KENTUCKY TRANSPORTATION CABINET

Value Engineering Study

Final Report

VE Number: 202203

Hal Rogers Parkway

KY 30 to KY 192

(MP 1.089 to MP 3.877)

Laurel County

Item No. 11-365.00

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RHA

May 25, 2022

Disclaimer

The information contained in this report summarizes the professional opinions of the VE Team members during the Value Engineering Study. These opinions were based on the information provided to the VE Team at the time of the Study. This information may develop further as the project continues, and new data may become available after this report was created. Evaluation on how this new information may affect the value proposals and findings contained in this report must be considered when using its content to judge their feasibility or any decision made about them.

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Section

1

Introduction

Section 1 – Introduction

1.1 Value Methodology

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.

Figure 1-1: The VM Process

The workshop is conducted in accordance with the methodology as established by SAVE International, the value society, and is structured using the Job Plan as outlined below.

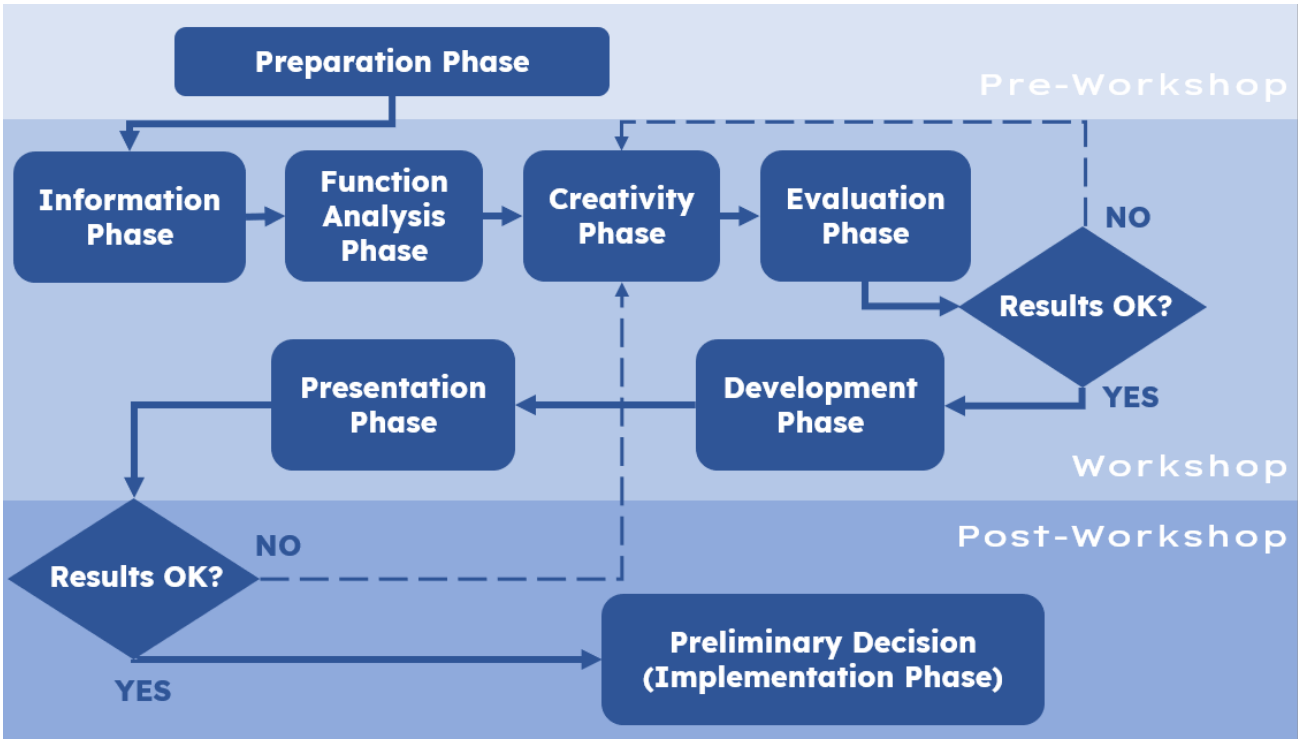
Table 1-1: The VM Job Plan

Value Methodology Stage / Phase	VM Phase Functions Achieved	Objectives of this Phase	Outcomes of this Phase
Phase 1: Preparation Phase	Identify Subject Identify Goals Define Value Organize Effort	• Identify the study project • Identify roles and responsibilities • Define study scope, goals, and objectives • Select team leader • Conduct pre-study meeting • Select VE Team members • Identify stakeholders, decision-makers, and technical reviewers • Obtain time commitment • Identify data collection • Select study dates • Determine study logistics, agenda • Collect and distribute data • Perform technology dry-run for a virtual workshop • Send team primer to VE Team • Team members to complete Key Issues Memos (KIM)	• Fosters understanding of VE Study priorities • Defines and manages expectations • Organizes the VE Study • Offers a thorough review of the project • Tests meeting platform and virtual tools to maximize engagement and collaboration • Primes the team for the VE workshop

Value Methodology Stage / Phase	VM Phase Functions Achieved	Objectives of this Phase	Outcomes of this Phase
Phase 2: Information Phase	Analyze Information Transform Information Orient Participants	• Present design concept • Present stakeholders' interests • Review project issues and objectives • Discuss deviation from design standards • Define project performance metrics • Discuss problems the project must solve • identify issues the design may not address • Visit project site / virtual site tour	• It brings all VE Team members to a common understanding of the project, including its challenges and constraints • Establishes the benchmark for which to identify alternatives • Gains a real-world perspective of the project and builds the foundation for function analysis
Phase 3: Function Analysis Phase	Define Functions Allocate Resources Allocate Performance Prioritize Functions	• Identify and classify functions • Apply cost and risk relative to performance • Prioritize functions • Select specific functions for study	• Provides a comprehensive understanding by focusing on what the project does rather than what it is • Identifies what the project must do to satisfy needs and objectives • Focuses on functions with the greatest opportunity for project improvements
Phase 4: Creativity Phase	Generate Ideas	• Brainstorm to generate performance-focused ideas for alternative ways to perform functions • Discuss, build on and clarify ideas	• The VE Team develops a broad array of ideas that provide a wide variety of possible alternative components or methods to improve project value
Phase 5: Evaluation Phase	Evaluate Ideas Select Ideas	• Eliminate obvious "fatal flaw" ideas • Score ideas based on meeting performance criteria, value key and project/study goals • Discuss conflicting rankings, further clarify ideas and determine final rankings • Discuss ideas with client and decision-makers (midpoint review) • Assign alternatives for the development phase	• Prioritizes ideas for development, focusing on those with the highest potential for performance improvement and cost savings • Determine value: performance/cost • Focuses team's effort to develop alternatives that best meet client study objectives
Phase 6: Development Phase	Transform Ideas Develop Information	• Validate and refine idea concepts • Compare to the original design concept • Define implementation considerations • Prepare sketches and calculations • Measure performance • Estimate costs, life-cycle cost benefits/costs	• Provides a side-by-side comparison of baseline and alternative—concepts, initial costs, life-cycle costs, sketches, performance metrics

Value Methodology Stage / Phase	VM Phase Functions Achieved	Objectives of this Phase	Outcomes of this Phase
Phase 7: Presentation Phase	Present Information Propose Change	• Present developed ideas to client, designers, decision-makers, stakeholders • Document feedback • Produce draft report	• Ensures management and other key stakeholders understand the rationale of the value alternatives and design suggestions
Phase 8: Implementation Phase	Implement Change Manage Change Realize Value	• Document process and study findings • Develop and distribute VE study summary report • Review study summary report • Assess alternatives for acceptance • Prepare draft implementation dispositions • Resolve conditionally accepted alternatives • Develop an implementation plan with the project manager • Project manager sign-off on VE implementation plan • Final presentation of study results	• Involves those who will implement and increases the likelihood of implementation • Improves the actual value of the project

Figure 1-2: The VM Process Flowchart



1.2 Report Contents

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

Section 1: Introduction – This section outlines the VE process and explains the content of the report.

Section 2: Project Description – This section outlines the project background, project corridor and project purpose and need.

Section 3: Executive Summary – This section is an overview that includes summary of results, a list of the VE Team members and the VE punch list.

Section 4: Summary Information – This section provides an overview in table format of the VE Proposals and Design Comments.

Section 5: VE Proposals and Design Suggestions – This section includes alternatives developed as a workbook during the Development Phase of the workshop.

Section 6: Appendices

- Appendix A – Study Participants
- Appendix B – Pareto Cost Models
- Appendix C – Function Analysis
- Appendix D - Creative Idea List and Evaluation
- Appendix E – Supporting Data
    - Risk Identification
    - VE Team Observations
    - Performance Criteria
    - Agenda

Section

2

Project Description

Section 2 – Project Description

2.1 Purpose & Need

The purpose of the Hal Rogers Parkway project is to reduce congestion, address the capacity deficiencies and operational issues that currently characterize the corridor, and provide increased efficiency and safety for the travelling public.

2.2 Background

The Kentucky Transportation Cabinet (KYTC) is in the design phase of a project to widen the Hal Rogers Parkway between KY 30 (MP 1.089) and KY 192 (MP 3.877). It will serve through traffic on Hal Rogers Parkway, as well as local users accessing North Laurel High School and North Laurel Middle School.

2.3 Value Engineering (VE) Study Baseline

The following figure illustrates the baseline concept for the VE Team to study and provide VE alternatives.

Figure 2-1: Baseline Concept

ID	LOCATION
A	Hal Rogers @ KY 30
B	Hal Rogers @ North Laurel High School
C	Hal Rogers @ KY 638
D	Hal Rogers @ KY 472 (North Laurel Middle School)
E	Hal Rogers @ KY 192

Length:	2.788 Miles
Current Working Estimate (dated 04/15/2021):	$17,340,626.64
KYTC Six-year Highway Plan (dated 01/07/2022):	$12,000,000.00

Section

3

Executive Summary

Section 3 – Executive Summary

3.1 Background

A Value Engineering (VE) Study was conducted on the Preliminary Line and Grade documents for the **Hal Rogers Parkway, MP 1.089 to MP 3.877 Project** for the KYTC on April 18-22, 2022, for the project described in Section 2 – Project Description.

3.2 Workshop In-brief Meeting

KYTC and American Engineers, Inc. (design team) representatives presented the project during the in-brief meeting on Monday, April 18, 2022.

The workshop objectives were identified at the start of the workshop and were used to focus the VE Team's efforts:

- Identify/evaluate alternatives at intersections
  - KY 30
  - North Laurel High School entrance
  - KY 638 (Between North Laurel High School and North Laurel Middle School)
  - KY 472 (North Laurel Middle School)
  - KY 192 (End of project)
- Identify access management strategies
- Evaluate bridge alternatives

3.3 Performance Criteria

During the Information Phase, on Monday, April 18th, 2022, performance criteria were identified to evaluate the impact of the Value Engineering (VE) Proposals on the project's performance. The table below presents the list and description of these criteria.

Table 3-1: List of Performance Criteria

LIST OF CRITERIA	#	Criteria	Description
	A	Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.
	B	Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.
	C	Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.

#	Criteria:	Description
D	Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.
E	Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.
F	Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).
G	Phaseability	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.
H	Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]

Using a "paired comparisons" evaluation process, these criteria were weighted and later used in the evaluation and development of VE Proposals. Appendix E provides more details on the process and use of the performance criteria.

3.4 Workshop Results

Summary workshop results are shown in the table below.

Table 3-2: Summary Workshop Results

Workshop Outcome	Number	Section of Report/Result
Ideas Brainstormed	66	See Creative Idea List and Evaluation (Section 6 – Appendices, Appendix D)
Ideas Developed into Value Engineering (VE) Proposals, costed	11	See Section 4 – Summary Information and Section 5 – Value Engineering Proposals
Design Comments (DC), not developed	14	See Section 4 – Summary Information
All VE Proposals – Cost Avoid (Potentially reduces initial and/or O&M cost without sacrificing function and/or performance)	5	See Section 4 – Summary Information and Section 5 – Value Engineering Proposals
All VE Proposals – Cost Add (At a cost add to the project, potentially improves function and/or performance)	6	See Section 4 – Summary Information and Section 5 – Value Engineering Proposals

3.5 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 purpose of 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 Section 6: Appendices, 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 (the "purpose" of the Purpose and Need) was defined as **Reduce Congestion**. A Random Function Identification Worksheet was completed and is included in Appendix C.

3.6 Value Engineering Punchlist

This section includes a Value Engineering Punchlist that the decision makers can use to guide and track decisions as they determine the ultimate disposition of each VE Proposal. The Value Engineering Punchlist is included on the following page.

VALUE ENGINEERING PUNCH LIST

ITEM NO. 11.365.00 **PROJECT COUNTY:** Laurel **DATE OF STUDY:** April 18-22, 2022

VE Proposal No.	Description	Location (Item No., Segment, Alternate)	Activity (Y,N,UC-Date)	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving (Add)	O&M Cost Saving (Add)	Life Cycle Cost Saving (Add) (Total Present Worth)	FHWA Categories	Remarks
01	Existing alignment with intersection improvements				$17,341,000	$1,677,000	$15,664,000		$15,664,000		
02	Baseline concept with intersection improvements				$0	$1,335,000	($1,335,000)		($1,335,000)		
03	Provide access management strategies at non-signalized approaches				$0	$50,000	($50,000)		($50,000)		
04	Add security/barrier fence on middle school property to isolate road; relocate gate to back				$0	$35,000	($35,000)		($35,000)		
05	Provide an additional access point to the rear entrance of the high school with a left-in and restricted left-out				$0	$274,000	($274,000)		($274,000)		
06	Add a dual-left from northbound KY 192 onto Hal Rogers Parkway				$0	$100,000	($100,000)		($100,000)		
07	Not used										
08	Add a sidewalk on the bridge				$1,236,000	$1,349,000	($113,000)		($113,000)		
09	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs				$1,429,000	$961,000	$468,000	$39,000	$507,000		
10	Remove the asphalt base layer from the overlay of the existing pavement				$857,000	$0	$857,000		$857,000		
11	Modify typical section to use 6' paved shoulders in lieu of 10'				$1,349,000	$999,000	$350,000		$350,000		
12	Shift alignment to south and widen one side only of bridge over Little Laurel River				$2,085,000	$1,482,000	$603,000		$603,000		

3.7 VE Team

Table 3-3: VE Team Participants

Name	Organization	Role in the Value Study	Level of Participation
Pat Miller	RHA	CVS Facilitator	Full Time
Colin Miller	RHA	VMA Workshop / Technical Assistant	Full Time
Jerry Leslie, PE	American Engineers, Inc.	Geometric Design	Full Time
Kenny Ott, PE	American Engineers, Inc.	Accelerated Bridge Construction	Full Time
Andrew Brown, PE, PTOE, RSPI	Palmer Engineering Company	Traffic & Safety Analysis	Full Time
Josh Coburn, PE, PTOE, RSPI	Palmer Engineering Company	Innovative Intersection Design	Full Time
Brent Sweger, PE	KYTC	Quality Assurance Branch Manager	Full Time
Justin Harrod	KYTC	TET 3	Part Time

Figure 3-1: VE Team

Top Row (left to right): Pat Miller, Andrew Brown, Brent Sweger

Bottom Row (left to right): Josh Coburn, Kenny Ott, Jerry Leslie, Justin Harrod, Colin Miller

3.8 Certification

The undersigned Certified Value Specialist (CVS®) facilitator attests that the Value Engineering Study documented by this report meets the KYTC Value Standard and that the Value Engineering Study was facilitated in accordance with the SAVE International® Standards of Conduct.

Patrice Miller
CVS® No. 201410500
Facilitator

Section

4

Summary Information

Section 4 – Summary Information

4.1 Introduction

The VE Team brainstormed 66 ideas. To shorten the list, the VE Team evaluated the ideas using a simultaneous two-step process (further described in Appendix D). A total of 11 ideas were developed as Value Engineering Proposals with costs; and 14 ideas were identified as Design Comments.

The table below summarizes by function the total number of ideas brainstormed and developed.

Table 4-1: Summary of Ideas Brainstormed (by Function)

6Function / Focus Area	Abbreviation	Total Number of Ideas Brainstormed	Total Number of VE Proposals (Developed)	Total Number of Design Comments (Not Developed)
Increase Capacity	IC	36	4	6
Protect People	PP	5	1	3
Span Roadway	SR	12	1	0
Support Load	SL	3	2	1
Prepare Subgrade	PS	2	0	2
Span Water	SW	4	1	1
Miscellaneous	MI	4	2	1
TOTAL	**--**	**66**	**11**	**14**

4.2 Value Engineering Proposals - Summary

The table on the following two pages summarizes the 11 VE Proposals and their respective cost implications, if any. It's important to note that costs reflected in positive numbers indicate a cost savings and costs reflected in negative numbers (parentheses) indicate a cost add. It's also important to note that, due to the conceptual nature of the alternatives and the early level of the design metrics, most costs are high level estimations. As the project design progresses and harder metrics are generated, these costs will need to be refined. The VE Team has attempted to maintain a high level of conservatism when making the estimations in this report.

It is important to reiterate that the definition of value is as follows:

$$\text{Value} = \frac{\text{Function Performance}}{\text{Resources}}$$

Understanding Function Performance is key in the evaluation and later recommendation of an idea to become a VE Proposal.

Several of the proposals overlap or represent different ways of approaching the same issue. As a result, the cost avoid/cost add in the summary table is not cumulative.

The following pages list the VE Proposals in table format.

Table 4-2: Summary of Value Engineering Proposals

VE Proposal No.	Creative Idea No.	VE Proposal Title	Overall Performance Impact	VE PROPOSAL SYNOPSIS					Initial Cost Decrease/(Increase)	O&M Cost Decrease/(Increase)	Total Cost Life Cycle Decrease/(Increase)
				VE Proposal Synopsis	Reliability	Functionality	O&M	Schedule Impact			
01	MI-03	Existing alignment with intersection improvements	5.3	Utilize the existing alignment with focused improvements at the intersections. The congestion and safety related areas of improvement along this project occur at the intersections. Investment of the available funding needs to address the congestion and safety concerns at the intersections.	Improved	Improved	Improved	Improved	$15,664,000	-	$15,664,000
02	MI-04	Baseline concept with intersection improvements	2.7	Utilize the baseline alignment with focused improvements at the intersections. The congestion and safety related areas of improvement along this project occur at the intersections. Investment of the available funding needs to address the congestion and safety concerns at the intersections.	Maintained	Improved	Improved	Maintained	($1,335,000)	-	($1,335,000)
03	IC-05	Provide access management strategies at non-signalized approaches	7.7	As the Hal Rogers Parkway evolves, it should do so in a way that minimizes the amount of direct access to the roadway in order to maximize safety and traffic flow efficiency. All unnecessary access should be removed and necessary access should have limited turning movements.	Maintained	Improved	Maintained	Maintained	($50,000)	-	($50,000)
04	IC-08	Add security/barrier fence on middle school property to isolate road; relocate gate to back	9.2	Moving the existing school gate 1325 feet to the back of the parking lot entrance provides additional vehicle storage. This will limit or eliminate the vehicle queuing onto existing Hal Rogers Parkway.	Improved	Improved	Maintained	Improved	($30,000)	-	($30,000)
05	IC-15	Provide an additional access point to the rear entrance of the high school with a left-in and restricted left-out	-0.2	Allows students direct access to the rear student parking directly from Hal Rogers Parkway and will help alleviate the student traffic off of the current entrance during both peak am and pm traffic. Left out is restricted due to safety concerns; however, students can get onto Hal Rogers EB via the Slate Lick Bridge/Street to 638.	Improved	Improved	Maintained	Maintained	($274,000)	-	($168,000)
06	IC-23	Add a dual-left from northbound KY 192 onto Hal Rogers Parkway	2.3	The northbound left turning movement from KY 192 onto the Hal Rogers Parkway experiences significant queuing, delay, and poor level of service due to the high volume demand and limited green time. A second, designated, left turn lane should be constructed to provide more capacity for this movement.	Maintained	Improved	Maintained	Degraded	($100,000)	-	($100,000)
07	IC-24	Build offset left-turn lanes at KY 638		NOTE: Downgraded to a “DC” near the end of the workshop.							
08	PP-02	Add a sidewalk on the bridge	2.5	The baseline requires the existing Slate Lick Bridge to be replaced with a new bridge that has a total width of 33-ft. A 5-ft sidewalk can be added by adding 3-ft (36-ft total width), with minimal additional bridge cost that will significantly increase safety for kids walking to school across this bridge.	Improved	Improved	Maintained	Maintained	($113,000)	-	($113,000)

VE Proposal No.	Creative Idea No.	VE Proposal Title	Overall Performance Impact	VE PROPOSAL SYNOPSIS					Initial Cost Decrease/(Increase)	O&M Cost Decrease/(Increase)	Total Cost Life Cycle Decrease/(Increase)
				VE Proposal Synopsis	Reliability	Functionality	O&M	Schedule Impact			
09	SR-03	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs	0.5	The cost of adding culvert pipes is small compared to the bridge length required to span over the roadside ditches. Using tie backs is a special design--not typical on KYTC projects but will be much more economical that a tall cantilevered wall and will allow the culvert pipes to pass through without concern of interference with the large footer required for a cantilever wall.	Maintained	Maintained	Improved	Maintained	$468,000	$39,000	$507,000
10	SL-02	Remove the asphalt base layer from the overlay of the existing pavement	-0.1	This proposal is to remove the 3.75 inch asphalt base layer with the 1.5 inch asphalt surface pavement overlay.	Maintained	Maintained	Degraded	Improved	$857,000	-	$857,000
11	SL-03	Modify typical section to use 6' paved shoulders in lieu of 10'	-0.2	Consider using a 6 foot paved shoulder with the baseline 12 foot usable shoulder. This option reduces cost without sacrificing operations of the facility.	Maintained	Maintained	Maintained	Maintained	$350,000	-	$350,000
12	SW-03	Shift alignment to south and widen one side only of bridge over Little Laurel River	0.9	Shift alignment 17-ft to the south so existing bridge over Little Laurel River is widened to one side only. This also shifts the alignment out of the rock cut at station 250+00. We have used 55:1 tapers before the bridge and after the rock cut to get back on the baseline alignment.	Improved	Improved	Maintained	Maintained	$603,000	-	$603,000

4.3 Design Comments (No Workbook Prepared)

The following table summarizes all those findings the VE Team identified during the preparation and performance of the VE Study that only comment about recommended corrections or concerns found in the project documents. Items such as errors, omissions, schedule corrections, estimate corrections, or document quality issues are examples of the elements listed in the following table and should be considered self-explanatory and do not require a formal response to accept or reject.

Table 4-3: Design Comments (No Workbook Prepared)

Idea No.	Design Comment
IC-01	Modify signal timing
IC-11	Construct right-turn lanes at KY 638 intersection, and KY 472 (to the south)
IC-24	Build offset left-turn lanes at KY 638
IC-28	Add right-turn overlap signal heads at intersection(s)
IC-31	Consider peak-hour patterns for timing at schools
IC-34	Restripe SB through-lane KY 30 to be a through-left onto Hal Rogers EB; requires signal modifications
PP-01	Add rumble strips to the center and edge line
PP-04	Flatten slopes to eliminate guardrail
PP-05	Add additional lighting at intersections
SL-01	Evaluate the pavement schedule and verify the need for the base overlay
PS-01	Identify opportunities to reuse excavated material
PS-02	Identify location to haul-off excavated material
SW-01	Construct Hal Rogers bridge over Little Laurel River to accommodate future replacement
MI-01	Use camera detection in lieu of conventional loop detection (signals)

Section

5

Value Engineering Proposals

Section 5 – Value Engineering Proposals

5.1 Introduction

During the Creativity Phase, the VE Team brainstormed 66 ideas. Of these, 11 were identified for further development into VE Proposals, including cost impacts. Several of the proposals overlap or represent different ways of approaching the same issue.

Cost savings are shown as positive costs, while any added costs are noted in parenthesis. Total Life Cycle Costs are the summation of the initial plus O&M costs as estimated by the VE Team.

5.2 Cost Estimating for VE Proposals

The costs used are those provided by American Engineers, Inc. (AEI). Where the VE Team has offered alternate costs, they are provided for information only, reflective of the short duration of the VE Study and should be evaluated by KYTC and AEI. Value Engineering Proposals are provided for their evaluation and implementation exclusively by KYTC and AEI.

5.3 Individual VE Proposals

The following pages detail the VE Proposals developed as part of the VE Team and include the following information:

- Unique Identifying Number (i.e., Value Engineering Proposal No. 01, 02, 03, etc.)
- Creative Idea No.
- Title of VE Proposal
- Function Identification
- Value Proposal Synopsis – A brief statement summarizing the VE proposal's value proposition
- Cost Avoidance – Estimated cost avoidance or cost add (a positive number indicates a reduction in cost and a negative number indicates an increase in cost)
- Qualitative Benefits (improved, maintained, degraded)
    - Reliability – Impact on the robustness and service life of the VE study subject
    - Operations & Maintenance – Impact on future and long-term operations and maintenance related to the VE study subject
    - Functionality – Impact on the performance and/or quality of the VE study subject
    - Schedule Impact – Time impact anticipated to result from the proposal
- Baseline Concept – Brief description of the baseline concept that would be changed by the relevant VE recommendation
- VE Proposal Description – Brief summary of the VE proposal relative to the baseline concept
- Advantages and Disadvantages – Bulleted list of potential benefits and drawbacks of the VE proposal
- Overall Performance Score – Cumulation of all scored performance criteria that are detailed under "Performance Impacts"
- Cost Summary – Summary of costs that are detailed under "Cost Estimates"
- Sketches and Diagrams – To assist the reader in visualizing how the proposal differs from the
- baseline concept

- Discussion and Justification – Detailed justification, including technical considerations, cost considerations, schedule impacts, risk considerations, project management considerations, stakeholder acceptance, implementation considerations
- Out-brief Presentation Comments & Response – Addresses any comments or feedback received during the out-brief presentation
- Performance Impacts – Addresses any impacts to performance measures
- Cost Estimates – Supports cost avoidance / cost add, including any assumptions and calculations

VALUE ENGINEERING (VE) PROPOSAL NO. 01

Creative Idea No. MI-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Existing alignment with intersection improvements
FUNCTION	**Miscellaneous**

VALUE PROPOSAL SYNOPSIS:

Utilize the existing alignment with focused improvements at the intersections. The congestion and safety related areas of improvement along this project occur at the intersections. Investment of the available funding needs to address the congestion and safety concerns at the intersections.

