Value Engineering Study & Constructability Review

US 127 ALBANY BYPASS

CLINTON COUNTY, KENTUCKY

ITEM NUMBER 8-260.02 & 8-260.10

VE STUDY NUMBER 201103

Study Date: March 7-9, 2011

Kentucky Transportation Cabinet
Frankfort, Kentucky

URS

US 127 ALBANY BYPASS
CLINTON COUNTY, KENTUCKY

Item Number 8-260.02 and 8-260.10

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VALUE ENGINEERING STUDY & CONSTRUCTABILITY REVIEW
for
Kentucky Transportation Cabinet
Frankfort, Kentucky

Study Date: March 7 – 9, 2011

Final Report

April 11, 2011

URS

EXECUTIVE SUMMARY

General
URS conducted a Value Engineering (VE) study and Constructability Review of the US 127 Albany Bypass project in Clinton County, Kentucky. The item number is 8-260.02 and 8-260.10. The topic was the 95% design submission prepared by Entran and HMB for the Kentucky Transportation Cabinet (KYTC).

The VE Team undertook the task assignment using the value engineering work plan and approach. The ideas generated from this process and chosen for full development as VE Team Recommendations are presented in Section 3 of this report. These recommendations are presented to all project stakeholders for judgment as to whether they should be implemented.

Estimate of Construction Costs and Budget
The preliminary construction cost estimate provided to the VE Team with the project documents indicates a total construction cost of $32,474,690 for the HMB section (8-260.02) and $13,927,093 for the Entran section (8-260.10). This project is scheduled to be developed as a traditional design/bid/build project, thus the cost of construction will be determined on a contractor bid.

Summary of VE Study Results
During the speculation phase of this VE study, 46 creative ideas were identified; nine of these ideas were developed into VE recommendations and six were developed into design comments with cost implications where applicable. In addition to the VE recommendations and design comments, the VE Team developed 22 constructability comments. Many of the ideas represent changes in design approach, reconsideration of criteria, and in some cases, modification of the project scope. In general, the idea evaluation took into account the economic impact, other benefits obtained, and the effect on the overall project objectives.

The following table presents a summary of the ideas developed into recommendations and design comments with cost implications where applicable. Since cost is an important issue for comparison of VE proposals, the costs presented in this report are based upon original design quantities with unit rates obtained from the estimate as prepared by the design team and included in their submission, published cost databases, and VE Team member experience.

The table also identifies the recommendations and alternatives that, in the opinion of the VE Team, are the best combination of all the VE recommendations. This selection takes into account that the cost savings of these recommendations can be added together (summarily additive), and it also considers whether the cost savings or project improvement potential are worth the change to the project design.

For this project, the VE Team selected two mutually exclusive scenarios to represent a range recommendations and potential cost savings. These scenarios are comprised of a combination of individual recommendations as shown in the Summary of VE Recommendation table. The VE Team's Selected Combination #1 represents an estimated potential cost savings of $4,312,000. VE Team Selected Combination #2 results in an estimated potential cost savings of $3,980,000. Total cost savings realized will be based upon the final implementation status of these VE recommendations.

SUMMARY OF VE RECOMMENDATIONS

Rec #	Recommendation Title / Description	1st cost savings (or cost)	VE Selected Combo
VE-1	Utilize a left turn option from the jughandle at US 127 Connector and eliminate the mainline northbound on-ramp	$346,000	
VE-2	Utilize an at-grade intersection for the US 127 Connector in lieu of grade separated interchange	$2,584,000	1
VE-3	Utilize two Michigan U-Turns at the intersection of the US 127 Connector in lieu of the proposed interchange	$2,252,000	2
VE-4	Utilize a roundabout at US 127 and State Line Road in lieu of unsignalized intersection	$216,000	1,2
VE-5	Utilize 10 ft shoulders (8 ft paved) in lieu of 12 ft shoulders (10 ft paved) for both projects	$534,000	1,2
VE-6	Move the guardrail face up to the edge of shoulder pavement in lieu of adding an extra 2 feet of paving for guardrails	$132,000	1,2
VE-7	Utilize 6 ft shoulders (4 ft paved) adjacent to truck climbing lanes in lieu of 12 ft shoulders (10 ft paved)	$111,000	
VE-8	Utilize rolled-in rumble strips and eliminate the bid item for milled rumble strips	$32,000	1,2
VE-9	Utilize wagon box for Old Burkesville Road in lieu of constructing mainline bridge over Old Burkesville Road	$814,000	1,2

Summary of VE Team Selected Combination # 1: $4,312,000
Summary of VE Team Selected Combination # 2: $3,980,000

SUMMARY OF VE DESIGN COMMENTS

DC #	Design Comment Title / Description
DC-1	Eliminate the proposed access point for US 127 at station 397+00, station 269+00, and station 281+00
DC-2	Dispose of all excess right-of-way by transferring ownership to adjacent property owners in lieu of maintaining remnants of old road (example at station 105+00 to 115+00)
DC-3	Utilize a roundabout at old US 127, TN 111, and State Line Road in lieu of unsignalized intersection and reconstructing a portion of KY 1076
DC-4	On Entran section, eliminate the edge drain quantities if not required by roadway pavement design
DC-5	Construct cross drains/ditches for ultimate construction section in fill sections in lieu of only constructing for current section
DC-6	Remove the guardrail barricades outside of cul-de-sacs

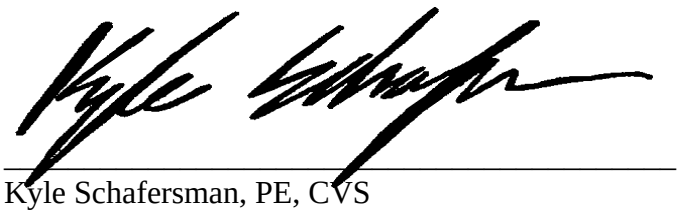
SUMMARY OF CONSTRUCTABILITY COMMENTS	
CC #	Constructability Comment Title / Description
CC-1	On the Entran section, evaluate the need to include a special note regarding Embankment and Excavation bid items
CC-2	On Entran section, update the asphalt mixtures to the current criteria (i.e., “CL3 ASPH SURF 0.50A PG76-22”)
CC-3	On HMB and Entran cost estimates, include a bid item for asphalt adjustments
CC-4	Verify the turn lane lengths/tapers are compliant with Highway Design Memo 3-09
CC-5	Require contractor to bid either lime stabilization or rock road bed in lieu of paying for rock road bed at the lime stabilization unit cost
CC-6	Add a tolerance note of 0.1 ft +/- for the rock road bed alternative of lime stabilized base
CC-7	Include a typical section to show the rock road bed will extend to the ditch line as compared to lime stabilized subgrade that only exists under pavement section
CC-8	On the Entran section, revise the quantity of guardrail in the cost estimate
CC-9	On the Entran section, revise the quantity of channel lining in the cost estimate
CC-10	On HMB and Entran estimates, add a bid item for witness posts
CC-11	In the general notes section of the design drawings, make lane closures incidental to maintain and control traffic and eliminate the bid item for lane closures in the cost estimate
CC-12	On the HMB section, verify all pipe outlets have channel protection
CC-13	On the HMB cost estimate, eliminate the bid item for “Special Seeding Crown Vetch”
CC-14	On Entran section, reduce the sodding quantity in the cost estimate from 183,408 SY to approximately 5,000 SY
CC-15	On HMB section, eliminate the bid items for temporary mulch and temporary seeding protection
CC-16	On the Entran cost estimate, update the erosion control “clean” quantities or use a lump sum line item for temporary erosion control
CC-17	On the Entran section, revise the cost estimate to include line item 2600 “Geotextile Type IV Fabric for Pipe”
CC-18	On Entran section cost estimate, include a line item for the pipeline video inspection
CC-19	Verify the storm culverts are in compliance with drainage manual section DR707-4 (access for maintenance)
CC-20	On HMB section at station 222+50, utilize 24-in culvert pipe in lieu of 18-in culvert pipe to comply with current standards for sections with over 30 ft of cover height
CC-21	Verify the turning radius (WB-50) and full depth of pavement within the intersections is compliant with heavy truck traffic
CC-22	Verify the remaining minor construction comments are incorporated

Acknowledgments
A thank you is given to the staff members from the Kentucky Transportation Cabinet, HMB, and Entran for their participation. Special thanks are also extended to Mr. Brent Sweger for his assistance with this study.

Value Engineering Study - Core Team

Name	Discipline / Role	Organization	Telephone
Greg Groves, PE	Roadway Design Engineer	URS	502-569-2301
Rodney Little, PE	Constructability Engineer	KYTC	606-677-4017
Luther Miracle, PE	Roadway Design Engineer	DLZ	502-695-2300
Kyle Schafersman, PE, CVS	VE Team Leader	URS	913-344-1019
Brent Sweger, PE	VE Coordinator	KYTC	502-564-3280
Mitch Thomas, PE	Transportation Engineer	URS	502-569-2301
Troy Woodyard, EIT	VE Team Member	KYTC	502-680-7311

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



Kyle Schafersman, PE, CVS
Value Engineering Program Manager

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SECTION 1 - INTRODUCTION

This report documents the results of a Value Engineering study and Constructability Review on the US 127 Albany Bypass project in Clinton County, Kentucky. The item number is 8-260.02 and 8-260.10. The study was held at the KYTC offices in Frankfort, KY on March 7 – 9, 2011. The study team was from URS, KYTC, and DLZ. Kyle Schafersman, a Certified Value Specialist (CVS), Professional Engineer (PE), and team leader from URS, facilitated the study. The names and telephone numbers of all participants in the study are listed in Appendix A.

The Job Plan

This study followed the value engineering methodology as endorsed by SAVE International, the professional organization of value engineering. This report does not include any detailed explanations of the value engineering / value analysis processes used during the workshop in development of the results presented herein. This would greatly expand the size of the report. The sole purpose of this report is to document the results of the study. Additional information regarding the processes used during the study can be obtained by contacting the Certified Value Specialist team leader that facilitated the study.

Ideas, Recommendations, and Design Comments

Part of the value engineering methodology is to generate as many ideas as is practical, evaluate each idea, and then select as candidates for further development only those ideas that offer added value to the project. If an idea thus selected, turns out to work in the manner expected, that idea is put forth as a formal value engineering recommendation. Recommendations represent only those ideas that are proven to the VE Team's satisfaction. Some ideas that did not make the selection for development as recommendations, were, nevertheless judged worthy of further consideration. These ideas have been written up as Design Comments and are included in Section 3 after the recommendations.

Level of Development

Value analysis studies are working sessions for the purpose of developing and recommending alternative approaches to a given project. As such, the results and recommendations presented are of a conceptual nature, and are not intended as a final design. Detailed feasibility assessment and final design development of any of the recommendations presented herein, should they be accepted, remain the responsibility of the owner. VE Team members have not and will not sign or seal any recommendations and comments contained in this report as certifiable engineering or architectural design. These value analysis alternatives have been developed by individual VE Team members and may not reflect the entire VE Team's opinion.

Organization of the Report

The report is organized in the following outline.

A. Introductory Information
    Section 1- Introduction
    Section 2- Project Description
B. Primary body of results
    Section 3- Recommendations and Design Comments
C. Supporting documentation
    Appendices

SECTION 2 – PROJECT DESCRIPTION

The proposed combined project is the reconstruction of US 127 from the intersection of Tennessee State Route 111 north to KY 1590, including a bypass around the western side of Albany in Clinton County. The northern section of the western Albany bypass is currently under construction. From Tennessee to the north side of Albany (to where the bypass reconnects to US 127) the improvements include construction of a two-lane facility initially, and a four-lane facility ultimately. The two-lane facility would include two 12 ft wide lanes with 12 ft wide shoulders (10 ft paved). The overall project is approximately 7.6 miles in length.

The purpose and need for the proposed project is to provide a safe roadway meeting current design standards and improve traffic flow through the US 127 corridor between Static, TN and KY 1590 while providing an alternative to traversing through downtown Albany.

US 127 is classified as a Rural Principal Arterial roadway, and is under various levels of design throughout Clinton and Russell Counties. In addition to this 7.6 mile segment from the Tennessee State Line to KY 1590, there are planned improvements from KY 1590 to Jamestown, KY, including a Bypass of Jamestown. When these improvements are implemented, this roadway will provide an improved direct north-south link from the Louie B. Nunn Parkway to Tennessee route 111 in the south. Tennessee route 111 has been reconstructed and is the preferred route to Cookeville and Interstate 40.

The revised scope of this project is the reconstruction of 7.6 mile of US 127 from the Tennessee State Line to KY 90 including the construction of a western bypass of Albany. Item no 8-260.02 differs in scope from the original in that the bypass was originally proposed to be on the East Side of Albany. Due to historical issues, KYTC was directed to look at the possibility of construction a Western Bypass of Albany. After a thorough environmental investigation, it was determined that a Western Bypass would in fact work. This project therefore includes a proposed Western Bypass of Albany. That alignment is shown on the accompanying map.

The project team decided to construct US 127 as a two-lane initial/four-lane ultimate construction for the following reasons:

1) Because of its roadway classification as a Principal Rural Arterial.
2) Traffic projections and large percentage of heavy truck use.
3) The level of uncertainty associated with how future improvements of the US 127 north could affect potential growth along US 127 near Albany

This 7.6 miles section of the corridor has been divided into separate design contracts and awarded to HMB and Entran. The following is a brief description of the separated design sections:

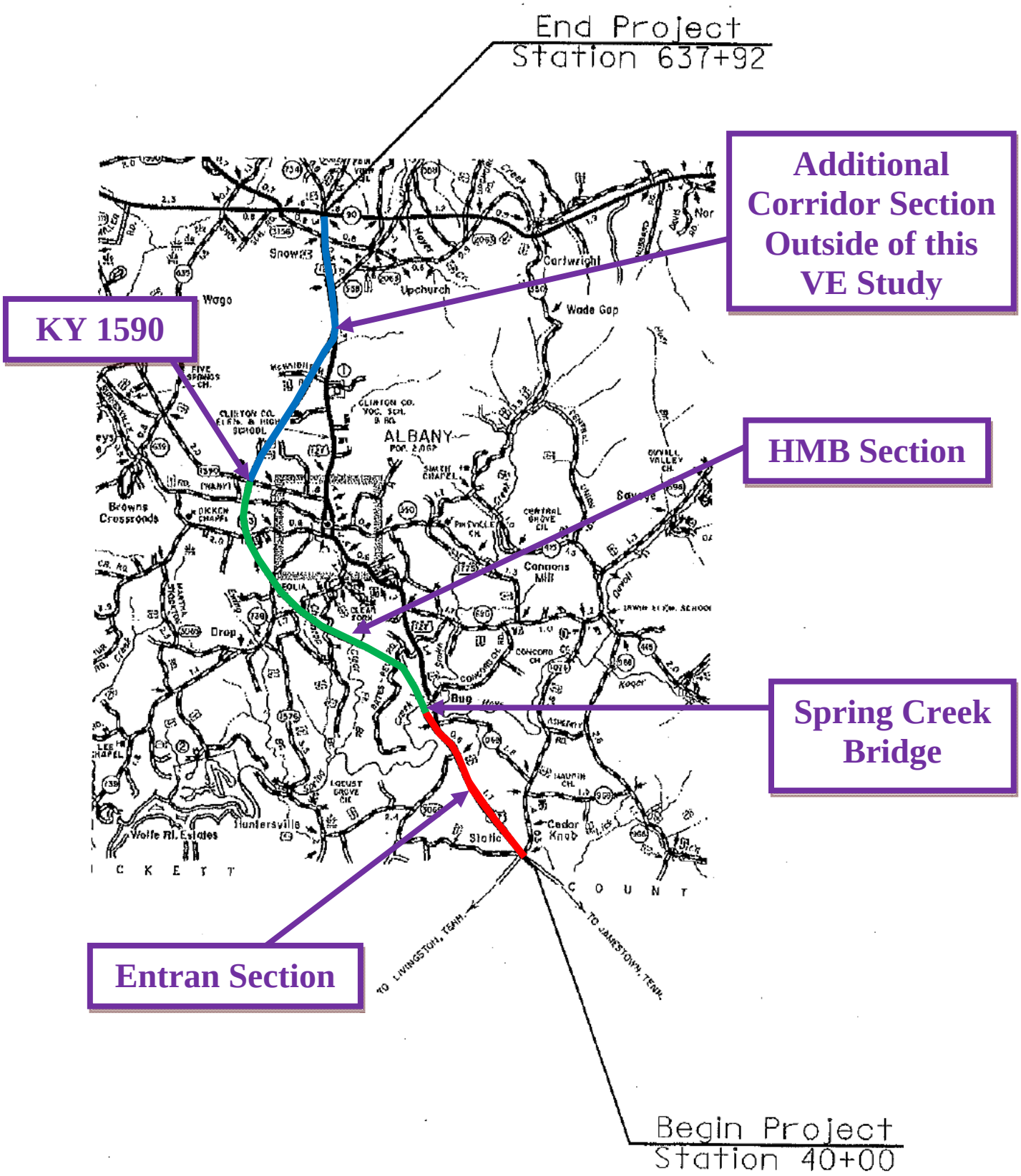
HMB Section (8-260.02)

