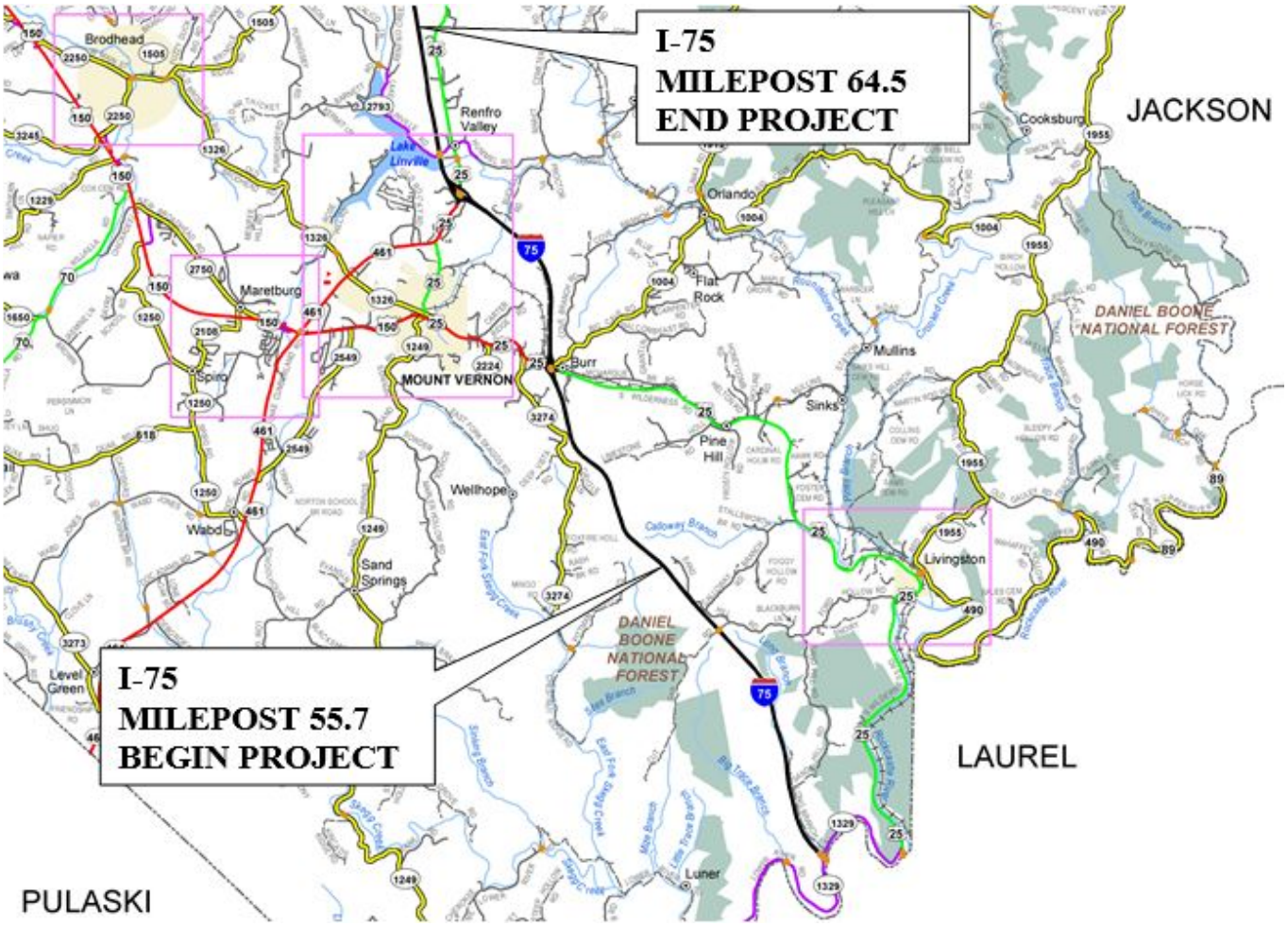
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

Final Value Engineering Study Report
VE Study Number 201603



Study Dates: October 25-28, 2016

Kentucky Transportation Cabinet
Division of Highway Design
200 Mero Street
Frankfort, KY 40622

Contact: **Patrice Miller, CVS®**
(602) 493-1947

September 2016

Guiding Teams – Building Success

February 1, 2017

Mr. Shawn Russell
Value Engineering Coordinator
Kentucky Transportation Cabinet
Division of Highway Design
200 Mero Street
Frankfort, KY 40622
Shawn.Russell@ky.gov

Re: I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County
Final Value Engineering Study Report (VE Study Number 201603)

Dear Shawn:

Transmitted herewith is the pdf copy of the Final Value Engineering Study Report for the above referenced project. Five printed copies of the report will be mailed to you.

RHA appreciates your assistance and cooperation. Should you have any questions, please contact us at (602) 493-1947.

Sincerely,

RHA, LLC

Patrice Miller, CVS®
Managing Partner
Patrice@TeamRHA.com

Value Engineering Study
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

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INTRODUCTION

Value Engineering Study
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

Introduction

The value methodology (Synonyms: value analysis, value engineering and value management) is a function-oriented, systematic, team approach to add customer value to a program, facility, system, or service. Improvements like performance, quality, initial and life cycle cost are paramount in the value methodology. The value engineering workshop was conducted in accordance with the methodology as established by SAVE International, "The Value Society," and was structured using the Job Plan as outlined below:

Value Methodology

- **Pre-Study**
  - Identify team members
  - Define workshop location
  - Review project documentation
  - Prepare for the study (workshop)
- **Value Study (Workshop) Job Plan**
  - *Information Phase*
    - Gather, organize and analyze data,
    - Define costs and cost models,
    - Define the problem/purpose of the study,
    - Define study scope, define project goals and workshop goals
    - Complete a risk analysis
  - *Function Analysis Phase*
    - Define and evaluate functions
    - Define needs versus wants
  - *Creative Phase*
    - What else will perform the functions?
    - Is this function required?
  - *Evaluation Phase*
    - Rank and rate the ideas to select
    - Refine the best ideas for further development
  - *Development Phase*
    - Develop the best ideas into VE Alternatives with support and justification
  - *Presentation/Implementation*
    - VE team presents results
    - Prepare and issue the report
    - Report implementation ideas
- **Post Study**
  - Implement approved alternatives
  - Monitor status

Report Contents

The report provides the outcomes associated with this VE workshop and includes the following sections:

Introduction – This section outlines the VE process and explains the content of the report.

Executive Summary – This section is an overview that includes project background, summary of results, a list of the VE study team members, and the VE punch list.

VE Recommendations and Design Suggestions – Each completed alternative and design suggestion has a separate workbook and is divided by function and project section, where applicable. Each workbook contains the following information:

- Baseline Assumption
- Proposed Alternative
- Benefits and Risks/Challenges of the Proposed Alternative
- Discussion and Justification
- Implementation Requirements
- Detailed Cost Estimate
- Life Cycle Cost Analysis, as needed
- Drawings and/or Sketches for the Baseline and the Proposed Alternative, as needed

Appendices

A – Study Participants
B – Pareto Cost Models and Cost Estimate Corrections
C – Function Analysis
D - Creative List and Evaluation
E – Supporting Data
- Team Observations
- Risk Identification
- Workshop Agenda
- In-brief Presentation
- Out-brief Presentation
- List of Standard KYTC VE Report Abbreviations

EXECUTIVE SUMMARY

Executive Summary

Background

A Value Engineering (VE) study was conducted for the I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10) and I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20) project during October 25-28, 2016 for the Kentucky Transportation Cabinet (KYTC).

Project Description

The purpose of this project is to increase capacity and safety along the I-75 corridor. The need for the project has developed as the traffic on I-75 has increased since its original construction. The project is needed to provide typical section and lane continuity with the proposed reconstruction of adjacent sections of I-75 through Kentucky. The need for an additional lane on the entrance ramps to northbound I-75 and the proposed truck climbing lane on mainline I-75 is the result of slow moving traffic on the up-grade ramp not being able to reach the appropriate entrance speed onto I-75 causing congestion on the ramp and mainline.

The project is due to let according to the following schedule (and work completed for each section within two construction seasons):

- Section No. 08-0006.10 – Spring 2017
- Section No. 08-0006.20 – Spring 2018
- Section No. 08-0006.30 – Fall 2016 (contiguous section, not a part of this VE study)

Workshop Objectives

The workshop objectives were identified at the start of the workshop to ensure the best value is attained while meeting the project goals and performance attributes. The project decision makers identified the following objectives for the workshop:

- Review pavement structure for both sections
- Identify opportunities to reduce impacts, e.g., review typical section near Lake Linville
- Evaluate truck lane and ramp traffic data/design
- Identify opportunities to reduce right-of-way takes (Section No. 08-0006.10)

Project Constraints

The project decision makers identified the project constraints for the VE team at the start of the VE study as:

- Both the vertical and horizontal alignments are set
- Right-of-way for Section No. 08-0006.20 is already purchased

Summary of Results

The VE team brainstormed a total of 56 ideas. Of the 56 ideas, 18 ideas were identified for further development into VE proposed alternatives, including cost impacts, as appropriate. Of the 18 VE proposed alternatives, one (VE-14) was not recommended by the VE team. There were four Design Suggestions which were also developed without cost impacts and 18 Design Comments for KYTC and the designers to consider. Of the Design Suggestions, two (VE-19 and VE-20) were not recommended by the VE team.

The description and further discussion of these are included in the VE Proposed Alternatives & Design Suggestions section of this report. The following table shows the proposed alternatives developed and the cost impacts. The costs shown in parenthesis represent an additional cost to the project. Those shown as positive numbers represent a savings.

VALUE ENGINEERING PROPOSALS

VE Alternative No.	Idea Title (×Not Recommended by VE Team)	Initial Cost Savings / (Add)	O&M	Total Life Cycle Cost
SL	**Support Load**			
1	Re-proportion pavement layer for inside median shoulder	$896,455		$896,455
2	Add stabilized base layer in the widening section	($227,687)		($227,687)
3	Add geogrid to reduce pavement section in the widening section	$1,223,350		$1,223,350
4	Reduce shoulder width adjacent to truck lane	$1,052,621		$1,052,621
5	Add approach slabs at bridges to minimize settlement	($315,000)		($315,000)
6	Add transverse trench drain bleeders in the existing pavement to relieve water pressure	($399,322)	$316,000	($83,322)
7	Eliminate I-75 outside pavement edge drains	$596,860		$596,860
MT	**Maintain Traffic**			
8	Add bid item for radar speed signs to reduce speed during construction	($7,400)		($7,400)
9	Extend lane closure in advance of the project limits	($2,000)		($2,000)

VE Alternative No.	Idea Title (×Not Recommended by VE Team)	Initial Cost Savings / (Add)	O&M	Total Life Cycle Cost
10	Add a requirement for the contractor to use a protect-the-queue vehicle	($20,000)		($20,000)
11	Add rumble strips prior to construction zone	($12,000)		($12,000)
SG	**Separate Grade**			
12	Rebuild existing wall at northbound exit ramp 59 interchange (Section No. 08-0006.10)	($411,809)		($411,809)
T	**Traffic**			
13	Reduce the number of lanes on Ramp B from two to one	$214,000		$214,000
14×	End ramp taper before the dam at I-75 northbound, Interchange 62	$485,776		$485,776
15	Extend island closer to through lane at exit 62 off-ramp C-1 using a painted island	$8,370		$8,370
16	Extend raised concrete island at exit 62 off-ramp C-1 closer to the US 25 through lane	($2,375)		($2,375)
17	Add painted hatching between the C-1 ramp concrete island and the US 25 driving lane on the shoulder	($486)		($486)
M	**Miscellaneous**			
18	Identify on-site waste areas	$161,738		$161,738

DESIGN SUGGESTIONS (Workbook Prepared, No Costing)

VE Alternative No.	Idea Title (× Not Recommended by VE Team)
SL	**Support Load**
19×	Re-proportion pavement layer for driving lane
20×	Reduce inside shoulder width from 14' to 12'
21	Validate overlay design
MT	**Maintain Traffic**
22	Add lane rental to the contract requirements

DESIGN & ESTIMATE COMMENTS (No Workbook Prepared)

VE Alternative No.	Idea Title
SL	**Support Load**
23	Update bridge drawings to reflect revised phasing
MT	**Maintain Traffic**
24	Review road closure time periods to minimize impacts to construction and the traveling public
25	Review blasting time periods to minimize impacts to construction and the traveling public
26	Add bid item for message boards to inform drivers during construction
27	Identify emergency access locations/routes during construction. As part of its traffic management plan for the reduction of traffic delays and for providing emergency vehicle access during construction, KYTC may desire to develop plans and provisions for the access to incident sites for emergency vehicle personnel and other necessary personnel for all stages of construction. This approach may help to reduce traffic delay and decrease the emergency response time. Practices adopted could include contractor supplied service patrols, using a professional advertising agency to keep the public informed of construction activities, using emergency medical services, establishing continuous police presence, establishing a staging area, using portable changeable message signs, establishing a "hotline," and establishing a detour and alternate route signing.
T	**Traffic**
28	Verify the taper at Station 3294 meets standards
29	Confirm taper lengths and rates meet current AASHTO standards
30	Lengthen taper for truck lane drop from 300' to 840' (70:1) to meet AASHTO standards
31	Update traffic counts at the ramp terminals
32	Use painted flush islands throughout the project
GS	**Geotechnical/Structures**
33	On plans, KY2793 should read "Lake Linville Road" in lieu of "Rose Hill Road"
34	Finalize geotechnical report as soon as possible
MM	**Minimize Maintenance**
35	Add marker at edge drain outlets to mark for scheduled maintenance
36	Add No. 57 aggregate as backfill for edge drain trench (detail "D" on Section No. 08-0006.20)
M	**Miscellaneous**
37	Re-evaluate Categorical Exclusion environmental document as early as possible to avoid or minimize schedule delay, right-of-way issues and costs
38	Meet with Division of Water

VE Alternative No.	Idea Title
29	Update cost estimates (e.g., two different excavation unit costs for Section Nos. 08-006.10 and 08-006.20)
40	Make the superelevations consistent for the inside median shoulder (all three sections)
41	Add signage ("add lane") at right turn off of exit 62 off-ramp C

Team Observations

Upon completion of the project presentation, the team discussed the various elements of the project including the project information they had reviewed prior to the workshop and the information provided during the presentation. These observations can be found in Appendix E.

Function Analysis

Function definition and analysis is the heart of Value Engineering. It is the primary activity that separates VE from all other "improvement" processes. The objective of this phase is to ensure the entire team agrees upon the purposes for the project elements. Furthermore, this phase assists with development of the most beneficial areas for continuing the study. The data supporting function analysis can be found in Appendix C.

The VE team identified the functions using active verbs and measurable nouns. This process allowed the team to truly understand all of the functions associated with the project. The basic function was defined as *Increase Capacity*.

VE Study Team
(from left to right)
- William Lucas, PE – KYTC
- Rodney Little, PE – QK4
- Gary Sharpe, PE – Palmer Engineering
- Bob Jones, PE, PLS – KYTC
- Keith Damron, PE – AEI
- Dennis Mitchell, PE – AEI
- Jeremy Lukat, PE – QK4

(not pictured)
- Shawn Russell, PE, AVS – KYTC
- Pat Miller, Certified Value Specialist (CVS) Team Leader – RHA, LLC

Certification

This is to verify that the Value Engineering Study was conducted in accordance with standard value engineering principles and practices.

Patrice Miller, CVS®
RHA, LLC

VALUE ENGINEERING PUNCH LIST
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20

ITEM NO. **08-0006.10 and 08-0006.20** PROJECT COUNTY: **Rockcastle** DATE OF STUDY: **October 25-28, 2016**

VE Alternative Number	VE Team Top Pick	Description	Activity (Y,N,UC-Date)	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving	Life Cycle Cost Savings (Total Present Worth)	FHWA Categories	Remarks
Support Load (SL)										
1		Re-proportion pavement layer for inside median shoulder			$9,925,054	$9,028,599	$896,455			
2		Add stabilized base layer in the widening section			$20,322,528	$20,550,215	($227,687)			
3		Add geogrid to reduce pavement section in the widening section			$20,322,528	$19,099,178	$1,223,350			
4		Reduce shoulder width adjacent to truck lane			$1,052,621	$0	$1,052,621			
5		Add approach slabs at bridges to minimize settlement			$0	$315,000	($315,000)			
6		Add transverse trench drain bleeders in the existing pavement to relieve water pressure			$0	$399,322	($399,322)	$316,000		
7		Eliminate I-75 outside pavement edge drains			$890,088	$293,228	$596,860			
Maintain Traffic (MT)										
8		Add bid item for radar speed signs to reduce speed during construction			$0	$7,400	($7,400)			
9		Extend lane closure in advance of the project limits			$0	$2,000	($2,000)			
10		Add a requirement for the contractor to use a protect-the-queue vehicle			$0	$20,000	($20,000)			
11		Add rumble strips prior to construction zone			$0	$12,000	($12,000)			
Separate Grade (SG)										
12		Rebuild existing wall at northbound exit ramp 59 interchange (Section No. 08-0006.10)			$300,000	$711,809	($411,809)			
Traffic (T)										
13		Reduce the number of lanes on Ramp B from two to one			$416,167	$202,167	$214,000			
15		Extend island closer to through lane at exit 62 off- ramp C-1 using a painted island			$9,450	$1,080	$8,370			
16		Extend raised concrete island at exit 62 off-ramp C-1 closer to the US 25 through lane			$11,102	$13,477	($2,375)			
17		Add painted hatching between the C-1 ramp concrete island and the US 25 driving lane on the shoulder			$0	$486	($486)			

VE Alternative Number	VE Team Top Pick	Description	Activity (Y,N,UC-Date)	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving	Life Cycle Cost Savings (Total Present Worth)	FHWA Categories	Remarks
Miscellaneous (M)										
18		Identify on-site waste areas			$5,680,789	$5,519,051	$161,738			
Design Suggestions										
21		Validate overlay design								
22		Add lane rental to the contract requirements								
Design Comments										
23		Bridge drawings need to reflect revised phasing								
24		Review road closure time periods to minimize impacts to construction and the traveling public								
25		Review blasting time periods to minimize impacts to construction and the traveling public								
26		Add bid item for message boards to inform drivers during construction								
27		Identify emergency access locations/routes during construction. As part of its traffic management plan for the reduction of traffic delays and for providing emergency vehicle access during construction, KYTC may desire to develop plans and provisions for the access to incident sites for emergency vehicle personnel and other necessary personnel for all stages of construction. This approach may help to reduce traffic delay and decrease the emergency response time. Practices adopted could include contractor supplied service patrols, using a professional advertising agency to keep the public informed of construction activities, using emergency medical services, establishing continuous police presence, establishing a staging area, using portable changeable message signs, establishing a "hotline," and establishing a detour and alternate route signing.								
28		Verify the taper at Station 3294 meets standards								
29		Confirm taper lengths and rates meet current AASHTO standards								
30		Lengthen taper for truck lane drop from 300' to 840' (70:1) to meet AASHTO standards								
31		Update traffic counts at the ramp terminals								
32		Use painted flush islands throughout the project to separate traffic								
33		On plans, KY2793 should read "Lake Linville Road" in lieu of "Rose Hill Road"								

VE Alternative Number	VE Team Top Pick	Description	Activity (Y,N,UC-Date)	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving	Life Cycle Cost Savings (Total Present Worth)	FHWA Categories	Remarks
34		Finalize geotechnical report as soon as possible								
35		Add marker at edge drain outlets to mark for scheduled maintenance								
36		Add No. 57 aggregate as backfill for edge drain trench (detail "D" on Section No. 08-0006.20)								
37		Re-evaluate Categorical Exclusion environmental document as early as possible to avoid or minimize schedule delay, right-of-way issues and costs								
38		Meet with Division of Water								
39		Update cost estimates (e.g., two different excavation unit costs for Section Nos. 08-006.10 and 08-006.20)								
40		Make the superelevations consistent for the inside median shoulder (all three sections)								
41		Add signage ("add lane") at right turn off of exit 62 off-ramp C								

VE PROPOSED ALTERNATIVES & DESIGN SUGGESTIONS

VE Proposed Alternatives & Design Suggestions

Introduction

The VE study evaluated the 56 ideas that were brainstormed during the Creative Phase. The 18 completed Alternatives are located in this section of the report. The alternatives developed included, as needed, the following information:

- Baseline Assumption
- Proposed Alternative
- Benefits and Risks/Challenges of the Proposed Alternative
- Discussion and Justification
- Implementation Requirements
- Detailed Cost Estimate
- Life Cycle Cost Analysis
- Pavement Calculations
- Drawings and/or Sketches for the Baseline and the Proposed Alternative

Additionally, four Design Suggestions were developed to provide some additional design direction to the design team. These are also included in this section of the report. The identified Design Comments can be found on the creative idea list in Appendix D.

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Re-proportion pavement layer for inside median shoulder

FUNCTION: **Support Load**

BASELINE ASSUMPTION:

Widening to the inside will take place in the depressed median and involve full depth construction with Structural Numbers (SN) associated with the proposed design as follows: Section 8-6.10 -- SN = 7.58; Section 8-6.20 -- SN = 7.47.

PROPOSED ALTERNATIVE:

The proposed design was evaluated for sections 8-6.10 and 8-6.20. As noted in the discussion under Value Engineering Alternative 19 (Design Suggestion), *Re-proportion pavement layer for driving lane* , the results of these analyses indicated that the structural numbers for the proposed design effectively satisfied Structural Number requirements for the inside driving lane and there was no opportunity for re-proportioning the pavement layers for the driving lanes for possible cost savings. However, the analysis did indicate a potential savings for re-proportioning the pavement layers for the inside median shoulder. The KYTC Pavement Design Guide (2-2007) indicates that the shoulder may be designed based on 20% of the mainline ESALs (assuming that the shoulders are not anticipated for use as a future driving lane). Thus, the inside median shoulders could be designed for a minimum SN = 6.44 (Section 8-6.10) and SN = 6.51 (Section 8-6.20). See **Sketch of Proposed Alternative** for an alternate layer pavement schedule for the inside median shoulder.

BENEFITS	**RISKS/CHALLENGES**
• Improves the drainage under the pavement	• If the future use of the shoulder was to change, the pavement would need to be reevaluated
• Allows for a better value pavement product while maintaining the structural requirements	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ 9,925,054	$ -	$ 9,925,054
PROPOSED ALTERNATIVE:	$ 9,028,599	$ -	$ 9,028,599
TOTAL (Baseline less Proposed)	$ 896,455	$ -	**$ 896,455**

Costs represent the two section estimates

SAVINGS

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Re-proportion pavement layer for inside median shoulder

DISCUSSION/JUSTIFICATION:

An analysis of the proposed mainline pavement designs was completed and is summarized in **Table VE-01A** and **Table VE-01B**. From these analyses, it was noted that Structural Numbers (SN) associated with the proposed designs have the following Structural Numbers: Section 8-6.10 -- SN = 7.58; Section 8-6.20 -- SN = 7.47. These SNs are slightly less than the minimum required SNs for the respective ESAL levels -- Section 8-6.10 (53,000,000) -- 7.94 and Section 8-6.20 (58,000,000) -- 8.04. While these Structural Numbers are slightly less than required, this is not considered a design flaw in that a much greater proportion of truck traffic will be in the two outside lanes. Thus, no additional pavement structure was required and this further confirmed that there was not a potential opportunity for savings by re-proportioning the pavement layers for the inside driving lane. However, the pavement layers for the inside shoulder can be re-proportioned as described in the **Sketch of Proposed Alternative**. Twenty percent of the mainline ESALs for shoulder design is as follows: Section 8-6.10 (10,600,000 ESALs) and Section 8-6.20 (11,600,000 ESALs). Required Structural Numbers for these ESAL Levels are: Section 8-6.10 (10,600,000) -- SN = 6.44 and Section 8-6.20 (11,600,000) -- SN = 6.51. This will allow the elimination of the proposed bottom asphalt base course and replacement of that material with additional Drainage Blanket TY II - Asphalt. The specifics for determination of the proposed re-proportioning of pavement layers are shown on **Table VE-01A** and **Table VE-01B**, and indicate the following Structural Numbers: Section 8-6.01 (SN = 6.73) and Section 8-6.02 (SN = 6.62).

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Re-proportion pavement layer for inside median shoulder

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
SECTION 8-6.10								
DGA BASE		TON	53,845	20.00	1,076,900	53,845	20.00	1,076,900
DRAINAGE BLANKET-TY II-ASPH		TON	21,460	55.00	1,180,300	40,774	55.00	2,242,570
CL4 ASPHALT BASE 1.50D PG 64-22		TON	19,314	65.00	1,255,410			
CL4 ASPHALT BASE 1.00D PG 64-22		TON	13,949	65.00	906,685	13,949	65.00	906,685
CL4 ASPHALT BASE 1.00D PG 76-22		TON	12,876	65.00	836,940	12,876	65.00	836,940
CL4 ASPHALT SURFACE 0.38A PG 76-22		TON	5,365	85.00	456,025	5,365	85.00	456,025
					5,712,260			**5,519,120**
							(BASELINE LESS PROPOSED)	**193,140**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Re-proportion pavement layer for inside median shoulder

BACKUP PAVEMENT CALCULATIONS (Section 8-6.10)

REPROPORTIONED MEDIAN SHOULDER

Latest Pavement Design — Full Depth Construction in Existing Median

BASELINE:

Lenth (LF)	Width (FT)	AREA (SY)
25083	28	78036

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	53,845	$ 20.00
18	DRAINAGE BLANKET-TY II-ASPH	5.00	110	TON	21,460	$ 55.00
208	CL4 ASPHALT BASE 1.50D PG 64-22	4.50	110	TON	19,314	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.25	110	TON	13,949	$ 65.00
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	12,876	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	5,365	$ 85.00

29.00

PROPOSED: **REPROPORTIONED MEDIAN SHOULDER**

Lenth (LF)	Width (FT)	AREA (SY)
25083	28	78036

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	53,845	$ 20.00
18	DRAINAGE BLANKET-TY II-ASPH	9.50	110	TON	40,774	$ 55.00
208	CL4 ASPHALT BASE 1.50D PG 64-22	0.00	110	TON	-	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.25	110	TON	13,949	$ 65.00
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	12,876	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	5,365	$ 85.00

29.00

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Re-proportion pavement layer for inside median shoulder

TABLE VE-01A (Section 8-6.10)

Full Depth Construction in Existing Median
CBR 3
53,000,000 ESALs

Existing Layers -- Inside Driving Lane and Inside Shoulder							**Re-Proportioned Shoulder**		
			Thickness	*Layer Coefficient*	*Structural Number (SN)*		*Thickness*	*Layer Coefficient*	*Structural Number (SN)*
DGA Base			12	0.14	1.68		12	0.14	1.68
Drainage Blanket TY II - Asph			5	0.21	1.05		9.5	0.21	1.995
CL 4 Asphalt Base 1.50D PG 64-22			4.5	0.4	1.8		0	0.4	0
CL 4 Asphalt Base 1.00D PG 64-22			3.25	0.4	1.3		3.25	0.4	1.3
CL 4 Asphalt Base 1.00D PG 76-22			3	0.4	1.2		3	0.4	1.2
CL 4 Asphalt Surface 0.38A PG 76-22			1.25	0.44	0.55		1.25	0.44	0.55
			29		**7.58**		29		**6.73**

				Theoretical Shoulder Required SN values					
Required SN		*53,000,000 ESALs*		*26,500,000 ESALS (50% Mainline)*		*21,200,000 ESALs (40% Mainline)*		*10,600,000 ESALs (20% Mainline)*	
		CBR 3		CBR 3		CBR 3		CBR 3	
	33% AC	8.61		7.84		7.62		6.98	
	50% AC	8.36		7.58		7.36		6.74	
	75% AC	7.94	Minimum	7.25	Minimum	7.04	Minimum	6.44	Minimum
		8.30		7.56		7.34		6.72	

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Re-proportion pavement layer for inside median shoulder

DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
SECTION 8-6.20								
DGA BASE		TON	49,313	18.00	887,634	49,313	18.00	887,634
DRAINAGE BLANKET-TY II-ASPH		TON	15,723	25.24	396,849	33,412	25.24	843,319
CL4 ASPHALT BASE 1.50D PG 64-22		TON	17,689	65.00	1,149,785			
CL4 ASPHALT BASE 1.00D PG 64-22		TON	13,758	55.54	764,119	13,758	55.54	764,119
CL4 ASPHALT BASE 1.00D PG 76-22		TON	11,793	65.00	766,545	11,793	65.00	766,545
CL4 ASPHALT SURFACE 0.38A PG 76-22		TON	4,914	50.44	247,862	4,914	50.44	247,862
					4,212,794			**3,509,479**
							(BASELINE LESS PROPOSED)	**703,315**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Re-proportion pavement layer for inside median shoulder

BACKUP PAVEMENT CALCULATIONS (Section 8-6.20)

REPROPORTIONED MEDIAN SHOULDER

Latest Pavement Design — Full Depth Construction in Existing Median

BASELINE:

Lenth (LF)	Width (FT)	AREA (SY)
22972	28	71468

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	49,313	$ 18.00
18	DRAINAGE BLANKET-TY II-ASPH	4.00	110	TON	15,723	$ 25.24
208	CL4 ASPHALT BASE 1.50D PG 64-22	4.50	110	TON	17,689	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.50	110	TON	13,758	$ 55.54
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	11,793	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	4,914	$ 50.44
		28.25				

PROPOSED: REPROPORTIONED MEDIAN SHOULDER

Lenth (LF)	Width (FT)	AREA (SY)
22972	28	71468

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	49,313	$ 18.00
18	DRAINAGE BLANKET-TY II-ASPH	8.50	110	TON	33,412	$ 25.24
208	CL4 ASPHALT BASE 1.50D PG 64-22	0.00	110	TON	-	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.50	110	TON	13,758	$ 55.54
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	11,793	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	4,914	$ 50.44
		28.25				

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE:	Re-proportion pavement layer for inside median shoulder

TABLE VE-01B (Section 8-6.20)

Full Depth Construction in Existing Median
CBR 3
58,000,000 ESALs

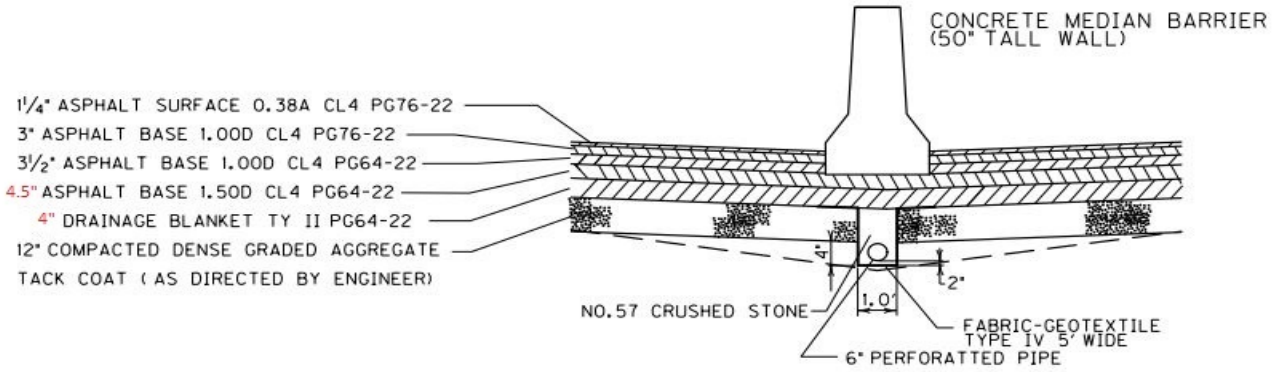
Existing Layers -- Inside Driving Lane and Inside Shoulder	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*	**Re-Proportioned Shoulder**	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*
DGA Base	12	0.14	1.68		12	0.14	1.68
Drainage Blanket TY II - Asph	4	0.21	0.84		8.5	0.21	1.785
CL 4 Asphalt Base 1.50D PG 64-22	4.5	0.4	1.8		0	0.4	0
CL 4 Asphalt Base 1.00D PG 64-22	3.5	0.4	1.4		3.5	0.4	1.4
CL 4 Asphalt Base 1.00D PG 76-22	3	0.4	1.2		3	0.4	1.2
CL 4 Asphalt Surface 0.38A PG 76-22	1.25	0.44	0.55		1.25	0.44	0.55
	28.25		**7.47**		28.25		**6.62**

		Theoretical Shoulder Required SN values					
Required SN	*58,000,000 ESALs*		*29000000 ESALs*		*23,200,000 ESALs*		*11,600,000 ESALs*	
	CBR 3		CBR 3		CBR 3		CBR 3	
33% AC	8.72		7.94		7.71		7.06	
50% AC	8.47		7.68		7.45		6.81	
75% AC	8.04	Minimum	7.33	Minimum	7.12	Minimum	6.51	Minimum
	8.41		7.65		7.43		6.79	

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

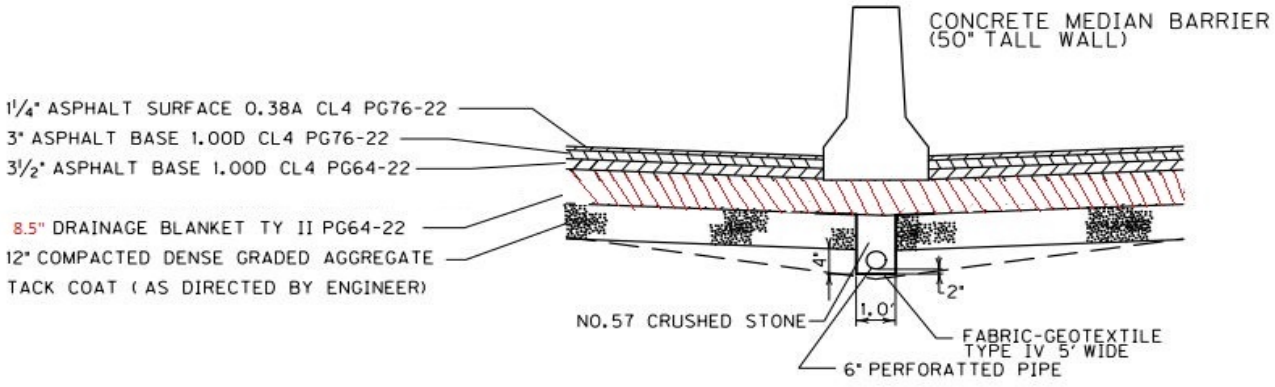
TITLE: Re-proportion pavement layer for inside median shoulder

SKETCH OF BASELINE ASSUMPTION



DETAIL "A"
ITEM 8-6.2

SKETCH OF PROPOSED ALTERNATIVE

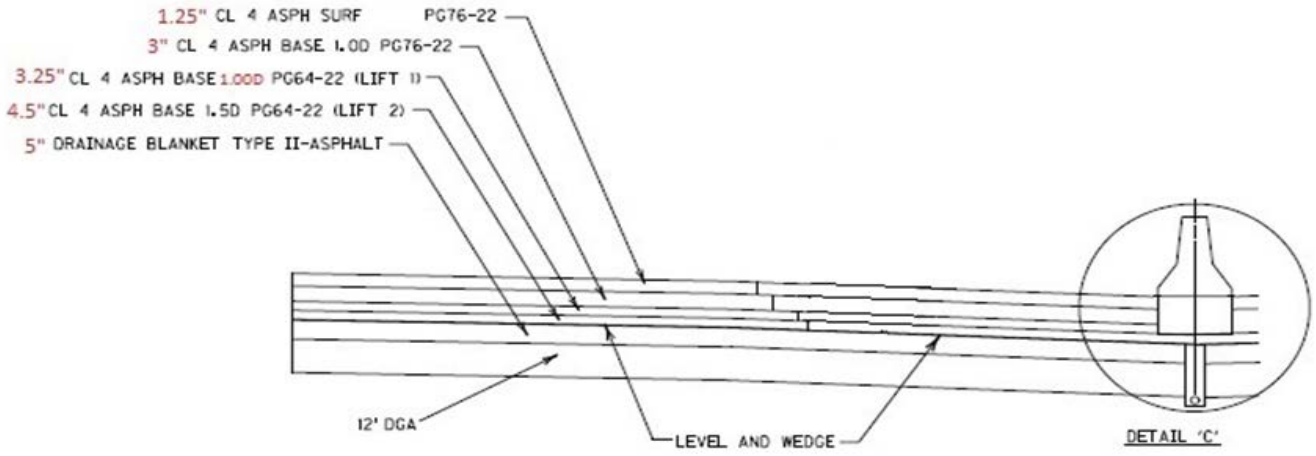


DETAIL "A"
ITEM 8-6.2

VALUE ENGINEERING ALTERNATIVE 1
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Re-proportion pavement layer for inside median shoulder

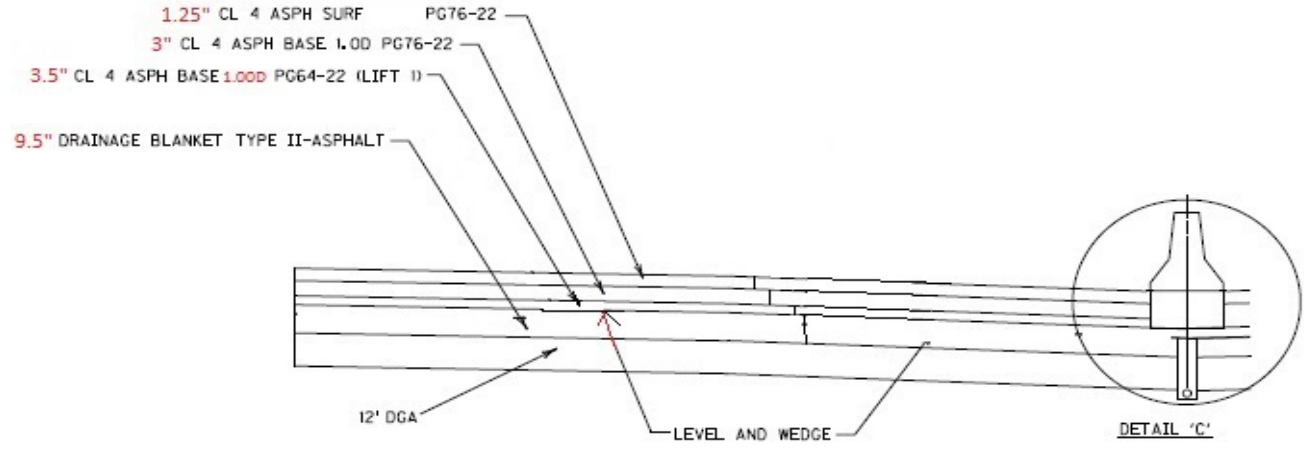
SKETCH OF BASELINE ASSUMPTION



DETAIL B

ITEM 8-6.1

SKETCH OF PROPOSED ALTERNATIVE



DETAIL B

ITEM 8-6.1

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add stabilized base layer in the widening section

FUNCTION: **Support Load**

BASELINE ASSUMPTION:

The current design of the inside lane and shoulder has no stabilization to the subgrade.