Reliability	**Improved**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Improved**	**Schedule Impact**	**Improved**	**$15,664,000**

BASELINE CONCEPT:

Pavement widening along the corridor to widen the existing typical to a four-lane undivided typical section. Improvements at the intersections include construction of innovative intersections, turn lane extensions, and signal timing adjustments.

VE PROPOSAL DESCRIPTION:

Utilize the existing two-lane alignment along the corridor. Construct focused intersection improvements at each intersection (specific intersection recommendations are detailed in subsequent pages).

ADVANTAGES:	DISADVANTAGES:
● Reduces congestion	● Travel time through the two lane corridor is longer with reduced opportunities to pass
● Improves safety	● The corridor level of service (LOS) is a "C" with two lanes roads, which is lower than a five lane typical LOS
● Under budget of the Six-Year Plan construction funding	●
● Intersection improvements could potentially reduce Fatal and Serious Crashes by 50%	●
● Eliminates need to replace Slate Lick Road Bridge	●
● Shorter construction duration and MOT	●
● Reduces future resurfacing costs (two lanes versus four lanes and median width)	●

Overall Performance Score	**5.3**

$ COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE CONCEPT:	$17,341,000	$0	$17,341,000
VE PROPOSAL DESCRIPTION:	$1,677,000	$0	$1,677,000
TOTAL (Baseline less Proposed)	$15,664,000	$0	$15,664,000

AVOID COST

VALUE ENGINEERING (VE) PROPOSAL NO. 01

Creative Idea No. MI-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Existing alignment with intersection improvements

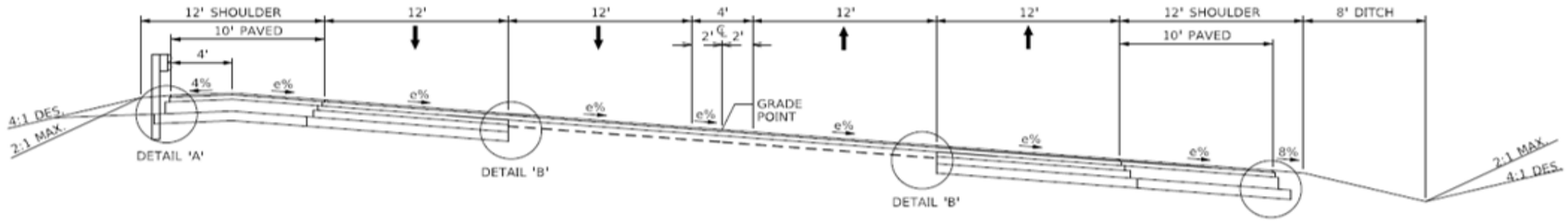
SKETCH/DIAGRAM: Existing Alignment vs. Baseline Concept (Two-Lane vs Four-Lane)

AADT
West: 11,882
East: 10,299
(12% Trucks)

5-Year Crash Analysis
Entire Route
Total Crashes = 154
Injury Crashes = 31
Intersections
Total Crashes = 131 (85%)
Injury Crashes = 29 (93%)

North Laurel High School
North Laurel Middle School
Johnson Elementary School

Six-Year Plan
$9 Mil Construction (2025)
$2 Mil Right-of-Way (2023)
$1 Mil Utilities (2024)



Typical Section	V/C Ratio	Average Speed	Predicted Number of Crashes (20 year)
Two-Lane Segments	0.41	58.3 MPH	19 Total 7 Fatal and Injury
Four-Lane Segments	0.20	58.2 MPH	24 Total 5 Fatal and Injury

VALUE ENGINEERING (VE) PROPOSAL NO. 01

Creative Idea No. MI-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Existing alignment with intersection improvements

SKETCH/DIAGRAM: VE PROPOSAL OVERVIEW FOR EXISTING ALIGNMENT INTERSECTION IMPROVEMENTS

ID	LOCATION	5-Year Crash History	Existing Signal Intersection Delay	IMPROVEMENT SUMMARY
A	Hal Rogers @ KY 30	59 Total (16 Injury)	39.2 sec LOS D	KY 30 SB Dual Left Multilane Roundabout
B	Hal Rogers @ High School	13 Total (5 Injury)	22.1 sec LOS C	Hal Rogers EB Dual Left Continuous Green T
C	Hal Rogers @ KY 638	25 Total (7 Injury)	19.5 sec LOS B	Unsignalized R-CUT
D	Hal Rogers @ KY 472 (Middle School)	33 Total (9 Injury)	27.2 sec LOS C	Optimize Signal Timing by adding peak timing
E	Hal Rogers @ KY 192	32 Total (8 Injury)	118.9 sec LOS F	Multilane Roundabout

VALUE ENGINEERING (VE) PROPOSAL NO. 01

Creative Idea No. MI-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Existing alignment with intersection improvements

DISCUSSION & JUSTIFICATION:

The preliminary cost estimate for the baseline concept was approximately $17.3 million, which is above the $9 million designated for construction in the Six-Year Plan. By using the existing two-lane roadway, focused improvements at each intersection from KY 30 to KY 192 may be implemented that are under budget. These improvements at the intersections would reduce congestion, along with reducing crashes, and satisfy the purpose and need for this project.

Over a five-year crash history, this corridor (from the High School to KY 192) had 154 total crashes with 31 crashes being injury related collisions. 131 crashes (85% of total crashes) occur at an intersection with 29 (93% of injury crashes) of those crashes being injury related collisions. The intersection of Hal Rogers at KY 30 had 59 total crashes with 16 crashes being injury related collisions.

This portion of Hal Rogers Parkway experiences AADT ranging from 11,882 to 10,299 with 11.98 percent trucks. Using Traffic Count Station data (AADT, K-Value, and Directional Splits), a planning level design hour was calculated. The VE team used background information provided and engineering judgment to estimate the turning movement percentages that resulted in hourly turning movement volumes. The school system also provided traffic counts for school buses, parent drop-off and pick-up, staff, and student drivers. This information was used to aid in the turning movement calculation at the High School intersection and KY 472 – Middle School intersection.

The existing two-lane roadway was analyzed using Highway Capacity Software and the associated calculated peak hour volumes. The Demand/Capacity ratio is 0.41 for the two-lane segments with a Free-Flow Speed of 61.1 mi/h. Passing zones are permitted in the tangent sections and between intersections and results in an average speed of 58.3 mi/hr with 6.4 Follower Density (followers/mi/ln). The existing two-lane HCS analysis resulted in LOS C.

TITLE	Existing alignment with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

The existing two-lane roadway was also analyzed using the Highway Safety Software and Highway Safety Manual methodologies. The analysis was summarized for the exiting two-lane undivided urban segments along the project. This included the three segments from the High School Entrance to KY 638, from KY 638 to KY 472 (Middle School), and from KY 472 (Middle School) to KY 192. There is an observed 17 crashes along these segments, based on the five-year crash history, with 1 crash being injury related. AADT, number of driveways, speed limit, roadside fixed objects, observed crash history and other existing conditions were used as inputs for calculating the expected crashes. The expected total number of crashes was calculated to be 4.774 and included 1.334 predicted fatal and injury crashes and 3.44 property damage only crashes. In comparison, the baseline concept predicted a slight increase in total crashes of 4.836 (+1.3%) and included 1.315 predicted fatal and injury crashes (-1.4%) and 3.521 property damage only (+2.5%) crashes. This results in a potential crash reduction benefit of $122,000 over a 20-year service life of widening the pavement to add a lane in each direction with 4-foot median.

Based on the traffic and safety analysis, the VE team recommends further exploring utilizing the existing two-lane roadway alignment and implement focused improvements at the intersections. The following is a summary of the recommended intersection improvements.

A. Hal Rogers @ KY 30:

The existing intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The below table is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	KY 30 SB Left Turn Delay and Queue
Existing Signal	39.2 sec LOS D	30.4 sec 357 feet	27.1 sec 315 feet	58.2 sec 339 feet
KY 30 SB Dual Left	33.9 sec LOS C	25.1 sec 327 feet	22.2 sec 287 feet	49.6 sec 158 feet
Multi-lane Roundabout (2x2)	**11.3 sec LOS B**	**11.1 sec 60 feet**	**9.2 sec 40 feet**	**13.9 sec 40 feet**

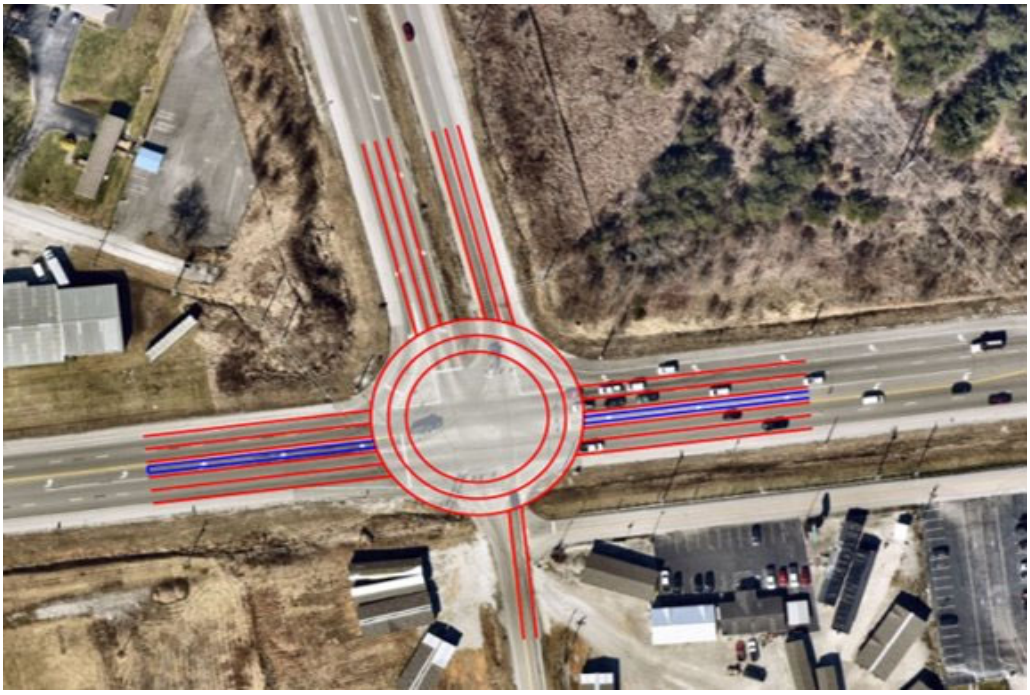
TITLE	Existing alignment with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

The existing intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The table below is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Existing Signal	59 Total (16 Injury)	42.43 (13.93 F&I)	---
Multi-lane Roundabout	**---**	**34.37 (6.27 F&I)**	**19% Total 55% Injury**

Based on the analysis, the VE team made the following recommendations: Multi-lane Roundabout as illustrated below.



TITLE	Existing alignment with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

B. Hal Rogers @ High School:

The existing intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The below table is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	School Exit Delay and Queue	Hal Rogers EB Left Delay and Queue
Existing Signal	22.1 sec LOS C	12.3 sec 97 feet	14.6 sec 180 feet	59.7 sec 244 feet	13.4 sec 208 feet
Hal Rogers EB Dual Lefts	**19.3 sec LOS B**	**9.4 sec 97 feet**	**10.7 sec 147 feet**	**59.7 sec 244 feet**	**8.2 sec 91 feet**
Continuous Green T (CGT)	**21.7 sec LOS C**	**0 sec**	**12.2 Sec 155 feet**	**56 sec 214 feet**	**10.6 sec 155 feet**
Multi-lane Roundabout	8.7 sec LOS A	7.6 Sec 40 feet	10.6 sec 60 feet	6.9 sec 20 feet	8.2 sec 40 feet

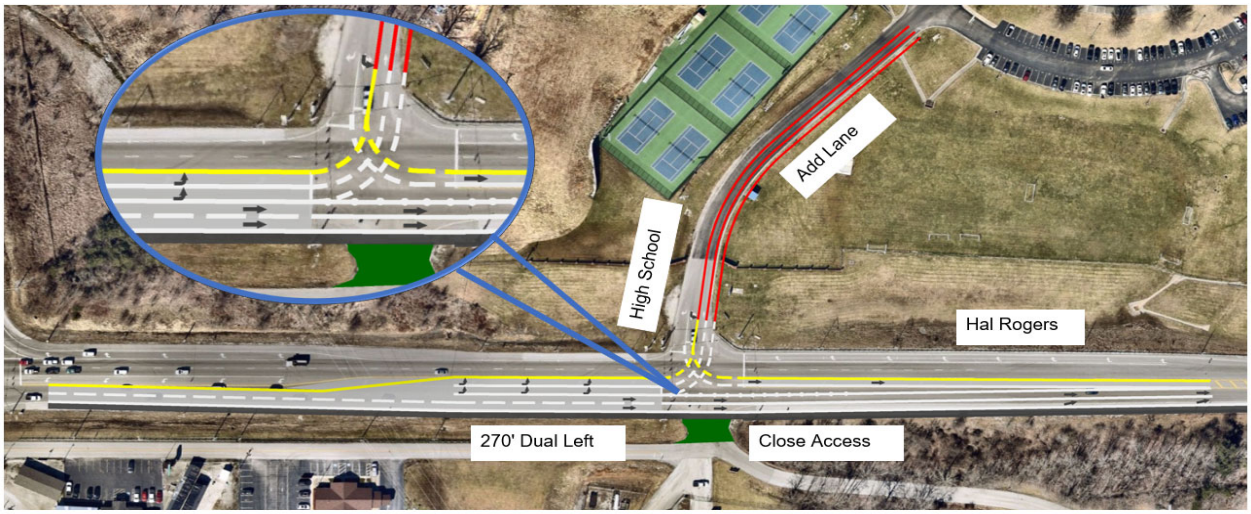
The existing intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The table below is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Existing Signal	13 Total (5 Injury)	26.97 (9.02 F&I)	---
Hal Rogers EB Dual Lefts	**---**	**---**	**---**
Continuous Green T (CGT)	**---**	**15.65 (5.81 F&I)**	**42% Total 36% Injury**
Multi-lane Roundabout (2x2)	---	21.85 (2.61 F&I)	19% Total 71% Injury

TITLE	Existing alignment with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

Based on the analysis, the VE Team made the following recommendations: Hal Rogers EB Dual Left and Continuous Greet T (CGT) as illustrated below.



C. Hal Rogers @ KY 638:

The existing intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The below table is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	KY 638 SB Rt Delay and Queue	KY 638 SB Th/Lt Delay and Queue
Existing Signal	19.5 sec LOS B	10.5 sec 342 feet	10.5 sec 286 feet	24.5 sec 81 feet	79 sec 129 feet
Unsignalized R-Cut	**3.7 sec**	**0 sec**	**0 sec**	**16.3 sec 40 feet**	**N/A**
Single Lane Roundabout	10.5 sec LOS B	11.9 sec 100 feet	9.9 sec 60 feet	8.7 sec 20 feet	N/A

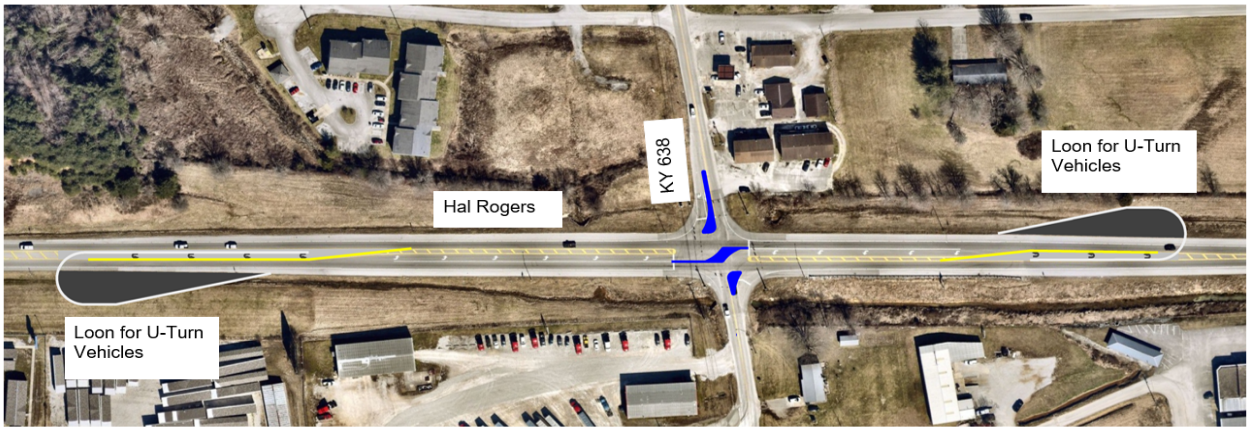
TITLE	Existing alignment with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

The existing intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The table below is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Existing Signal	25 Total (7 Injury)	29.88 (9.81 F&I)	---
Unsignalized RCUT	---	**23.43 (6.43 F&I)**	**22% Total 35% Injury**
Single Lane Roundabout	---	24.10 (4.80 F&I)	19% Total 51% Injury

Based on the analysis, the VE team made the following recommendations: Unsignalized R-CUT. The diagram below illustrates the sizing of the roundabout within the site.



TITLE	Existing alignment with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

D. Hal Rogers @ KY 472 (Middle School):

The existing intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The below table is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	Hal Rogers EB LT Delay and Queue	KY 472 SB RT Delay and Queue	KY 472 SB TH/LT Delay and Queue
Existing Signal	27.2 sec LOS C	18.7 sec 183 feet	38.7 sec 375 feet	21.5 sec 238 feet	10.7 sec 25 feet	59.3 sec 297 feet
Unsignalized R-Cut	75.3 sec	N/A	N/A	12.4 sec 52 feet	209.1 sec 826 feet	N/A
Single Lane Roundabout	14.2 sec LOS B	18.9 sec 160 feet	12.0 sec 60 feet*	N/A	18.9 sec 160 feet*	8.1 sec 20 feet

*Free Flow Right turn Bypass Lane included in analysis
NOTE: An additional improvement for this intersection involves the relocation of the Student Drop-off and Pick-Up gate that creates queues back to and along Hal Rogers

The existing intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The table below is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Existing Signal	33 Total (9 Injury)	33.8 (10.57 F&I)	---
Unsignalized RCUT	---	25.48 (7.04 F&I)	25% Total 33% Injury
Single Lane Roundabout	---	25.01 (4.97 F&I)	24% Total 53% Injury

Based on the analysis, the VE team made the following recommendations: Optimize Signal Timing by adding peak timing.

TITLE	Existing alignment with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

E. Hal Rogers @ KY 192:

The existing intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The below table is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	Hal Rogers WB LT Delay and Queue	KY 192 NB Delay and Queue
Existing Signal	118.9 sec LOS F	12.2 sec 210 feet	17.9 sec 143 feet	18.4 sec 237 feet	261.1 sec 1,470 feet
Continuous Green T	83.2 LOS F	39.9 sec 198 feet	N/A	27.3 sec 252 feet	122 sec 1,026 feet
Single Lane Roundabout	**15.7 sec LOS C**	**6.5 sec 20 feet***	**38.5 sec 180 feet****	**N/A**	**15.4 sec 120 feet****

*Free Flow Right turn Bypass Lane included in analysis
**Yield Right turn Bypass Lane included in analysis

The existing intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The table below is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Existing Signal	32 Total (8 Injury)	45.19 (14.68 F&I)	---
Continuous Green T	---	32.30 (9.99 F&I)	29% Total 32% Injury
Single Lane Roundabout	---	**33.44 (6.61 F&I)**	**26% Total 55% Injury**

TITLE	Existing alignment with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

Based on the analysis, the VE team made the following recommendations: Multilane Roundabout; a Turbo Roundabout is illustrated below.

VALUE ENGINEERING (VE) PROPOSAL NO. 01

Creative Idea No. MI-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Existing alignment with intersection improvements

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	2	0.6
Justification for Impact Score	The improvements at each intersection will greatly improve safety on the mainline facility. The improvements will also reduce congestion but will add some time spent following compared to baseline.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	2	0.5
Justification for Impact Score	Some of the improvements at each intersection may increase the length of the distance drivers have to travel from the side streets to make left turns, but travel time may be similar to baseline conditions. Safety for local operations is improved.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	10	1.8
Justification for Impact Score	Only need to maintain two lanes (one in each direction) compared to four lanes and median with baseline. Intersection improvements also proposed removing signals and therefore, won't need to be maintained.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	10	0.7
Justification for Impact Score	Reduces construction greatly with only needing to construct improvements at the intersections. Eliminates the need to replace Slate Lick Road Bridge.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	5	0.3
Justification for Impact Score	Less impact along the length of the project.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	10	0.4
Justification for Impact Score	Funded project and plans can be quickly developed to implement at the intersections.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	10	0.0
Justification for Impact Score	Intersection improvements can be implemented with future widening project.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	10	1.0
Justification for Impact Score	Eliminates ROW impacts along the project.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**5.3**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10 Large positive impact to performance	5 Small positive impact to performance
0 No impact to performance	
-5 Small negative impact to performance	-10 Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 01

Creative Idea No. MI-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Existing alignment with intersection improvements
Assumptions & Calculations	No assumptions or calculations noted.

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Roundabout KY 30							
CSB	Ton				700	$24	$17,122
CL3 ASPH BASE 1.00D PG64-22	Ton				1,850	$70	$129,167
CL3 ASPH SURF 0.38B PG64-22	Ton				425	$83	$35,381
Raised Median	SY				1,170	$60	$70,200
Turbo Roundabout KY 192							
CSB	Ton				710	$24	$17,367
CL3 ASPH BASE 1.00D PG64-22	Ton				1,870	$70	$130,563
CL3 ASPH SURF 0.38B PG64-22	Ton				445	$83	$37,046
Raised Median	SY				1,250	$60	$75,000
High School Entrance							
CSB	Ton				201	$24	$4,916
CL3 ASPH BASE 1.00D PG64-22	Ton				158	$70	$11,032
CL3 ASPH SURF 0.38B PG64-22	Ton				59	$83	$4,912
Guardrail	LF				960	$24	$23,472
Remove Pavement	SY				225	$9	$1,999
Remove and Replace Signals	LS				1	$200,000	$200,000
Strip and Sign	LS				1	$30,000	$30,000
Quick Curb	LF				300	$150	$45,000
KY 638 Intersection							
CSB	Ton				595	$24	$14,554
CL3 ASPH BASE 1.00D PG64-22	Ton				3,038	$70	$212,113
CL3 ASPH SURF 0.38B PG64-22	Ton				1,304	$83	$108,558
Raised Median	SY				200	$60	$12,000

DESIGN ELEMENT	BASELINE CONCEPT				VE PROPOSAL		
Striping and signing	LS				1	$50,000	$50,000
Remove Signal	LS				1	$20,000	$20,000
KY 472 Intersection							
Signal Timing and Misc	LS				1	$100,000	$100,000
Subtotal				$0			$1,350,402
Mark-up - 24.2%				$0			$326,797
TOTAL				$17,341,000			$1,677,000
Impact to Initial Cost (Baseline Less Proposed)							**$15,664,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE ENGINEERING (VE) PROPOSAL NO. 02

Creative Idea No. MI-04

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Baseline concept with intersection improvements
FUNCTION	**Miscellaneous**

VALUE PROPOSAL SYNOPSIS:

Utilize the baseline alignment with focused improvements at the intersections. The congestion and safety related areas of improvement along this project occur at the intersections. Investment of the available funding needs to address the congestion and safety concerns at the intersections.

Reliability	**Maintained**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Improved**	**Schedule Impact**	**Maintained**	**($1,335,000)**

BASELINE CONCEPT:

Pavement widening along the corridor to widen the existing typical to a four-lane undivided typical section. Improvements at the intersections include construction of innovative intersections, turn lane extensions, and signal timing adjustments.

VE PROPOSAL DESCRIPTION:

In addition to the pavement widening, construct focused intersection improvements at each intersection.

ADVANTAGES:	DISADVANTAGES:
● Reduces congestion	● Adds cost
● Improves safety	●
● Intersection improvements could potentially reduce Fatal and Serious Crashes by 50%	●
●	●
●	●
●	●

Performance Score	**2.7**

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$0	$0	$0
VE PROPOSAL DESCRIPTION:	$1,335,000	$0	$1,335,000
TOTAL (Baseline less Proposed)	($1,335,000)	$0	($1,335,000)

ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 02

Creative Idea No. MI-04

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Baseline concept with intersection improvements

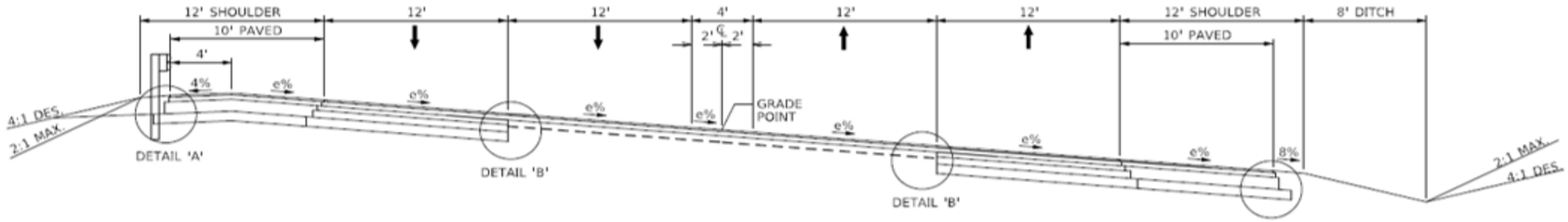
SKETCH/DIAGRAM: BASELINE CONCEPT

AADT
West: 11,882
East: 10,299
(12% Trucks)

5-Year Crash Analysis
Entire Route
Total Crashes = 154
Injury Crashes = 31
Intersections
Total Crashes = 131 (85%)
Injury Crashes = 29 (93%)

North Laurel High School
North Laurel Middle School
Johnson Elementary School

Six-Year Plan
$9 Mil Construction (2025)
$2 Mil Right-of-Way (2023)
$1 Mil Utilities (2024)



Typical Section	V/C Ratio	Average Speed	Predicted Number of Crashes (20 year)
Two-Lane Segments	0.41	58.3 MPH	19 Total 7 Fatal and Injury
Four-Lane Segments	0.20	58.2 MPH	24 Total 5 Fatal and Injury

VALUE ENGINEERING (VE) PROPOSAL NO. 02

Creative Idea No. MI-04

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Baseline concept with intersection improvements

SKETCH/DIAGRAM: VE PROPOSAL OVERVIEW OF BASELINE CONCEPT WITH INTERSECTION IMPROVEMENTS

ID	LOCATION	Baseline Signal Intersection Delay	IMPROVEMENT SUMMARY
A	Hal Rogers @ KY 30	39.2 sec LOS D	KY 30 SB Dual Left Multilane Roundabout
B	Hal Rogers @ High School	22.1 sec LOS C	Continuous Green T
C	Hal Rogers @ KY 638	17.2 sec LOS B	Unsignalized R-CUT
D	Hal Rogers @ KY 472 (Middle School)	21.3 sec LOS C	Optimize Signal Timing by adding peak timing
E	Hal Rogers @ KY 192	118.9 sec LOS F	Multilane Roundabout

TITLE	Baseline concept with intersection improvements

DISCUSSION & JUSTIFICATION:

The baseline concept for this corridor is focused around widening the pavement to provide a four-lane typical section. Minor improvements that include extending turn lanes and signal modifications are proposed at intersections. Since 131 crashes (85% of total crashes) occur at an intersection with 29 (93% of injury crashes) of those crashes being injury related collisions, the VE Team recommended focused improvements at each intersection. Before we look at the intersection improvements, below is a traffic and safety summary of the four-lane segments.

