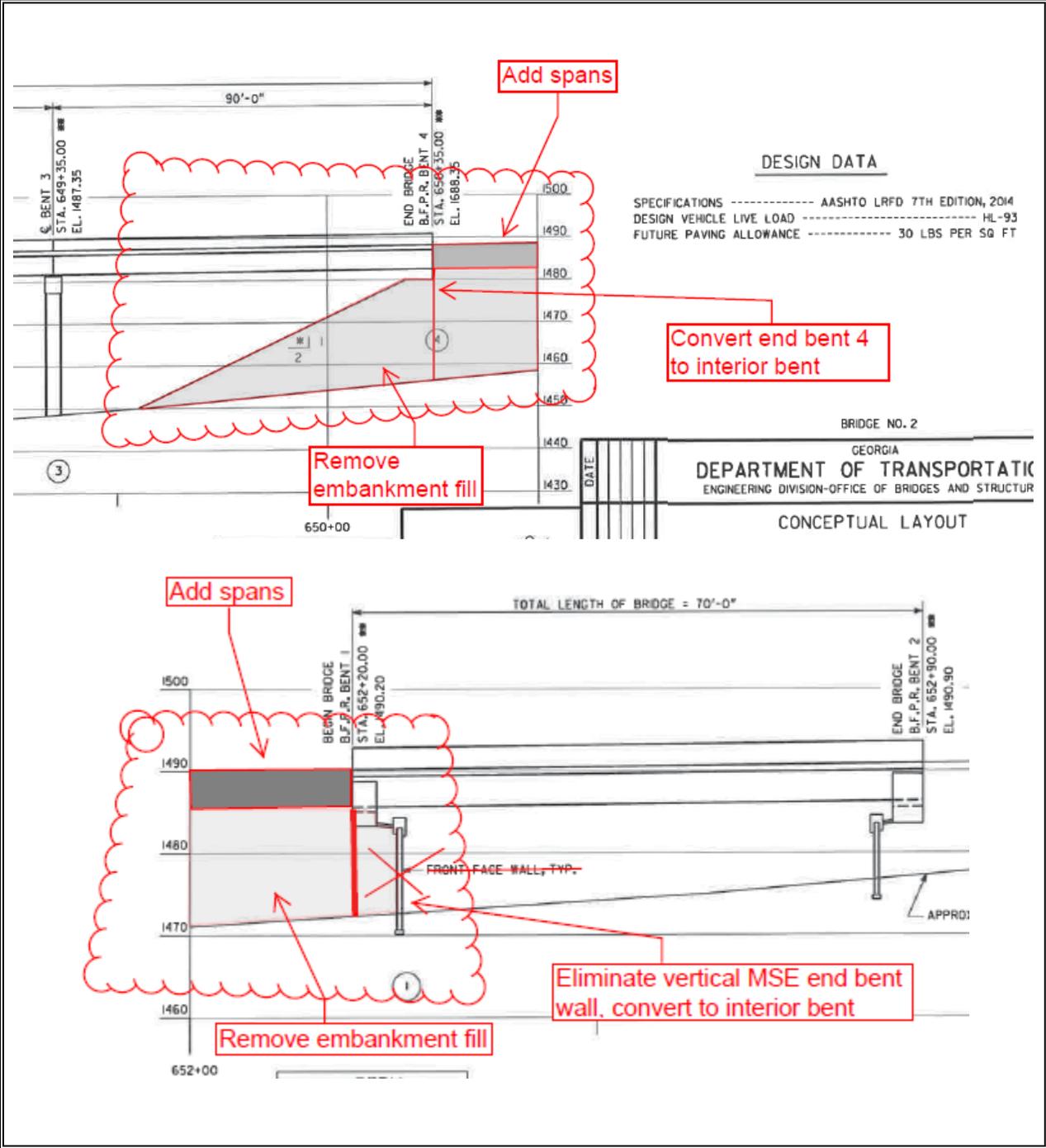
PI #: 620490-



PROPOSED CHANGE SKETCH/DETAIL

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

PI #: 620490-



CALCULATIONS

PROPOSAL NUMBER: B-4.0

PAGE NUMBER: 6 of 7

PI #: 620490-

Proposed Bridge Quantity Calculations:

Additional Length = 165'

Additional Bridge Area: 165' x 51'-3" = 8,456 SF

Current Design Pavement Cost Calculations:

310-1101: 12" GAB = 0.68 tons/SY x \$19.83/ton = \$13.48/SY

402-3121: 660#/SY Asph 25MM = (660#/2,000#)(\$63.79/T) = \$21.05/SY

402-3190: 220#/SY Asph 19MM = (220#/2,000#)(\$68.25/T) = \$7.51/SY

402-3130: 165#/SY Asph 12.5MM = (165#/2,000#)(\$69.61/T) = \$5.74/SY

413-0750: 4 layers tack coat = 0.035 gals/SY/layer x 4 x \$2.09/gal = \$0.29

Total pavement cost = \$48.07/SY

Current Roadway Quantity Calculations:

Pavement Width = 24' + 4' + 10' + 10' = 48'

Reduced Pavement Length = 165' - [2 x (30' approach slab STD 9017R)] = 105'

