Value Engineering Workshop Report
– Draft

US 41 - North Main Street
Kentucky Transportation Cabinet

Workshop Dates: August 16 - 20, 2021

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September 3, 2021

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SECTION 1

INTRODUCTION

Section 1: Introduction

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. 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 as follows:

Value Methodology Phase	Objectives of this Phase	Outcomes of this Phase
Stage 1: Pre-workshop Study (Preparation)		
Pre-workshop	● Identify study project ● Identify study roles and responsibilities ● Define study scope, goals and objectives ● Select team leader ● Conduct pre-study meeting ● Select value study 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 virtual workshop ● Send team primer to value study team ● Value team members to complete Key Issues Memos (KIM)	● Fosters understanding of value study priorities ● Defines and manages expectations ● Organizes the value study ● Offers a thorough review of the project ● Tests meeting platform and virtual tools to maximize engagement and collaboration ● Primes the team for the value workshop

Value Methodology Phase	Objectives of this Phase	Outcomes of this Phase
Stage 2: Workshop Study		
Phase 1: Information	● 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	● Brings all value study 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 foundation for function analysis
Phase 2: Function Analysis	● 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 3: Creative	● Brainstorm to generate performance-focused ideas for alternative ways to perform functions ● Discuss, build-on and clarify ideas	● Value team develops a broad array of ideas that provides a wide variety of possible alternative components or methods to improve project value

Phase 4: Evaluation	● 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 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
Value Methodology Phase	**Objectives of this Phase**	**Outcomes of this Phase**
Phase 5: Development	● Validate and refine idea concepts ● Compare to original design concept ● Define implementation considerations ● Prepare sketches and calculations ● Measure performance ● Estimate costs, life-cycle cost benefits/costs	● Provides side-by-side comparison of baseline and alternative—concepts, initial costs, life-cycle costs, sketches, performance metrics
Phase 6: Presentation	● 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

Stage 3: Post-workshop Study (Implementation)		
Post-workshop	● 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 implementation plan with project manager ● Project manager sign-off on VE implementation plan ● Final presentation of study results	● Involves those who will implement and increases likelihood of implementation ● Improves actual value of the project

Description of Study

The VE study was conducted in accordance with the SAVE International Value Methodology, found in Section 4: Support Data. The Value Methodology includes pre-workshop (Stage 1), workshop (Stage 2) and post-workshop (Stage 3) activities. Stage 2, workshop activities include six phases as follows: Information (Phase 1), Function Analysis (Phase 2), Creative (Phase 3), Evaluation (Phase 4), Development (Phase 5) and Presentation (Phase 6).

The Summary of Value Engineering Proposals (Great and Good Opportunities) along with Design Suggestions and Design Comments are found in Section 2: Summary Information. This summarizes the ideas brainstormed and developed during the study indicating the areas of opportunity for improving the value, performance and functions of the project. A complete list of all of the ideas, the Creative idea List, is located in Section 4: Support Data.

Details of the Value Engineering Proposals and Design Suggestions can be found in Section 3: Value Engineering Workbooks. A presentation of the VE study recommendations and key findings was given to the decision makers on August 20, 2021; a copy is included in Section 4: Support Data.

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 project background, summary of results, a list of the VE study team members and the VE punch list.

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

Section 5: VE Proposals and Design Suggestions - This section includes alternatives developed as a workbook during the workshop. Each workbook contains the following information:

- Unique Identifying Number (XX-##)
- Creative Idea Title
- Function Identification
- Baseline Assumption – brief description
- Proposed Alternative – brief description
- Benefits
- Risks/Challenges
- Overall Performance Score
- Cost Summary
- Discussion/Justification
- Implementation Considerations, if applicable
- Impact to Performance – alternative scored against performance criteria
- Initial Cost Detail
- Replacement/Salvage and Annual Cost Detail, if applicable
- Baseline and Proposed Sketches, if applicable

Section 6: Appendices
Appendix A - Study Participants

SECTION 2

PROJECT DESCRIPTION

Section 2: Project Description

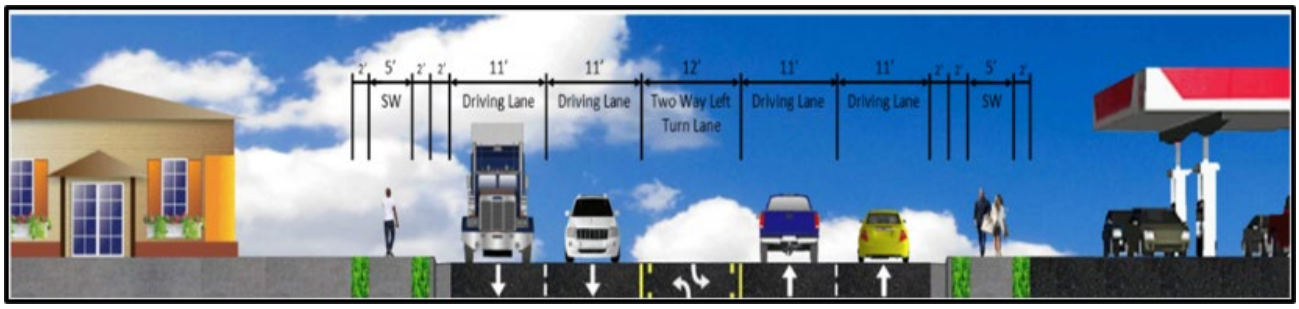
Summary Project Description

The purpose of this project is to improve the traffic flow, increase capacity, improve safety for motorists and pedestrians, and improve the efficiency and connectivity of US 41.

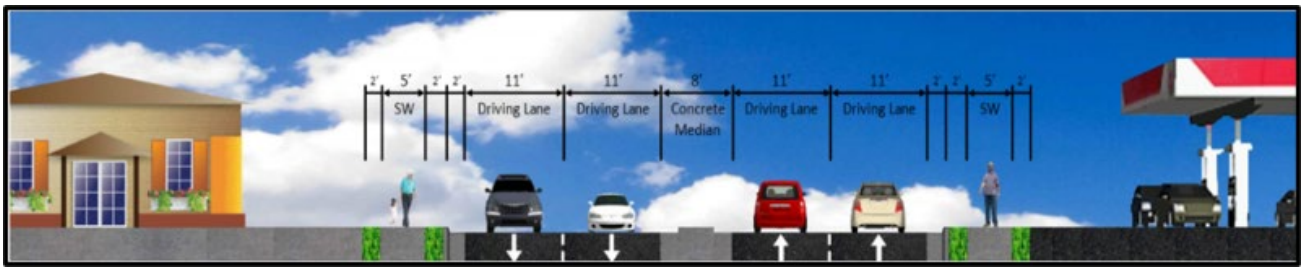
The Kentucky Transportation Cabinet (KYTC) is developing alternative approaches to improving US 41 between Hospital Drive and US 41A/KY 281. The portion of US 41 within the project area is currently a three-lane roadway with one travel lane in each direction and a center two-way left-turn lane. The most recent traffic count for this section of US 41 identified the Average Daily Traffic (ADT) as 20,382 vehicles in 2015. The corridor is bounded by a high concentration of approach roads and entrances which contribute heavily to increased traffic volumes and diminished mobility. As a result, the corridor is plagued by periods of significant traffic congestion and accompanying vehicular delay throughout the day. These numerous access points also create an environment that increases the likelihood of vehicular collisions. Sidewalks and pedestrian accommodations range from minimal to non-existent.

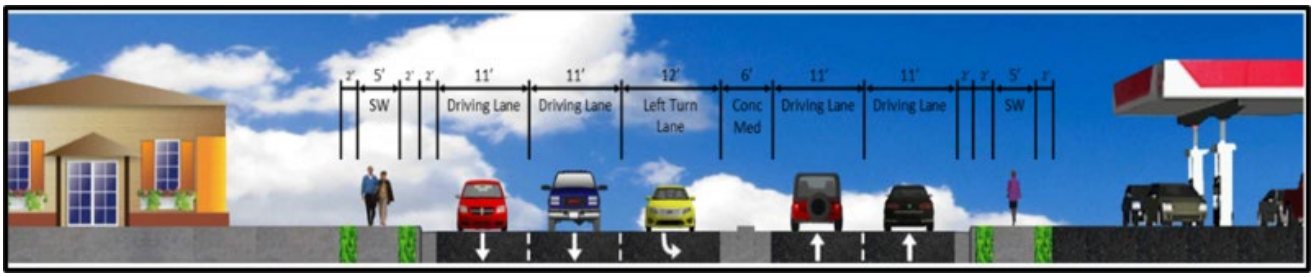
The design team presented three alternatives for the project which the team evaluated. Alternative 1 was identified as the baseline alternative for the VE team to use for the VE study.

Alternative 1 has the typical cross-section of two travel lanes in each direction with a two-way left turn lane in the center. Both sides of the roadway will include sidewalks. This also includes a widening of the CMX railroad bridge.

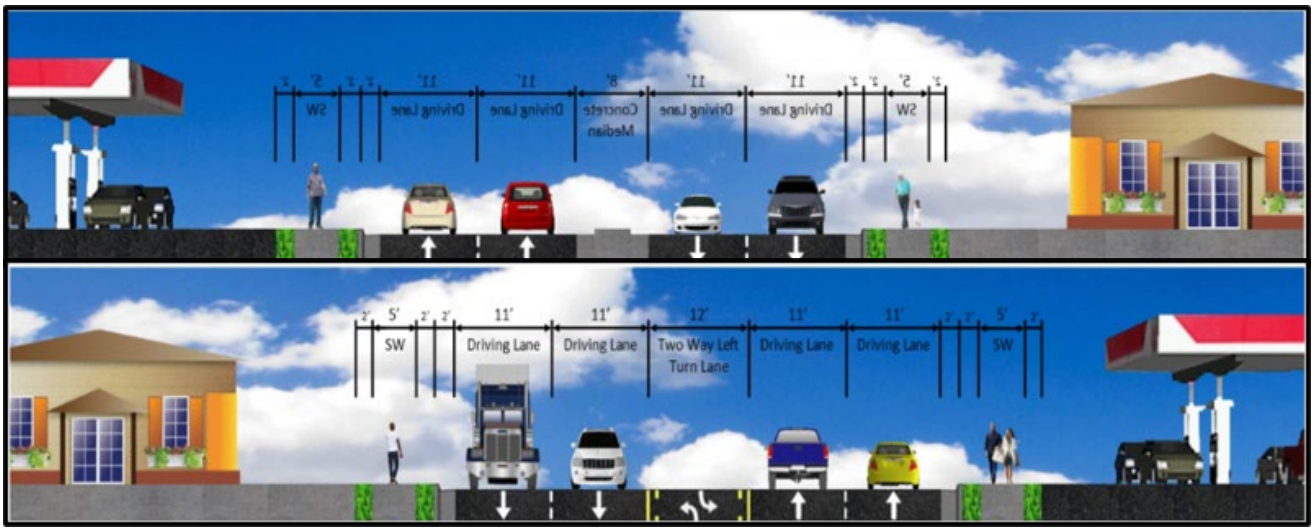


Alternative 2 has the typical cross-section of 2 travel lanes in each direction with a concrete median separating traffic with left hand turn lanes along the corridor. There are sidewalks on both sides of the roadway as well. This also includes the widening of the CMX railroad bridge.





Alternative 3 is a combination of Alternative 1 and 2 with a typical cross-section of two travel lanes in each direction with a concrete median separating traffic for portions of the project and a typical cross-section of two lanes in each direction with a two-way left turn lane in the center. There are sidewalks on both sides of the roadway along the entire project. This also includes the widening of the CMX railroad bridge.



SECTION 3

EXECUTIVE SUMMARY

Section 3: Executive Summary

Background

A Value Engineering (VE) study was conducted on the scoping documents for the **US 41 - North Main Street, Hopkins County Project** for the Kentucky Transportation Cabinet (KYTC) on August 16 - 20, 2021, for the project described below.

The VE team provided a review of the design and/or planning document submission that were prepared. The general impression of the VE team was that the design was complete for this level of submission. The design team had successfully developed three concepts that met the purpose and need, and functional requirements of the scope of work. The VE team believes that the transportation improvements as conceived are constructible however, after further study, Identified improvements in regards to access management, safety, and traffic flow.