- From southern Spring Creek Bridge tie-in to KY 1590 (northern portion of the project)
- 4.6 miles of partially controlled access rural arterial roadway
- 2-12 ft lanes with 12 ft shoulders (10 ft paved)
- 95% of right-of-way already purchased for 4-lane ultimate section on mostly new alignment
- 4 new proposed bridges
- $32.4M total construction (~$6M portion already under construction)
- 5,000 – 15,800 ADT (2030)

Entran Section (8-260.10)

- From TN 111 to the southern Spring Creek Bridge tie-in (southern portion of the project)
- 3 miles of partially controlled access rural arterial roadway
- 2-12 ft lanes with 12 ft shoulders (10 ft paved)
- 95% of right-of-way already purchased for 4-lane ultimate section mostly adjacent to existing alignment
- 7,000 – 9,000 ADT (2030)
- No structures proposed on this section
- $13.9M total construction (mostly new paving and embankment)

Overall Aerial Image of Project Alignment



SECTION 3 - VE RECOMMENDATIONS & DESIGN COMMENTS

Organization of Recommendations
This section contains the complete documentation of all recommendations that have resulted from this study. Each recommendation has been marked by a unique identification number.

The parent idea, or ideas from which the recommendation began, can be determined from the Creative Idea List and Evaluation located in Appendix D of this report.

Each recommendation is documented by a separate write-up that includes:
- a description of both the original design and recommended change
- a list of advantages and disadvantages
- sketches where appropriate,
- calculations,
- cost estimate,
- the economic impact of the recommendation on the first cost,
- and where applicable, the life cycle cost.

The economic impact is shown in terms of savings or added cost.

Acceptance of VE Recommendations
The Summary of VE Recommendations table presented in the Executive Summary of this report identifies the recommendations that, in the opinion of the VE Team, are the best combination of all the VE recommendations. This selection takes into account not only that the recommendations, and likewise their cost savings, are summarily additive (can be added together), but also the likelihood and ease of implementing the recommendations.

However, this report also includes other recommendations that could enhance the value of this project. These recommendations are either mutually exclusive of the recommendations selected by the VE Team (i.e., implementing one immediately precludes the implementation of another) or they require additional design and/or evaluation prior to implementation. These recommendations should be evaluated individually to determine whether they are worthy of implementation or not. Consideration should be given to the areas within a recommendation that are acceptable and implement those parts only. Any recommendation can be accepted in whole or in part as the owner and design team see fit.

Design Comments
Design Comments are ideas that in the opinion of the VE Team were good ideas, but for any number of reasons were not selected for development as VE recommendations. Design Comments can be notes to the owner or designer, a documentation of various thoughts that come up during the course of the study, a reference to possible problems, suggested items that might need further study, or questions that the owner and designer might want to explore. These comments may have implications on project cost, but due to time constraints, the VE Team did not develop cost savings estimates for Design Comments. Some comments might relate to things of which the owner or designer is already aware. Because the study is done on a design in progress and as an independent team, the VE Team may not be aware of everything intended by the owner and designer. The following comments are presented with the intent that they may aid the design team in some way.

Constructability Comments

Constructability Comments are ideas that in the opinion of the VE Team need to be addressed by the project design team throughout the design process. These are abbreviated comments that in most cases will not require significant redesign or deliberation. These comments are the results of the constructability review conducted during the course of the VE study. Some comments might relate to things of which the owner or designer is already aware. Because the study is done on a design in progress and as an independent team, the VE Team may not be aware of everything intended by the owner and designer. The following constructability comments are presented with the intent that they may aid the design team in some way.

VALUE ENGINEERING RECOMMENDATION # VE-1

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize a left turn option from the jughandle at US 127 Connector and eliminate the mainline northbound on-ramp.

ORIGINAL DESIGN:
The original design calls for a northbound on-ramp for traffic turning from US 127 to Albany Bypass.

RECOMMENDED CHANGE:
The VE Team recommends the elimination of the northbound on-ramp.

ADVANTAGES:

- Reduce unnecessary initial construction
- Handles traffic turning movements adequately
- Reduced pavement and maintenance
- Ramp can be added in the future, if needed

DISADVANTAGES:

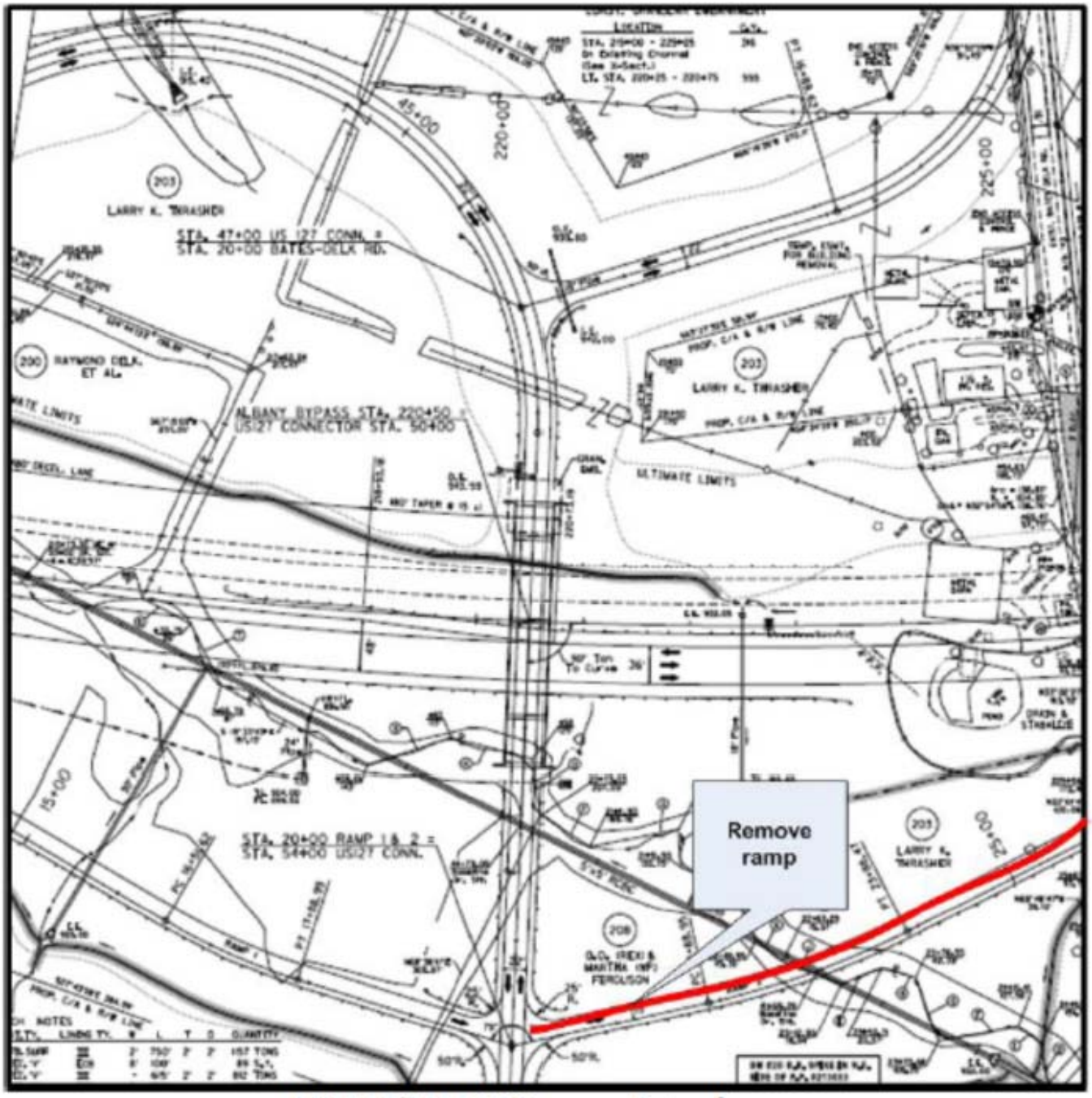
- Some drivers may cross traffic by turning left (conflicts)

JUSTIFICATION:
There is not a significant need for this ramp. The turning movement for US 127 to the Albany Bypass is very low (30 vehicles projected in the peak hour in 2030). By eliminating the on-ramp, drivers have two basic alternatives: use the jughandle ramp and then turn left to head north or divert along other routes such as KY 738 to reach the bypass. The channelization island at the base of the ramp would need to be removed.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$1,310,000	$0	$1,310,000
RECOMMENDED DESIGN	$964,000	$0	$964,000
ESTIMATED SAVINGS OR (COST)	$346,000	$0	$346,000