This portion of Hal Rogers Parkway experiences AADT ranging from 11,882 to 10,299 with 11.98 percent trucks. Using Traffic Count Station data (AADT, K-Value, and Directional Splits), a planning level design hour was calculated. The VE Team used background information provided and engineering judgment to estimate the turning movement percentages that resulted in hourly turning movement volumes. The school system also provided traffic counts for school buses, parent drop-off and pick-up, staff, and student drivers. This information was used to aid in the turning movement calculation at the High School intersection and KY 472 – Middle School intersection.

The proposed baseline concept of four-lane roadway was analyzed using Highway Capacity Software and the associated calculated peak hour volumes. The Volume-to-Capacity Ratio (v/c) is 0.20 for the four-lane segments with a Free-Flow Speed of 58.2 mi/h. The average speed was calculated to be 56.7 mi/hr with 7.4 Density (pc/mi/ln). The baseline concept HCS analysis resulted in LOS A. It was noted during the Project Information Phase, that the main congestion areas of improvement are at the intersections, especially the intersections at the High School and Middle School. Adding an additional lane in each direction would improve the thru movement capacity and allow for signal timing adjustments. Analysis for the baseline concept, along with comparisons to proposed intersection improvements were further evaluated and discussed in depth on the following workbook pages.

TITLE	Baseline concept with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

The proposed baseline concept was also analyzed using the Highway Safety Software and Highway Safety Manual methodologies. The analysis was summarized for the proposed four-lane undivided urban segments along the project. This included the three segments from the High School Entrance to KY 638, from KY 638 to KY 472 (Middle School), and from KY 472 (Middle School) to KY 192. There is an observed 17 crashes along these segments, based on the five-year crash history, with 1 crash being injury related. AADT, number of driveways, speed limit, roadside fixed objects, observed crash history and other existing conditions were used as inputs for calculating the expected crashes. The predicted total number of crashes was calculated to be 4.836 and included 1.315 predicted fatal and injury crashes and 3.521 property damage only crashes. HSM Methodology uses the same Crash Modification Factor for median widths less than 15 feet. Therefore, the safety analysis yields the same predicted number of crashes for the 4-foot median and the 12-foot median. For comparison, a 15-foot median was analyzed and predicted a slight decrease in total crashes of 4.788 (-0.99%) and included 1.302 predicted fatal and injury crashes (-0.99%) and 3.486 property damage only (-0.99%) crashes. This results in a potential crash reduction benefit of $109,000 over a 20-year service life of widening the median to 15 feet. These calculations result in very little safety benefit along the corridor since so many of the crashes occur at the intersections. Therefore, focused improvements at the intersection were further explored as an opportunity to reduce crashes and improve safety.

Based on the traffic and safety analysis, the VE Team recommends further exploring utilizing the existing two-lane roadway alignment and implement focused improvements at the intersections. The following is a summary of the recommended intersection improvements.

A. Hal Rogers @ KY 30:

The baseline intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The below table is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	KY 30 SB Left Turn Delay and Queue
Baseline Signal	39.2 sec LOS D	30.4 sec 357 feet	27.1 sec 315 feet	58.2 sec 339 feet
KY 30 SB Dual Left	33.9 sec LOS C	25.1 sec 327 feet	22.2 sec 287 feet	49.6 sec 158 feet
Multi-lane Roundabout (2x2)	**11.3 sec LOS B**	**11.1 sec 60 feet**	**9.2 sec 40 feet**	**13.9 sec 40 feet**

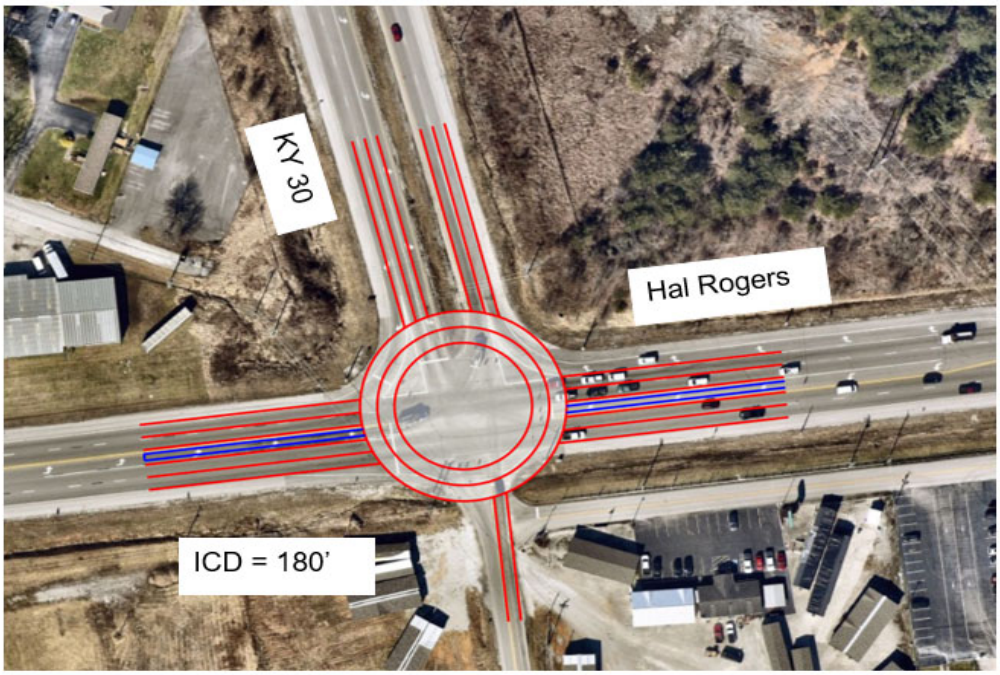
TITLE	Baseline concept with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

The baseline intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The table below is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Baseline Signal	59 Total (16 Injury)	42.43 (13.93 F&I)	---
Multi-lane Roundabout	---	34.37 (6.27 F&I)	19% Total 55% Injury

Based on the analysis, the VE Team made the following recommendations: Multilane Roundabout as illustrated below.



TITLE	Baseline concept with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

B. Hal Rogers @ High School:

The baseline intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The below table is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	School Exit Delay and Queue	Hal Rogers EB Left Delay and Queue
Baseline Signal	22.1 sec LOS C	12.3 sec 97 feet	14.6 sec 180 feet	59.7 sec 244 feet	13.4 sec 208 feet
Hal Rogers EB Dual Lefts	**19.3 sec LOS B**	**9.4 sec 97 feet**	**10.7 sec 147 feet**	**59.7 sec 244 feet**	**8.2 sec 91 feet**
Continuous Green T (CGT)	**21.7 sec LOS C**	**0 sec**	**12.2 Sec 155 feet**	**56 sec 214 feet**	**10.6 sec 155 feet**
Multi-lane Roundabout	8.7 sec LOS A	7.6 Sec 40 feet	10.6 sec 60 feet	6.9 sec 20 feet	8.2 sec 40 feet

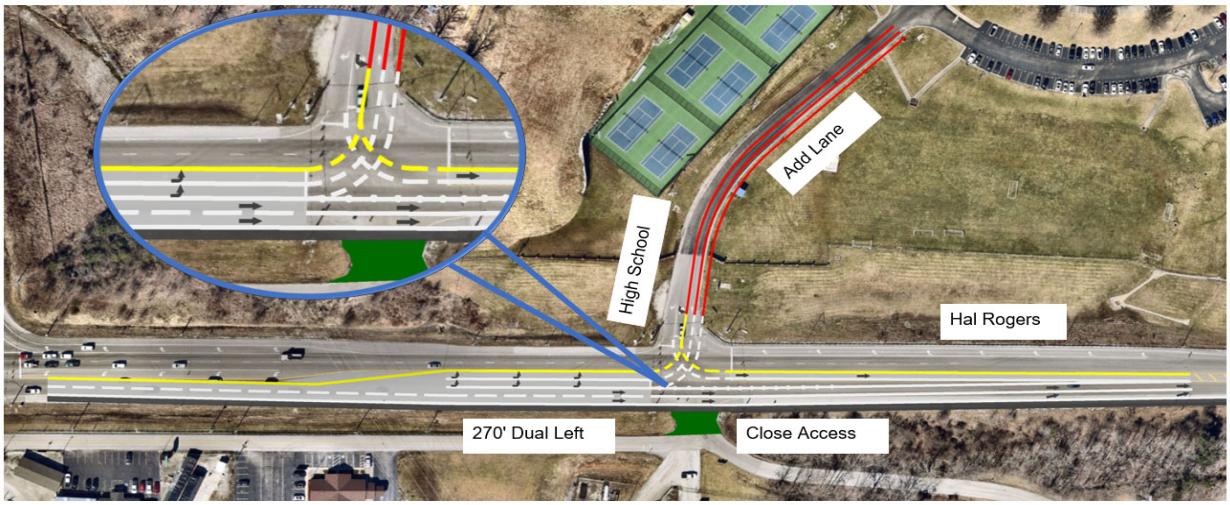
The baseline intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The below table is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Baseline Signal	13 Total (5 Injury)	26.97 (9.02 F&I)	---
Hal Rogers EB Dual Lefts	**---**	**---**	**---**
Continuous Green T (CGT)	**---**	**15.65 (5.81 F&I)**	**42% Total 36% Injury**
Multi-lane Roundabout (2x2)	---	21.85 (2.61 F&I)	19% Total 71% Injury

TITLE	Baseline concept with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

Based on the analysis, the VE Team made the following recommendations: Continuous Green T (CGT) as illustrated below.



C. Hal Rogers @ KY 638:

The baseline intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The below table is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	KY 638 SB Rt Delay and Queue	KY 638 SB Th/Lt Delay and Queue
Baseline Signal	17.2 sec LOS B	7.3 sec 135 feet	7.7 sec 117 feet	24.5 sec 81 feet	79 sec 129 feet
Unsignalized R-Cut	**2.9 sec**	**0 sec**	**0 sec**	**12.3 sec 26 feet**	**N/A**
Single Lane Roundabout	6.2 sec LOS A	6.2 sec 20 feet	5.8 sec 20 feet	7.3 sec 20 feet	N/A

TITLE	Baseline concept with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

The baseline intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The below table is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Baseline Signal	25 Total (7 Injury)	29.88 (9.81 F&I)	---
Unsignalized RCUT	---	**23.43 (6.43 F&I)**	**22% Total 35% Injury**
Single Lane Roundabout	---	24.10 (4.80 F&I)	19% Total 51% Injury

Based on the analysis, the VE Team made the following recommendations: Unsignalized R-CUT as illustrated below.

TITLE	Baseline concept with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

D. Hal Rogers @ KY 472 (Middle School):

The baseline intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The below table is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	Hal Rogers EB LT Delay and Queue	KY 472 SB RT Delay and Queue	KY 472 SB TH/LT Delay and Queue
Baseline Signal	21.3 sec LOS C	13.7 sec 78 feet	28.3 sec 163 feet	15.4 sec 212 feet	10.4 sec 29 feet	49.7 sec 228 feet
Unsignalized R-Cut	36.3 sec	0 sec	0 sec	12.6 sec 54 feet	97.6 sec 536 feet	N/A
Single Lane Roundabout	9.7 sec LOS A	6.6 sec 20 feet	7.1 sec 20feet*	8.8 sec 40 feet	19.0 sec 140 feet*	7.0 sec 20 feet

*Free Flow Right turn Bypass Lane included in analysis

NOTE: An additional improvement for this intersection involves the relocation of the Student Drop-off and Pick-Up gate that creates queues back to and along Hal Rogers

The baseline intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The below table is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Baseline Signal	33 Total (9 Injury)	33.8 (10.57 F&I)	---
Unsignalized RCUT	---	25.48 (7.04 F&I)	25% Total 33% Injury
Single Lane Roundabout	---	25.01 (4.97 F&I)	24% Total 53% Injury

Based on the analysis, the VE Team made the following recommendations: Optimize Signal Timing by adding peak timing.

TITLE	Baseline concept with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

E. Hal Rogers @ KY 192:

The baseline intersection was analyzed using Synchro and Highway Capacity Manual methodologies. The table below is a summary of the analysis.

Description	Intersection Delay (sec) and LOS	Hal Rogers EB Delay and Queue	Hal Rogers WB Delay and Queue	Hal Rogers WB LT Delay and Queue	KY 192 NB Delay and Queue
Baseline Signal	118.9 sec LOS F	12.2 sec 210 feet	17.9 sec 143 feet	18.4 sec 237 feet	320.3 sec 1,470 feet
Continuous Green T	83.2 LOS F	39.9 sec 198 feet	0 sec	27.3 sec 252 feet	122 sec 1,026 feet
Turbo Roundabout	**8.7 sec LOS A**	**5.8 sec 20 feet***	**15.6 sec 60 feet****	**N/A**	**13.2 sec 100 feet****

The baseline intersection was analyzed using the Safety Performance for Intersection Control Evaluation (SPICE) methodologies. The below table is a summary of the analysis.

Description	Observed Crashes	SPICE Predicted Crashes	Potential % Reduced Crashes
Baseline Signal	32 Total (8 Injury)	45.19 (14.68 F&I)	---
Continuous Green T	---	32.30 (9.99 F&I)	29% Total 32% Injury
Turbo Roundabout	**---**	**33.44 (6.61 F&I)**	**26% Total 55% Injury**

TITLE	Baseline concept with intersection improvements

DISCUSSION & JUSTIFICATION (continued):

Based on the analysis, the VE Team made the following recommendations: Multilane (Turbo) Roundabout as illustrated below.

VALUE ENGINEERING (VE) PROPOSAL NO. 02

Creative Idea No. MI-04

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Baseline concept with intersection improvements

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	8	2.4
Justification for Impact Score	The improvements at each intersection will greatly improve safety on the mainline facility. The improvements will also reduce congestion in comparison to the operation of existing signals.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	2	0.5
Justification for Impact Score	Some of the improvements at each intersection may increase the length of the distance drivers have to travel from the side streets to make left turns, but travel time may be similar to baseline conditions. Safety for local operations is improved.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	1	0.2
Justification for Impact Score	Some of the intersection improvements remove signals that will no longer need to be maintained.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	-5	-0.3
Justification for Impact Score	Adds construction at each intersection and further MOT needs for constructing roundabouts, U-Turn loons, etc.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	-1	0.0
Justification for Impact Score	Will need to further evaluate and design the intersection improvements.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	-5	0.0
Justification for Impact Score	Adds cost to the work that can completed within the $9M construction budget.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**2.7**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10	Large positive impact to performance	5	Small positive impact to performance
0	No impact to performance		
-5	Small negative impact to performance	-10	Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 02

Creative Idea No. MI-04

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Baseline concept with intersection improvements
Assumptions & Calculations	No assumptions or calculations noted.

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Roundabout KY 30							
CSB	Ton				700	$24	$17,122
CL3 ASPH BASE 1.00D PG64-22	Ton				1,850	$70	$129,167
CL3 ASPH SURF 0.38B PG64-22	Ton				425	$83	$35,381
Raised Median	SY				1,170	$60	$70,200
High School Entrance							
CSB	Ton				201	$24	$4,916
CL3 ASPH BASE 1.00D PG64-22	Ton				158	$70	$11,032
CL3 ASPH SURF 0.38B PG64-22	Ton				59	$83	$4,912
Guardrail	LF				960	$24	$23,472
Remove Pavement	SY				225	$9	$1,999
Remove and Replace Signals	LS				1	$200,000	$200,000
Strip and Sign	LS				1	$30,000	$30,000
Quick Curb	LF				300	$150	$45,000
KY 638 Intersection							
CSB	Ton				493	$24	$12,059
CL3 ASPH BASE 1.00D PG64-22	Ton				471	$70	$32,885
CL3 ASPH SURF 0.38B PG64-22	Ton				177	$83	$14,735
Raised Median	SY				200	$60	$12,000
Striping and signing	LS				1	$50,000	$50,000
Remove Signal	LS				1	$20,000	$20,000
KY 472 Intersection							
Signal Timing and Misc.	LS				1	$100,000	$100,000
Turbo Roundabout KY 192							

DESIGN ELEMENT	BASELINE CONCEPT				VE PROPOSAL		
CSB	Ton				710	$24	$17,367
CL3 ASPH BASE 1.00D PG64-22	Ton				1,870	$70	$130,563
CL3 ASPH SURF 0.38B PG64-22	Ton				445	$83	$37,046
Raised Median	SY				1,250	$60	$75,000
Subtotal				$0			$1,074,857
Mark-up - 24.2%				$0			$260,115
TOTAL				$0			$1,335,000
						Impact to Initial Cost (Baseline Less Proposed)	**($1,335,000)**

Note: Total costs are rounded to the nearest thousand dollars.

ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 03

Creative Idea No. IC-05

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide access management strategies at non-signalized approaches
FUNCTION	**Increase Capacity (Improve traffic flow, reduce delay)**

VALUE PROPOSAL SYNOPSIS:

As the Hal Rogers Parkway evolves, it should do so in a way that minimizes the amount of direct access to the roadway in order to maximize safety and traffic flow efficiency. All unnecessary access should be removed and necessary access should have limited turning movements.

Reliability	**Maintained**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Maintained**	**($50,000)**

BASELINE CONCEPT:

The current design leaves each existing access point with no restrictions on turning movements.

VE PROPOSAL DESCRIPTION:

For each uncontrolled access, restrict exiting movements to a right-in and right-out or close the access where alternative access can be provided. Do not allow additional access in the future to this section of the mainline.

ADVANTAGES:	DISADVANTAGES:
● Reduces conflict points, especially those that often lead to angle collisions	● Limits amounts of circuitous travel
● Protects functionality over time	●
● Eliminates need for future signals or traffic control on mainline	●
● Maximizes capacity	●
●	●

OVERALL PERFORMANCE SCORE	**2.8**

$ COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE CONCEPT:	$0	$0	$0
VE PROPOSAL DESCRIPTION:	$50,000	$0	$50,000
TOTAL (Baseline less Proposed)	($50,000)	$0	($50,000)

ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 03

Creative Idea No. IC-05

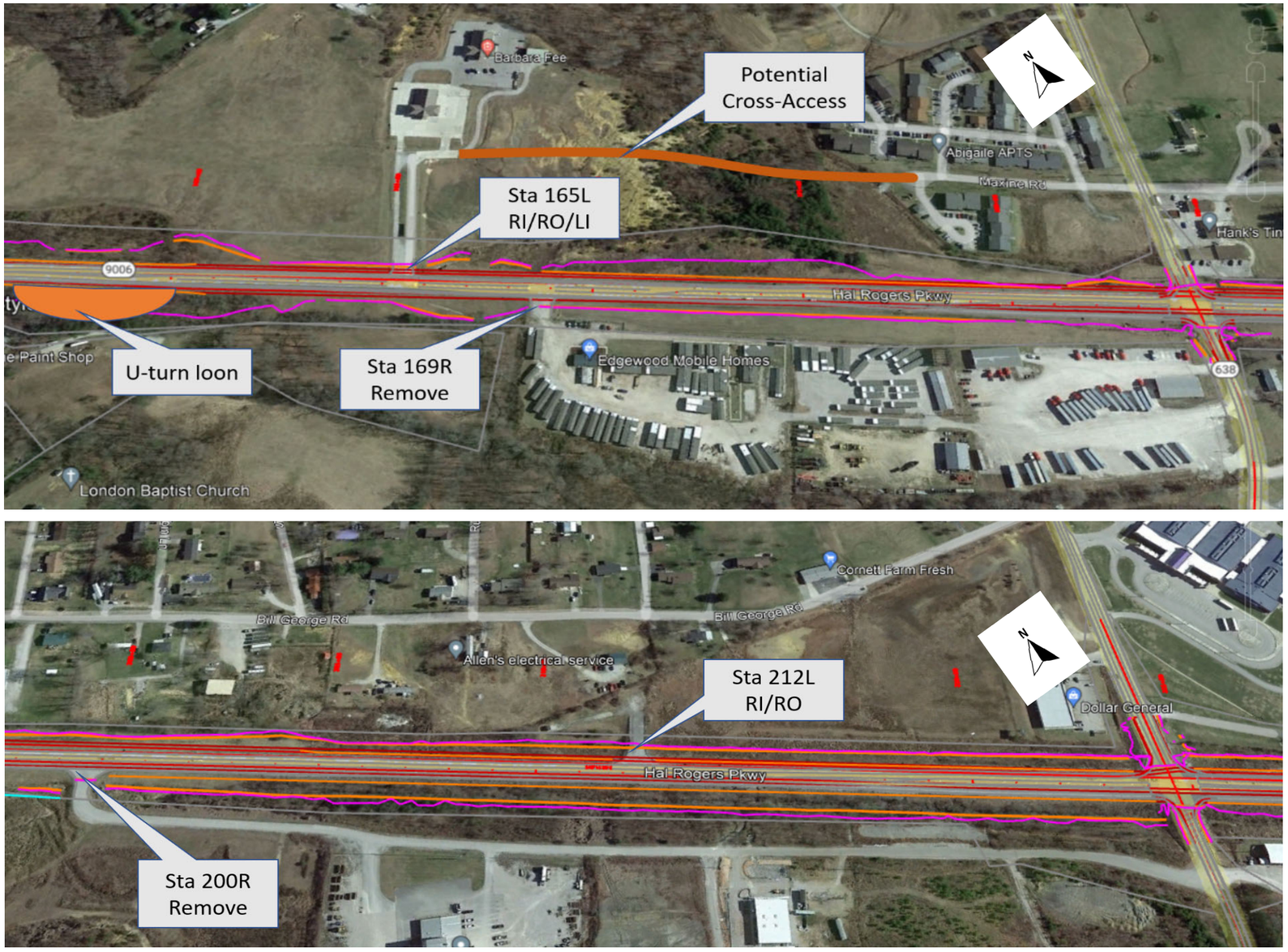
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide access management strategies at non-signalized approaches

SKETCH/DIAGRAM: VE PROPOSAL



Recommended modifications to unsignalized access locations

VALUE ENGINEERING (VE) PROPOSAL NO. 03

Creative Idea No. IC-05

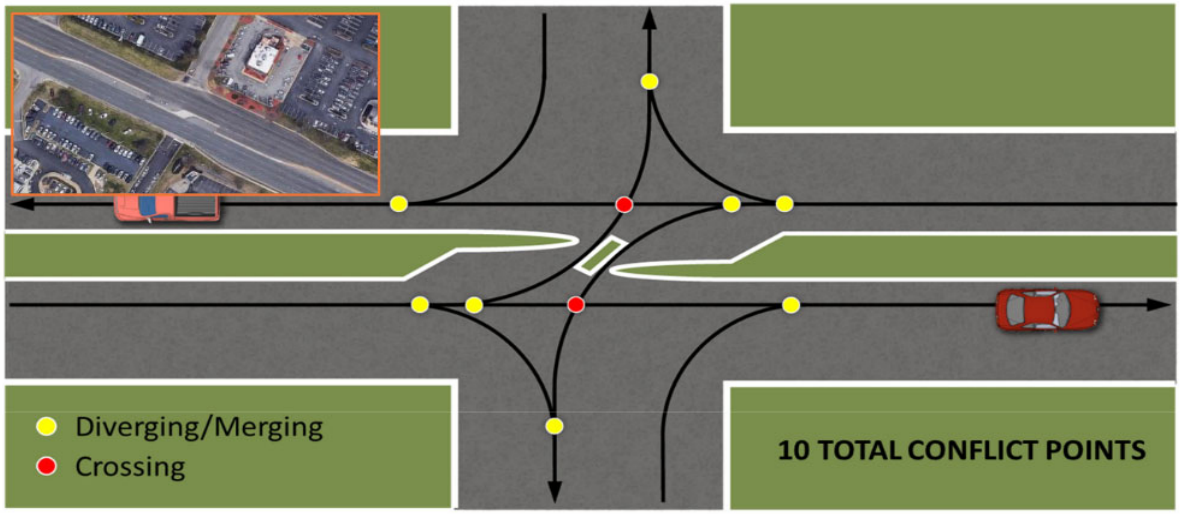
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide access management strategies at non-signalized approaches

SKETCH/DIAGRAM: VE PROPOSAL



Directional median opening allows right-in, right-out, and left-in movements only

VALUE ENGINEERING (VE) PROPOSAL NO. 03

Creative Idea No. IC-05

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide access management strategies at non-signalized approaches

DISCUSSION & JUSTIFICATION:

As the Hal Rogers Parkway evolves, it should do so in a way that minimizes the amount of direct access to the roadway in order to maximize safety and traffic flow efficiency. All unnecessary access should be removed and necessary access should have limited turning movements.