The VE team, having reviewed the documents and received the in-briefing presentation by the design team, began to see their opportunity was to contribute quantitative and qualitative suggestions and improvements to the design that would improve the value of this project through improved function. While the VE team was able to pursue cost savings and/or achieve savings through suggested changes, the real focus of the team was to enhance the quality that was already taking shape in the current design. The VE team had the benefit of providing a new set of lenses in trying to find additional enhancements to the design, as they are not burdened by the history of the project. The team could see that project with a fresh perspective; and the value alternatives are offered as creative contributions to the plan that has brought the project to this point.

In all cases, the focus was to search for opportunities that will enhance the functionality of the facility to support infrastructure while reducing the resources required to build, operate, and maintain it. The documentation that follows will indicate the process that was followed and resulted in the value alternatives in this report.

KYTC representatives presented the project during the kick-off meeting on August 16, 2021 to the VE team.

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

- Overall local operations in regards to access management and safety

- Mainline operations to reduce congestion and travel delays
- Access management (flow, U-turns, etc.)
- Drainage/flooding issues at the CMX railroad crossing
- Accommodate pedestrians
- Use Alternative 1 as the baseline

Additionally, the project's goals and objectives were identified as they relate to the success of the project:

- Increase capacity
- Improve safety
- Enhance efficiencies
- Minimize impacts to businesses
- Salvage new utilities at US 41/US 41A/ KY 281
- Budget $10M
- Schedule – Right of Way and utility acquisition work in 2022 and construction in 2024

Performance Criteria

During the kick-off meeting on August 16, 2021, the decision makers helped the VE study team understand what defined project success for the US 41 North Main Street Project. Using a paired-comparison matrix, performance criteria were scored and ranked (see Section 4: Support Data). These criteria were used later in the workshop by the VE study team for both evaluating and developing alternatives.

- **Mainline Operations -** Capacity, congestion, traffic delays, conflicts **(28.6%)**
- **Local Operations -** Access to businesses and properties while minimizing impacts to US 41 **(21.4%)**
- **Level of Service-** Pedestrian access and comfort **(21.4%)**
- **Connectivity-** Enhance community economy **(14.3%)**
- **Drainage -** Impacts to flooding **(9.5%)**
- **Schedule –** Right of Way acquisition and utility plans by 2022 **(4.8%)**

Summary Workshop Results

Summary workshop results are shown in the table below.

Workshop Outcome	Number	Section Report / Result
Ideas brainstormed	67	See Creative Idea List (Section 4: Support Data)
Ideas developed into VE Proposal (and costed, if possible)	9	See Section 2: Summary Information and Section 3: Value Engineering Workbooks
Design Suggestions (ideas developed but not costed)	1	See Section 2: Summary Information and Section 3: Value Engineering Workbooks
Design Comments (DC), not developed	11	See Section 2: Summary Information

The team also developed a Traffic and Safety Analysis as supporting information for the three existing Alternatives and then for the two new Alternatives. The analysis can be found.....in Section 6: Appendices, Appendix D: Supporting Data.

Function Analysis

Function definition and analysis is the heart of Value Engineering. It is the primary activity that separates VE from 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 the function analysis can be found in Section 6: Appendices, Appendix C.

The VE Team identified the functions using active verb and measurable noun combinations. This process allowed the team to truly understand all of the functions associated with the project. The basic functions (the purpose of the Purpose and Need) were defined as **"Increase Capacity"** and **"Reduce Congestion".** A Random Function Identification Worksheet was completed and is included in Appendix C.

Value Engineering Punch List

This section includes a Value Engineering Punch List that the decision makers can use to guide and track decisions as they determine the ultimate disposition of each VE alternative.

Value Engineering Punchlist

Idea No.	Idea Title	Performance Score	Initial Cost Avoidance / (Cost Add)	O&M Avoidance / (Cost Add)	Total Life Cycle Cost Avoidance / (Cost Add)	VE Team Recommended Package	Location	Activity	FHWA Categories	Comments
PP	**Proposal Packages**				**$0**	**$0**				
PP-01	Improve access management and pedestrian access using backage roads in the Northwest Quadrant	4.3	($89,000)		($89,000)	($89,000)				
PP-02	Improve access management and pedestrian access using backage roads in the Northeast Quadrant	4.3	($60,000)		($60,000)	($60,000)				
PP-03	Improve access management and pedestrian access using backage roads in the Southwest Quadrant	4.3	($113,000)		($113,000)	($113,000)				
PP-04	Improve access management and pedestrian access using backage roads in the Northwest Quadrant	4.3	($250,000)		($250,000)	($250,000)				
PP-05	Manage US 41 direct access	4.3	$32,000		$32,000	$32,000				
PP-06	Promote walkability on the mainline using Complete Streets	4.0	--	--	--	---				
PP-07	Alternative 4 – (New Alternative)	5.7	$1,936,000	$234,000	$2,170,000	$2,170,000				
PP-08	Alternative 5 – (Tweaks to Alternative #2)	6.8	$618,000		$618,000	$618,000				
PP-09	Replace signals with roundabouts and use quick-curb	5.0	$5,314,000	$248,000	$5,562,000	$5,562,000				

Value Engineering Team

- Andrew Brown, Palmer Engineering
- Phil Demosthenes, Demosthenes, LLC
- Jason Littleton, AEI
- Jerry Leslie, AEI
- Sandra Affare, UTC
- Justin Harrod, KYTC
- Brent Sweger, KYTC
- David Otte, KYTC
- Renee Hoekstra , RHA
- Kaitlyn Stewart, RHA

SECTION 4

SUMMARY INFORMATION

Section 4: Summary Information

Introduction

The VE study team brainstormed 67 ideas. A total of 9 ideas were developed as Value Engineering Proposals Packages (with costs); one idea was developed as a Design Suggestions (no costs). The Proposal Packages are combinations of the brainstormed ideas that were similar in nature. The tables on the following pages summarize the overall performance score (from the performance criteria explained in Section 1: Executive Summary and further detailed in Section 4: Support Data sections of this report) and potential cost avoidance/savings (or cost add) to the project. There is a total Life Cycle Cost which is cumulative with an overall cost avoidance/savings (or cost add) representing construction cost only, as appropriate.

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

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

Understanding Performance for each of the ideas is important as it supports the formula above. The performance for this project was developed, rated and ranked with the aid of the project management team. At any time, if a performance shows an improvement, a positive number, that is beneficial to the project, and of even more benefit if there shows a cost avoidance for the specific idea. However, if there is an addition of cost for a specific idea, the performance improvement might outweigh the added costs. If there is zero impact to performance, but there is a cost avoidance from the idea, this is also a great opportunity. The performance scores are based on a total possible ten (10) points.

Cost avoidance/savings is shown as positive costs while any added costs are noted in parenthesis.

There were 11 Design Comments (DC) for the project management team to consider in the next phase of design development.

Summary of Value Engineering Proposals and Design Suggestions (table)

Idea No.	Idea Title	Performance Impact	Initial Cost Avoidance / (Cost Add)	O&M Avoidance / (Cost Add)	Total Life Cycle Cost Avoidance / (Cost Add)
PP-01	Improve access management and pedestrian access using backage roads in the Northwest Quadrant	4.3	($89,000)	-	($89,000)
PP-02	Improve access management and pedestrian access using backage roads in the Northeast Quadrant	4.3	($60,000)	-	($60,000)
PP-03	Improve access management and pedestrian access using backage roads in the Southwest Quadrant	4.3	($113,000)	-	($113,000)
PP-04	Improve access management and pedestrian access using backage roads in the Northwest Quadrant	4.3	($250,000)	-	($250,000)
PP-05	Manage US 41 direct access	4.0	$32,000	-	$32,000
PP-06	Promote walkability on the mainline using Complete Streets	4.0	-	-	-
PP-07	Alternative 4 – (New Alternative)	5.7	$1,936,000	$234,000	$2,170,000
PP-08	Alternative 5 – (Tweaks to Alternative #2)	6.5	$618,000	-	$618,000
PP-09	Replace signals with roundabouts and use quick-Kurb	5.0	$5,314,000	$248,000	$5,560,000

Design Comments (table)

31 Design Comments (DC) are shown below. No additional information is provided for these however, the VE team believed that these are important to be considered in the next phase of design development.

Idea No.	Idea Title
MA	**Manage Access**
MA-15	Correct the labelling of Hopewell Road to W Railroad Street on the existing documents
MA-30	Close W Railroad Street access at US 41
MA-31	Close Margaret Court access at US 41
RC	**Reduce Congestion**
RC-06	Coordinate signal timing and have interconnect master controller
RC-09	Increase the width of the TWLTL to 14 feet
RC-14	Increase the width of the TWLTL to 22 feet
RC-20	Tighten the radius for eastbound US 41A to southbound US 41
RC-21	Obtain crash data for the Hanson Street frontage road to determine final design requirements
IW	**Improve Walkability**
IW-05	Provide pedestrian crossing island (or refuge areas) along US 41
IW-10	Consider transit stops within the project limits
M	**Miscellaneous**
M-02	Add mural or decorative treatment on/around railroad bridge

SECTION

5

VALUE ENGINEERING PROPOSALS & DESIGN SUGGESTIONS

Section 5: Value Engineering Workbooks

Introduction

The VE study team brainstormed 67 ideas. Of these, 9 ideas were identified for further development into Value Engineering proposals, including cost impacts. Due to the uniqueness of the study, it was deemed that the best way to present the brainstormed ideas was in Proposal Packages. The Proposal Packages were grouped by ideas that included the same quadrant of the project and/or the same topic.

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 Operational and Maintenance costs as estimated by the VE study team, as appropriate.

The VE study team also identified one Design Suggestion (DS) and 11 Design Comments (DC). A list of these was provided in Section 4: Summary Information.

The following pages detail the Value Engineering Proposals developed as part of the study by the VE study team and include the following information:

- Unique Identifying Number (XX-##)
- Creative Idea Title
- Function Identification
- Baseline Assumption – brief description
- Proposed Alternative – brief description
- Benefits
- Risks/Challenges
- Overall Performance Score
- Cost Summary
- Discussion/Justification
- Implementation Considerations, if applicable
- Impact to Performance – alternative scored against performance criteria
- Initial Cost Detail
- Replacement/Salvage and Annual Cost Detail, if applicable
- Baseline and Proposed Sketches, if applicable

Cost Estimating for VE Proposals

The costs used are those provided by KYTC. Where the VE study 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. Value Engineering ideas are provided for their evaluation and implementation exclusively by KYTC.

VALUE ENGINEERING PROPOSAL
PP-01
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northwest Quadrant
FUNCTION	**Manage access and reduce congestion**

BASELINE ASSUMPTION:

The baseline, Alternate 1, does not include upgrading backage roads and pedestrian access outside of the immediate US 41 Corridor in the Northwest Quadrant.

PROPOSED ALTERNATIVE:

This proposal is to aid in reducing congestion, improving safety and improving pedestrian access on and from US 41 by providing improved access (all modes of travel) through a defined and upgraded backage road system along Briarwood Drive and the private church entrance. This also will provide secondary circulation for businesses that front the proposed backage road improvements and improved pedestrian access to the businesses.