PROPOSED ALTERNATIVE:

Because of the existing median depth, the pavement design was evaluated for the potential for using stabilized base in the pavement design. The proposed design was evaluated for each section -- 8-6.10 and 8-6.20. As noted in the discussion under Value Engineering Alternative 19 (Design Suggestion), *Re-proportion pavement layer for driving lane* , the results of these analyses indicated that the Structural Numbers for the proposed design effectively satisfied structural number requirements for the inside driving lane and there was no opportunity for re-proportioning the pavement layers for possible cost savings. The KYTC Pavement Design Guide (2-2007) indicates that stabilized base layers should be considered when the design CBR is less than a CBR 6. See **Sketch of Proposed Alternative** for an alternate layer pavement schedule for the widening to the inside for the inside driving lane and inside median shoulder using stabilized base.

BENEFITS	RISKS/CHALLENGES
• Allows for use of better value pavement product while maintaining the structural requirements	• Requires mobilization and coordination of a specialty stabilization contractor
• Provides stable paving platform for placement of subgrade layers	• Potential dust issues during application and mixing of lime if lime is not placed as a slurry
• Meets the intent of the current Pavement Design Guide	• Additional time required for curing
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 20,322,528	$ -	$ 20,322,528
PROPOSED ALTERNATIVE:	$ 20,550,215	$ -	$ 20,550,215
TOTAL (Baseline less Proposed)	$ (227,687)	$ -	**$ (227,687)**

Costs represent the two section estimates

COST

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add stabilized base layer in the widening section

DISCUSSION/JUSTIFICATION:

An analysis of the proposed mainline pavement designs was completed and is summarized in **Table VE-02A** and **Table VE-02B**. From these analyses, it was seen that Structural Numbers (SN) associated with the proposed designs have the following Structural Numbers: Section 8-6.10 -- SN = 7.58; Section 8-6.20 -- SN = 7.47. These SNs are slightly less than the minimum required SNs for the respective ESAL levels -- Section 8-6.10 (53,000,000) -- 7.94 and Section 8-6.20 (58,000,000) -- 8.04. While these Structural Numbers are slightly less than required, this is not considered a design flaw in that a much greater proportion of truck traffic will be in the two outside lanes. Thus, no additional pavement structure was required and this further confirmed that there was not a potential opportunity for savings by re-proportioning the pavement layers for the inside driving lane. However, the Pavement Design Guide (2-2007) indicates it is typical practice to stabilize subgrade when the design CBR is less than 6. The design CBR used for pavement design is CBR 3 for both sections -- Sections 8-6.10 and 8-6.20. Thus, use of a stabilized base layer in the widening section (inside lane and median shoulder) was analyzed. See **Sketch of Proposed Alternative** for details of an alternate pavement layering scenario using a stabilized layer and re-proportioned asphalt pavement layers.

With re-proportioning of the pavement layer to eliminate the bottom pavement base layers in each section, the following Structural Numbers were determined: Section 8-6.10 (SN = 7.61) and Section 8-6.20 (SN = 7.50). These still effectively satisfy the required design criteria.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add stabilized base layer in the widening section

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
SECTION 8-6.10								
DGA BASE		TON	110,254	20.00	2,205,080	110,254	20.00	2,205,080
DRAINAGE BLANKET-TY II-ASPH		TON	43,942	55.00	2,416,810	83,489	55.00	4,591,895
CL4 ASPHALT BASE 1.50D PG 64-22		TON	39,548	65.00	2,570,620			
CL4 ASPHALT BASE 1.00D PG 64-22		TON	28,562	65.00	1,856,530	28,562	65.00	1,856,530
CL4 ASPHALT BASE 1.00D PG 76-22		TON	26,365	65.00	1,713,725	26,365	65.00	1,713,725
CL4 ASPHALT SURFACE 0.38A PG 76-22		TON	10,986	85.00	933,810	10,986	85.00	933,810
LIME STABILIZED ROADBED (all items)		SY		6.74		159,787	6.74	1,076,964
					11,696,575			**12,378,004**
							(BASELINE LESS PROPOSED)	**(681,429)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Add stabilized base layer in the widening section

BACKUP PAVEMENT CALCULATIONS (Section 8-6.10)

MEDIAN DRIVING LANE & SHOULDER REPROPORTION W/ CHEMICAL STABILIZATION

Latest Pavement Design — Full Depth Construction in Existing Median

BASELINE:

Lenth (LF)	Width (FT)	AREA (SY)
25083	57.333	159787

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	110,254	$ 20.00
18	DRAINAGE BLANKET-TY II-ASPH	5.00	110	TON	43,942	$ 55.00
208	CL4 ASPHALT BASE 1.50D PG 64-22	4.50	110	TON	39,548	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.25	110	TON	28,562	$ 65.00
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	26,365	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	10,986	$ 85.00
		29.00				

PROPOSED: **REPROPORTIONED W/ CHEMICAL STABILAZATION MEDIAN DRIVING LANES & SHOULDER**

Lenth (LF)	Width (FT)	AREA (SY)
25083	57.333	159787

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	110,254	$ 20.00
18	DRAINAGE BLANKET-TY II-ASPH	9.50	110	TON	83,489	$ 55.00
208	CL4 ASPHALT BASE 1.50D PG 64-22	0.00	110	TON	-	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.25	110	TON	28,562	$ 65.00
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	26,365	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	10,986	$ 85.00
	LIME STABILIZED ROADBED (all items)	8.00		SY	159,787	$ 6.74
		37.00				

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Use stabilized base layer in the widening section

TABLE VE-02A (Section 8-6.10)

Full Depth Construction in Existing Median
CBR 3
53,000,000 ESALs

Existing Layers -- Inside Driving Lane and Inside Shoulder	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*	**Re-Proportion with Chemical Stabilization** *Thickness*	*Layer Coefficient*	*Structural Number (SN)*	**No Re-Proportion with Chemical Stabilization** *Thickness*	*Layer Coefficient*	*Structural Number (SN)*
				8	0.11	0.88	8	0.11	0.88
DGA Base	12	0.14	1.68	12	0.14	1.68	12	0.14	1.68
Drainage Blanket TY II - Asph	5	0.21	1.05	9.5	0.21	1.995	5	0.21	1.05
CL 4 Asphalt Base 1.50D PG 64-22	4.5	0.4	1.8	0	0.4	0	4.5	0.4	1.8
CL 4 Asphalt Base 1.00D PG 64-22	3.25	0.4	1.3	3.25	0.4	1.3	3.25	0.4	1.3
CL 4 Asphalt Base 1.00D PG 76-22	3	0.4	1.2	3	0.4	1.2	3	0.4	1.2
CL 4 Asphalt Surface 0.38A PG 76-22	1.25	0.44	0.55	1.25	0.44	0.55	1.25	0.44	0.55
	29		**7.58**	37		**7.61**	37		**8.46**

			Theoretical Shoulder Required SN values					
Required SN	*53,000,000 ESALs*		*26,500,000 ESALS (50% Mainline)*		*21,200,000 ESALs (40% Mainline)*		*10,600,000 ESALs (20% Mainline)*	
	CBR 3		CBR 3		CBR 3		CBR 3	
33% AC	8.61		7.84		7.62		6.98	
50% AC	8.36		7.58		7.36		6.74	
75% AC	7.94	Minimum	7.25	Minimum	7.04	Minimum	6.44	Minimum
	8.30		7.56		7.34		6.72	

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add stabilized base layer in the widening section

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
SECTION 8-6.20								
DGA BASE		TON	100,974	18.00	1,817,532	100,974	18.00	1,817,532
DRAINAGE BLANKET-TY II-ASPH		TON	32,195	25.24	812,602	68,414	25.24	1,726,769
CL4 ASPHALT BASE 1.50D PG 64-22		TON	36,219	65.00	2,354,235			
CL4 ASPHALT BASE 1.00D PG 64-22		TON	28,171	55.54	1,564,617	28,171	55.54	1,564,617
CL4 ASPHALT BASE 1.00D PG 76-22		TON	24,146	65.00	1,569,490	24,146	65.00	1,569,490
CL4 ASPHALT SURFACE 0.38A PG 76-22		TON	10,061	50.44	507,477	10,061	50.44	507,477
LIME STABILIZED ROADBED (all items)		SY		6.74		146,339	6.74	986,325
					8,625,953			**8,172,210**
							(BASELINE LESS PROPOSED)	**453,743**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Add stabilized base layer in the widening section

BACKUP PAVEMENT CALCULATIONS (Section 8-6.20)

REPROPORTION MEDIAN DRIVING LANE & SHOULDER W/ CHEMICAL STABILIZATION

Latest Pavement Design — Full Depth Construction in Existing Median

BASELINE:

Lenth (LF)	Width (FT)	AREA (SY)
22972	57.333	146339

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	100,974	$ 18.00
18	DRAINAGE BLANKET-TY II-ASPH	4.00	110	TON	32,195	$ 25.24
208	CL4 ASPHALT BASE 1.50D PG 64-22	4.50	110	TON	36,219	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.50	110	TON	28,171	$ 55.54
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	24,146	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	10,061	$ 50.44
		28.25				

PROPOSED: MEDIAN DRIVING LANES & SHOULDER W/ CHEMICAL STABILIZATION (NO REPROPORTION)

Lenth (LF)	Width (FT)	AREA (SY)
22972	57.333	146339

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	100,974	$ 18.00
18	DRAINAGE BLANKET-TY II-ASPH	8.50	110	TON	68,414	$ 25.24
208	CL4 ASPHALT BASE 1.50D PG 64-22	0.00	110	TON	-	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.50	110	TON	28,171	$ 55.54
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	24,146	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	10,061	$ 50.44
	LIME STABILIZED ROADBED (all items)	8.00		SY	146,339	$ 6.74
		36.25				

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Use stabilized base layer in the widening section

TABLE VE-02B (Section 8-6.20)

Full Depth Construction in Existing Median
CBR 3
58,000,000 ESALs

Existing Layers -- Inside Driving Lane and Inside Shoulder	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*	**Re-Proportion with Chemical Stabilization**	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*	**No Re-Proportion with Chemical Stabilization**	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*
					8	0.11	0.88		8	0.11	0.88
DGA Base	12	0.14	1.68		12	0.14	1.68		12	0.14	1.68
Drainage Blanket TY II - Asph	4	0.21	0.84		8.5	0.21	1.785		4	0.21	0.84
CL 4 Asphalt Base 1.50D PG 64-22	4.5	0.4	1.8		0	0.4	0		4.5	0.4	1.8
CL 4 Asphalt Base 1.00D PG 64-22	3.5	0.4	1.4		3.5	0.4	1.4		3.5	0.4	1.4
CL 4 Asphalt Base 1.00D PG 76-22	3	0.4	1.2		3	0.4	1.2		3	0.4	1.2
CL 4 Asphalt Surface 0.38A PG 76-22	1.25	0.44	0.55		1.25	0.44	0.55		1.25	0.44	0.55
	28.25		**7.47**		36.25		**7.50**		36.25		**8.35**

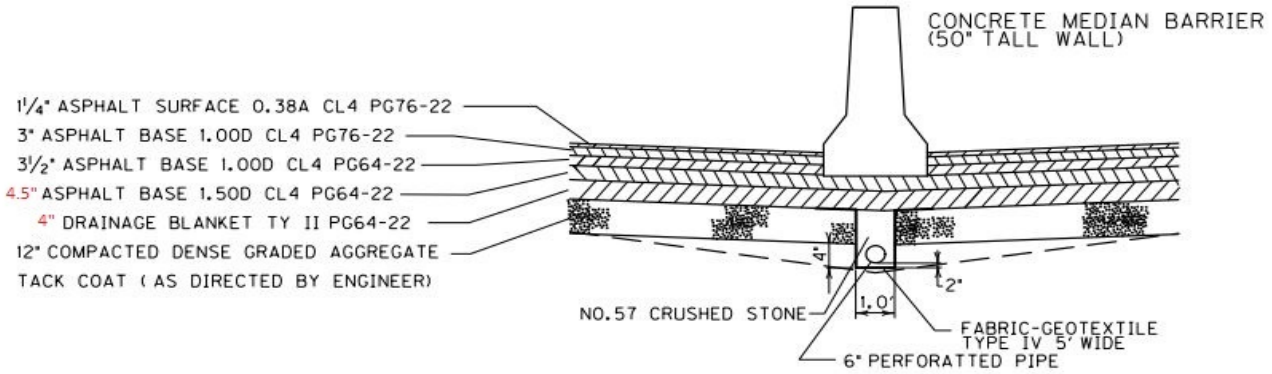
Required SN	*58,000,000 ESALs*		*29000000 ESALs*		*23,200,000 ESALs*		*11,600,000 ESALs*	
	CBR 3		CBR 3		CBR 3		CBR 3	
33% AC	8.72		7.94		7.71		7.06	
50% AC	8.47		7.68		7.45		6.81	
75% AC	8.04	Minimum	7.33	Minimum	7.12	Minimum	6.51	Minimum
	8.41		7.65		7.43		6.79	

Theoretical Shoulder Required SN values

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

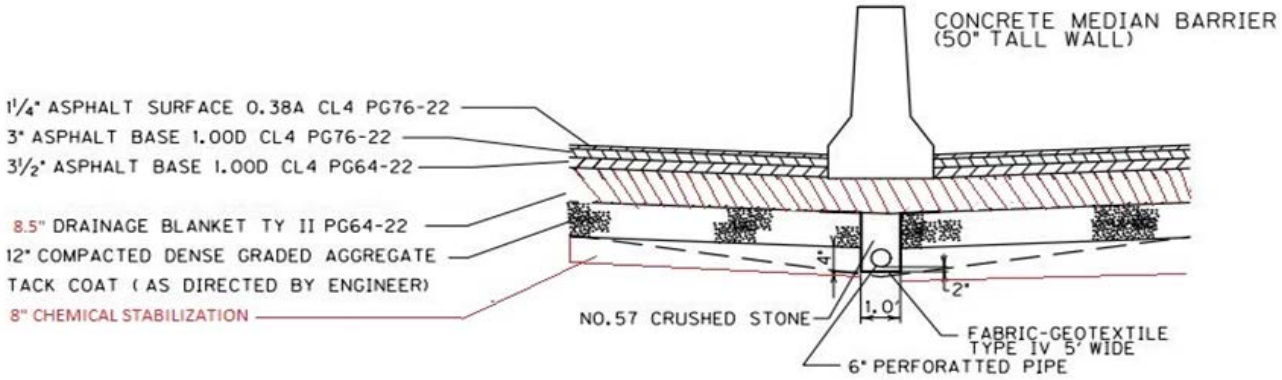
TITLE: Add stabilized base layer in the widening section

SKETCH OF BASELINE ASSUMPTION



DETAIL "A"
ITEM 8-6.2

SKETCH OF PROPOSED ALTERNATIVE

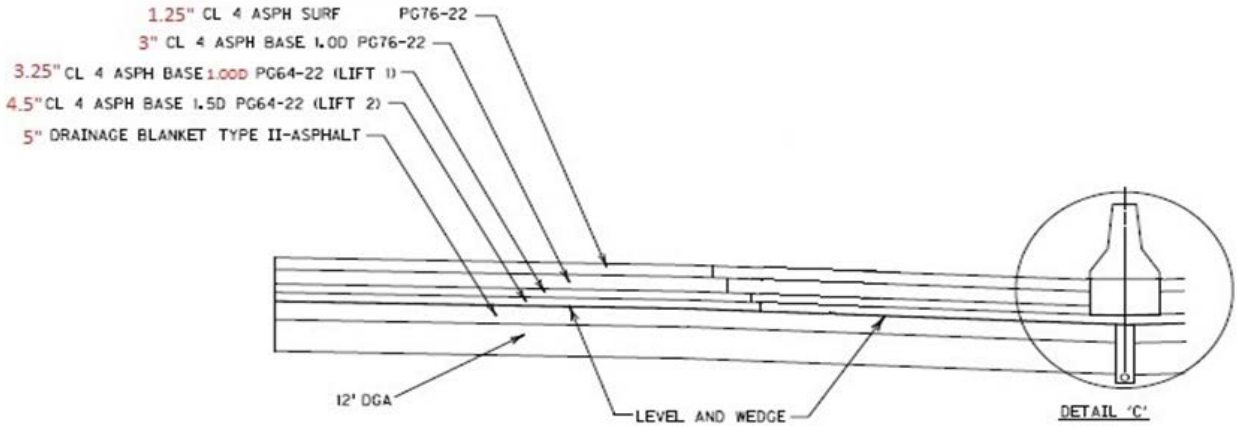


DETAIL "A"
ITEM 8-6.2

VALUE ENGINEERING ALTERNATIVE 2
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add stabilized base layer in the widening section

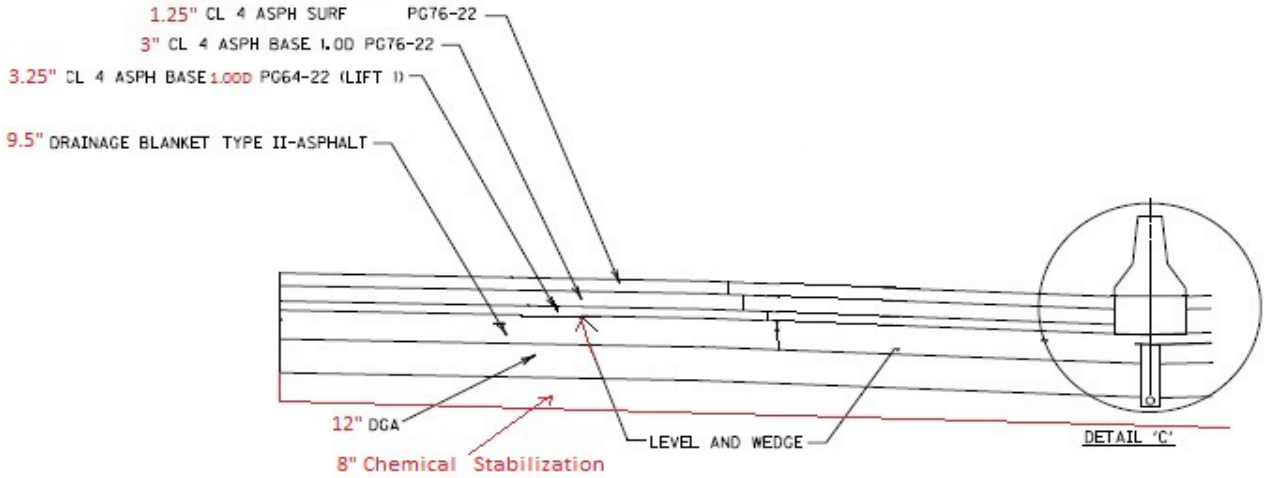
SKETCH OF BASELINE ASSUMPTION



DETAIL B

ITEM 8-6.1

SKETCH OF PROPOSED ALTERNATIVE



DETAIL B

ITEM 8-6.1

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add geogrid to reduce pavement section in the widening section

FUNCTION: **Support Load**

BASELINE ASSUMPTION:

Widening to the inside will take place in the depressed median and involve full depth construction with Structural Numbers (SN) associated with the proposed design as follows: Section 8-6.10 -- SN = 7.58; Section 8-6.20 -- SN = 7.47.

PROPOSED ALTERNATIVE:

The proposed design was evaluated for each section, 8-6.10 and 8-6.20. As noted in the discussion under *VE-19, Re-proportion pavement layer for driving lane* , the results of these analyses indicated that the Structural Numbers for the proposed design effectively satisfied structural number requirements for the inside driving lane and there was no opportunity for re-proportioning the pavement layers for possible cost savings. The KYTC Pavement Design Guide (2-2007) indicates that stabilized base layers should be considered when the design CBR is less than a CBR 6. The **Sketch of Proposed Alternative** shows an alternate layer pavement schedule for the widening for the inside driving lane and inside median shoulder using geogrid to stabilize the aggregate base and to then re-proportion the pavement layers for the inside lane and median shoulder. Under this scenario, geogrid will be placed at the mid-layer of the DGA layer. Because of the thickness of the DGA, the Type IV Fabric may not be required. The **Sketch of Proposed Alternative** illustrates re-proportioning of the pavement layers for the inside driving lane and shoulder pavement.

BENEFITS	**RISKS/CHALLENGES**
• Allows for use of a better value pavement product	• Slightly additional construction time required for placement of DGA base
• Meets the intent of the Current Pavement Design guide	•
•	•
•	•
•	•

COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ 20,322,528	$ -	$ 20,322,528
PROPOSED ALTERNATIVE:	$ 19,099,178	$ -	$ 19,099,178
TOTAL (Baseline less Proposed)	$ 1,223,350	$ -	**$ 1,223,350**

Costs represent the two section estimates

SAVINGS

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add geogrid to reduce pavement section in the widening section

DISCUSSION/JUSTIFICATION:

An analysis of the proposed mainline pavement designs was completed and is summarized in **Table VE-03A** and **Table VE-03B**. From these analyses, it was seen that Structural Numbers (SN) associated with the proposed designs have the following Structural Numbers: Section 8-6.10 -- SN = 7.58; Section 8-6.20 -- SN = 7.47. These SNs are slightly less than the minimum required SNs for the respective ESAL levels -- Section 8-6.10 (53,000,000) -- 7.94 and Section 8-6.20 (58,000,000) -- 8.04. While these Structural Numbers are slightly less than required, this is not considered a design flaw in that a much greater proportion of truck traffic will be in the two outside lanes. Thus, no additional pavement structure was required and this further confirmed that there was not a potential opportuity for savings by re-proportioning the pavement layers for the inside driving lane. However, the Pavement Design Guide (2-2007) indicates typical practice to stabilize subgrade when the design CBR is less than 6. The design CBR used for pavement design is CBR 3 for both sections -- Sections 8-6.10 and 8-6.20. Thus, use of a geogrid placed in the 12" DGA layer in the widening section (inside lane and median shoulder) was analyzed. See **Sketch of Proposed Alternative** for the details of an alternate pavement layering scenario using a geogrid stabilized DGA layer and re-proportioned asphalt pavement layers. The SNs associated with the initially proposed design are Section 8-6.10 (SN = 7.58) and Section 8-6.20 (SN = 7.47). With the use of the geogrid for stabilization but without re-proportioning the pavement layers, the SNs are as follows: Section 8-6.10 (SN = 8.18) and Section 8-6.20 (SN = 8.07). With re-proportioning the pavement layers for the inside (median) shoulder and driving lane, the resultant SNs for the re-proportioned asphalt layers are: Section 8-6.10 (SN = 7.33) and Section 8-6.20 (SN = 7.22). Thus, the re-proportioned layer still effectively satisfies pavement design criteria.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add geogrid to reduce pavement section in the widening section

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
SECTION 8-6.10								
DGA BASE		TON	110,254	20.00	2,205,080	110,254	20.00	2,205,080
DRAINAGE BLANKET-TY II-ASPH		TON	43,942	55.00	2,416,810	83,489	55.00	4,591,895
CL4 ASPHALT BASE 1.50D PG 64-22		TON	39,548	65.00	2,570,620			
CL4 ASPHALT BASE 1.00D PG 64-22		TON	28,562	65.00	1,856,530	28,562	65.00	1,856,530
CL4 ASPHALT BASE 1.00D PG 76-22		TON	26,365	65.00	1,713,725	26,365	65.00	1,713,725
CL4 ASPHALT SURFACE 0.38A PG 76-22		TON	10,986	85.00	933,810	10,986	85.00	933,810
GEOGRID REINFORCEMENT FOR SUBGRADE		SY		2.00		159787	2.00	319,574
					11,696,575			**11,620,614**
							(BASELINE LESS PROPOSED)	**75,961**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Use geogrid to reduce pavement section in the widening section

BACKUP PAVEMENT CALCULATIONS (Section 8-6.10)

MEDIAN DRIVING LANE & SHOULDER REPROPORTIONED W/ GEOGRID

Latest Pavement Design — Full Depth Construction in Existing Median

BASELINE:

Lenth (LF)	Width (FT)	AREA (SY)
25,083	57.333	159,787

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	110,254	$ 20.00
18	DRAINAGE BLANKET-TY II-ASPH	5.00	110	TON	43,942	$ 55.00
208	CL4 ASPHALT BASE 1.50D PG 64-22	4.50	110	TON	39,548	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.25	110	TON	28,562	$ 65.00
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	26,365	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	10,986	$ 85.00
		29.00				

PROPOSED: **REPROPORTIONED MEDIAN DRIVING LANE & SHOULDER W/ GEOGRID**

Lenth (LF)	Width (FT)	AREA (SY)
25,083	57.333	159,787

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	110,254	$ 20.00
18	DRAINAGE BLANKET-TY II-ASPH	9.50	110	TON	83,489	$ 55.00
208	CL4 ASPHALT BASE 1.50D PG 64-22	0.00	110	TON	-	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.25	110	TON	28,562	$ 65.00
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	26,365	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	10,986	$ 85.00
	GEOGRID REINFORCEMENT FOR SUBGRADE			SY	159,787	$ 2.00
		29.00				

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Use geogrid to reduce pavement section in the widening section

TABLE VE-03A (Section 8-6.10)

Full Depth Construction in Existing Median
CBR 3
53,000,000 ESALs

Existing Layers -- Inside Driving Lane and Inside Shoulder			**Re-Proportion With Geogrid**			**No Re-Proportion With Geogrid**		
	Thickness	*Layer Coefficient*	*Structural Number (SN)*	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*
DGA Base	12	0.14	1.68	12	0.14	2.28	12	0.14	2.28
Drainage Blanket TY II - Asph	5	0.21	1.05	9.5	0.21	1.995	5	0.21	1.05
CL 4 Asphalt Base 1.50D PG 64-22	4.5	0.4	1.8	0	0.4	0	4.5	0.4	1.8
CL 4 Asphalt Base 1.00D PG 64-22	3.25	0.4	1.3	3.25	0.4	1.3	3.25	0.4	1.3
CL 4 Asphalt Base 1.00D PG 76-22	3	0.4	1.2	3	0.4	1.2	3	0.4	1.2
CL 4 Asphalt Surface 0.38A PG 76-22	1.25	0.44	0.55	1.25	0.44	0.55	1.25	0.44	0.55
	29		**7.58**	29		**7.33**	29		**8.18**

	Theoretical Shoulder Required SN values		
Required SN *53,000,000 ESALs*	*26,500,000 ESALS (50% Mainline)*	*21,200,000 ESALs (40% Mainline)*	*10,600,000 ESALs (20% Mainline)*
	CBR 3	CBR 3	CBR 3
33% AC	8.61	7.84	7.62	6.98
50% AC	8.36	7.58	7.36	6.74
75% AC	7.94 Minimum	7.25 Minimum	7.04 Minimum	6.44 Minimum
	8.30	7.56	7.34	6.72

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add geogrid to reduce pavement section in the widening section

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
SECTION 8-6.20								
DGA BASE		TON	100,974	18.00	1,817,532	100,974	18.00	1,817,532
DRAINAGE BLANKET-TY II-ASPH		TON	32,195	25.24	812,602	68,414	25.24	1,726,769
CL4 ASPHALT BASE 1.50D PG 64-22		TON	36,219	65.00	2,354,235			
CL4 ASPHALT BASE 1.00D PG 64-22		TON	28,171	55.54	1,564,617	28,171	55.54	1,564,617
CL4 ASPHALT BASE 1.00D PG 76-22		TON	24,146	65.00	1,569,490	24,146	65.00	1,569,490
CL4 ASPHALT SURFACE 0.38A PG 76-22		TON	10,061	50.44	507,477	10,061	50.44	507,477
GEOGRID REINFORCEMENT FOR SUBGRADE		SY				146,339	2.00	292,678
					8,625,953			**7,478,564**
							(BASELINE LESS PROPOSED)	**1,147,389**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Use geogrid to reduce pavement section in the widening section

BACKUP PAVEMENT CALCULATIONS (Section 8-6.20)

MEDIAN DRIVING LANE & SHOULDER REPROPORTIONED W/ GEOGRID

Latest Pavement Design — Full Depth Construction in Existing Median

BASELINE:

Lenth (LF)	Width (FT)	AREA (SY)
22,972	57.333	146,339

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	100,974	$ 18.00
18	DRAINAGE BLANKET-TY II-ASPH	4.00	110	TON	32,195	$ 25.24
208	CL4 ASPHALT BASE 1.50D PG 64-22	4.50	110	TON	36,219	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.50	110	TON	28,171	$ 55.54
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	24,146	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	10,061	$ 50.44

28.25

PROPOSED: **REPROPORTIONED MEDIAN DRIVING LANE & SHOULDER W/ GEOGRID**

Lenth (LF)	Width (FT)	AREA (SY)
22,972	57.333	146,339

ITEM CODE	ITEM	DEPTH (IN)	RATE LBS/SY/In	UNITS	QUANTITY	UNIT PRICE
1	DGA BASE	12.00	115	TON	100,974	$ 18.00
18	DRAINAGE BLANKET-TY II-ASPH	8.50	110	TON	68,414	$ 25.24
208	CL4 ASPHALT BASE 1.50D PG 64-22	0.00	110	TON	-	$ 65.00
217	CL4 ASPHALT BASE 1.00D PG 64-22	3.50	110	TON	28,171	$ 55.54
219	CL4 ASPHALT BASE 1.00D PG 76-22	3.00	110	TON	24,146	$ 65.00
342	CL4 ASPHALT SURFACE 0.38A PG 76-22	1.25	110	TON	10,061	$ 50.44
	GEOGRID REINFORCEMENT FOR SUBGRADE			SY	146,339	$ 2.00

28.25

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Use geogrid to reduce pavement section in the widening section

TABLE VE-03B (Section 8-6.20)

Full Depth Construction in Existing Median
CBR 3
58,000,000 ESALs

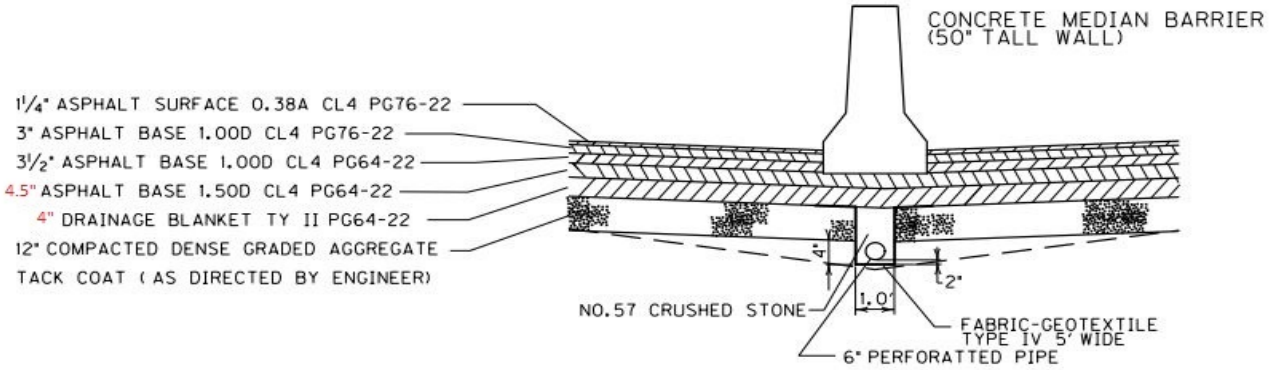
Existing Layers -- Inside Driving Lane and Inside Shoulder			**Re-Proportion With Geogrid**			**No Re-Proportion With Geogrid**		
	Thickness	*Layer Coefficient*	*Structural Number (SN)*	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*	*Thickness*	*Layer Coefficient*	*Structural Number (SN)*
DGA Base	12	0.14	1.68	12	0.14	2.28	12	0.14	2.28
Drainage Blanket TY II - Asph	4	0.21	0.84	8.5	0.21	1.785	4	0.21	0.84
CL 4 Asphalt Base 1.50D PG 64-22	4.5	0.4	1.8	0	0.4	0	4.5	0.4	1.8
CL 4 Asphalt Base 1.00D PG 64-22	3.5	0.4	1.4	3.5	0.4	1.4	3.5	0.4	1.4
CL 4 Asphalt Base 1.00D PG 76-22	3	0.4	1.2	3	0.4	1.2	3	0.4	1.2
CL 4 Asphalt Surface 0.38A PG 76-22	1.25	0.44	0.55	1.25	0.44	0.55	1.25	0.44	0.55
	28.25		**7.47**	28.25		**7.22**	28.25		**8.07**

	Theoretical Shoulder Required SN values			
Required SN	*58,000,000 ESALs*	*29000000 ESALs*	*23,200,000 ESALs*	*11,600,000 ESALs*
	CBR 3	CBR 3	CBR 3	CBR 3
33% AC	8.72	7.94	7.71	7.06
50% AC	8.47	7.68	7.45	6.81
75% AC	8.04 Minimum	7.33 Minimum	7.12 Minimum	6.51 Minimum
	8.41	7.65	7.43	6.79

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

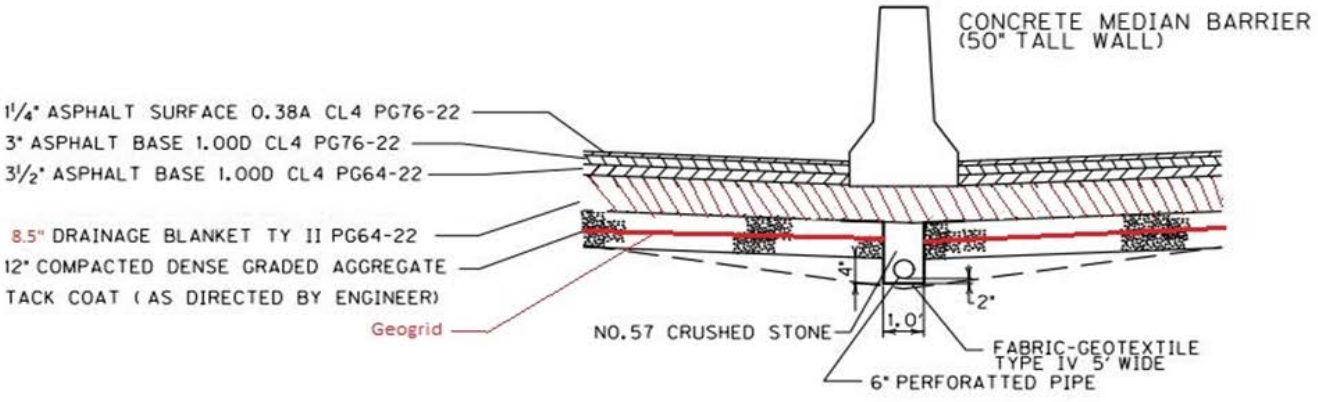
TITLE: Add geogrid to reduce pavement section in the widening section

SKETCH OF BASELINE ASSUMPTION



DETAIL "A"
ITEM 8-6.2

SKETCH OF PROPOSED ALTERNATIVE

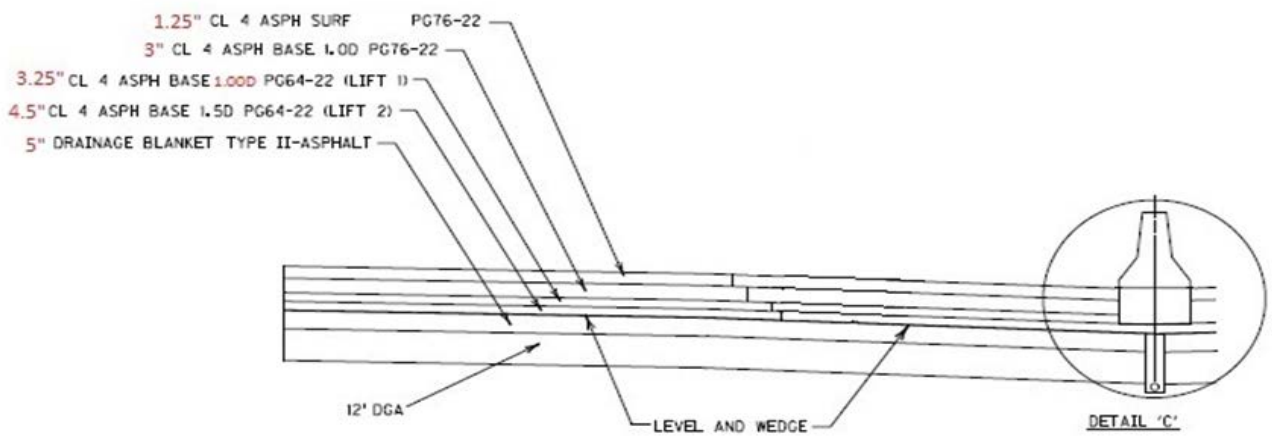


DETAIL "A"
ITEM 8-6.2

VALUE ENGINEERING ALTERNATIVE 3
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add geogrid to reduce pavement section in the widening section

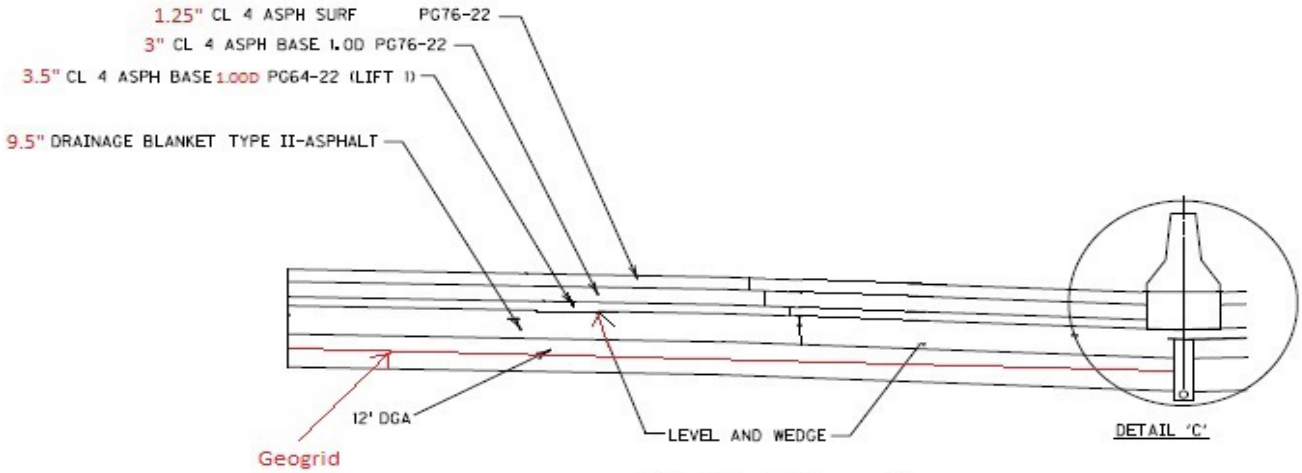
SKETCH OF BASELINE ASSUMPTION



DETAIL B

ITEM 8-6.1

SKETCH OF PROPOSED ALTERNATIVE



DETAIL B

ITEM 8-6.1

VALUE ENGINEERING ALTERNATIVE 4
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce shoulder width adjacent to truck lane

FUNCTION: **Support Load**

BASELINE ASSUMPTION:

The current typical width for the northbound truck lane section includes an inside paved shoulder of 14 feet and an outside paved shoulder of ten feet.