There are currently four locations that should have modifications to the existing access (see diagram). It is important to make changes so as to set the precedent that no additional full access is given in the future.

Two of the locations should fully close the access. At each, there is a secondary existing access to a cross street. Note that there are two crashes from the given crash data associated with the entrance at Station 169.

The other two locations should have the turning movements restricted so no traffic from the property can turn left or go straight across. For the location at approximately Station 165, it is recommended that a loon be built on the parkway to the west of the intersection. This will accommodate drivers to make the left-turn movement indirectly - would turn right from the entrance and then do a U-turn at the loon. This design enhancement will be critical as the intensity of land use at this location is currently planned to intensify with additional development. There were two crashes (1 injury) at the access at station 165; without this design change, the number of crashes would be expected to increase with increased traffic to and from this property.

Although this section of the parkway is classified as partially-controlled, KYTC should develop a policy to not allow additional access points in the future. This will protect the functional integrity of the design and maximize safety and traffic efficiency for years to come, especially if traffic volumes increase over time.

TITLE	Provide access management strategies at non-signalized approaches

DISCUSSION & JUSTIFICATION (continued):

One other option to improve connectivity and limit access is through the construction of a backage road on the property where the medical complex will be built. It would be desirable if the development plan would include a connection over to Maxine Road, southeast of the site. This would allow for drivers to directly connect with KY 638 and KY 472 without going on the mainline.

VALUE ENGINEERING (VE) PROPOSAL NO. 03

Creative Idea No. IC-05

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide access management strategies at non-signalized approaches

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	7	2.1
Justification for Impact Score	The elimination of left and through movements out of entrances will allow for smoother and safer traffic flow along mainline.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	-1	-0.3
Justification for Impact Score	This will create some longer distances to travel when using a frontage road or a U-turn location.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	0	0.0
Justification for Impact Score	No perceived impact to maintainability.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	0	0.0
Justification for Impact Score	Negligible impact during construction.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to the environment.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	0	0.0
Justification for Impact Score	No perceived impact to schedule due to small scale of construction.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	0	0.0
Justification for Impact Score	No perceived impact to phaseability.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	10	1.0
Justification for Impact Score	Any development that happens in the vicinity of the parkway should get access from side streets. For grandfathered locations (and future permitted access), eliminating left and through out movements is highly appropriate.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**2.8**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10 Large positive impact to performance	5 Small positive impact to performance
0 No impact to performance	
-5 Small negative impact to performance	-10 Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 03

Creative Idea No. IC-05

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide access management strategies at non-signalized approaches
Assumptions & Calculations	No assumptions or calculations noted.

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Concrete (channelization)	CY	0	$706	$0	50	$706	$35,300
Excavation (2 driveways)	CY	0	$7	$0	88	$7	$585
Pavement (loon)							
CSB	Ton	0	$24	$0	45	$24	$1,101
Asphalt base	Ton	0	$70	$0	30	$70	$2,095
Asphalt surface	Ton	0	$83	$0	15	$83	$1,249
Subtotal				$0			$40,329
Mark-up - 24.2%				$0			$9,760
TOTAL				$0			$50,000
						Impact to Initial Cost (Baseline Less Proposed)	**($50,000)**

Note: Total costs are rounded to the nearest thousand dollars.

ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 04

Creative Idea No. IC-08

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add security/barrier fence on middle school property to isolate road; relocate gate to back
FUNCTION	**Increase Capacity (Improve traffic flow, reduce delay)**

VALUE PROPOSAL SYNOPSIS:

Moving the existing school gate 1325 feet to the back of the parking lot entrance provides additional vehicle storage. This will limit or eliminate the vehicle queuing onto existing Hal Rogers Parkway.

Reliability	**Improved**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Improved**	**($35,000)**

BASELINE CONCEPT:

Currently there is a gate at the middle school entrance by KY 472 that is closed to pickups until a designated time. This causes vehicles arriving for student pickup to back up onto Hal Rogers Parkway (westbound).

VE PROPOSAL DESCRIPTION:

Move the gate from the front of the entrance to the back of entrance drive approximately 1325 feet. Add privacy fence between the entrance and the school parking lot.

ADVANTAGES:	DISADVANTAGES:
● Adds additional vehicle storage for afternoon pickups	● Relies on school to follow through with moving gate
● Improves safety by removing vehicles off Hal Rogers	● Adds cost
● Improves congestion	● Disadvantage for the school - maintenance of the fence and having to mow and weed around the fence
● Reduces delay	●
● May reduce the need for pickups to arrive so early so they get in front of the queue and don't want to be late and backed out onto Hal Rogers	●
● Safety advantage for the school - the privacy fence provides barrier between the pickup line and the school grounds	●

OVERALL PERFORMANCE SCORE	**7.7**

$ COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE CONCEPT:	$0	$0	$0
VE PROPOSAL DESCRIPTION:	$35,000	$0	$35,000
TOTAL (Baseline less Proposed)	($35,000)	$0	($35,000)
			ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 04

Creative Idea No. IC-08

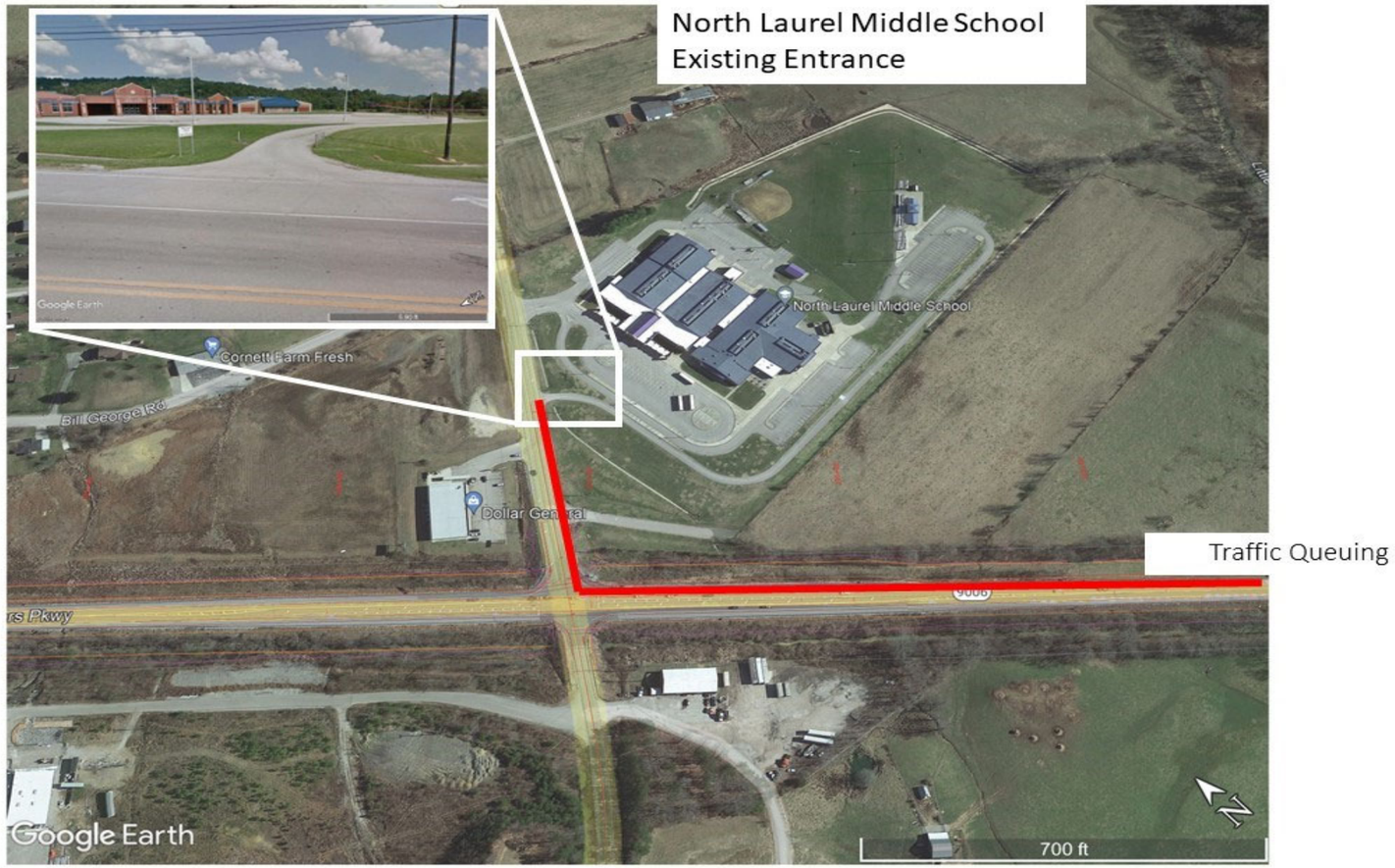
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add security/barrier fence on middle school property to isolate road; relocate gate to back

SKETCH/DIAGRAM: BASELINE CONCEPT



VALUE ENGINEERING (VE) PROPOSAL NO. 04

Creative Idea No. IC-08

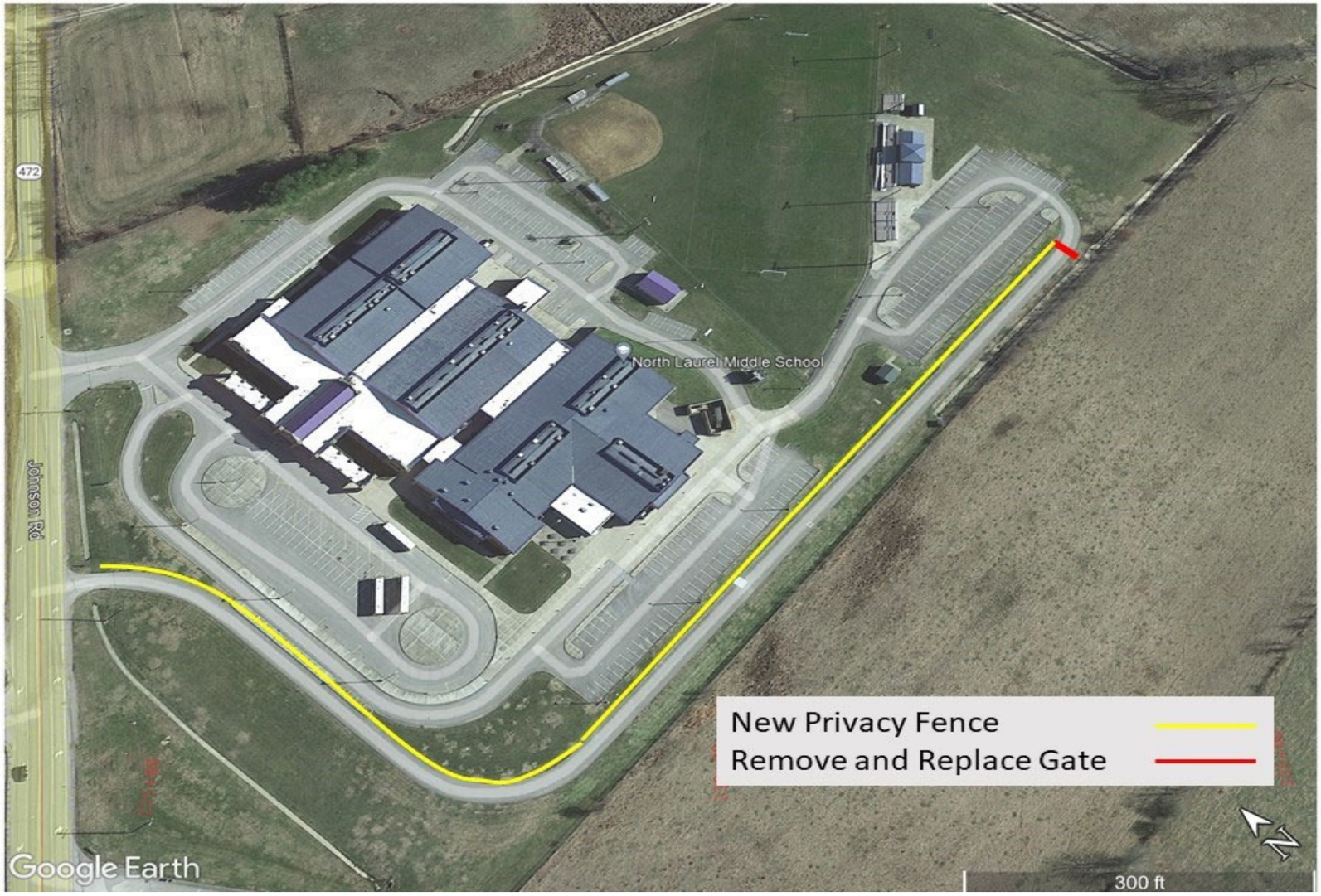
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add security/barrier fence on middle school property to isolate road; relocate gate to back

SKETCH/DIAGRAM: VE PROPOSAL



VALUE ENGINEERING (VE) PROPOSAL NO. 04

Creative Idea No. IC-08

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add security/barrier fence on middle school property to isolate road; relocate gate to back

DISCUSSION & JUSTIFICATION:

The baseline alternate doesn't change the existing condition for the North Laurel Middle School Entrance. There is currently a gate that closes off access to the middle school until the a specific time for student pick up. This causes traffic to back up onto Hal Rogers Parkway until the gate opens. This alternative proposes to move the gate to the back of the middle school.

This alternative would create 1325 feet of additional vehicle storage within the school. Due to security concerns for the school, we suggest adding a privacy fence along the entrance as shown in the proposed sketch. The Project Team stated that the middle school would be receptive to this option.

The risk to project is that the operation of this alternative relies on the school to move the gate and open it at the appropriate times.

A benefit of the option is that this alternative can be implemented regardless of the disposition of the overall project.

VALUE ENGINEERING (VE) PROPOSAL NO. 04

Creative Idea No. IC-08

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add security/barrier fence on middle school property to isolate road; relocate gate to back

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	9	2.7
Justification for Impact Score	Removing traffic queuing off of Hal Rogers Parkway due to the middle school afternoon pickup traffic.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	9	2.3
Justification for Impact Score	Removing traffic queuing off of Hal Rogers Parkway due to middle school afternoon pickup traffic.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	9	1.6
Justification for Impact Score	The maintenance of the privacy fence would be at the discretion of the middle school. No adverse maintenance cost to the transportation facility.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	10	0.7
Justification for Impact Score	No impacts to the public because this can be constructed when school is out and construction time would be short in duration.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	0	0.0
Justification for Impact Score	There is no additional impact to the environment.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	0	0.0
Justification for Impact Score	Construction of this alternate has no impact to project schedule.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	10	0.0
Justification for Impact Score	This could be done within any phase of the project or completed prior to construction of baseline.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	5	0.5
Justification for Impact Score	This doesn't impact land-use but will require coordination with school.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**7.7**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10 Large positive impact to performance	5 Small positive impact to performance
0 No impact to performance	
-5 Small negative impact to performance	-10 Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 04

Creative Idea No. IC-08

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add security/barrier fence on middle school property to isolate road; relocate gate to back
Assumptions & Calculations	No assumptions or calculations noted.

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Privacy Fence	LF				1,325	$20	$26,500
Gate removal and replacement	LS				1	$2,000	$2,000
Subtotal				$0			$28,500
Mark-up - 24.2%				$0			$6,897
TOTAL				$0			$35,000
						Impact to Initial Cost (Baseline Less Proposed)	**($35,000)**

Note: Total costs are rounded to the nearest thousand dollars. **ADD COST**

VALUE ENGINEERING (VE) PROPOSAL NO. 05

Creative Idea No. IC-15

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide an additional access point to the rear entrance of the high school with a left-in and restricted left-out
FUNCTION	**Increase Capacity (Improve traffic flow, reduce delay)**

VALUE PROPOSAL SYNOPSIS:

Allows students direct access to the rear student parking directly from Hal Rogers Parkway and will help alleviate some of the student traffic off of the current entrance during both peak am and pm traffic. Left out is restricted due to safety concerns; however, students can get onto Hal Rogers EB via the Slate Lick Bridge/Street to 638.

Reliability	**Improved**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Maintained**	**($274,000)**

BASELINE CONCEPT:

The baseline does not provide direct access to the student parking lot directly from or to Hal Rogers Parkway.

VE PROPOSAL DESCRIPTION:

Provides a new T-intersection to the Hal Rogers Parkway that is not proposed by the baseline. This new T-intersection allows students direct access to the rear student parking and will remove student traffic from bus traffic and parents dropping off students in the morning and bus traffic and parents picking up student in the afternoon.

ADVANTAGES:	**DISADVANTAGES:**
● Reduces congestion during am and pm student, parent, and bus traffic	● Adds cost
● Works with VE Proposal No. 01 in justifying leaving Parkway 2 lanes as is with intersection improvements	● New intersection to Hal Rogers creates more potential conflict points
● Leaving parkway as is would eliminate bridge replacement	● Left turn lane needs to be added since baseline has 4-ft flush median in this area
● Provides an additional entrance that connects to Hal Rogers in case of an emergency and closure of the existing entrance	● Bridge will need to be lengthened to allow for left and right turn lanes
●	●

OVERALL PERFORMANCE SCORE	**-0.2**

$ COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE CONCEPT:	$0	$0	$0
VE PROPOSAL DESCRIPTION:	$274,000	$0	$274,000
TOTAL (Baseline less Proposed)	($274,000)	$0	($274,000)

ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 05

Creative Idea No. IC-15

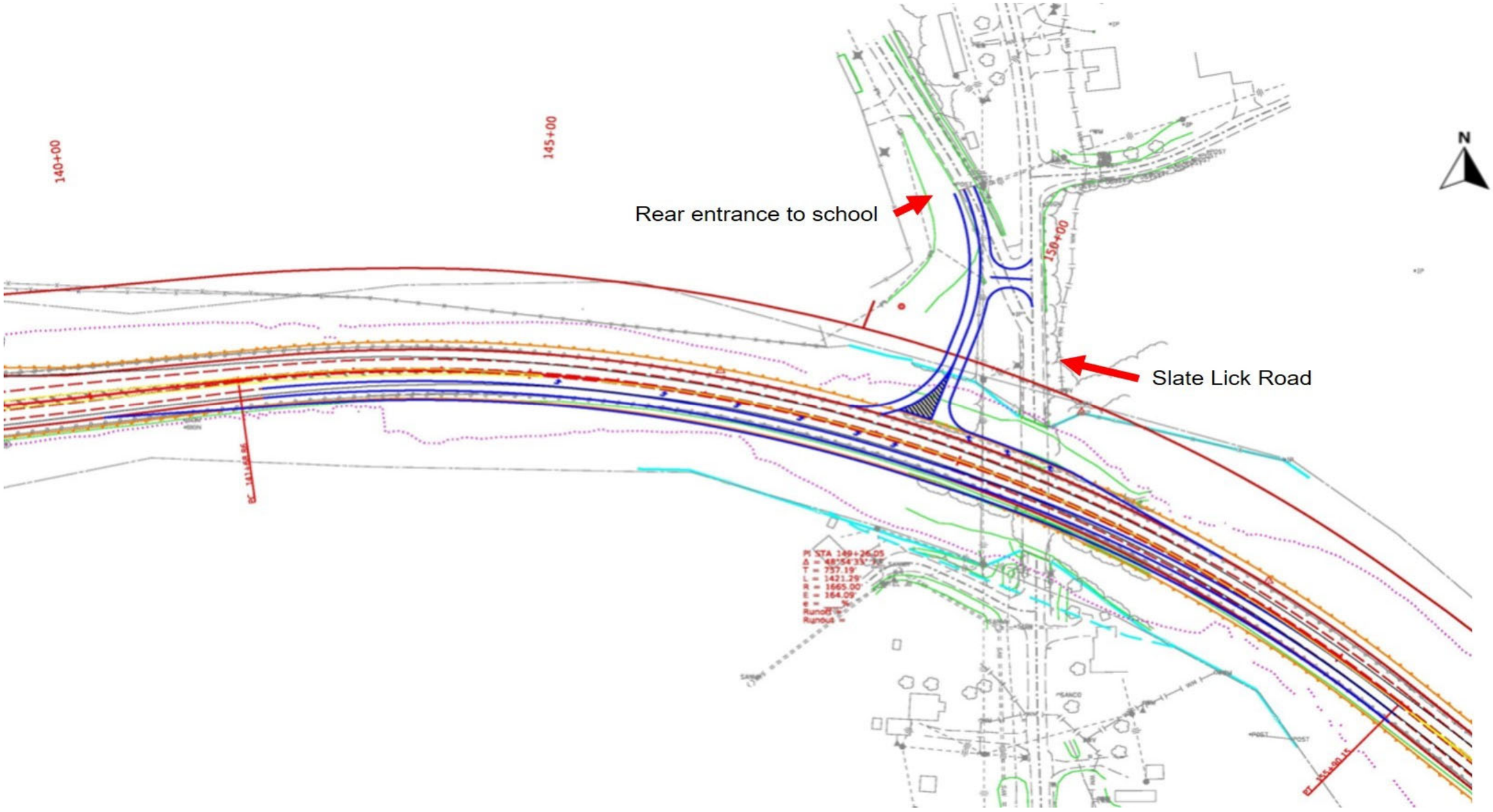
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide an additional access point to the rear entrance of the high school with a left-in and restricted left-out

SKETCH/DIAGRAM: VE PROPOSAL



VALUE ENGINEERING (VE) PROPOSAL NO. 05

Creative Idea No. IC-15

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide an additional access point to the rear entrance of the high school with a left-in and restricted left-out

DISCUSSION & JUSTIFICATION:

Adding a new entrance to the rear student parking has the potential to remove all of the students driving to school from the current entrance that is currently shared with bus traffic as well as parents either dropping off or picking up their kids. This should significantly reduce traffic at the existing entrance during the peak am and pm times, before school and just after school lets out.

A short right turn lane will need to be added under the Slate Lick Bridge to allow WB traffic turning right from the Hal Rogers Parkway into this new rear entrance located west of the existing Slate Lick Bridge. This may be added behind the existing shoulder pier requiring a retaining wall to hold back the existing spill-through slope. A modified "Pork Chop" for right turns only exiting from the rear entrance to WB Hal Rogers is proposed to prevent left turns onto the Hal Rogers. Since the baseline has eliminated the 12-ft TWTL in this area by reducing it to a 4-ft flush median, a 12-ft left turn lane for EB Hal Rogers to this new entrance will need to be developed similar to the left turn lane into Professional Drive at Sta 165+00. The new 12-ft left turn lane and widening the flush median by 8-ft will require the center span of proposed Slate Lick Bridge to be lengthened by about 20-ft. The additional cost to add this new entrance and turn lanes as well as lengthening the bridge will be significant, but the benefits should more than outweigh the additional cost. We believe parents, students, and the community would be mostly in favor of the new entrance, and would have stakeholder acceptance. Reconfiguring Slate Lick Road rear entrance at the extreme skew will be a challenge in meeting traffic and safety requirements where they intersect.

This will complement VE Proposal No. 01 to leave the parkway with a single lane in each direction but improve the intersections. Under this option, the existing Slate Lick Bridge can stay as is and will not need to be replaced, thus being a big cost savings rather than adding cost. The right turn lane can be constructed on the back side of the shoulder pier, using a retaining wall to cut back the existing spill-through slope. In fact, this could be constructed today as a standalone project.

TITLE	Provide an additional access point to the rear entrance of the high school with a left-in and restricted left-out

DISCUSSION & JUSTIFICATION (continued):

Quantities for Cost Estimate:

	Mainline	New Entrance
	1400-ft	350-ft
Cement Stabilized-base	643	250
Asphalt Base	764	180
Asphalt Surface	154	90
Roadway Excavation	1867	2262

VALUE ENGINEERING (VE) PROPOSAL NO. 05

Creative Idea No. IC-15

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide an additional access point to the rear entrance of the high school with a left-in and restricted left-out

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	-5	-1.5
Justification for Impact Score	The added entrance with right and left turn lanes will have a slight negative impact.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	10	2.5
Justification for Impact Score	Direct access to the rear student parking will have a large positive impact to traffic performance during peak periods before school and when school lets out.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	-5	-0.9
Justification for Impact Score	The additional road and entrance will add pavement that will need to be maintained.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	-5	-0.3
Justification for Impact Score	There will be temporary impacts traffic from Slate Lick to the rear parking during construction.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**-0.2**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10 Large positive impact to performance	5 Small positive impact to performance
0 No impact to performance	
-5 Small negative impact to performance	-10 Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 05

Creative Idea No. IC-15

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Provide an additional access point to the rear entrance of the high school with a left-in and restricted left-out
Assumptions & Calculations	No assumptions or calculations noted.

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Cement-stabilized Base	TON	0	$ 24.46	$0	892	$24.46	$21,830
Asphalt Base	TON	0	$ 69.82	$0	944	$69.82	$65,943
Asphalt Surface	TON	0	$ 83.25	$0	244	$83.25	$20,345
Roadway Excavation	CY	0	$ 6.65	$0	4,128	$6.65	$27,453
Pork Chop Raised Median	SY	0	$150	$0	100	$150	$15,000
Striping	LS	0	$15,000	$0	1	$15,000	$15,000
Signing	LS	0	$5,000	$0	1	$5,000	$5,000
Lighting	LS	0	$50,000	$0	1	$50,000	$50,000
Subtotal				$0			$220,571
Mark-up - 24.2%				$0			$53,378
TOTAL				$0			$274,000
						Impact to Initial Cost (Baseline Less Proposed)	**($274,000)**

Note: Total costs are rounded to the nearest thousand dollars. **ADD COST**

VALUE ENGINEERING (VE) PROPOSAL NO. 06

Creative Idea No. IC-23

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a dual-left from northbound KY 192 onto Hal Rogers Parkway
FUNCTION	**Increase Capacity (Improve traffic flow, reduce delay)**

VALUE PROPOSAL SYNOPSIS:

The northbound left turning movement from KY 192 onto the Hal Rogers Parkway experiences significant queuing, delays, and poor level of service due to the high volume demand and limited green time. A second, designated, left turn lane should be constructed to provide more capacity for this movement.

Reliability	**Maintained**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Degraded**	**($100,000)**

BASELINE CONCEPT:

There would be no change to the baseline concept. This is in addition to the baseline concept.