Reduced Pavement Area = 105' x 48' = 5,040 SF = 560 SY

Approach Slab (STD 9017R) ==> BW = 48'-0" ==> G = 49'-6"

Approach Slab Area = 168.33 SY per approach slab (STD 9017R)

Reduced Approach Slab Area = 168.33 SY x 2 = 337 SY

CALCULATIONS

PROPOSAL NUMBER: B-4.0

PAGE NUMBER: 7 of 7

PI #: 620490-

Embankment Volume Along Roadway assumptions:

1. Depth = 30' (assumed) between End Bridge 2 and Begin Bridge 3
2. Width = 48' pavement
3. Length = (165' btwn bridges) – (30' at End Bent 1, Bridge 3 for MSE backfill) = 135'
4. Side Slope = 30' depth x 2:1 side slope = 60' length
5. Side Slope Volume = $[1/2 \times 30' \times 60'] \times 2 \text{ sides} = 1,800 \text{ SF}$ per foot of roadway length

Embankment Volume Along Roadway ==>

- (1) Pavement Volume = $48' \times 30' \times 135' = 194,400 \text{ CF}$
- (2) Side Slope Volume = $1,800 \text{ SF} \times 135' = 243,000 \text{ CF}$

Embankment Volume at End Bent 4, Bridge 2 assumptions: ==>

1. End Slope Length = $(\text{EL } 1480 - \text{EL } 1450) \times 2: 1 \text{ slope} = 60'$
2. End Slope Height = $(\text{EL } 1480 - \text{EL } 1450) = 30'$

Embankment Volume at End Bent 4, Bridge 2 ==>

- (3) End Slope Volume = $1/2 \times (30') \times (60') \times (51.25' \text{ bridge width}) = 46,125 \text{ CF}$

Reduced Embankment Volume = (1) + (2) + (3) = 483,525 CF = 17,908 CY

MSE Wall Width at End Bent 1, Bridge 3 = 51.25' Bridge Width

MSE Wall Height at End Bent 1, Bridge 3 = $(\text{EL } 1485 - \text{EL } 1470) = 15'$

MSE Wall Wrap along roadway edge approaching End Bent 1, Bridge 3 = $15' \times 2:1 \text{ slope} = 30'$

- (5) Reduced MSE Wall Face Area (End Bent 1): $15' \text{ Height} \times 51.25' \text{ Width} = 769 \text{ SF}$
- (6) Reduced MSE Wall Face Area (Rdwy Edge): $15' \text{ Height} \times 30' \text{ Length} \times 2 \text{ sides} = 900 \text{ SF}$

Reduced MSE Wall Face Area = (1) + (2) = 1,669 SF

"Additional MSE Backfill" Volume ==> Depth of backfill approx. equivalent to MSE wall height

1. (End Bent 1, Bridge 3) = $769 \text{ SF} \times 15' \text{ depth} = 11,535 \text{ CF} = 427 \text{ CY}$

Reduced "Additional MSE Backfill" Volume = 427 CY

Coping with Traffic Barrier H ==> Reduction in LF is equal to the length of wall along 2 sides

3. (End Bent 1, Bridge 3) = $30' \times 2 \text{ sides} = 60 \text{ LF}$

Reduced Coping Traffic Barrier H = 60 LF

Slope Paving (End Bent 4, Bridge 2):

- (4) Slope Length = $(\text{EL } 1480 - \text{EL } 1450) \times 2: 1 \text{ slope} = 60'$
- (5) Slope Width = 51.25' Bridge Width

Reduced Slope Paving Area: $60' \times 51.25' = 3,075 \text{ SF} = 342 \text{ SY}$

Current Bridge Cost Calculations:

543-9000: $\$1,035,000 \text{ LS} / [(270' \text{ Length})(51.25' \text{ Wide})] = \$75/\text{SF}$ (Bridge 2) per concept CES

VALUE ENGINEERING PROPOSAL

PROPOSAL NUMBER: Bypass B-4.1	PAGE NUMBER: 1 of 7
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PI #: 620490-	PROJECT TITLE: McCaysville Truck Bypass from SR 5 to Tennessee State Line Fannin County
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PROPOSAL DESCRIPTION: Eliminate Bridge 3 and Provide Driveway to East Side of Bypass

ORIGINAL DESIGN: The current design proposes Bridge 3 (70'-0") to span an existing access road to the Copper Hill Wastewater treatment plant.

PROPOSED CHANGE: It is proposed to eliminate Bridge 3 and provide access to the treatment plant through a driveway connection to the east side of the truck bypass at approx. Sta 654+00.

JUSTIFICATION: The proposed grade of the bypass (approx. 1,490) can tie to the existing grade of the treatment plant (approx. 1,465) via a driveway connection to the east side of the truck bypass. This connection will continue to serve the existing access pattern from W. Tennessee Ave. to the treatment plant, via the intersection of W. Tennessee Ave. and the proposed truck bypass segment. The proposed change is not anticipated to create a significant operational issue due to the anticipated low-volume of turns into the treatment plant on a daily basis. The proposed change results in only additional driveway easement for the connection.