BENEFITS	**RISKS/CHALLENGES**
● Improves vehicle safety	● Additional Right of Way may be necessary
● Improves pedestrian safety	● Potential additional operation and maintenance costs to the City
● Reduces congestion along US 41	● More effective with the use of barrier median along US 41
● Provides a better opportunity for future development along the corridor	●
● Provides safer access to the Blue Line Bus Route	●
● Reduces left turn activity	●
●	●

		Performance Score	**4.3**
COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 89,000	$ -	$ 89,000
TOTAL (Baseline less Proposed)	$ (89,000)	$ -	$ (89,000)
			ADD COST

VALUE ENGINEERING PROPOSAL
PP-01
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northwest Quadrant

DISCUSSION/JUSTIFICATION:

The goal of this proposal is to reduce congestion and improve safety on and from US 41 by providing improved access for all modes of travel (auto, transit, and pedestrian) through a defined and upgraded backage road system along Briarwood Drive and the private church entrance in the Northwest Quadrant of the project corridor. This includes upgrading pedestrian facilities by extending sidewalks from the US 41/Briarwood Drive intersection to the Covenant Community Church sidewalk. It is proposed to add curb and gutter on kthe southside of Briarwood Drive from US 41 to the church parking lot directly across from the sidewalk in front of church. Also, we propose to provide two curb openings into the Enterprise parking lot to provide defined entrances into the property and improve pedestrian connectivity. The typical section for Briarwood Drive would be revised to include a sidewalk, however the total width will remain the same. The typical section for Briarwood Drive would be a five-foot sidewalk with a two-foot berm on either side, then a barrier header curb, with an 11-foot through lane exit and a 12-foot left turn lane exit, with 2.16-foot raised median, with a 16 foot entrance and barrier header curb with two-foot berm. Finally, the assumption is that access through the church parking lot would remain the same and function the same as it does today. We would need to purchase Right of Way for the construction of the sidewalk from US 41 to the Church. An alternative would be if the owner of the property donated the needed Right of Way to build the sidewalk. The additional sidewalk along Briarwood Drive would be 319 feet long to connect to the Church sidewalk. Briarwood Drive would need to be reconstructed with the proposed typical section including approximately 260 feet. These improvements, along with the any alternates that include a barrier median, will improve access for those properties along the US 41 corridor in the northwest quadrant.

SPECIAL IMPLEMENTATION CONSIDERATIONS:

May require additional Right of Way acquisition or negotiation with the Church to donate the Right of Way.

VALUE ENGINEERING PROPOSAL
PP-01
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northwest Quadrant

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Local Operations	Access to businesses and properties while minimizing impacts	21.43%	5	1.1
Justification for Impact Score	This provides additional access for properties.			
Mainline Operations	Capacity, congestion, traffic delays, conflicts	28.57%	5	1.4
Justification for Impact Score	This will reduce conflict points by allowing additional access from the back of properties in lieu of the front US 41.			
Schedule	Able to complete ROW acquisition and utility plans	4.76%	0	0.0
Justification for Impact Score	Since Right of Way acquisition is already occurring for this project, acquiring additional property should not have an impact on schedule.			
Drainage	Impacts to flooding	9.52%	0	0.0
Justification for Impact Score	No impact to performance.			
Connectivity	Enhances community economy	14.29%	5	0.7
Justification for Impact Score	This option enhances the economy by providing better access to the business and opening property for future development.			
Level of Service	Pedestrian access and comfort	21.43%	5	1.1
Justification for Impact Score	This option enhances pedestrian access and comfort by provide better sidewalks and connectivity to the local businesses and to development across the street.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**4.3**

**Note: Although this performance attribute did not have any weight during the initial assessment, the VE team*

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 PROPOSAL
PP-01
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northwest Quadrant

DESIGN ELEMENT	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Sidewalk	SY		$ 53.21	$ -	178	$ 53.21	$ 9,471
Barrier Header Curb	LF		$ 35.00	$ -	280	$ 35.00	$ 9,800
TY 2 Median	SY		$ 80.00	$ -	89	$ 80.00	$ 7,120
Additional Right of Way							
Pavement							
CL3 ASPH Surf 0.5B PG64-22	Ton				122	$ 86.08	$ 10,502
CLS ASPH BAS 1.00D PF64-22	Ton				571	$ 71.07	$ 40,581
Crushed Stone Base	Ton				489	$ 23.78	$ 11,628
TOTAL				$ -			$ 89,000
						CWE (BASELINE LESS PROPOSED)	$ (89,000)

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

ADD COST

VALUE ENGINEERING PROPOSAL
PP-01
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northwest Quadrant

SKETCH OF BASELINE ASSUMPTION

Proposed sketch of Sidewalk going to Church. Maybe a Typical Section

VALUE ENGINEERING PROPOSAL
PP-01
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northwest Quadrant

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL
PP-02
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northeast Quadrant
FUNCTION	**Manage access and reduce congestion**

BASELINE ASSUMPTION:

The baseline, Alternate 1, does not include upgrading backage roads and pedestrian access outside the immediate US 41 Corridor in the Northeast Quadrant.

PROPOSED ALTERNATIVE:

This proposal reduces congestion, improves safety and improves pedestrian access on and from US 41 by providing improved access (all modes of travel) through a defined and upgraded backage road system along Thornberry Drive, Margret Court and Chelsea Drive. Also provide a secondary circulation for businesses that front the proposed backage road improvements.

BENEFITS	**RISKS/CHALLENGES**
● Improves vehicle safety	● Additional operations and maintenance costs to the City
● Improves pedestrian safety	● More effective with a barrier median along US 41
● Reduces congestion along US 41	●
● Provides a better opportunity for future development along the corridor	●
● Provides safer access to the Blue Line bus route	●
● Reduces left turn activity	●
●	●

		Performance Score	**4.3**
COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 60,000	$ -	$ 60,000
TOTAL (Baseline less Proposed)	$ (60,000)	$ -	$ (60,000)
			ADD COST

VALUE ENGINEERING PROPOSAL
PP-02
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northeast Quadrant

DISCUSSION/JUSTIFICATION:

This proposal reduces congestion and improves safety on and from US 41 by providing improved access for all modes of travel (auto, transit, and pedestrian) through a defined and upgraded backage road system along Briarwood Drive , Thornberry Drive, Chelsea Drive and Margret Court in the Northeast Quadrant of the project corridor. This includes upgrading pedestrian facilities by extending sidewalks from the US 41/Briarwood Drive intersection to the sidewalk in front of the shopping center This proposes to install curb and gutter on the southside of Briarwood Drive from US 41 to directly across the shopping center building. This also proposes to add crosswalks for crossing Briarwood Drive on both sides of Thornberry Street. The typical section for Briarwood Drive would be revised to include a sidewalk although the total width would remain the same. The typical section for Briarwood Drive would be a five-foot sidewalk with a two-foot berm on either side, then a barrier header curb, with an 11-foot through lane exit and a 12-foot left turn lane exit, with a four-foot raised median, with a 16-foot entrance and barrier header curb with a two-foot berm. This would carry this typical to the Thornberry Street Intersection. From Thornberry Street this would include installing the curb and gutter and sidewalk along the south side of Briarwood Drive. The additional sidewalk along Briarwood Drive is 395 feet and Thornberry Street is 616 feet. Briarwood Drive would be reconstructed with the proposed typical section which is approximately 163 feet. These improvements, along with any alternates that include a barrier median, will improve access for those properties along the US 41 corridor in the northeast quadrant.

SPECIAL IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING PROPOSAL
PP-02
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northeast Quadrant

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Local Operations	Access to businesses and properties while minimizing impacts	21.43%	5	1.1
Justification for Impact Score	This provides additional access for properties.			
Mainline Operations	Capacity, congestion, traffic delays, conflicts	28.57%	5	1.4
Justification for Impact Score	This will reduce conflict points by allowing additional access from the back of properties to the front of US 41.			
Schedule	Able to complete Right of Way acquisition and utility plans	4.76%	0	0.0
Justification for Impact Score	No impact to performance.			
Drainage	Impacts to flooding	9.52%	0	0.0
Justification for Impact Score	No impact to performance.			
Connectivity	Enhances community economy	14.29%	5	0.7
Justification for Impact Score	This option enhances the economy by providing better access to the businesses and opens up the property for future development.			
Level of Service	Pedestrian access and comfort	21.43%	5	1.1
Justification for Impact Score	This option enhances pedestrian access and comfort by providing better sidewalks and connectivity to the local businesses and to the development across the street.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**4.3**

**Note: Although this performance attribute did not have any weight during the initial assessment, the VE team*

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 PROPOSAL
PP-02
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northeast Quadrant

DESIGN ELEMENT	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Sidewalk	SY				112	$ 53.21	$ 5,960
Barrier Header Curb	LF				326	$ 35.00	$ 11,410
TY2 Median	SY				54	$ 80.00	$ 4,320
Pavement							
CL3 ASPH Surf 0.5B PG64-22	Ton				74	$ 86.08	$ 6,370
CLS ASPH BAS 1.00D PF64-22	Ton				348	$ 71.07	$ 24,732
Crushed Stone Base	Ton				312	$ 23.78	$ 7,419
TOTAL				$ -			$ 60,000
						CWE (BASELINE LESS PROPOSED)	$ (60,000)

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

ADD COST

VALUE ENGINEERING PROPOSAL
PP-02
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northeast Quadrant

SKETCH OF BASELINE ASSUMPTION

VALUE ENGINEERING PROPOSAL
PP-02
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Northeast Quadrant

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL
PP-03
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southwest Quadrant
FUNCTION	**Manage access and reduce congestion**

BASELINE ASSUMPTION:

The proposed baseline, Alternate 1, does not include upgrading backage roads and pedestrian access outside the immediate US 41 Corridor in the Southwest Quadrant.

PROPOSED ALTERNATIVE:

This proposes to widen the alley to 22 feet to develop as a backage road system. This would also include connecting the sidewalk to the proposed backage road and tie into any residential sidewalks.

BENEFITS	**RISKS/CHALLENGES**
● Improves access for potential development along US 41 from Railroad Drive and Cates Street	● There are no existing sidewalks within the residential streets
● Potential to increase bike and pedestrian use by introducing sidewalks into residential streets that currently don't have sidewalks	● There are potential issues with the overhead line at Railroad
● Reduces left turn activity	● More effective with the barrier raised median
●	●
●	●
●	●
●	●

		Performance Score	**4.3**
COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 113,000	$ -	$ 113,000
TOTAL (Baseline less Proposed)	$ (113,000)	$ -	$ (113,000)
			ADD COST

VALUE ENGINEERING PROPOSAL
PP-03
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southwest Quadrant

DISCUSSION/JUSTIFICATION:

This proposal is provided to reduce congestion and improve safety on US 41 by providing improved access through a defined backage road system along the Alley way between Railroad Street and Cate Street in the Southwest Quadrant of the project corridor. This includes providing a five-foot sidewalk on the east side of the new backage road. The typical section for the new backage road would be a Five-foot sidewalk with a two-foot berm on either side, with two 11-foot lanes. This would require additonal purchase of Right of Way for the construction of the new backage road. These improvements, along with any alternates that include a barrier median, will improve access for those properties along the US 41 corridor in the southwest quadrant.