PROPOSED ALTERNATIVE:

Reduce the inside shoulder to four feet and the outside shoulder to eight feet.

BENEFITS	RISKS/CHALLENGES
• Reduces excavation	• Inconsistency in shoulders when compared to remainder of project
• Reduces or eliminates sliver fills on the road slope	• Decreases available pavement from proposed in crash situations needing to move traffic
• Could eliminate significant impact to the Dam	•
• By reducing the width of shoulder, the truck climbing lane can be constructed with the reduced width for the shoulder	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 1,052,621	$ -	$ 1,052,621
PROPOSED ALTERNATIVE:	$ -	$ -	$ -
TOTAL (Baseline less Proposed)	$ 1,052,621	$ -	**$ 1,052,621**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 4
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce shoulder width adjacent to truck lane

DISCUSSION/JUSTIFICATION:

The current typical width for the truck lane section includes an inside paved shoulder of 14 feet and an outside paved shoulder of ten feet. The proposed alternative requires a design exception to use a mountainous terrain criteria instead of a rolling terrain criteria for the truck lane section, which allows a reduction in the roadway template for the truck lane section, especially along the Lake Linville, to a four-foot inside paved shoulder and an eight-foot outside paved shoulder. This template would be consistent with the July 2005 AASHTO Design Standards for an Interstate System in a mountainous terrain. The changing of this template would allow eliminating the majority of excavation on the right along the truck lane as well as most sliver fills would be eliminated or at least minimized. (**Note**: The excavation unit cost of the proposed 8-6.2 is $3.17 which is much lower than the estimated unit cost of excavation for 8-6.1 which has $5.27 per CUYD. This difference for the approximate reduced excavation quantity shown in the cost detail would add an additional savings of $52,500, increasing the total of the SL-08 reduced cost to be approximately $1.1 million.)

IMPLEMENTATION CONSIDERATIONS:

Special Consideration: This reduced template would possibly eliminate the sliver fill across the dam and therefore eliminate any impact to the dam. If necessary, the inside left shoulder for the southbound direction could also be reduced to assure that the road template fits the top of the dam without impacting side slopes. If Creative Idea T-03, *Add truck climing lane after the dam at northbound I-75* , developed with Value Engineering Alternative 14, *End ramp taper before the dam at I-75 northbound, Interchange 62* is desired in order to eliminate the impact to the dam, this alternative would allow keeping the truck lane at its current proposed beginning while achieving the goal of Creative Idea T-03, which is to minimize the road template in an effort to eliminate the impact to the dam slopes.

The proposed alternative requires a design exception to use the criteria for a mountainous terrain instead of a rolling terrain. Coordination with Division of Water and the USACE may be required to address specific concerns for widening I-75 across the dam for Lake Linville.

VALUE ENGINEERING ALTERNATIVE 4
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce shoulder width adjacent to truck lane

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
ROADWAY EXCAVATION (02200)		CUYD	25,000	3.17	79,125			
CL3 ASPH SURF 0.38A PG76-22 (00336)		TON	930	99.08	92,144			
CL3 ASPH BASE 1.00D PG76-22 (00216)		TON	2,233	85.38	190,642			
CL3 ASPH BASE 1.00D PG64-22 (00214		TON	6,327	62.56	395,804			
DRAINAGE BLANKET-TYPE II-ASPH (00018)		TON	5,024	25.24	126,821			
DGA BASE (00001)		TON	9,338	18.00	168,084			
					1,052,621			
							(BASELINE LESS PROPOSED)	**1,052,621**

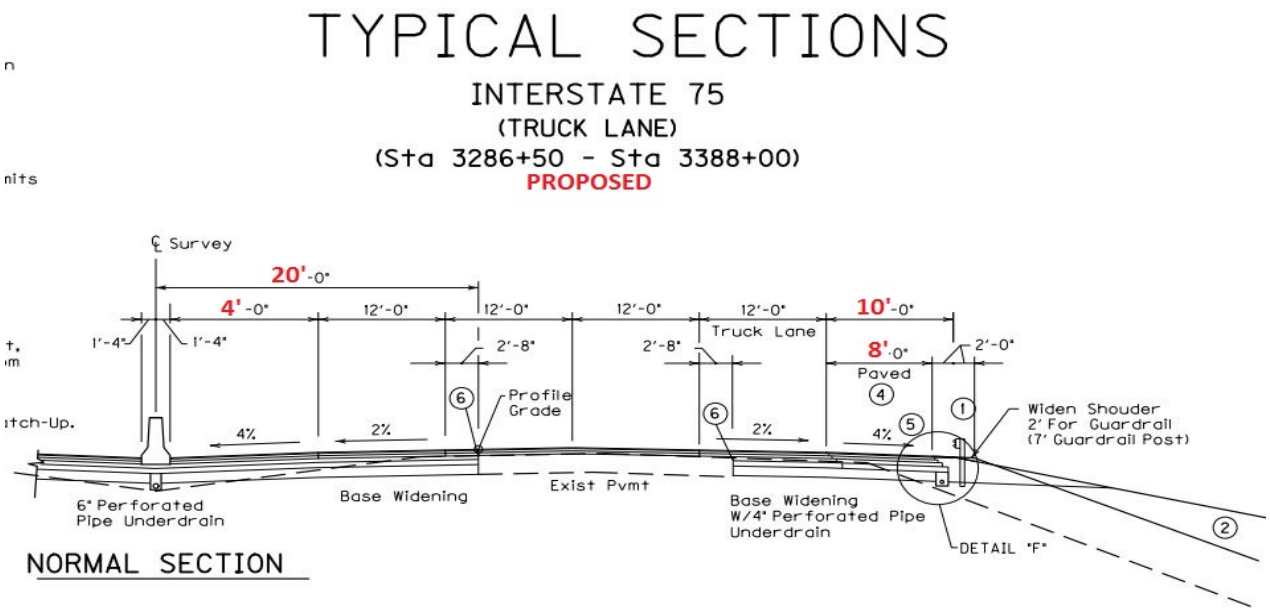
*Note: Costs are rounded to nearest thousand dollars.

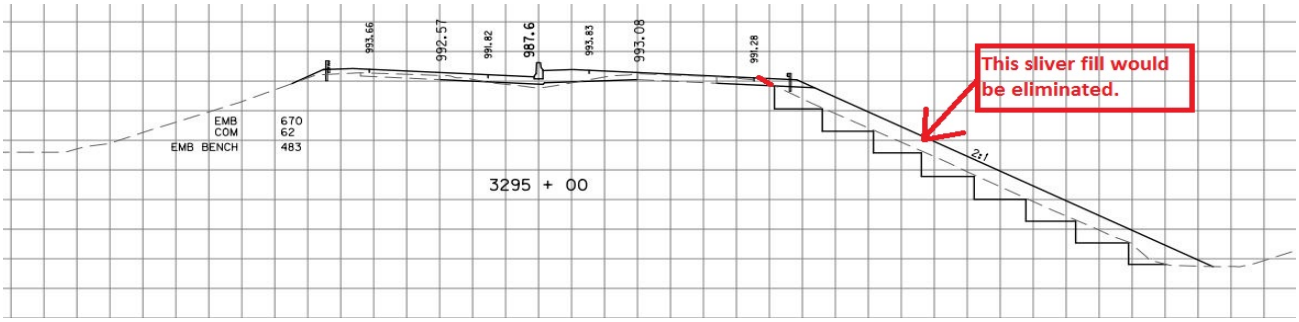
SAVINGS

VALUE ENGINEERING ALTERNATIVE 4
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce shoulder width adjacent to truck lane

SKETCH OF PROPOSED ALTERNATIVE





VALUE ENGINEERING ALTERNATIVE 5
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add approach slabs at bridges to minimize settlement

FUNCTION: **Support Load**

BASELINE ASSUMPTION:

The preliminary bridge design for I-75 over US 25 (Exit 62) utilizes approach slabs at the bridge ends. Currently, approach slabs are not shown for the bridges at Exit 59 and Lake Linville Road (MM 62.6).

PROPOSED ALTERNATIVE:

Approach slabs are proposed at the I-75 bridges at Exit 59 and Lake Linville Road (MM 62.6) to minimize the potential for settlement at the bridge ends. These approach slabs are proposed for the full width of each abutment and 25 feet long.

BENEFITS	RISKS/CHALLENGES
• Lowers long term mainteneance costs due to differential settlement at the bridge ends	• None apparent
• Improves driver experience by smoothing transition from road to bridge	•
• Safety as a result of less maintenance	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 315,000	$ -	$ 315,000
TOTAL (Baseline less Proposed)	$ (315,000)	$ -	**$ (315,000)**

COST

VALUE ENGINEERING ALTERNATIVE 5
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add approach slabs at bridges to minimize settlement

DISCUSSION/JUSTIFICATION:

Maintenance on interstate facilities can be difficult, expensive and dangerous to both the traveling public and maintenance workers. The use of approach slabs will help to minimize the frequency of maintenance required at the bridge ends. While the implementation of this alternative adds cost to the project, the transition from the road to the bridge would be smoother resulting in improved performance and driver experience, and reduced maintenance. In addition, recent research indicates that approach slabs can be effective in many instances for minimizing differential settlement between the bridge approach and abutment.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 5
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add approach slabs at bridges to minimize settlement

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
APPROACH SLAB		SY				1,400	225.00	315,000
								315,000
							(BASELINE LESS PROPOSED)	**(315,000)**

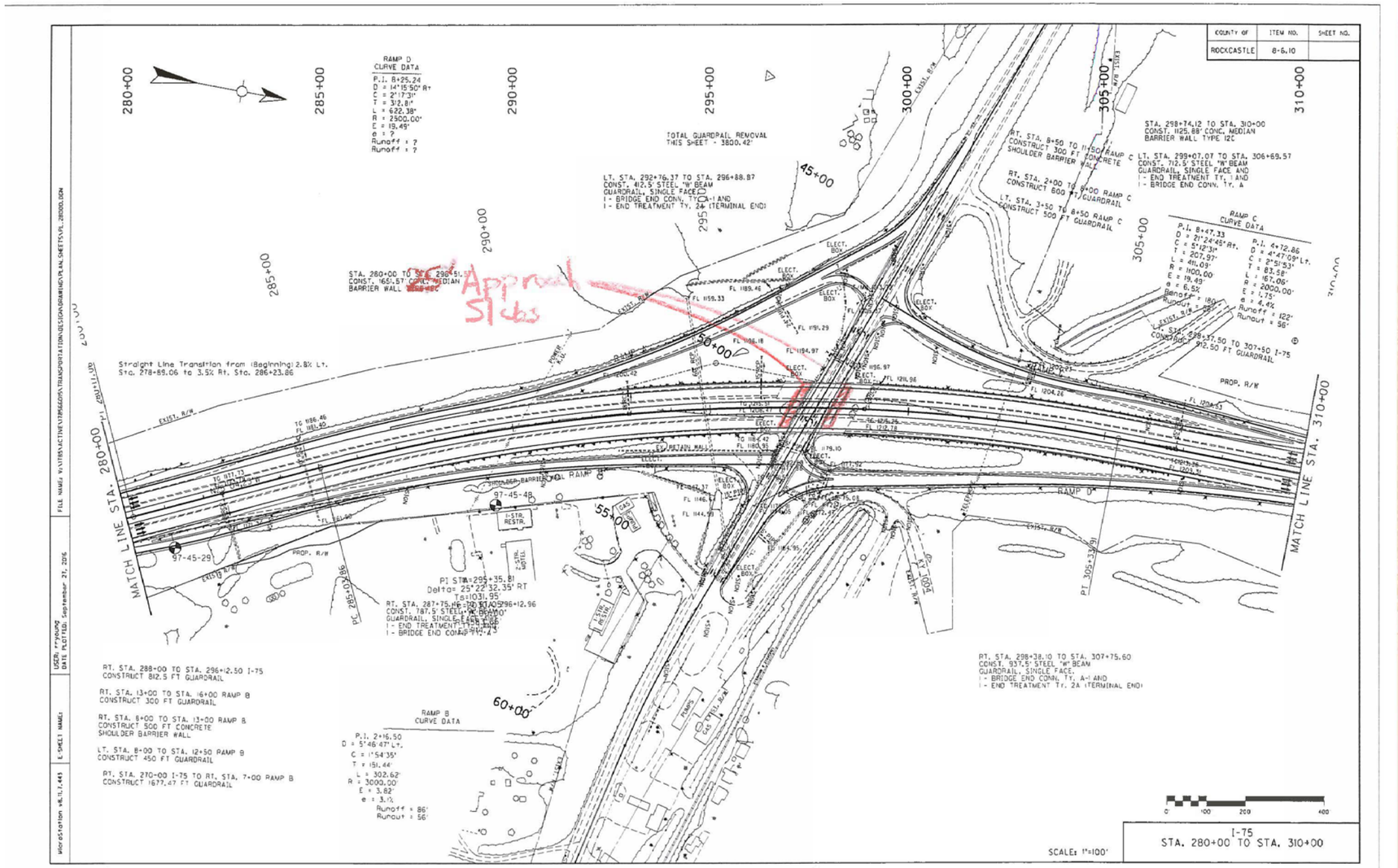
*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 5
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE:	Add approach slabs at bridges to minimize settlement

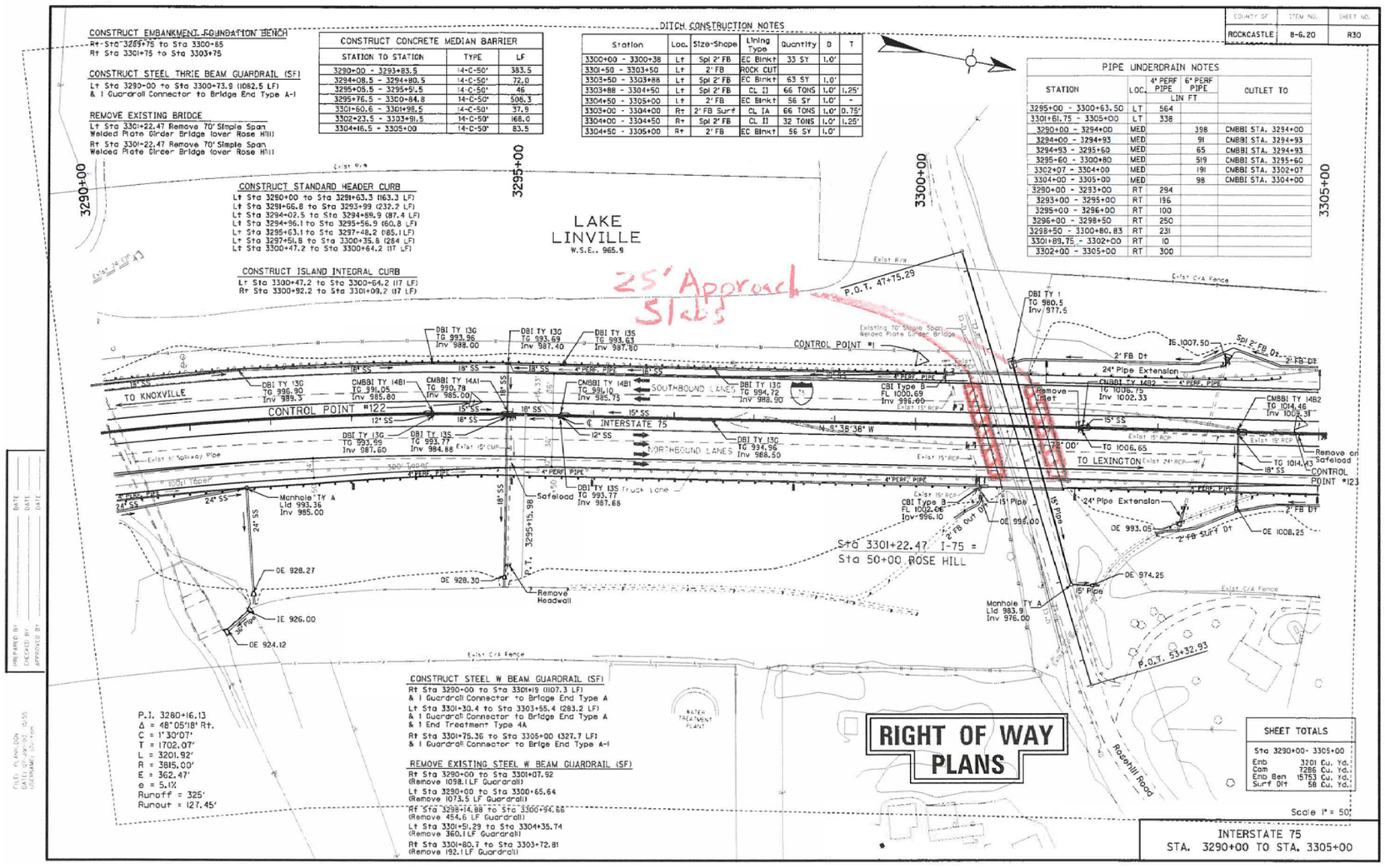
SKETCH OF BASELINE ASSUMPTION AND PROPOSED ALTERNATIVE –Section 8-6.10



VALUE ENGINEERING ALTERNATIVE 5
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE:	Add approach slabs at bridges to minimize settlement

SKETCH OF BASLINE ASSUMPTION AND PROPOSED ALTERNATIVE – Section 8-6.20



VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Add transverse trench drain bleeders in the existing pavement to relieve water pressure
FUNCTION:	**Support Load**

BASELINE ASSUMPTION:

On the design plans, there are no transverse pavement drains included.

PROPOSED ALTERNATIVE:

Install transverse trench drains in the existing asphalt pavement at approximately 500 foot intervals prior to construction of the proposed pavement overlay. Trench will be 8 inches wide and minimum of 10 to 12 inches deep with a 4-inch perforated pipe.

BENEFITS	RISKS/CHALLENGES
• Reduces future maintenance of pavement	• Additional operation during construction
• Improves safety (minimize wet spots at pavement surface)	• Increase in project construction time
• Relieves water pressure under the pavement	• May affect rideability
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ 632,000	$ 632,000
PROPOSED ALTERNATIVE:	$ 399,322	$ 316,000	$ 715,322
TOTAL (Baseline less Proposed)	$ (399,322)	$ 316,000	**$ (83,322)**

COST

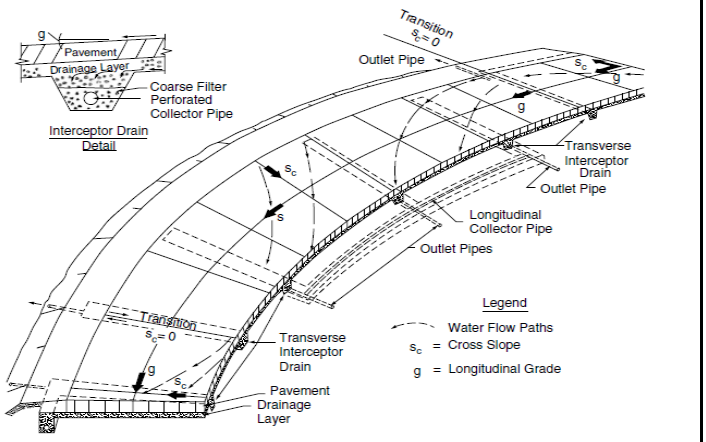
VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add transverse trench drain bleeders in the existing pavement to relieve water pressure

DISCUSSION/JUSTIFICATION:

Several areas along the I-75 corridor in Rockcastle and Laurel counties have existing pavement issues related to water trapped within the pavement layers building up pressure and migrating to the surface. This sometimes results in stripping of asphalt from pavement at these locations causing general deterioration of pavement and potholes. The "bubbling up" of water to the surface can also be a safety problem for motorists, especially during winter time when these wet areas freeze. The use of transverse trench drains on some other projects along this corridor in the past few years have been successful in minimizing this problem.

The transverse drain is similar in construction to a lateral drain, but these drains generally run perpendicular to the centerline of the roadway or slightly skewed. The most common use of a transverse drain is to remove the water that may seep into the roadbed at joints as shown in figure below. Draining water at joints is a necessary activity; however, these types of drains should be used with great caution in areas prone to frost heave. Frost action may damage the roadway except above the drains, causing a wave to appear on the pavement surface. Horizontal drains are used in cut or fill slopes, and often empty directly into the side ditches. The pipes may enter directly into these side-ditches, or it may be necessary to use a treatment to prevent erosion, such as a paving the drainage ditches or placing riprap or splashblocks at the drain outlets *(source: Handbook of Highway Engineering)* .



IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add transverse trench drain bleeders in the existing pavement to relieve water pressure

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
TRENCHING-PAVEMENT DRAIN (8-6.1)		LF				5,202	38.50	200,277
CL3 ASPH BASE 1.00D PG64-22 (8-6.1)		TON				212	60.00	12,720
TRENCHING-PAVEMENT DRAIN (8-6.2)		LF				4,539	38.50	174,752
CL3 ASPH BASE 1.00D PG64-22 (8-6.2)		TON				185	62.56	11,574
								399,322
							(BASELINE LESS PROPOSED)	**(399,322)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Add transverse trench drain bleeders in the existing pavement to relieve water pressure

BACKUP PAVEMENT CALCULATIONS (Section 8-6.10)

PAVEMENT TRENCH DRAINS

Note: Drains to be @45° Skew downgrade

ASPHALT BASE REFILL QUANTITY PER LINEAR FOOT OF TRENCH:

Volume of 8" x 10" Trench per Linear Foot of Trench =		0.556	CF / LF	(A)
Asphalt Base weight per CF =		0.073	TON / CF	(B)
Asphalt Base Quantity per LF of Trench =	(A) x (B) =	0.0407	TON / LF	(D)

ITEM NO. 8-6.10

TRENCH LENGTH:

Location	Begin Station	End Station	Segment Length (LF)	# of Drains @ 500' Intervals	Trench Length per Drain (LF)	Total Trench Length (LF)
LT	104+03	356+00	25197	51	51	2601
RT	104+03	356+00	25197	51	51	2601
					TOTAL =	5202

ASPHALT BASE FOR REFILL QUANTITY:

Quantity = Asphalt quantiy rate (Tons/LF) x Trench Length

Quantity =	0.0407	x	5202	=	212	TONS

VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Add transverse trench drain bleeders in the existing pavement to relieve water pressure

BACKUP PAVEMENT CALCULATIONS (Section 8-6.20)

PAVEMENT TRENCH DRAINS

Note: Drains to be @45° Skew downgrade

ASPHALT BASE REFILL QUANTITY PER LINEAR FOOT OF TRENCH:

Volume of 8" x 10" Trench per Linear Foot of Trench =	0.556	CF / LF	(A)
Asphalt Base weight per CF =	0.073	TON / CF	(B)
Asphalt Base Quantity per LF of Trench = (A) x (B) =	0.0407	TON / LF	(D)

ITEM NO. 8-6.20

TRENCH LENGTH:

Location	Begin Station	End Station	Segment Length (LF)	# of Drains @ 500' Intervals	Trench Length per Drain (LF)	Total Trench Length (LF)	
LT	3165+72	3399+02	23330	47	51	2397	
RT	3165+72	3286+50	12078	25	51	1275	
RT	3286+50	3388+00	10150	21	34	714	Truck lane area
RT	3388+00	3399+02	1102	3	51	153	
					TOTAL =	4539	

ASPHALT BASE FOR REFILL QUANTITY:

Quantity = Asphalt quantiy rate (Tons/LF) x Trench Length

Quantity =	4539	x	0.0407	=	185	TONS

VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add transverse trench drain bleeders in the existing pavement to relieve water pressure

Assumptions

Interest/Discount Rate (%):	3.5%	**Economic Life (yrs):**	10

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			Baseline Assumption		Proposed Alternative	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1						
2						
3						
4						
5						
Total Salvage & Replacement Costs						

Annual Costs (pres worth calculated over 10 yrs)		Baseline Assumption		Proposed Alternative	
Item	**Description**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Pavement Repair	76,000	632,062	38,000	316,031
2					
3					
4					
5					
Total Annual Costs		**76,000**	**632,062**	**38,000**	**316,031**

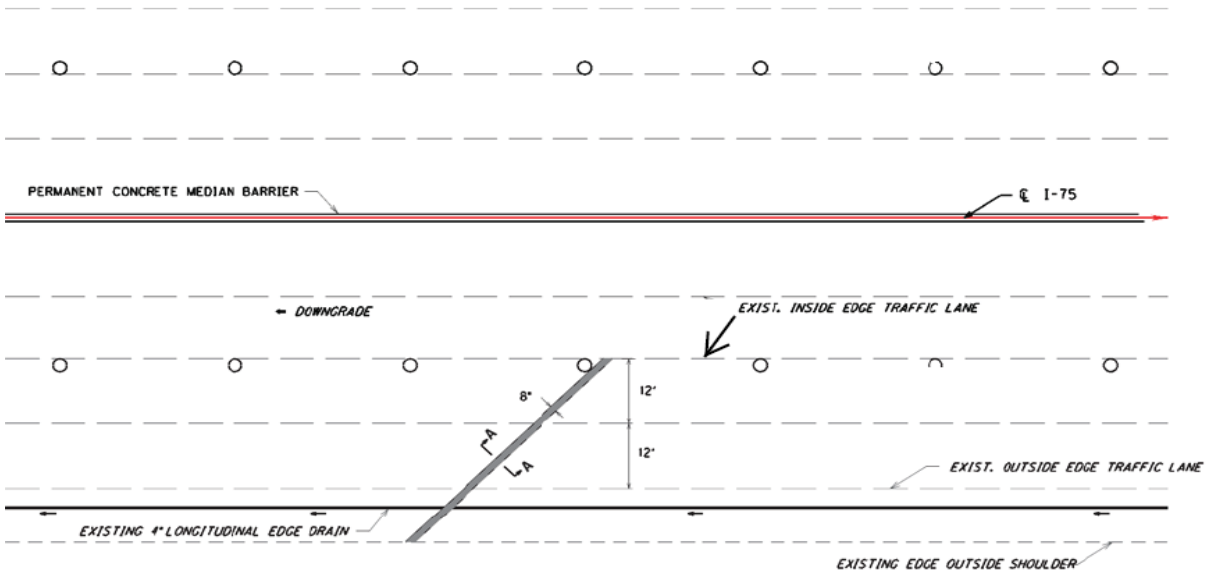
SUMMARY	Baseline Present Worth	Proposed Present Worth
Total Present Worth (salvage+annual pres worth)	632,000	316,000
RESULTS (Proposed less baseline)		

Notes: 1) Total Present Worth is rounded to the nearest thousand dollars, 2) Initial costs are covered in the Detail sheet.

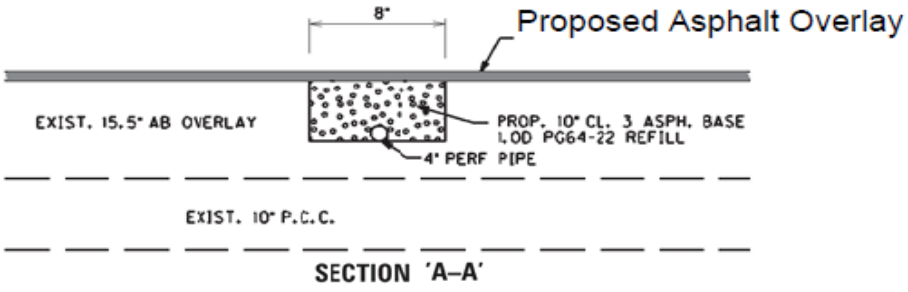
VALUE ENGINEERING ALTERNATIVE 6
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add transverse trench drain bleeders in the existing pavement to relieve water pressure

SKETCH OF PROPOSED ALTERNATIVE



PERMEABLE PAVEMENT DRAIN DETAIL



SECTION 'A–A'

REFILL THE 8" WIDE TRENCH WITH CL. 3 ASPH. BASE 1.00 PG64-22 UP TO THE EXISTING PAVEMENT ELEVATION. COMPACT THE LAYERS OF ASPHALT WITH A MECHANICAL TAMPER IN LAYERS NOT EXCEEDING THREE INCHES.

MILL THE EXISTING SURFACE AND CONSTRUCT THE OVERALL SURFACE COURSE.

NOTE :
THE PERMEABLE PAVEMENT DRAIN WILL BE PAID FOR AS LINEAR FOOT OF "TRENCHING" AND TONS OF "CL. 3 ASPH BASE 1.000 PG64-22". PERFORATED PIPE WILL BE INCIDENTAL TO THE BID ITEM "TRENCHING" AND SHALL INCLUDE ALL MATERIALS AND LABOR REQUIRED TO CONSTRUCT THE DRAIN AS SHOWN IN THE DETAIL. NO ADDITIONAL PAYMENT WILL BE MADE FOR THE DISPOSAL OF THE REMOVED PAVEMENT.

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Eliminate I-75 outside pavement edge drains
FUNCTION:	**Support Load**

BASELINE ASSUMPTION:

Pavement edge drains are provided along the outside of existing driving lanes.

PROPOSED ALTERNATIVE:

Delete installation of new pavement edge drains along outside of existing driving lanes.

BENEFITS	RISKS/CHALLENGES
• Reduces construction work/time	• Condition of existing edge drains is unknown
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 890,088	$ -	$ 890,088
PROPOSED ALTERNATIVE:	$ 293,228	$ -	$ 293,228
TOTAL (Baseline less Proposed)	$ 596,860	$ -	**$ 596,860**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Eliminate I-75 outside pavement edge drains

DISCUSSION/JUSTIFICATION:

Baseline plans require installation of new pavement edge drains on the outside of the existing driving lanes, in both directions, prior to pavement overlay. These are at the same location as the existing pavement edge drains which were installed during pavement rehabilitation projects from 2012 to 2014: Contract ID 121028, NB MP 55.7 - MP 58.9 (2012); Contract ID 121046, SB MP 55.7 - MP 58.9 (2013): and Contract ID 141035, MP 58.9 - MP 65.2 (2014). Since these existing edge drains are relatively new, there is no need to remove and reinstall new drains.

IMPLEMENTATION CONSIDERATIONS:

Implementation of this proposed alternative requires video inspection of the existing edge drain system to determine if any sections are not functioning properly and need repair or replacement.

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Eliminate I-75 outside pavement edge drains

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
PERFORATED PIPE-4 INCH (8-6.1)		LF	55,480	6.18	342,866	20,006	6.18	123,637
INSPECT & CERTIFY EDGE DRAIN SYSTEM (8-6.1)		LS	1	20,000.00	20,000	2	20,000.00	40,000
PERFORATED PIPE-4 INCH (8-6.2)		LF	55,800	9.09	507,222	9,856	9.09	89,591
INSPECT & CERTIFY EDGE DRAIN SYSTEM (8-6.2)		LS	1	20,000.00	20,000	2	20,000.00	40,000
					890,088			**293,228**
							(BASELINE LESS PROPOSED)	**596,860**

*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Eliminate I-75 outside pavement edge drains

BACKUP CALCULATIONS - 8-6.10

ELIMINATE PAVEMENT EDGE DRAINS ON OUTSIDE OF EXISTING DRIVING LANES

ITEM NO. 8-6.10

PAVEMENT EDGE DRAIN REDUCTION LENGTH:

Location	Begin Station	End Station	Segment Length (LF)
LT	104+03	356+00	25197
RT	104+03	356+00	25197
Deduct Bridge lengths			-228
		TOTAL Eliminated =	**50166**
	from Estimate	Original =	55480
		Remaining =	5314

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Eliminate I-75 outside pavement edge drains

BACKUP CALCULATIONS - 8-6.20

ITEM NO. 8-6.20

PAVEMENT EDGE DRAIN REDUCTION LENGTH:

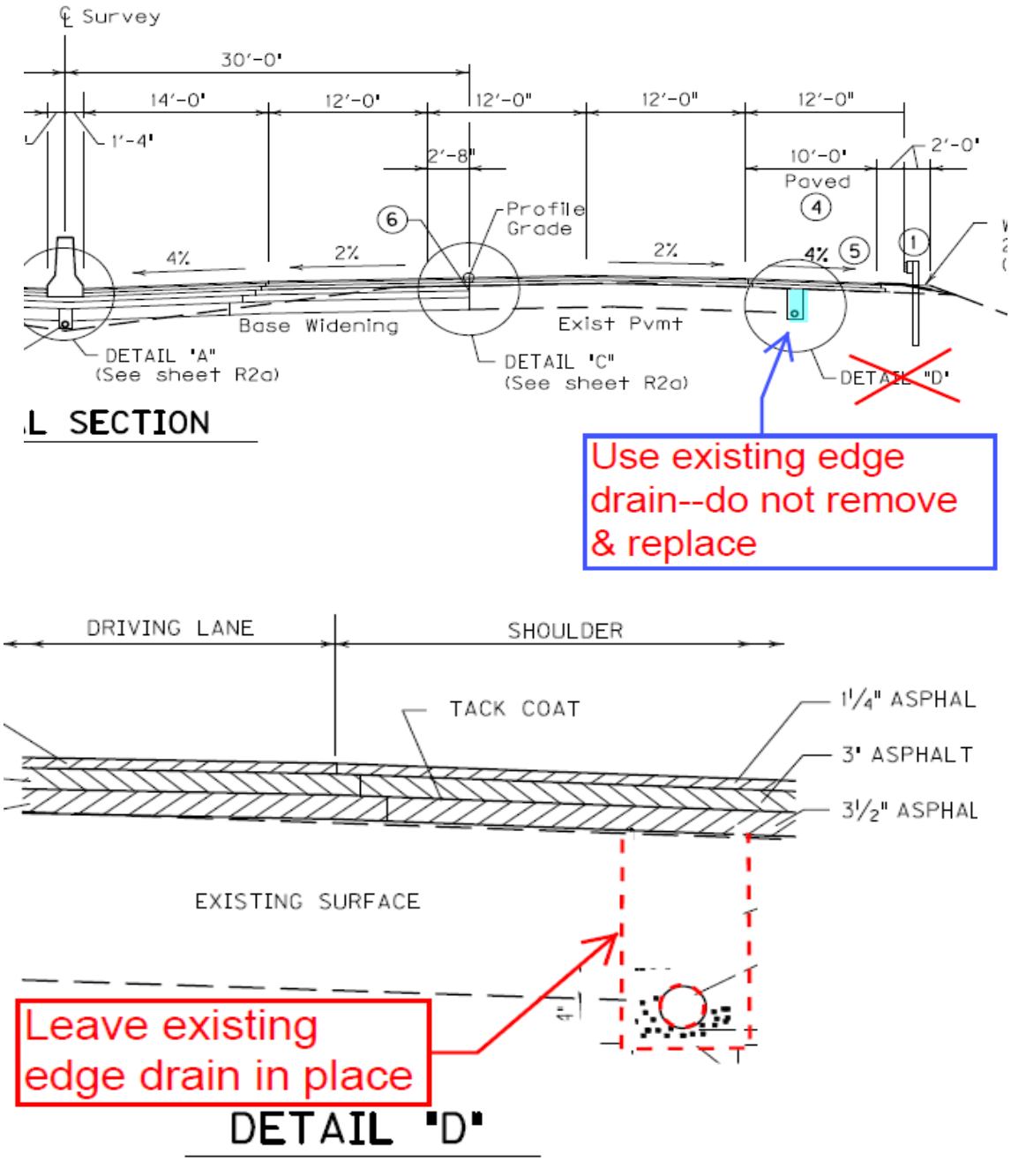
Location	Begin Station	End Station	Segment Length (LF)
LT	3165+72	3399+02	23330
RT	3165+72	3286+50	12078
RT (Truck Lane) will need new edge drain	3286+50	3388+00	0
RT	3388+00	3399+02	1102
Deduct Bridge lengths			-716
		TOTAL Eliminated=	**35794**

	from Estimate	Original =	55800	LF
		Remaining =	20006	LF

VALUE ENGINEERING ALTERNATIVE 7
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Eliminate I-75 outside pavement edge drains

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 8
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add bid item for radar speed signs to reduce speed during construction

FUNCTION: **Maintain Traffic**

BASELINE ASSUMPTION:

The construction zone will have warning signs for the upcoming construction zone and for the speed limit in the construction zone.

PROPOSED ALTERNATIVE:

Place a radar speed sign before the construction zone on the I-75 northbound and I-75 southbound to reduce driver speeds.

BENEFITS	RISKS/CHALLENGES
• Reduces driver speeds	• None apparent
• Protects workers	•
• Reduces crashes	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 7,400	$ -	$ 7,400
TOTAL (Baseline less Proposed)	$ (7,400)	$ -	**$ (7,400)**

COST

VALUE ENGINEERING ALTERNATIVE 8
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add bid item for radar speed signs to reduce speed during construction

DISCUSSION/JUSTIFICATION:

I-75 is a major North-South highway in the Eastern United States, and this portion of the corridor is located in a hilly rural location, where the posted speed limit is 70 mph. Therefore, there will be a consistent flow of vehicles that will be driving at or above the speed limit. In addition, during construction there will be several lane changes, including reducing I-75 to one lane at night, and other construction related issues. Using radar speed signs to warn motorists when they are speeding may reduce the running speeds in the work zone. Therefore, the radar speed signs are needed to protect workers from incoming vehicles.

IMPLEMENTATION CONSIDERATIONS:

The radar speed signs should be placed in advance of the construction zone or merging zone just after the beginning of the reduced speed zone. This allows drivers to slow down to the construction zone speed limit, but still should not be too far in advance that drivers ignore it or speed back up again.

VALUE ENGINEERING ALTERNATIVE 8
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add bid item for radar speed signs to reduce speed during construction

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
RADAR SPEED SIGN		EA				2	3,700.00	7,400
								7,400
							(BASELINE LESS PROPOSED)	**(7,400)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 8
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add bid item for radar speed signs to reduce speed during construction

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING ALTERNATIVE 9
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend lane closure in advance of the project

FUNCTION: **Maintain Traffic**

BASELINE ASSUMPTION:

The Maintenance of Traffic Plans call for standard lane closures per MUTCD requirements at either end of the project, when setting temporary barrier wall.

PROPOSED ALTERNATIVE:

Extend lane closure beyond MUTCD minimums to group drivers in advance of the worksite.