VALUE ENGINEERING RECOMMENDATION # VE-1

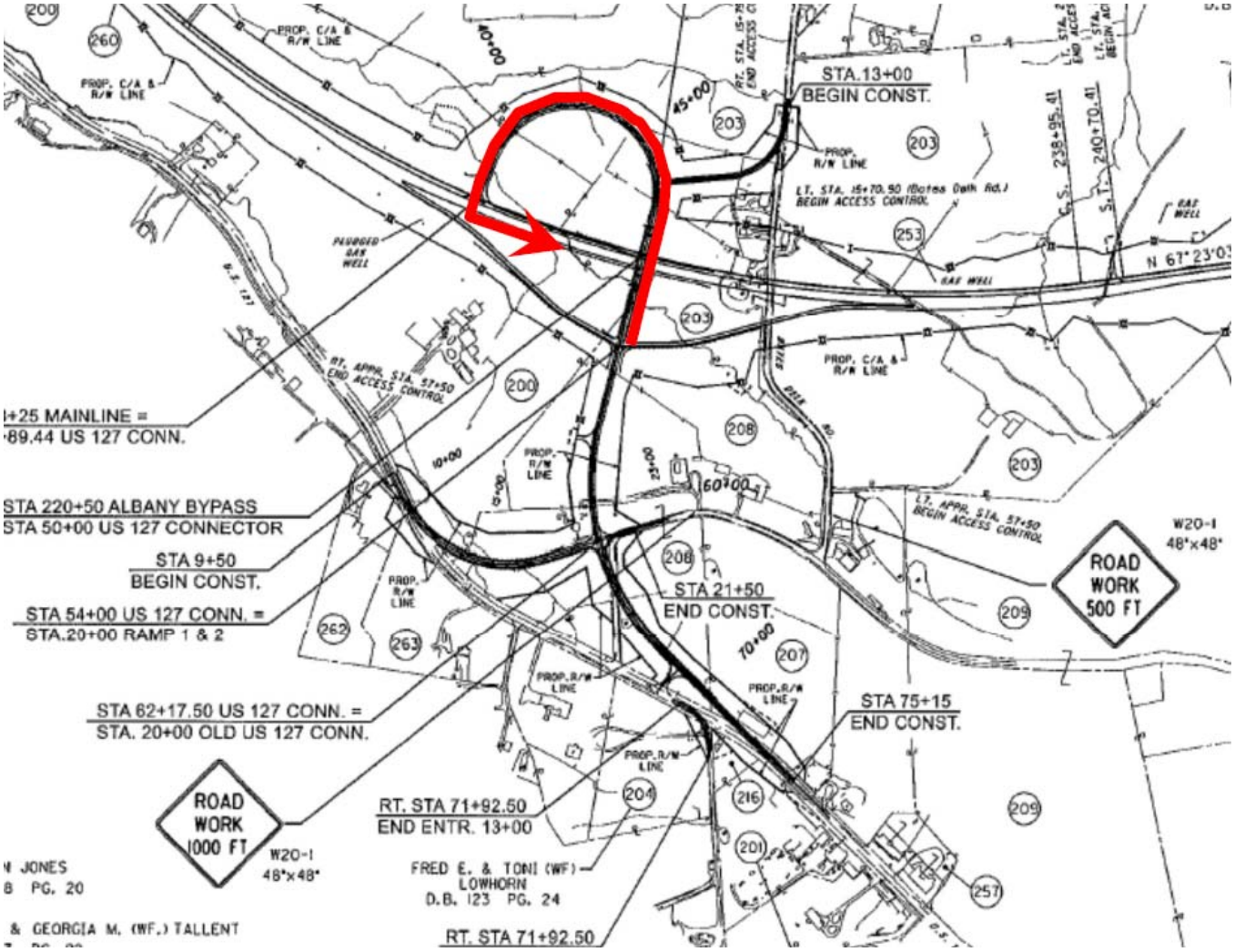
SKETCH OF RECOMMENDED DESIGN



US127/US127 Bypass Interchange

VALUE ENGINEERING RECOMMENDATION # VE-1

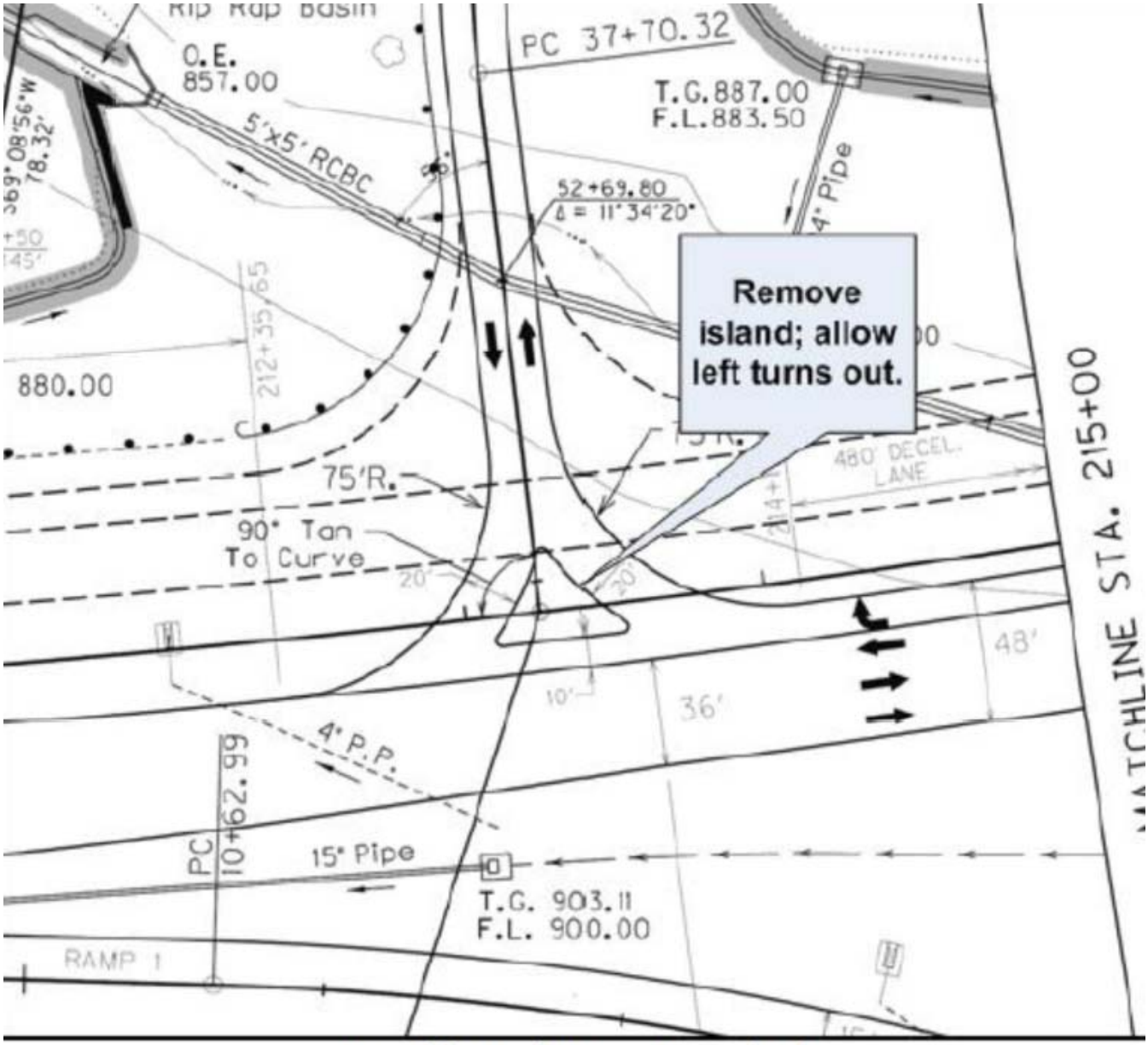
SKETCH OF RECOMMENDED DESIGN



Proposed turning movement from US 127 Connector to US 127

VALUE ENGINEERING RECOMMENDATION # VE-1

SKETCH OF RECOMMENDED DESIGN



Southbound Ramp Terminal

VALUE ENGINEERING RECOMMENDATION # VE-1

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Num of Units	Total $	Num of Units	Total $
Paving	LS	$100,000	1	1	$100,000		
5 ft x 5 ft Box Culvert	LF	$723.13	1	1,419	$1,026,121	1,159	$838,108
Guardrail	LF	$18.03	1	700	$12,621		
Subtotal					$1,138,742		$838,108
Engineering & Contingency	@	15%			$170,811		$125,716
Total					$1,309,554		$963,824

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

Assumptions/Calculations:
7,227 ft of bridge length X 2 shoulders
X 12 ft wide = 173,448 SF
X 10 ft wide = 144,540 SF

✓ VE Selected
Scenario #1

VALUE ENGINEERING RECOMMENDATION # VE-2

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize an at-grade intersection for the US 127 Connector in lieu of grade separated interchange.

ORIGINAL DESIGN:
The original design calls for a grade-separated interchange where the existing US 127 ties into Albany Bypass.

RECOMMENDED CHANGE:
The VE Team recommends the construction of an initial at-grade intersection.

ADVANTAGES:

- Reduce unnecessary initial construction
- Handles intermediate traffic turning movements adequately without a traffic signal
- Interchange can be added in the future, as needed
- Reduced pavement and maintenance
- Reduces cost of culvert construction

DISADVANTAGES:

- Increased conflict points
- Will add some waste material from the excavation to the job

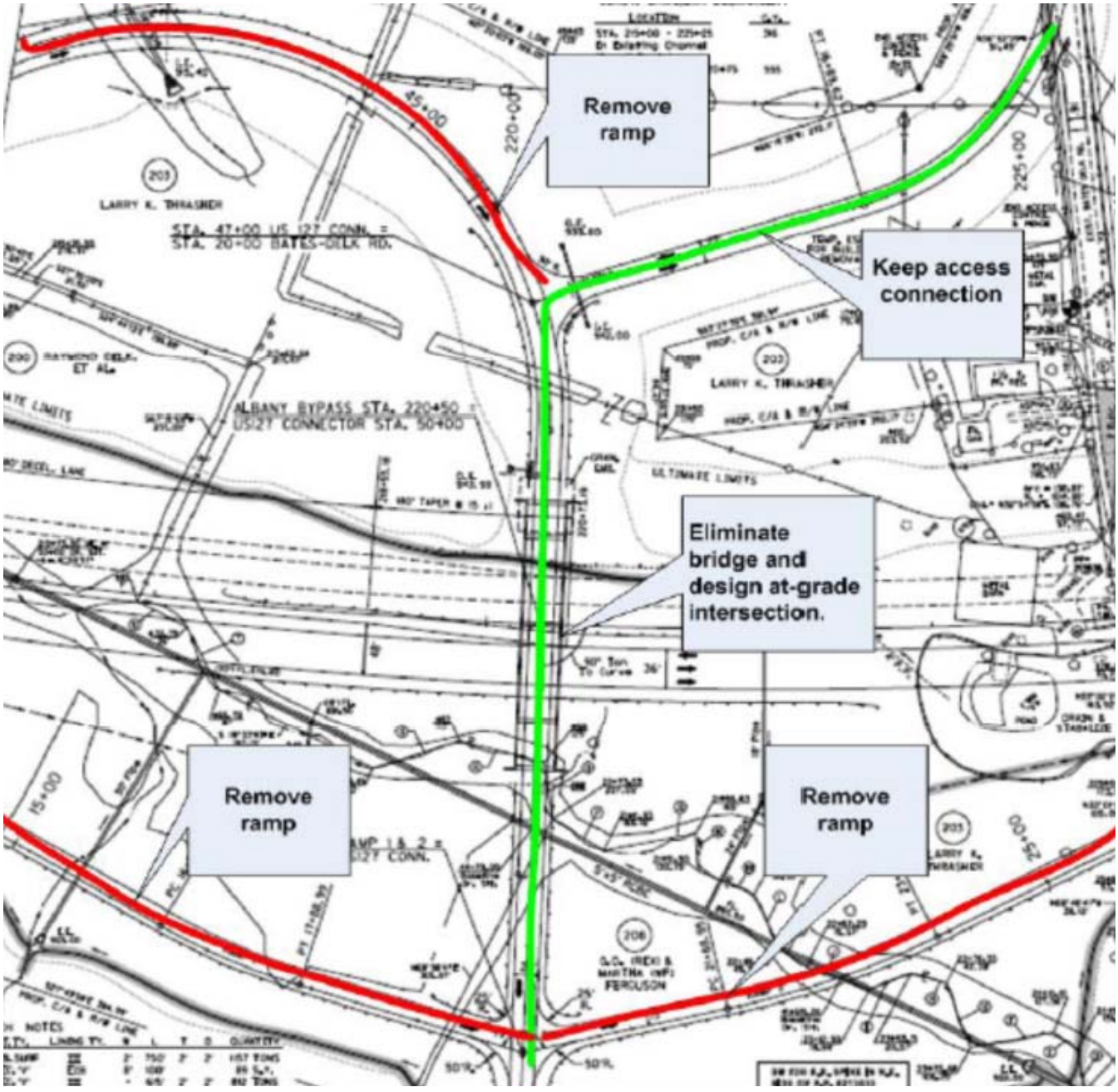
JUSTIFICATION:
Based on the traffic forecast figures, a grade-separated interchange will not be needed in the intermediate future. The traffic forecast has a base year of 2002 and a future forecast year of 2030. Based on the traffic counts south of Albany on US 127, traffic volumes have not increased between 1997 and 2010 (3900 vs. 3960 vehicles per day). This indicates that the forecasts may be higher than what is happening in reality. With traffic growth increasing at a slower rate, an unsignalized intersection appears to adequately handle traffic volumes, even during the peak hour. Through movement on US 127 and the bypass operate with almost no delay. During the peak hour, the approach delay on the old US 127 is 47 seconds with only an average queue of seven vehicles.

By removing the ramps, the large box culvert design can be changed. Currently, there is approximately 1,400 ft of 5 ft x 5 ft RCBC. This can be reduced to 200 ft or less of RCBC with the change of design.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$2,750,000	$0	$2,750,000
RECOMMENDED DESIGN	$166,000	$0	$166,000
ESTIMATED SAVINGS OR (COST)	$2,584,000	$0	$2,584,000

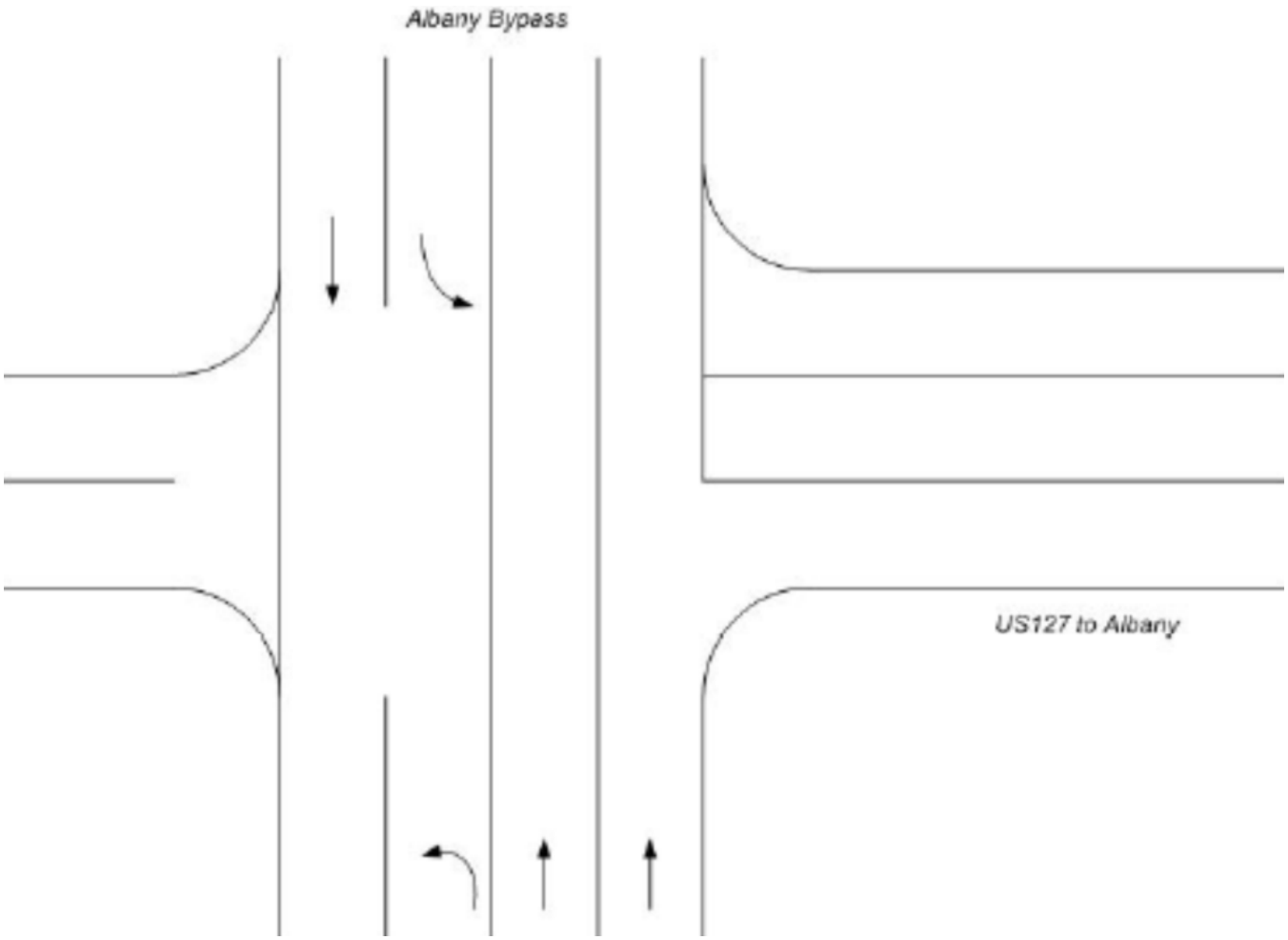
VALUE ENGINEERING RECOMMENDATION # VE-2

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-2

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-2

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Num of Units	Total $	Num of Units	Total $
Bridge	LS	$950,000	1	1	$950,000		
Paving	LS	$335,000	1	1	$335,000		
5 ft x 5 ft Box Culvert	LF	$723.13	1	1,419	$1,026,121	200	$144,626
Guardrail	LF	$18.03	1	4,450	$80,234		
Subtotal					$2,391,355		$144,626
Engineering & Contingency	@	15%			$358,703		$21,694
Total					$2,750,058		$166,320

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

Assumptions/Calculations:
7,227 ft of bridge length X 2 shoulders
X 12 ft wide = 173,448 SF
X 10 ft wide = 144,540 SF

✓ VE Selected
Scenario #2

VALUE ENGINEERING RECOMMENDATION # VE-3

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize two Michigan U-Turns at the intersection of the US 127 Connector in lieu of the proposed interchange.

ORIGINAL DESIGN:
The original design specifies a grade separation at this location with a north bound off-ramp, a north bound on-ramp and a jughandle in the southwest quadrant. The jughandle accommodates southbound traffic that desires to travel east on the proposed US 127 Connector and westbound traffic that wishes to travel south on the US 127 Bypass from the US 127 Connector.

RECOMMENDED CHANGE:
The VE Team recommends constructing an at-grade intersection with Michigan U-Turn movements that will accommodate traffic wishing to turn left from the US 127 Connector to southbound US 127 Bypass and southbound US 127 Bypass wishing to turn left to eastbound US 127 Connector.