SPECIAL IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING PROPOSAL
PP-03
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southwest Quadrant

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Local Operations	Access to businesses and properties while minimizing impacts	21.43%	5	1.1
Justification for Impact Score	This provides additional access for properties in the southwest quadrant.			
Mainline Operations	Capacity, congestion, traffic delays, conflicts	28.57%	5	1.4
Justification for Impact Score	This will reduce conflict points by allowing additional access from the back of properties that front US 41.			
Schedule	Able to complete Right of Way acquisition and utility plans	4.76%	0	0.0
Justification for Impact Score	Since Right of Way acquisition is already occurring for this project acquiring additional property should not have an impact on schedule.			
Drainage	Impacts to flooding	9.52%	0	0.0
Justification for Impact Score	No impact to performance.			
Connectivity	Enhances community economy	14.29%	5	0.7
Justification for Impact Score	This option enhances the economy by providing better access to the businesses and opening property for future development.			
Level of Service	Pedestrian access and comfort	21.43%	5	1.1
Justification for Impact Score	This option enhances pedestrian access and comfort by provide better sidewalks and connectivity to the local businesses and Trover Wellness Park.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**4.3**

**Note: Although this performance attribute did not have any weight during the initial assessment, the VE team*

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 PROPOSAL
PP-03
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southwest Quadrant

DESIGN ELEMENT	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Sidewalk	SY				144	$ 53.21	$ 7,662
Standard Header Curb	LF				1,200	$ 30.00	$ 36,000
Additional Righ of Way							
Pavement							
CL3 ASPH Surf 0.5B PG64-22	TON				135	$ 86.08	$ 11,621
CLS ASPH BAS 1.00D PF64-22	TON				630	$ 71.07	$ 44,774
Crushed Stone Base	TON				565	$ 23.78	$ 13,436
TOTAL				$ -			$ 113,000
						CWE (BASELINE LESS PROPOSED)	$ (113,000)

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

ADD COST

VALUE ENGINEERING PROPOSAL
PP-03
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

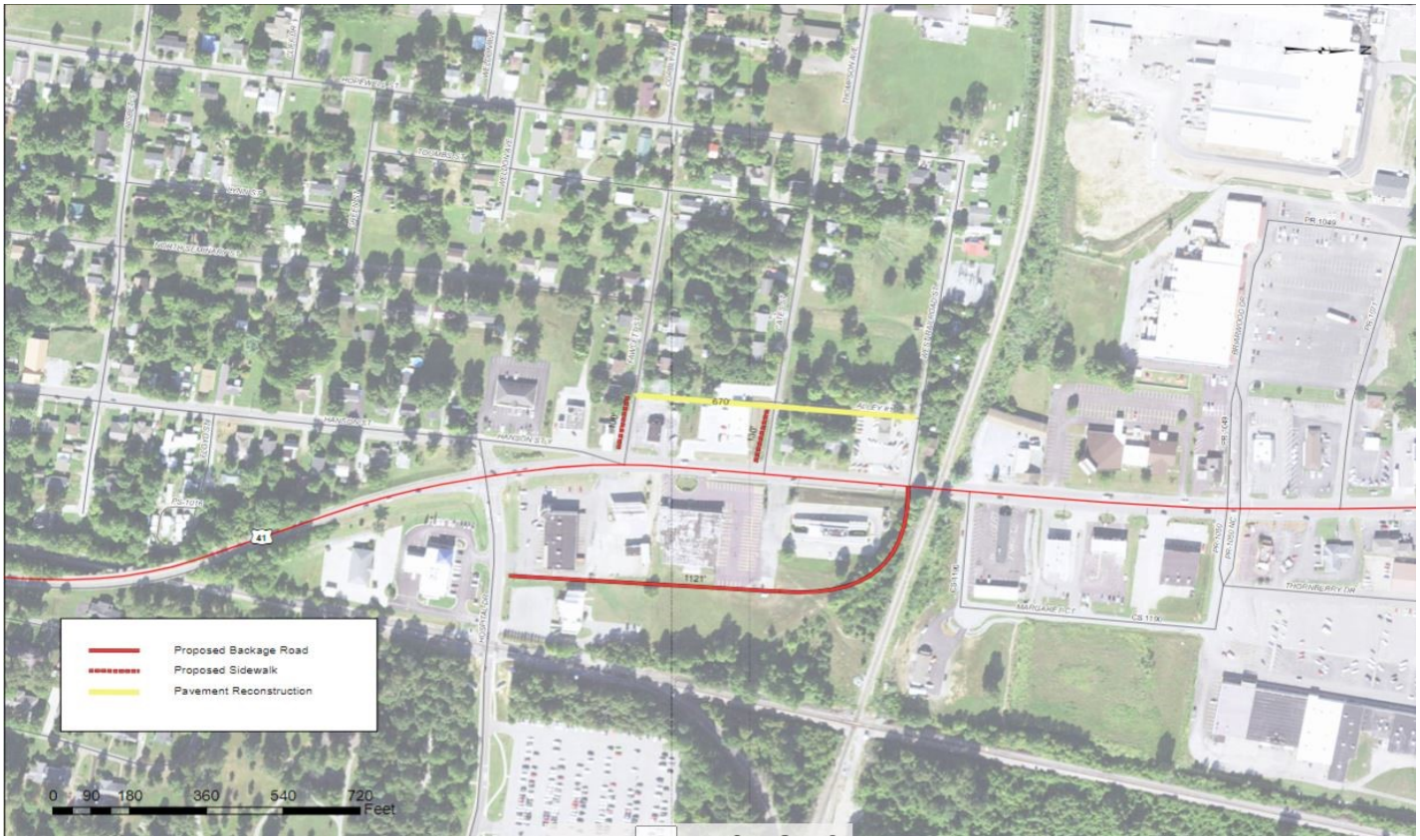
TITLE	Improve access management and pedestrian access using backage roads in the Southwest Quadrant

SKETCH OF BASELINE ASSUMPTION

VALUE ENGINEERING PROPOSAL
PP-03
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southwest Quadrant

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL
PP-04
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southeast Quadrant
FUNCTION	**Manage access and reduce congestion**

BASELINE ASSUMPTION:

The baseline, Alternate 1, does not include upgrading backage roads and pedestrian access outside the immediate US 41 Corridor in the Southwest Quadrant.

PROPOSED ALTERNATIVE:

This proposal is to reduce congestion, improve safety and improve pedestrian access on and from US 41 by providing improved access through a new backage road system from Hospital Drive to US 41.

BENEFITS	RISKS/CHALLENGES
● Reduces left turn activity	● Additional Right of Way is required
● Potential for an increase in bike and pedestrian use with better connectivity to hospital	● Need additional sidewalks to the Hospital
● Provides better access for current and future development on vacant property in the Southeast Quadrant	● More effective with the barrier raised median
● Allows access to the CVS without getting onto US 41	●
●	●
●	●
●	●

		Performance Score	**4.3**
COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 250,000	$ -	$ 250,000
TOTAL (Baseline less Proposed)	$ (250,000)	$ -	$ (250,000)
			ADD COST

VALUE ENGINEERING PROPOSAL
PP-04
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southeast Quadrant

DISCUSSION/JUSTIFICATION:

This proposal reduces congestion and improves safety on US 41 by providing improved access through a defined backage road system from Hospital Drive to US 41 just south of the CSX Railroad Bridge in the Southeast Quadrant of the project corridor. This includes a providing a five-foot sidewalk on both sides of the new backage road. The typical section for the new backage road would be a five-foot sidewalk with a two-foot berm on either side, and a barrier header curb, with two 11-foot lanes. This would require additional Right of Way purchase for the construction of the new backage road. These improvements, along with any alternates that include a barrier median, will improve access for those properties along the US 41 corridor in the southeast quadrant.

SPECIAL IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING PROPOSAL
PP-04
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southeast Quadrant

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Local Operations	Access to businesses and properties while minimizing impacts	21.43%	5	1.1
Justification for Impact Score	This provides additional access for properties.			
Mainline Operations	Capacity, congestion, traffic delays, conflicts	28.57%	5	1.4
Justification for Impact Score	This will reduce conflict points by allowing additional access from the back of properties along US 41.			
Schedule	Able to complete Right f Way acquisition and utility plans	4.76%	0	0.0
Justification for Impact Score	Since Right of Way acquisition is already occurring for this project acquiring additional property should not have an impact on schedule.			
Drainage	Impacts to flooding	9.52%	0	0.0
Justification for Impact Score	No impact to performance			
Connectivity	Enhances community economy	14.29%	5	0.7
Justification for Impact Score	This option enhances the economy by providing better access to the business and opening property for future development.			
Level of Service	Pedestrian access and comfort	21.43%	5	1.1
Justification for Impact Score	This option enhances pedestrian access and comfort by provide better sidewalks and connectivity to the local businesses and Trover Wellness Park.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**4.3**

**Note: Although this performance attribute did not have any weight during the initial assessment, the VE team*

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 PROPOSAL
PP-04
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southeast Quadrant

DESIGN ELEMENT	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Sidewalk	SY				1,245	$ 53.21	$ 66,246
Standard Header Curb	LF				2,242	$ 30.00	$ 67,260
Pavement							
Additional Right of Way							
CL3 ASPH Surf 0.5B PG64-22	Ton				226	$ 86.08	$ 19,454
CLS ASPH BAS 1.00D PF64-22	Ton				1,054	$ 71.07	$ 74,908
Crushed Stone Base	Ton				945	$ 23.78	$ 22,472
TOTAL				$ -			$ 250,000
						CWE (BASELINE LESS PROPOSED)	$ (250,000)

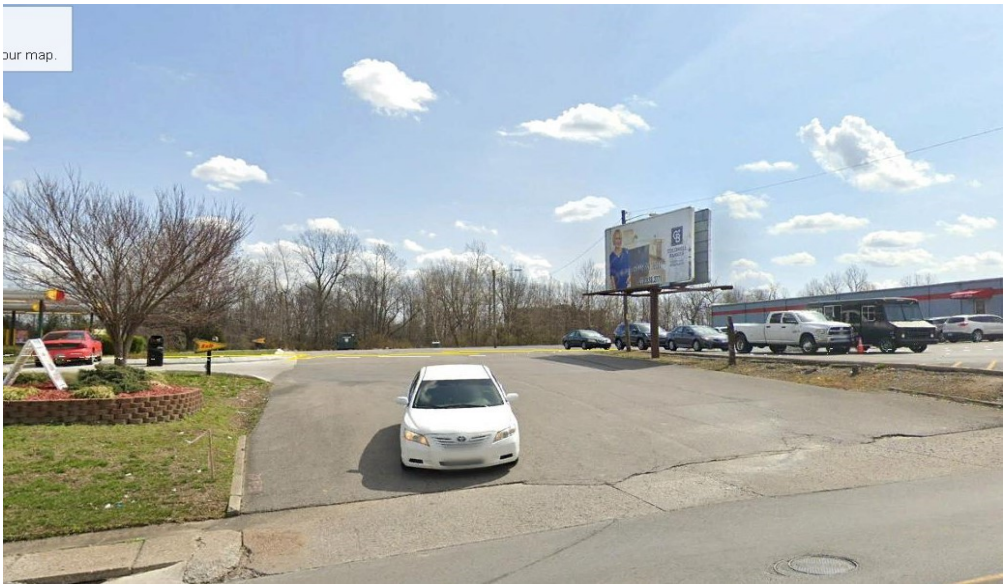
Note: Total costs are rounded to the nearest thousand dollars.

ADD COST

VALUE ENGINEERING PROPOSAL
PP-04
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southeast Quadrant

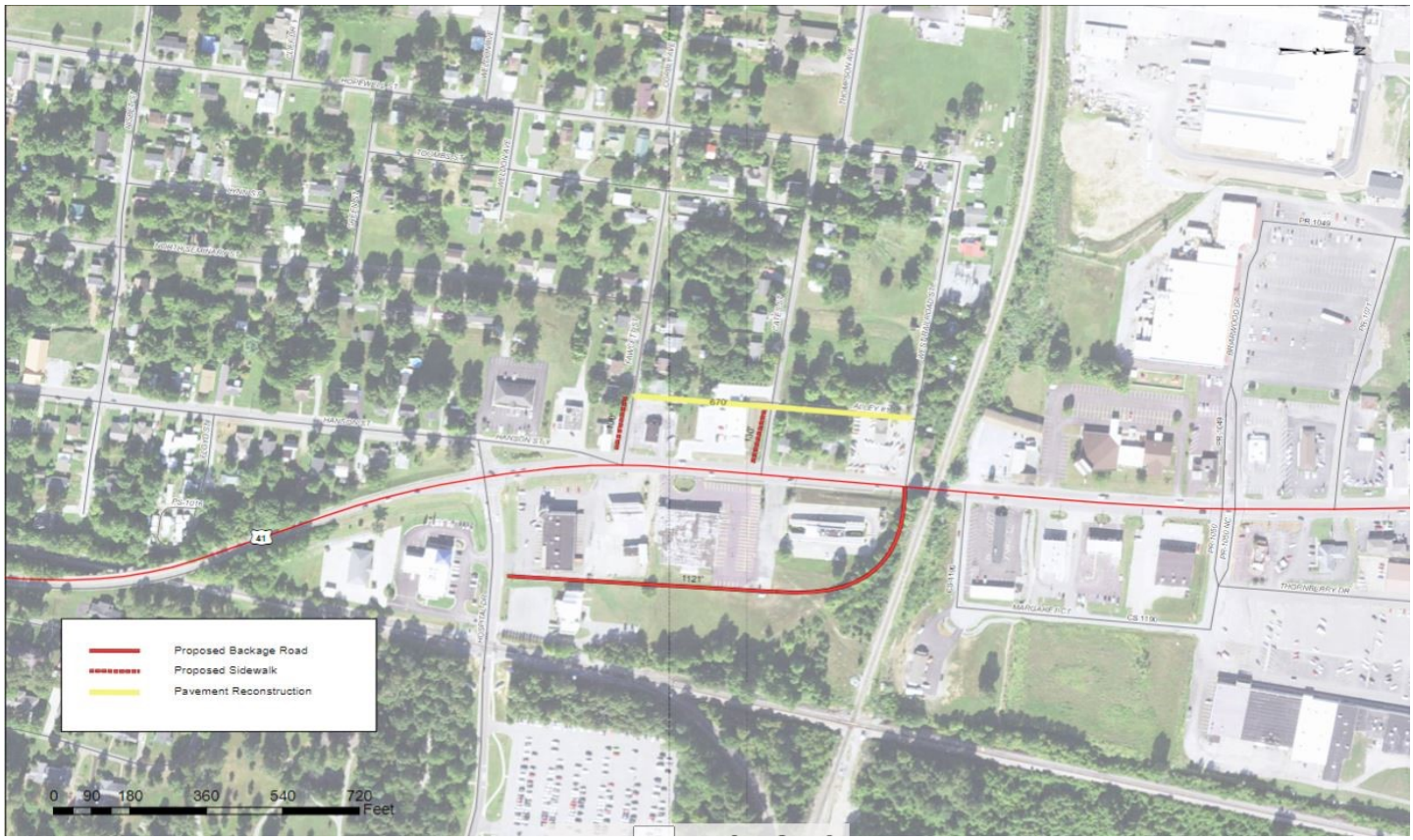
SKETCH OF BASELINE ASSUMPTION



VALUE ENGINEERING PROPOSAL
PP-04
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Improve access management and pedestrian access using backage roads in the Southeast Quadrant