BENEFITS	RISKS/CHALLENGES
• Positively affects traffic flow by more evenly distributing the "bottleneck," thus potentially reducing back-ups	• Work items extend beyond construction limits
• Reduces crash potential near work zone	• Increases contractor daily maintenance
• Reduces driver frustration of two lanes merging into one at the same time	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 2,000	$ -	$ 2,000
TOTAL (Baseline less Proposed)	$ (2,000)	$ -	**$ (2,000)**

COST

VALUE ENGINEERING ALTERNATIVE 9
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend lane closure in advance of the project

DISCUSSION/JUSTIFICATION:

Often, there are long queues resulting from lane closures on the Interstate. For Section 8-6.02, this particular location (the southbound lanes on the north end of the project) presents a situation where traffic will be transitioned from three lanes to one lane during the placement of the temporary barrier wall. For Section 8-6.01, both ends of the project will be at times transitioned from three lanes to one lane during the placement of temporary wall and at times one lane is required to allow for a lane closure.

If one of the lanes on the project is closed well in advance of the project limits when three lanes exist on the adjoining projects, traffic would have time to be "calmed" before having to merge into one lane immediately prior to the project. This circumstance is unique to the project ends where it ties into an existing three lanes.

Although there would be a slight cost increase by having to add additional traffic control devices (i.e., traffic delineators such as barrels), the benefits of potentially shorter back-ups and fewer crashes could far outweigh the additional cost to the project.

IMPLEMENTATION CONSIDERATIONS:

To implement this alternative, there would be a need to have the third lane closed well in advance of the one-lane section.

The barrels could be left in place on the outside edges of existing lanes throughout the project construction period, allowing normal transition from a three-lane section to a two-lane section.

To accomplish the longer transition area, the project would need to account for additional TCD (barrels) and the assumption would be approximately an additional one-half mile of construction limits.

VALUE ENGINEERING ALTERNATIVE 9
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend lane closure in advance of the project

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
ADDITIONAL BARRELS		EA				40	50.00	2,000
								2,000
							(BASELINE LESS PROPOSED)	**(2,000)**

*Note: Costs are rounded to nearest thousand dollars.

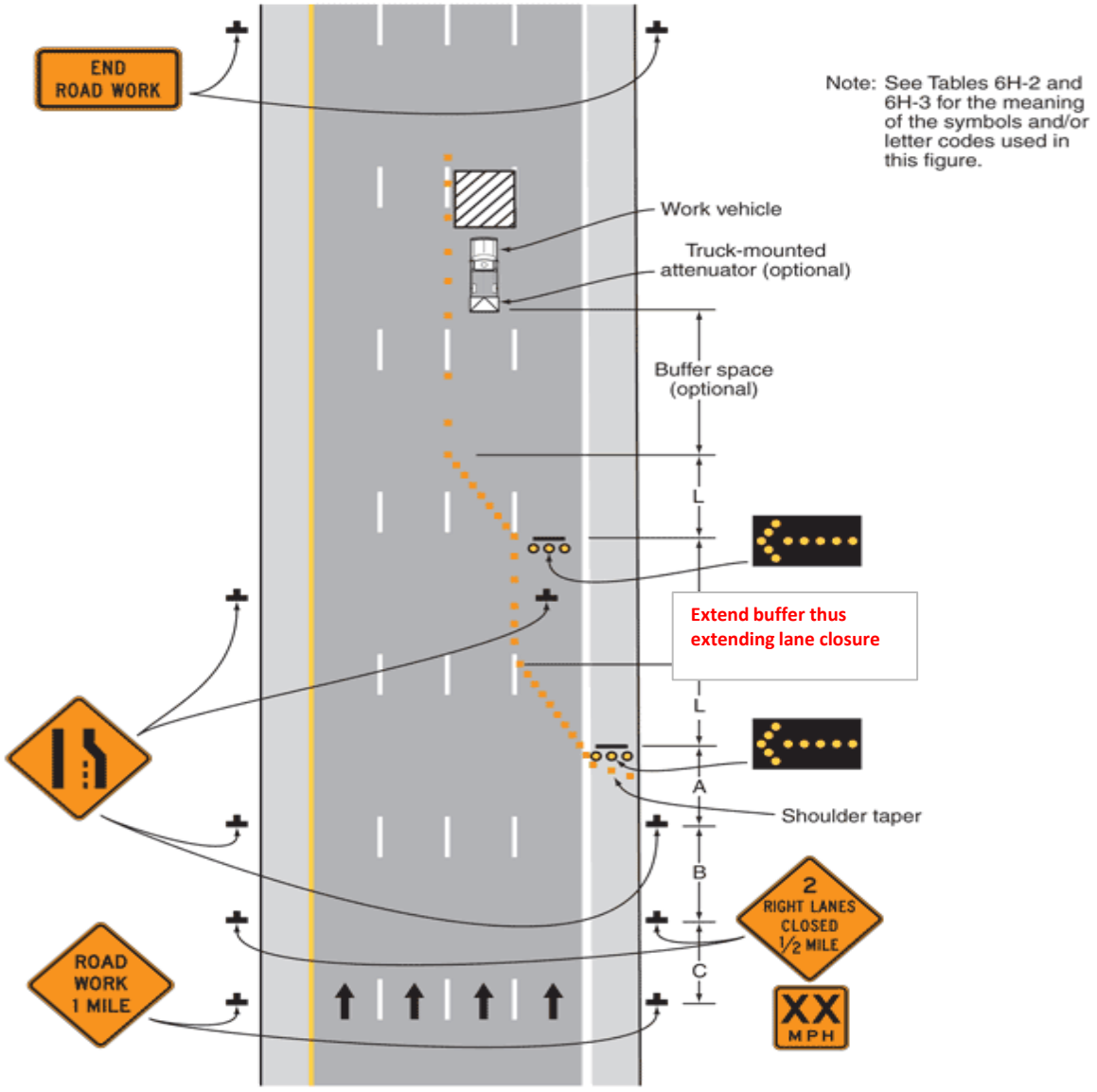
COST

VALUE ENGINEERING ALTERNATIVE 9
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend lane closure in advance of the project

SKETCH OF PROPOSED ALTERNATIVE

Figure 6H-37. Double Lane Closure on a Freeway (TA-37)



Typical Application 37

VALUE ENGINEERING ALTERNATIVE 10
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Add a requirement for the contractor to use a protect-the-queue vehicle
FUNCTION:	**Maintain Traffic**

BASELINE ASSUMPTION:

No vehicle is currently required.

PROPOSED ALTERNATIVE:

Add a protect-the-queue vehicle to alert drivers of downstream congestion to reduce crashes related to construction backups.

BENEFITS	RISKS/CHALLENGES
• Reduces crash potential	• New concept for KYTC; may require learning curve
• Protects workers	•
• Improves communication to motorist	•
• Warns motorist when delays back-up traffic beyond the beginning of construction	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 20,000	$ -	$ 20,000
TOTAL (Baseline less Proposed)	$ (20,000)	$ -	**$ (20,000)**

COST

VALUE ENGINEERING ALTERNATIVE 10
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add a requirement for the contractor to use a protect-the-queue vehicle

DISCUSSION/JUSTIFICATION:

Extensive traffic backups are expected for this stretch of I-75. When the contractor will have to close a lane in order to set-up temporary concrete barriers, back-ups may extend for miles. These long back-ups have the potential to result in severe crashes, due to the possibility of being encountered before drivers see the advance warning signs.

If a truck equipped with an attenuator and changeable message sign unit is located beyond the traffic queue, drivers have an additional warning of the hazard ahead.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 10
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add a requirement for the contractor to use a protect-the-queue vehicle

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
PROTECT-THE-QUEUE VEHICLE		EA				1	20,000.00	20,000
								20,000
							(BASELINE LESS PROPOSED)	**(20,000)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 10
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add a requirement for the contractor to use a protect-the-queue vehicle

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING ALTERNATIVE 10
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add a requirement for the contractor to use a protect-the-queue vehicle

PROPOSED ALTERNATIVE - SPECIFICATION
(2 pages attached)

S T A T E **O F** **T E N N E S S E E**

January 1, 2015

SPECIAL PROVISION

REGARDING

TRAFFIC QUEUE PROTECTION

Description: When construction activities are performed on control-access or limited access facilities, the Contractor shall pursue efforts for the protection of traffic queues caused by project operations and clearly demonstrate adequate good faith efforts as described herein. The queue protection truck is expected to alert motorists (inside or outside of project limits) of all stopped traffic caused by construction activities or incidents within the project limits.

Equipment: The contractor shall provide a minimum of one (1) queue protection truck for each traveling direction where traffic flow is reduced. One (1) additional queue protection truck shall be onsite in reserve. The system deployed must fulfill the following minimum requirements:

1. A truck mounted attenuator that meets or exceeds NCHRP TL-3 requirements.
2. Four (4) round yellow strobe lights (with auto-dimmers) positioned rear facing
    - Two (2) mounted under rear bumper
    - Two (2) mounted at cab level
3. One (1) standard cab mounted light bar.
4. A truck mounted message board with a minimum of 3 Lines and 8 Characters per line.
5. Four Hour National Traffic Incident Management (TIM) Responder Training for Queue Truck Operators.

Maintenance of Traffic: The following procedures will be followed until free flow traffic conditions are present:

- The queue protection truck shall be positioned no further than ½ mile upstream from the back of the slow moving traffic.
- The queue protection truck shall be positioned on the shoulder and clear of the traveled way so as not to impede traffic.
- The queue protection truck shall relocate as needed to maintain the minimum ½ mile distance from the back of the slow moving traffic.
- The 2nd queue protection truck shall be held in reserve, on site, and

support the primary truck if conditions prevent repositioning by reverse. This truck shall not be paid for idle time.

- Trucks shall be kept in project limits during planned lane closures and other project activities expected to cause a queue.
- Queue length estimates and traffic conditions shall be reported to the TDOT District Operations Supervisor or designee at the following periods:
    1. At 30 minute intervals
    2. At significant changes
    3. When free flow traffic is achieved

The queue protection truck shall be mobilized as directed by the District Operations Supervisor or designee and shall be de-mobilized when free flow conditions are reached.

Basis of Payment: The queue protection truck, all related equipment, and labor shall be paid for as Item No. 712-08.10, per hour. All costs are to be included in the price bid. Idle time shall not be paid.

VALUE ENGINEERING ALTERNATIVE 11
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add rumble strips prior to construction zone

FUNCTION: **Maintain Traffic**

BASELINE ASSUMPTION:

The construction zone will have warning signs for the upcoming construction zone and for the speed limit in the construction zone.

PROPOSED ALTERNATIVE:

Place rumble strips before the beginning of the construction zone to reduce driver speeds. There will be several sets of rumble strips for the northbound and several for the southbound traffic.

BENEFITS	RISKS/CHALLENGES
• Protects workers due to a reduction in speed just prior to the beginning of the construction zone	• Could increase motorcycle crashes
• Reduces crashes due to a reduction in speed just prior to the beginning of the construction zone	• Not typically used on Interstates
• Alerts drivers of possible downstream congestion	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 12,000	$ -	$ 12,000
TOTAL (Baseline less Proposed)	$ (12,000)	$ -	**$ (12,000)**

COST

VALUE ENGINEERING ALTERNATIVE 11
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add rumble strips prior to construction zone

DISCUSSION/JUSTIFICATION:

I-75 is a major North-South highway in the Eastern United States, with this project being located in a hilly rural location, where the posted speed limit is 70 mph. Therefore, there will be a consistent flow of vehicles that will be driving at or above the speed limit. In addition, during construction there will be several lanes changes, including reducing I-75 to one lane at night, and other construction related issues. Using rumble strips to reduce vehicles speeds through the work zone may give drivers a good audio cue that they are about to enter a work zone and need to slow down.

IMPLEMENTATION CONSIDERATIONS:

The roadway should be cleaned before the rumble strips are installed.

The rumble strips should be placed well in advance to allow the drivers to slow down, but should not be too far in advance that drivers ignore them or speed back-up again.

The designer should reference the MUTCD, Guidance for the Use of Temporary Rumble Strips in Work Zones, and other guidance or document for the spacing and amount of rumble strips to reduce the drivers speed form 70 mph to the construction zone speed limit. This recommendation has included the cost for the installation of 10 rumbles strips for northbound and southbound I-75. In addition, the following guidance for motorcycles should be followed:

- Well lit signs warning motorcyclists that rumbles strips are coming up.
- The rumble strips should be visible during day time and night time
- The distance between the rumble strips should be wide enough so that one motorcycle tire is on a rumble strip at a time.

VALUE ENGINEERING ALTERNATIVE 11
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add rumble strips prior to construction zone

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
RUMBLE STRIPS		EA				20	600.00	12,000
								12,000
							(BASELINE LESS PROPOSED)	**(12,000)**

*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 11
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add rumble strips prior to construction zone

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING ALTERNATIVE 12
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Rebuild existing wall at northbound exit ramp 59 interchange (Section No. 08-0006.10)

FUNCTION: **Separate Grade**

BASELINE ASSUMPTION:

Current design does not indicate whether the existing wall is to remain as is, modified, or replaced.

PROPOSED ALTERNATIVE:

Replace 425 feet of existing retaining wall with same length of reinforced concrete retaining wall. Gabion or gravity walls could be considered for aesthetic or economic reasons depending on site conditions determined during further evaluation.

BENEFITS	RISKS/CHALLENGES
• Lowers future maintenance	• Portion of existing ramp may need to be temporarily closed
• Improves sight distance if wall is moved back to meet intersection sight distance criteria	•
•	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 300,000	$ -	$ 300,000
PROPOSED ALTERNATIVE:	$ 711,809	$ -	$ 711,809
TOTAL (Baseline less Proposed)	$ (411,809)	$ -	**$ (411,809)**

COST

VALUE ENGINEERING ALTERNATIVE 12
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Rebuild existing wall at northbound exit ramp 59 interchange (Section No. 08-0006.10)

DISCUSSION/JUSTIFICATION:

The age, type and condition of the current wall was not known at the time of the VE study. Other structures are being replaced on the project. Replacement of this wall will allow maintenance costs to be deferred further into the future. The termination point of the wall may be able to be terminated further to the south to meet intersection sight distance criteria.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 12
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Rebuild existing wall at northbound exit ramp 59 interchange (Section No. 08-0006.10)

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
REINFORCED CONCRETE RETAINING WALL		SF				10,450	56.55	590,948
EXCAVATION		CY				2,100	4.35	9,135
TRENCH EXCAVATION		CY				189	29.61	5,596
NO. 57 STONE BACKFILL		TON				2,850	33.73	96,131
TRAFFIC CONTROL		LS				1	10,000.00	10,000
RETAINING WALLS		LS	1	300,000.00	300,000			
					300,000			**711,809**
							(BASELINE LESS PROPOSED)	**(411,809)**

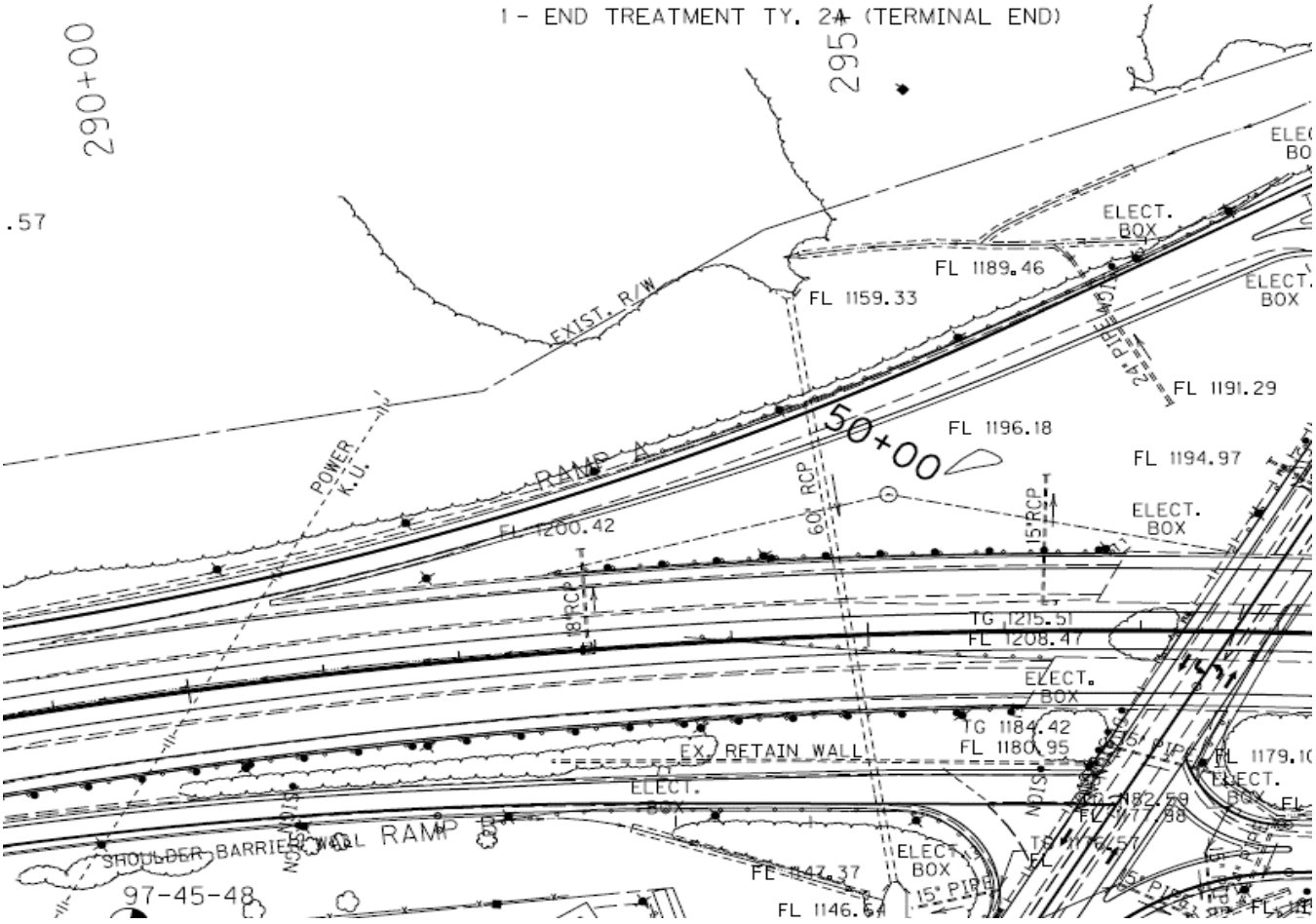
*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 12
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Rebuild existing wall at northbound exit ramp 59 interchange (Section No. 08-0006.10)

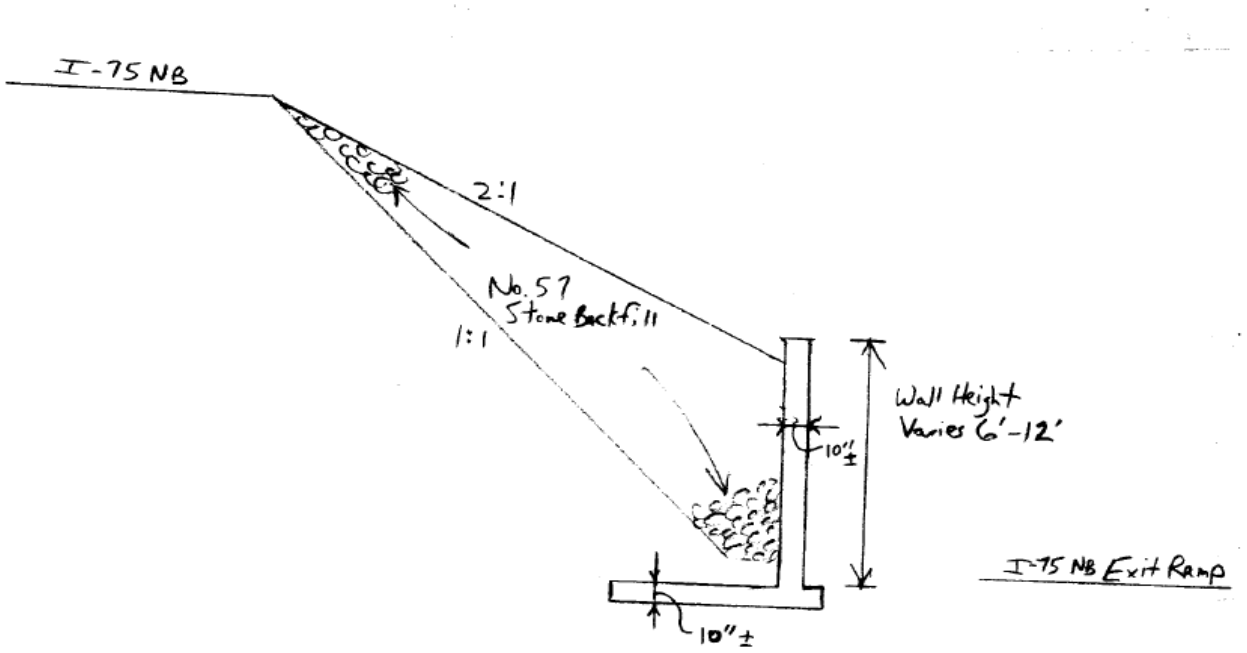
SKETCH OF BASELINE ASSUMPTION



VALUE ENGINEERING ALTERNATIVE 12
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Rebuild existing wall at northbound exit ramp 59 interchange (Section No. 08-0006.10)

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce the number of lanes on Ramp B from two to one

FUNCTION: **Traffic**

BASELINE ASSUMPTION:

Current design would construct a two lane northbound on-ramp that narrows to one lane over the dam, transitioning to a truck climbing lane through the up-grade.

PROPOSED ALTERNATIVE:

The proposed design would eliminate one of the lanes on the ramp, but the single lane would still be carried over the dam and up the hill.

BENEFITS	RISKS/CHALLENGES
• Allows ramp to be tapered into I-75 before the dam, reducing construction on the dam	• Traffic forecast is dated and may not accurately reflect current and future conditions
•	• I-75 forecasted volumes are reasonable, but 1998 ramp volumes haven't changed much
•	• Weekend traffic may be too high for one lane
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 416,167	$ -	$ 416,167
PROPOSED ALTERNATIVE:	$ 202,167	$ -	$ 202,167
TOTAL (Baseline less Proposed)	$ 214,000	$ -	**$ 214,000**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce the number of lanes on Ramp B from two to one

DISCUSSION/JUSTIFICATION:

The 1998 traffic forecast shows 2022 ramp volumes of 780 in the AM peak and 1,160 in the PM peak. More recent counts conducted in 2013 show a peak volume of 340 vehicles per hour. One lane should be able to carry this amount of traffic for the foreseeable future, as little growth has occurred on the ramps since the original 1998 traffic forecast. The 1998 ADT on the ramp was reported as 4,500. The 2013 counted ADT was 4,200.

This design would still carry the single ramp lane over the Lake Linville dam and transition to a truck climbing lane north of the dam.

IMPLEMENTATION CONSIDERATIONS:

The 2013 counts were made as Lake Cumberland was being raised back to its normal level. Traffic to the lake has increased significantly since this time. Friday to Sunday counts on Interstate 75 show the highest hourly volumes of the week. Summer, weekend volumes on this ramp may be considerably higher than what was counted in 2013. Construction to widen Interstate 75 over the dam would still occur. It may be necessary to take a new traffic count and develop a new forecast prior to changing the existing design.

VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce the number of lanes on Ramp B from two to one

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Asphalt Surface 038A		TON	438	99.08	43,398	212	99.08	21,006
Asphalt Base 1.00 CL4 PG 76-22		TON	1,052	65.00	68,380	509	65.00	33,085
Asphalt Base 1.00 CL4 PG 64-22		TON	2,980	55.54	165,499	1,443	56.00	80,808
Drainage Blanket Type II PG 64-22		TON	2,366	25.24	59,725	1,146	25.24	28,929
Dense Grade Aggregate		TON	4,398	18.00	79,164	2,130	18.00	38,340
					416,167			**202,167**
							(BASELINE LESS PROPOSED)	**214,000**

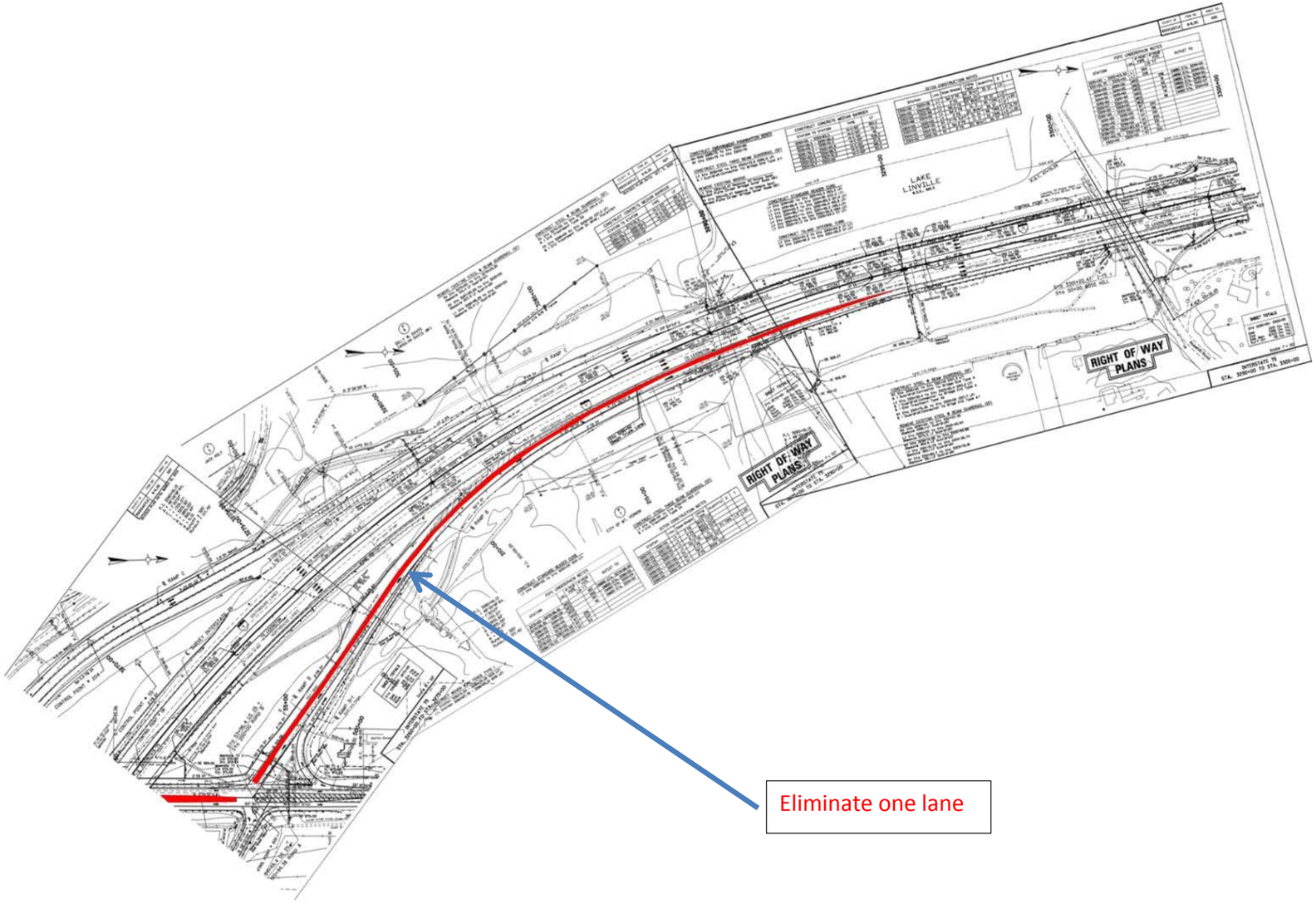
*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 13
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE:	Reduce the number of lanes on Ramp B from two to one

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 14
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: End ramp taper before the dam at I-75 northbound, Interchange 62

FUNCTION: **Traffic**

BASELINE ASSUMPTION:

Current design would construct a two lane northbound on-ramp that narrows to one lane that is carried over the dam, transitioning to a truck climbing lane through the up-grade.

PROPOSED ALTERNATIVE:

The proposed design would eliminate one of the lanes on the ramp (*VE-13, Reduce the number of lanes on Ramp B from two to one*), taper the other lane into Interstate 75 before Lake Linville dam (*VE-14, End ramp taper before the dam at I-75 northbound, Interchange 62*), and then develop a separate truck climbing lane after Lake Linville Dam (*Creative Idea T-03, Add truck climing lane after the dam at northbound I-75*).

NOT RECOMMENDED BY VE TEAM

BENEFITS	RISKS/CHALLENGES
• Minimizes disturbances to Lake Linville dam	• Traffic forecast is dated and may not accurately reflect current and future conditions
•	• I-75 forecasted volumes are reasonable, but 1998 ramp volumes haven't changed much
•	• Weekend traffic may be too high for one lane
•	• There is not a lot of room to taper northbound on-ramp before Lake Linville dam; would require design exception
•	• Truck climbing lane will start on the grade
•	• High volume of RVs and trucks pulling boats entering Interstate on-grade
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 1,735,810	$ -	$ 1,735,810
PROPOSED ALTERNATIVE:	$ 1,250,034	$ -	$ 1,250,034
TOTAL (Baseline less Proposed)	$ 485,776	$ -	**$ 485,776**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 14
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: End ramp taper before the dam at I-75 northbound, Interchange 62

DISCUSSION/JUSTIFICATION:

This proposal would remove one lane from the dam reducing construction on the dam and changes to the downhill slope.

As with T-01 (*Use single lane on-ramp at I-75 northbound, Interchange 62 Ramp B*), the dated traffic forecast shows 2022 ramp volumes of 780 in the AM peak and 1,160 in the PM peak. More recent counts conducted in 2013 show a peak volume of 340 vehicles per hour. One lane should be able to carry this amount of traffic for the foreseeable future, as little growth has occurred on the ramps since the original 1998 traffic forecast. The 1998 ADT on the ramp was reported as 4,500. The 2013 counted ADT was 4,200.

This design would still carry the single ramp lane over the Lake Linville dam and transition to a truck climbing lane north of the dam.

A risk is that the second lane essentially begins the truck climbing lane for a high number of recreational vehicles turning from US 25 onto the ramp. These include RVs and vehicles pulling boats that begin from a standstill, protecting them until they reach interstate speeds.

IMPLEMENTATION CONSIDERATIONS:

There is very limited room to merge the acceleration lane onto Interstate 75 before reaching the Lake Linville dam. The ramp grade and alignment may need to be shifted slightly in order to start the merge as soon as possible. The truck climbing lane would also need to start as soon as possible after passing the Lake Linville Road bridge. Northbound vehicles are on grade after passing this structure. There would be no way to merge the acceleration lane into the interstate before Lake Linville dam without a design exception. With the large number of recreational vehicles and vehicles pulling boats, this shortened merge length would not be desirable. **Upon consideration, the VE team felt, based on this condition, the need to rescind this recommendation.**

VALUE ENGINEERING ALTERNATIVE 14
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: End ramp taper before the dam at I-75 northbound, Interchange 62

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
ASPHALT SURFACE 038A		TON	621	99	61,580	212	99	21,026
ASPHALT BASE 1.00 CL4 PG 76-22		TON	1,492	65	96,954	509	65	33,104
ASPHALT BASE 1.00 CL4 PG 64-22		TON	4,226	56	234,709	1,443	56	80,140
DRAINAGE BLANKET TYPE II PG 64-22		TON	3,356	25	84,718	1,146	25	28,927
DENSE GRADE AGGREGATE		TON	6,238	18	112,277	2,130	18	38,336
BRIDGE		EA	1	1,145,572	1,145,572	1	1,048,500.00	1,048,500
					1,735,810			**1,250,034**
							(BASELINE LESS PROPOSED)	**485,776**

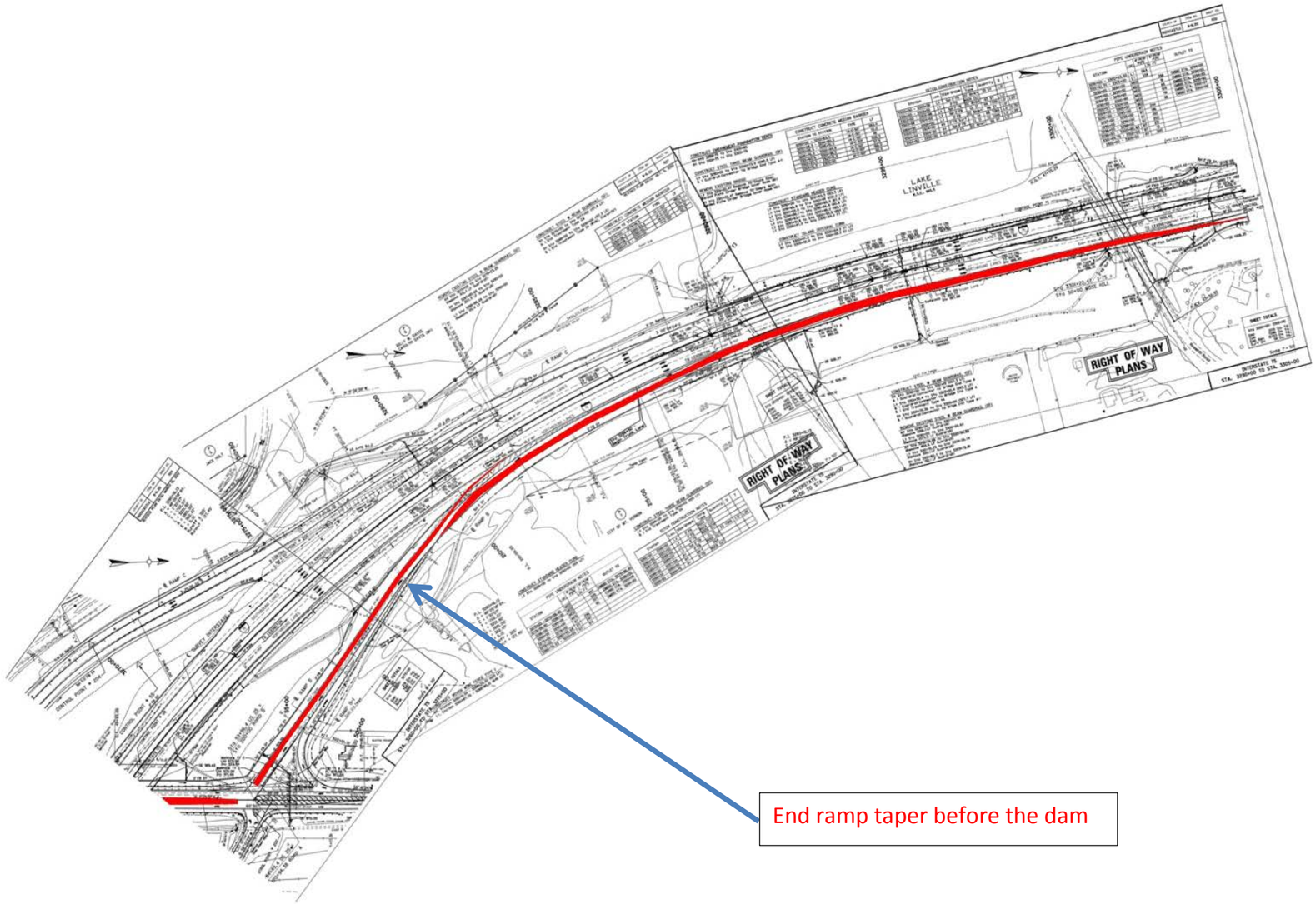
*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 14
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE:	End ramp taper before the dam at I-75 northbound, Interchange 62

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 15
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Extend island closer to through lane at exit 62 off-ramp C-1 using a painted island
FUNCTION:	**Traffic**

BASELINE ASSUMPTION:

The intersection of the I-75 southbound exit ramp C-1 to US 25 has a proposed concrete island header curb on the ramp separating right and left turn movements.

PROPOSED ALTERNATIVE:

Paint the proposed channelization island and extend it onto the shoulder area of US25 rather than using a raised concrete island.

BENEFITS	RISKS/CHALLENGES
• Allows for communicating that through traffic on US 25 does not yet have the right to use the added	• Painted island will not provide the same degree of separation as the raised island
• Reduces chances of sideswipe collisions on US 25 and rear end collisions on the ramp	•
• Reduces congestion on the exit ramp	•
•	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 9,450	$ -	$ 9,450
PROPOSED ALTERNATIVE:	$ 1,080	$ -	$ 1,080
TOTAL (Baseline less Proposed)	$ 8,370	$ -	**$ 8,370**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 15
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend island closer to through lane at exit 62 off-ramp C-1 using a painted island

DISCUSSION/JUSTIFICATION:

The intersection of the I-75 southbound exit ramp C-1 to US 25 has a proposed concrete island header curb on the ramp ending at the edge of a proposed ten-foot paved shoulder. A second westbound through lane is coming off the C-1 ramp westbound onto US 25 that should be a continuous, non-stop, free flow movement. However, it is the tendency of motorists to want to stop on the ramp to assure they have the right-of-way to continue. This can result in an increase in rear end collisions. Additionally, because of the ten-foot shoulder on US 25, some aggressive drivers have a tendency to want to begin the added lane early as they come through the intersection in order to pass a slower moving car, therefore increasing the chances of sideswipe collisions. Removing the proposed island curb and using thermoplastic road marking paint will allow for hatching off this shoulder area to the white edge line, creating the non-obtrusive barrier to traffic and better relaying to ramp C-1 motorist that it is not a stop condition.