<p>ADVANTAGES:</p> <ul style="list-style-type: none"> • Reduces costs • Reduces long-term maintenance of walls • Reduces long-term maintenance of bridge 	<p>DISADVANTAGES:</p> <ul style="list-style-type: none"> • Increases turning movements
--	--

	INITIAL COST	OPERATING COST	TOTAL LIFE-CYCLE COST
ORIGINAL DESIGN:	\$ 602,155	\$	\$ 602,155
PROPOSED CHANGE:	\$ 101,023	\$	\$ 101,023
SAVINGS:	\$ 501,132	\$	\$ 501,132

VALUE ENGINEERING TEAM STUDY

COST ESTIMATING WORKSHEET

PROPOSAL NUMBER: B-4.1	PAGE NUMBER: 2 of 7
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PI #: 620490-

ORIGINAL DESIGN

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
MSE Wall Face, H = 10-20 Ft (add)	3	SF	2,581	\$55.00	\$141,955
Roadway Paving	1,7	SY	0	\$48.07	0
208-0100 In Place Embankment	3	CY	0	\$6.00	0
627-1180 Additional MSE Backfill (add)	3	CY	617	\$50.00	\$30,850
627-1160 Traffic Barrier H (add)	3	LF	100	\$200.00	\$20,000
433-1300 Reinf Conc Appr Slab, Inc Barrier (add)	3	SY	337	\$150.00	\$50,550
Bridge 3 (add)	1,7	SF	3,588	\$100.00	\$358,800
SUBTOTAL – COST TO PRIME					\$602,155
MARKUP					--
TOTAL CONTRACT COST					\$602,155

PROPOSED CHANGE

ITEM	SOURCE CODE	U/M	QTY	UNIT COST	TOTAL COST
MSE Wall Face, H = 30 ft. or Greater	3	SF	0	\$55.00	0
Roadway Paving (add)	1,7	SY	1,293	\$48.07	\$62,155
208-0100 In Place Embankment (add)	3	CY	6,478	\$6.00	\$38,868
627-1180 Additional MSE Backfill	3	CY	0	\$50.00	0
627-1160 Traffic Barrier H	3	LF	0	\$200.00	0
433-1300 Reinf Conc Appr Slab, Inc Barrier	3	LF	0	\$93.00	0
Bridge 3	1,7	SF	0	\$100.00	0
SUBTOTAL – COST TO PRIME					\$101,023
MARKUP					--
TOTAL CONTRACT COST					\$101,023

Difference [Original-Proposed] **\$501,132**

SOURCES

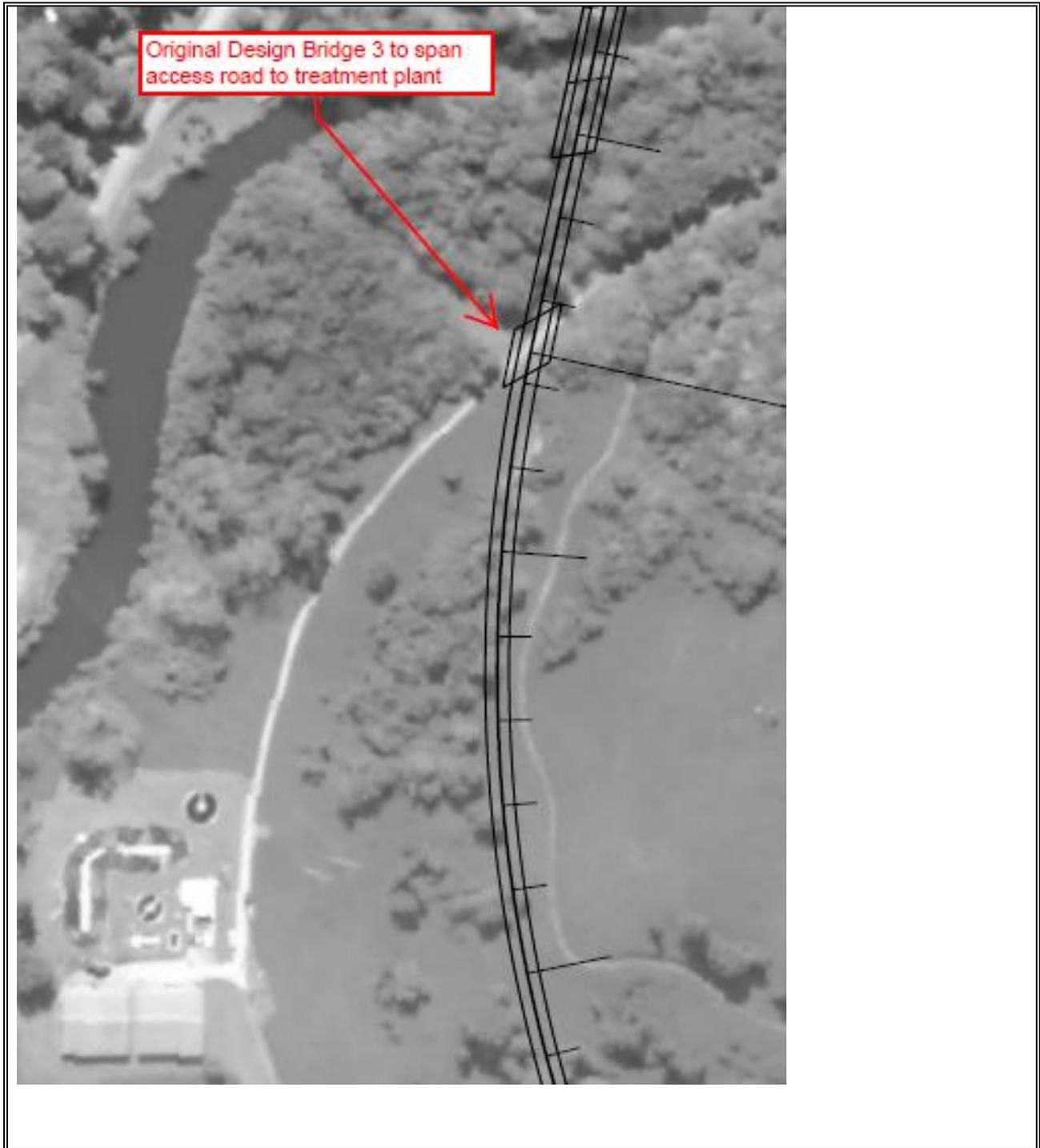
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|---|--|
| <ol style="list-style-type: none"> 1. Project Cost Estimate 2. MBP Estimate Database 3. GDOT Item Mean Summary 4. Means Estimating Manual | <ol style="list-style-type: none"> 5. Richardson's Estimating Manual 6. Vendor (Specify) 7. Other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