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL
PP-05
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Manage US 41 direct access
FUNCTION	

BASELINE ASSUMPTION:

In the baseline, Alternative 1, most of the current access points are left in the current location. A few have been removed or include a channelization island to encourage right-in/right-out only movement.

PROPOSED ALTERNATIVE:

This proposal suggest an opportunity to close redundant access points to US 41 that are duplicative or where there is sufficient access from the side or back of the property. This also ensures that the project provide adequate corner clearance both on US 41 and along side streets and entrances.

BENEFITS	RISKS/CHALLENGES
● Improves traffic flow	● Will add time and potential cost to Right of Way acquisition
● Reduces conflict points, thus expected crashes	● Probable resistance by property owners whose access is modified
● Better use of backage road system for access	●
● Cleaner look along the corridor	●
● Safer for pedestrians due to less conflicts with turning vehicles	●
●	●
●	●

		Performance Score	**4.3**
COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ 64,000	$ -	$ 64,000
PROPOSED ALTERNATIVE:	$ 32,000	$ -	$ 32,000
TOTAL (Baseline less Proposed)	$ 32,000	$ -	$ 32,000

AVOID COST

VALUE ENGINEERING PROPOSAL
PP-05
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Manage US 41 direct access

DISCUSSION/JUSTIFICATION:

Currently, there are approximately 55 entrances (driveways and streets) along the 3000-foot stretch of US 41 between Hospital Drive and KY 281/US 41A. These entrances serve the many businesses and neighborhoods on or near US 41. The high density of uncontrolled entrances has led to a large number of crashes. This can be attributed to two primary conditions; first, vehicles turning left out of businesses onto US 41 get hit by oncoming vehicles, secondly, vehicles slowing down for signals or to turn into a business are getting rear ended by faster moving vehicles behind them.

There is ample research that shows the density of driveways along a corridor corresponds with crash rates. This proposal examined the baseline design (Alternative 1) to identify which driveways could be closed to reduce the driveway density. Consideration for business operation and customer access was given to each property. Of the 52 entrances that remain in the baseline design, 20 were identified to be candidates for closure. These include access points that are redundant or where access is possible from a side or back property line. Closure locations are marked in red on the attached diagram.

A predictive safety analysis conducted by the VE team, shows an expected reduction in crashes from the baseline design by nearly 9% annually when removing these entrances. This equates to a crash cost savings of $790k over 20 years.

Looking at a four-lane with median alternate, if these same entrances are removed, it improves safety performance by 3%. For an alternate with two lanes and a median and roundabouts, removing these entrances improves safety performance by 8%.

There are also four locations in which an entrance/exit to a business is close to the intersection of US 41 along a side street or shared access. It is recommended that adequate corner clearance be established at those locations to ensure safe ingress and egress from US 41. These locations are marked in blue on the diagram on the Proposed Sketch.

VALUE ENGINEERING PROPOSAL
PP-05
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Manage US 41 direct access

DISCUSSION/JUSTIFICATION:

Of the private entrances remaining, the driveways should be sized to the standard width for a commercial entrance and should in most cases, be limited to a right-in, right-out, or combination right-in/out traffic movement.

There are four side streets that are very narrow in width. This can cause conflicts when a vehicle turning onto the street encounters a vehicle stopped waiting to turn onto US 41. It is recommended that the street entrance be widened to at least 22 feet or wider and then tapered back to the original width, allowing turning vehicles to easily clear from the US 41 traffic stream.

SPECIAL IMPLEMENTATION CONSIDERATIONS:

This approach will require more extensive discussions with property owners during the Right of Way acquisition process. Although no compensation will be required if access remains reasonable and operation of the business is not significantly altered, some payment may help accelerate settlements and avoid lawsuits.

Subtract 20 driveways x 30' x 15' (/9) x $63.88/SY
Add Curb 20 x 28' x $$28.04

VALUE ENGINEERING PROPOSAL
PP-05
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Manage US 41 direct access

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Local Operations	Access to businesses and properties while minimizing impacts	21.43%	0	0.0
Justification for Impact Score	Does not significantly affect access to businesses. Business operations were considered when determining which to remove.			
Mainline Operations	Capacity, congestion, traffic delays, conflicts	28.57%	5	1.4
Justification for Impact Score	Fewer driveways on the mainline will contribute to fewer deceleration/stop and go movements			
Schedule	Able to complete Right of Way acquisition and utility plans	4.76%	0	0.0
Justification for Impact Score	This will likely slow down the Right of Way process somewhat, but should not negatively impact the schedule.			
Drainage	Impacts to flooding	9.52%	0	0.0
Justification for Impact Score	No impact to performance.			
Connectivity	Enhances community economy	14.29%	5	0.7
Justification for Impact Score	Better traffic flow and fewer crashes should help the economy of businesses on this corridor. (supporting information on FHWA publication on corridor access management: https://safety.fhwa.dot.gov/intersection/cam/fhwasa15005.pdf)			
Level of Service	Pedestrian access and comfort	21.43%	10	2.1
Justification for Impact Score	Fewer driveways crossing the sidewalks will lead to fewer vehicle/pedestrian conflicts and fewer ramps to maneuver.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**4.3**

**Note: Although this performance attribute did not have any weight during the initial assessment, the VE team*

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 PROPOSAL
PP-05
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Manage US 41 direct access

DESIGN ELEMENT	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Driveway entrances - concrete	SY	1,000	$ 63.88	$ 63,880	0		
Standard curb and gutter	LF	0			560	$ 28.00	$ 15,680
Sidewalk 560x5/9	SY				311	$ 53.61	$ 16,673
TOTAL				$ 64,000			$ 32,000
						CWE (BASELINE LESS PROPOSED)	$ 32,000

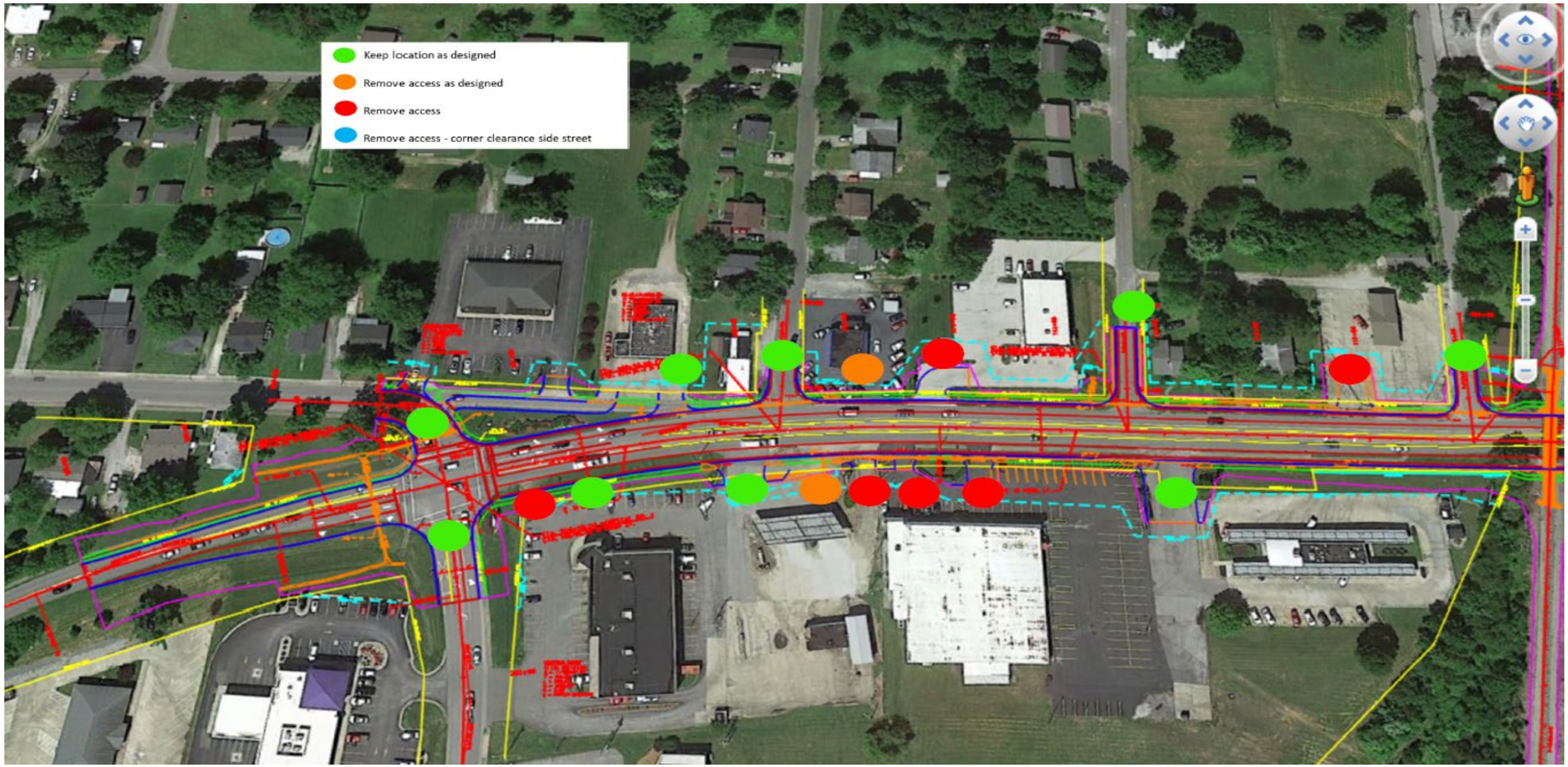
Note: Total costs are rounded to the nearest thousand dollars.