NOTE: This VE proposal, or a combination thereof, could be combined with VE-16 and/or VE-17.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 15
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend island closer to through lane at exit 62 off-ramp C-1 using a painted island

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
ISLAND HEADER CURB TYPE 2 (01967)		LF	280	33.75	9,450			
PAVE STRIPING-THERMO-4 IN W (6540)		LF				500	2.16	1,080
					9,450			**1,080**
							(BASELINE LESS PROPOSED)	**8,370**

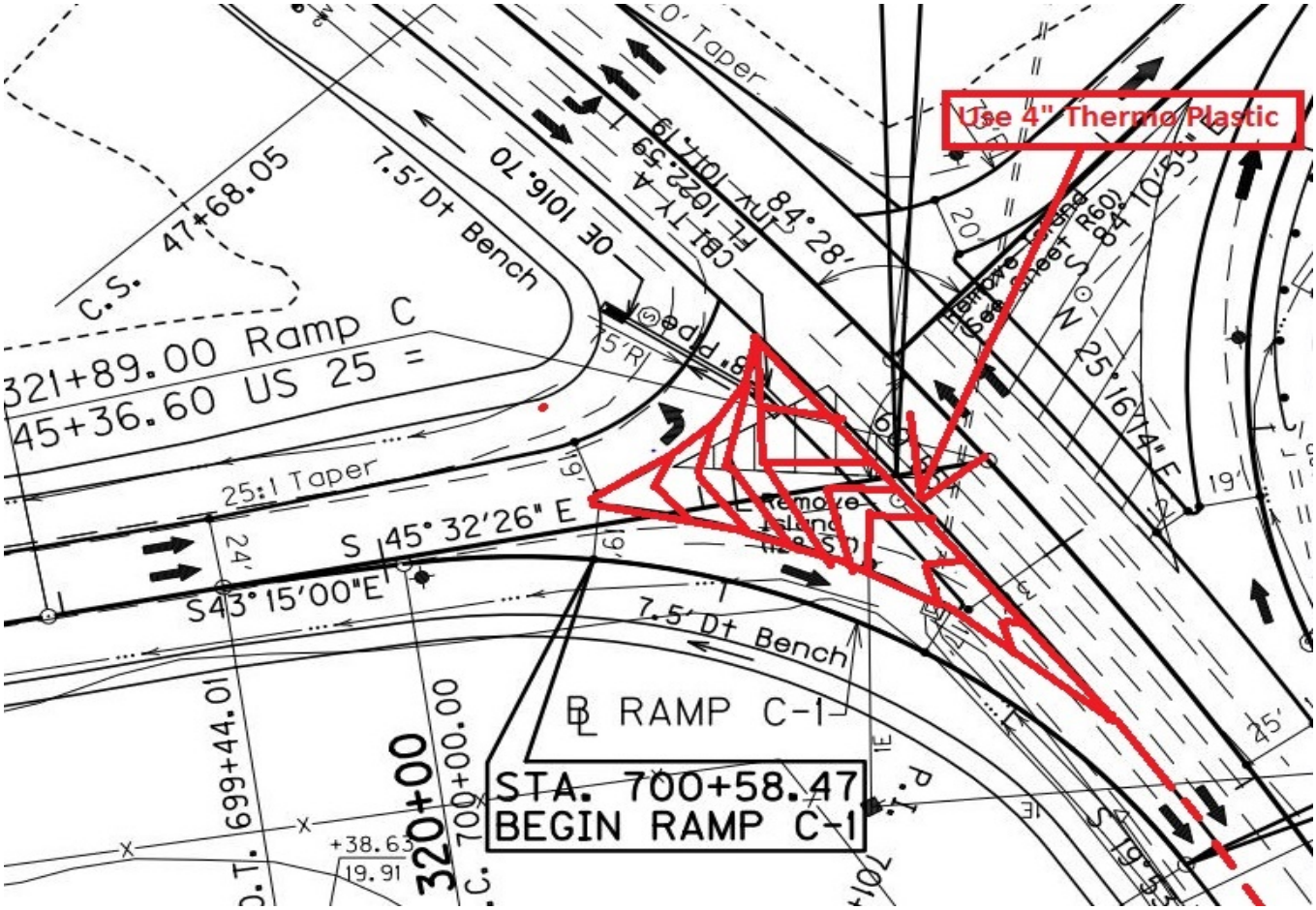
*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 15
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend island closer to through lane at exit 62 off-ramp C-1 using a painted island

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 16
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Extend raised concrete island at exit 62 off-ramp C-1 closer to the US 25 through lane
FUNCTION:	**Traffic**

BASELINE ASSUMPTION:

Raised concrete island at terminus of I-75 southbound exit ramp to US 25, separating left turn and right turn traffic, is located approximately 12 feet parallel to the US 25 southbound through lane.

PROPOSED ALTERNATIVE:

Extend raised island approximately eight feet closer to edge of the US 25 southbound through driving lane.

BENEFITS	RISKS/CHALLENGES
• Increases delineation/separation to increase motorist comfort for added continuous lane	• Reduces outside shoulder width along US 25 southbound
• Reduces congestion on exit ramp	• Additional design for revising location of curb box inlet
• Reduces crashes related to motorists slowing or stopping on ramp C-1	•
• Reduces potential for side swipes	•
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 11,102	$ -	$ 11,102
PROPOSED ALTERNATIVE:	$ 13,477	$ -	$ 13,477
TOTAL (Baseline less Proposed)	$ (2,375)	$ -	**$ (2,375)**

COST

VALUE ENGINEERING ALTERNATIVE 16
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend raised concrete island at exit 62 off-ramp C-1 closer to the US 25 through lane

DISCUSSION/JUSTIFICATION:

The current right turn from the I-75 exit ramp onto the existing US 25 southbound lane is a non-stop continuous movement. The baseline plan reconstructs this intersection with a larger radius. However, it is the tendency of motorists to want to stop, or slow down significantly on the ramp, as currently happens many times, to assure they have the right of way to continue. This can possibly cause accidents (i.e., rear ends on the ramp). The proposed alternative would extend the raised island into the US 25 southbound shoulder area creating more physical separation through the right, free flow movement into the added US 25 lane. This should provide more comfort to motorists by eliminating the appearance of a merge situation.

NOTE: This VE proposal, or a combination thereof, could be combined with VE-15 and/or VE-17.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 16
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend raised concrete island at exit 62 off-ramp C-1 closer to the US 25 through lane

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
ISLAND HEADER CURB TYPE 2		LF	288	33.75	9,720	345	33.75	11,644
DGA BASE		TON	18	18.00	324	25	18.00	450
ASPHALT SEAL AGGREGATE		TON	7	82.09	575	9	82.09	739
EMULSIFIED ASPHALT RS-2		TON	0.9	537.20	483	1.2	537.20	645
					11,102			**13,477**
							(BASELINE LESS PROPOSED)	**(2,375)**

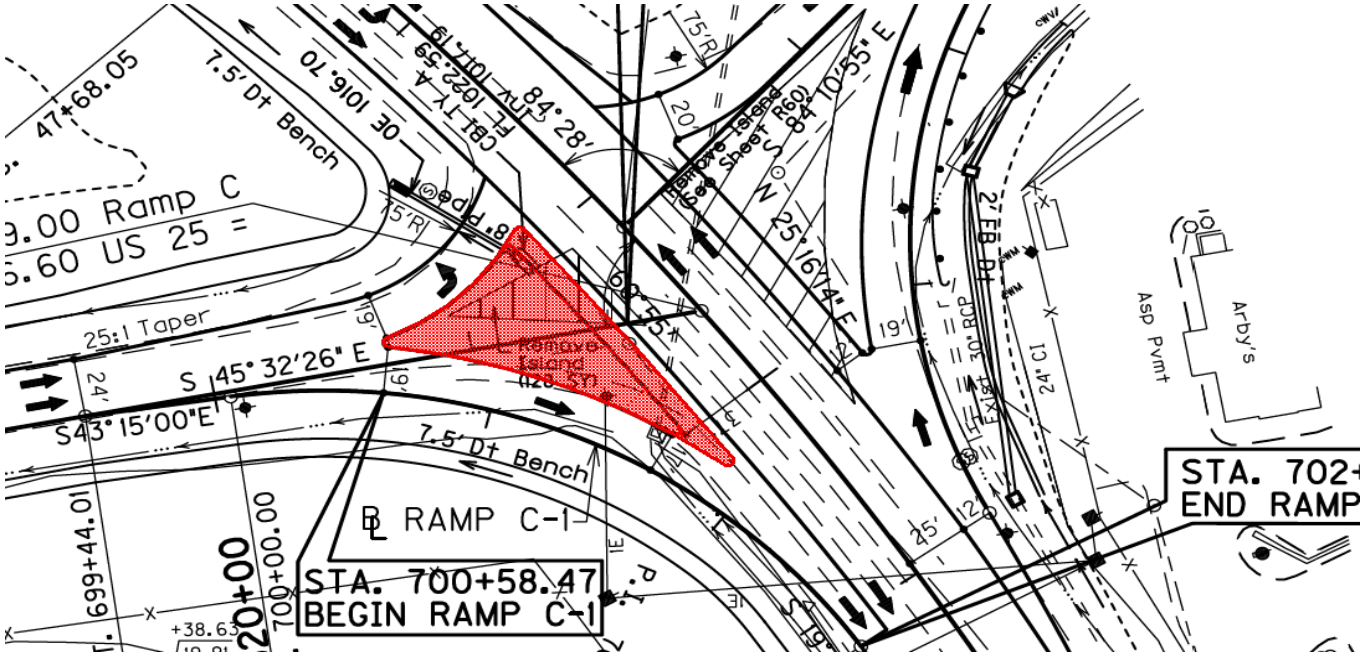
*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 16
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Extend raised concrete island at exit 62 off-ramp C-1 closer to the US 25 through lane

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 17
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Add painted hatching between the C-1 ramp concrete island and the US 25 driving lane on the shoulder
FUNCTION:	**Traffic**

BASELINE ASSUMPTION:

The intersection of the I-75 southbound exit ramp C-1 to US 25 currently has a proposed concrete island header curb on the ramp.

PROPOSED ALTERNATIVE:

Add flush painted hatching on the shoulder between the island and the US 25 westbound driving lane.

BENEFITS	RISKS/CHALLENGES
• Allows for communicating that through traffic on US 25 remains in through lane	• None apparent
• Allows for a more continuous movement of ramp C-1's right turn on to the US 25	•
• Reduces chance of sideswipe collisions on US 25 and rear-end collisions on the ramp	•
• Maintains the functionality of the US 25 shoulder	•
• Reduces congestion on exit ramps	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 486	$ -	$ 486
TOTAL (Baseline less Proposed)	$ (486)	$ -	**$ (486)**

COST

VALUE ENGINEERING ALTERNATIVE 17
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Add painted hatching between the C-1 ramp concrete island and the US 25 driving lane on the shoulder

DISCUSSION/JUSTIFICATION:

The intersection of the I-75 southbound exit ramp C-1 to US 25 currently has a proposed concrete island header curb on the ramp ending at the edge of a proposed ten-foot paved shoulder. A second through westbound lane is proposed coming off the C-1 ramp westbound on US 25 that should be a continuous, non-stop, free flow movement. However, it is the tendency of motorists to want to stop on the ramp to assure they have the right of way before continuing. This can result in an increase in rear-end collisions and backups. Additionally, because of the ten-foot shoulder on US 25, some aggressive drivers have a tendency to want to begin the added lane early as they come through the intersection to pass a slower moving vehicle, therefore increasing the chance of sideswipe collisions. Using white striping to hatch the area between the edge of the proposed concrete header island curb and the edge of the westbound US 25 through lane to create the non-obtrusive barrier to traffic and better relaying to ramp C-1 motorist that the right turn movement does not need to yield to US 25 traffic.

NOTE: This VE proposal, or a combination thereof, could be combined with VE-15 and/or VE-16.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 17
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Add painted hatching between the C-1 ramp concrete island and the US 25 driving lane on the shoulder							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
PAVE STRIPING-THERMO-4 IN W (6540)		LF				225	2.16	486
								486
							(BASELINE LESS PROPOSED)	**(486)**

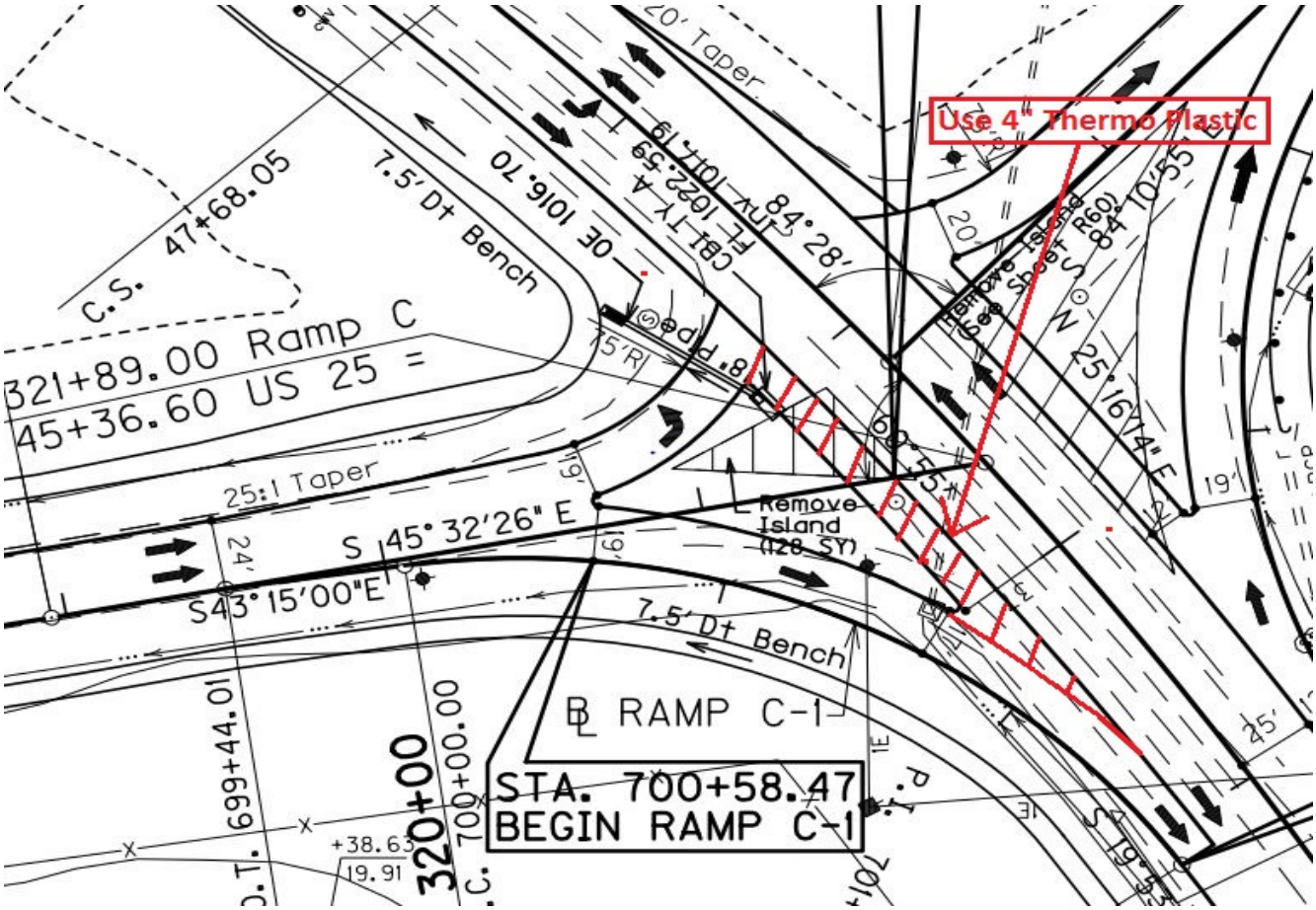
*Note: Costs are rounded to nearest thousand dollars.

COST

VALUE ENGINEERING ALTERNATIVE 17
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Add painted hatching between the C-1 ramp concrete island and the US 25 driving lane on the shoulder

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 18
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Identify on-site waste areas

FUNCTION: **Miscellaneous**

BASELINE ASSUMPTION:

All of the excess excavated material is to be wasted off-site (i.e., outside of the right-of-way).

PROPOSED ALTERNATIVE:

Waste some excess excavated material within the right-of-way at the interchanges.

BENEFITS	RISKS/CHALLENGES
• Reduces roadway excavation cost	• Utilities will be encountered which may offset cost savings
• Speeds up construction efforts	• Surface drainage may need to be redesigned which may offset cost savings
• Enhances project safety (eliminate some guardrail)	• May be difficult to access these areas
•	• Motorist safety in these areas may be problematic
•	•
•	•
•	•
•	•

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 5,680,789	$ -	$ 5,680,789
PROPOSED ALTERNATIVE:	$ 5,519,051	$ -	$ 5,519,051
TOTAL (Baseline less Proposed)	$ 161,738	$ -	**$ 161,738**
			SAVINGS

VALUE ENGINEERING ALTERNATIVE 18
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Identify on-site waste areas

DISCUSSION/JUSTIFICATION:

Roadway excavation is one of the largest bid items in these projects. Excavation accounts for $6.1 million which is eight percent of the total cost of both projects combined. To potentially reduce excavation costs, speed up construction efforts and enhance project safety, excavation waste areas should be designated for the project area.

IMPLEMENTATION CONSIDERATIONS

Roadway excavation waste areas are unknown and, therefore, the estimated bid unit price and overall cost for these projects are not as well known (i.e., estimated) as could be with known designated waste areas. Moreover, location(s) will be outside of the right-of-way and further away from the project area which will lead to more costly construction efforts to properly waste material. Other negatives are possible permits and environmental impacts that may be associated with unknown waste sites which are to be determined.

VALUE ENGINEERING ALTERNATIVE 18
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Identify on-site waste areas

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
ROADWAY EXCAVATION (8-6.10)		CY	600,000	5.27	3,162,000	600,000	5.12	3,072,000
ROADWAY EXCAVATION (8-6.20)		CY	797,085	3.16	2,518,789	797,085	3.07	2,447,051
					5,680,789			**5,519,051**
							(BASELINE LESS PROPOSED)	**161,738**

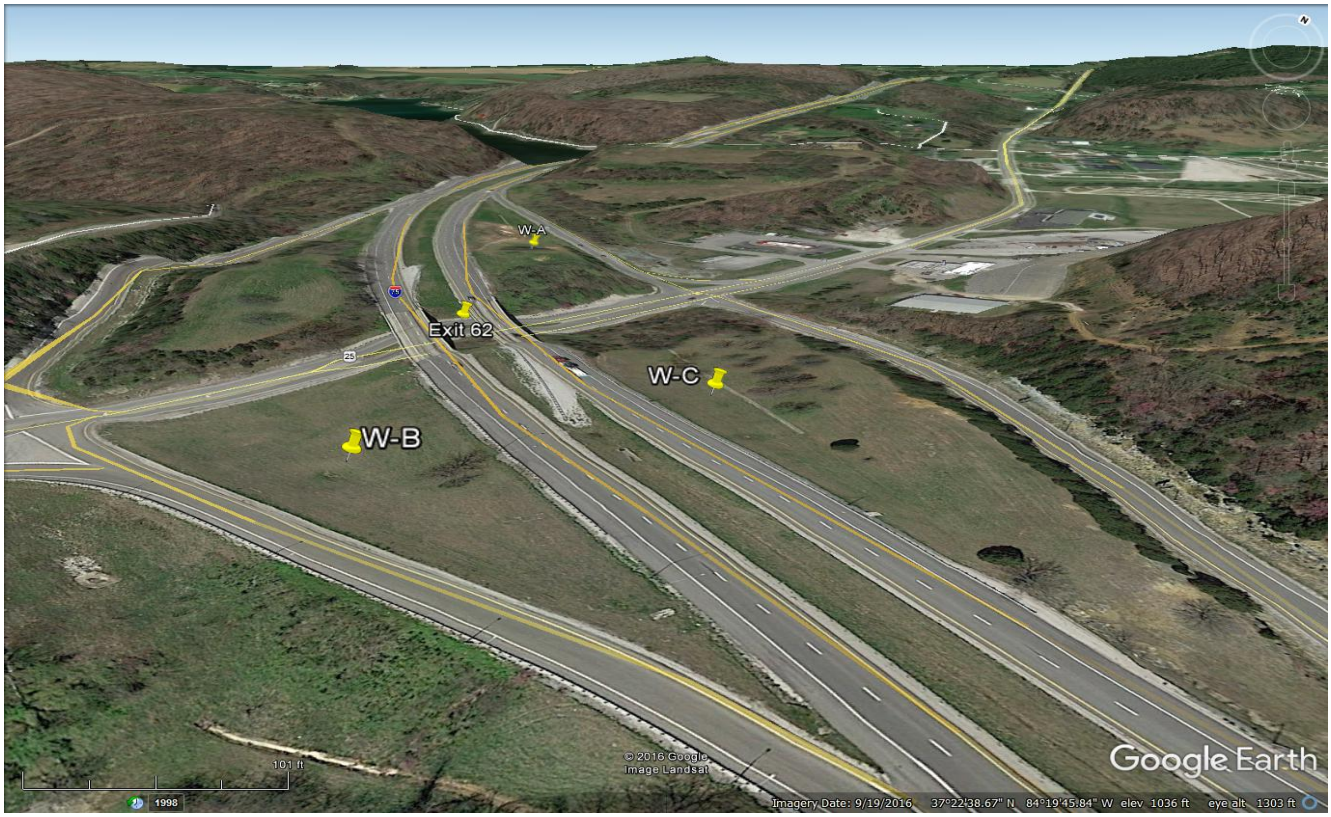
*Note: Costs are rounded to nearest thousand dollars.

SAVINGS

VALUE ENGINEERING ALTERNATIVE 18
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Identify on-site waste areas

Proposed On-Site Waste Areas A, B & C



VALUE ENGINEERING ALTERNATIVE 18
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Identify on-site waste areas

Proposed On-Site Waste Areas D & E

VALUE ENGINEERING ALTERNATIVE 19
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Re-proportion pavement layer for driving lane

FUNCTION: **Support Load**

BASELINE ASSUMPTION:

Adding a lane and shoulder to the inside involves widening within the existing depressed median. Because of the existing median depth, the pavement design for the inside driving lane was evaluated for the potential for re-proportioning for potential cost savings.

PROPOSED ALTERNATIVE:

The proposed design was evaluated for each section -- 8-6.10 and 8-6.20. The results of these analyses indicated that the Structural Numbers for the proposed design effectively satisfied Structural Number requirements and there is no opportunity for re-proportioning the pavement layers for the inside lane.

NOT RECOMMENDED BY VE TEAM

BENEFITS	RISKS/CHALLENGES
• No plan changes are necessary	• None apparent
• Pavement design efficiency has been maximized	•
•	•
•	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING ALTERNATIVE 19
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Re-proportion pavement layer for driving lane

DISCUSSION/JUSTIFICATION:

An analysis of the proposed designs was completed and is summarized in **Table VE-19A** and **Table VE-19B**. From these analyses, it can be seen that Structural Numbers (SN) that are associated with the proposed designs have the following Structural Numbers: Section 8-6.10 -- SN = 7.58; Section 8-6.20 -- SN = 7.47. These SNs are slightly less than the minimum required SNs for the respective ESAL levels -- Section 8-6.10 (53,000,000) -- 7.94 and Section 8-6.20 (58,000,000) -- 8.04. While these Structural Numbers are slightly less than required, this is not considered a design flaw in that a much greater proportion of truck traffic will be in the two outside lanes. Thus, no additional pavement structure is required. At the same time, this further confirms that there is not a potential opportunity for savings by re-proportioning the pavement layers. This pavement section in near what could be termed a "perpetual pavement section."

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 19
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Re-proportion pavement layer for driving lane

TABLE VE-19A (Section 8-6.10)

Full Depth Construction in Existing Median
CBR 3
53,000,000 ESALs

Existing Layers -- Inside Driving Lane and Inside Shoulder

	Thickness	*Layer Coefficient*	*Structural Number (SN)*
DGA Base	12	0.14	1.68
Drainage Blanket TY II - Asph	5	0.21	1.05
CL 4 Asphalt Base 1.50D PG 64-22	4.5	0.4	1.8
CL 4 Asphalt Base 1.00D PG 64-22	3.25	0.4	1.3
CL 4 Asphalt Base 1.00D PG 76-22	3	0.4	1.2
CL 4 Asphalt Surface 0.38A PG 76-22	1.25	0.44	0.55
	29		**7.58**

Theoretical Shoulder Required SN values

Required SN	*53,000,000 ESALs*		*26,500,000 ESALS (50% Mainline)*		*21,200,000 ESALs (40% Mainline)*		*10,600,000 ESALs (20% Mainline)*	
	CBR 3		CBR 3		CBR 3		CBR 3	
33% AC	8.61		7.84		7.62		6.98	
50% AC	8.36		7.58		7.36		6.74	
75% AC	7.94	Minimum	7.25	Minimum	7.04	Minimum	6.44	Minimum
	8.30		7.56		7.34		6.72	

VALUE ENGINEERING ALTERNATIVE 19
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Re-proportion pavement layer for driving lane

TABLE VE-19B (Section 8-6.20)

Full Depth Construction in Existing Median
CBR 3
58,000,000 ESALs

Existing Layers -- Inside Driving Lane and Inside Shoulder

	Thickness	Layer Coefficient	Structural Number (SN)
DGA Base	12	0.14	1.68
Drainage Blanket TY II - Asph	4	0.21	0.84
CL 4 Asphalt Base 1.50D PG 64-22	4.5	0.4	1.8
CL 4 Asphalt Base 1.00D PG 64-22	3.5	0.4	1.4
CL 4 Asphalt Base 1.00D PG 76-22	3	0.4	1.2
CL 4 Asphalt Surface 0.38A PG 76-22	1.25	0.44	0.55
	28.25		**7.47**

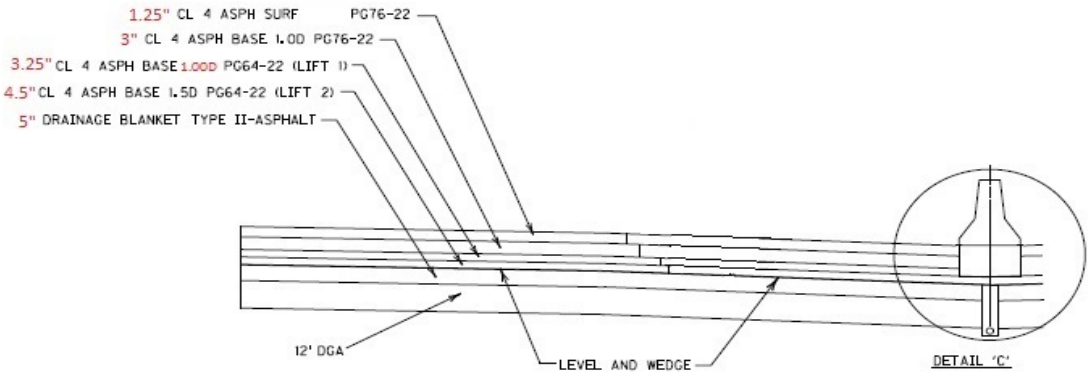
Theoretical Shoulder Required SN values

Required SN	*58,000,000 ESALs*		*29000000 ESALs*		*23,200,000 ESALs*		*11,600,000 ESALs*	
	CBR 3		CBR 3		CBR 3		CBR 3	
33% AC	8.72		7.94		7.71		7.06	
50% AC	8.47		7.68		7.45		6.81	
75% AC	8.04	Minimum	7.33	Minimum	7.12	Minimum	6.51	Minimum
	8.41		7.65		7.43		6.79	

VALUE ENGINEERING ALTERNATIVE 19
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

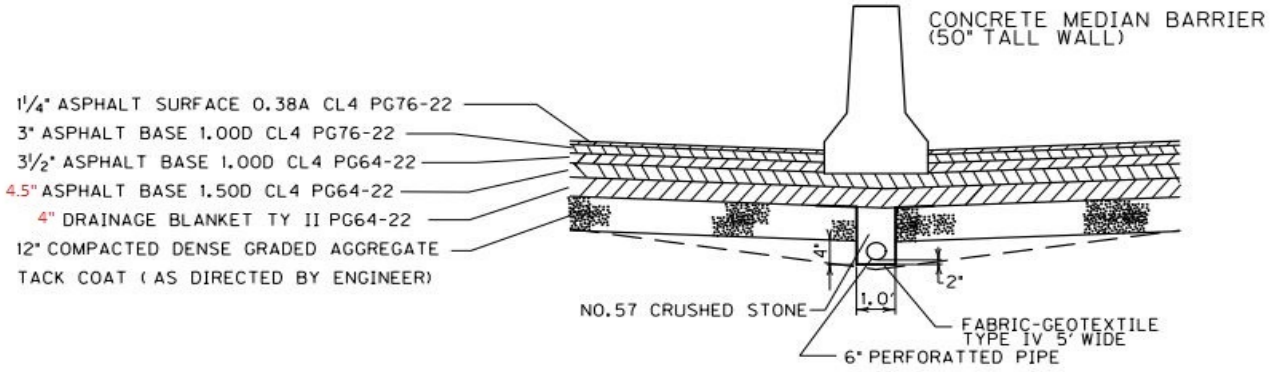
TITLE: Re-proportion pavement layer for driving lane

SKETCH OF BASELINE ASSUMPTION



DETAIL B

ITEM 8-6.1



DETAIL "A"

ITEM 8-6.2

VALUE ENGINEERING ALTERNATIVE 20
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce inside shoulder width from 14' to 12'

FUNCTION: **Support Load**

BASELINE ASSUMPTION:

Adding a lane and shoulder to the inside involves widening within the existing depressed median. The proposed design uses a 14-foot inside shoulder width.

PROPOSED ALTERNATIVE:

Current design criteria for rural interstates indicates that the minimum shoulder width is 12 feet paved when the truck traffic exceeds 250 DDHV. Thus the proposed alternative is to reduce the proposed shoulder from 14 feet to 12 feet.

NOT RECOMMENDED BY VE TEAM

BENEFITS	RISKS/CHALLENGES
• Narrow typical section minimizes impacts to the dam (Lake Linville area)	• Requires shifting crown point an additional two feet
•	•
•	•
•	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING ALTERNATIVE 20
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce inside shoulder width from 14' to 12'

DISCUSSION/JUSTIFICATION:

With a 14-foot inside shoulder width, the crown point for the inside edge of the center lane is shifted 2.67 feet toward the median. Older interstates such as this section of interstate were constructed with a 3/8 inch per foot pavement cross-slope. Current interstate standards require a desirable cross-slope of 2%. Reducing the inside shoulder width from 14 feet to 12 feet will also require shifting the crown point an additional two feet. The **Sketch of the Proposed Alternative** illustrates this condition. It can be seen from the sketch that the savings for reducing the inside shoulder width by two feet must be offset by the associated wedge associated shown the sketch.

Thus, reducing the inside shoulder width from 14 feet to 12 feet is not recommended except for situations such as crossing the dam for Lake Linville wherein a more narrow typical section could allow for minimizing impacts to the dam. Upon consideration, the VE team felt, based on this condition, the need to rescind this recommendation.

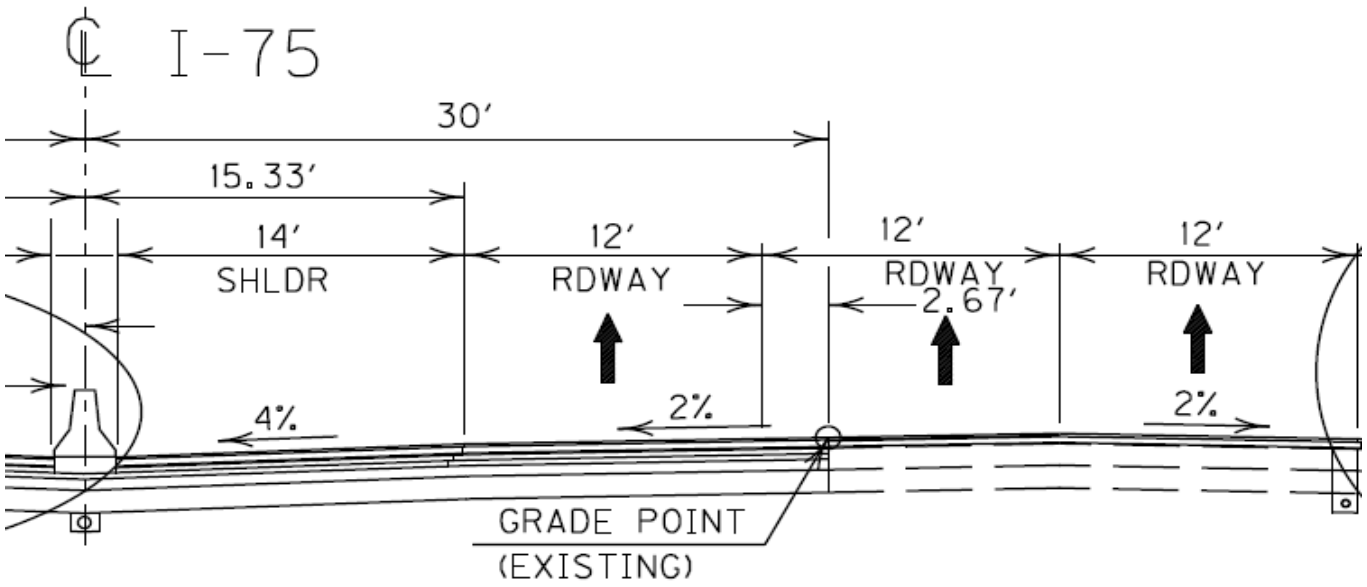
IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 20
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce inside shoulder width from 14' to 12'

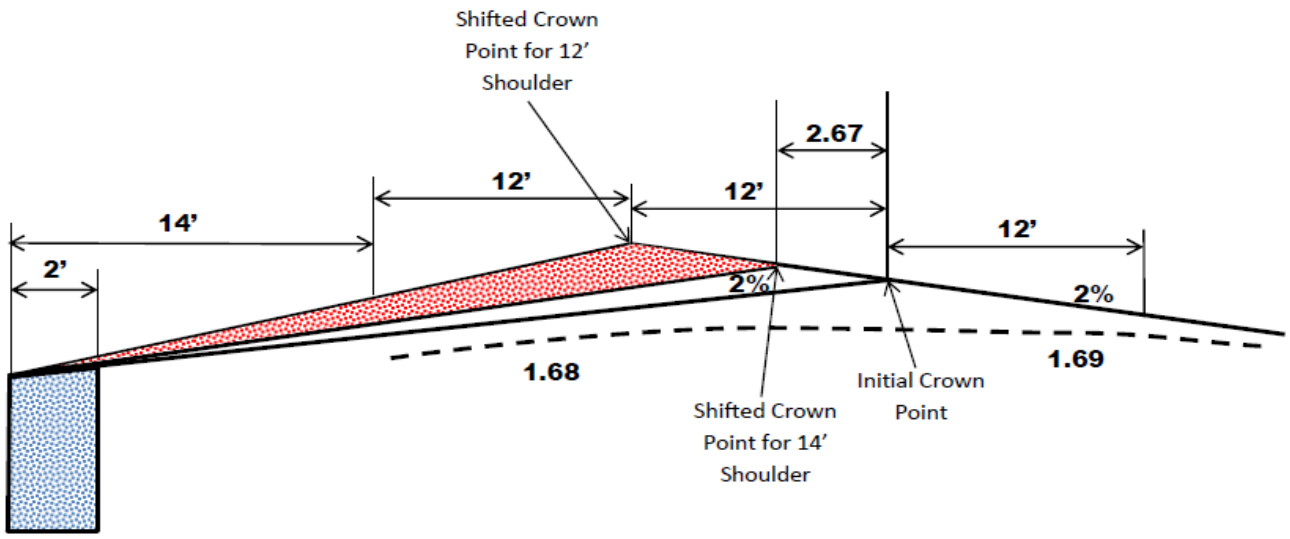
SKETCH OF BASELINE ASSUMPTION



VALUE ENGINEERING ALTERNATIVE 20
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Reduce inside shoulder width from 14' to 12'

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING ALTERNATIVE 21
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Validate overlay design

FUNCTION: **Support Load**

BASELINE ASSUMPTION:

The current proposed design involves variable depth leveling and wedging for the existing driving lanes and then overlay with 1.25 inches of asphalt surface. Section 8-6.10 includes a 1.0 inch asphalt scratch course, whereas Section 8-6.20 includes a variable depth leveling and wedging layer. Both sections include a 1.25 inch asphalt surface overlay. The baseline assumption for the overlay design was predicated upon pavement management data which traced the evolution of the pavement structure from the initial construction (1968) through rehabilitation actions in 1978, 1990, 2000, 2011, and 2013. Initial construction in 1968 involved a pavement structure totaling 19.5 inches (1"surface, 6.5" asphalt base, and 12" aggregate base). The total thickness with subsequent millings and overlays is 29.25 inches (+/- one inch).

PROPOSED ALTERNATIVE:

An analysis was completed to validate the need for the current proposed leveling and wedging / one-inch scratch course and 1.25 inches asphalt overlay. Analyses indicate that the following Structural Numbers are required for a CBR=3 and the associated ESALs for each section -- Section 8-6.10 (53,000,000 ESALs) and Section 8-6.20 (58,000,000 ESALs). Required Structural Numbers (SNs) are Section 8-6.10 (SN = 7.94) and Section 8-6.20 (SN = 8.04). The analyses indicates that the associated SN for the total existing pavement structure plus the proposed overlay design is SN = 7.88. In looking at the cores, it was noted that the total pavement thickness varies from about 26 inches to about 32 inches and seems to have a median value of about 29 inches. Thus, the proposed overlay design seemed reasonable.

BENEFITS	RISKS/CHALLENGES
• Provide KYTC with peer review of design	• None apparent
•	•
•	•
•	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING ALTERNATIVE 21
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Validate overlay design

DISCUSSION/JUSTIFICATION:

The approach taken for this analyses involved computing an in-situ pavement Structural Number for each layer of the existing pavement structure and the proposed 1.25 inch overlay. A layer coefficient for the existing aggregate base was assumed as: a = 0.14. A layer coefficient of a = 0.35 was used for all existing asphalt. A layer coefficient of a = 0.40 was used for the proposed leveling and wedging / scratch course. A layer coefficient of a = 0.44 was used for the 1.25 inch asphalt surface overlay. These values are assumptions but are thought to be reasonable based on inspection of the cores. See **Table VE-21A** and **Table VE-21B** for details of the analysis.