ADVANTAGES:
- Eliminates unnecessary construction
- Meets traffic operations needs adequately.
- Will likely not require a traffic signal
- Potentially safer than at-grade, full-movement intersection.
- Can be done within right-of-way limits
- Eliminates maintenance costs of bridge & ramps

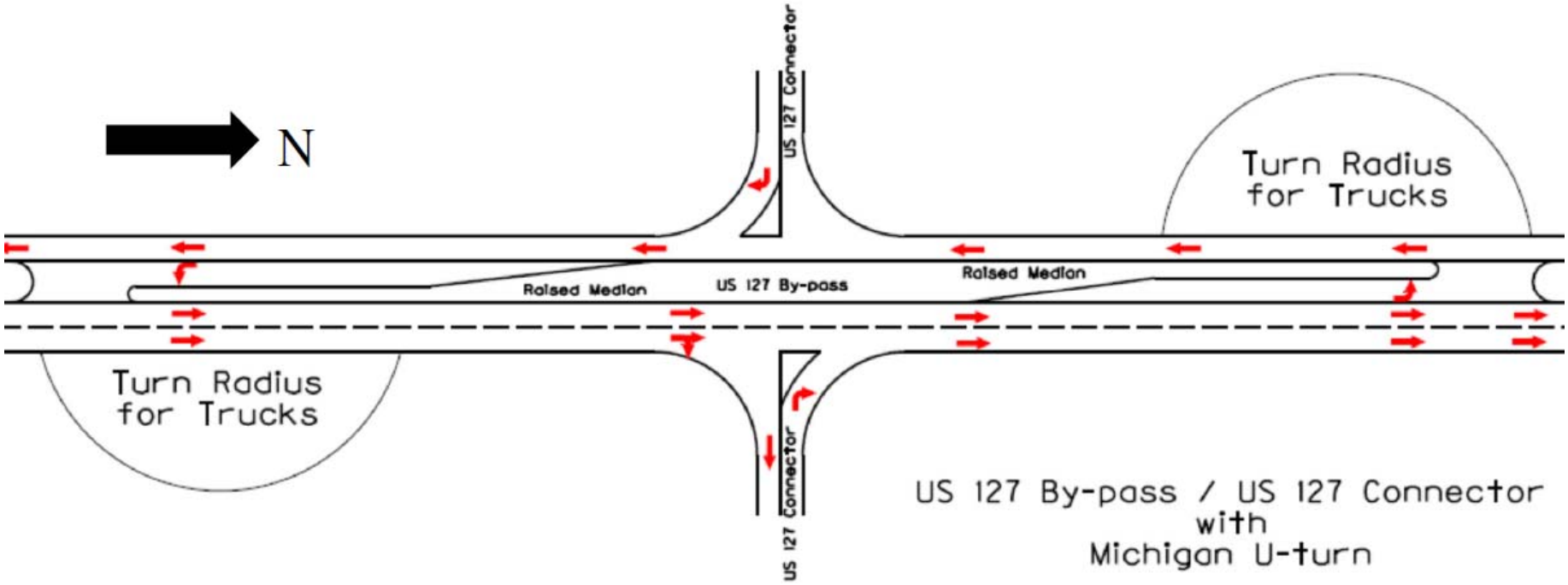
DISADVANTAGES:
- Widening of pavement to accommodate U-turns for large trucks (loons)
- Possible confusion by drivers who must turn right from US 127 Connector to go south on US 127 Bypass

JUSTIFICATION:
The turning movement volumes indicate that this intersection will function at an acceptable level with this configuration. This configuration will allow for safe, continuous traffic flow of the US 127 Bypass without stops from a signal and for a much lower cost than the proposed design. The costs associated with Ramp 1, Ramp 2, Bridge over US 127 Bypass and partial elimination of the US 127 Connector will reduce construction costs and future maintenance costs of the bridge and ramps.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$2,750,000	$0	$2,750,000
RECOMMENDED DESIGN	$498,000	$0	$498,000
ESTIMATED SAVINGS OR (COST)	$2,252,000	$0	$2,252,000

VALUE ENGINEERING DESIGN COMMENT # VE-3

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-3

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Num of Units	Total $	Num of Units	Total $
Bridge	LS	$950,000	1	1	$950,000		
Paving	LS	$335,000	1	1	$335,000		
5 ft x 5 ft Box Culvert	LF	$723.13	1	1,419	$1,026,121	200	$144,626
Guardrail	LF	$18.03	1	4,450	$80,234		
MUT Paving	LS	$1.00	1			179,128	$179,128
MUT Earthwork	CY	$3.30	1			33,000	$108,900
Subtotal					$2,391,355		$432,654
Engineering & Contingency	@	15%			$358,703		$64,898
Total					$2,750,058		$497,552

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

✓ VE Selected
Scenario #1, 2

VALUE ENGINEERING RECOMMENDATION # VE-4

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize a roundabout at US 127 and State Line Road in lieu of unsignalized intersection.

ORIGINAL DESIGN:
The original design specifies an unsignalized intersection left, thru, right turn lanes northbound; left and thru/right turn lanes southbound; left, thru/right turn lanes westbound; and a left/thru/right lane eastbound.

RECOMMENDED CHANGE:
The VE Team recommends constructing an initial one-lane, ultimate two-lane (or major-minor) roundabout at this location.

ADVANTAGES:

- Allows for continuous traffic movements on all intersection legs
- Very little delay with future traffic
- Eliminates the potential for the future need of a signal at this intersection
- Minimizes conflict points
- Safer than a traffic signal
- Can easily be expanded as traffic needs change

DISADVANTAGES:

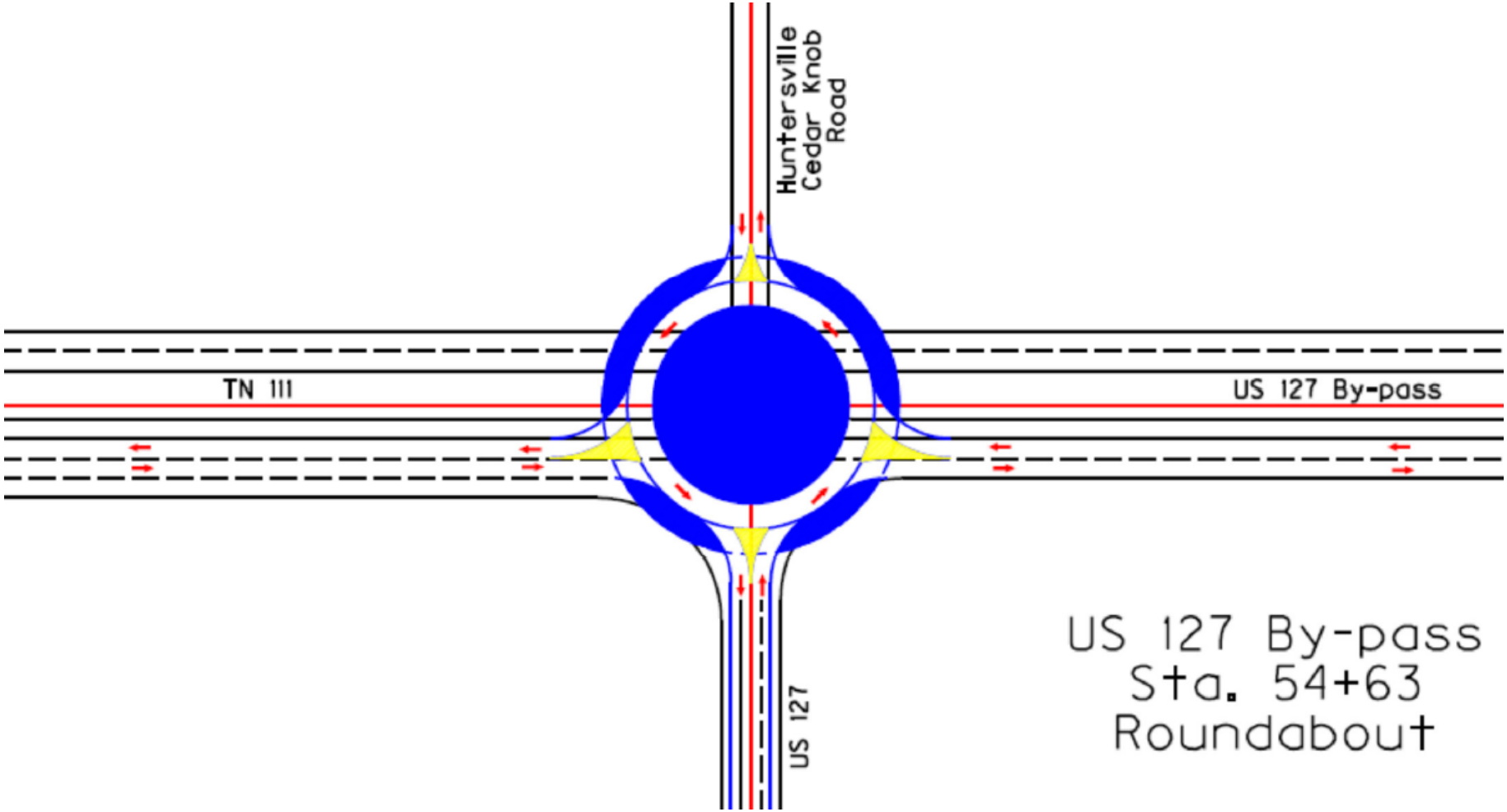
- Requires design to accommodate both initial and ultimate configurations.
- May require additional right-of-way

JUSTIFICATION:
The incorporation of a roundabout designed to accommodate initial and ultimate will eliminate the need to modify the intersection with future increases in traffic movements thru this intersection, thereby minimizing the inconvenience to the traveling public. Modifications to accommodate a two-lane roundabout in the future would involve minimal construction costs.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$216,000	$0	$216,000
RECOMMENDED DESIGN	$0	$0	$0
ESTIMATED SAVINGS OR (COST)	$216,000	$0	$216,000

VALUE ENGINEERING DESIGN COMMENT # VE-4

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-4

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Num of Units	Total $	Num of Units	Total $
Mainline Paving	LS	$187,500	1	1	$187,500		
Subtotal					$187,500		$0
Engineering & Contingency	@	15%			$28,125		$0
Total					$215,625		$0

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

✓ VE Selected
Scenario #1, 2

VALUE ENGINEERING RECOMMENDATION # VE-5

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize 10 ft shoulders (8 ft paved) in lieu of 12 ft shoulders (10 ft paved) for both projects.

ORIGINAL DESIGN:
The original design specifies 12 foot shoulders on mainline with 10 foot of shoulder being paved using crushed stone, asphalt base, and asphalt surface.

RECOMMENDED CHANGE:
The VE Team recommends utilizing 10 foot shoulders with 8 foot being paved.

ADVANTAGES:
- Reduces materials
- Shorter construction time

DISADVANTAGES:
- Traffic closer to guardrail

JUSTIFICATION:
This roadway section is considered a rural arterial and has a design speed of 60 miles per hour. The use of 10 foot shoulders for this type of facility complies with current design policy. Common Geometric Practices for Rural Arterial Roads in the Kentucky Transportation Cabinet's *Highway Design Manual* only requires a minimum graded shoulder width of 8 feet based on the design criteria (design speed and traffic volume) for this project.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$2,760,000	$0	$2,760,000
RECOMMENDED DESIGN	$2,226,000	$0	$2,226,000
ESTIMATED SAVINGS OR (COST)	$534,000	$0	$534,000

VALUE ENGINEERING RECOMMENDATION # VE-5

CALCULATIONS

Begin Station	23+00	End Station	414+00
Total Length	39100	Linear Feet (LF)	
bridge lengths	1215		
Net pavement	37885	LF	

Asphalt unit weight = 110 pounds/square yard/inch of depth (LBS/SY/Inch)
Crushed Stone Base (CSB) unit weight = 115 (LBS/SY/Inch)

Material	Length (LF)	# Sides	Paved Width (LF)	Average Depth (Inches)	Rate	Quantity (Tons)	Quantity
CSB	37885	2	10	8.75	115	42358	Ton
Asphalt Surface	37885	2	10	1.25	110	5788	Ton
Asphalt Base	37885	2	10	3	110	13891	Ton
							(Square Yards)
Lime Modified Roadbed	37885	2	10			84189	SY
LIME				Tons/SY =	0.01845	1553	Ton
Recommended:							
CSB	37885	2	8	9	115	34854	Ton
Asphalt Surface	37885	2	8	1.25	110	4630	Ton
Asphalt Base	37885	2	8	3	110	11113	Ton
Lime Modified Roadbed	37885	2	8			67351	SY
LIME				Tons/SY =	0.01845	1242	Ton

VALUE ENGINEERING RECOMMENDATION # VE-5

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Num of Units	Total $	Num of Units	Total $
Crushed Stone Base	TON	$16.75	1	42,358	$709,489	34,854	$583,808
CL2 ASPH SURF 0.38D PG64-22	TON	$68.32	2	5,788	$395,435	4,630	$316,348
CL2 ASPH BASE 1.00D PG64-22	TON	$61.45	2	13,891	$853,612	11,113	$682,890
Lime Stabilized Roadbed	SY	$2.53	1	84,189	$212,998	67,351	$170,398
Lime	TON	$147.00	2	1,553	$228,291	1,242	$182,574
Subtotal					$2,399,825		$1,936,018
Engineering & Contingency	@	15%			$359,974		$290,403
Total					$2,759,799		$2,226,420

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

✓ VE Selected
Scenario #1, 2

VALUE ENGINEERING RECOMMENDATION # VE-6

DESCRIPTIVE TITLE OF RECOMMENDATION:
Move the guardrail face up to the edge of shoulder pavement in lieu of adding an extra 2 feet of paving for guardrails.

ORIGINAL DESIGN:
The original design specifies that shoulders are to be widened 3 feet in areas with guardrail, with face of rail located 12 feet from edge of driving lane. Asphalt paving of shoulder in these areas is to be extended to the face of guardrail, which is an additional 2 feet of pavement.

RECOMMENDED CHANGE:
The VE Team recommends widening shoulders only 1 foot in guardrail areas and placing face of guardrail at 10 feet from driving lane; paved portion of shoulder would be a constant 10 feet throughout project.