AVOID COST

VALUE ENGINEERING PROPOSAL
PP-05
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Manage US 41 direct access

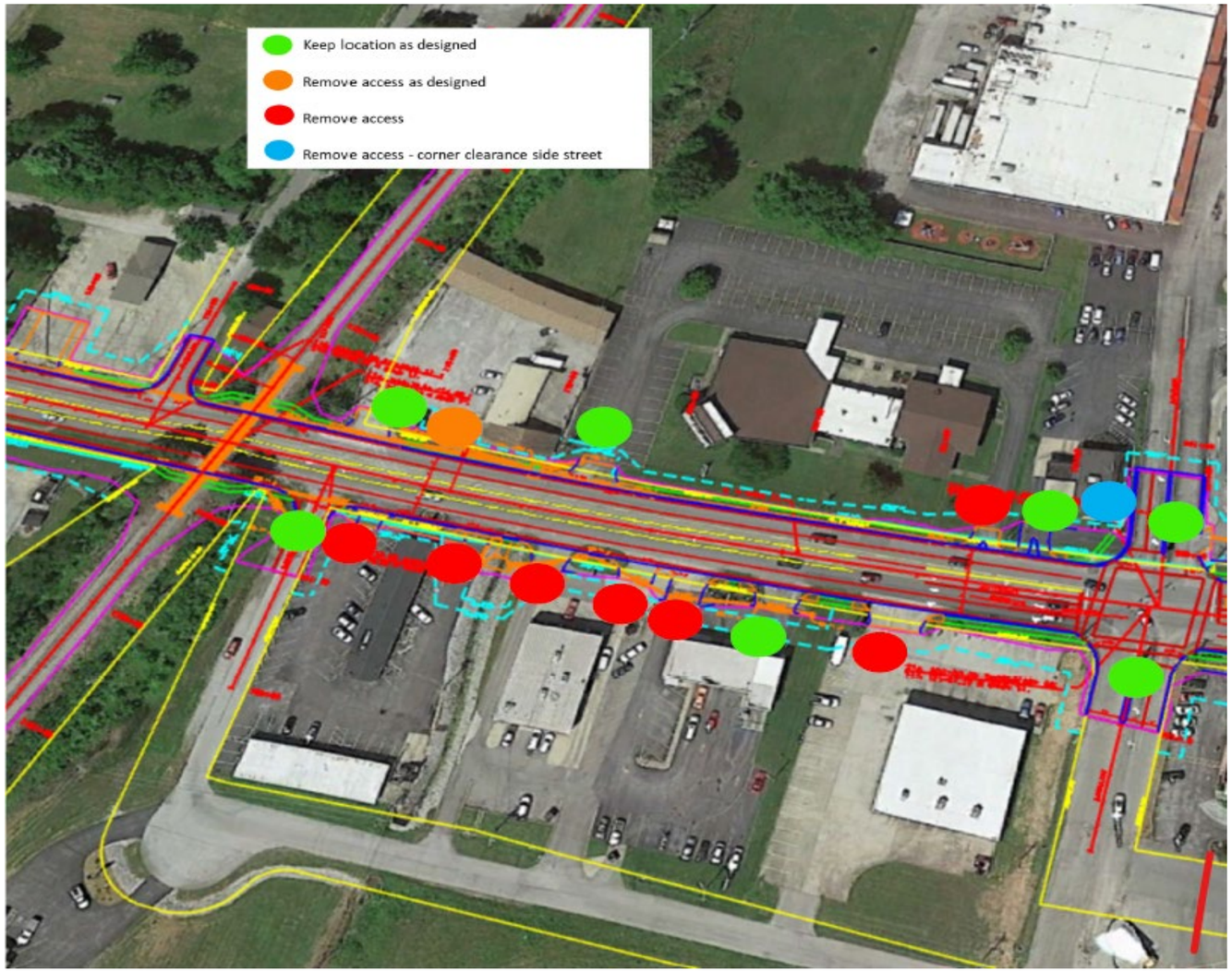
SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL
PP-05
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Manage US 41 direct access

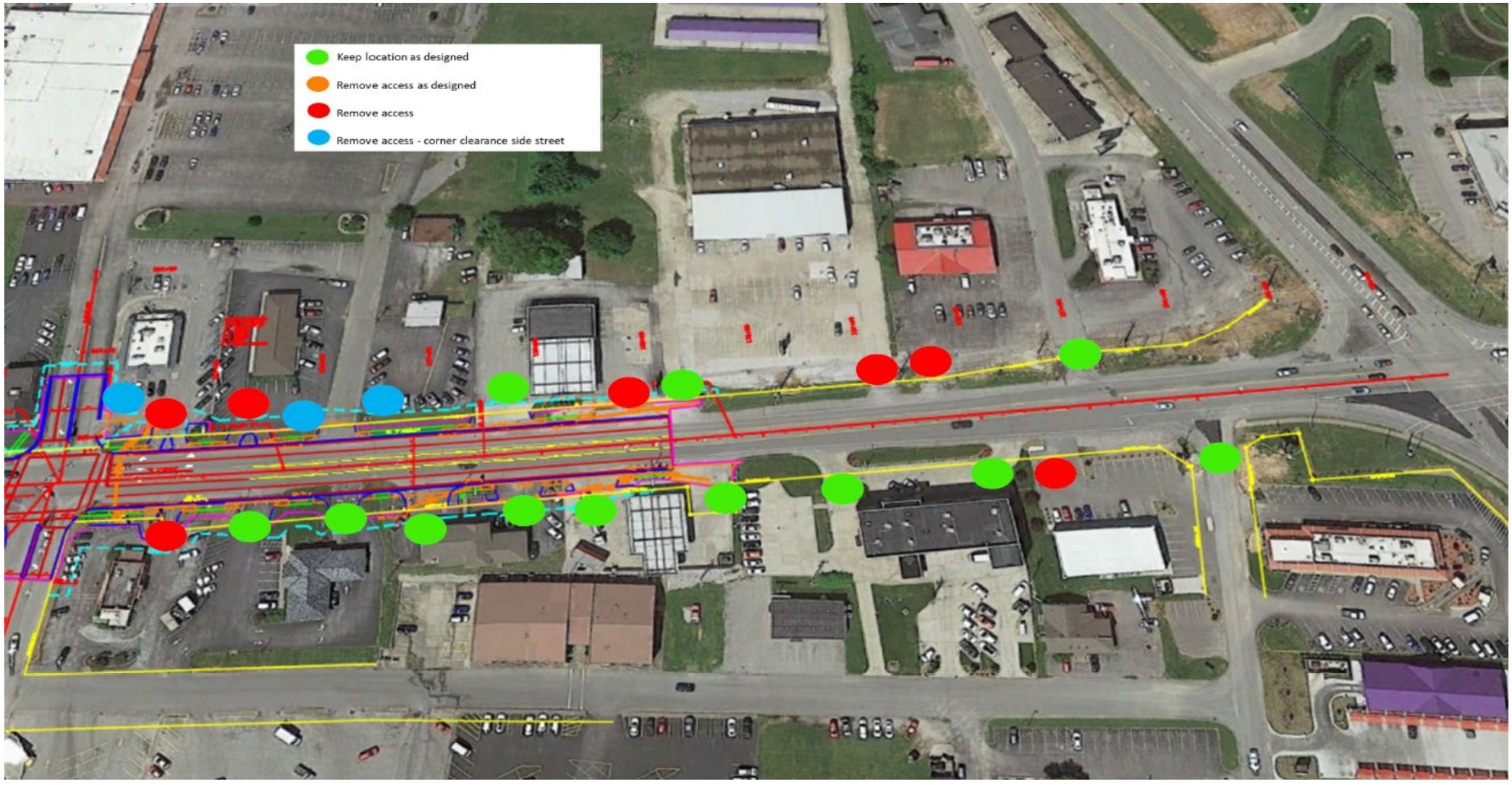
SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL
PP-05
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Manage US 41 direct access

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL
PP-06DS
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Promote walkability on the mainline using Complete Streets (this will become a Design Suggestion)
FUNCTION	

BASELINE ASSUMPTION:

The current design calls for a 5-foot wide sidewalk offset from the travel lanes by a two-foot buffer.

PROPOSED ALTERNATIVE:

This proposes to widen the buffer strip, add street trees, provide adequate pedestrian crossings, and connect sidewalks to adjacent land uses along US 41.

BENEFITS	RISKS/CHALLENGES
● Higher pedestrian LOS (comfort level)	● Long term maintenance and future replacement of trees and landscaping must be considered
● Separation of pedestrians from vehicles	●
● Shade from trees to increase comfort	●
● Visual beauty to the corridor and provides gateway entrance to city of Madisonville	●
● Makes walking between businesses and other land uses more feasible	●
● May increase attractiveness for redevelopment of adjacent and nearby properties	●
●	●

Performance Score	**4.0**

DESIGN SUGGESTION

VALUE ENGINEERING PROPOSAL
PP-06DS
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Promote walkability on the mainline using Complete Streets (this will become a Design Suggestion)

DISCUSSION/JUSTIFICATION:

Approach to transportation improvements has evolved over the last several decades. The objective is to not only address traffic concerns for automobiles and freight, but to consider solutions that balance the needs for all users, including pedestrians, cyclists, and transit riders. Often, it will address aesthetics of the corridor, in addition to meeting the basic transportation functions. Safe and smooth traffic flow, coupled with well-designed visual treatments will often lead to more private investment in nearby properties.

The current corridor contains few sidewalks. There are also no pedestrian connections to the businesses, shopping centers, churches, and neighborhoods from US 41.

The baseline design recognizes the need to provide sidewalks along with a buffer strip along US 41. This recommendation, however, adds in a larger buffer strip (4 feet) and a planting strip (6 feet) with street trees to increase the comfort level of a pedestrian walking alongside traffic. NOTE: the additional planting strip and buffer width is under the assumption that the roadway footprint (number of lanes) is reduced and everything can be built within the current baseline 78-foot Right of Way width.

It is also recommended that the project team discuss with business owners the possibility of making a sidewalk connection to or toward their front doors as part of this project. In many cases, the length of sidewalk needed would be rather short.

Street trees offer many benefits to the community, including increased beauty, shade for pedestrians, and reduction in the heat island effect from so much impervious surface. Improving the aesthetics and walkability often leads to increased private investment to properties within the area.

VALUE ENGINEERING PROPOSAL
PP-06DS
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Promote walkability on the mainline using Complete Streets (this will become a Design Suggestion)

DISCUSSION/JUSTIFICATION:

Approach to transportation improvements has evolved over the last decade or two. The objective is to not only address traffic concerns for automobiles and freight, but to consider solutions that balance the needs for all users, including pedestrians, cyclists, and transit riders.
Mid-block pedestrian crossings are also recommended. Currently, the design calls for traffic signals at Hospital Drive, Briarwood Drive, and KY281 (just north of this project). These would be the only official pedestrian crossings on this section of US41. The distances between signals is 1700 and 1200. To shorten that distance, it recommended to provide midblock crossings in between signals. One potential location would be close to Railroad Street. Another would be located approximately half way between Briarwood and KY281. Constructing a refuge island or median cut-through at these locations will allow a location protected from moving vehicles and allowing peds to cross one direction of traffic at a time.

SPECIAL IMPLEMENTATION CONSIDERATIONS:

"An agreement with local government to maintain (trim, replace, treat) trees and landscape would be necessary.

Although not required, mid-block crossing can be accommodated using a pedestrian hybrid beacon, commonly known as a HAWK signal.

Street trees installed would be approximately $200 each, planted every 40 feet. Where overhead utilities exist, smaller varieties are recommended to avoid conflict between the branches and lines in the future. This will add approximately $30,000 to the project cost.

Sod at $5.50/SY x2YD x 1333YD = $14,667 (trees planter)
Sodding extra 2-foot buffer: $5.50/SY x 2/3YDx1333YD = $4,888"
Although not required, mid-block crossing can be accommodated using a pedestrian hybrid beacon, commonly known as a HAWK signal.