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 21
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Validate overlay design

TABLE VE-21A (Section 8-6.10)

Full Depth Construction in Existing Median
CBR 3
53,000,000 ESALs

Existing Layers -- Inside Driving Lane and Inside Shoulder

	Thickness	*Layer Coefficient*	*Structural Number (SN)*	**Required SN**	*53,000,000 ESALs*		*26,500,000 ESALS (50% Mainline)*		*21,200,000 ESALs (40% Mainline)*		*10,600,000 ESALs (20% Mainline)*	
					CBR 3		CBR 3		CBR 3		CBR 3	
DGA Base	12	0.14	1.68	33% AC	8.61		7.84		7.62		6.98	
Drainage Blanket TY II - Asph	5	0.21	1.05	50% AC	8.36		7.58		7.36		6.74	
CL 4 Asphalt Base 1.50D PG 64-22	4.5	0.4	1.8	75% AC	7.94	Minimum	7.25	Minimum	7.04	Minimum	6.44	Minimum
CL 4 Asphalt Base 1.00D PG 64-22	3.25	0.4	1.3		8.30		7.56		7.34		6.72	
CL 4 Asphalt Base 1.00D PG 76-22	3	0.4	1.2									
CL 4 Asphalt Surface 0.38A PG 76-22	1.25	0.44	0.55									
	29		**7.58**									

Verify Overlay Design

Section 8-6.10		**SB 58.954 to 65.220**	**SB 55.744 to 58.954**	**NB 58.954 to 65.220**	**Layer Coefficients**	**SN Section 8-6.10 & Section 8-6.20**
1968	Surface	1	1	1	0.35	0.35
	Base	6.5	6.5	6.5	0.35	2.275
	DGA	12	12	12	0.14	1.68
1978	Mill	-1	-1	-1	0.35	-0.35
	Surface	1	1	1	0.35	0.35
1990	Mill	-0.5	-0.5	-0.5	0.35	-0.175
	Base	3	3	3	0.35	1.05
	Surface	1.25	1.25	1.25	0.35	0.4375
2000	Mill	-1	-1	-1	0.35	-0.35
	Surface	1.5	1.5	1.5	0.35	0.525
2013	Mill	-1.5	-1.5	-1.5	0.35	-0.525
	Surface	3.5	3.5	3.5	0.35	1.225
	Base	1.25	1.25	1.25	0.35	0.4375
OL--Base		1	1	1	0.4	0.4
OL--Surf		1.25	1.25	1.25	0.44	0.55
	Total	**29.25**	**29.25**	**29.25**		**7.88**

VALUE ENGINEERING ALTERNATIVE 21
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County

TITLE: Validate overlay design

TABLE VE-21B (Section 8-6.20)

Full Depth Construction in Existing Median
CBR 3
58,000,000 ESALs

Existing Layers -- Inside Driving Lane and Inside Shoulder

	Thickness	*Layer Coefficient*	*Structural Number (SN)*
DGA Base	12	0.14	1.68
Drainage Blanket TY II - Asph	4	0.21	0.84
CL 4 Asphalt Base 1.50D PG 64-22	4.5	0.4	1.8
CL 4 Asphalt Base 1.00D PG 64-22	3.5	0.4	1.4
CL 4 Asphalt Base 1.00D PG 76-22	3	0.4	1.2
CL 4 Asphalt Surface 0.38A PG 76-22	1.25	0.44	0.55
	28.25		**7.47**

Required SN	*58,000,000 ESALs*		*29000000 ESALs*		*23,200,000 ESALs*		*11,600,000 ESALs*	
	CBR 3		CBR 3		CBR 3		CBR 3	
33% AC	8.72		7.94		7.71		7.06	
50% AC	8.47		7.68		7.45		6.81	
75% AC	8.04	Minimum	7.33	Minimum	7.12	Minimum	6.51	Minimum
	8.41		7.65		7.43		6.79	

Theoretical Shoulder Required SN values

Verify Overlay Design

Section 8-6.10		**SB 58.954 to 65.220**	**SB 55.744 to 58.954**	**NB 58.954 to 65.220**	**Layer Coefficients**	**SN Section 8-6.10 & Section 8-6.20**
1968	Surface	1	1	1	0.35	0.35
	Base	6.5	6.5	6.5	0.35	2.275
	DGA	12	12	12	0.14	1.68
1978	Mill	-1	-1	-1	0.35	-0.35
	Surface	1	1	1	0.35	0.35
1990	Mill	-0.5	-0.5	-0.5	0.35	-0.175
	Base	3	3	3	0.35	1.05
	Surface	1.25	1.25	1.25	0.35	0.4375
2000	Mill	-1	-1	-1	0.35	-0.35
	Surface	1.5	1.5	1.5	0.35	0.525
2013	Mill	-1.5	-1.5	-1.5	0.35	-0.525
	Surface	3.5	3.5	3.5	0.35	1.225
	Base	1.25	1.25	1.25	0.35	0.4375
OL--Base		1	1	1	0.4	0.4
OL--Surf		1.25	1.25	1.25	0.44	0.55
	Total	**29.25**	**29.25**	**29.25**		**7.88**

VALUE ENGINEERING ALTERNATIVE 22
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE:	Add lane rental to the contract requirements
FUNCTION:	**Maintain Traffic**

BASELINE ASSUMPTION:

Standard liquidated damages are applied to the project.

PROPOSED ALTERNATIVE:

Modify project notes to apply escalating damages for lane closures.

BENEFITS	RISKS/CHALLENGES
• Greater emphasis on traffic conveyance	• None apparent
• Reduces impacts during construction	•
• Reduces traffic back-ups	•
• Gives contractor incentive to minimize lane closures	•
•	•
•	•
•	•
•	•

DESIGN SUGGESTION

VALUE ENGINEERING ALTERNATIVE 22
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add lane rental to the contract requirements

DISCUSSION/JUSTIFICATION:

By using escalating lane rental rates for partial and full lane closures, emphasis is given to the conveyance of traffic over contractor convenience or profitability. The concept has been used in the urban areas of the state and is reasonable, due to high traffic volumes, to apply to this project. A previous study shows the highest user cost for southbound traffic to be on Friday between 5:00 PM and 11:00 PM, and northbound traffic to be on Sunday between 4:00 PM and 12:00 AM. Lane rental rates are based heavily on user costs rather than liquidated damage rates set by project cost.

There are occasions when it would be more beneficial to the Cabinet to allow work that begins during an allowed time period to continue if longer total delays may result from multiple starts/stops.

Additional information for consideration is provided on the following pages and includes narrative related to:

- Design Phase
- Bid Process
- Approval for Use
- How Lane Rental Works
- Special Provisions/GSP (General Special Provisions)
- Background Information
- Construction Cost with Lane Rental
- Safety Issues
- Number of Lane Rentals
- Lane Rental Charges and Liquidated Damages
- Change Orders (added and deleted work)
- Pricing Lane Rental by Time of Day
- Time Credits
- Overrun of Lane Rental Days
- Lane Rental Considerations

IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING ALTERNATIVE 22
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1, Item No. 08-0006.10
I-75 Widening, MP 60.1 to MP 64.5, Item No. 08-0006.20
Rockcastle County

TITLE: Add lane rental to the contract requirements

ADDITIONAL INFORMATION - LANE RENTAL
(following this page)

Additional information on Lane Rentals
(Courtesy of Washington State Department of Transportation)

http://www.wsdot.wa.gov/Projects/delivery/alternative/LaneRental.htm)

Introduction

Lane Rental is used to minimize the impacts of a project on the traveling public. It is a method of transferring the roadway user costs to the contractor. The contractor must rent a lane in order to close it. This creates a monetary incentive for the contractor to be innovative and minimize the duration of lane closures.

The contractor makes decisions that consider the roadway user costs, both during the bid and as the contract progresses. The contractor's bid consists of a combination of the cost to perform the work (A component) with the cost of the impact to the public (B component) to provide the lowest cost to the public. By providing a more aggressive scheduling package, a contractor may be able to gain a competitive advantage by decreasing the overall impact to the traveling public and thereby reducing the amount for bid consideration.

Design Phase

During the design phase, the public impacts of the project are evaluated. The appropriate lane rental units and charges are determined. Lane rental time credit units will vary in size (minutes, hours, days) depending on the road user impacts, and will be as defined in the special provisions. For example, any section of one lane for any part of a working day is equal to one unit.

Bid Process

During the bidding process, the contractor determines the number of lane closures that will be required to complete the work. This number is included in the bid proposal.

After bids are opened, the contractor's lane rental bid is combined with the price proposal. The project is awarded to the contractor with the lowest adjusted bid. The number of "free" lane rental units in the contract is modified to reflect the awarded contractor's bid.

A lane rental closure is applied anytime a lane is closed, for any reason, to progress contract work. The project office tracks lane rentals.

Should the contractor go over the allotted amount, all additional lane rentals will be charged to "Lane Rental - Additional."

If a contract progresses into liquidated damages, the project office continues to track lane rentals but does not charge them.

Additional information on Lane Rentals
(Courtesy of Washington State Department of Transportation)

http://www.wsdot.wa.gov/Projects/delivery/alternative/LaneRental.htm)

Approval for Use

The State Construction Engineer has conditionally approved lane rental on a pilot basis. The use of lane rental requires the approval of the State Specifications Engineer for the following reasons:

- To assist in establishing an appropriate unit and value for the closure.
- To concur that the application is appropriate. Commitments regarding application and notification have been made to industry, and we want to give this tool a fair chance to be successful.
- Headquarters Construction needs to be aware of where lane rental is being used in order to monitor the effectiveness of the specification and provide lessons learned throughout the state.

How Lane Rental Works

The contract is awarded based on the lowest responsible bid, using the following formula:

The bid amount for evaluation = A+ (B x LRC)

A	Bidder's total estimate for all contract bid items (expressed in dollars).
B	Total number of days subject to lane closure, as defined previously, required to complete all contract work.
LRC	Lane rental cost. These costs can be variable and applied to one or more lanes during a construction project.

This formula is used as a measurement for awarding purposes only, and is not used to determine payment to the contractor. The low bidder may not be the successful bidder. A bidder who proposes to minimize user impacts realizes the value of that benefit as part of their bid. They also run the greatest risk for damages (overrun of lane rental time credits).

Once the contract is awarded, the number of lane rental closures is contractually set. The item "Lane Rental - Additional" is included in the contract to address any overruns in this item. An incentive provision is also included to reward the contractor if the work is completed earlier than the (B) portion bid.

Special Provisions/GSP

When using the Flexible Start Date provision several options may be considered, depending on the desired outcome.

Section 1-02.6, Preparation of Proposal

Additional information on Lane Rentals
(Courtesy of Washington State Department of Transportation)

http://www.wsdot.wa.gov/Projects/delivery/alternative/LaneRental.htm)

Supplement with the following:

A lane rental fee is included as part of this contract. The bidder shall establish the number of lanes necessary to complete the work by utilizing lane closures in accordance with the Plans and these Specifications and include this number in the bid proposal.

Definition of
(***$$1$$***)
A Lane Rental Credit shall be assessed for
The number of lane rental credits allowed shall not exceed (***$$2$$***) of lane closures and shall not be less than ***$$2$$*** of lane closure.

The product of the number of lane rental credits established by the bidder multiplied by the Lane Rental Cost shall be added to the bid total determined from all other bid items. The sum of these two amounts will be the amount used for comparison of bids to determine the lowest bid for award purposes. If a bidder fails to establish the number of lane rental credits, or if the bidder enters a number of lane rental credits not within the range specified above, the maximum credits shown above will be used for calculations to determine the lowest bid for award purposes. The product of lane rental credits times daily road user benefit costs will not be considered in determining payment to the contractor except as described in this special provision.

Note to designer: Requires an additional proposal page supplied through Pre-Contract Administration (similar to A+B bidding specification). Also requires the daily roadway user benefit to be entered on that additional proposal page.

Section 1-02.7, Amount of Bid Deposit:

Supplement with the following:

It will not be necessary for the bid deposit to include an amount to cover the product of lane rental credits of traffic control times daily road user benefit cost

Section 1-03.1, Consideration of Bids:

Supplement with the following:

Each bid submitted shall consist of two parts:

A = The dollar amount for all work to be performed under the contract
B = The total number of lane rental credits required to complete the work.

The lowest responsible bid will then be determined by the Contracting Agency as the lowest combination of (A) and (B) according to the following formula:

A + (B x Lane Rental Cost)

It is mutually agreed by the parties to the contract that ***$$3$$*** per lane rental credit of traffic impact is the stipulated adjustment for road user benefit costs. The preceding formula will only be used to determine the lowest responsible bidder and will not be used to determine final payment to the Contractor when the project is completed other than as

described in this special provision.

Section 1-03.4, Contract Bond:

Supplement with the following:

It will not be necessary for the contract bond to include an amount to cover the product of lane rental credits of traffic impact times hourly road user benefit cost.

Measurement

In the event that the contractor exceeds the number of lane rental credits established in the bid the Engineer shall take a credit under the unit item Additional Lane Rental Credits." Upon physical completion, the contractor will be paid for an under-run in lane rental credits under the item "Additional Lane Rental Credits.

Payment

Credits and Payments will be made per unit as described elsewhere in this special provision.

Background Information

What considerations need to be made to determine if the project lends itself to lane rental?

The risk in using this type of tool is associated with changes and delays beyond the contractor's control. Changes in lane rental costs will have to be considered with regard to change orders. One way to reduce the chance of problems is to sort out the details of potential third party conflicts prior to construction, to the extent it is possible. These conflicts may involve utilities, railroad agreements, environmental/archaeological issues, hazardous materials, biohazards, public support issues, and other potential problems.

Consideration should also be given to whether a contractor, at the time of bid, can accurately predict the duration of all activities for the project. Larger, more complex projects may not be appropriate for lane rental.

Construction Cost with Lane Rental

Lane rental can increase construction cost. On a standard project, a contractor may see an opportunity to reduce the total impacts. A shorter duration solution may increase the primary item cost but reduce lane rental and overall traffic control costs. The contractor will try to determine the most advantageous bid while balancing the potential overrun in lane rental costs.

Designers should anticipate that there will be a cost for the reduction in days. Whether through

acceleration, aggressive management of subcontractors, or specialty equipment, it is likely that the construction price will increase. In no case will the project cost increase greater than the incentive (road user benefit) being offered.

WSDOT construction engineering and inspection costs should be reduced due to the anticipated increase in multiple activities occurring concurrently coupled with the reduced amount of traffic control being used.

Safety Issues

Safety shall not be compromised. The contractor is required to comply with the approved Work Zone Traffic Control Plans along with other related contract requirements.

Number of Lane Rentals

A special provision allows for a maximum number of lane rentals to be specified. Doing so can provide an upper limit of the public impact allowed on the project. However, the purpose of a lane rental charge is ultimately to produce the best value product. If a contractor can provide a far cheaper bid with more public impacts, this may be the best solution. The challenge is to set the lane rental charge at an appropriate level.

Lane Rental Charges and Liquidated Damages

Section 1-08.9 states that liquidated damages are for delays that inconvenience the traveling public, obstruct traffic, interfere with and delay commerce, and increase risks to highway users. For that loss of lane use, WSDOT charges liquidated damages. We do not charge the contractor for lane closures during this time frame, it would be a duplication of the liquidated damages.

Change orders (added and deleted work)

Change orders need to adjust lane rental days as they would any other contract item that is impacted by the change. Projects that have a likelihood of a large number of changes may not be good candidates for lane rental.

Pricing Lane Rental by Time of Day

The lane rental may be broken out by time of day. We can also break out the number of lanes closed at a location.

Time Credits

The lane rental specification identified time in terms of units. These units, once defined, are established in the contractor's initial bid. The lowest combination of the construction cost combined with the time units required would establish the winning bid.

Additional information on Lane Rentals
(Courtesy of Washington State Department of Transportation)

http://www.wsdot.wa.gov/Projects/delivery/alternative/LaneRental.htm)

Once the contract is awarded, time credits will be tracked much like working days. Should a contractor go over the bid amount, the credits will continue to be charged. The unit item "Lane Rental Units - Additional" should be included in the contract and entries made based upon an established value. These units are deducted as a standard item.

Additional information on Lane Rentals
(Courtesy of Washington State Department of Transportation)

http://www.wsdot.wa.gov/Projects/delivery/alternative/LaneRental.htm)

Overrun of Lane Rental Days

Traffic control items are generally reimbursed as unit items. The intention of lane rental is not to punish, but rather to reward a contractor for sound management and appropriate risk taking.

Lane Rental Considerations

Consider these factors when selecting lane rental for a project:

- Traffic restrictions or lane closures with no (or limited) alternate routes result in a high user cost.
- The project is relatively free of third party conflicts that are outside the control of the contract (right of way, utility, environmental, etc.).
- There is a high degree of confidence that design uncertainties have been addressed in the plans.
- A reasonable contractor can accurately schedule (and bid) the amount of necessary lane closures to complete the work as described.
- "Closures" can be well defined.
- Opportunities exist to reduce closure times.
- User fees are substantial enough to offset the cost of the effort to reduce the closure time.

APPENDICES

APPENDIX A
Study Participants

VALUE ENGINEERING STUDY ATTENDEES
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Kentucky Transportation Cabinet
October 25-28, 2016

October				Name	Organization	Position	Office Phone Cell Phone	Email
25	26	27	28					
			✓	Andre Johannes	KYTC	Project Manager		Andre.Johannes@ky.gov
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			✓	Greg Sharp	Stantec	Designer - Section 08-0006.10		greg.sharp@stantec.com
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✓	✓	✓	✓	Bob Jones	KYTC	VE Team: Construction, O&M		Bob.Jones@ky.gov
✓	✓	✓	✓	Rodney Little	Qk4	VE Team: Construction		rlittle@qk4.com
✓	✓	✓	✓	Jeremy Lukat	Qk4	VE Team: Traffic		jlukat@qk4.com

P = via Phone

VALUE ENGINEERING STUDY ATTENDEES
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Kentucky Transportation Cabinet
October 25-28, 2016

October				Name	Organization	Position	Office Phone Cell Phone	Email
25	26	27	28					
✓	✓	✓	✓	Gary Sharpe	Palmer Engineering	VE Team: Pavement	Off: (859) 744-1218 Cell: (859) 221-6912	gsharpe@palmernet.com
✓	✓	✓	✓	Ashley McLain	Palmer Engineering	VE Team: Pavement Analysis (part-time)		amclain@palmernet.com
✓	✓	✓	✓	Dennis Mitchell	American Engineers, Inc.	VE Team: Geotechnical / Structures	Off: (270) 651-7220 Cell: (270) 590-5390	dmitchell@aei.cc
✓	✓	✓	✓	Keith Damron	American Engineers, Inc.	VE Team: Roadway	Off: (502) 245-3813 Cell: (502) 409-2544	kdamron@aei.cc
✓	✓	✓	✓	Patrice Miller	RHA, LLC	VE Team Leader	Off: (602) 493-1947 Cell: (480) 773-8533	Patrice@TeamRHA.com
✓				Ryan Tenges	FHWA		Off: (502) 223-6750	Ryan.Tenges@dot.gov
			✓	Andy Barber	KYTC	Deputy State Highway Engineer	Off: (502) 551-4828	Andy.Barber@ky.gov
			✓	Joe Tucker	KYTC	Engineer	Off: (502) 782-4915	Joseph.Tucker@ky.gov
			✓	Tamra Wilson	KYTC	CDE D8	Off: (606) 677-4017	Tamra.Wilson@ky.gov
			✓	William Chany	KYTC	PD&P D8	Off: (606) 677-4017	William.Chaney@ky.gov

P = via Phone

APPENDIX B
Pareto Cost Models

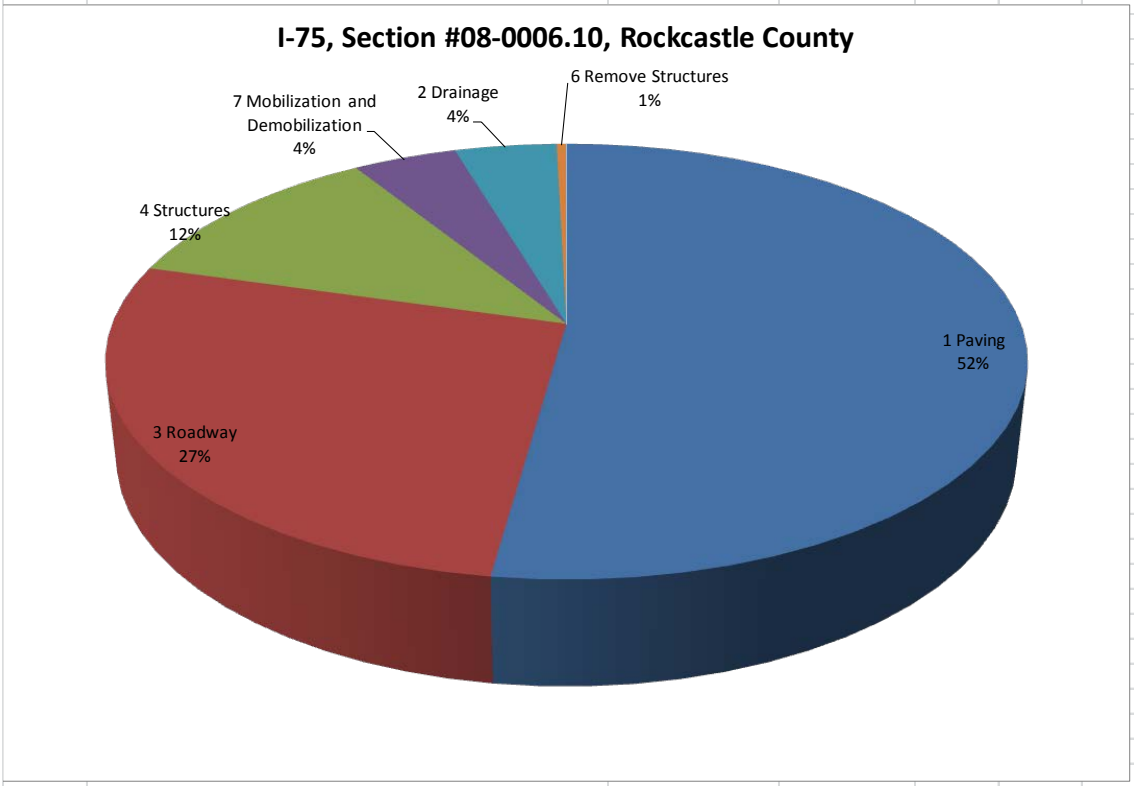
Appendix B – Cost Model

The team reviewed and discussed the project's cost model (below and on the following page).

Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1
(Section No. 08-0006.10)
Rockcastle County

Cost Model ***(from Estimate dated 03/23/16)***

Group #	Name	Cost	% of Total Project	
1	Paving	$ 19,299,504	52.21%	52.21%
3	Roadway	$ 10,063,440	27.22%	79.43%
4	Structures	$ 4,300,000	11.63%	91.07%
7	Mobilization and Demobilization	$ 1,591,791	4.31%	95.37%
2	Drainage	$ 1,560,199	4.22%	99.59%
6	Remove Structures	$ 150,000	0.41%	100.00%
	TOTAL	**$ 36,964,934**		



Value Engineering Study
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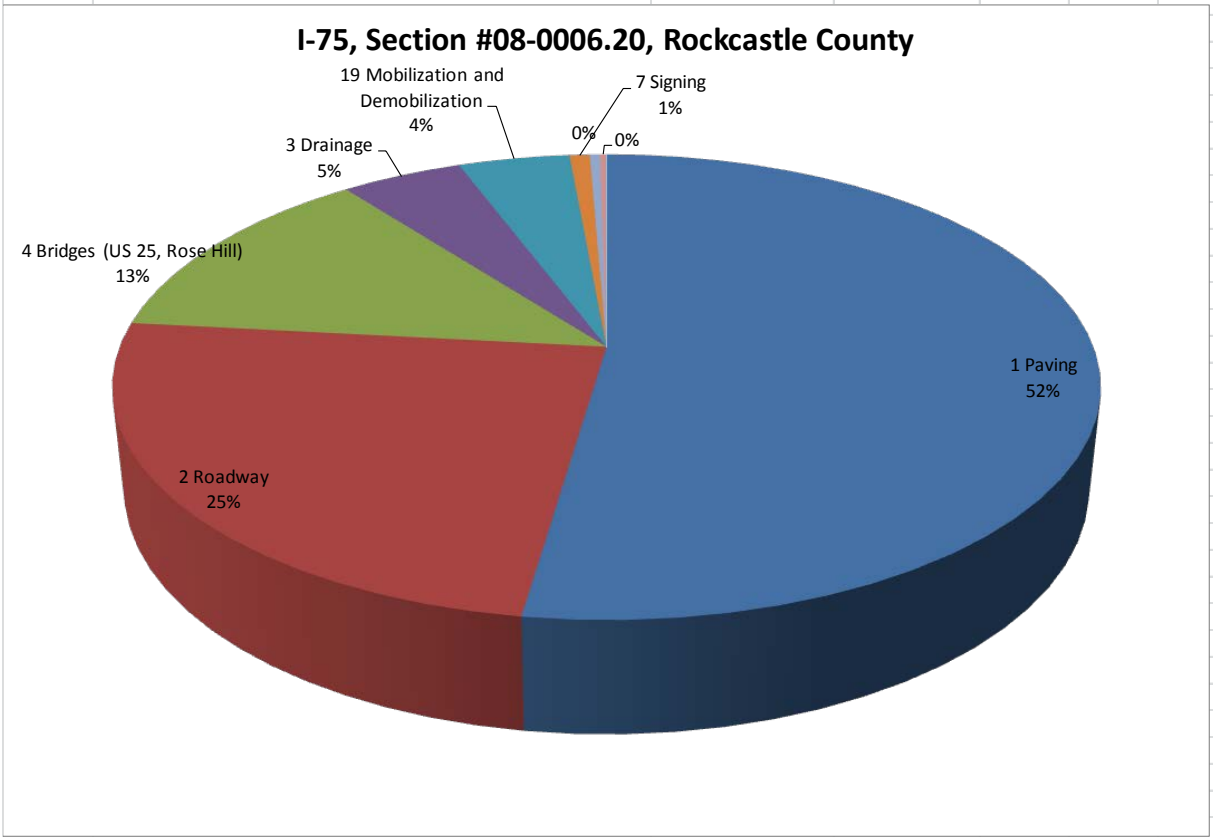
Rockcastle County

Kentucky Transportation Cabinet
I-75 Widening, MP 60.1 to MP 64.5
(Section No. 08-0006.20)
Rockcastle County
Cost Model ***(from Estimate dated 03/16/16)***

Group #	Name		Cost	% of Total Project	
1	Paving	$	20,239,817	52.31%	52.31%
2	Roadway	$	9,439,741	24.40%	76.71%
4	Bridges (US 25, Rose Hill)	$	4,976,896	12.86%	
3	Drainage	$	1,817,095	4.70%	
19	Mobilization and Demobilization	$	1,666,132	4.31%	
7	Signing	$	301,600	0.78%	
9	Lighting	$	150,000	0.39%	
8	Signalization	$	100,000	0.26%	
	TOTAL	**$**	**38,691,281**		



NOTE: Unit prices for excavation are different for Section Nos. 08-0006.10 and 08-0006.20 (e.g., $1.8M identified in cost estimate appears to be too low for Section No. 08-0006.10).

APPENDIX C
Function Analysis

Appendix C – Function Analysis

Function definition and analysis is the heart of Value Engineering. It is the primary activity that separates VE from all other "improvement" programs. The objective of this phase is to ensure the entire team agrees upon the purposes for the project elements. Furthermore, this phase assists with development of the most beneficial areas for continuing study.

The VE team identified the functions of the project based using active verbs and measurable nouns. This process allowed the team to truly understand all of the functions associated with the project. Those functions identified as high risk or high cost were identified as such and were potentially easy targets for the VE team to brainstorm in the Creative Phase.

FUNCTION	CLASSIFICATION	FUNCTION IDENTIFIED AS HIGH RISK (R) OR HIGH COST ($)
Increase Capacity (Level of Service)	Basic	$
Improve Connectivity	Higher Order	
Connect Communities	Higher Order	
Improve Safety	Secondary	
Improve Mobility	Secondary	
Convey Traffic	Secondary	
Reduce Congestion	Secondary	
Support Load	Secondary	$
Direct Water	Secondary	
Drain Roadway	Secondary	$
Meet Schedule	Secondary	
Separate Traffic	Secondary	$
Maintain Traffic	Secondary	$, R
Inform Motorist	Secondary	

FUNCTION	CLASSIFICATION	FUNCTION IDENTIFIED AS HIGH RISK (R) OR HIGH COST ($)
Improve Visibility	Secondary	
Illuminate Space	Secondary	
Stabilize Slope	Secondary	
Separate Grade	Secondary	
Minimize Right-of-way	Secondary	
Control Traffic	Secondary	
Accommodate Expansion (future)	Secondary	
Span Space	Secondary	$
Minimize Impacts (i.e., water quality/quantity, dam)	Secondary	R
Maintain Access	Secondary	
Minimize Maintenance	Secondary	$

The definitions of the classifications are:

Higher Order Function defines the problem (study) goal and is outside the scope of the study.

Basic Function defines a performance feature that *must* be obtained to satisfy only user's needs not desires. It answers the question, “What must it do?”.

Secondary Functions define required performance features other than those that must be accomplished. These are the user’s desires and answers the question, “What else do we want or does it do?”.

A Function Analysis Systems Technique (FAST) diagram was not completed.

APPENDIX D
Creative Idea List & Evaluation

Appendix D – Creative List and Evaluation Process

Creative Idea List

The list of ideas and comments that resulted from the study is included in this appendix. Some of the ideas were selected for further development as represented in the previous section.

Performance Attributes

The decision maker/stakeholders identified and defined the following performance attributes as a means to aid the team in evaluating the ideas:

- Schedule – meet proposed letting date
- Maintenance of Traffic (MOT) – two lanes to remain open in each direction
- Level of Service (LOS) – improve capacity lanes per lane per hour
- User Comfort/Satisfaction – perception, user cost
- Maintainability – maintenance; snow removal; drainage

Evaluation Process

To aid in the evaluation of the ideas, the team scored the ideas using a group nominal technique using functions and the performance attributes as their guide. All ideas that received a rating of “4” (Good Value Opportunity) or “5” (Great Value Opportunity) were further developed.

The creative idea list represents all of the ideas and includes scoring for the ideas that were rated using the value index.

Value Relationship	**Value Index = Function / Cost = F / C**
Rating	
5. Great Opportunity	F / C-- F+ / C- F++ / C F++ / C- F++ / C-- F++ / C+
4. Good Opportunity	F- / C-- F / C- F+ / C F+ / C- F+ / C+ F++(*) / C++
3. Moderate Value	F-- / C-- F- / C- F++(*) / C++
2. Poor Value	F-- / C F-- / C-- F / C+ F / C++
1. Unacceptable Impacts/Fatal Flaw	

*Is the Function improved to the point that it overcomes the high cost?

VALUE CUE KEY – MAGNITUDE OF CHANGE

F	=	No impact to function
F-	=	Small negative impact to function
F--	=	Large negative impact to function
F+	=	Small increase in function
F++	=	Large increase in function
C	=	No impact to cost
C-	=	Small decrease in cost
C--	=	Large decrease in cost
C+	=	Small increase in cost
C++	=	Large increase in cost

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Rockcastle County, KY

Creative Idea List

VE Alternative No.	VE No.	Idea Title (✖ Not Recommended by VE Team)	Score
SL		**Support Load**	
SL-01	19	Re-proportion pavement layer for driving lane	DS*
SL-02	1	Re-proportion pavement layer for inside median shoulder	4
SL-03		Use aggregate-treated drainage blanket in lieu of asphalt-treated drainage blanket	2
SL-04	2	Add stabilized base layer in the widening section	4
SL-05	3	Add geogrid to reduce pavement section in the widening section	4
SL-06		Use concrete in lieu of asphalt for pavement	2
SL-07✖	20	Reduce inside shoulder width from 14' to 12'	DS*
SL-08	4	Reduce shoulder width adjacent to truck lane	4
SL-09		Reduce shoulder width on bridges	2
SL-10	5	Add approach slabs at bridges to minimize settlement	4
SL-11	6	Add transverse trench drain bleeders in the existing pavement to relieve water pressure	4
SL-12	23	Update bridge drawings to reflect revised phasing	DC
SL-13	21	Validate overlay design	DS*
SL-14	7	Eliminate I-75 outside pavement edge drains	4
MT		**Maintain Traffic**	
MT-01	24	Review road closure time periods to minimize impacts to construction and the traveling public	DC
MT-02	25	Review blasting time periods to minimize impacts to construction and the traveling public	DC
MT-03	8	Add bid item for radar speed signs to reduce speed during construction	4
MT-04	9	Extend lane closure in advance of the project limits	4
MT-05		Drop existing lane prior to construction project	w/MT-04
MT-06	10	Add a requirement for the contractor to use a protect-the-queue vehicle	4
MT-07		Revise phasing in plan set to be consistent with Section No. 08-0006.30	ABC
MT-08	22	Add lane rental to the contract requirements	DS*
MT-09	26	Add bid item for message boards to inform drivers during construction	DC
MT-10	11	Add rumble strips prior to construction zone	4

OS = Out of Scope
FF = Fatal Flaw
DC = Design Comment (No Workbook)
DS = Design Suggestion (Workbook Prepared)
EC = Estimate Correction
ABC= Already Being Considered

Value Engineering Study
Kentucky Transportation Cabinet
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Rockcastle County, KY

Creative Idea List

VE Alternative No.	VE No.	Idea Title (× Not Recommended by VE Team)	Score
MT-11	27	Identify emergency access locations/routes during construction. As part of its traffic management plan for the reduction of traffic delays and for providing emergency vehicle access during construction, KYTC may desire to develop plans and provisions for the access to incident sites for emergency vehicle personnel and other necessary personnel for all stages of construction. This approach may help to reduce traffic delay and decrease the emergency response time. Practices adopted could include contractor supplied service patrols, using a professional advertising agency to keep the public informed of construction activities, using emergency medical services, establishing continuous police presence, establishing a staging area, using portable changeable message signs, establishing a "hotline," and establishing a detour and alternate route signing.	DC
SG		**Separate Grade**	
SG-01		Revise horizontal alignment of southbound ramp "C" at 62 interchange (Section No. 08-0006.20)	3
SG-02	12	Rebuild existing wall at northbound exit ramp 59 interchange (Section No. 08-0006.10)	4
T		**Traffic**	
T-01	13	Reduce the number of lanes on Ramp B from two to one	4
T-02×	14	End ramp taper before the dam at I-75 northbound, Interchange 62	4
T-03		Add truck climbing lane after the dam at northbound I-75	w/T-02
T-04	28	Verify the taper at Station 3294 meets standards	DC
T-05	29	Confirm taper lengths and rates meet current AASHTO standards	DC
T-06	30	Lengthen taper for truck lane drop from 300' to 840' (70:1) to meet AASHTO standards	DC
T-07	31	Update traffic counts at the ramp terminals	DC
T-08		Increase radius of right turn off of exit 62 off-ramp C-1	3
T-09	41	Add signage ("add lane") at right turn off of exit 62 off-ramp C	DC
T-10		Add quick curb with delineator at exit 62 off-ramp C-1	3
T-11	15	Extend island closer to through lane at exit 62 off-ramp C-1 using a painted island	4
T-12	32	Use painted flush islands throughout the project	DC
T-13	16	Extend raised concrete island at exit 62 off-ramp C-1 closer to the US 25 through lane	4
T-14	17	Add painted hatching between the C-1 ramp concrete island and the US 25 driving lane on the shoulder	4
GS		**Geotechnical/Structures**	
GS-01		Reuse existing bridges in lieu of bridge replacement	2
GS-02		Reuse bridge substructure in lieu of total bridge replacement	3
GS-03		Widen KY2793 to 140' to address emergency spillway issue	3
GS-04		Use box culvert ("wagon box") and eliminate bridge at KY2793	2
GS-05	33	On plans, KY2793 should read "Lake Linville Road" in lieu of "Rose Hill Road"	DC

OS = Out of Scope
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EC = Estimate Correction
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Value Engineering Study
Kentucky Transportation Cabinet
I-75 Widening, MP 55.3 to MP 60.1 (Item No. 08-0006.10)
I-75 Widening, MP 60.1 to MP 64.5 (Item No. 08-0006.20)
Rockcastle County, KY

Creative Idea List

VE Alternative No.	VE No.	Idea Title (✖ Not Recommended by VE Team)	Score
GS-06	34	Finalize geotechnical report as soon as possible	DC
GS-07		Lower KY2793 to address emergency spillway issue	2
MM		**Minimize Maintenance**	
MM-01	35	Add marker at edge drain outlets to mark for scheduled maintenance	DC
MM-02	36	Add No. 57 aggregate as backfill for edge drain trench (detail "D" on Section No. 08-0006.20)	DC
M		**Miscellaneous**	
M-01	37	Re-evaluate Categorical Exclusion environmental document as early as possible to avoid or minimize schedule delay, right-of-way issues and costs	DC
M-02	38	Meet with Division of Water	DC
M-03	39	Update cost estimates (e.g., two different excavation unit costs for Section Nos. 08-006.10 and 08-006.20)	EC
M-04	18	Identify on-site waste areas	4
M-05		Reduce typical section through Lake Linville area to AASHTO minimum	3
M-06	40	Make the superelevations consistent for the inside median shoulder (all three sections)	DC

OS = Out of Scope
FF = Fatal Flaw
DC = Design Comment (No Workbook)
DS = Design Suggestion (Workbook Prepared)
EC = Estimate Correction
ABC= Already Being Considered

APPENDIX E
Supporting Data

Appendix E – Supporting Data

Team Observations

The VE team identified observations, concerns and opportunities to be addressed during the creative generation of potential ideas and alternatives. The following is a list of the VE team's observations:

- Unit prices for excavation are different for Section Nos. 08-0006.10 and 08-0006.20 (e.g., $1.8M identified in cost estimate appears to be too low for Section No. 08-0006.10)
- May be opportunity to review phasing for Section No. 08-0006.20 for continuity; match phasing scheme for all sections (08-0006.10, 08-0006.20 and 08-0006.30)
- Concern that the VE team doesn't have pavement design
- Concern for pavement design continuity (e.g., thickness and type, mixes)
- Concern for drainage, both at the surface and in the median
- Water bubbling up may require trench drains
- Opportunity for constrained outside shoulder
- Structural issues may exist inside the spillway
- Downstream seepage – unable to compact clay soils
- Contract language may be needed to manage specialized construction
- Division of Water requirements are critical to maintain the schedule
- All stakeholders tied to Lake Linville are critical to project success and meeting schedule
- Consistency with Section No. 08-0006.30 is a concern
- Categorical Exclusion (CE) is dated; will need to be re-evaluated to current standards (i.e., erosion, ecology, karst (sink holes), etc.
- Traffic numbers are dated; do not go beyond 2022
- Traffic issue – dual left northbound at 62 interchange
- Inconsistencies in pavement types between sections (Section Nos. 08-0006.10 and 08-0006.20)
- May be advantageous to use one contractor/one project
- No "approved" geotechnical report
- Maintenance of traffic may need additional clarification
- Clarification if shoulder is same as driving lane (future)
- Opportunity for "mix" to be alternate material – structural foundation
- Truck climbing lane – 12'/10' shoulder may be opportunity to reduce to 6'/4' (area around dam)
- 300' transition for truck lane appears to be short (speed x width)
- Design Executive Summary (DES) to address pedestrian/bicyclist
- Peak delay period is 4 PM to 7 PM (Sunday 6 PM to 9 PM), not 3 PM to 5 PM
- Pavement thickness 25-28" based on core data; 50M ESALs would require 26"

Risk Identification

The VE team identified potentials risks of the project. The purpose of understanding the project risks is to identify potential mitigation strategies during creative generation of potential ideas and alternatives.