ADVANTAGES:
- Less materials
- Shorter construction time
- Easier construction due to constant pavement width

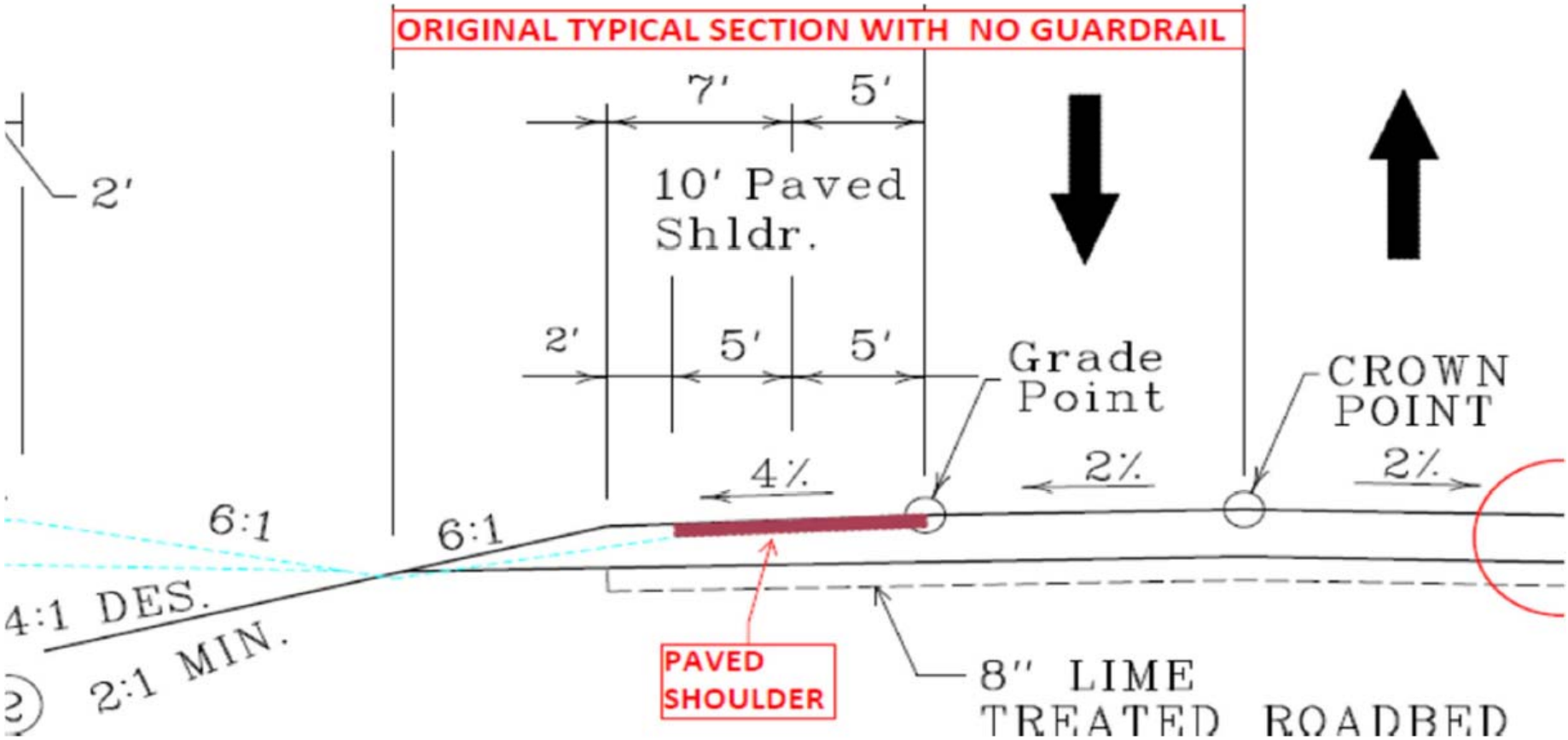
DISADVANTAGES:
- Traffic closer to guardrail

JUSTIFICATION:
This change would eliminate 2 feet width of shoulder paving for approximately 23,455 linear feet of shoulder. The paved portion of shoulder would remain constant throughout project and would still provide for an effective 10 feet of width for emergency pullovers or farm vehicle traffic.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$132,000	$0	$132,000
RECOMMENDED DESIGN	$0	$0	$0
ESTIMATED SAVINGS OR (COST)	$132,000	$0	$132,000

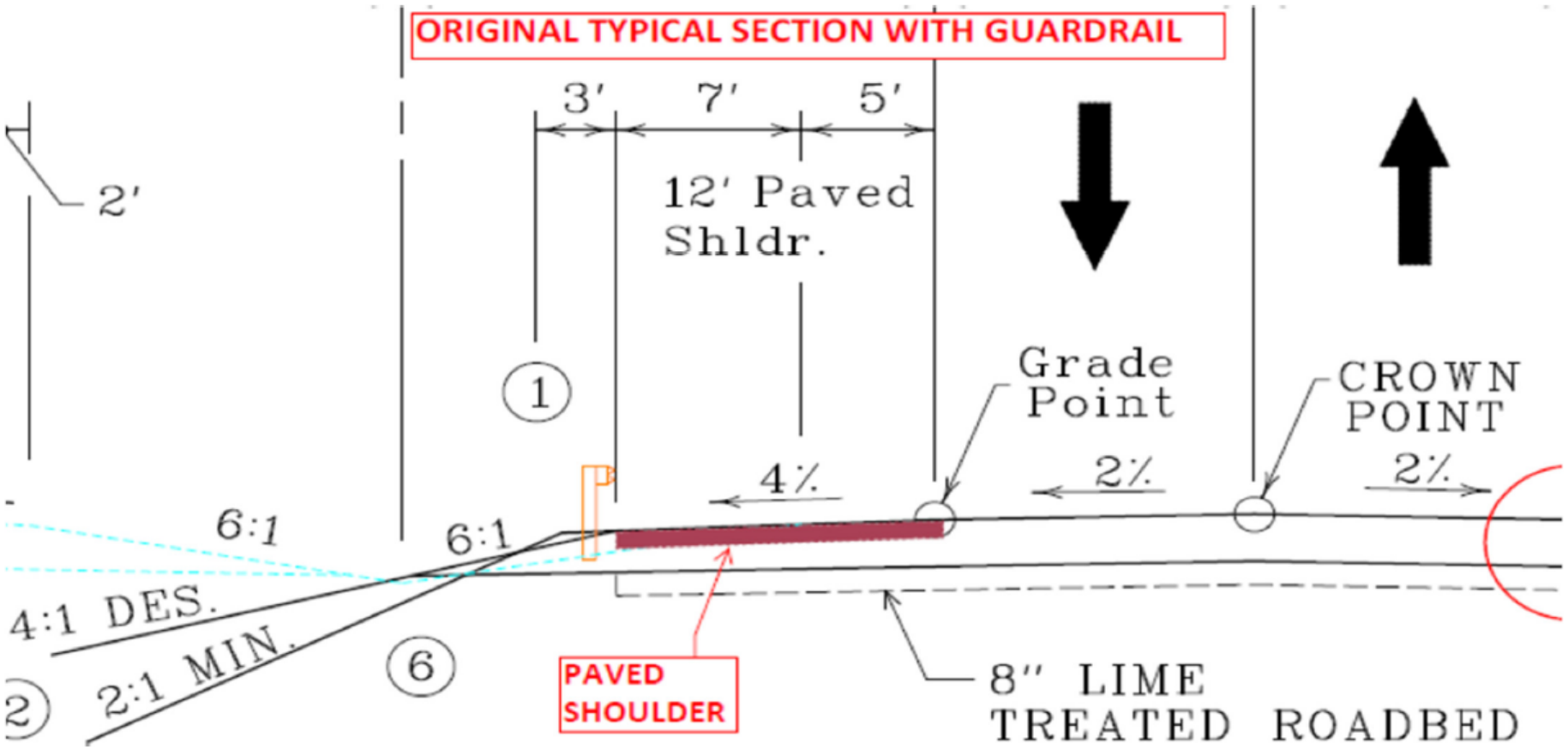
VALUE ENGINEERING DESIGN COMMENT # VE-6

SKETCH OF ORIGINAL DESIGN



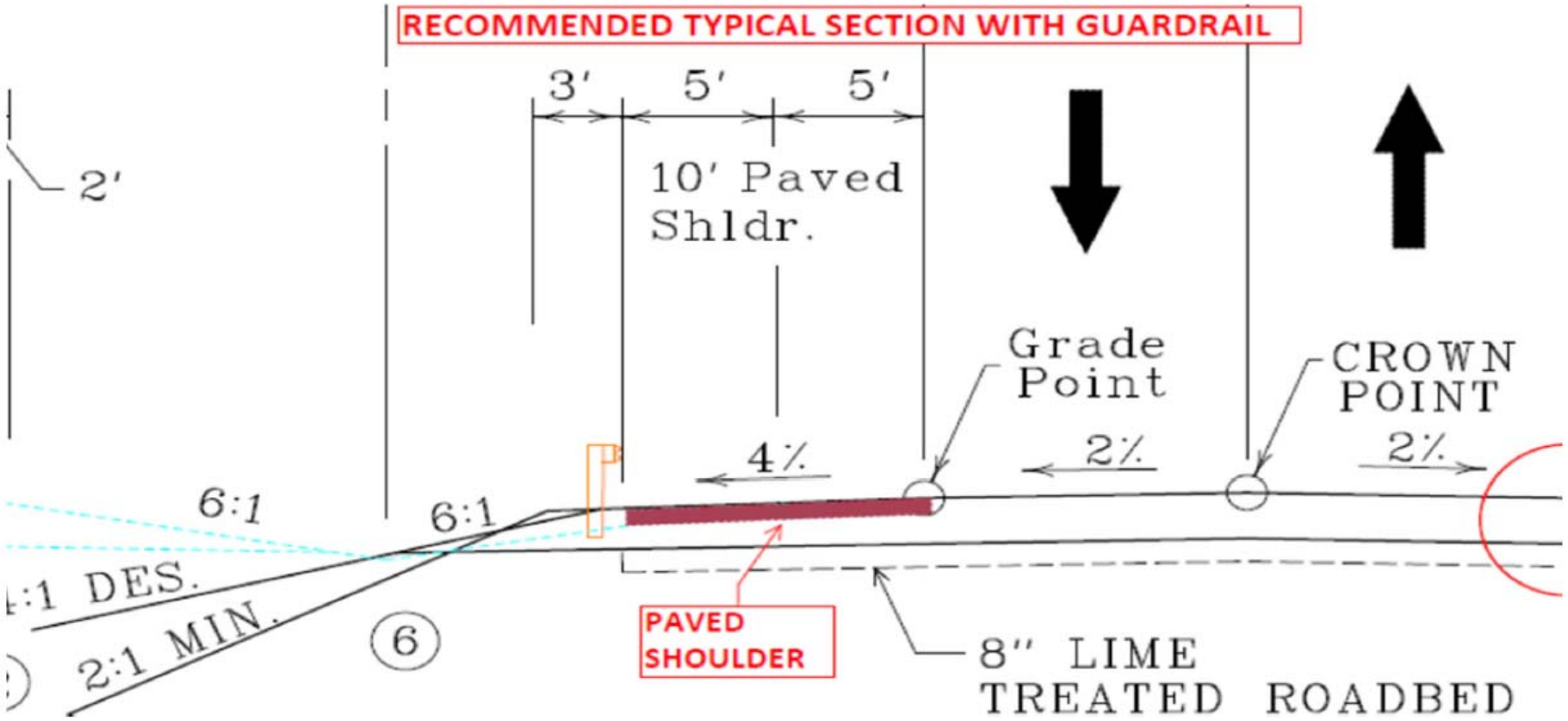
VALUE ENGINEERING DESIGN COMMENT # VE-6

SKETCH OF ORIGINAL DESIGN



VALUE ENGINEERING DESIGN COMMENT # VE-6

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-6

CALCULATIONS

Length Guardrail Sections (M/L) 23455 Linear Feet (LF)

Asphalt unit weight = 110 pounds/square yard/inch of depth (LBS/SY/Inch)
Crushed Stone Base (CSB) unit weight = 115 (LBS/SY/Inch)

Material	Length (LF)	Paved Width (LF)	Average Depth (Inches)	Rate	Quantity (Tons)
CSB	23455	2	7.5	115	2248
Asphalt Surface	23455	2	1.25	110	358
Asphalt Base	23455	2	3	110	860

VALUE ENGINEERING RECOMMENDATION # VE-6

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Num of Units	Total $	Num of Units	Total $
Crushed Stone Base	TON	$16.75	1	2,248	$37,650		
CL2 ASPH SURF 0.38D PG64-22	TON	$68.32	2	358	$24,482		
CL2 ASPH BASE 1.00D PG64-22	TON	$61.45	2	860	$52,848		
Subtotal					$114,980		$0
Engineering & Contingency	@	15%			$17,247		$0
Total					$132,227		$0

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING RECOMMENDATION # VE-7

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize 6 ft shoulders (4 ft paved) adjacent to truck climbing lanes in lieu of 12 ft shoulders (10 ft paved).

ORIGINAL DESIGN:
The original design specifies 12 foot wide shoulders on mainline with 10 feet of shoulder being paved using crushed stone, asphalt base, and asphalt surface.

RECOMMENDED CHANGE:
The Value Engineering team recommends shoulder adjacent to truck climbing lane (approximately Stations 195+00 – 247+00 Right) be 6 foot wide with 4 feet being paved.

ADVANTAGES:
- Less materials

DISADVANTAGES:
- Traffic cannot completely pull off of driving lanes in emergency
- Traffic closer to guardrail

JUSTIFICATION:
This roadway section is considered a rural arterial and has a design speed of 60 miles per hour. The use of a reduced shoulder adjacent to truck climbing lanes for this type of facility is an acceptable practice. *The Policy on Geometric Design of Highways and Streets* states that a usable shoulder width of 4 feet or greater is acceptable for truck climbing lanes.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$189,000	$0	$189,000
RECOMMENDED DESIGN	$78,000	$0	$78,000
ESTIMATED SAVINGS OR (COST)	$111,000	$0	$111,000

VALUE ENGINEERING RECOMMENDATION # VE-7

CALCULATIONS

Truck Lane Section 5200 Linear Feet (LF)

Stations 195+00 - 247+00

Asphalt unit weight = 110 pounds/square yard/inch of depth (LBS/SY/Inch)
Crushed Stone Base (CSB) unit weight = 115 (LBS/SY/Inch)

Material	Length (LF)	Paved Width (LF)	Average Depth (Inches)	Rate	Units	Quantity
CSB	5200	10	8.75	115	Ton	2907
Asphalt Surface	5200	10	1.25	110	Ton	397
Asphalt Base	5200	10	3	110	Ton	953
Lime Modified Roadbed	5200	10	(Square Yards)		SY	5778
LIME			Tons/SY = 0.0184463		Ton	107
Recommended:						
CSB	5200	4	9.5	115	Ton	1262
Asphalt Surface	5200	4	1.25	110	Ton	159
Asphalt Base	5200	4	3	110	Ton	381
Lime Modified Roadbed	5200	4			SY	2311
LIME			Tons/SY = 0.0184463		Ton	43

VALUE ENGINEERING RECOMMENDATION # VE-7

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Num of Units	Total $	Num of Units	Total $
Crushed Stone Base	TON	$16.75	1	2,907	$48,691	1,262	$21,146
CL2 ASPH SURF 0.38D PG64-22	TON	$68.32	2	397	$27,138	159	$10,855
CL2 ASPH BASE 1.00D PG64-22	TON	$61.45	2	953	$58,582	381	$23,433
Lime Stabilized Roadbed	SY	$2.53	1	5,778	$14,618	2,311	$5,847
Lime	TON	$147.00	2	107	$15,729	43	$6,321
Subtotal					$164,759		$67,602
Engineering & Contingency	@	15%			$24,714		$10,140
Total					$189,473		$77,742

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

✓ VE Selected
Scenario #1, 2

VALUE ENGINEERING RECOMMENDATION # VE-8

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize rolled-in rumble strips and eliminate the bid item for milled rumble strips.

ORIGINAL DESIGN:
The original design specifies for 79,992 LF of milled rumble strips.

RECOMMENDED CHANGE:
The VE Team recommends removing this item and using rolled in rumble strips since it is incidental to paving and this cost is included in pavement quantities. Sawed rumble strips are only required for interstates and parkways per current standard specifications. The rumble strips will be rolled in during paving operations and this bid item should be removed.