VALUE ENGINEERING PROPOSAL
PP-06DS
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Promote walkability on the mainline using Complete Streets (this will become a Design Suggestion)

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Local Operations	Access to businesses and properties while minimizing impacts	21.43%	0	0.0
Justification for Impact Score	No impact to performance.			
Mainline Operations	Capacity, congestion, traffic delays, conflicts	28.57%	0	0.0
Justification for Impact Score	No impact to performance.			
Schedule	Able to complete Right of Way acquisition and utility plans	4.76%	0	0.0
Justification for Impact Score	No impact to performance.			
Drainage	Impacts to flooding	9.52%	5	0.5
Justification for Impact Score	Introduces more permeable surface/less impermeable surface.			
Connectivity	Enhances community economy	14.29%	10	1.4
Justification for Impact Score	Aesthetic and walkability improvement will add to appeal to reinvest in area.			
Level of Service	Pedestrian access and comfort	21.43%	10	2.1
Justification for Impact Score	Buffer from traffic shade, better crossings.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**4.0**

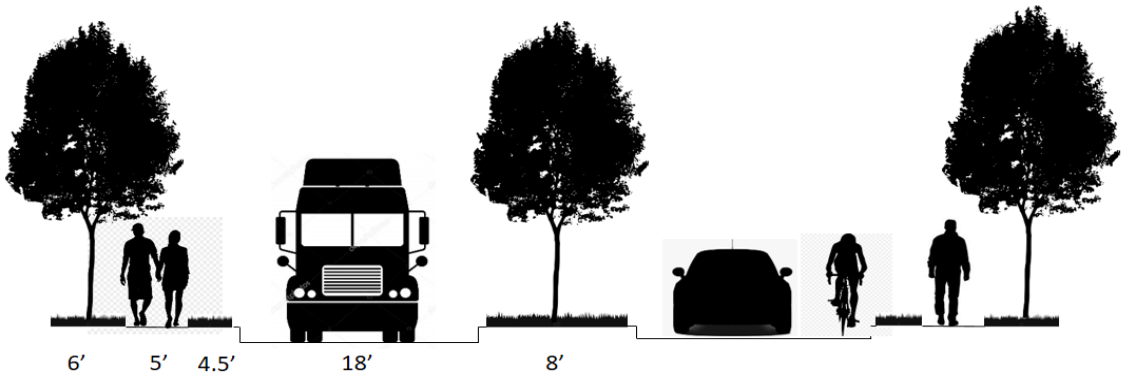
**Note: Although this performance attribute did not have any weight during the initial assessment, the VE team*

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

TITLE	Promote walkability on the mainline using Complete Streets (this will become a Design Suggestion)

SKETCH OF PROPOSED ALTERNATIVE

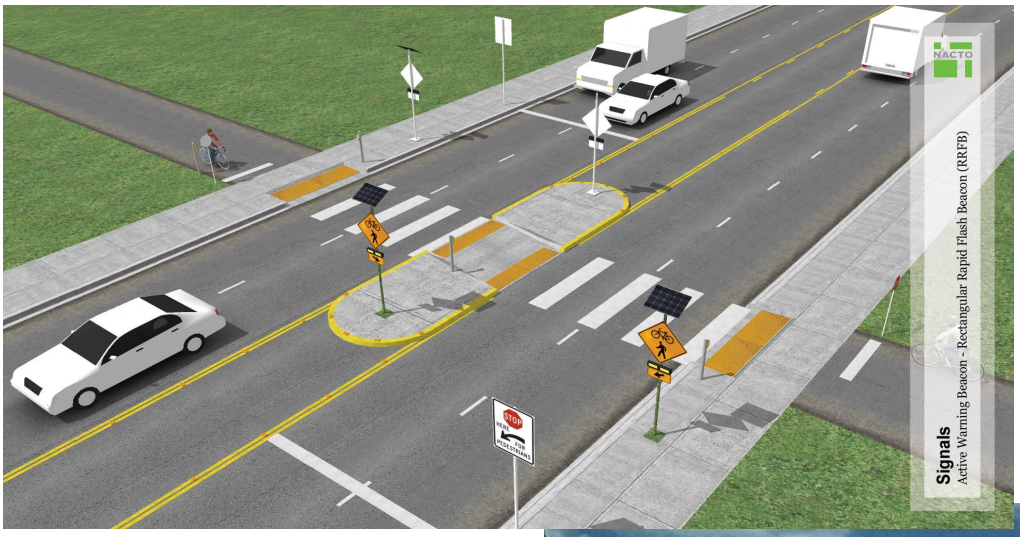


US41 Main Street
Re-Visioned

VALUE ENGINEERING PROPOSAL
PP-06DS
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Promote walkability on the mainline using Complete Streets (this will become a Design Suggestion)

SKETCH OF PROPOSED ALTERNATIVE

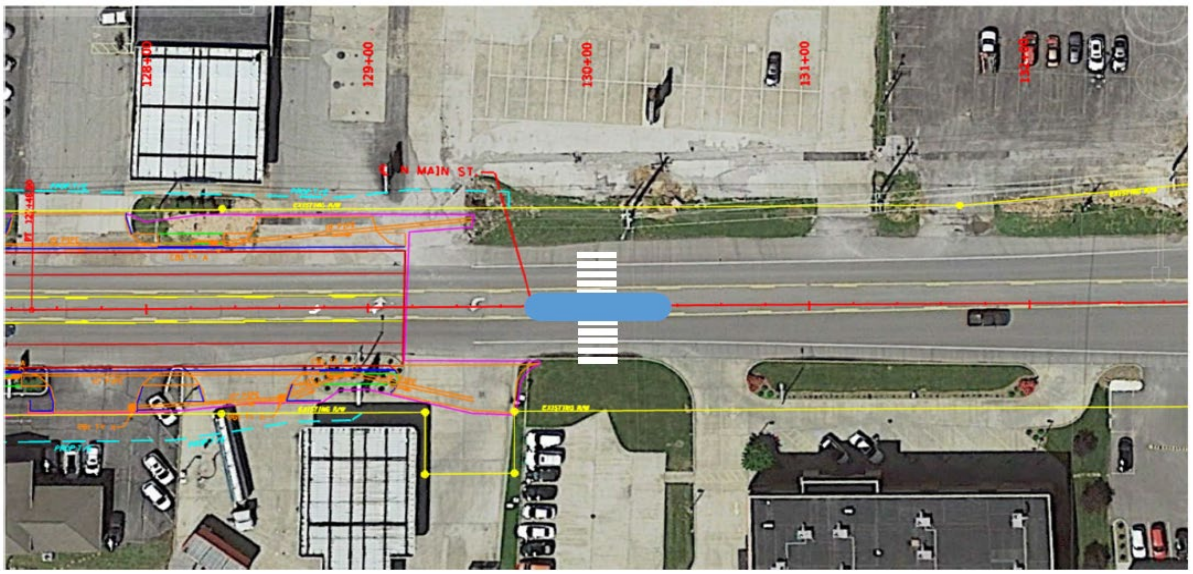


Midblock crossing examples

VALUE ENGINEERING PROPOSAL
PP-06DS
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Promote walkability on the mainline using Complete Streets (this will become a Design Suggestion)

SKETCH OF PROPOSED ALTERNATIVE



Potential Mid-block Crossing Location

VALUE ENGINEERING PROPOSAL
PP-07
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

bout intersections	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts
FUNCTION	**Reduce Congestion**

BASELINE ASSUMPTION:

The baseline, Alternative 1, is proposed as a four-lane highway (two travel lanes in each direction) with a TWLTL and sidewalks using traffic signals for traffic control at Hospital Drive and Briarwood Drive intersections.

PROPOSED ALTERNATIVE:

This is a proposed new alternative; Alternative Four. This would include a two-lane highway (one travel lane in each direction), a raised median throughout, sidewalks, and using single lane roundabouts for traffic control at Hospital Drive and Briarwood Drive intersections.

BENEFITS	RISKS/CHALLENGES
● An approximate 37% reduction in total annual crashes	● While beneficial technically, local community may have strong concerns
● Reduces Right of Way acquisition to a two-lane highway	● Construction usually more expensive than a standard intersection for a two-lane roadway.
● Roundabouts are able to accommodate up to 24,000 ADT on US 41	● Will restrict direct left turn ingress and egress from roadside properties (businesses)
● Reduces the size of the beam (single) for RR bridge (58') resting on the abutments. No additional piers and beams	● Will require a slightly larger Right of Way footprint at Hospiital Drive and Briarwood Drive intersections
● Elimination of mid-block left turns across two opposing lanes	● Benefits from backage road circulation for best performance
● Reduces pedestrian crossing distances	●
● Reduce the current intersection queues, decreases delay, decreases travel time	●
● Eliminates traffic signal replacement or annual maintenance costs	●
●	●
●	●

		Performance Score	**5.7**
COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ 3,713,000	$ 502,000	$ 4,215,000
PROPOSED ALTERNATIVE:	$ 1,777,000	$ 268,000	$ 2,045,000
TOTAL (Baseline less Proposed)	$ 1,936,000	$ 234,000	$ 2,170,000
			AVOID COST

VALUE ENGINEERING PROPOSAL
PP-07
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

DISCUSSION/JUSTIFICATION:

The baseline alternative will result in a significant increase in crashes and the severity of crashes compared to existing conditions. This will occur as the alternative reduces congestion. With less congestion and a wider roadway, prevailing speeds will increase at all hours. Higher speeds mean longer stopping sight distance requirements. Left turns across two opposing lanes will result in a higher crash rate as compared to crossing a single opposing lane (current conditions). Intersection sight distance at intersections will be reduced. The bottle necks causing delay and long queues appear to be the traffic signals, not the two-lane roadway.

A single lane roundabout should be able to accommodate up to 24,000 ADT. There is no reason to install a four-lane highway to accommodate the predicted 2040 traffic volume. The current bottlenecks that are causing congestion are the single lane traffic signals. The HCS software shows that the baseline, Alternative , with four lanes and this Alternative 4 with two lanes and roundabouts operate at similar overall intersection delay.

Total width of the two-lane lane typical is 58 feet in with two 15-foot travel lanes compared to 78 feet for Alternative 1 with four 11-foot travel lanes and a center 12-foot TWLTL.

At the railroad under pass, this reduces the beams as only a set of two 58-foot beams will be necessary, abutment to abutment. The baseline Alternative 1 requires three sets of two beams for the length and the additional piers. It is assumed two beams (girders) per span. The height of the remaining 2 beams should be about the same. The result would be a wider version of the current underpass.

Roundabouts have significant resilience and recovery to adverse weather conditions.

The roundabout intersections only need right turn lanes at Southbound to Westbound Hanson, Northbound to Eastbound Hospital Drive, and Northbound to Eastbound Briarwood Drive. No left turns are necessary, therefore there is no need for a center lane of 12 feet. Alternative 4 does require a raised center median with curb and gutter (1.5 feet) on both sides.

VALUE ENGINEERING PROPOSAL
PP-07
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

DISCUSSION/JUSTIFICATION:

Roundabouts provide a significant improvement in safety. Several studies show an over 90 percent reduction in severe injuries and the elimination of fatalities. The raised median will prohibit left turns at driveways. About 74% of access crashes are left turn maneuvers. Overall, Alternative 4 is expected to reduce total crashes by 37% and serious injury crashes by 49%.

Single-lane roundabouts are safer than multi-lane roundabouts in terms of total crashes. (Based on current studies).

Roundabout are more efficient for traffic. There is no signal related stop delay, which is currently the basis for the current back-up situation in the current condition, there is, however, some delay due to the yield at entry requirements. HCS shows the peak hour queues are slightly longer at the roundabouts for the Northbound and Southbound US 41. Roundabouts are much more efficient than signals during off-peak hours. (22 to 23 hours each day). Roundabouts should perform at LOS A during non-peak hours.

Roundabouts can accommodate a larger design vehicle for U-turns and provides better turning radius for trucks. The loons proposed for Alternative 1 only accommodate passenger vehicles.

The roundabout also relieves sight distance difficulties typical of left turn lanes with negative off-set.

ICD diameter for single lane varies between 135 and 90 feet. 135 feet is used here to estimate the footprint.

HCM shows the roundabouts outperform both Alternative 1 and current conditions in terms of both delays and queues.

This also provides a level of traffic calming as the roundabout design speed will be about 15 -18 mph

None apparent.