- Environmental – Categorical Exclusion (CE) is dated; re-evaluation could influence schedule, cost, etc.
- Dam (60 years old) – owned by Division of Water; requirements, mitigation, remediation (embankments)
- Northbound exit ramp – retaining wall, tight, construction
- Geotechnical – no “approved” report

Value Engineering Study Agenda
I-75, MP 55.3 to MP 60.1 (Item #08-0006.10)
I-75, MP 60.1 to MP 64.5 (Item #08-0006.20)
Kentucky Transportation Cabinet
Rockcastle County

VE Study Workshop Agenda (4-Day): October 25-28, 2016

Tuesday, October 25, 2016: ***Kick-Off Meeting – KYTC Office, 200 Mero Street, Frankfort, KY***
1st Floor, TCOB Room C118
(Attendance by Stakeholders, Decision Makers, Designers and VE Team)

9:00 – 9:15	Introductions (All) & Brief Overview of the VE Process (Team Leader-Patrice Miller)
9:15 – 10:45	Project Overview & Presentation (Project Manager/Design Team)
10:45 – 11:00	Break
11:00 – 12:00	Project Goals & Constraints, Workshop Objectives, Identify Key Performance Attributes Identify Risks *Conclusion of Kick-Off Meeting Adjourn all but the VE Team*
12:00 – 1:00	Lunch
1:00 – 1:15	Review Cost Estimates
1:15 – 1:45	VE Team Observations
1:45 – 2:15	Function Analysis
2:15 – 5:00	Speculation – Team Brainstorming

Wednesday, October 26: 1st Floor, TCOB Room C118, Frankfort, KY

8:00 – 8:15	Recap of First Day/Additional Information Review
8:15 – 10:00	Speculation – Team Brainstorming
8:15 – 10:00	Evaluation of Ideas
10:00 – 10:15	Break
10:15 – 11:45	Evaluation of Ideas
11:45 – 12:00	Review/Distribution of Handouts and VE Alternative Forms
12:00 – 1:00	Lunch
1:00 – 5:00	Alternatives Development

Thursday, October 27: 1st Floor, TCOB Room C118, Frankfort, KY

8:00 – 12:00	Alternatives Development
12:00 – 1:00	Lunch
1:00 – 5:00	Alternatives Development

Friday, October 28: 1st Floor, TCOB Room C118, Frankfort, KY

8:00 – 11:30	Alternatives Development
11:30 – 12:30	Working Lunch
12:30 – 1:30	Finalize Alternatives Development
1:30 – 3:00	Group Review of VE Alternatives / Prepare Presentation
3:00 – 4:30	***Presentation of VE Alternatives Meeting*** **(Presentation of VE Study Results to Management and Stakeholders)**
4:30 – 5:00	Team Wrap-up


I-75 Rockcastle County
MP 55.7 to MP 64.5
October 25, 2016
151
Stantec

Agenda

1 Introduction

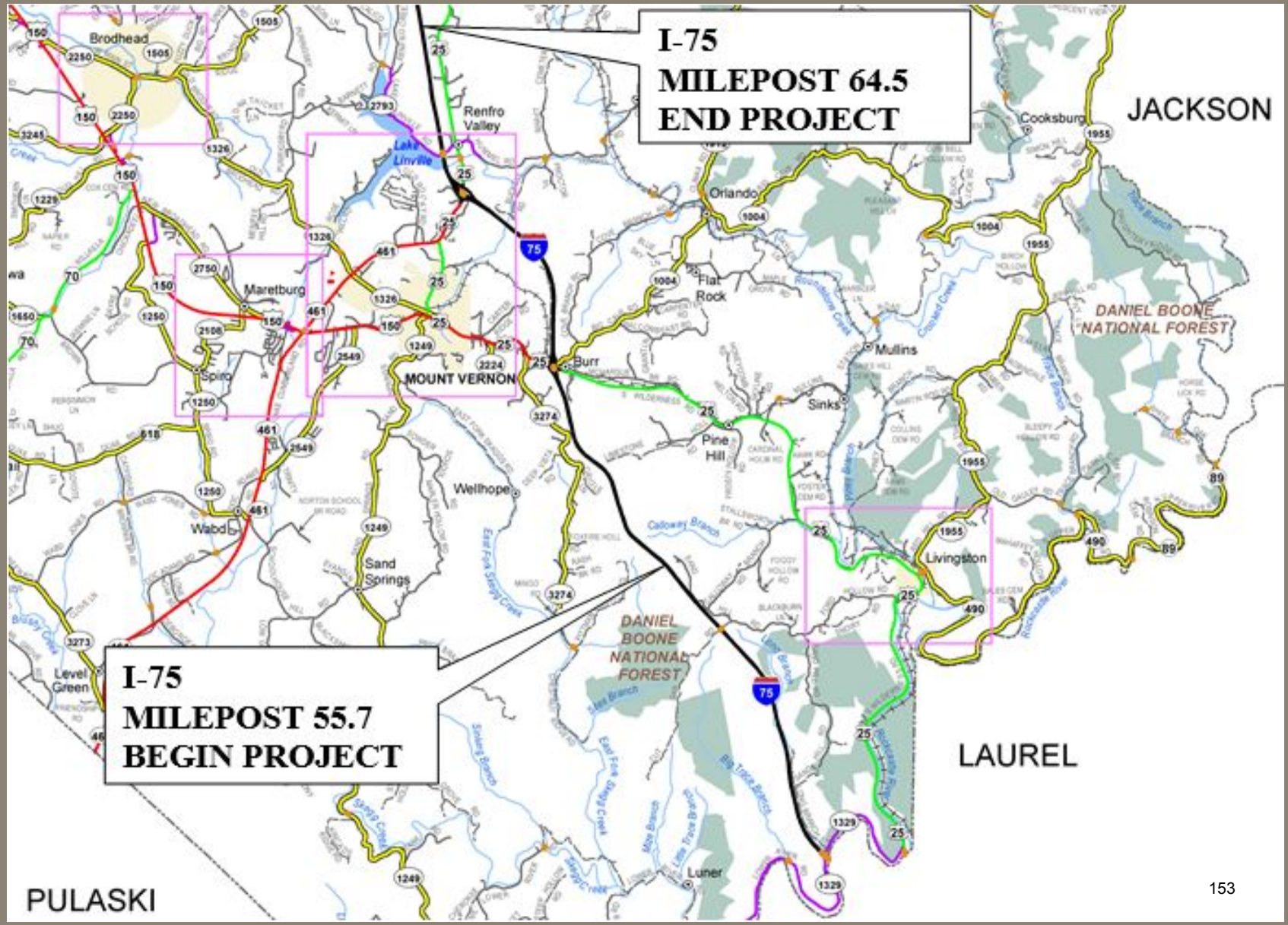
2 Project Data \ Project History

3 Roadway

4 Structures

5 Summary

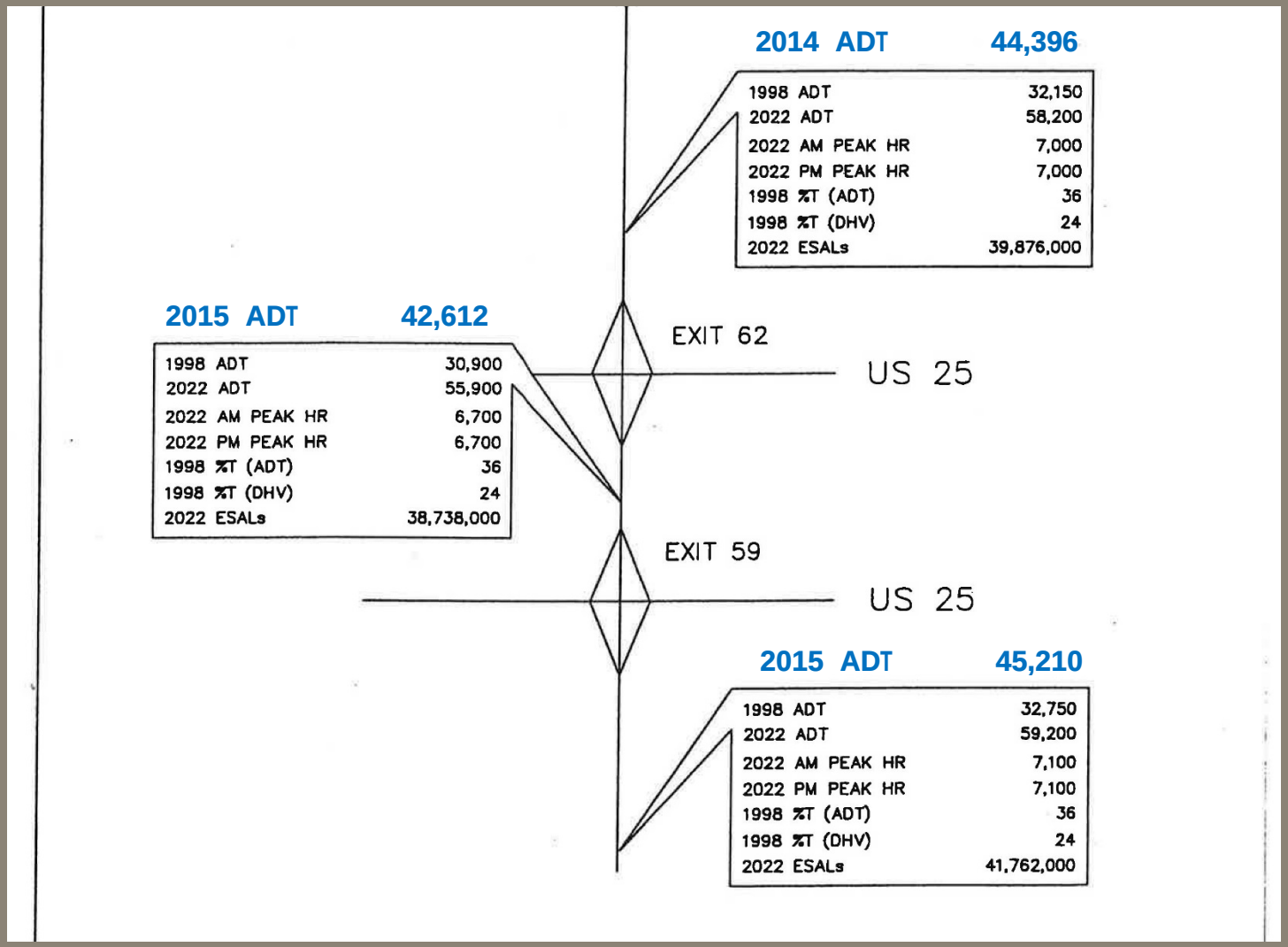
1 Project Location



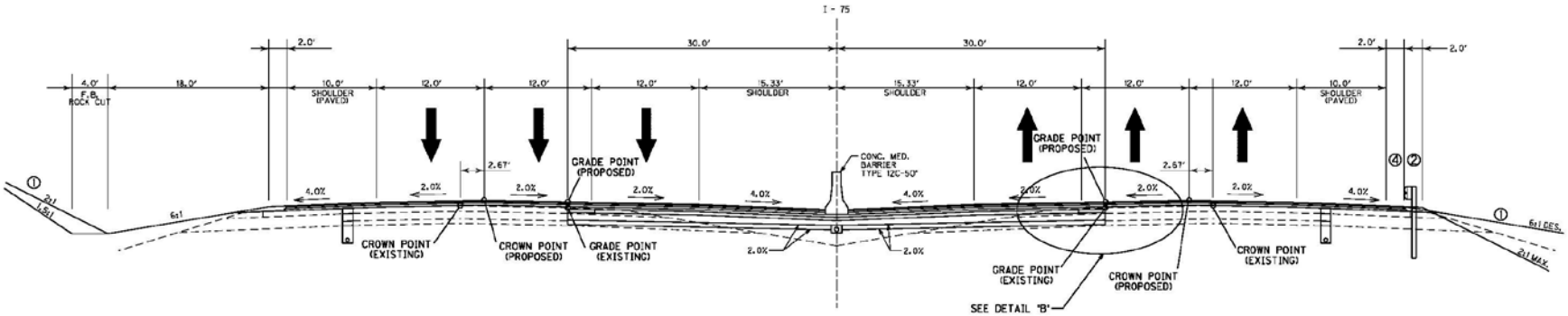
1 Project History

- NTP - April 1998
- March 2001 – PL&G
- Hibernation - 2002
- Pavement Rehab - 2013
- June 2016 – Extension to Letter Agreement No. 4

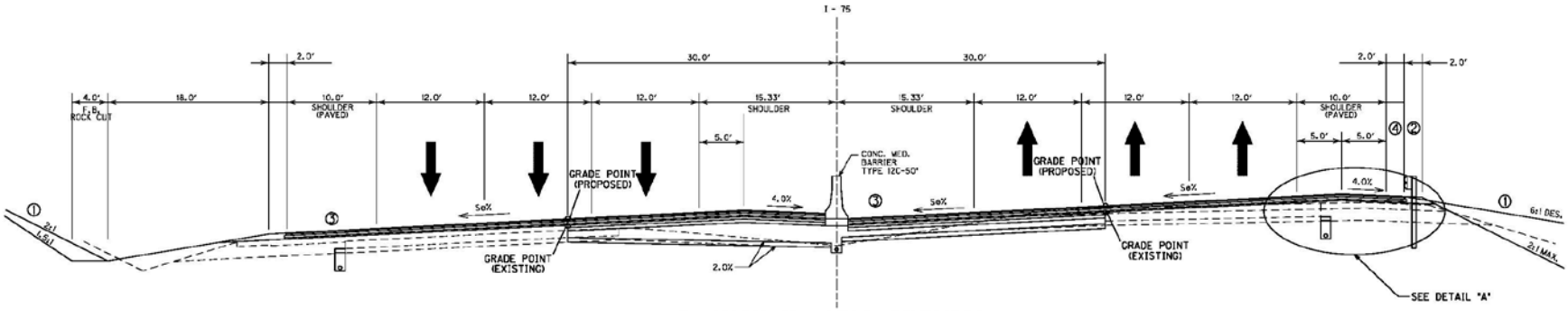
Traffic


2014 ADT 44,396
1998 ADT 32,150
2022 ADT 58,200
2022 AM PEAK HR 7,000
2022 PM PEAK HR 7,000
1998 %T (ADT) 36
1998 %T (DHV) 24
2022 ESALs 39,876,000
2015 ADT 42,612
1998 ADT 30,900
2022 ADT 55,900
2022 AM PEAK HR 6,700
2022 PM PEAK HR 6,700
1998 %T (ADT) 36
1998 %T (DHV) 24
2022 ESALs 38,738,000
EXIT 62
US 25
EXIT 59
US 25
2015 ADT 45,210
1998 ADT 32,750
2022 ADT 59,200
2022 AM PEAK HR 7,100
2022 PM PEAK HR 7,100
1998 %T (ADT) 36
1998 %T (DHV) 24
2022 ESALs 41,762,000

I-75 Mainline Typical

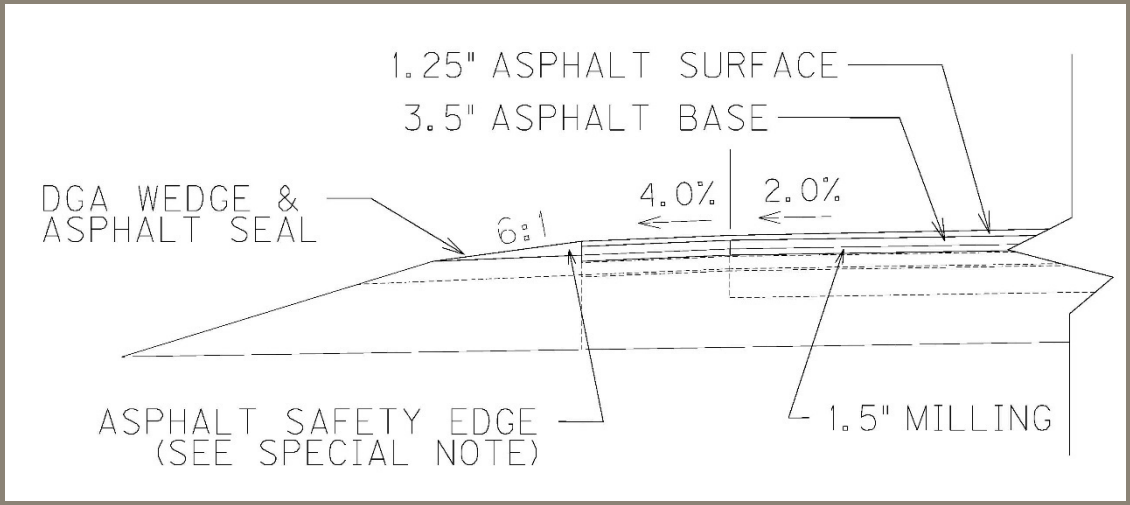


NORMAL SECTION



SUPERELEVATED SECTION

I-75 Pavement



2013 Pavement Rehab

Original overlay was 5.5”

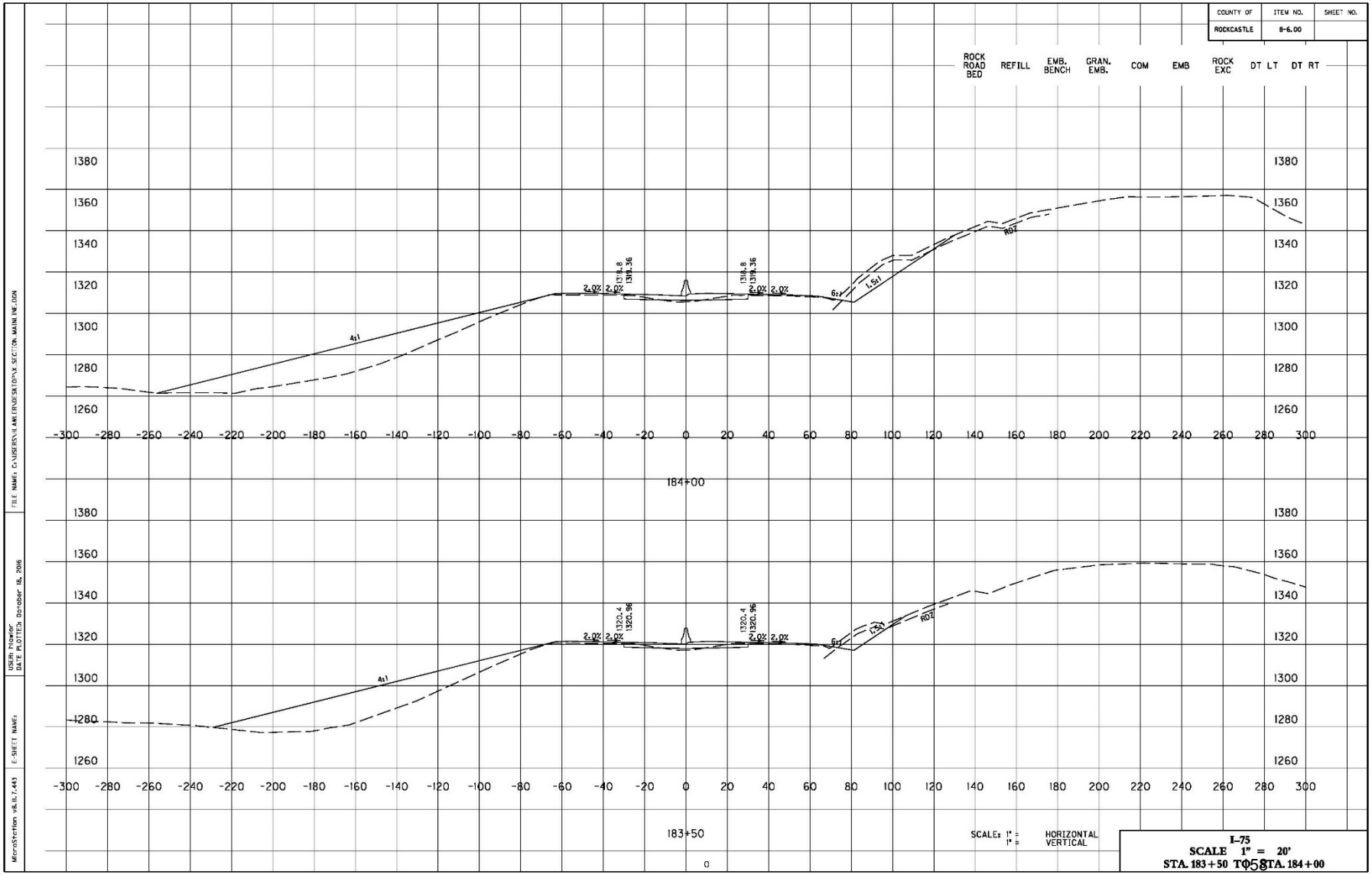
Difference of 2.25”

New overlay will be

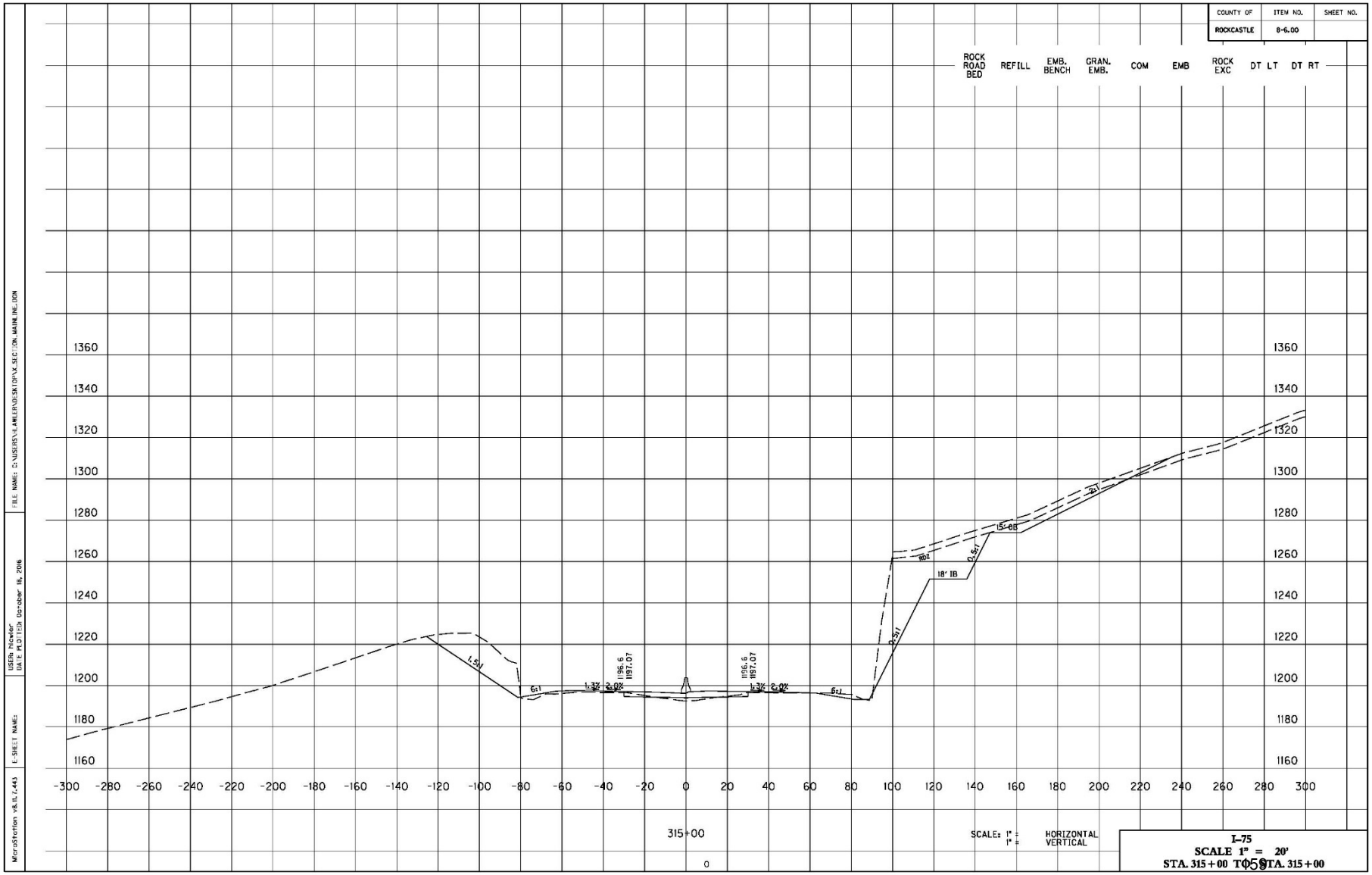
- 1.00” Binder Course
- 1.25” Surface Course

All ramps received a mill and fill
Waiting on pavement design for median portion

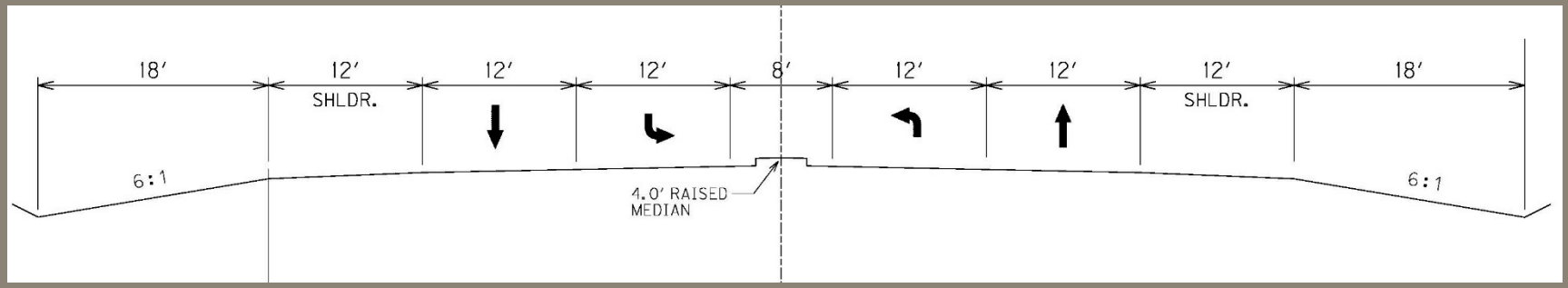
Embankment Section



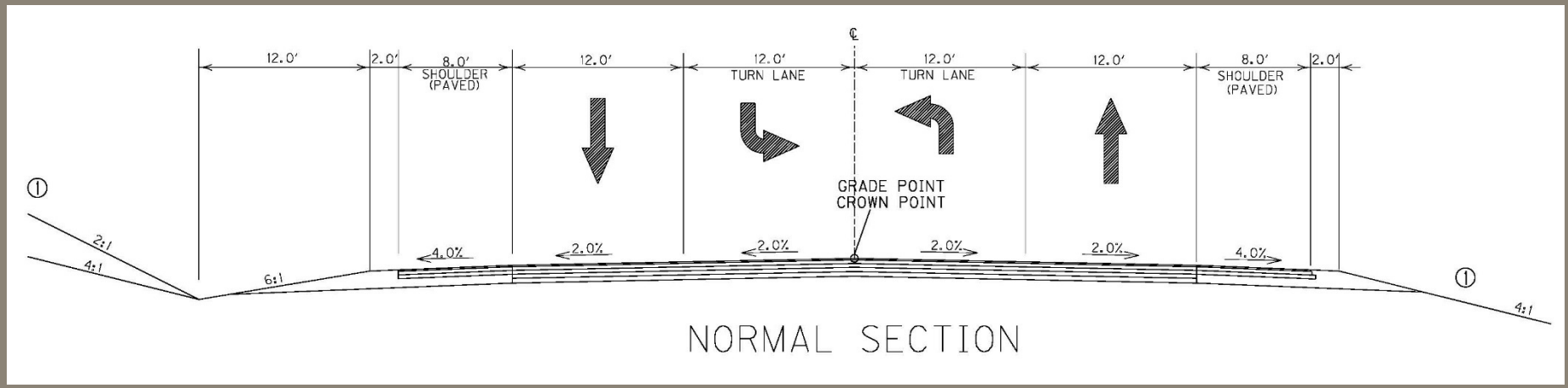
Rock Cut


COUNTY OF
ROCKCASTLE
ITEM NO.
8-6.00
SHEET NO.
ROCK ROAD BED
REFILL
EMB. BENCH
GRAN. EMB.
COM
EMB
ROCK EXC
DT LT
DT RT
1360
1340
1320
1300
1280
1260
1240
1220
1200
1180
1160
-300 -280 -260 -240 -220 -200 -180 -160 -140 -120 -100 -80 -60 -40 -20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300
1.5:1
6:1
1.5%
2.0%
1196.6
1197.07
0.5:1
18" IB
315+00
SCALE: 1" = HORIZONTAL
1" = VERTICAL
I-75
SCALE 1" = 20'
STA. 315+00 TO STA. 315+00

US 25

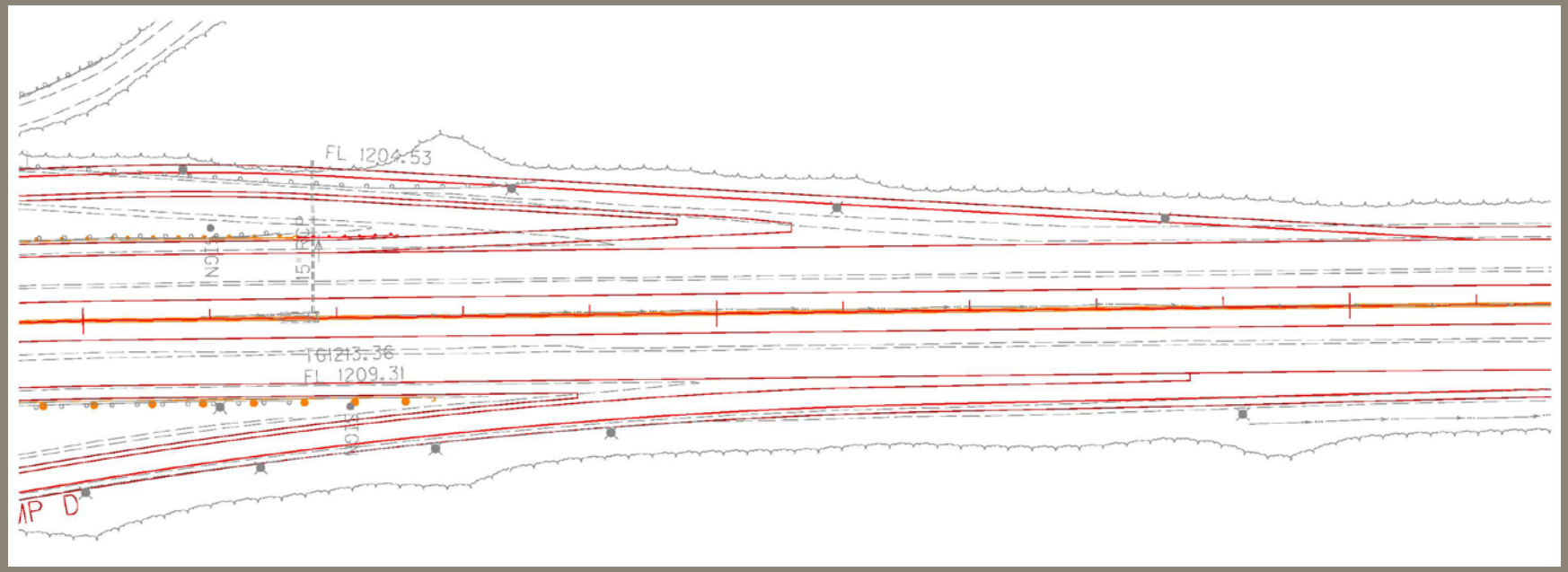


80 ft (edge to edge)



68 ft (edge to edge)

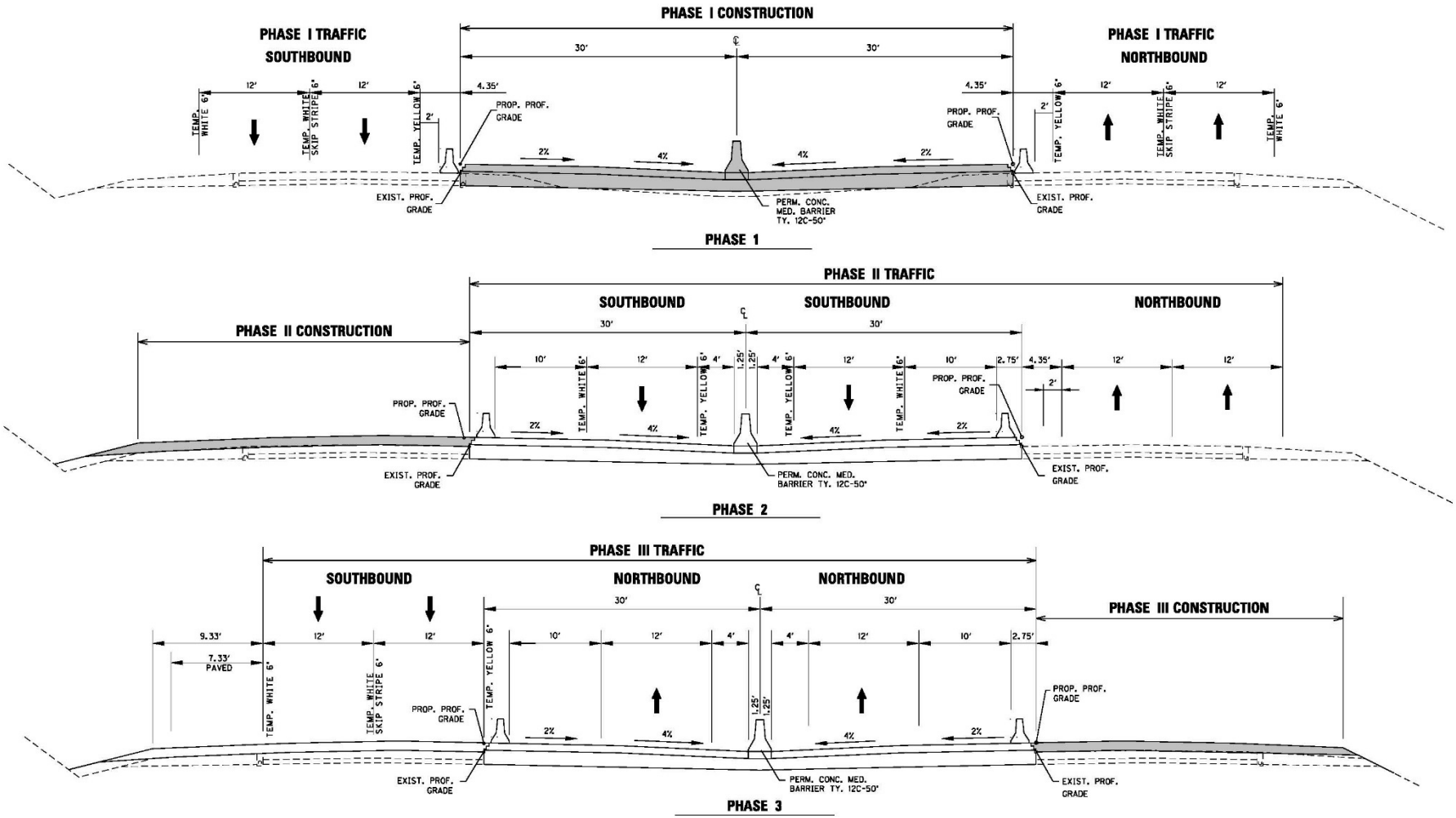
US 25 RAMPS



All ramps have updated recovery tapers to match current standards

US 25 RAMP RETAINING WALL

I-75 Maintenance of Traffic



Questions?

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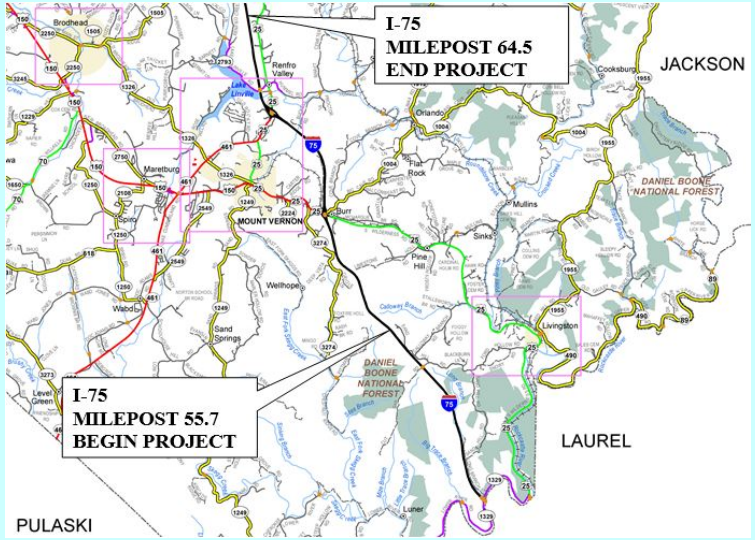
I-75 Widening, MP 55.3 to MP 60.1 (Item #08-0006.10) and MP 60.1 to MP 64.5 (Item #08-0006.20)
Rockcastle County

Value Engineering Presentation



October 28, 2016

VE Study Team Members

- William Lucas, PE – KYTC
- Bob Jones, PE, PLS – KYTC
- Shawn Russell, PE, AVS – KYTC
- Rodney Little, PE – QK4
- Jeremy Lukat, PE – QK4
- Keith Damron, PE – AEI
- Dennis Mitchell, PE – AEI
- Gary Sharpe, PE – Palmer Engineering
- Certified Value Specialist (CVS) Team Leader – Pat Miller, RHA

VE Job Plan


Information Phase
Function Analysis Phase
Creative Phase
Evaluation Phase
Development Phase
Presentation Phase
SAVE
Adding Value. Enhancing Ideas.