ORIGINAL DESIGN SKETCH/DETAIL

PROPOSAL NUMBER: B-4.1

PAGE NUMBER: 3 of 7

PI #: 620490-

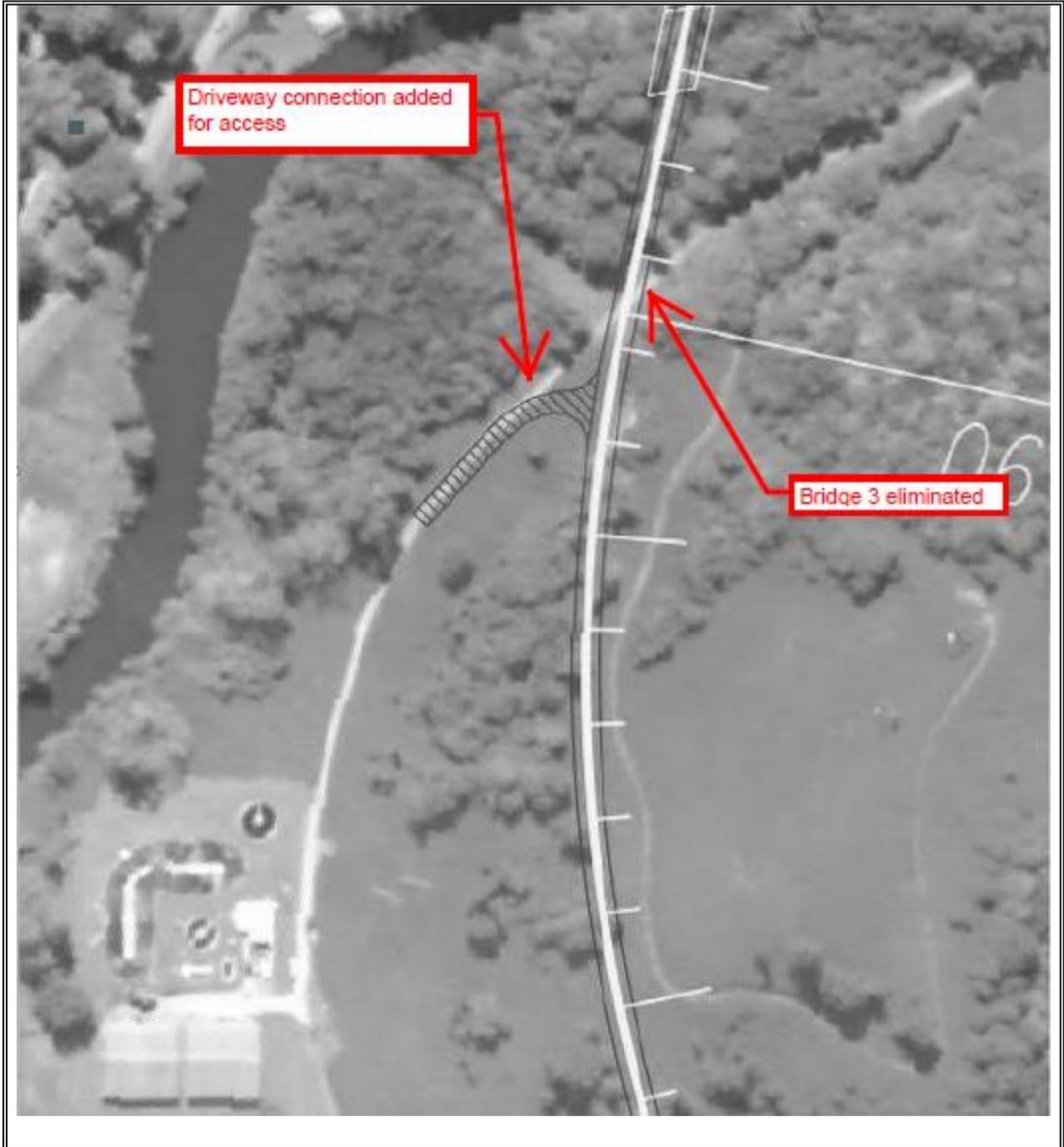


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: B-4.1

PAGE NUMBER: 4 of 7

PI #: 620490-

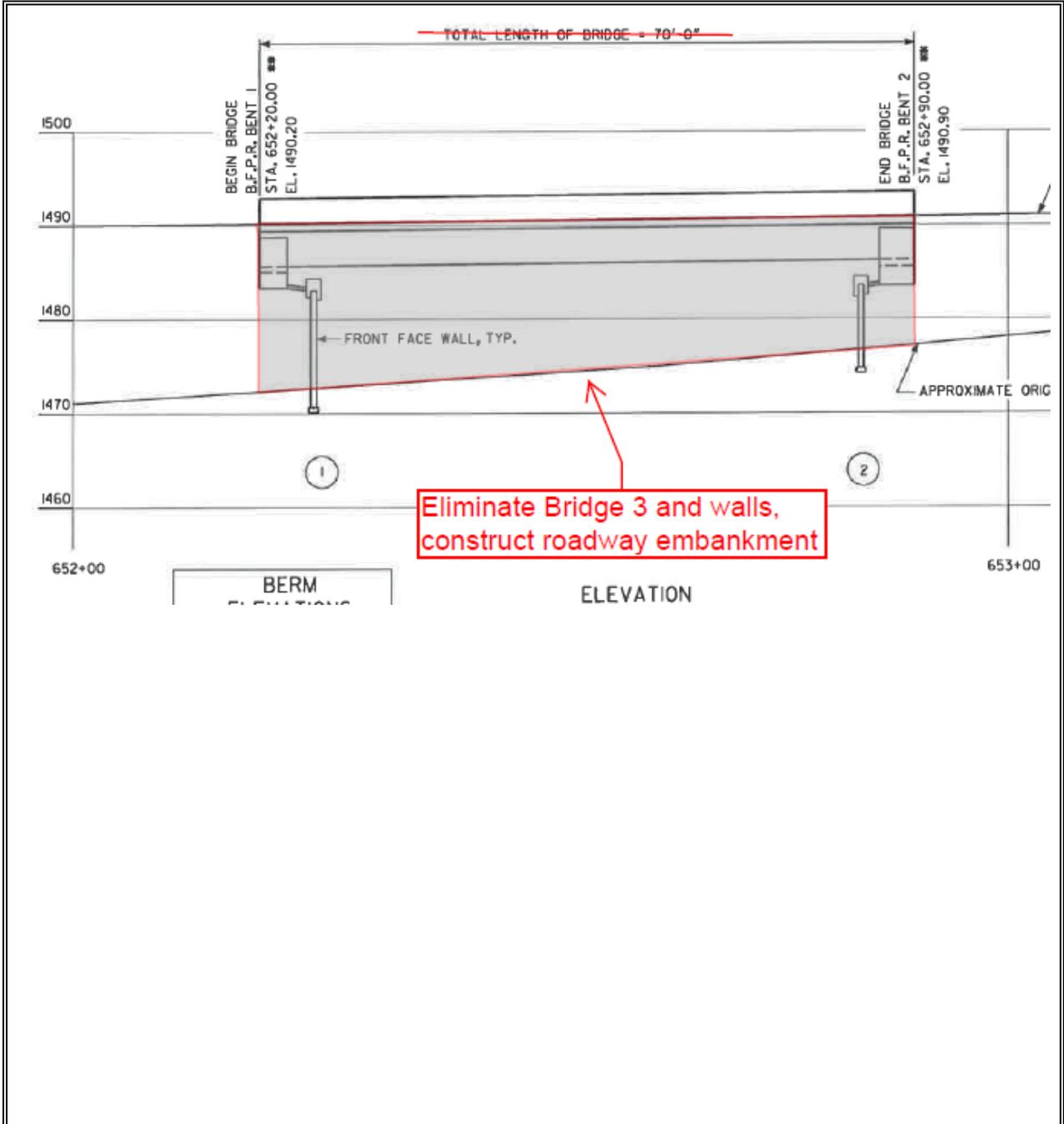


PROPOSED CHANGE SKETCH/DETAIL

PROPOSAL NUMBER: B-4.1

PAGE NUMBER: 5 of 7

PI #: 620490-



CALCULATIONS

PROPOSAL NUMBER: B-4.1

PAGE NUMBER: 6 of 7

PI #: 620490-

Proposed Bridge Quantity Calculations:

Bridge Length = 70'

Reduced Bridge Area: 70' x 51'-3" = 3,588 SF

Current Design Pavement Cost Calculations:

310-1101: 12" GAB = 0.68 tons/SY x \$19.83/ton = \$13.48/SY

402-3121: 660#/SY Asph 25MM = (660#/2,000#)(\$63.79/T) = \$21.05/SY

402-3190: 220#/SY Asph 19MM = (220#/2,000#)(\$68.25/T) = \$7.51/SY

402-3130: 165#/SY Asph 12.5MM = (165#/2,000#)(\$69.61/T) = \$5.74/SY

413-0750: 4 layers tack coat = 0.035 gals/SY/layer x 4 x \$2.09/gal = \$0.29

Total pavement cost = \$48.07/SY

Current Roadway Quantity Calculations:

Pavement Width = 24' + 4' + 10' + 10' = 48'

Pavement Length = 70' + [2 x (30' approach slab STD 9017R)] = 130'

Additional Roadway Pavement Area = 130' x 48' = 6,240 SF = 693 SY

Driveway Width = 20'

Driveway Length = 270' for grade tie

Additional Driveway Pavement Area = 20' x 270' = 5,400 SF = 600 SY

Approach Slab (STD 9017R) ==> BW = 48'-0" ==> G = 49'-6"

Approach Slab Area = 168.33 SY per approach slab (STD 9017R)

Reduced Approach Slab Area = 168.33 SY x 2 = 337 SY

CALCULATIONS

PROPOSAL NUMBER: B-4.1

PAGE NUMBER: 7 of 7

PI #: 620490-

Embankment Volume Along Roadway assumptions:

- 6. Depth = 15' (assumed average) between End Bent 1 and End Bent 2
- 7. Width = 48' pavement
- 8. Length = (70' btwn bridges) + [(30' at End Bents to replace MSE backfill) x 2] = 130'
- 9. Side Slope = 15' depth x 2:1 side slope = 30' length
- 10. Side Slope Volume = $[1/2 \times 15' \times 30'] \times 2$ sides = 450 SF per foot of roadway length

Embankment Volume Along Roadway ==>

- (6) Pavement Volume = $48' \times 15' \times 130' = 93,600$ CF
- (7) Side Slope Volume = 450 SF x 130' = 58,500 CF

Additional Embankment Volume Along Roadway = (1) + (2) = 152,100 CF = 5,633 CY

Additional Embankment Volume at Driveway = 5,633 * 15% = 845 CY

Additional Embankment Volume = 6,478 CY

MSE Wall Width at End Bents, Bridge 3 = 51.25' Bridge Width

MSE Wall Height at End Bent 1, Bridge 3 = (EL 1485 – EL 1470) = 15'

MSE Wall Height at End Bent 2, Bridge 3 = (EL 1485 – EL 1475) = 10'

MSE Wall Wrap along roadway edge approaching End Bent 1, Bridge 3 = 15' x 2:1 slope = 30'

MSE Wall Wrap along roadway edge approaching End Bent 1, Bridge 3 = 10' x 2:1 slope = 20'

- (7) Reduced MSE Wall Face Area (End Bent 1): 15' Height x 51.25' Width = 769 SF
- (8) Reduced MSE Wall Face Area (Rdwy Edge): 15' Height x 30' Length x 2 sides = 900 SF
- (9) Reduced MSE Wall Face Area (End Bent 2): 10' Height x 51.25' Width = 512 SF
- (10) Reduced MSE Wall Face Area (Rdwy Edge): 10' Height x 20' Length x 2 sides = 400 SF

Reduced MSE Wall Face Area = (1) + (2) + (3) + (4) = 2,581 SF

“Additional MSE Backfill” Volume ==> Depth of backfill approx. equivalent to MSE wall height

- 2. (End Bent 1) = 769 SF x 15' depth = 11,535 CF = 427 CY
- 3. (End Bent 1) = 512 SF x 10' depth = 5,120 CF = 190 CY

Reduced “Additional MSE Backfill” Volume = 617 CY

Coping with Traffic Barrier H ==> Reduction in LF is equal to the length of wall along 2 sides

- 4. (End Bent 1, Bridge 3) = 30' x 2 sides = 60 LF
- 5. (End Bent 2, Bridge 3) = 20' x 2 sides = 40 LF

Reduced Coping Traffic Barrier H = 100 LF

Current Bridge Cost Calculations:

543-9000: Assume \$100/SF (Bridge 3)