VE PROPOSAL DESCRIPTION:

Construct a designated left turn lane in the northbound left turning movement at the intersection of Hal Rogers Parkway and KY 192.

ADVANTAGES:	DISADVANTAGES:
● Increases capacity in the movement	● Additional construction cost
● Decreases delays in the movement	● Southbound right turning movement would no longer operate as free flowing
● Decreases queue lengths in the movement	●
● Improves safety with reduced opportunity for rear ends and vehicles speeding thru to make green light	●
● Overall improvement to the intersection delays and level of service	●
●	●

OVERALL PERFORMANCE SCORE	**2.3**

$ COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE CONCEPT:	$0	$0	$0
VE PROPOSAL DESCRIPTION:	$100,000	$0	$100,000
TOTAL (Baseline less Proposed)	($100,000)	$0	($100,000)
			ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 06

Creative Idea No. IC-23

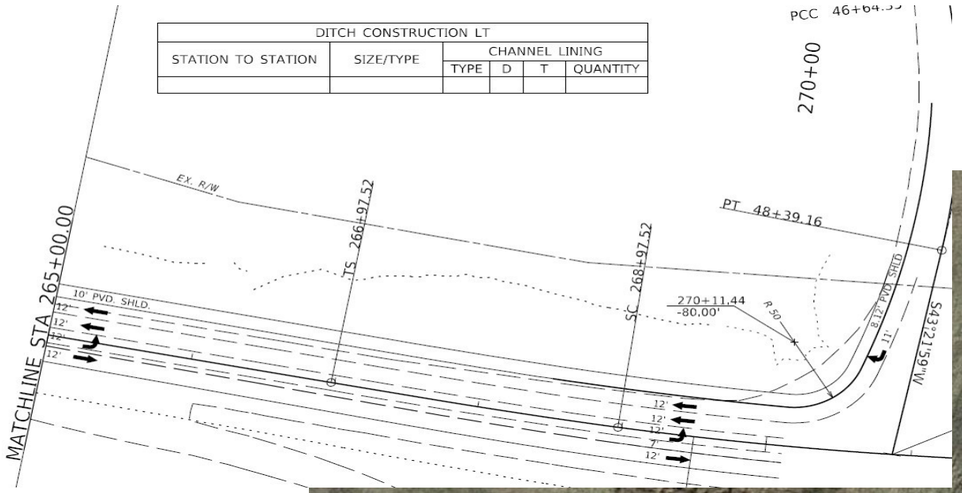
Kentucky Transportation Cabinet

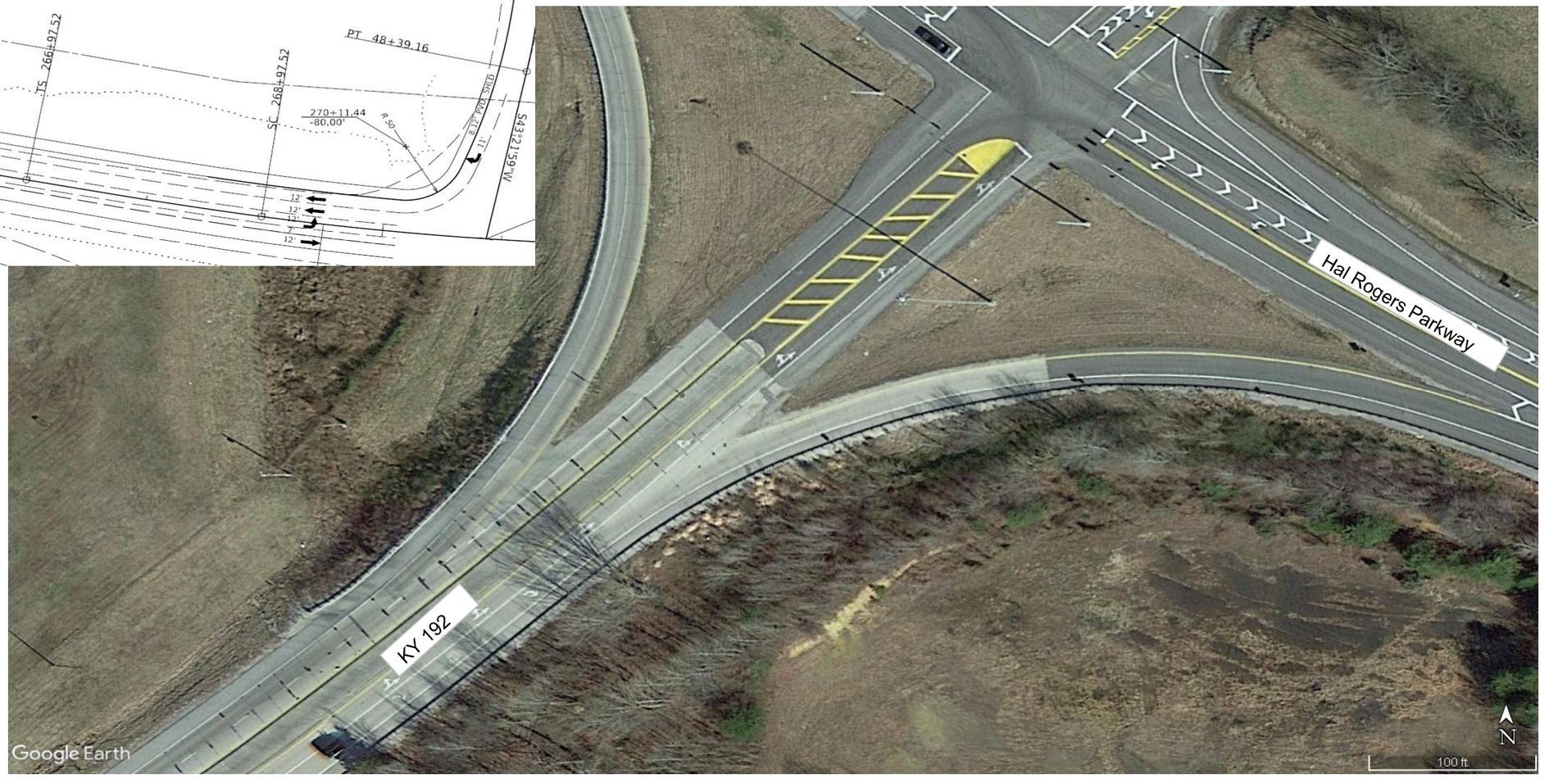
Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a dual-left from northbound KY 192 onto Hal Rogers Parkway

SKETCH/DIAGRAM: BASELINE CONCEPT





VALUE ENGINEERING (VE) PROPOSAL NO. 06

Creative Idea No. IC-23

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a dual-left from northbound KY 192 onto Hal Rogers Parkway

SKETCH/DIAGRAM: VE PROPOSAL

VALUE ENGINEERING (VE) PROPOSAL NO. 06

Creative Idea No. IC-23

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a dual-left from northbound KY 192 onto Hal Rogers Parkway

DISCUSSION & JUSTIFICATION:

A known issue at the intersection of Hal Rogers Parkway and KY 192 is the northbound left turning movement from KY 192 onto Hal Rogers Parkway westbound. This signal currently operates with split phasing between the northbound and southbound traffic. The baseline design showed an additional lane being constructed in the Hal Rogers Parkway westbound direction beginning at KY 192. The baseline showed the southbound right turning movement free flowing onto the parkway and utilizing the added through lane. Due to the low volume in the southbound direction, it is recommended that an additional left turn lane be constructed in the northbound approach to provide a dual-left onto Hal Rogers Parkway. The information phase for this project made no mention of any issues in the southbound movements; therefore, having the southbound movements continuing to operate as split phased movements with the northbound traffic should have no negative effect on the southbound movement or require and existing issue to remain.

The proposed sketch and cost estimate assume a turn lane with 300 feet of storage be taken from the raised median along KY 192. The median would be removed and roadway excavation performed to match the depth of the proposed pavement along mainline. A new header curb would be constructed for where the island was reduced in size and a new lane poured to match the mainline pavement design. The stop bar for the added turn lane should be placed such that left turning movements from Hal Rogers Parkway onto KY 192 will be able to avoid contact with vehicles queued in the added turn lane.

Based on the highway capacity analysis performed using estimated turning movement volumes, the baseline intersection operates as a level of service (LOS) "F" with an intersection delay of 118.9 seconds. With this proposal, the conditions improve to a LOS "D" with a delay of 39.4 seconds. The queue for the northbound lefts reduces from 1470 ft in a single lane to 615 feet in two lanes.

VALUE ENGINEERING (VE) PROPOSAL NO. 06

Creative Idea No. IC-23

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a dual-left from northbound KY 192 onto Hal Rogers Parkway

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	8	2.0
Justification for Impact Score	An additional lane for northbound left turning movements, will increase the number of vehicles able to pass through the intersection during the northbound green time. The intersection already appears to be split phasing time; therefore, no changes to the phasing would be required. The additional lane would also provide more storage capacity, reduce delay, and reduce queue lengths in the northbound direction.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	-2	-0.1
Justification for Impact Score	An additional lane is going in the place of an existing median so thoughts on the maintenance of traffic would be to keep the existing lane open by utilizing the outside shoulder, if needed, so that it continues to operate during construction. There would be speed reductions, "rubber necking effects" and possible short term closures when finishing work and trying the lanes together. The area is not very suburban so noise impacts would be minimal and would mostly consist of visual impacts and slightly longer delays at an already busy intersection.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	-1	0.0
Justification for Impact Score	The impact is minimal but there would be some time added to cut out the island and pour the new lane.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	5	0.5
Justification for Impact Score	Providing more turning capacity at this busy intersection will benefit the commercial businesses around them and promote vehicles that may have avoided this intersection due to delay timing to travel through this area.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**2.3**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10	Large positive impact to performance	5	Small positive impact to performance
0	No impact to performance		
-5	Small negative impact to performance	-10	Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 06

Creative Idea No. IC-23

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a dual-left from northbound KY 192 onto Hal Rogers Parkway
Assumptions & Calculations	No assumptions or calculations noted.

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
CSB	TON				149	$24	$3,645
CEMENT STABILIZED ROADBED	SQYD				433	$3	$1,490
ASPHALT SEAL AGGREGATE	TON				4	$83	$334
ASPHALT SEAL COAT	TON				1	$742	$742
CL3 ASPH BASE 1.00D PG64-22	TON				185	$70	$12,917
CL3 ASPH SURF 0.38A PG64-22	TON				36	$83	$2,997
ISLAND HEADER CURB TYPE 1	LF				355	$62	$22,092
ROADWAY EXCAVATION	CUYD				20	$7	$133
PAVE STRIPING - PERM PAINT - 4 IN	LF				1,010	$0	$232
PAVE MARKING - THERMO STOP BAR - 24 IN	LF				12	$16	$186
PAVE MARKING - THERMO CROSS-HATCH	SQFT				1,390	$3	$4,809
PAVE MARKING - PRE THERM CURV ARROW	EACH				4	$116	$464
WATERBLAST EXISTING STRIPE	LF				400	$4	$1,460
REMOVE CONCRETE MEDIAN	SQYD				433	$57	$24,690
INSTALL LED SIGNAL - 3 SECTION	EACH				1	$351	$351
LOOP DETECTORS	EACH				2	$2,000	$4,000
Subtotal				$0			$80,542
Mark-up - 24.2%				$0			$19,491
TOTAL				$0			$100,000
						Impact to Initial Cost (Baseline Less Proposed)	**($100,000)**

Note: Total costs are rounded to the nearest thousand dollars.

ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 08

Creative Idea No. PP-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a sidewalk on the bridge
FUNCTION	**Protect People**

VALUE PROPOSAL SYNOPSIS:

The baseline requires the existing Slate Lick Bridge to be replaced with a new bridge that has a total width of 33-ft. A 5-ft sidewalk can be added by adding 3-ft (36-ft total width), with minimal additional bridge cost that will significantly increase safety for kids walking to school across this bridge.

Reliability	**Improved**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Maintained**	**($113,000)**

BASELINE CONCEPT:

The baseline bridge has two 11-ft lanes with 4-ft shoulders and single sloped barriers

VE PROPOSAL DESCRIPTION:

Add a 5-ft sidewalk but decrease the shoulder on the sidewalk side from 4-ft to 2-ft and the 1.5-ft wide single sloped barrier is replaced with a 1-ft wide straight wall with a handrail along the proposed sidewalk.

ADVANTAGES:	DISADVANTAGES:
● Provides safety for pedestrians crossing the bridge with a relatively small additional bridge cost	● Increases the cost of the proposed bridge
● Allows for future sidewalk connectivity along Slate Lick Road	●
● May increase walkers to school	●
●	●
●	●
●	●

OVERALL PERFORMANCE SCORE	**2.5**

$ COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE CONCEPT:	$1,236,000	$0	$1,236,000
VE PROPOSAL DESCRIPTION:	$1,349,000	$0	$1,349,000
TOTAL (Baseline less Proposed)	($113,000)	$0	($113,000)
			ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 08

Creative Idea No. PP-02

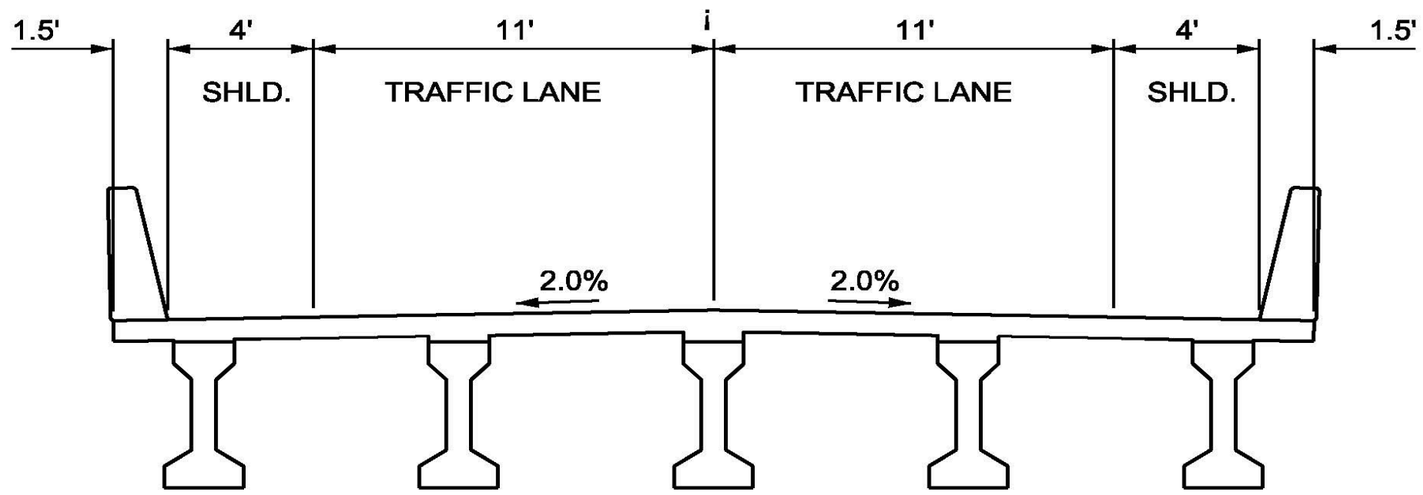
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a sidewalk on the bridge

SKETCH/DIAGRAM: BASELINE CONCEPT



BRIDGE SECTION

VALUE ENGINEERING (VE) PROPOSAL NO. 08

Creative Idea No. PP-02

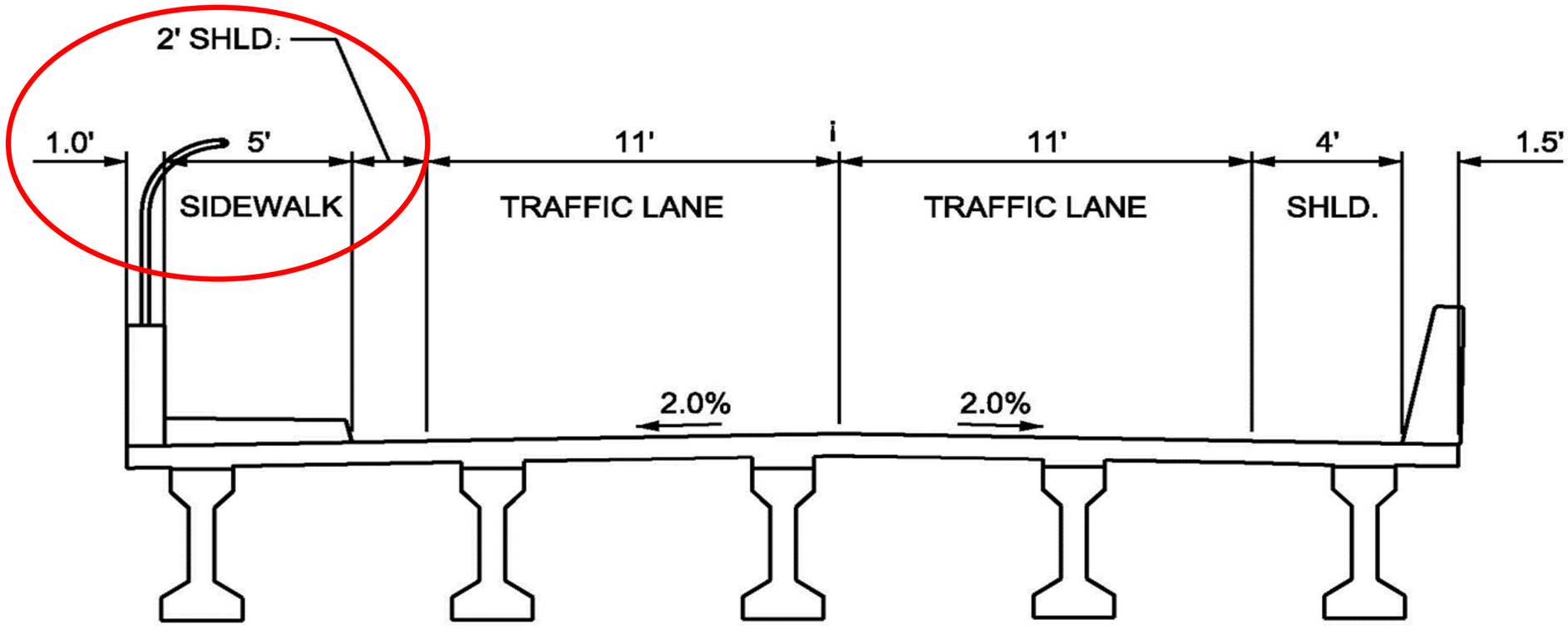
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a sidewalk on the bridge

SKETCH/DIAGRAM: VE PROPOSAL



BRIDGE SECTION

VALUE ENGINEERING (VE) PROPOSAL NO. 08

Creative Idea No. PP-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a sidewalk on the bridge

DISCUSSION & JUSTIFICATION:

The baseline is replacing the existing Slate Run Bridge with a new bridge because the existing shoulder piers are too close to allow the proposed 5-lane roadway section with 12-ft shoulders to pass through.

With the bridge being replaced, now is the time to add a sidewalk. Even though there are currently no sidewalks along Slate Lick Road, school children walking to school along Slate Lick Road from the south side of Hal Rogers Parkway have no place of safety in case of an errant car while walking across the bridge.

Adding a sidewalk will increase the cost of the bridge by about 9% which is a small price to pay for the added safety for children walking or riding their bikes to school. This also allows for a future project to add a sidewalk along Slate Lick Road.

The proposal shows the sidewalk to be constructed on the school side so children do not need to cross Slate Lick Road when they arrive at school or leave school in the afternoon. Since the proposal reduces the shoulder on the sidewalk side from 4-ft to 2-ft, it may make sense to reduce the other shoulder to 2-ft as well. If this is done then this proposal widens the proposed baseline bridge by 1-ft which will increase cost minimally.

VALUE ENGINEERING (VE) PROPOSAL NO. 08

Creative Idea No. PP-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a sidewalk on the bridge

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	10	2.5
Justification for Impact Score	Large positive impact to pedestrian safety.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**2.5**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10	Large positive impact to performance	5	Small positive impact to performance
0	No impact to performance		
-5	Small negative impact to performance	-10	Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 08

Creative Idea No. PP-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Add a sidewalk on the bridge
Assumptions & Calculations	The VE Team ratioed the lump sum bridge cost by the increase in bridge width: (36/33) x Lump Sum

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
New Bridge	LS	1	$995,440	$995,440	1	$1,085,935	$1,085,935
Subtotal				$995,440			$1,085,935
Mark-up - 24.2%				$240,896			$262,796
TOTAL				$1,236,000			$1,349,000
						Impact to Initial Cost (Baseline Less Proposed)	**($113,000)**

Note: Total costs are rounded to the nearest thousand dollars.

ADD COST

VALUE ENGINEERING (VE) PROPOSAL NO. 09

Creative Idea No. SR-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs
FUNCTION	**Span Roadway**

VALUE PROPOSAL SYNOPSIS:

The cost of adding culvert pipes is small compared to the bridge length required to span over the roadside ditches. Using tie backs is a special design not typical on KYTC projects but will be much more economical that a tall cantilevered wall and will allow the culvert pipes to pass through without concern of interference with the large footer required for a cantilever wall.

Reliability	**Maintained**	**Functionality**	**Maintained**	**$ Initial Cost Avoidance (Add)**
O&M	**Improved**	**Schedule Impact**	**Maintained**	**$468,000**

BASELINE CONCEPT:

Baseline uses a 140-ft single span bridge that span over the 5-lane section with 12-ft shoulders and 8-ft ditches.

VE PROPOSAL DESCRIPTION:

Construct 94-ft single span bridge to clear span the 5-lanes and shoulders. The roadside ditches are carried through the bridge via pipe culverts behind the abutments. Using tie-backs, the abutments are supported on single row piles so there is no footing that will interfere with the culvert pipes that pass through behind the abutments.

ADVANTAGES:	DISADVANTAGES:
● Bridge span is reduced by 46, thus having a significant superstructure cost savings	● Non-standard KYTC design may be difficult to get KYTC approval
● Using single row pile abuts. with tie backs has a significant cost savings versus cantilevered abutments	● Culvert pipes will require maintenance
● Lowers bridge depth by 1.5' thus shortening tie-in on each approach by 150-ft	●
●	●
●	●

OVERALL PERFORMANCE SCORE	**0.5**

$ COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE CONCEPT:	$1,429,000	$117,000	$1,546,000
VE PROPOSAL DESCRIPTION:	$961,000	$78,000	$1,039,000
TOTAL (Baseline less Proposed)	$468,000	$39,000	$507,000

AVOID COST

VALUE ENGINEERING (VE) PROPOSAL NO. 09

Creative Idea No. SR-03

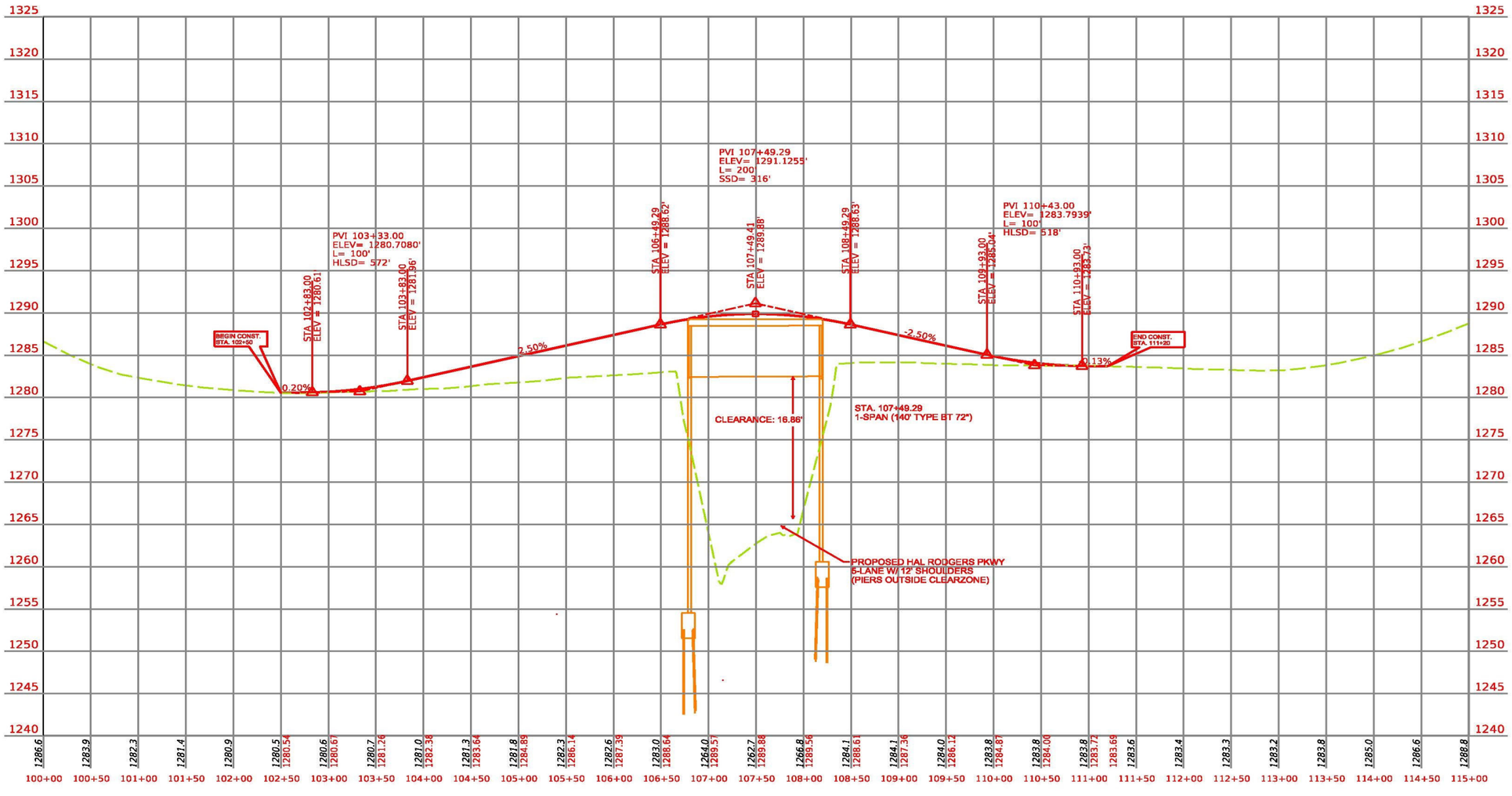
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs

SKETCH/DIAGRAM: BASELINE CONCEPT



VALUE ENGINEERING (VE) PROPOSAL NO. 09

Creative Idea No. SR-03

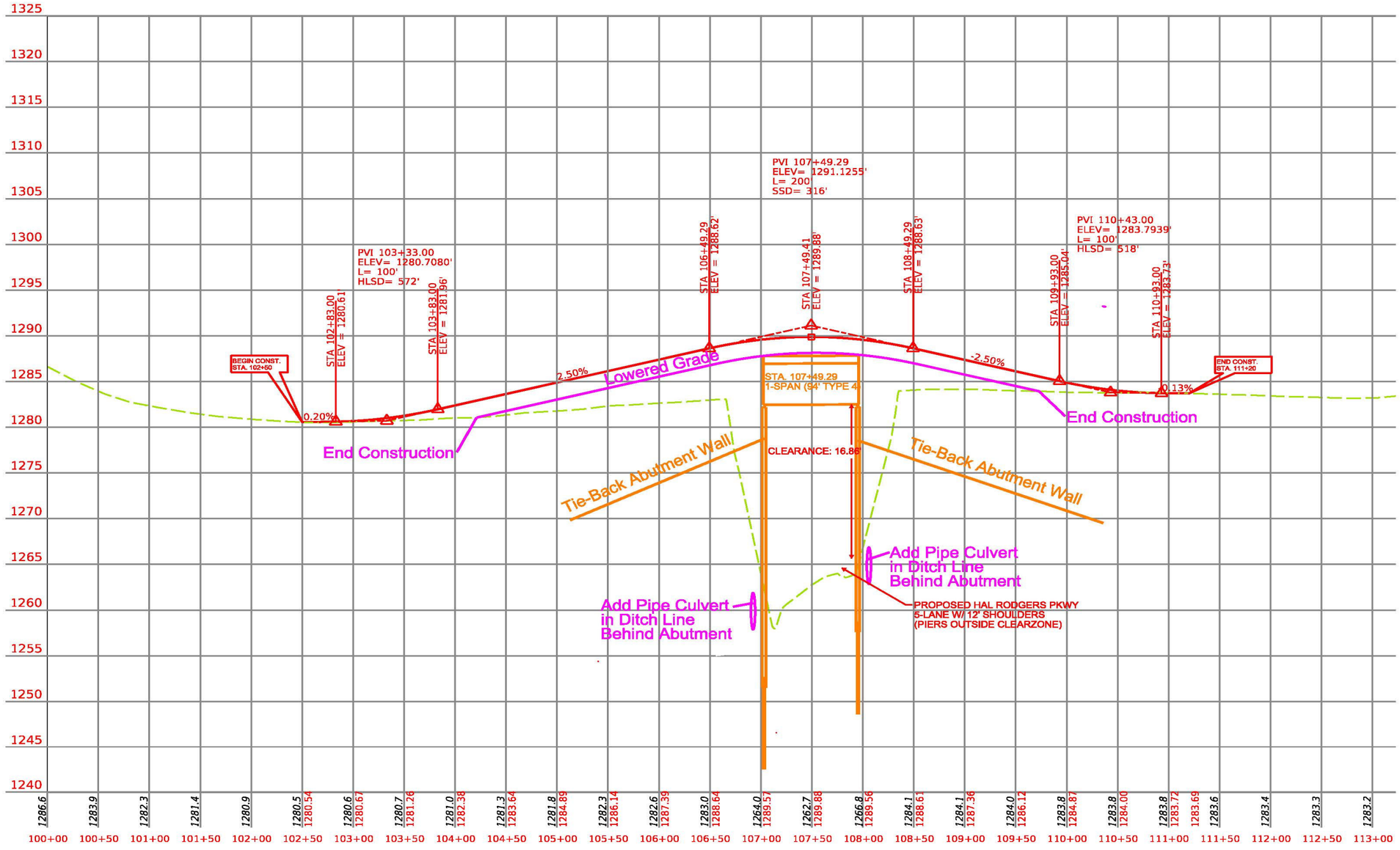
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs

SKETCH/DIAGRAM: VE PROPOSAL



VALUE ENGINEERING (VE) PROPOSAL NO. 09

Creative Idea No. SR-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs

DISCUSSION & JUSTIFICATION:

The baseline proposes a 140-ft single span bridge to span over 5 traffic lanes, 12-ft shoulders, and beyond the outside banks of the roadside ditches. 6-ft deep bulb T beams supported on full height abutments designed as a cantilever retaining walls with 2 rows of piles are proposed.

The VE proposal places the full height abutments behind the guardrail along each shoulder so it spans over 5-lanes and two 12-ft shoulders. Taking the skew into account, a 94-ft span is required and 4.5-ft deep, AASHTO Type 4 beams are proposed. Storm water in the roadside ditches is carried through the bridge in culvert pipes that align with the proposed roadside ditches and are in the approach embankment behind the abutments.

The VE Team proposes to use single row piles to support the full height abutment walls with the horizontal earth pressure resisted with tie backs so as to eliminate the large footings required for the cantilever abutments that could potentially interfere with the installation of the culvert pipes located behind the abutments. Not having the large footers will also cut way back on the amount of existing approach fill that will have to be cut out for construction. In-fact, the tie-back will be drilled and grouted into the existing approach embankments. This tied back abutment is a much more efficient design than the cantilevered abutment and could cut the abutment cost nearly in half. The shallower beams will significantly reduce the approach embankment fill and will allow the approaches to tie down to the existing Slate Lick Road 150-ft sooner on each approach. The main risk is that a tied back abutment wall is not a standard practice for KYTC so KYTC may be hesitant to grant approval on a type of design they don't have a history of experience with.

Another benefit with a shorter bridge, is reduced future maintenance cost such as the cost to do a bridge overlay will cost 1/3 less since there is 1/3 less bridge slab to overlay.

VALUE ENGINEERING (VE) PROPOSAL NO. 09

Creative Idea No. SR-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	5	0.9
Justification for Impact Score	Less bridge has less future maintenance.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	-5	-0.3
Justification for Impact Score	Piers being constructed closer to existing shoulder may have small negative impact to MOT.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**0.5**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10 Large positive impact to performance	5 Small positive impact to performance
0 No impact to performance	
-5 Small negative impact to performance	-10 Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 09

Creative Idea No. SR-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs
Assumptions & Calculations	No assumptions or calculations noted.

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Bridge	LS	1	$995,440	$995,440	1	$668,367	$668,367
Slate Lick Pavement	LF	785	$ 144.56	$113,483	531	$ 144.56	$76,764
Slate Lick Roadway	LF	785	$ 53.42	$41,933	531	$ 53.42	$28,365
Subtotal				$1,150,856			$773,495
Mark-up - 24.2%				$278,507			$187,186
TOTAL				$1,429,000			$961,000
						Impact to Initial Cost (Baseline Less Proposed)	**$468,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE ENGINEERING (VE) PROPOSAL NO. 09

Creative Idea No. SR-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs

Assumptions				
Interest/Discount Rate(%):	**2.4%**		**Economic Life (yrs):**	50

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Concept**		**Value Proposal**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Slab overlay	20	$115,500	$71,876	$77,550	$48,259
2	Slab overlay	40	$115,500	$44,728	$77,750	$30,109
3						
4						
5						
6						
7						
8						
9						
10						
Total Salvage & Replacement Costs			**$231,000**	**$116,604**	**$155,300**	**$78,369**

Annual Costs (pres worth calculated over 50 yrs)		**Baseline Concept**		**Value Proposal**	
Item	**Description**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1					
2					
3					
4					
5					
Total Annual Costs		**$0**	**$0**	**$0**	**$0**

SUMMARY	**Baseline Present Worth**	**Proposed Present Worth**
Total Present Worth (salvage+annual pres worth	**$117,000**	**$78,000**
RESULTS (Proposed less Baseline)	**AVOID COST of $39,000**	

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

Assumptions & Calculations: Any assumptions made or support calculations that were developed to support the quantities used in the LCC should be included.

VALUE ENGINEERING (VE) PROPOSAL NO. 10

Creative Idea No. SL-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Remove the asphalt base layer from the overlay of the existing pavement
FUNCTION	**Support Load**

VALUE PROPOSAL SYNOPSIS:

This proposal is to remove the 3.75 inch asphalt base layer with the 1.5 inch asphalt surface pavement overlay.

Reliability	**Maintained**	**Functionality**	**Maintained**	**$ Initial Cost Avoidance (Add)**
O&M	**Degraded**	**Schedule Impact**	**Improved**	**$857,000**

BASELINE CONCEPT:

The baseline concept includes a 3.75 inch asphalt base layer with a 1.5 inch asphalt surface for the overlay of existing pavement.

VE PROPOSAL DESCRIPTION:

Remove the 3.75 inch asphalt base layer from the existing pavement overlay.

ADVANTAGES:	DISADVANTAGES:
● Reduces cost	● Potentially an increase in future maintenance cost
● Reduces construction time	●
●	●
●	●

OVERALL PERFORMANCE SCORE	**-0.1**

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$857,000	$0	$857,000
VE PROPOSAL DESCRIPTION:	$0	$0	$0
TOTAL (Baseline less Proposed)	$857,000	$0	$857,000

AVOID COST

VALUE ENGINEERING (VE) PROPOSAL NO. 10

Creative Idea No. SL-02

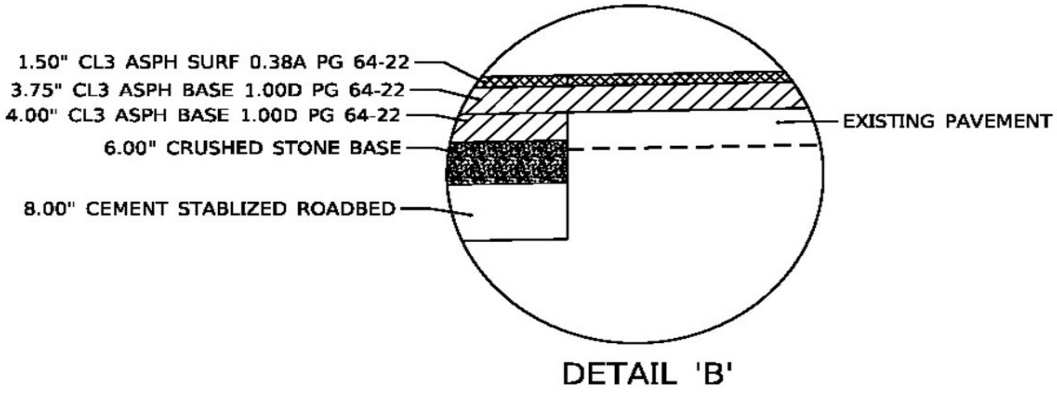
Kentucky Transportation Cabinet

Hal Rogers Parkway

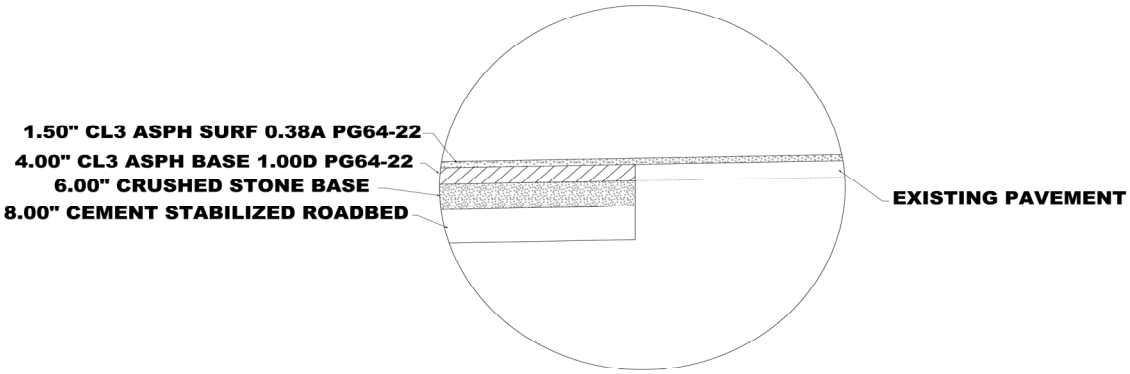
MP 1.089 to MP 3.877 (Laurel County)

TITLE	Remove the asphalt base layer from the overlay of the existing pavement

SKETCH/DIAGRAM: BASELINE CONCEPT & VE PROPOSAL



DETAIL 'B'



VALUE ENGINEERING (VE) PROPOSAL NO. 10

Creative Idea No. SL-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Remove the asphalt base layer from the overlay of the existing pavement

DISCUSSION & JUSTIFICATION:

The proposed typical section includes a 3.75 inch asphalt base layer for the existing 1.5 inch asphalt surface pavement overlay. This value engineering concept is to remove the 3.75 inch asphalt base layer to the overlay pavement design. This recommendation stems from the project team explaining during the information phase that the existing pavement appears to be in good condition. With additional through lanes proposed in the baseline, the amount of traffic per lane will be reduced which is why the VE Team believes that the additional pavement layer may be unnecessary. Pavement cores should be obtained prior to making a final decision on the pavement design to verify if the additional base layer is necessary.

The benefit of this alternate is that you reduce pavement cost and slightly reduce the construction schedule. The removal of the 3.75 inch asphalt base layer reduces the cost by $857,000. The disadvantage of this alternative would be additional maintenance costs in the future if the pavement does not provide adequate structural support. This would be verified with core samples of the existing pavement. The VE Team agrees that if the core samples show that the additional base layer is needed for structural support then it should be constructed.

VALUE ENGINEERING (VE) PROPOSAL NO. 10

Creative Idea No. SL-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Remove the asphalt base layer from the overlay of the existing pavement

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	-2	-0.4
Justification for Impact Score	Potential future increase in maintenance cost due to less pavement.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	2	0.1
Justification for Impact Score	Utilizing this option reduces construction time.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	2	0.1
Justification for Impact Score	Slightly reduces construction schedule.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	5	0.0
Justification for Impact Score	This option saves approximately $857k which may allow for constructing more of the project.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**-0.1**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10 Large positive impact to performance	5 Small positive impact to performance
0 No impact to performance	
-5 Small negative impact to performance	-10 Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 10

Creative Idea No. SL-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Remove the asphalt base layer from the overlay of the existing pavement
Assumptions & Calculations	No assumptions or calculations noted.

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
CL2 ASPH BASE 1.00D PG64-22	Ton	9,888	$70	$690,380	0	$70	$0
Subtotal				$690,380			$0
Mark-up - 24.2%				$167,072			$0
TOTAL				$857,000			$0
						Impact to Initial Cost (Baseline Less Proposed)	**$857,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE ENGINEERING (VE) PROPOSAL NO. 11

Creative Idea No. SL-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Modify typical section to use 6' paved shoulders in lieu of 10'
FUNCTION	**Support Load**

VALUE PROPOSAL SYNOPSIS:

Use a 6-foot paved shoulder with the baseline 12-foot usable shoulder. This option reduces cost without sacrificing operations of the facility.

Reliability	**Maintained**	**Functionality**	**Maintained**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Maintained**	**$350,000**

BASELINE CONCEPT:

The baseline Hal Rogers typical section includes a 12-foot shoulder with 10 feet paved.

VE PROPOSAL DESCRIPTION:

The proposed typical section is a 12-foot shoulder with 6 feet paved.

ADVANTAGES:	DISADVANTAGES:
● Lowers initial cost	● Less paved shoulder for semi pull-off
● Less pavement maintenance cost	● More shoulder maintenance cost
●	● Loss of potential use of right turns off of shoulder
●	●

OVERALL PERFORMANCE SCORE	**-0.2**

$ COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE CONCEPT:	$1,349,000	$0	$1,349,000
VE PROPOSAL DESCRIPTION:	$999,000	$0	$999,000
TOTAL (Baseline less Proposed)	$350,000	$0	$350,000
			AVOID COST

VALUE ENGINEERING (VE) PROPOSAL NO. 11

Creative Idea No. SL-03

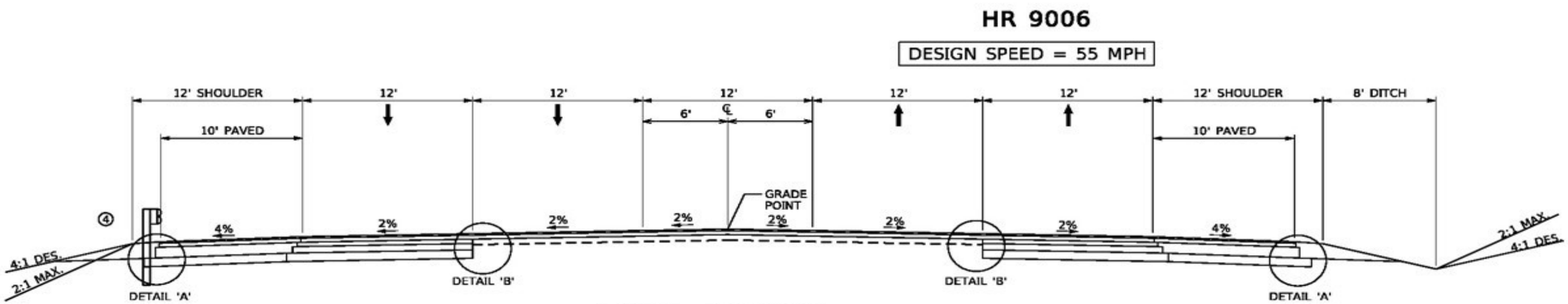
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Modify typical section to use 6' paved shoulders in lieu of 10'

SKETCH/DIAGRAM: BASELINE CONCEPT



RURAL (NORMAL)
STA 134+00 TO STA 139+01.11
STA 158+57.90 TO STA 266+15.05

VALUE ENGINEERING (VE) PROPOSAL NO. 11

Creative Idea No. SL-03

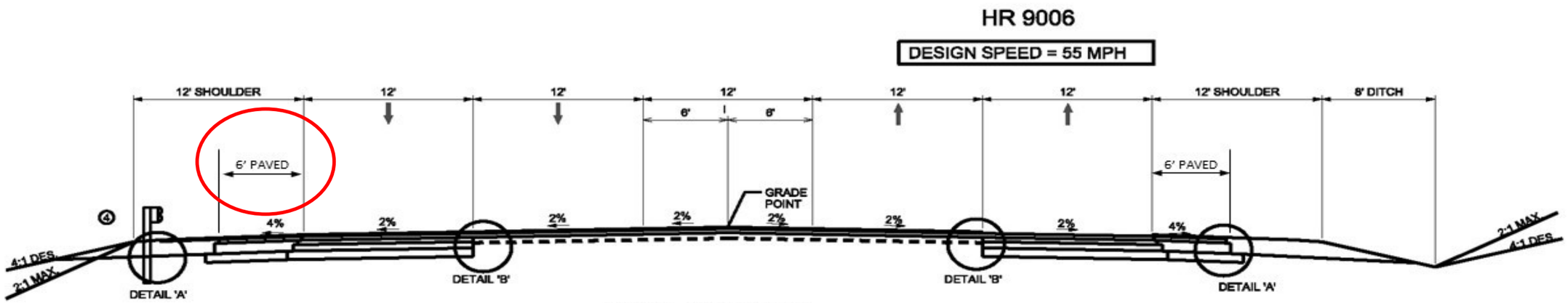
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Modify typical section to use 6' paved shoulders in lieu of 10'

SKETCH/DIAGRAM: VE PROPOSAL



RURAL (NORMAL)
STA 134+00 TO STA 139+01.11
STA 158+57.90 TO STA 266+15.05

VALUE ENGINEERING (VE) PROPOSAL NO. 11

Creative Idea No. SL-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Modify typical section to use 6' paved shoulders in lieu of 10'

DISCUSSION & JUSTIFICATION:

The proposed baseline typical section is 5-lane typical section with 12-foot shoulders (10 feet paved). Approximately 2000 feet of the typical section reduces the middle lane to a 4-foot median. This alternative proposes 12-foot shoulders (6 feet paved). The number of lanes and inside median width remain the same as baseline.

The benefit of this alternate is that you maintain the 12-foot usable shoulder and reduce the cost by $350,000. The two disadvantages of this alternate is the loss of paved area for a semi-truck or vehicle to pull off for an emergency situation, and one loses the potential to use a paved shoulder for right turn movements.

VALUE ENGINEERING (VE) PROPOSAL NO. 11

Creative Idea No. SL-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Modify typical section to use 6' paved shoulders in lieu of 10'

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	0	0.0
Justification for Impact Score	No perceived impact to performance. The basic layout is the same as baseline.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	-1	-0.3
Justification for Impact Score	There would be a perceived loss safe pedestrian use of shoulder since not paved.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	0	0.0
Justification for Impact Score	There would potential be more cost added to shoulder maintenance but less cost for pavement maintenance. The cost for each is assumed to balance out.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	1	0.1
Justification for Impact Score	This could be a minimal benefit to environment by reducing the paved surface storm runoff.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	2	0.0
Justification for Impact Score	This option allows for more work to be done at less cost.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**-0.2**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10 Large positive impact to performance	5 Small positive impact to performance
0 No impact to performance	
-5 Small negative impact to performance	-10 Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 11

Creative Idea No. SL-03

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Modify typical section to use 6' paved shoulders in lieu of 10'
Assumptions & Calculations	No assumptions and calculations noted.

DESIGN ELEMENT	**BASELINE CONCEPT**				**VE PROPOSAL**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
CL3 ASPH SURF 0.38B PG64-22		2,484	$83	$206,793	1,491	$83	$124,126
CL3 ASPH BASE 1.00D PG64-22		6,624	$69	$455,864	3,726	$69	$256,423
CSB		17,314	$24	$423,500	17,314	$24	$423,500
Subtotal				$1,086,157			$804,050
Mark-up - 24.2%				$262,850			$194,580
TOTAL				$1,349,000			$999,000
						Impact to Initial Cost (Baseline Less Proposed)	**$350,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE ENGINEERING (VE) PROPOSAL NO. 12

Creative Idea No. SW-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Shift alignment to south and widen one side only of bridge over Little Laurel River
FUNCTION	**Span Water**

VALUE PROPOSAL SYNOPSIS:

Shift alignment 17-feet to the south so existing bridge over Little Laurel River is widened to one side only. This also shifts the alignment out of the rock cut at station 250+00. We have used 55:1 tapers before the bridge and after the rock cut to get back on the baseline alignment.

Reliability	**Improved**	**Functionality**	**Improved**	**$ Initial Cost Avoidance (Add)**
O&M	**Maintained**	**Schedule Impact**	**Maintained**	**$603,000**

BASELINE CONCEPT:

The existing bridge over Little Laurel River is proposed to be widened 17-feet on each side.

VE PROPOSAL DESCRIPTION:

Shift alignment 17-feet to the south so existing bridge over Little Laurel River is widened to one side only. This also shifts the alignment out of the rock cut at station 250+00. The VE Team has offered 55:1 tapers before the bridge and after the rock cut to tie into the baseline alignment.