ADVANTAGES:
- Installation is included in paving quantity
- Labor is included in paving quantity

DISADVANTAGES:
- None

JUSTIFICATION:
The VE Team recommends removing this item since it is incidental to paving and the cost associated with this bid item is included in the pavement quantities. The rumble strips will be rolled in during paving operations and this bid item should be removed.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$32,000	$0	$32,000
RECOMMENDED DESIGN	$0	$0	$0
ESTIMATED SAVINGS OR (COST)	$32,000	$0	$32,000

VALUE ENGINEERING RECOMMENDATION # VE-8

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Num of Units	Total $	Num of Units	Total $
Milled Rumbled Strips	LF	$0.35	1	79,992	$27,997		
Subtotal					$27,997		$0
Engineering & Contingency	@	15%			$4,200		$0
Total					$32,197		$0

SOURCE CODE:
1 Project Cost Estimate
2 KYTC Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

✓ VE Selected
Scenario #1, 2

VALUE ENGINEERING RECOMMENDATION # VE-9

DESCRIPTIVE TITLE OF RECOMMENDATION:
Utilize a wagon box for Old Burkesville Road in lieu of constructing mainline bridge over Old Burkesville Road.

ORIGINAL DESIGN:
The original design specifies utilizes using a TY III Pre-Cast "I" Beam "PCIB" Bridge that is approximately 155 feet long. This proposed bridge goes over Old Burkesville Road and is only for the initial section.

RECOMMENDED CHANGE:
The VE Team recommends utilizing a wagon box in lieu of the bridge. The proposed wagon box will be placed on Old Burkesville Road and the US 127 mainline will cross over it. The wagon box is only for the initial section.

ADVANTAGES:
- Bridge not required on mainline
- Project construction savings
- No additional right-of-way required from a cursory review

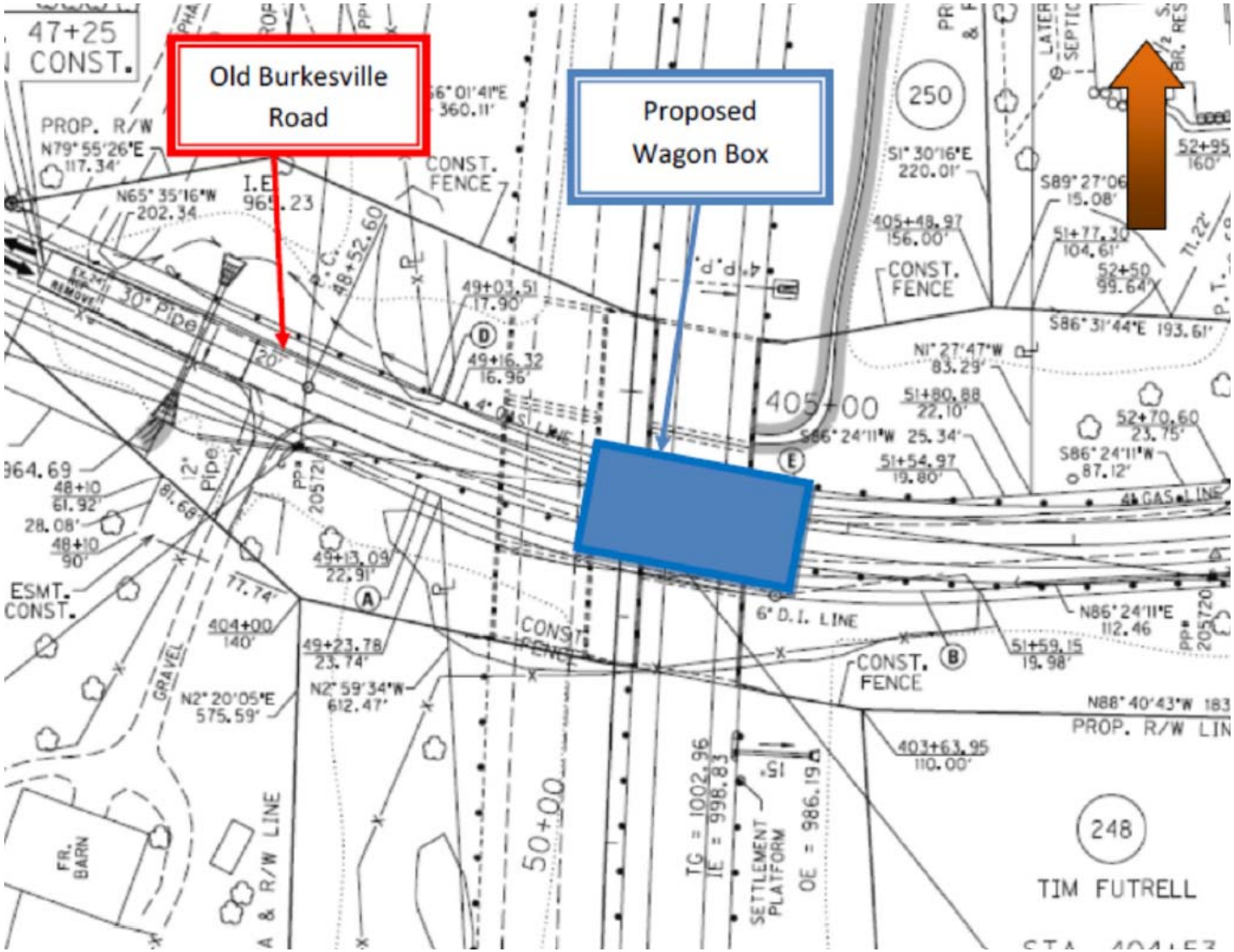
DISADVANTAGES:
- Roadway is not in a tangent section (currently in a curve)
- More difficult to construct

JUSTIFICATION:
The existing and proposed horizontal alignment of Old Burkesville Road is in a horizontal curve under the proposed US 127 mainline. The minimum vertical clearance from low beam for this roadway class can be 14.5 feet per KYTC design manual (HD-903). Old Burkesville Road is currently proposed to achieve a vertical clearance to low beam at 16'-10". The proposed profile of Old Burkesville Road can be raised to achieve a smaller vertical clearance which may also potentially save on other construction items such as but not limited to earthwork, guardrail, drainage features, etc. Please note these items are not included in the value engineering estimate but only major items (structures). In order to eliminate the horizontal curve and construct a tangent wagon box, the design team may want to consider flattening the curve or revising the horizontal alignment to achieve a tangent section if constructing the box in a curve is an issue. The proposed right of way in this area is very wide and this option should be further coordinated with the project team. Utilizing the wagon box in lieu of the bridge will achieve a construction savings and still provide continual access for residents on both sides of the wagon box.

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	$1,218,000	$0	$1,218,000
RECOMMENDED DESIGN	$404,000	$0	$404,000
ESTIMATED SAVINGS OR (COST)	$814,000	$0	$814,000

VALUE ENGINEERING DESIGN COMMENT # VE-9

SKETCH OF RECOMMENDED DESIGN



VALUE ENGINEERING RECOMMENDATION # VE-9

COST ESTIMATE - FIRST COST

Cost Item	Units	$/Unit	Source Code	Original Design		Recommended Design	
				Num of Units	Total $	Num of Units	Total $
TY III PCIB Bridge	LS	$1,050,000	1	1	$1,050,000		
Guardrail Connector to Bridge TY A	EA	$2,248	1	4	$8,991		
Proposed Wagon Box	LF	$3,000	9			100	$300,000
Guardrail-Steel W Beam-S Face	LF	$18.03	1			312.5	$5,634
15% Miscellaneous	LS	$45,845	9			1	$45,845
Subtotal					$1,058,991		$351,479
Engineering & Contingency	@	15%			$158,849		$52,722
Total					$1,217,839		$404,201

SOURCE CODE: 1 Project Cost Estimate
2 KYTC Data Base
3 CACES Data Base
4 Means Estimating Manual
5 National Construction Estimator
6 Vendor Lit or Quote (list name / details)
7 Professional Experience (List job if applicable)
8 Other Sources (specify)

VALUE ENGINEERING DESIGN COMMENT # DC-1

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Eliminate the proposed access point for US 127 at station 397+00, station 269+00, and station 281+00.

COMMENTARY:
The VE Team recommends that these access points be eliminated from the design because there is no need to provide additional access at these locations and by keeping them, six additional conflict points are included onto a high speed, principal arterial. Additionally, it would save the projects money by not constructing the entrances and frontage roads. Access points at approximately stations 269+00 and 281+00 redundantly serve parcels 210 and 214 at both locations. Both parcels have access from Churntop Road and neither were split as part of the design. At station 397+00, access roads are proposed to connect parcels 234, 242, 231, 237, and 248. All of these parcels already contain access to either Old Burkesville Road or KY 553.

VALUE ENGINEERING DESIGN COMMENT # DC-2

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Dispose of all excess right-of-way by transferring ownership to adjacent property owners in lieu of maintaining remnants of old road (example at station 105+00 to 115+00)

COMMENTARY:
The VE Team recommends that as much of the existing right of way which is considered surplus to be transferred to adjacent property owners. This will eliminate the need to maintain these areas and take property that is "tax free" and transfer it to private owners who must pay property taxes on it. A good example of this situation is on Entran's section (station 105+00 to station 115+00) since it fronts one property owner (Robert Boles) and could be disposed of without a negative effect to the proposed roadway.

VALUE ENGINEERING DESIGN COMMENT # DC-3

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Utilize a roundabout at old US 127, TN 111, and State Line Road in lieu of unsignalized intersection and reconstructing a portion of KY 1076

COMMENTARY:
The VE Team recommends consideration of a roundabout at the existing US 127 intersection with TN 111 in the community of Static, TN. The proposed project relocates US 127 to the west of Static and requires the reconstruction of a portion of KY 1076. The intersection in Static has five legs and the awkward geometry may be a good location for a roundabout to avoid rebuilding KY 1076. There will be trade-offs in cost for this roundabout such as increased right of way costs. The Project Team should consider all the costs and impacts before making a decision on which way to proceed.

VALUE ENGINEERING DESIGN COMMENT # DC-4

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On Entran section, eliminate the edge drain quantities if not required by roadway pavement design.

COMMENTARY:
The VE Team recommends the elimination of the edge drain quantities currently shown in the Entran section unless they are specifically called out in the pavement design. This comment is based on the fact that edge drains were not used on the HMB section and it was assumed it would not be needed on the Entran section either. Clarification with the Pavement Design section would be warranted to address this comment.

VALUE ENGINEERING DESIGN COMMENT # DC-5

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Construct cross drains/ditches for ultimate construction section in fill sections in lieu of only constructing for current section.

COMMENTARY:
The VE Team recommends consideration of constructing the ultimate location for drainage structures and ditches in fill sections along US 127. While the savings from not constructing the ultimate section in cut sections is obvious, the savings from not constructing the ultimate fill will be offset by needing embankment benching in the future. This may be even more practical if the earthwork balance is recalculated after the advanced construction is completed and there is a need to waste material on site.

VALUE ENGINEERING DESIGN COMMENT # DC-6

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Remove the guardrail barricades outside of cul-de-sacs.

COMMENTARY:
The original design drawings indicate the installation of guardrail in the several newly formed cul-de-sacs. The cul-de-sacs were formed by taking the mainline through a surface street and not granting access. The intent of the guardrail is to visually separate the dead end road from the newly constructed mainline, but this function could be accomplished with a less costly, more aesthetically appealing treatment such as curb, sign, or bollards. These solutions should reduce the cost of the project as opposed to the guardrail. The VE Team does not feel this is an appropriate use for guardrail.

CONSTRUCTABILITY COMMENT # CC-1

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On the Entran section, evaluate the need to include a special note regarding Embankment and Excavation bid items.

COMMENTARY:
The VE Team recommends that the Entran project team consider including both Embankment in Place and Roadway Excavation bid items if the revised earthwork quantities for these two items are within 10% of each other. This is due to the uncertainty of which bid item controls the costs and can be an effective tool to offset construction claims during the project. This method will require the use of a Special Note developed for similar projects in recent lettings and can be obtained through the Division of Highway Design.

CONSTRUCTABILITY COMMENT # CC-2

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On Entran section, update the asphalt mixtures to the current criteria (i.e., "CL3 ASPH SURF 0.50A PG76-22").

COMMENTARY:
The VE Team recommends the pavement design be updated to reflect the changes in asphalt material specification required by the Division of Material, *Warrants for Selecting Asphalt Mixtures and Compaction Options* approved 3/20/2009. As an example, this new warrant would eliminate the use of PG76-22 since it is only used on interstates or Class 4 facilities with an ESAL count greater than 30 million.

CONSTRUCTABILITY COMMENT # CC-3

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On HMB and Entran cost estimates, include a bid item for asphalt adjustments.

COMMENTARY:
The VE Team recommends the addition of an Asphalt Adjustment bid item on the cost estimates for both US 127 sections as specified by Highway Design Memo 1-06. The purpose of this bid item is to address the fluctuation of asphalt material prices by building in some contingency funding, thereby avoiding a construction change order during the project.

CONSTRUCTABILITY COMMENT # CC-4

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Verify the turn lane lengths/tapers are compliant with Highway Design Memo 3-09.

COMMENTARY:
Per Highway Design Memo 3-09 and project team coordination, verify turning lane lengths and tapers are compliant as some of the originally designed lengths and tapers are not currently in compliance.

CONSTRUCTABILITY COMMENT # CC-5

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Require contractor to bid either lime stabilization or rock road bed in lieu of paying for rock road bed at the lime stabilization unit cost.

COMMENTARY:
The project is designed with Lime Stabilized Roadbed as part of the pavement structure. A note on typical sections and paving summary sheets allows contractor option of substituting 24 inches of rock roadbed for the Lime Stabilized Roadbed, with compensation for the rock roadbed being full payment of the plan quantities for the bid items associated with lime stabilization.

The VE Team recommends that alternate bid items be included, instead of allowing option by note, so that contractors would select and bid one type or the other during bid process. The awarded contract would then have the actual item used, which would allow the proper materials' tracking and certification during construction administration without having to process a construction change order.

CONSTRUCTABILITY COMMENT # CC-6

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Add a tolerance note of 0.1 ft +/- for the rock road bed alternative of lime stabilized base.

COMMENTARY:
The project is designed with Lime Stabilized Roadbed as part of the pavement structure. A note on typical sections and paving summary sheets allows contractor option of substituting 24 inches of Rock Roadbed (meeting requirements of the current Standard Specifications) for the Lime Stabilized. The current Standard Specifications for rock roadbed has a construction tolerance of +/- 0.2 foot from designated grade.

The VE Team recommends that rock roadbed option note in plans be revised to add language setting the construction tolerance at +/- 0.1 foot. The use of a tighter tolerance would possibly reduce the amount of quantity overrun for crushed stone base that sometimes occurs when using rock roadbed.

CONSTRUCTABILITY COMMENT # CC-7

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Include a typical section to show the rock road bed will extend to the ditch line as compared to lime stabilized subgrade that only exists under pavement section.

COMMENTARY:
The project is designed with lime stabilized roadbed as part of the pavement structure. A note on typical sections and paving summary sheets allows contractor option of using 24 inches of rock roadbed in lieu of the lime treated roadbed.

As shown on typical sections, the lime treated roadbed limits is from outside edge of shoulder to outside edge of opposite shoulder. However when using rock roadbed, rock is to extend from ditch line to ditch line in cuts, and in embankment sections it is preferable to extend out to fill slope line (daylight out). Recommend that a typical section drawing depicting rock roadbed limits be included with the option note to prevent any confusion or dispute over exactly what is required should the rock roadbed option be chosen.

CONSTRUCTABILITY COMMENT # CC-8

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On the Entran section, revise the quantity of guardrail in the cost estimate.