VALUE ENGINEERING TEAM STUDY

VE ANALYSIS SIGN-IN SHEET

PI No.: 621340- and 620490-

County: Fannin

Date: Aug-Sept 29-1, 2016

Days

FIRST	LAST	NAME	GDOT OFFICE OR COMPANY NAME	PHONE NUMBER	EMAIL ADDRESS
X	O	Erik Rohde	Engineering Services	404-631-1611	erohde@dot.ga.gov
X	X	Matt Sanders	Engineering Services	404-631-1752	msanders@dot.ga.gov
X	O	Melissa Harper	Construction	404-631-1971	mharper@dot.ga.gov
X	X	Steve Gaston	Bridge Design	404-631-1881	sgaston@dot.ga.gov
O	X	Lisa L. Myers	Engineering Services	404-631-1770	lmyers@dot.ga.gov
X	X	Cynthia Burney	Program Delivery	404-631-1851	cburney@dot.ga.gov
X	O	Nicole Law	Program Delivery	404-631-1723	nlaw@dot.ga.gov
X	X	Tom Orr	MBP	404-414-9957	torr@mbpce.com
X	X	Buffy Campbell	MBP	404-862-6862	bcampbell@mbpce.com
X	X	Scott Jordan	Southeastern Engineering	404-670-2040	sjordan@seengineering.com
X	X	Johnny Lee	RS&H	678-528-7213	Johnny.lee@rsandh.com
X	X	Mike Rushing	Kimley-Horn	678-533-3925	Mike.rushing@kimley-horn.com
X	X	Gary Newton	Kimley-Horn	678-533-3902	Gary.newton@kimley-horn.com
X	X	Brian Iselin	Jacobs	404-978-7432	Brian.iselin@jacobs.com
X	X	Patrick Capasse	Jacobs	404-978-7510	Patrick.capasse@jacobs.com
X	X	Mark Westbrook	Jacobs	706-273-0674	Mark.westbrook@jacobs.com
X	O	Jonathan Cox	Jacobs	404-978-7516	Jonathan.cox@jacobs.com
X	X	Lionel Alexander	Jacobs	404-973-7648	Lionel.alexander@jacobs.com
X	X	Ryan Triick	Jacobs	404-978-7431	Ryan.triick@jacobs.com
X	O	Aaron Burgess	Environmental Services	404-631-1159	aburgess@dot.ga.gov
O	X	Gretel Sims	OPD	TBD	gsims@dot.ga.gov
X	O	Jeremy Scott (Via Video)	D-6 Area Construction	706-272-2211	jescott@dot.ga.gov

Place an "X" for all who attend "O" = Did Not Attend 20 Attended Project Overview (Day 1) 16 Attended Project Presentation (Day 4)

FUNCTION ANALYSIS

The following functions for the SR 5 Widening and McCaysville Truck Bypass projects were identified during discussions with the VE participants on the first day of the study. These two-word functions consist of an active verb, and a quantifiable (measurable) noun. The functions represent the proposed capital improvement expenditures of the project, and assist the VE Team in becoming familiar with the needs and long-term goals for the project. The Basic Function of the project is to “Improve Operations”. The following are considered by the VE Team to be Secondary and Supporting Functions.

Verb	Noun	Verb	Noun
Increase	Capacity	Reduce	Crash Frequency
Support	Commerce	Minimize	Impacts
Span	Water	Convey	Water
Span	Roadway	Control	Erosion
Span	Railroad	Maintain	Sight Distance
Stage	Construction	Inform	Traveler
Drain	Site	Retain	Earth
Direct	Traffic	Excavate	Earth
Maintain	Traffic	Correct	Deficiencies
Separate	Traffic	Achieve	Speed Design

VALUE ENGINEERING TEAM STUDY

COST MODEL – PI #621340-, SR 5 Widening

PI No. 621340-		
SR 5 from SR 2/Blue Ridge North to Proposed McCaysville Bypass		
Fannin County, Georgia		
ITEM	COST \$	% OF TOTAL
ASPHALT CONCRETE PAVING	13,720,871	25.36%
EARTHWORK	10,610,272	19.61%
RIGHT-OF-WAY	6,982,500	12.90%
AGGREGATE BASE COURSE	5,973,278	11.04%
CLEARING AND GRUBBING	5,118,750	9.46%
GRASSING/EROSION CONTROL	3,606,401	6.66%
CONCRETE SLABS/APRONS/MEDIANS	2,050,008	3.79%
TRAFFIC CONTROL	2,046,393	3.78%
DRAINAGE SYSTEM	1,382,084	2.55%
RETAINING WALLS	1,304,625	2.41%
GUARDRAILS	385,636	0.71%
SIGNALS	321,670	0.59%
SIGNAGE/MARKING	311,171	0.58%
FENCING	139,206	0.26%
FIELD OFFICE	110,228	0.20%
CURB & GUTTER	40,532	0.07%
SIDEWALKS	10,752	0.02%
BRIDGES/STRUCTURES	0	0.00%
DEMOLITION	0	0.00%
LIGHTING	0	0.00%
LANDSCAPING	0	0.00%
*TOTAL - PROJECT	54,114,376	100.00%
*Does not include Engrg & Inspection, Fuel Adjustment, Liquid AC Adjustment or Utility Relocation		

VALUE ENGINEERING TEAM STUDY

COST MODEL – PI #620490-, McCaysville Truck Bypass

PI No. 620490-		
SR 5 Proposed McCaysville Bypass		
Fannin County, Georgia & Polk County, TN		
ITEM	COST \$	% OF TOTAL
EARTHWORK	9,792,996	31.90%
BRIDGES/STRUCTURES	6,546,750	21.32%
ASPHALT CONCRETE PAVING	3,913,585	12.75%
RIGHT-OF-WAY	2,719,500	8.86%
CLEARING AND GRUBBING	1,926,988	6.28%
AGGREGATE BASE COURSE	1,812,597	5.90%
GRASSING/EROSION CONTROL	1,497,974	4.88%
RETAINING WALLS	559,125	1.82%
TRAFFIC CONTROL	508,148	1.66%
CONCRETE SLABS/APRONS/MEDIANS	452,550	1.47%
DRAINAGE SYSTEM	352,485	1.15%
GUARDRAILS	175,803	0.57%
SIGNAGE/MARKING	167,681	0.55%
SIGNALS	131,250	0.43%
FIELD OFFICE	110,228	0.36%
FENCING	27,937	0.09%
CURB & GUTTER	6,740	0.02%
SIDEWALKS	0	0.00%
DEMOLITION	0	0.00%
LIGHTING	0	0.00%
LANDSCAPING	0	0.00%
*TOTAL - PROJECT	30,702,337	100.00%
*Does not include Engrg & Inspection, Fuel Adjustment, Liquid AC Adjustment or Utility Relocation		