ADVANTAGES:	DISADVANTAGES:
● Widening to one side only will reduce cost and improve MOT	● South side is closer to ROW and could require some acquisition on the right side
● Reduces the rock cut from station 248+00 to station 252+00	● Wetlands could be impacted
● Reduces ROW acquisition on the left side	●
● Proposed guardrail on left side is eliminated as existing guardrail remains as is	●
● May be easier for construction to only do one side; also, don't have to do any blasting of the rock cut	●
●	●

OVERALL PERFORMANCE SCORE	**0.9**

$ COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE CONCEPT:	$2,085,000	$0	$2,085,000
VE PROPOSAL DESCRIPTION:	$1,482,000	$0	$1,482,000
TOTAL (Baseline less Proposed)	$603,000	$0	$603,000

AVOID COST

VALUE ENGINEERING (VE) PROPOSAL NO. 12

Creative Idea No. SW-02

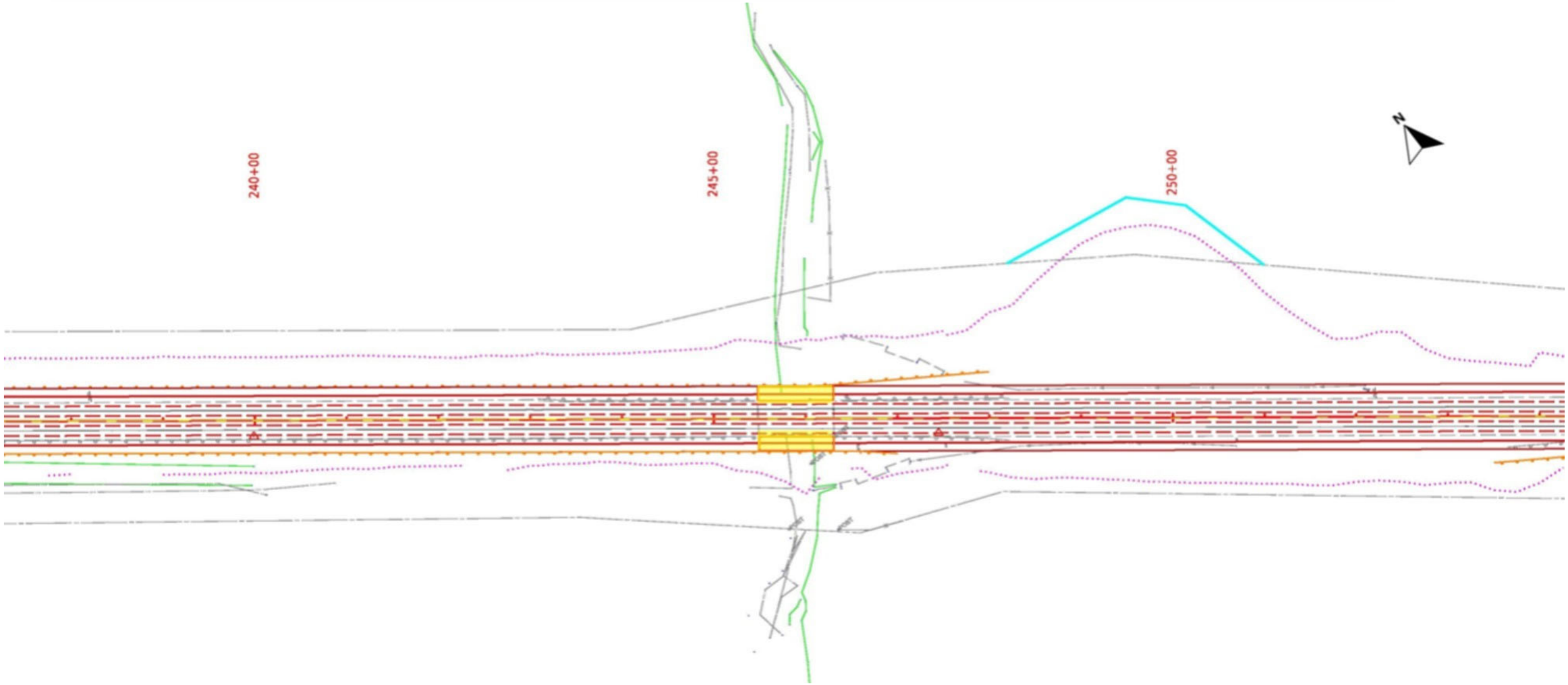
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Shift alignment to south and widen one side only of bridge over Little Laurel River

SKETCH/DIAGRAM: BASELINE CONCEPT



VALUE ENGINEERING (VE) PROPOSAL NO. 12

Creative Idea No. SW-02

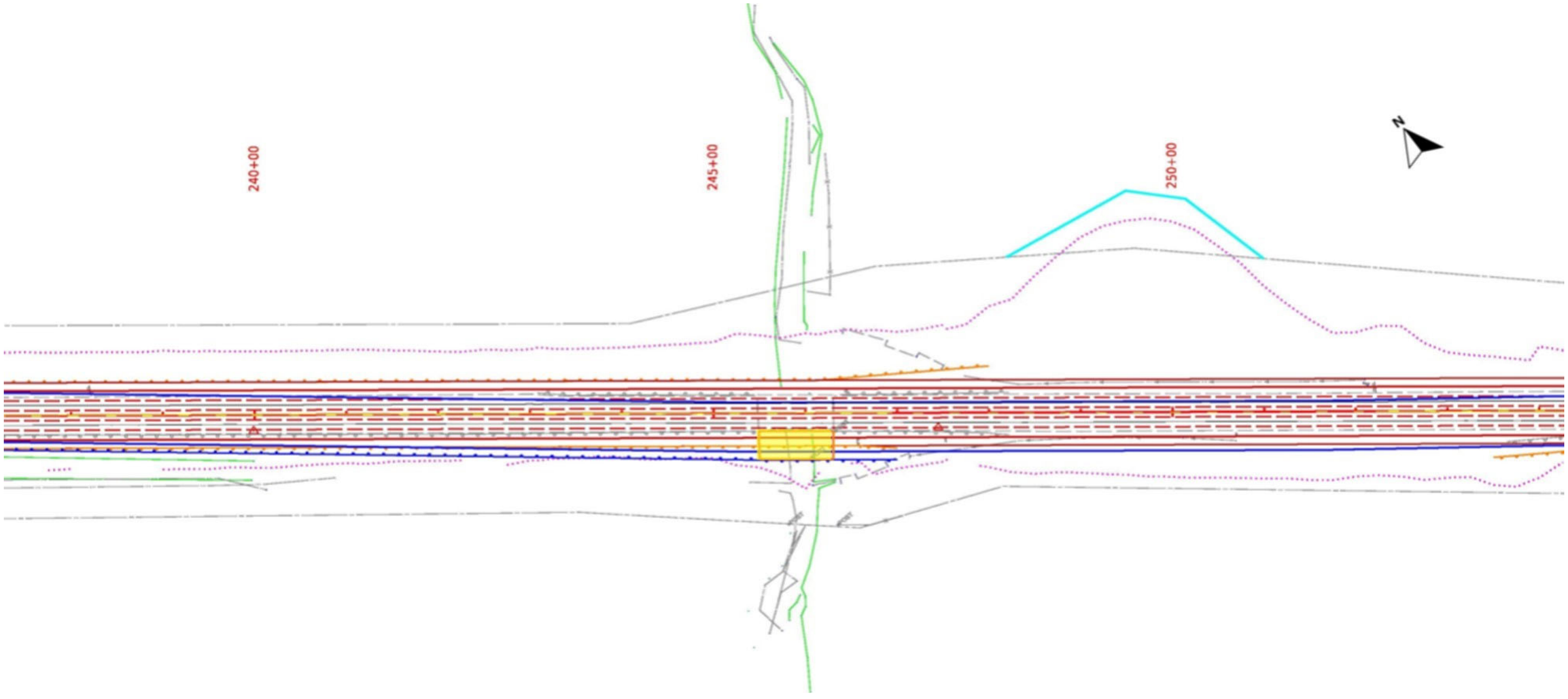
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Shift alignment to south and widen one side only of bridge over Little Laurel River

SKETCH/DIAGRAM: VE PROPOSAL



VALUE ENGINEERING (VE) PROPOSAL NO. 12

Creative Idea No. SW-02

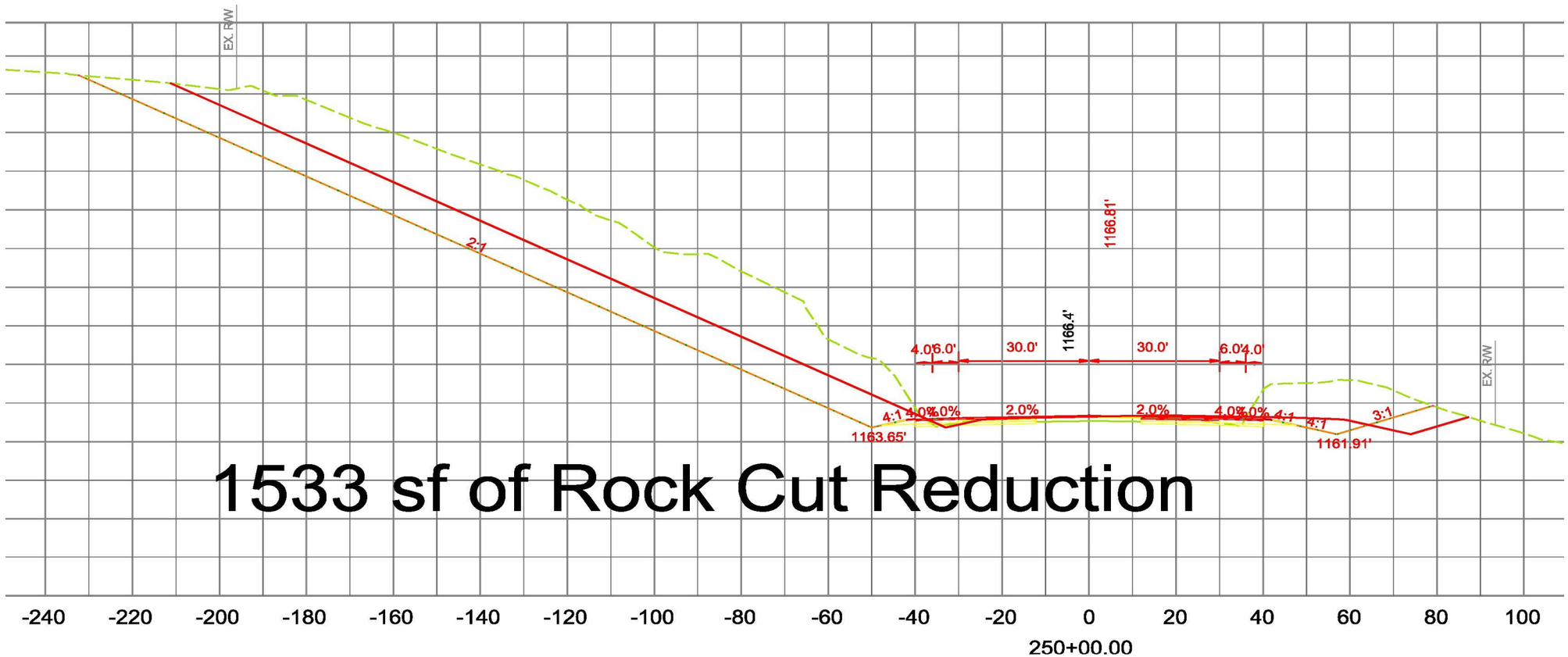
Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Shift alignment to south and widen one side only of bridge over Little Laurel River

SKETCH/DIAGRAM: VE PROPOSAL



VALUE ENGINEERING (VE) PROPOSAL NO. 12

Creative Idea No. SW-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Shift alignment to south and widen one side only of bridge over Little Laurel River

DISCUSSION & JUSTIFICATION:

Widening the existing bridge to one side only reduces the MOT phases and thus cost per square foot to construct the bridge widening.

The baseline widens the existing bridge 17-feet to each side, whereas this proposal widens 34-feet to the south side only. This leaves bridge and approach roads including guardrail as is on the north side. The baseline uses a 2:1 cut slope throughout with no consideration of the existing stable rock cut to the east of the bridge from station 248+00 to station 252+00, thus cutting this rock cut back along a 2:1 slope and needing to take ROW to do so.

In reality this proposal would avoid the rock excavation all together, so the savings would be much more than the cost estimate shows. For the VE proposal, suggest using a 55:1 taper before the bridge and after the rock cut to tie back to the baseline alignment that widens equally to both sides. Each taper length therefore equals 17-ft x 55 = 935-ft.

This should have no impact on traffic function or safety but will improve MOT and thus schedule while reducing cost by $479,000. It also eliminates the need to acquire R/W on the north side from station 248+00 to station 252+00.

VALUE ENGINEERING (VE) PROPOSAL NO. 12

Creative Idea No. SW-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Shift alignment to south and widen one side only of bridge over Little Laurel River

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Mainline Operations	An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Local Operations	An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Maintainability	An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Construction Impacts	An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	10	0.7
Justification for Impact Score	Widening to one side only is much better for MOT.			
Environmental Impacts	An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Project Schedule	An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	5	0.2
Justification for Impact Score	Widening to one side should improve schedule some as it reduces phasing of construction.			
Phaseability*	An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
Land-Use Compatibility	An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	0	0.0
Justification for Impact Score	No perceived impact to performance.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**0.9**

*Although this performance attribute did not have any weight during the initial assessment, the VE team acknowledges it is an attribute that should be considered in the performance evaluation of alternatives.

SCALE

10 Large positive impact to performance	5 Small positive impact to performance
0 No impact to performance	
-5 Small negative impact to performance	-10 Large negative impact to performance

VALUE ENGINEERING (VE) PROPOSAL NO. 12

Creative Idea No. SW-02

Kentucky Transportation Cabinet

Hal Rogers Parkway

MP 1.089 to MP 3.877 (Laurel County)

TITLE	Shift alignment to south and widen one side only of bridge over Little Laurel River
Assumptions & Calculations	Widening bridge to one side is less costly than widening to both sides so the VE Team used $200 per SF. The VE team stayed with the Rdwy Excav cost in the baseline but believe the rock excavation to be much more of a savings than shown.

DESIGN ELEMENT	BASELINE CONCEPT				VE PROPOSAL		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Rdwy Excav Reduction	CY	26,407	$ 6.65	$175,609	0	$ 6.65	$0
Guardrail Reduction	LF	500	$ 24.45	$12,225	0	$ 24.45	$0
Bridge Widening	SF	5,965	$ 250.00	$1,491,250	5,965	$ 200.00	$1,193,000
Subtotal				$1,679,084			$1,193,000
Mark-up - 24.2%				$406,338			$288,706
TOTAL				$2,085,000			$1,482,000
						Impact to Initial Cost (Baseline Less Proposed)	**$603,000**

Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

Section

6

Appendices

Appendix A – VE Study Participants

A.1 VE Workshop Attendance Record

A copy of the workshop attendee list is included for reference.

Table A-1: VE Workshop Attendance Record

April 18-22, 2022									Name	Organization	Position
18		19		20		21		22			
am	pm	am	pm	am	pm	am	pm	am			
☑	☑	☑	☑	☑	☑	☑	☑	☑	Patrice Miller, CVS	RHA	Team Leader
☑	☑	☑	☑	☑	☑	☑	☑	☑	Colin Miller, VMA	RHA	Technical Assistant
☑	☑	☑	☑	☑	☑	☑	☑	☑	Jerry Leslie	AEI	Geometric Design
☑	☑	☑	☑	☑	☑	☑	☑	☑	Kenny Ott	AEI	Accelerated Bridge Construction
☑	☑	☑	☑	☑	☑	☑	☑	☑	Josh Coburn	Palmer	Innovative Intersection Design
☑	☑	☑	☑	☑	☑	☑	☑	☑	Andrew Brown	Palmer	Traffic & Safety Analysis
☑	☑	☑	☑	☑	☑	☑	☑	☑	Brent Sweger	KYTC	Branch Manager of QA Branch
☑	☐	☑	☐	☑	☐	☑	☑	☑	Justin Harrod	KYTC	TET 3
☑	☐	☐	☐	☐	☐	☐	☐	☑	Sherri Chappel	KYTC	Project Manager
☑	☐	☐	☐	☐	☐	☐	☐	☑	Kevin Sandefur	KYTC District 7	Location Engineer
☑	☐	☐	☐	☐	☐	☐	☐	☐	Eileen Vaughan	FHWA	Liason
☑	☐	☐	☐	☐	☐	☐	☐	☑	Peter Overmohle	KYTC	Design Consultant Lead
☐	☐	☐	☐	☐	☐	☐	☐	☑	David Whitworth	FHWA	
☐	☐	☐	☐	☐	☐	☐	☐	☑	Daniel W Hoffman	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☑	Tim T Layson	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☑	David Otte	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☑	Wesley Combs	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☑	Chris Harris	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☑	Mathew Bailey	KYTC	
☐	☐	☐	☐	☐	☐	☐	☐	☑	Jill Asher	FHWA	
☐	☐	☐	☐	☐	☐	☐	☐	☑	Keenan Jones	KYTC	

Appendix B – Cost Models

B.1 Introduction

Cost models were prepared by RHA, LLC for this project. It was based on the cost estimate data provided by American Engineers, Inc. The cost models illustrate the cost drivers for the project and were used to guide the VE Team during the workshop.

Overall, the current construction estimate is approximately $17.3M (without design, right-of-way, and utilities). The project budget in the Six-Year Highway Plan shows $9M for construction. The VE Team noted there may be opportunities to reduce costs through the value methodology.

Table B-1: Cost Model Data Table

Description	Estimated Cost	% Total	% Cumulative
Pavement	$6,427,131	46.03%	46.03%
Roadway	$4,788,475	34.30%	80.33%
Structures	$2,639,106	18.90%	99.23%
Drainage	$57,145	0.41%	99.64%
Signing	$50,000	0.36%	100.00%
Contingency, Mobilization, Demobilization, Staking	$3,3478,770	Not Included	Not Included
Total	**$17,340,627**	**100.00%**	

The shaded rows represent approximately 80% of the construction cost.

The Pareto Concept: Typically, 80% of the total cost of a project is due to 20% of the elements of that project. Focusing on that 20% achieves the greatest impact in cost reduction and value improvement.

How to read the Cost Model Data Table: In the Cost Model Data Table, the project elements are sorted from largest down to smallest with a cumulative percentage; all project items above the 80% mark represent approximately 80% of the total project cost.

How to read the Cost Model Pareto Curve: In the Cost Model Pareto Curve, the curve measures the cumulative total percentage of the costs of the combined project elements as you move from left to right. Prior to this point, the curve and costs have been accumulating at a rapid rate, while after this point the curve increasingly flattens out. Focusing on elements to the left of this point provides the greatest impact to cost reduction and value improvement.

Figure B-1: Cost Model Pie Chart

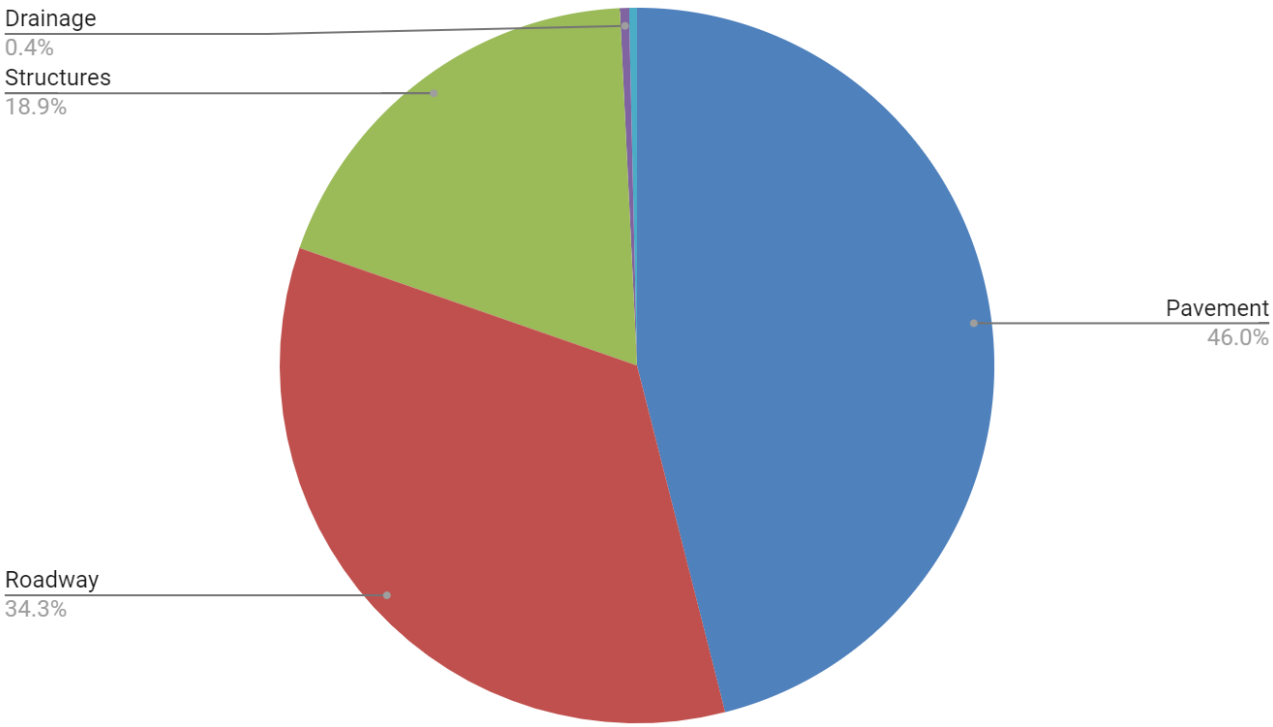
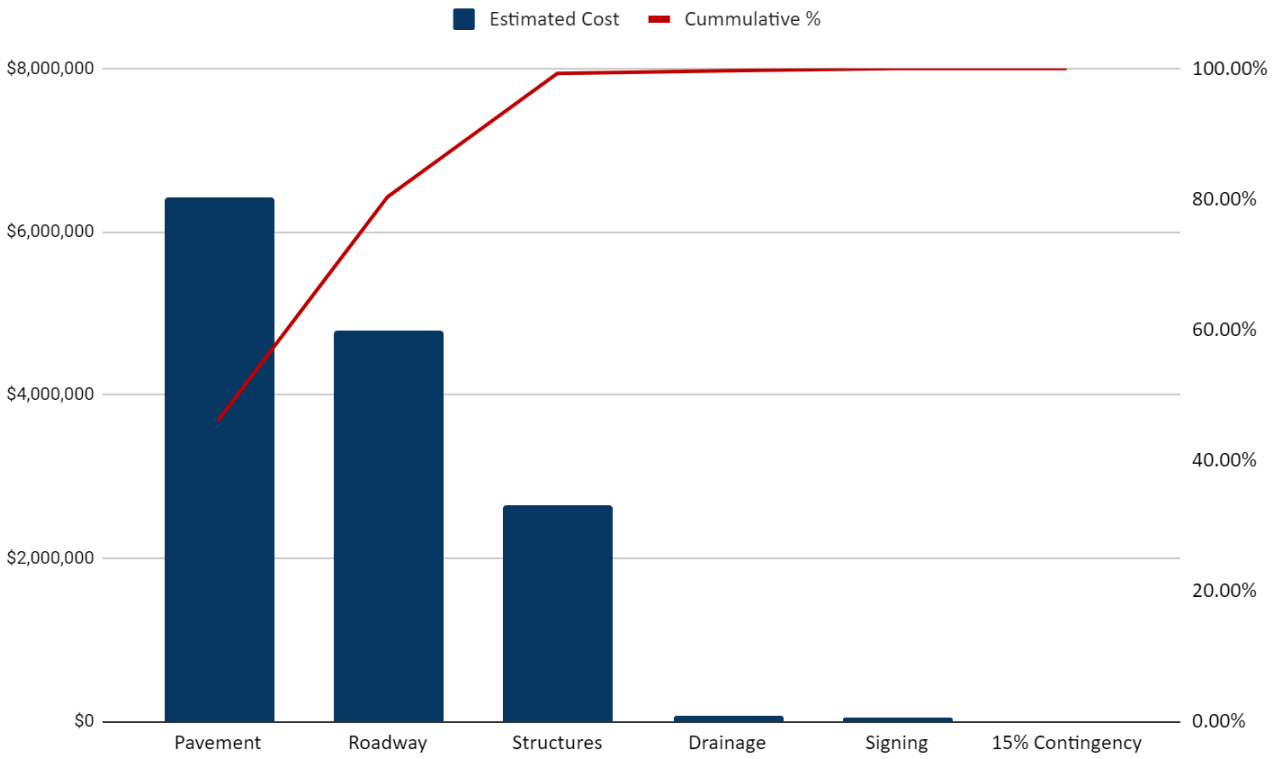


Figure B-2: Cost Model Pareto Curve



B.2 Cost Estimate Observations

There were a few Cost Estimate Observations identified and discussed during the VE Workshop.

- Bid Item 214 (CL3 ASPH BASE 1.00D PG64-22): Unit cost seems low; potentially $100 per ton versus $69.82
- Bid Items should be in square feet, not square yards as follows:
  - 5950 (EROSION CONTROL BLANKET) with adjusted cost of $8,701.77 versus $78,315.95
  - 5952 (TEMPORARY MULCH) with adjusted cost of $24,206.32 versus $217,856.85
  - 5953 (TEMP SEEDING AND PROTECTION) with adjusted cost of $20,582.45 versus $185,242.03
  - 5985 (SEEDING AND PROTECTION) with adjusted cost of $50,624.80 versus $455,623.16
  - 5990 (SODDING) with adjusted cost of $51,175.35 versus $460,578.16
- Regarding Slate Lick Bridge, the cost estimate indicates a 140 LF SINGLE SPAN BT-72 BEAM which seems low at $995,440.00. The VE Team discussed construction sequencing (close bridge and build bridge offline to set in place quickly) would yield a higher cost. However, during the post-preliminary meeting, a three-span bridge was discussed which may yield the lower cost.
- High cost items, potentially for the VE Team's review, include:
  - Pavement
  - Excavation
  - Guardrail
  - Structures

Appendix C – Function Analysis

C.1 Introduction

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.

C.2 Random Function Identification

The VE Team identified the functions of the Hal Rogers Parkway Project using active verbs and measurable nouns. This process allowed the team to truly understand the functions associated with the project. A Random Function Identification Worksheet is provided below.

Table C-1: Random Function Identification Worksheet

Identify Functions		Classify Functions	Prioritize Functions			
Active Verb	**Measurable Noun**	**Higher-Order Basic Secondary**	**COST**	**RISK**	**SELECT FOR CREATIVITY PHASE**	**Remarks**
Reduce	**Congestion**	**Basic**				
Improve	*Safety*	*Higher-Order*				
Reduce	*Crash-incidents*	*Higher-Order*				
Increase	Capacity	Secondary	High		YES	
Manage	Access	Secondary				
Accommodate	Driver-expectancy	Secondary				
Reduce	Conflicts	Secondary				
Accommodate	Pedestrians	Secondary				Shoulders; may be other opportunities (i.e., sidewalks) to meet this function (all-the-time function; not driving the project)
Accommodate	Vehicle-breakdowns	Secondary				
Remove	Obstacles	Secondary				
Define	Refuge	Secondary				
Support	Load	Secondary	High		YES	
Increase	Friction	Secondary				
Manage	Water	Secondary				
Transport	Water	Secondary				
Collect	Water	Secondary				
Protect	People	Secondary	High		YES	

Identify Functions		Classify Functions	Prioritize Functions			
Active Verb	**Measurable Noun**	**Higher-Order Basic Secondary**	**COST**	**RISK**	**SELECT FOR CREATIVITY PHASE**	**Remarks**
Prepare	Sub-grade	Secondary	High		YES	
Create	Foundation	Secondary				
Maintain	Traffic	Secondary	Medium			
Control	Erosion	Secondary	Medium			
Span	Roadway	Secondary	High		YES	
Span	Water	Secondary	High		YES	
Guide	Traffic	Secondary				
Convey	Traffic	Secondary				
Inform	Driver	Secondary	Low			
Control	Traffic	Secondary	Medium			
Separate	Traffic	Secondary	Low			
Reduce	*Delay*	*Higher-Order*				

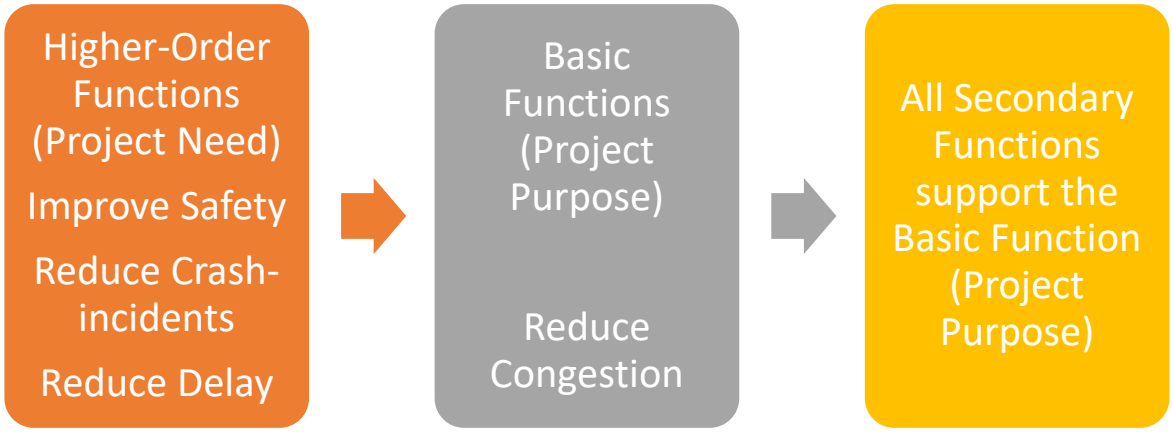
After these were listed and discussed, the functions were classified as described in the following classifications:

- **Higher-Order Function:** The specific goals or needs for which the basic function exists and is outside the scope of the subject under study.
- **Basic Function:** The specific purpose(s) for which a project exists and answers the question, “what must it do?”
- **Secondary Function:** A function that supports the basic function or required secondary functions and results from the specific design approach to achieve the basic function.