COMMENTARY:
The Entran cost estimate includes a line item for 7,238 LF of guardrail with a unit cost of $17.11/LF and a total cost of $123,833.63. Since there are no longer any bridges on this section, the VE Team recommends revising the cost estimate to reduce or remove this line item entirely.

CONSTRUCTABILITY COMMENT # CC-9

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On the Entran section, revise the quantity of channel lining in the cost estimate.

COMMENTARY:
The Entran cost estimate includes a line item for 7,749 TON of channel lining with a unit cost of $22.41/TON and a total cost of $173,655.09. Since there are no longer any bridges or stream crossings on this section, the VE Team recommends revising the cost estimate to reduce or remove this line item entirely.

CONSTRUCTABILITY COMMENT # CC-10

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On HMB and Entran estimates, add a bid item for witness posts.

COMMENTARY:
Per Highway Design Memo 6B-04 add a quantity for witness posts by right of way monuments where feasible.

CONSTRUCTABILITY COMMENT # CC-11

DESCRIPTIVE TITLE OF DESIGN COMMENT:
In the general notes section of the design drawings, make lane closures incidental to maintain and control traffic and eliminate the bid item for lane closures in the cost estimate.

COMMENTARY:
This is in accordance in the KYTC Standard Specifications for Maintain and Control Traffic.

CONSTRUCTABILITY COMMENT # CC-12

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On the HMB section, verify all pipe outlets have channel protection.

COMMENTARY:
Some of the pipes sections do not show channel lining at the outlet (i.e., Ent. Lt. station 269+00 depicted on sheet R229).

CONSTRUCTABILITY COMMENT # CC-13

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On the HMB cost estimate, eliminate the bid item for “Special Seeding Crown Vetch”.

COMMENTARY:
Ground cover (Sericea Lespedeza) for slopes greater than 3:1 is included in seed mixture III which is now part of normal seeding & protection bid item per current Standard Specifications. The bid item of SPECIAL SEEDING CROWN VETCH (5989) is no longer needed and should be deleted from general summary and estimate.

CONSTRUCTABILITY COMMENT # CC-14

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On Entran section, reduce the sodding quantity in the cost estimate from 183,408 SY to approximately 5,000 SY.

COMMENTARY:
Quantity shown in current estimate appears to have been copied from an adjacent line in the cost estimate.

CONSTRUCTABILITY COMMENT # CC-15

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On HMB section, eliminate the bid items for temporary mulch and temporary seeding protection.

COMMENTARY:
The bid item of "***KPDES PERMIT AND TEMP EROSION CONTROL***" (23143ED) is included in General Summary along with reference to the corresponding Special Note, which is to be a Proposal attachment. The Special Note establishes that all **temporary** erosion control items are included in payment of the Lump Sum item. Therefore, the bid items and quantities for TEMPORARY MULCH and TEMPORARY SEEDING & PROTECTION should be deleted from the general summary of HMB's design section.

Note: Project team should consider whether or not to also use the Special Note and lump sum temporary erosion control bid item on the southern project (Entran design section).

CONSTRUCTABILITY COMMENT # CC-16

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On the Entran cost estimate, update the erosion control "clean" quantities or use a lump sum line item for temporary erosion control.

COMMENTARY:
Per the Erosion Control Plan (ECP) development process, on page 71 it recommends to utilize a factor of three for cleaning items three times a year such as, but not limited to, silt fence, traps, etc of the original quantity. The project team may also consider using a total lump sum bid item for all erosion control devices which would include cleaning them out.

CONSTRUCTABILITY COMMENT # CC-17

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On the Entran section, revise the cost estimate to include line item 2600 “Geotextile Type IV Fabric for Pipe”.

COMMENTARY:
As per Standard Drawing RDI-020-08 and Standard Specification 701.02.07.

CONSTRUCTABILITY COMMENT # CC-18

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On Entran section cost estimate, include a line item for the pipeline video inspection.

COMMENTARY:
This item is to be included in accordance with current KYTC Policy.

CONSTRUCTABILITY COMMENT # CC-19

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Verify the storm culverts are in compliance with drainage manual section DR707-4 (access for maintenance).

COMMENTARY:
Please see the table on page DR 707-4 of the updated drainage manual concerning maintenance on long storm sewers and/or open channel pipes. The project team may want to consider implementing a manhole or a similar structure in open channel pipes and/or storm sewers in these areas to allow for future maintenance.

CONSTRUCTABILITY COMMENT # CC-20

DESCRIPTIVE TITLE OF DESIGN COMMENT:
On HMB section at station 222+50, utilize 24-in culvert pipe in lieu of 18-in culvert pipe to comply with current standards for sections with over 30 ft of cover height.

COMMENTARY:
In accordance with current Standard Drawings for culvert pipe types and cover heights, the minimum size pipe for cover heights of 30 feet to 65 feet is 24 inch. The proposed 18-inch culvert pipe (167 linear feet) at Station 222+50 has a cover height of approximately 43 feet. Therefore, culvert pipe at this location needs to be revised to 24 inch size.

CONSTRUCTABILITY COMMENT # CC-21

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Verify the turning radius (WB-50) and full depth of pavement within the intersections is compliant with heavy truck traffic.

COMMENTARY:
As commented in the Final Inspection Meeting Minutes 12/7/2006.

CONSTRUCTABILITY COMMENT # CC-22

DESCRIPTIVE TITLE OF DESIGN COMMENT:
Verify the following minor construction comments are incorporated.

COMMENTARY:
Before submitting to plan processing, the project team may want to consider adding or revising the following:

- Update Before You Dig (BUD) note to current note
- Station limits on typical section (TS) and add perforated pipe to TS where appropriate
- Use "triangles" for control points instead of benchmark (BM) cell
- Paved shoulder line missing on plans (verify level not turned off)
- Verify entrance profiles (several have very high algebraic breaks between the tie point)
- Add sight distance (SD) on approach profiles
- Add low wire to profiles
- Add underground utilities (UG) to profiles
- Verify Striping sheets are complete (only one sheet in set)
- Update pipe summary sheet to current sheet (abrasion level, etc)
- Add perforated pipe summary sheet (missing in set)
- Typo on R2L "Structural"
- General Summary place in numeric order by item code
- Verify quantities on general summary
- Verify KY 553 skew angle (label)
- Update layout sheet with new cell and add approach lengths
- Update standard drawings with appropriate sepias as necessary
- Verify sinkhole is compliant with updated drainage manual

APPENDICES

The appendices in this report contain backup information supporting the body of the report, and the mechanics of the workshop. The following appendices are included.

CONTENTS

APPENDIX A
Study Participants

APPENDIX A – Study Participants

Workshop Attendance

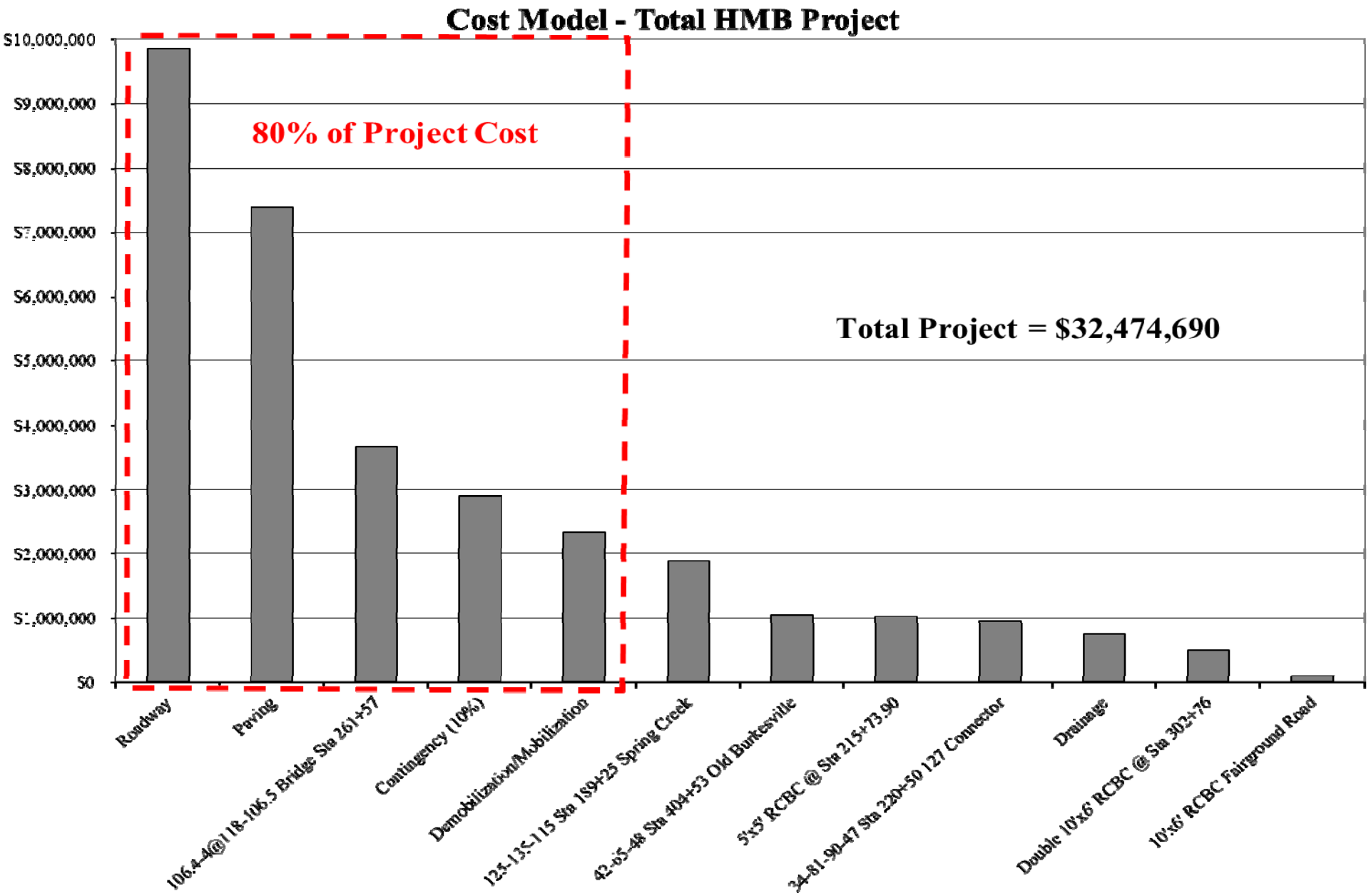
Attendees				Participation				
				Meetings		Study Sessions		
Name	**Organization and Address (Organization first, with complete address underneath)**	**Tel # and Email (Tel first with Email underneath)**	**Role in Workshop**	**Intro**	**Out Brief**	**Day 1**	**Day 2**	**Day 3**
Boday Borres	KYTC 200 Mero Street Frankfort, KY 40602	502-564-3280 Boday.borres@ky.gov	KYTC Representative	X	X			
Jason Bricker	Entran 400 East Vine Street, Suite 300 Lexington, KY 40507	859-233-2100 Jbricker@entran.us	Design Team	X	X			
Rachel Catchings	KYTC 200 Mero Street Frankfort, KY 40602	502-564-3280 Rachel.catchings@ky.gov	Roadway Designer		X			
Tom Clouse	KYTC – District 8 1660 South Highway 27 Somerset, KY 42501	606-677-4017 Tom.clouse@ky.gov	KYTC Project Manager	X	X			
Bob Criscillis	HMB Professional Engineers, Inc. 3 HMB Circle, U.S. 460 Frankfort, KY 40601	502-695-9800 jdcriscillis@hmbpe.com	Design Team	X	X			
Kevin Damron	KYTC 200 Mero Street Frankfort, KY 40602	Kevin.damron@ky.gov	Observer		X			
Rob Dowler	HMB Professional Engineers, Inc. 3 HMB Circle, U.S. 460 Frankfort, KY 40601	502-695-9800 rdowler@hmbpe.com	Design Team Project	X				
Robert Farley	KYTC 200 Mero Street Frankfort, KY 40602	502-564-3280 Bob.farley@ky.gov	KYTC Design	X				
Greg Groves	URS Corporation 325 W. Main Street, Suite 1200 Louisville, KY 40202	502-569-2301 Greg_Groves@urscorp.com	VE Roadway Designer	X	X	X	X	X
Glen Hardin	Entran 400 East Vine Street, Suite 300 Lexington, KY 40507	859-233-2100 Ghardin@entran.us	Design Team	X	X			
Rodney Little	KYTC – Highway Design Quality Assurance Branch	606-677-4017 Rodney.Little@ky.gov	VE Highway Design	X	X	X	X	X