VALUE ENGINEERING TEAM STUDY

BRAINSTORMING/SPECULATION IDEAS

NO.	IDEA	*Ranking
621340- SR 5 WIDENING: ROADWAY (R)		
1.0	Construct 5-Lane from Beginning of Project to Sta 235+00 (Tom Boyd Rd/Scenic Dr.) then 3-Lanes with Passing Lanes for Remainder of Project	5
1.1	Construct 3-Lanes with Passing Lanes for Entire Project	4
1.2	Construct 4-Lane with 24' Grassed Median for Entire Length of Project	2
2.0	Reduce All Lane Widths from 12' to 11'	2
2.1	Reduce Inside Lane Widths from 12' to 11'. Outside Lane Widths to Remain 12'	5
3.0	Reduce Paved Shoulder Width from 6.5' Partial Depth Section to 4' Full Depth Section	5
4.0	Reduce Design and Posted Speed from 55 MPH to 45 MPH from Beginning of Project to Sta 235+00 (Tom Boyd Rd/Scenic Dr.)	5
5.0	Adjust Vertical Curves to Meet Design Speed	Comment
6.0	Reduce Displacements Along Road Widening	5
7.0	Combine Projects into a Single Bid	5

NO.	IDEA	*Ranking
620490- McCAYSVILLE TRUCK BYPASS: ROADWAY (R)		
1.0	Eliminate 4' Flush Median	5
2.0	Reduce Paved Shoulder Width from 10' Partial Depth Section to 4' Partial Depth Section	2
2.1	Reduce Paved Shoulder Width from 10' Partial Depth Section to 4' Full Depth Section	5
3.0	Revise Roadway Connections at End of Project (Hwy 68/Bypass)	3
4.0	Combine Projects into a Single Bid	5
5.0	Reduce Tie-in Length at End of Project (Hwy 68/Bypass)	5

NO.	IDEA	*Ranking
620490- McCAYSVILLE TRUCK BYPASS: BRIDGE (B)		
1.0	Reduce Bridge Widths from 48' to 44'	5
2.0	Bridge 1, Extend Bridge to 3-Span and Eliminate Walls	5
3.0	Bridge 4, Extend Bridge to 9-Spans and Eliminate Walls	5
4.0	Combine Bridges 2 and 3 into a Single Bridge	5
4.1	Eliminate Bridge 3 and Provide Access Road to East Side of the Bypass	5
5.0	Revise Alignment at Bridge 4 and Construct Straight Bridge on Tangent	3

TEAM STUDY AGENDA

VALUE ENGINEERING WORKSHOP AGENDA

For

GEORGIA DEPARTMENT OF TRANSPORTATION

PI #621340- and PI #620490-

**SR 5 Widening from SR 2 to Proposed McCaysville Bypass; and McCaysville Bypass
Fannin County, Georgia**

28 HOUR – VE STUDY

29 August-1 September, 2016

The value engineering workshop for the subject project will be conducted for 3-1/2 days from 29 August - 1 September 2016, **in the Engineering Services Conference Room (5CR1L2) on the 5th floor of the GDOT General Office Facility located at 600 W. Peachtree Street NW, Atlanta GA 30308; POC – Matt Sanders @ (404)631-1752 voice**

Pre-workshop Activities

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

MONDAY

0800 - 0900

VE Team Introduction Phase

Tom Orr, PE, CVS
VE Team Leader, MBP
(VE Team Only)

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

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

0900 - 1030

Project Design Briefing

VE Team; A/E, GDOT

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

MONDAY (CONTINUED)

1030 - 1200 **Function Analysis and Risks** VE Team

The VE team will discuss the required functions and inherent risks of the project. The project cost model will be analyzed to identify functions provided by all project features.

1200 - 1300 **Lunch**

1300 - 1600 **Creative Phase** VE Team

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

- What is the system/item?***
- What does it do (what is its basic function)?***
- What must it do?***
- What does it cost?***
- What is the item worth?***
- What else will do the same, or a better job?***
- What does that alternative cost?***

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

1600 - 1700 **Analysis Phase** VE Team

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

TUESDAY

0800 - 1700 **Development Phase** VE Team

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

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

WEDNESDAY

0800 - 1200 **Development Phase** VE Team

1200 - 1300 Lunch

1300 - 1700 **Development Phase & Quality Review** VE Team

THURSDAY

0800 – 0900 **Prepare for Presentation** VE Team

0900 – 1000 **VE Presentation** VE Team Members, Design Team & GDOT Reps

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

1000 – 1200 **VE Team Wrap-up & Final QC/QA** VE Team Members only

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