Functions were identified and prioritized using the previously identified risks, available cost data, and the VE Team’s expertise. A function model, or Function Analysis System Technique (FAST) diagram, was not developed for this project. The VE Team identified “Reduce Congestion” as the basic function of the project.

Please note that the Basic and Higher-Order functions relate directly to the project’s Purpose and Need as illustrated in Figure C-1.

Figure C-1: Function Analysis and Purpose & Need



Please note that although this project is listed in the Six-Year Highway Plan as a "Major Widening," the identification of the Basic Function to "Reduce Congestion" and Secondary Functions (supporting the Basic Function) opened the solution set to more than just "widening" alternatives.

Appendix D – Creative Idea List and Evaluation

D.1 Introduction

The objective of the Creativity Phase is to generate a large number of ideas on alternate ways to perform each function selected for the value engineering study. It uses standard brainstorming techniques, including ideation that is unconstrained by habit, tradition, negative attitudes, assumed restrictions, and specific criteria. No judgment takes place during this phase of the study, though ideas are discussed for clarification purposes.

What makes the Creativity Phase of the Value Methodology successful is for the team not to conceive ways to design a project but to develop ways to perform the functions selected for the study. Past experience is combined and recombined to form new combinations that will perform the desired functions, regardless of what is included in the original project concept, and improve the value of the project compared to what was originally considered attainable.

D.2 Evaluation Techniques Used

The VE Team members evaluated the ideas using a two-step process. The first step, to shorten the list, identified ideas that scored as follows:

Table D-1: Evaluation Key (Step 1)

Score	Description
5	Great Value (Workbook prepared)
4	Good Value (Workbook prepared)
3	Moderate Value (No workbook prepared)
2	Poor Value (No workbook prepared)
DS	Design Suggestion, More than a DC, requires further explanation
DC	Design Comment, Stand-alone comment that needs no further explanation; a list of these will be given to the design team
ABC	Already Being Considered/Done, Included in the baseline concept
OS	Out of Scope, Not a part of this project
FF	Fatal Flaw, Violates a code or standard

This first step evaluation scored the ideas as appropriate to eliminate them from further evaluation.

The second step scored the remaining ideas using the Value Relationship Key along with the idea's alignment with previously identified project goals, functions, and performance criteria. The prioritization for further development and documentation is as follows:

Table D-2: Rating (Step 2)

Value Relationship Key	*Value =* Function / Resource					
5 *Great Value*	*F*	*F+*	*F++*	*F++*	*F++*	*F++*
	R--	*R--*	*R*	*R-*	*R--*	*R+*
4 *Good Value*	*F-*	*F*	*F+*	*F+*	*F+*	
	R--	*R-*	*R*	*R-*	*R+*	
3 *Moderate Value*	*F--*	*F-*	*F+(*)*	*F++(*)*		
	R--	*R-*	*R++*	*R++*		
2 *Poor Value*	*F--*	*F-*	*F*	*F*		
	R	*R--*	*R+*	*R++*		
1 *Fatal Flaw*	*Unacceptable Impacts, violates a code or standard*					

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

Figure D-1: Value Cue Key (Magnitude of Change)

Value Cue Key – Magnitude of Change	
F++ = Large positive impact to function F+ = Small positive impact to function F = No impact to function F- = Small negative impact to function F-- = Large negative impact to function	R-- = Large decrease in resources used R- = Small decrease in resources used R = No impact in resources used R+ = Small increase in resources used R++ = Large increase in resources used

D.3 List of Scored Ideas Organized by Function

The list of scored ideas is shown below and on the following pages. During the Creativity and Evaluation Phases of the workshop, VE Team members were actively engaged in the brainstorming and evaluation of ideas. During the Evaluation Phase, some ideas were combined with others and are designated as such by the nomenclature "w/" (with another idea). In addition, there were two primary ideas that surfaced during the Evaluation Phase, MI-03 "Existing alignment with intersection improvements" and MI-04 "Baseline concept with intersection improvements". Many of the ideas that scored a "4" (Good Value) or "5" (Great Value), were combined into MI-03 (VE Proposal No. 01) and MI-04 (VE Proposal No. 02) for the VE Team to evaluate further during the Development Phase.

Table D-3: List of Scored Ideas Organized by Function

Idea No.	Idea Title	Combination(s) or SA=Standalone	Score*
*Key: **5 = Great Value** (Workbook prepared), **4 = Good Value** (Workbook prepared), **3 = Moderate Value** (No workbook prepared), **2 = Poor Value** (No workbook prepared), **FF = Fatal Flaw**, Violates a code or standard, **DS = Design Suggestion**, More than a DC, requires further explanation, **DC = Design Comment**, Stand-alone comment that needs no further explanation; a list of these will be given to the design team, **ABC = Already Being Considered/Done**, Included in the baseline concept, **OS = Out of Scope**, Not a part of this project			
IC	**Increase Capacity (Improve traffic flow, reduce delay)**		
IC-01	Modify signal timing		DC
IC-02	Keep existing two-lane typical and improve intersection	1	5
IC-03	Build RCUT intersections in lieu of signalized intersections	1, 2	5
IC-04	Build roundabout in lieu of signalized intersections	1, 2	5
IC-05	Provide access management strategies at non-signalized approaches	03 (SA)	4
IC-06	Build non-traversed median throughout the entire corridor		3
IC-07	Add median barrier throughout the entire corridor		3
IC-08	Add security/barrier fence on middle school property to isolate road; relocate gate to back	04 (SA)	5
IC-09	Add secondary right-turn lane on KY 472: add quick curb (physical barrier) between right-turn movement on KY 472		w/IC-08
IC-10	Ask the middle school to move gate inward		w/IC-08
IC-11	Construct right-turn lanes at KY 638 intersection, and KY 472 (to the south)		DC
IC-12	Add an acceleration lane for right-turning vehicles onto Hal Rogers from KY 638 in lieu of extending storage lane on the side road		3
IC-13	Add an acceleration lane for right-turning vehicles onto Hal Rogers from KY 472 in lieu of extending storage lane on the side road	1, 2	4
IC-14	Remove bridge, and provide an additional entrance to the high school		2
IC-15	Provide an additional access point to the rear entrance of the high school with a left-in and restricted left-out	05 (SA)	4
IC-16	Provide a uniformed officer to direct traffic during pick-up/drop-off times for middle and high schools		OS
IC-17	Create a variable-lane layout to accommodate peak hour traffic for high school		2
IC-18	Create a dual-left turn into the high school (would require a second receiving lane)	1, 2	4
IC-19	Encourage more bus riders/carpooling (incentive)		OS
IC-20	Encourage more bus riders/carpooling (increase cost of student parking)		OS
IC-21	Create a park-and-ride system for students		2
IC-22	Split entrances and parking/drop-off areas		w/other ideas
IC-23	Add a dual-left from northbound KY 192 onto Hal Rogers Parkway	06 (SA)	4

Idea No.	Idea Title	Combination(s) or SA=Standalone	Score*
*Key: **5 = Great Value** (Workbook prepared), **4 = Good Value** (Workbook prepared), **3 = Moderate Value** (No workbook prepared), **2 = Poor Value** (No workbook prepared), **FF = Fatal Flaw**, Violates a code or standard, **DS = Design Suggestion**, More than a DC, requires further explanation, **DC = Design Comment**, Stand-alone comment that needs no further explanation; a list of these will be given to the design team, **ABC = Already Being Considered/Done**, Included in the baseline concept, **OS = Out of Scope**, Not a part of this project			
IC-24	Build offset left-turn lanes at KY 638	07 (SA) – Downgraded to a "DC" near the end of the workshop.	DC
IC-25	Create a Continuous Green-T (CGT) at KY 192	1, 2	5
IC-26	Create a Continuous Green-T (CGT) at the high school entrance	1, 2	5
IC-27	Construct a modified jug-handle at the high school entrance	1, 2	4
IC-28	Add right-turn overlap signal heads at intersection(s)		DC
IC-29	At KY 472, include a jug-handle as an option	1, 2	4
IC-30	At KY 472, include a median turnaround as an option	1, 2	4
IC-31	Consider peak-hour patterns for timing at schools		DC
IC-32	Construct median U-turns at high school		3
IC-33	Add back entrance off of Hal Rogers near medical development and connect to Slate Lick Road (rear entrance to the school)		OS
IC-34	Restripe SB through-lane KY 30 to be a through-left onto Hal Rogers EB; requires signal modifications		DC
IC-35	Add a double-flush median	2	4
IC-36	Remove bridge and create cul-de-sac		2
PP	**Protect People**		
PP-01	Add rumble strips to the center and edge line		DC
PP-02	Add a sidewalk on the bridge	08 (SA)	4
PP-03	Construct a multi-use path along Hal Rogers		3
PP-04	Flatten slopes to eliminate guardrail		DC
PP-05	Add additional lighting at intersections		DC
SR	**Span Roadway**		
SR-01	Reuse existing Slate Lick bridge		w/IC-02
SR-02	Construct Slate Lick bridge as a two-span with a pier in the middle		2
SR-03	Construct Slate Lick bridge as a 94-foot single span bridge with full height abutments using tie backs	09 (SA)	4
SR-04	Construct Slate Lick bridge as a single-span bridge		w/SR-03
SR-05	Construct Slate Lick bridge as a single-row pile-bent wall with tiebacks		w/SR-03
SR-06	Construct Slate Lick bridge as a single-row pile-bent wall with deadman tiebacks		w/SR-03
SR-07	Construct Slate Lick bridge as a single-span bridge with GRS to accelerate construction		w/SR-03

Idea No.	Idea Title	Combination(s) or SA=Standalone	Score*
*Key: **5 = Great Value** (Workbook prepared), **4 = Good Value** (Workbook prepared), **3 = Moderate Value** (No workbook prepared), **2 = Poor Value** (No workbook prepared), **FF = Fatal Flaw**, Violates a code or standard, **DS = Design Suggestion**, More than a DC, requires further explanation, **DC = Design Comment**, Stand-alone comment that needs no further explanation; a list of these will be given to the design team, **ABC = Already Being Considered/Done**, Included in the baseline concept, **OS = Out of Scope**, Not a part of this project			
SR-08	Construct Slate Lick bridge as a single-span bridge with reinforced earth		w/SR-03
SR-09	Construct Slate Lick bridge with three beams/two beams and tie together with a pour strip; off-site		3
SR-10	Construct Slate Lick bridge super-structure in several segments that can be set in place with a pour strip		3
SR-11	Modify the Slate Lick bridge section typical to provide a sidewalk		w/PP-02
SR-12	Construct Slate Lick bridge as an interchange to add entrance point at back entrance; tight diamond		2
SL	**Support Load**		
SL-01	Evaluate the pavement schedule and verify the need for the base overlay		DC
SL-02	Evaluate the need for base overlay over the existing pavement	10 (SA)	4
SL-03	Modify typical section to use 6′ paved shoulders in lieu of 10′	11 (SA)	4
PS	**Prepare Subgrade**		
PS-01	Identify opportunities to reuse excavated material		DC
PS-02	Identify location to haul-off excavated material		DC
SW	**Span Water**		
SW-01	Construct Hal Rogers bridge over Little Laurel River to accommodate future replacement		DC
SW-02	Shift alignment to south and widen one side only of bridge over Little Laurel River (five-lane) and to remove a large quantity of rock cut	12 (SA)	4
SW-03	Replace bridge over Hal Rogers as a single-span		w/SW-01
SW-04	Shift alignment to south and replace bridge over Hal Rogers		w/SW-01
MI	**Miscellaneous**		
MI-01	Use camera detection in lieu of conventional loop detection (signals)		DC
MI-02	Add advance warning flasher on Hal Rogers westbound at KY 192		ABC
MI-03	Existing alignment with intersection improvements	01**	5
MI-04	Baseline concept with intersection improvements	02**	5

**These VE Proposals (01 and 02) included many of the creative ideas that initially scored a "4" (Good Value) or "5" (Great Value) but were later combined into VE Proposal No. 01 and/or VE Proposal No. 02 for the Development Phase.

Appendix E – Supporting Data

E.1 Risk Identification

Risk is a measure of future uncertainties in achieving program and/or project performance goals and objectives within defined cost, schedules, and performance constraints. Risk can be associated with all aspects of a program/project (e.g., threat, technology maturity, supplier capability, design maturation, performance against plan) as these aspects relate across the project's cost and schedule. Risk addresses the potential variation in the planned approach and its expected outcome. Risks may also represent opportunities within a project that could be exploited to the benefit of the project.

During the preparation for the VE Workshop and after reviewing project documentation, the VE Team identified project risks on their Key Issue Memos. The following risks were reviewed at the workshop and addition risks were added to the list, as follows:

- MEDIUM RISK: Maintaining heavy school traffic during construction of Slate Lick Road over Hal Rogers (MOT on Hal Rogers); completion date with high LDs. Alternate 1 detour and maintain traffic during constructions. Statewide counts 2020 indicate ~11000; detouring that much traffic could be a risk.
- LOW RISK (if stay within ROW): Environmental issues (wetlands, stream impacts and endangered species) - environmental permitting may present issues
- LOW RISK: ROW acquisitions
- MEDIUM-HIGH RISK: Adding an additional lane in each direction on Hal Rogers could potentially lead to increased travel speeds and more serious crashes; especially at approaches and entrances where vehicles have to navigate across 5 lanes (2 lanes in each direction plus TWLTL)
- MEDIUM RISK: Construction begins just north of the North Laurel High School entrance and matches the existing typical section. Will this project improve any capacity or safety issues at this intersection?
- MEDIUM RISK: Having a five-lane typical will encourage higher speeds.
- MEDIUM RISK: Higher speeds from the typical could also lead to more crashes and those crashes may have a higher severity. During Maintenance of Traffic (MOT) on I-71, is it necessary to require trucks to use the left lane to avoid excessive wear and tear to the existing shoulder? Or would the existing shoulder need to be reconstructed after Phase I?

The VE Team considered these risks during the Creativity Phase; these have the potential of impacting the project budget, schedule and performance.

E.2 VE Team Observations

During the preparation for the VE Workshop and after reviewing the project documentation, the VE Team identified observations on their Key Issue Memos. The following were reviewed at the workshop and additional observations were added to the list, as follows:

- Appears to have a lot of wetlands along corridor. Environmental permitting may present issues
- Need an EA to see what the impacts are to the environment.
- Detour - There is over 10,000 AADT.
- Rock Cuts. If benching is required, this will have a greater impact of ROW.

- Salt Lick Road Typical Section.
- Traffic Movement for North Laurel School. What entrances are used for Morning and Afternoon major movement times. Is there a specific flow pattern for Parent drop-off and pick-up? Number of Walkers that walk to School.
- Existing improvements at intersections include low-cost safety improvements have been implemented at signalized intersection such as reflective backplates and supplemental signal heads.
- There is only one entrance into North Laurel High School which leads to capacity issues during peak hours.
- There were 41 angle and 7 opposing left crashes over the 5-year crash period. This accounts for 31% of the total 154 crashes along the corridor. Furthermore, a majority of these crashes occur at the intersections along the route; the proposed improvements need to focus on reducing these crashes.
- Where is the CL2 ASPH in the estimate for shoulder quantities?
- Extending turn lanes at minor approaches helps hold the queue but does not help reduce it or eliminate it.
- Is the pavement design substantial enough for over 10,000 pcpd?

E.3 Performance Criteria

Performance criteria were identified and defined during the in-brief meeting (Information Phase) on Monday, April 18, 2022. Performance criteria have continually proven to be essential measures of project performance for design and construction projects. These criteria may not always appear to be relevant or essential based upon the current solutions being considered; however, the VM process has proven to generate alternative solutions that can, and often do, impact these areas of a project.

After identifying and defining the performance criteria, a paired-comparison exercise assigned weights to each criterion resulting in a relative ranking of criteria and shown in the table on the following page.

Table E-1: Paired-Comparison Exercise to Assign Weight to Performance Criteria

Criteria Scoring Matrix	Weight	Preference		Preference		Preference		Preference		Preference		Preference		Preference	
A Mainline Operations An assessment of traffic operations and safety on the mainline facility(s), including turn lanes and storage capacity. Operational considerations include level of service relative to the traffic projections as well as geometric considerations such as design speed, sight distance, lane widths and shoulder widths.	29.67%	A	B	A	C	A	D	A	E	A	F	A	G	A	H
		3		4		4		4		4		4		4	
B Local Operations An assessment of traffic operations and safety on the local roadway infrastructure, including intersections and frontage roads. Operational considerations include level of service relative to the traffic projections; geometric considerations such as design speed, sight distance, lane widths; bicycle and pedestrian operations and access.	25.27%	B	C	B	D	B	E	B	F	B	G	B	H	B	I
		3		4		4		4		4		4			
C Maintainability An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity and maintainability of pavements, structures and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.	17.58%	C	D	C	E	C	F	C	G	C	H	C	I	C	J
		3		3		4		3		3					
D Construction Impacts An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours and delays; impacts to schools, businesses and residents relative to access, visual, noise, vibration, dust and construction traffic; environmental impacts.	6.59%	D	E	D	F	D	G	D	H	D	I	D	J	D	K
		1	1	2		3			3						
E Environmental Impacts An assessment of the permanent impacts to the environment including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice, business, residents); impacts to cultural, recreational and historic resources.	6.59%	E	F	E	G	E	H	E	I	E	J	E	K	E	L
		1	1	3		1	1								
F Project Schedule An assessment of the total project delivery from the time as measured from the time of the VE Study to completion of construction. Project ready to let by June 2024. Bridge construction during summer months (May through July).	4.40%	F	G	F	H	F	I	F	J	F	K	F	L		
		3			2										
G Phaseability An assessment of how easily a transportation facility can be improved or expanded upon at some future date. This attribute considers the degree of "throw-away work" involved as well as future traffic and public impacts when the planned future improvements are made. Assessment of what can be completed within the $9M construction budget.	0.00%	G	H	G	I	G	J	G	K	G	L				
			3												
H Land-Use Compatibility An assessment of the overall compatibility of transportation facilities with existing and planned land uses. This attribute considers how a transportation facility will directly affect the quality and viability of the land-uses around it. [NOTE: This attribute is often used for projects that involve significant right-of-way acquisition and that will have significant impacts to municipalities and/or private entities.]	9.89%	H	I	H	J	H	K	H	L						

A	B
4	

Sample 1
Criteria A is significantly preferred than B

D	E
	2

Sample 2
Criteria E is just slightly preferred than D

How Important:
4 = Major Preference
3 = Medium Preference
2 = Minor Preference
1 = No Preference (each)

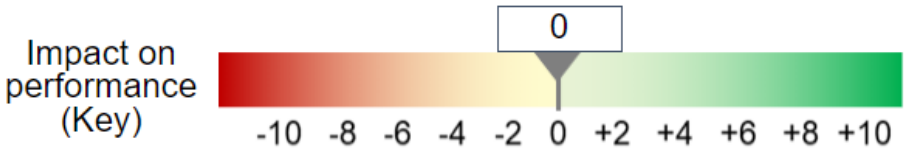
During the Development Phase, each VE Proposal included an evaluation of its impact on project performance, if applicable. The performance impact score was on a scale as follows:

Figure E-1: Performance Impact Scale (positive 10 to negative 10)

10	Large positive impact to performance	5	Small positive impact to performance
0	No impact to performance		
-5	Small negative impact to performance	-10	Large negative impact to performance

Each of the individual performance attribute scores were added to provide a cumulative or overall performance impact on the following scale:

Figure E-2: Overall Performance Impact Scale



An overall performance impact number is an attempt at quantifying a qualitative assessment of performance, which is the extent to which a project achieves its intended function(s) and answers the question of how well the function(s) is(are) being performed. Performance, risk and cost considerations are all important in the decision-making process in reviewing an alternative against the baseline concept presented.

E.4 Agenda

A copy of the workshop agenda is included on the following pages for reference.

Value Engineering (VE) Workshop Agenda

Project Name: Kentucky Transportation Cabinet
Hal Rogers Parkway Widening, KY-30 to KY-192
MP 1.089 to MP 3.877, Laurel County
Item No. 11-365.00

Dates: VE Workshop
April 18-22, 2022 (see detailed times below)

Study Location: "Hybrid" (In-person / Virtual) – KYTC Conference Room 416

Day 1: Monday, April 18, 2022, 9:00 AM – 5:00 PM EDT

MS Teams Link: CLICK HERE -or- Call In: +1 323-484-8978 168 826 213 #

https://teams.microsoft.com/l/meetup-join/19%3ameeting_MDMxMTNkN2EtNWU2Zi00Yzg2LThjMmQtY2Y1N2ZhMWI3YTBl%40thread.v2/0?context=%7b%22Tid%22%3a%221d1815b2-3640-4616-b274-6541c40ce470%22%2c%22Oid%22%3a%22bdf1582f-f83a-4f82-a512-15b645c10219%22%7d

Time EDT	VE Activity	Participants	Comments
9:00	Welcome & Introductions Brief Overview of Value Engineering Process & VE Agenda Review (CVS Facilitator)	All	
INFORMATION PHASE			
9:20	Project Overview, Presentation & Virtual Site Tour (KYTC Project Manager, Consultant Design Lead/s)	All	
10:30	Short Break		
10:45	Identify/Review: ▪ Project Goals ▪ VE Study Objectives (Focus of VE Study) ▪ VE Study Constraints ▪ Identify, Define & Rank Performance Attributes	All	
12:00	Conclusion of In-brief meeting / Long Break		
1:00	Discuss Team Observations, Project Risks Review Cost Model, Schedule, Other	VE Team	
FUNCTION ANALYSIS PHASE			
2:00	Function Identification of Project Elements ▪ Identify/Classify Project Functions ▪ Apply Risks/Resources to Functions ▪ Select Specific Functions for Study	VE Team	
3:00	Short Break		
CREATIVE PHASE			
3:15	Brainstorm Ideas / Alternatives		
5:00	Adjourn		

Day 2: Tuesday, April 19, 2022, 9:00 AM – 5:00 PM EDT

MS Teams Link: CLICK HERE -or- Call In: +1 323-484-8978 168 826 213 #

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Time EDT	VE Activity	Participants	Comments
9:00	Check-in	VE Team	
CREATIVE PHASE - continued			
9:05	Brainstorm Ideas / Alternatives	VE Team	
10:30	Short Break		
10:45	Brainstorm Ideas / Alternatives	VE Team	
12:00	Long Break		
EVALUATION PHASE			
1:00	Evaluation of Ideas – Team Assignments for Development	VE Team	
3:00	Short Break		
DEVELOPMENT PHASE			
3:15	Review Workbook Template & Process Flow Develop / Cost Alternatives	VE Team	
5:00	Adjourn		

Day 3: Wednesday, April 20, 2022, 9:00 AM – 5:00 PM EDT

MS Teams Link: CLICK HERE -or- Call In: +1 323-484-8978 168 826 213 #

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Time EDT	VE Study Activity	Participants	Comments
9:00	Check-in	VE Team	
DEVELOPMENT PHASE - continued			
9:05	Develop / Cost Alternatives	VE Team	
10:45	Develop / Cost Alternatives	VE Team	
11:30	Check-in	VE Team	
12:00	Long Break		
1:00	Develop / Cost Alternatives	VE Team	
4:30	Check-in	VE Team	
5:00	Adjourn		

Day 4: Thursday, April 21, 2022, 9:00 AM – 5:00 PM EDT

MS Teams Link: CLICK HERE -or- Call In: +1 323-484-8978 168 826 213 #

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Time EDT	VE Study Activity	Participants	Comments
9:00	Check-in	VE Team	
DEVELOPMENT PHASE –			
9:10	Develop / Cost Alternatives - Complete	VE Team	
11:30	Check-in		
12:00	Long Break		
1:00	Alternatives to Present Peer Review Workbooks Prepare Presentation	VE Team	
4:00	Run-through Presentation	VE Team	
5:00	Adjourn		

Day 5: Friday, April 22, 2022, 8:00 AM – Noon EDT

MS Teams Link: CLICK HERE -or- Call In: +1 323-484-8978 539 169 905 #

https://teams.microsoft.com/l/meetup-join/19%3ameeting_OGY1MjI0ZTctMTkxNC00NmJmLWJkMDctMjljZTZhNjBkNDJj%40thread.v2/0?context=%7b%22Tid%22%3a%221d1815b2-3640-4616-b274-6541c40ce470%22%2c%22Oid%22%3a%22bdf1582f-f83a-4f82-a512-15b645c10219%22%7d

Time EDT	VE Study Activity	Participants	Comments
8:00	Check-in	VE Team	
DEVELOPMENT PHASE - continued			
8:05	Peer Review Workbooks – Complete Practice Presentation	VE Team	
9:30	Short Break		
9:45	Ready to present	VE Team	
PRESENTATION PHASE			
10:00	Presentation of Key Finding/VE Alternatives to Stakeholders/Decision-makers	All	
11:30	Workshop Close-out	VE Team	
12:00	Adjourn	VE Team	

All: Decision-makers, Design Team, Stakeholders, VE Team (Shaded rows)
VE Team: Subject Matter Experts and others serving as full-time VE Team members