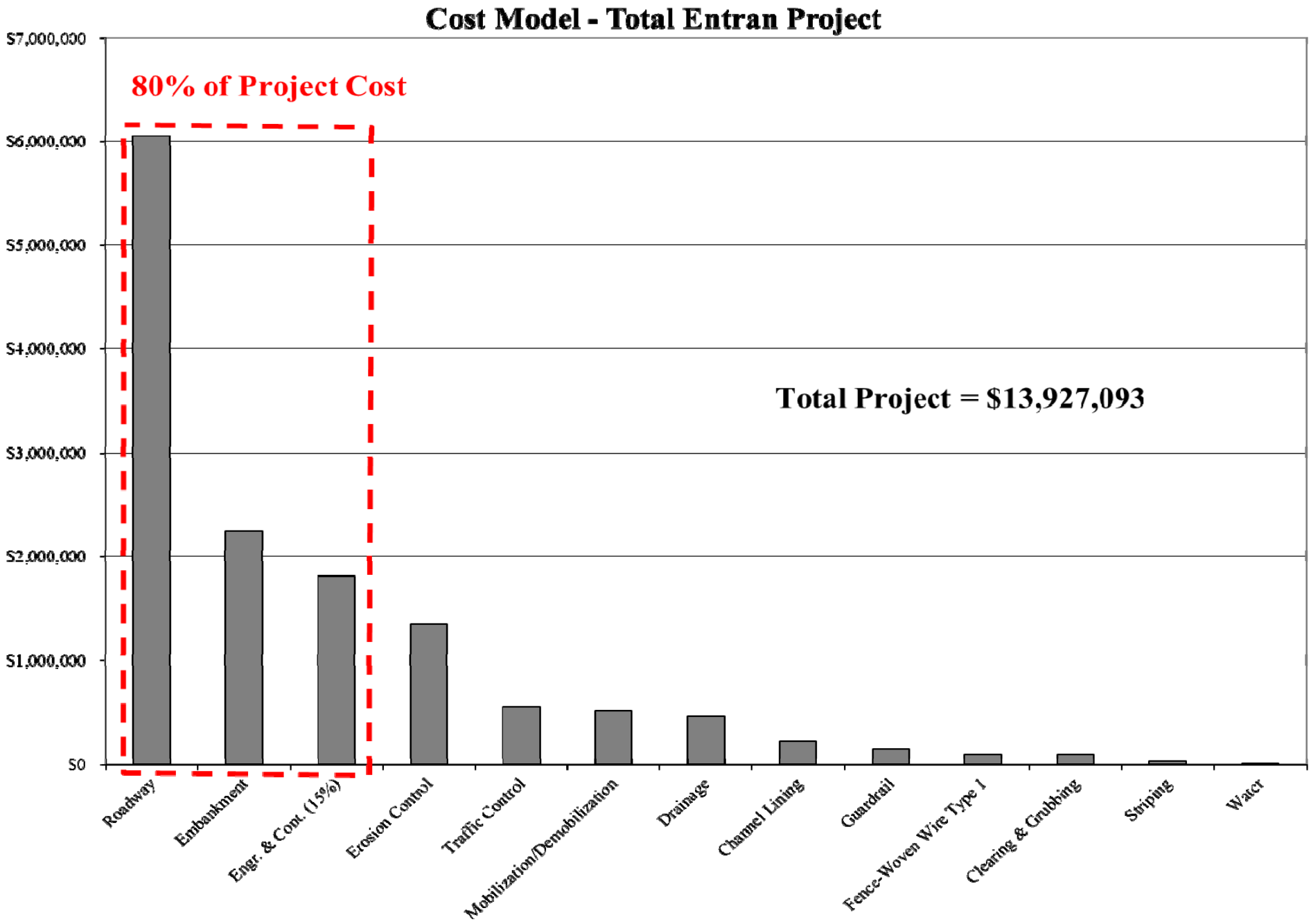
Workshop Attendance

Attendees				Participation				
				Meetings		Study Sessions		
Name	**Organization and Address (Organization first, with complete address underneath)**	**Tel # and Email (Tel first with Email underneath)**	**Role in Workshop**	**Intro**	**Out Brief**	**Day 1**	**Day 2**	**Day 3**
Marcie Mathews	DLZ	502-695-2300 mmathews@dlz.com	Observer		X			
Luther Miracle	DLZ	502-695-2300 lmiracle@dlz.com	VE Team Member	X	X	X	X	X
Mary Murray	FHWA-Kentucky Division John C. Watts Federal Building 330 W. Broadway Frankfort, KY 40601	502-223-6745 Mary.murray@dot.gov	FHWA Representative		X			
Kyle Schafersman	URS Corporation 8300 College Boulevard, Suite 200 Overland Park, KS 66210	913-344-1019 Kyle_Schafersman@urscorp.com	VE Team Leader	X	X	X	X	X
Brent Sweger	KYTC 200 Mero Street Frankfort, KY 40602	502-564-3280 Brent.Sweger@ky.gov	KYTC VE Coordinator	X	X	X	X	X
Mitch Thomas	URS Corporation 325 W. Main Street, Suite 1200 Louisville, KY 40202	502-569-2301 Mitch_thomas@urscorp.com	VE Roadway Designer	X	X	X	X	X
Troy Woodyard	KYTC 200 Mero Street Frankfort, KY 40602	502-680-7311 Troy.woodyard@ky.gov	VE Team Member	X	X	X	X	X

APPENDIX B
Cost Information

APPENDIX B - Cost Information


Cost Model - Total HMB Project
$10,000,000
$9,000,000
$8,000,000
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
80% of Project Cost
Total Project = $32,474,690
Roadway
Paving
106.4-4@118-106.5 Bridge Sta 261+57
Contingency (10%)
Demobilization/Mobilization
125-135-115 Sta 189+25 Spring Creek
42-65-48 Sta 404+53 Old Burkesville
5'x5' RCBC @ Sta 215+73.90
34-81-90-47 Sta 220+50 127 Connector
Drainage
Double 10'x6' RCBC @ Sta 302+76
10'x6' RCBC Fairground Road


Cost Model - Total Entran Project
80% of Project Cost
Total Project = $13,927,093
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
Roadway
Embankment
Engr. & Cont. (15%)
Erosion Control
Traffic Control
Mobilization/Demobilization
Drainage
Channel Lining
Guardrail
Fence-Woven Wire Type 1
Clearing & Grubbing
Striping
Water

APPENDIX C
Function Analysis

APPENDIX C - Function Analysis

Function Model

Item	Cost	Function
Total HMB Project (Alternative 1)	$32,474,690	Bypass Albany
Roadway	$9,869,088	Support cars and trucks
-Woven Wire Fence – Type I		Delineate right-of-way
-Excavation ($3.30/CY)		Prepare site grades
-Guardrail		Keep vehicles on roadway
-Erosion control		Control erosion
Paving	$7,409,757	Smooth rideability
106.4-4@118-106.5 Bridge Sta 261+57	$3,667,017	Span valley
Contingency (10%)	$2,905,172	Account for unknowns
Demobilization/Mobilization	$2,343,112	Mobilize labor and material
125-135-115 Sta 189+25 Spring Creek	$1,900,000	Span creek
42-65-48 Sta 404+53 Old Burkesville	$1,050,000	Maintain local connectivity
5'x5' RCBC @ Sta 215+73.90	$1,026,116	Convey storm water
34-81-90-47 Sta 220+50 127 Connector	$950,000	Avoid conflicts
Drainage	$756,533	Drain stormwater
Double 10'x6' RCBC @ Sta 302+76	$498,626	Convey storm water
10'x6' RCBC Fairground Road	$99,270	Convey storm water
Total Entran Project	$13,927,093	Connect US 127 to TN 111
Paving	$6,054,050	Smooth rideability
Embankment	$2,244,187	Establish finish grades
-372,279 CY @ $6.00/CY		
Engr. & Cont. (15%)	$1,816,577	Account for unknowns
Erosion Control	$1,357,054	Control erosion during construction Meet requirements

Item	Cost	Function
Traffic Control	$553,552	Control traffic
Mobilization/Demobilization	$521,505	Mobilize people and equipment
Drainage	$464,344	Drain storm water
Channel Lining	$223,472	Line channel
Guardrail	$150,438	Keep vehicles within roadway
Fence-Woven Wire Type 1	$101,107	Delineate right-of-way Control access to right-of-way
Clearing & Grubbing	$98,045	Prepare site
Striping	$32,666	Notify drivers

APPENDIX D
Creative Idea List and Evaluation

APPENDIX D - Creative Idea List and Evaluation

List of Creative Ideas			
ID #	**Name of Idea / Description**	**Develop Status**	**TM Resp.**
1	Utilize 10 ft shoulders (8 ft paved) in lieu of 12 ft shoulders (10 ft paved) for both projects	1	R. Little
2	Move the guardrail face up to the edge of shoulder pavement in lieu of adding an extra 2 ft of paved for guardrails	1	R. Little
3	Utilize rolled-in rumble strips and eliminate the bid item for sawed rumble strips	1	M. Thomas
4	Close Old Burkesville Road and improve Copeland Avenue in lieu of constructing mainline bridge over Old Burkesville Road	3	
5	Utilize wagon box for Old Burkesville Road in lieu of constructing mainline bridge over Old Burkesville Road	1	M. Thomas
6	Utilize Old Burkesville Road bridged over the mainline in lieu of constructing mainline bridge over Old Burkesville Road	3	
7	At the US 127 Connector, only span the initial 2-lane construction in lieu of spanning ultimate 4-lane construction	3	
8	Eliminate both of the northbound ramps at the US 127 Connector	3	
9	Utilize an at-grade intersection for the US 127 Connector in lieu of grade separated interchange	1	B. Sweger & T. Woodyard
10	Utilize a left turn option from the jug handle at US 127 Connector and eliminate the mainline northbound on-ramp	1	B. Sweger & T. Woodyard
11	Utilize two Michigan U-turns from US 127 Connector southbound to Tennessee in lieu of the proposed connector bridge	2	L. Miracle
12	Utilize a roundabout at the US 127 Connector and the mainline in lieu of grade separated interchange	4	
13	Utilize a wagon box in lieu of the US 127 Connector bridge	4	
14	Utilize 6 ft shoulders (4 ft paved) adjacent to truck climbing lanes in lieu of 12 ft shoulders (10 ft paved)	1	R. Little
15	Utilize a roundabout at US 127 and State Line Road in lieu of unsignalized intersection	2	L. Miracle
16	Utilize a roundabout at old US 127, TN 111, and State Line Road in lieu of unsignalized intersection and reconstructing a portion of KY 1076	DC	G. Groves
17	Utilize a signalized intersection at US 127 and State Line Road in lieu of unsignalized intersection	4	
18	Dispose of all excess right-of-way by transferring ownership to adjacent property owners in lieu of maintaining remnants of old road (example at station 105 to 115)	DC	G. Groves
19	On HMB section, eliminate the bid items for temporary mulch and temporary seeding protection	CC	R. Little
20	Remove the guardrail barricades within cul-de-sacs	DC	K. Schafersman
21	On Entran section, reduce the sodding quantity in the cost estimate from 183,408 SY to approximately 5,000 SY	CC	L. Miracle
22	On the HMB and Entran cost estimates, add a bid item for “Asphalt Placement with MTV”	CC	R. Little

List of Creative Ideas			
ID #	**Name of Idea / Description**	**Develop Status**	**TM Resp.**
23	On Entran section, update the asphalt mixtures to the current criteria (i.e. “CL3 ASPH SURF 0.50A PG76-22”)	CC	G. Groves
24	On the Entran cost estimate, update the erosion control “clean” quantities or use a lump sum line item for temporary erosion control	CC	M. Thomas
25	On Entran section, eliminate the edge drain quantities if not required by roadway pavement design	DC	G. Groves
26	On Entran section cost estimate, include a line item for the pipeline video inspection	CC	L. Miracle
27	In the general notes section of the design drawings, make lane closures incidental to maintain and control traffic and eliminate the bid item for lane closures in the cost estimate	CC	L. Miracle
28	On HMB and Entran cost estimates, include a bid item for asphalt adjustments	CC	G. Groves
29	Verify the storm culverts are in compliance with drainage manual section DR707-4 (access for maintenance)	CC	M. Thomas
30	On HMB section at station 222+50, utilize 24-in culvert pipe in lieu of 18-in culvert pipe to comply with current standards for sections with over 30 ft of cover height	CC	R. Little
31	On HMB and Entran estimates, add a bid item for witness posts	CC	M. Thomas
32	Verify the turn lane lengths are compliant with design memo 3-09	CC	M. Thomas
33	Verify the turning radius (WB-50) and full depth of pavement within the intersections is compliant with heavy truck traffic	CC	L. Miracle
34	On the HMB cost estimate, eliminate the bid item for “Special Seeding Crown Vetch”	CC	R. Little
35	Construct cross drains/ditches for ultimate construction section in fill sections in lieu of only constructing for current section	DC	G. Groves
36	Eliminate the proposed access point for US 127 at station 397+00, station 269+00, and station 281+00	DC	B. Sweger\
37	Construct a right turn lane along US 127 approaching Churn Top Road from the south	4	
38	Require contractor to bid either lime stabilization or rock road bed in lieu of paying for rock road bed at the lime stabilization unit cost	CC	R. Little
39	Add a tolerance note of 0.1 ft +/- for the rock road bed alternative of lime stabilized base	CC	R. Little
40	Include a typical section to show the rock road bed will extend to the ditch line as compared to lime stabilized subgrade that only exists under pavement section	CC	R. Little
41	On the Entran section, evaluate the need to include a special note regarding an embankment and an excavation bid item	CC	G. Groves
42	On the Entran section, revise the cost estimate to include line item 2600 “Geotextile Type IV Fabric for Pipe”	CC	L. Miracle
43	On the Entran section, revise the quantity of guardrail in the cost estimate	CC	K. Schafersman

List of Creative Ideas			
ID #	**Name of Idea / Description**	**Develop Status**	**TM Resp.**
44	On the Entran section, revise the quantity of channel lining in the cost estimate	CC	K. Schafersman
45	On the HMB section, verify all pipe outlets have channel protection	CC	L. Miracle
46	Verify the following construction comments are incorporated	CC	M. Thomas

Development Status Legend:

1: Idea is considered by the VE Team to be the best value enhancement possibility and is currently being developed as a VE recommendation

2: Idea is considered by the VE Team to be a good value enhancement possibility and will be developed as a VE recommendation after all the “1s” have been developed

3: Idea is considered by the VE Team to be of marginal value enhancement possibility and may be developed as a VE recommendation after all the “1s” and “2s” have been developed

4: Idea was not considered to enhance the value of the project and has been eliminated from further consideration by the VE Team

DC: Idea is being developed as a Value Engineering Design Comment to the designers with no easily quantifiable cost associated

CC: Idea is being developed as a Constructability Comment to the designers with no easily quantifiable cost associated

APPENDIX E
VE Punchlist

APPENDIX E – VE Punchlist

VALUE ENGINEERING PUNCH LIST

ITEM NO. **8-260.02 & 8-260.10** PROJECT COUNTY: **Clinton** DATE OF STUDY: **3/7/2011 to 3/9/2011** **VE # 201103**

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
Roadway										
VE-4	✓-1,2	Utilize a roundabout at US 127 and State Line Road in lieu of unsignalized intersection			$216,000	$0	$216,000	NA		
VE-5	✓-1,2	Utilize 10 ft shoulders (8 ft paved) in lieu of 12 ft shoulders (10 ft paved) for both projects			$2,760,000	$2,226,000	$534,000	NA		
VE-6	✓-1,2	Move the guardrail face up to the edge of shoulder pavement in lieu of adding an extra 2 feet of paving for guardrails			$132,000	$0	$132,000	NA		
VE-7		Utilize 6 ft shoulders (4 ft paved) adjacent to truck climbing lanes in lieu of 12 ft shoulders (10 ft paved)			$189,000	$78,000	$111,000	NA		
VE-8	✓-1,2	Utilize rolled-in rumble strips and eliminate the bid item for milled rumble strips			$32,000	$0	$32,000	NA		
Structures										
VE-1		Utilize a left turn option from the jughandle at US 127 Connector and eliminate the mainline northbound on-ramp			$1,310,000	$964,000	$346,000	NA		
VE-2	✓-1	Utilize an at-grade intersection for the US 127 Connector in lieu of grade separated interchange			$2,750,000	$166,000	$2,584,000	NA		
VE-3	✓-2	Utilize two Michigan U-Turns at the intersection of the US 127 Connector in lieu of the proposed interchange			$2,750,000	$498,000	$2,252,000	NA		
VE-9	✓-1,2	Utilize wagon box for Old Burkesville Road in lieu of constructing mainline bridge over Old Burkesville Road			$1,218,000	$404,000	$814,000	NA		
Other Design Comments										
DC-1		Eliminate the proposed access point for US 127 at station 397+00, station 269+00, and station 281+00			NA	NA	NA	NA		
DC-2		Dispose of all excess right-of-way by transferring ownership to adjacent property owners in lieu of maintaining remnants of old road (example at station 105+00 to 115+00)			NA	NA	NA	NA		
DC-3		Utilize a roundabout at old US 127, TN 111, and State Line Road in lieu of unsignalized intersection and reconstructing a portion of KY 1076			NA	NA	NA	NA		
DC-4		On Entran section, eliminate the edge drain quantities if not required by roadway pavement design			NA	NA	NA	NA		
DC-5		Construct cross drains/ditches for ultimate construction section in fill sections in lieu of only constructing for current section			NA	NA	NA	NA		
DC-6		Remove the guardrail barricades outside of cul-de-sacs			NA	NA	NA	NA		
					Saf 0 Ops 0 Env 0 Con 0 Oth 0					

END OF REPORT

This report was compiled and edited by:
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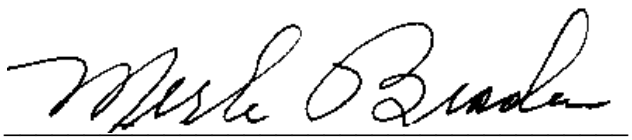

Approved by Merle Braden, PE, CVS-Life (URS)