Workshop Objectives

- Review pavement structure for both sections
- Reduce impacts – review typical section near Lake Linville
- Evaluate truck lane and ramp traffic data/design
- Identify opportunities to reduce right-of-way (Section No. 08-0006.10)

Creative Ideas

- **56** Ideas
  - **18** VE Alternatives developed
  - **4** Design Suggestions developed
  - **19** Design/Estimate Comments identified

Summary

- Validate Design
- Value Opportunities
  - Proper balance between
    - Function/performance
    - Quality
    - Safety
    - Cost

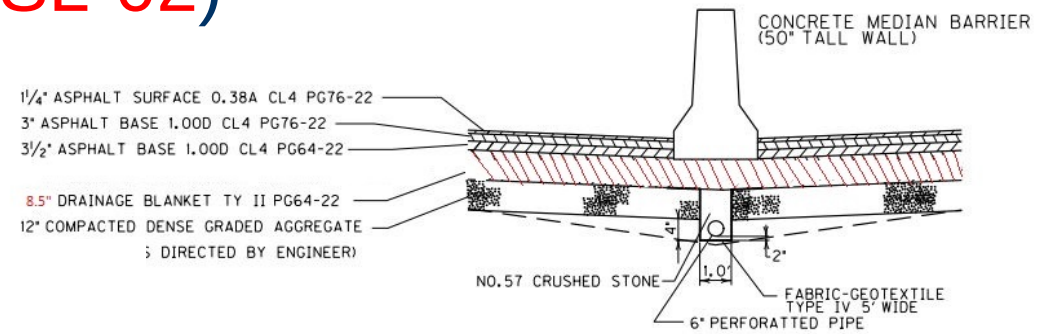
ALTERNATIVES

Pavement - Validation

- Initial design - 1998
- Pavement design philosophy and criteria have evolved
- Validation needs to happen before opportunities can be explored
- Details discussed with Pavement Branch and will be included in VE report
- Inconsistency in unit costs among sections (e.g., drainage blanket)

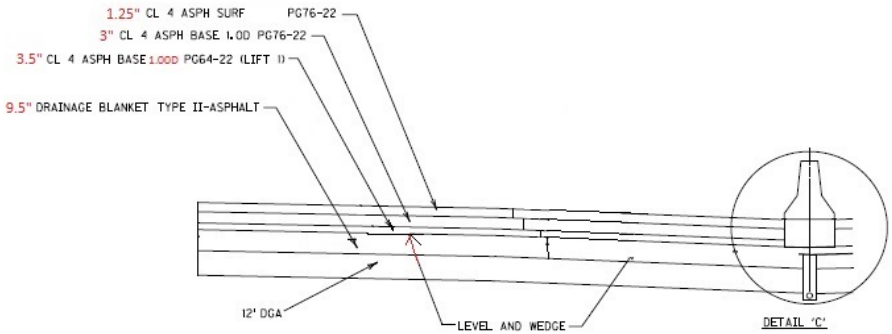
Pavement – Value Opportunities

- Re-proportion inside median shoulder pavement layers (SL-02)



DETAIL "A"

ITEM 8-6.2



DETAIL B

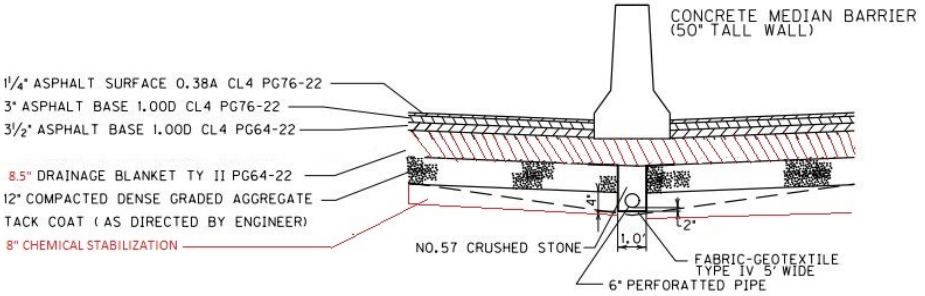
ITEM 8-6.1

Pavement – Value Opportunities

- Use stabilized base layer in the widening section (SL-04)
- Varying unit cost for drainage blanket skews potential cost savings
- Based on average unit cost, re-proportioning the pavement layers offset the costs for stabilized base

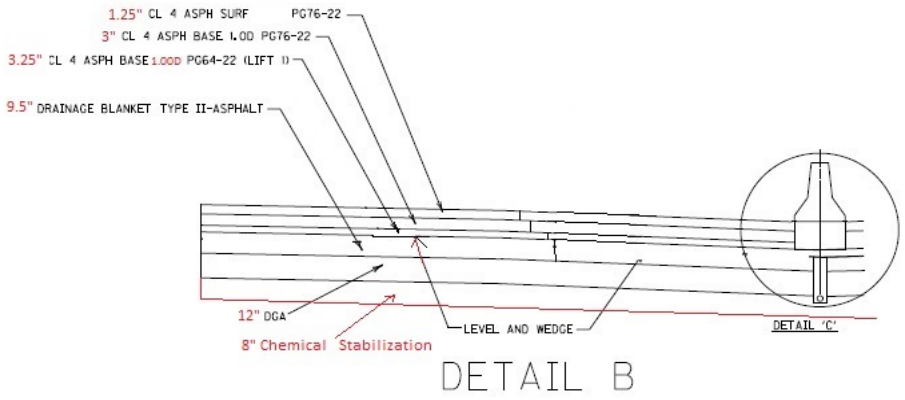
Pavement – Value Opportunities

- Use stabilized base layer in the widening section (SL-04)



DETAIL "A"

ITEM 8-6.2

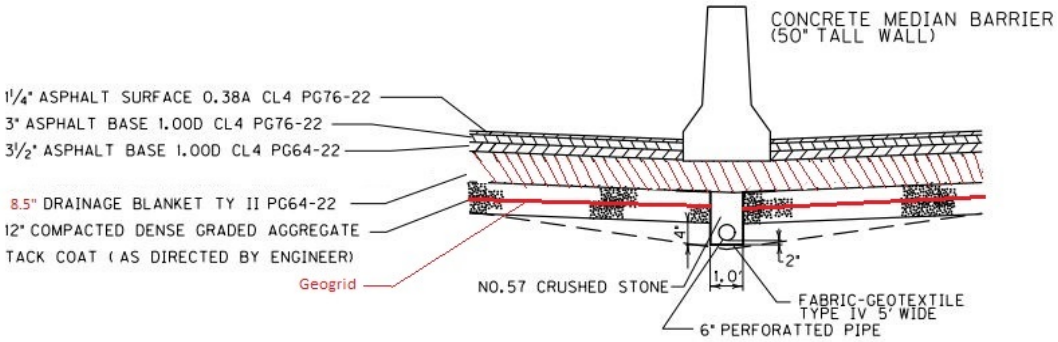


DETAIL B

ITEM 8-6.1

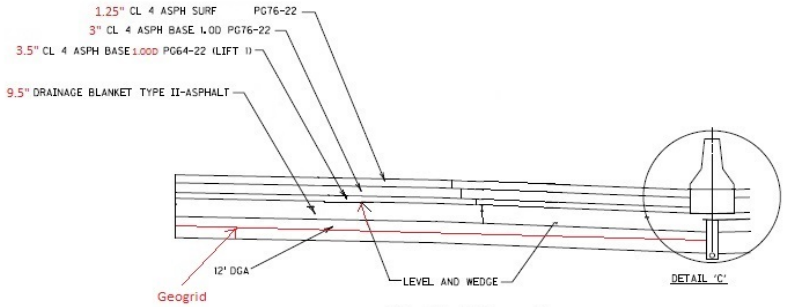
Pavement – Value Opportunities

- Use geogrid to thin pavement section in the widening section (SL-05)



DETAIL "A"

ITEM 8-6.2

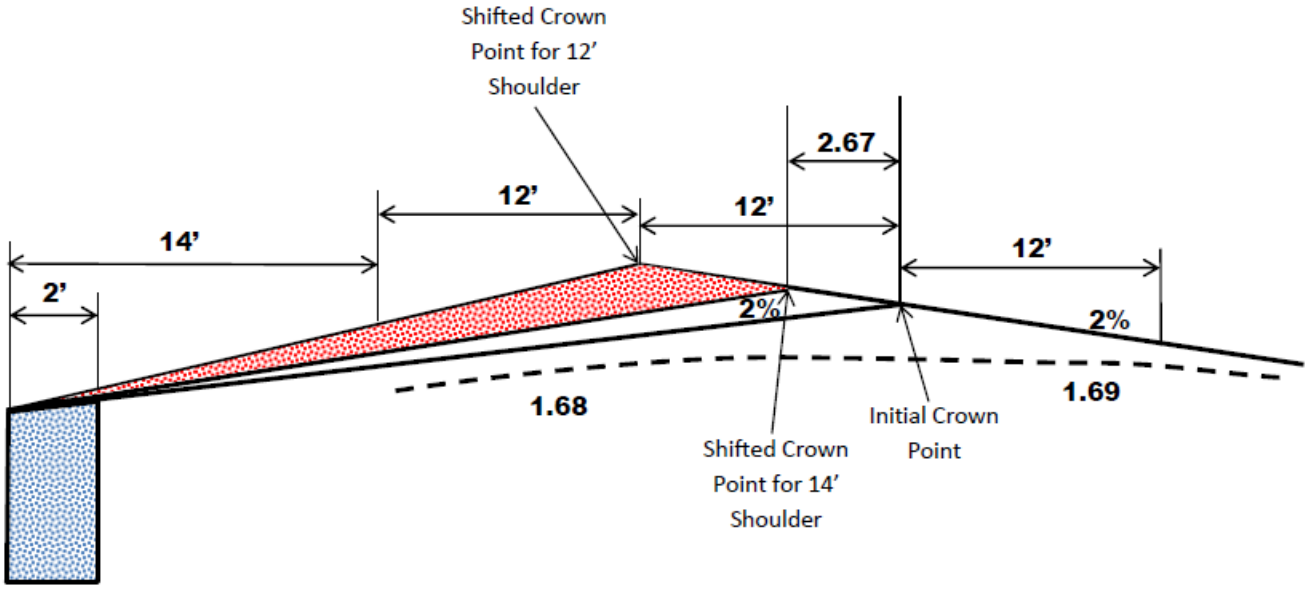


DETAIL B

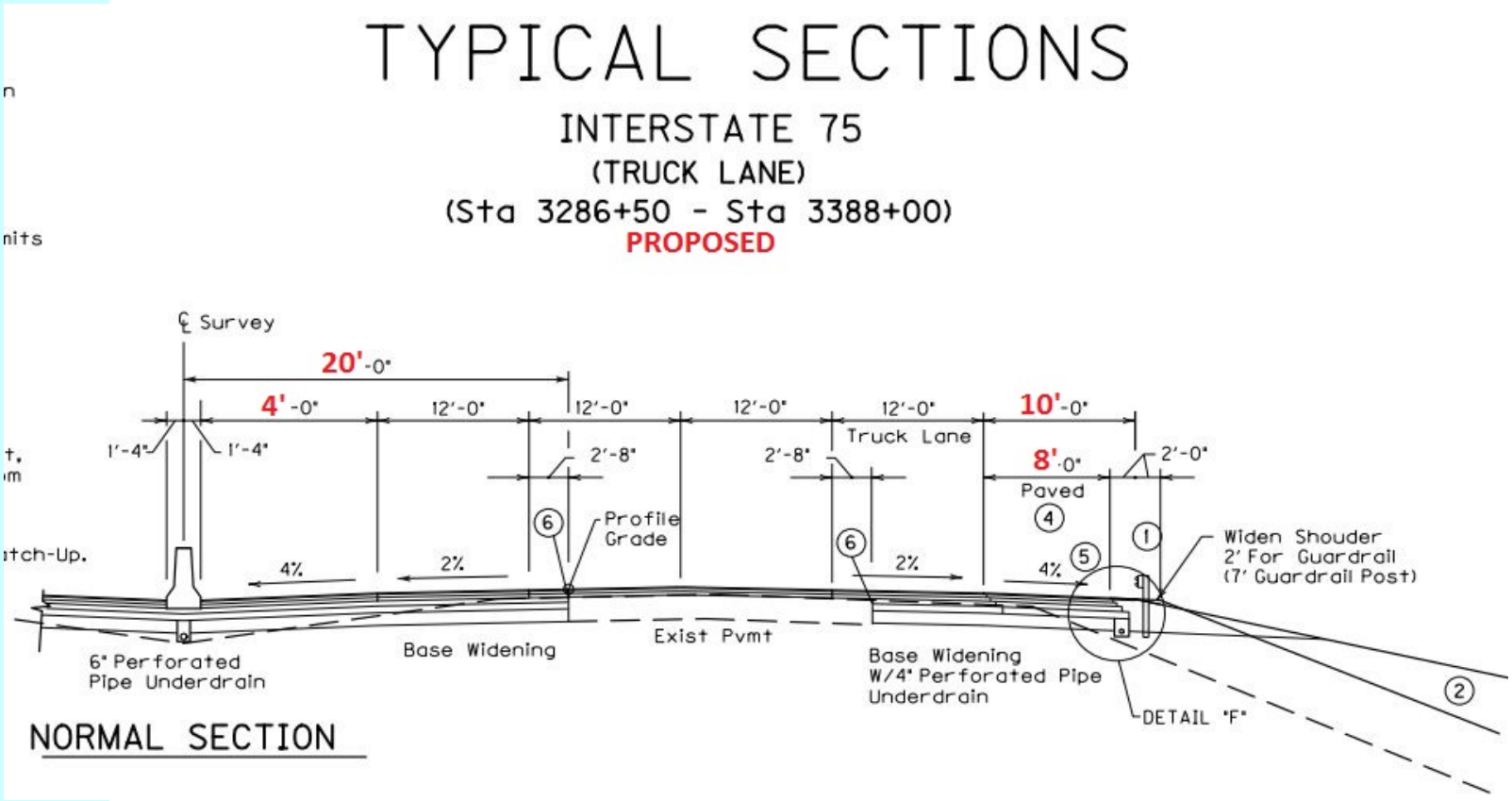
ITEM 8-6.1

Reduce Inside Shoulder (SL-07)

- Reduce inside shoulder width from 14’ to 12’ - Not recommended

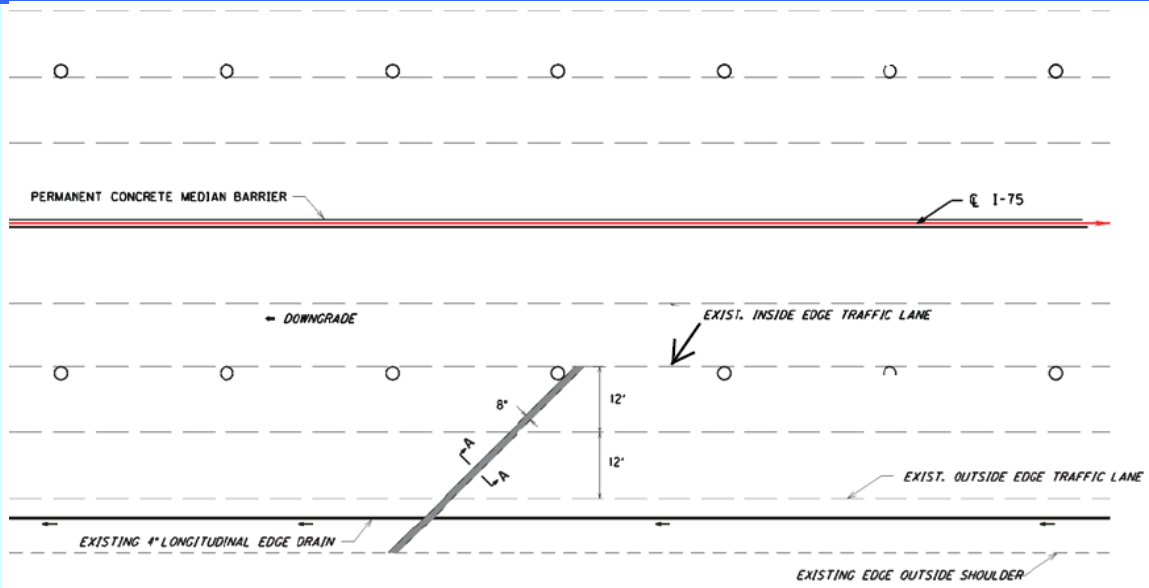


Reduce Truck Lane Shoulders (SL-08)

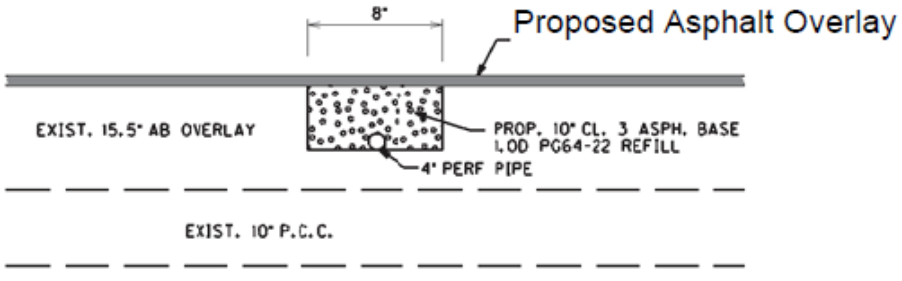


Reduce Truck Lane Shoulders (SL-08)

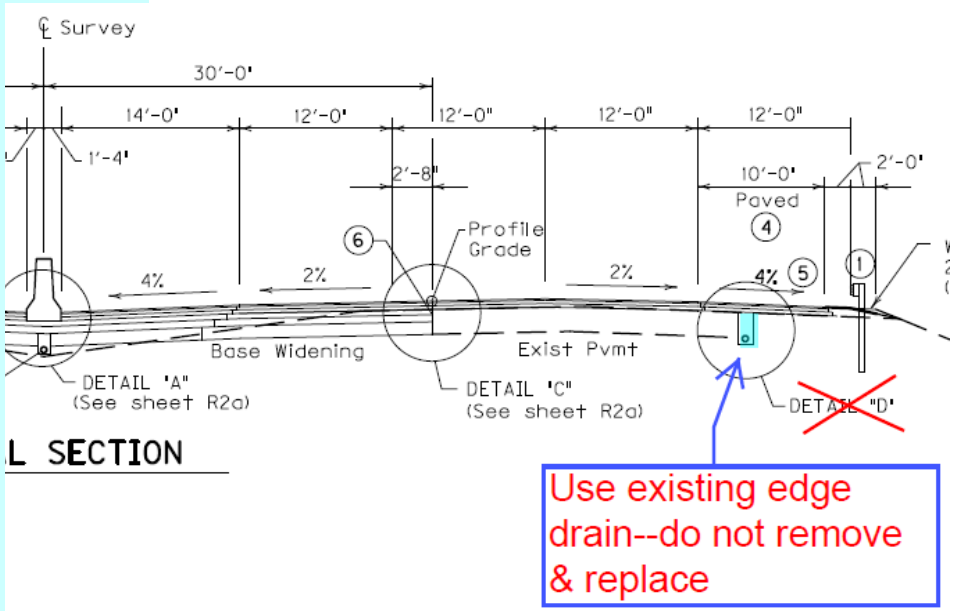
Use Pavement Trench Drains (SL-11)

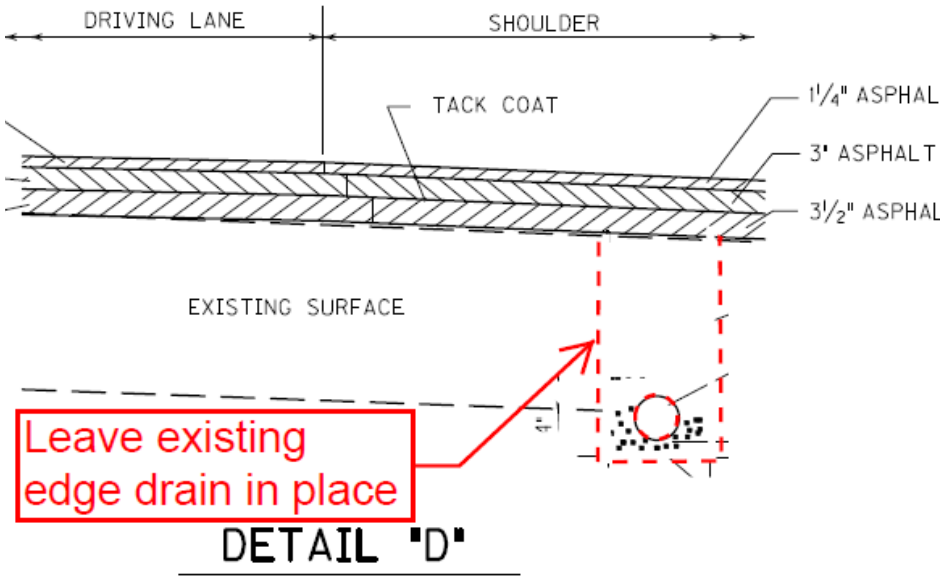


PERMEABLE PAVEMENT DRAIN DETAIL



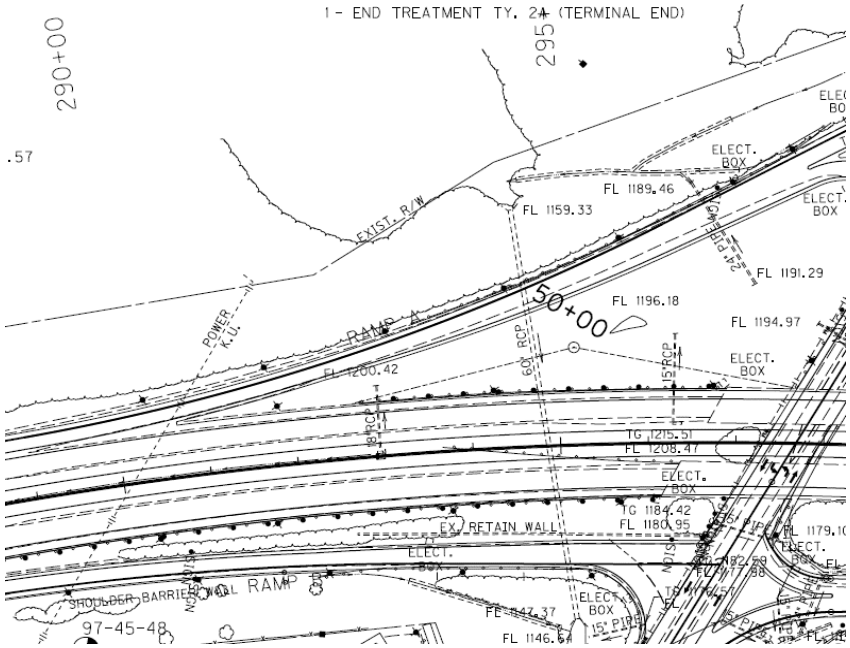
Utilize Existing Pavement Edge Drains (SL-14)





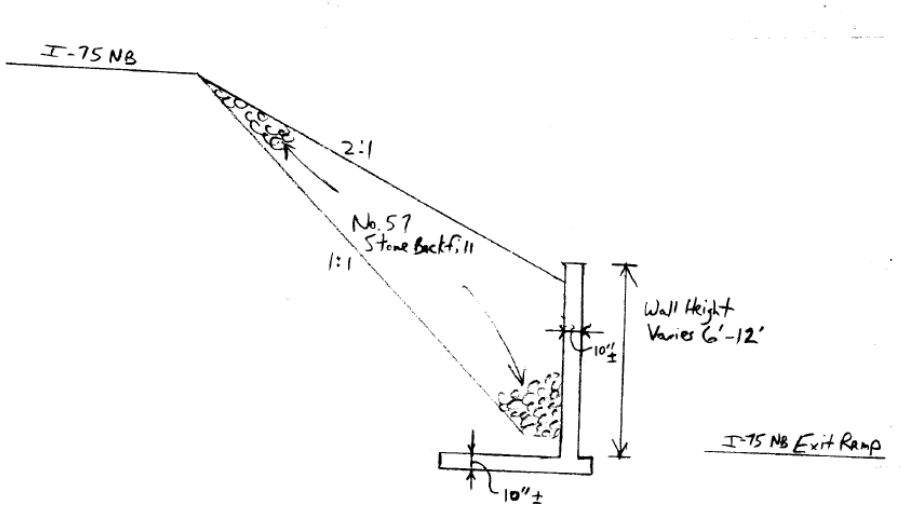
NB Exit Ramp @ 59 Interchange (SG-02)

- Type and condition of current wall is not known
- Plans do not indicate if existing wall is to remain or be replaced

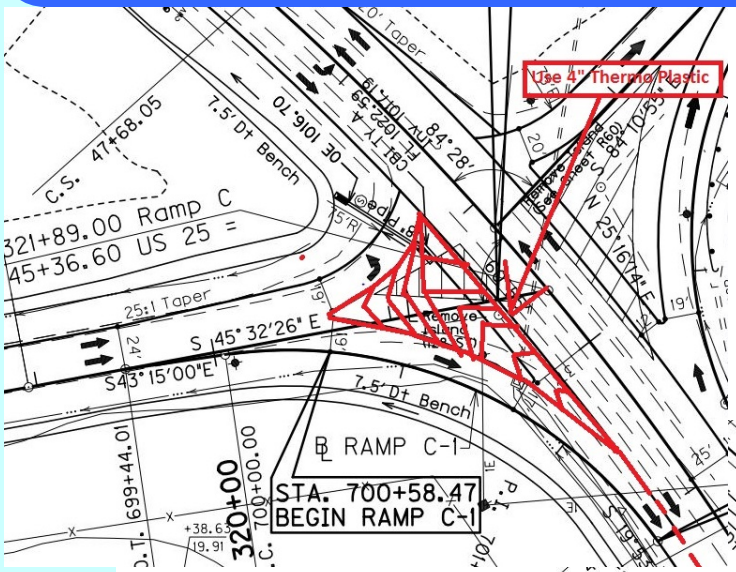


NB Exit Ramp @ 59 Interchange (SG-02)

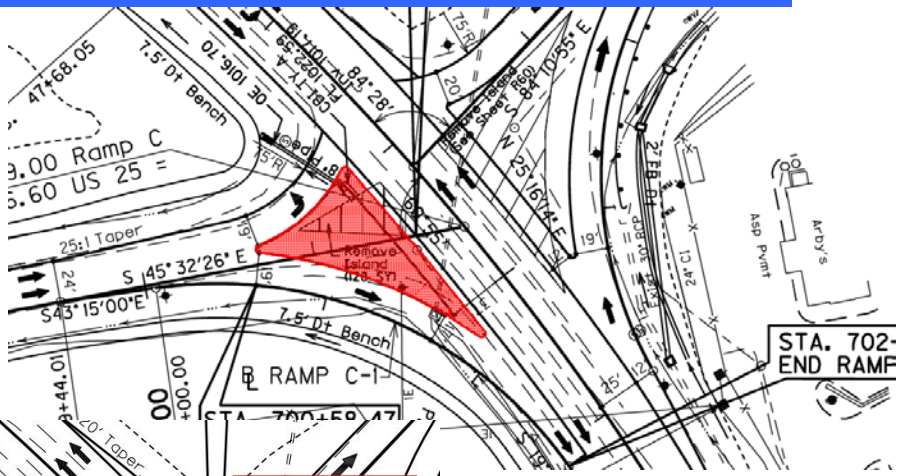
- Replace 425’ of existing retaining wall and possibly terminating the wall further to the south
- Improves sight distance
- Lowers future maintenance



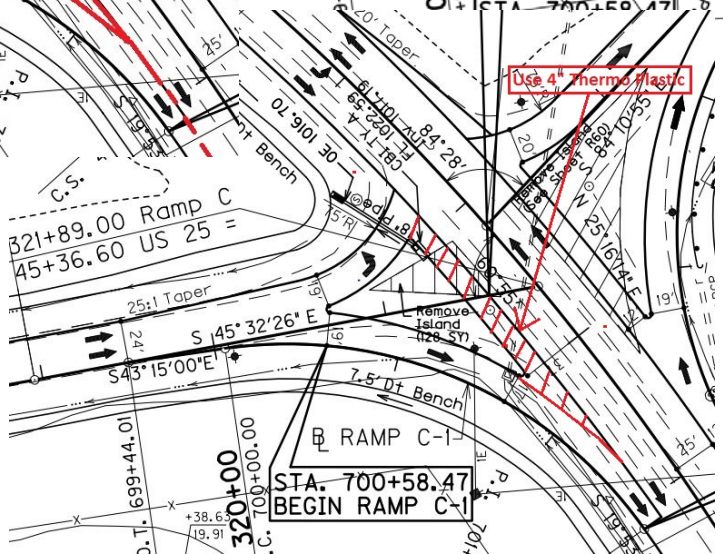
Interchange 62 C-1 Ramp Island Modifications



T-11

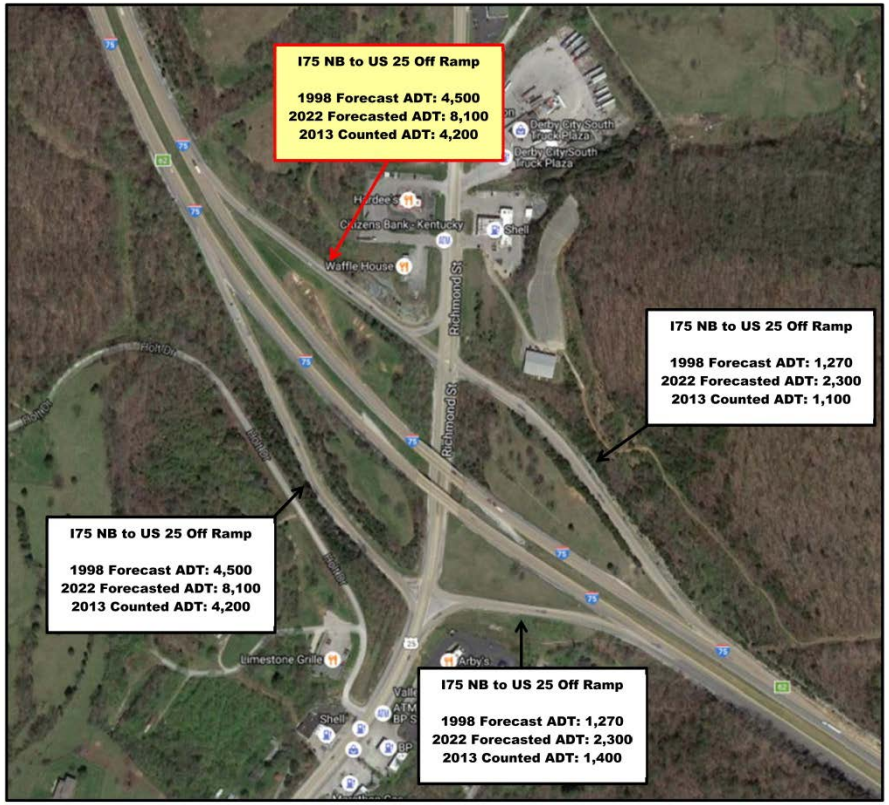


T-13



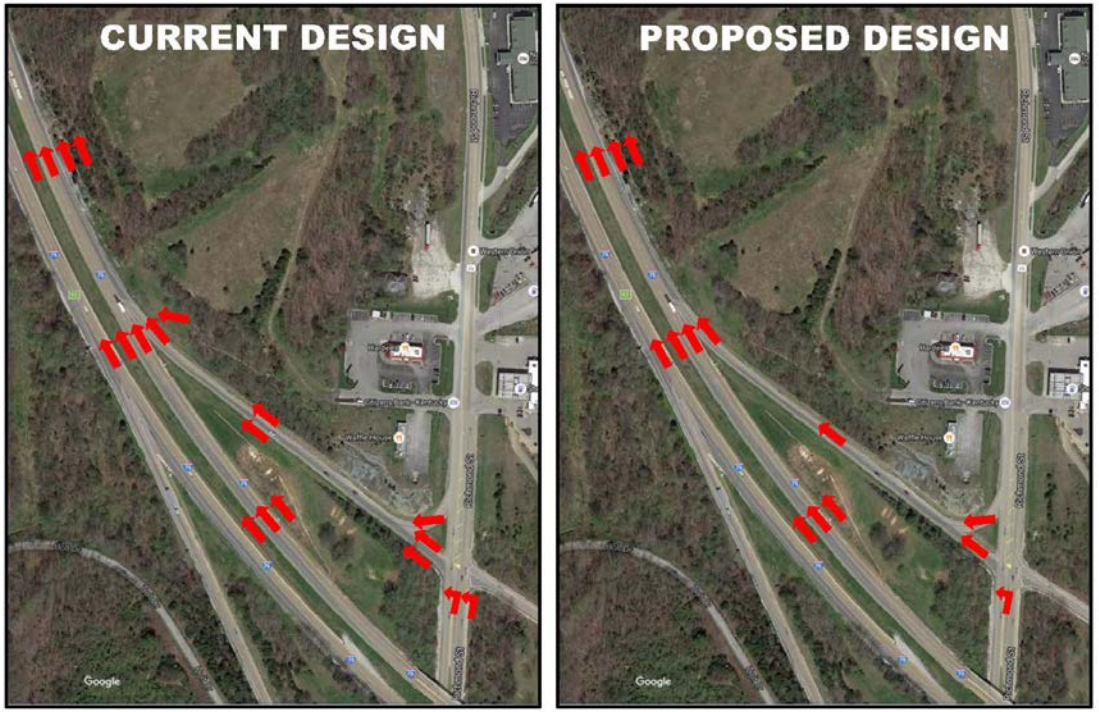
T-14

Interchange 62 NB On-ramp (T-01)



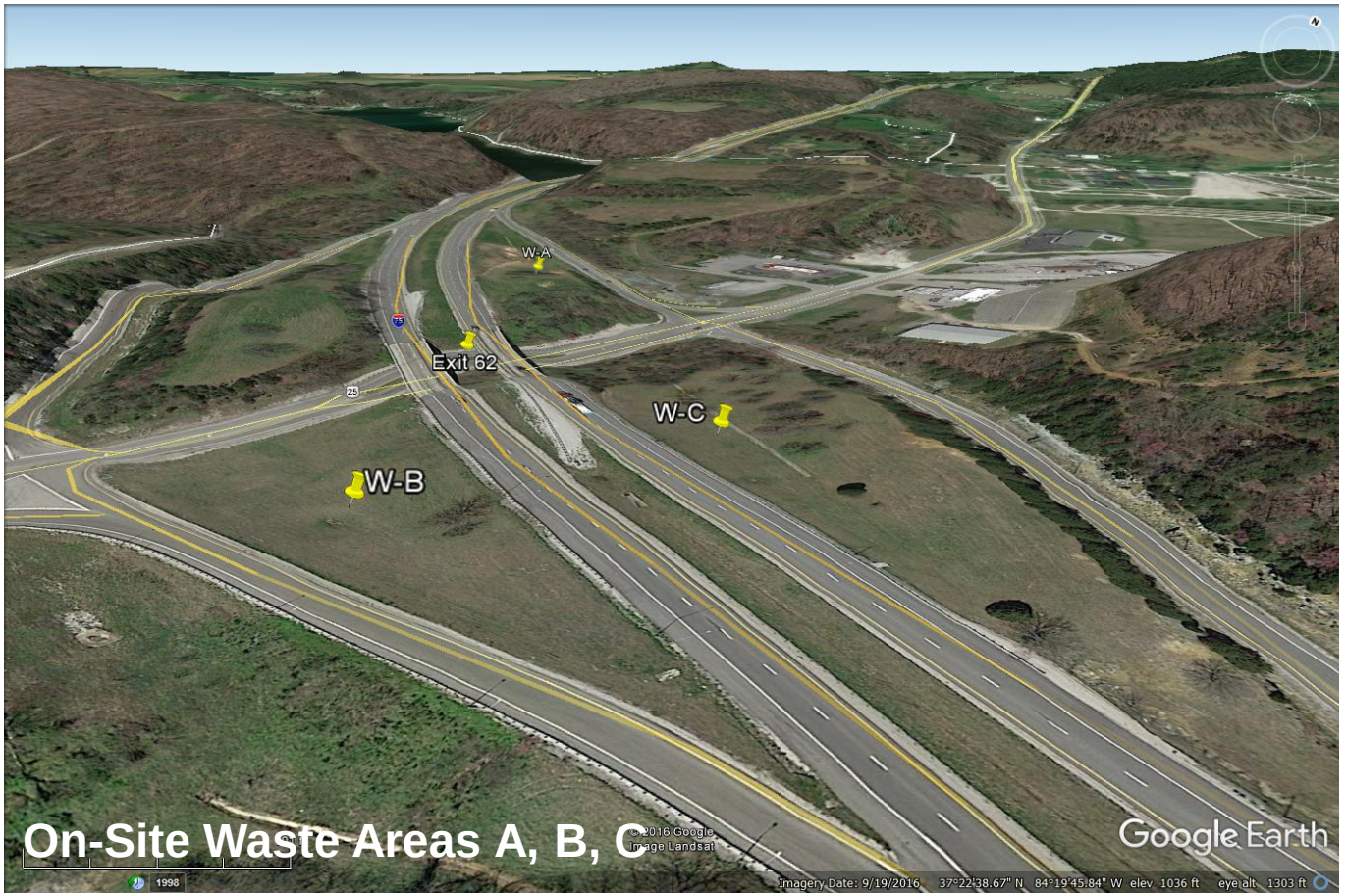
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
837	630	807	667	740	794	1,033
692	522	497	511	573	665	832
528	419	436	456	540	525	618
483	407	462	477	515	570	644
480	620	691	745	768	690	753
514	956	895	990	1,063	1,096	1,005
655	1,411	1,399	1,415	1,487	1,553	1,290
1,122	1,765	1,835	1,939	2,101	2,003	1,790
1,749	2,064	1,979	2,197	2,493	2,449	2,502
2,712	2,349	2,138	2,372	2,649	3,066	3,281
3,850	2,728	2,471	2,655	3,114	2,879	4,129
4,667	3,266	2,769	2,967	3,625	4,156	4,663
5,036	3,407	2,867	3,187	3,698	4,353	4,691
5,281	3,435	2,915	3,106	3,782	4,433	4,528
5,251	3,420	2,643	3,301	3,652	4,365	4,709
4,803	3,299	2,902	3,224	3,864	3,839	4,396
4,320	3,344	2,882	3,182	3,886	4,428	3,900
4,038	3,049	2,767	3,025	3,368	4,238	3,497
3,451	2,265	2,292	2,543	2,742	3,491	2,955
2,887	1,849	1,770	1,897	2,286	2,983	2,635
2,161	1,552	1,580	1,753	2,024	2,644	2,241
1,687	1,384	1,448	1,489	1,790	2,454	1,989
1,420	1,025	1,124	1,217	1,310	1,751	1,462
894	682	826	817	1,020	1,307	1,113

Interchange 62 NB On-ramp (T-01)



Interchange 62 NB On-ramp (T-02)

Identify Waste Areas



Identify Waste Areas

On-Site Waste Areas D & E

Next Steps

- Draft Report
- Implementation Meeting
- Final Report

Questions

Standard KYTC VE Report Abbreviations

List of Common Abbreviations

AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADD	Area Development District
ADT	Average Daily Traffic
CRF	Crtical Rate Factor
CSB	Crushed Stone Base
CY	Cubic Yard
DES	Design Executive Summary
DGA	Dense Graded Aggregate
DHV	Design Hour Volume
EA	Each
FHWA	Federal Highway Administration
FT	Foot or Feet
IJS	Interchange Justification Study
KTC	Kentucky Transportation Center
KYTC	Kentucky Transportation Cabinet
LF	Linear Feet
LOS	Level of Service
LS	Lump Sum
MI	Mile
MOU	Memorandum of Understanding
MP	Milepoint
MPO	Metropolitan Planning Organziation
MSE	Mechanically Stabilized Earth
NHS	National Highway System
PD	Project Development
PDP	Project Delivery and Preservation
PL&G	Preliminary Line and Grade
RCBC	Reinforced Concrete Box Culvert
ROW	Right-of-Way
SYP	Six Year Plan
TRB	Transportation Research Board
V/C	Volume to Capacity Ratio
VE	Value Engineering
VPH	Vehicles per Hour