+

PP-07

Kentucky Transportation Cabinet

US 41 - North Main Street, Hopkins County

TITLE	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Local Operations	Access to businesses and properties while safety and operational minimizing impacts	21.43%	5	1.1
Justification for Impact Score	While direct left access for properties is restricted, right turns are allowed at driveways and all traffic can use the roundabouts for safe U-turns and circulate on local street.			
Mainline Operations	Capacity, congestion, traffic delays, conflicts	28.57%	10	2.9
Justification for Impact Score	Roundabouts at Hospital and Briarwood Drives will be much more efficient than current signals, queues will be shorter during peak hours and almost non-existant during 22 hours of non-peak volumes.			
Schedule	Able to complete Right of Way acquisition and utility plans	4.76%	0	0.0
Justification for Impact Score	Almost no Right of Way acquistion mid-block compared to Alternative 1. Right of Way acquistion necessary at the two intersections to build the roundabouts. Should reduce the number of involved parcels.			
Drainage	Impacts to flooding	9.52%	0	0.0
Justification for Impact Score	No impact to performance.			
Connectivity	Enhances community economy	14.29%	5	0.7
Justification for Impact Score	With the more efficient roundabout intersection control, reduced queues and less congestion, US 41 will operate much better and people should be more willing to use the roadway.			
Level of Service	Pedestrian access and comfort	21.43%	5	1.1
Justification for Impact Score	Pedestrain access and comfort parallel to US 41 will be similar to Alternative 1 base condition. However, the single-lane roadway and 15-foot crosswalks at the roundabouts will significantly increase the safety and comfort to cross US 41.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**5.7**

**Note: Although this performance attribute did not have any weight during the initial assessment, the VE team*

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 PROPOSAL
PP-07
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

DESIGN ELEMENT	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Outside curb and gutter, 2.5 ft both sides	LF	4,600	$ 28.04	$ 128,984	4,600	$ 28.04	$ 128,984
Center median curb and gutter 1.5 ft, both sides	LF				4,600	$ 28.04	$ 128,984
Truck apron on 2 roundabouts	SY		$ -	$ -	332	$ 63.00	$ 20,916
Narrow width may allow utility avoiding utilities							
Right turn lanes (3 total)	SY	366	$ 35.00	$ 12,810	366	$ 35.00	$ 12,810
RBT for 2 center island (Sod)	SY		$ -	$ -	1,413	$ 5.50	$ 7,772
Railroad bridge	LS	1		$ 2,848,000	0.5	$ 2,848,000.00	$ 1,424,000
Right of Way cost reduction							
Full depth Pavement, 5 ln 18 ft width	SY	4,600	$ 35.00	$ 161,000			
Resurfacing Pavement, 2 ln 36 ft width basline 30 ft width proposed	SY	9,200	$ 35.00	$ 322,000	7,667	$ 7.00	$ 53,669
Signal Intersections	none	2	$ 120,000.00	$ 240,000	0	$ -	$ -
TOTAL				$ 3,713,000			$ 1,777,000
						CWE (BASELINE LESS PROPOSED)	$ 1,936,000

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

AVOID COST

VALUE ENGINEERING PROPOSAL
PP-07
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

Alt 4. Roundabout corridor	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

Assumptions			
Interest/Discount Rate(%):	**3.0%**	**Economic Life (yrs):**	20

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Assumption**		**Proposed Alternative**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Resurfacing	10	$ 675,000	$ 502,263	$ 360,000	$ 267,874
2						
3						
4						
5						
6						
7						
8						
9						
10						
Total Salvage & Replacement Costs			**$ 675,000**	**$ 502,263**	**$ 360,000**	**$ 267,874**

Annual Costs (pres worth calculated over 20 yrs)		**Baseline Assumption**		**Proposed Alternative**	
Item	**Description**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1					
2					
3					
4					
5					
Total Annual Costs		**$ -**	**$ -**	**$ -**	**$ -**

SUMMARY	**Baseline Present Worth**	**Proposed Present Worth**
Total Present Worth (salvage+annual pres worth)	$ 502,000	$ 268,000
RESULTS (Proposed less Baseline)	**AVOID COST of $234,000**	

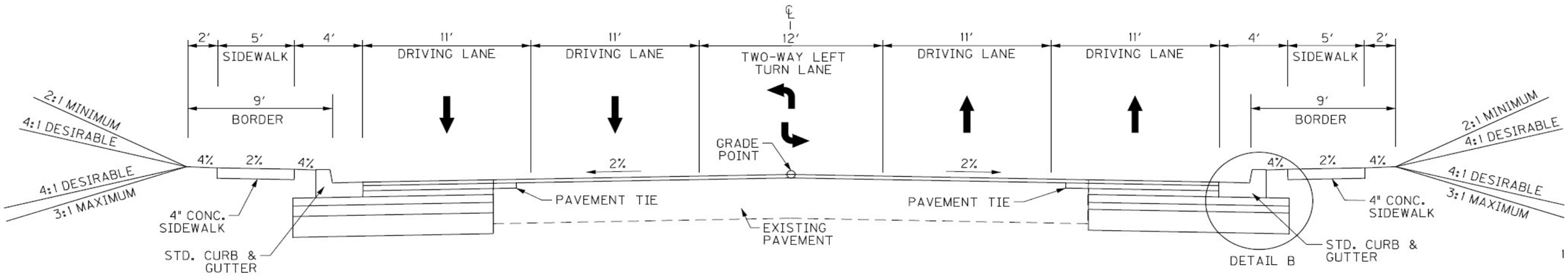
Notes: 1) Total Present Worth is rounded to the nearest thousand dollars, 2) Initial costs are covered in the Detail sheet.

TITLE	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

SKETCH OF BASELINE ASSUMPTION

TITLE	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

SKETCH OF BASELINE ASSUMPTION



N MAIN ST. OVERLAY AND WIDENING
HANSON ST./ HOSPITAL DR. TO END CONSTRUCTION

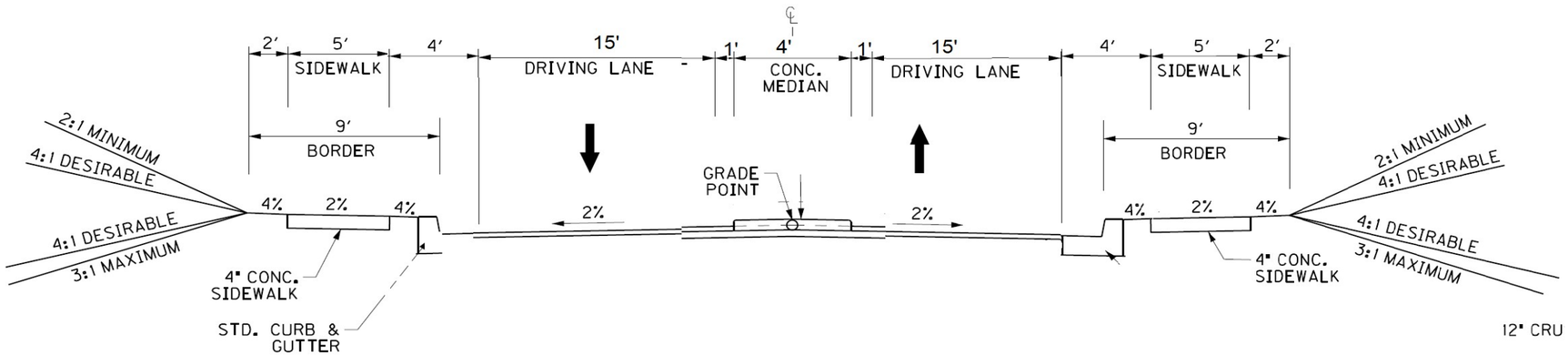
TITLE	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

SKETCH OF PROPOSED ALTERNATIVE - CROSS SECTION BETWEEN INTERSECTIONS

A typical single lane roundabout. US 41 roundabouts will have 2 right turn lanes at Hospital and one right turn lane at Briarwood.

TITLE	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

SKETCH OF PROPOSED ALTERNATIVE - CROSS SECTION BETWEEN INTERSECTIONS



TITLE	Alternative 4 – (New Alternative) Two-lane roadway with two roundabouts

SKETCH OF PROPOSED ALTERNATIVE - CROSS SECTION BETWEEN INTERSECTIONS

A typical single lane roundabout. US 41 roundabouts will have 2 right turn lanes at Hospital and one right turn lane at Briarwood.

VALUE ENGINEERING PROPOSAL
PP-08
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Alternative 5 – (Tweaks to Alternative #2)
FUNCTION	**Manage Access and Reduce Congestion**

BASELINE ASSUMPTION:

The baseline, Alternate 1, provides two through lanes of traffic in each direction and features a two-way left-turn lane in the center. The proposed roadway will replace paved shoulders with curb and gutter and include new sidewalks along both sides of the road. The CSX Railroad bridge will be reconstructed to accommodate the wider roadway and sidewalks.

PROPOSED ALTERNATIVE:

This proposed alternative, provides two through lanes in each direction (for a majority of the project's length) and features a raised concrete median barrier in the center. This proposes adjustments to KYTC's Alternative 2 with the following:

MA-27 - Leave Hanson Street open in front of the real estate office and dry-cleaners and eliminate right-turn only at the Hospital Drive intersection.

M-01 - Design a single-span railroad bridge in lieu of three-span bridge.

RC-15 - Lengthen the right lane northbound at US 41 and Hospital Road (with 200 feet of storage).

RC-23 - Extend the southbound US 41 to eastbound Hospital Drive left-hand turn lane (200 foot storage is also useful here).

RC-08 - Install a raised median, per Alternative 2, but increase the width (minimum of 6feet) of the raised median for

BENEFITS	**RISKS/CHALLENGES**
● Improves pedestrian accommodations	● RC-15 - The increase in turn lane length may force construction limits closer to the existing parking lot of the Madisonville Lion's Club
● Adds traffic capacity	● M-01 - Additional coordination will be needed with CSX to revise bridge configuration
● Improves traffic safety	●
●	●
●	●
●	●

		Performance Score	**6.8**
COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ 3,264,000	$ -	$ 3,264,000
PROPOSED ALTERNATIVE:	$ 2,646,000	$ -	$ 2,646,000
TOTAL (Baseline less Proposed)	$ 618,000	$ -	$ 618,000
			AVOID COST

VALUE ENGINEERING PROPOSAL
PP-08
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Alternative 5 – (Tweaks to Alternative #2)

DISCUSSION/JUSTIFICATION:

MA-27 - Traffic data shows that approximately 30% of the cars per day uses the Hanson Street (one-way) path towards town. Keeping this path open eliminates the need for the right turn onto Hanson Street from Hospital Drive.
M-01 - The main span is 70 feet long. (Including the sidewalks, makes the span 90 feet. This means that a bigger (taller) beam is needed to clear the width.) Having a median in the middle with two spans means 45-foot sections containing two lanes in one direction and a sidewalk (providing a buffer between the pedestrians and traffic). Lanes are 11 feet wide each. (See the Proposed Sketch.)
RC- 15 - While the 75 feet of storage for the RTL design meets the need, the through lane will block access to the right turn. While this Alternative will have a similar safety performance to Alternative. 2, compared to the baseline, Alternative 1, this Alternative estimates a 20% reduction in total crashes per year with a 15.67 crashes per year. The proposed 200-foot storage will allow adequate length to access the turn lane when the through lane is queued up, subsequently this will improve emergency response times to the Baptist Health Hospital. The extended lane provides better performance in the queue length based on traffic analyses. (See Proposed Sketch)
RC-23 - While 30 ft of storage for the LTL design meets the need, the through lane will block access to the left turn; therefore, the proposed 200-foot storage will allow adequate space to move into the turn lane and subsequently improve emergency response times to the Baptist Health Hospital. (See Proposed Sketch)

SPECIAL IMPLEMENTATION CONSIDERATIONS:

Additional coordination needed with CSX to review and approve new bridge concept.

VALUE ENGINEERING PROPOSAL
PP-08
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Alternative 5 – (Tweaks to Alternative #2)

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Local Operations	Access to businesses and properties while minimizing impacts	21.43%	**5**	1.1
Justification for Impact Score	Leaving Hanson Street open in front of the real estate office and dry cleaners improves the businesses and properties; also, extending the RTL and LTL at Hospital Drive to accommodate the traffic queue provides access to Baptist Health Hospital on a more regular basis.			
Mainline Operations	Capacity, congestion, traffic delays, conflicts	28.57%	**10**	2.9
Justification for Impact Score	Traffic data shows that approximately 30% of the cars per day uses the Hanson Stree (one-way) path towards town. Keeping this path open eliminates the need for the RTL onto Hanson Street from Hospital Drive. Extending the RTL and LTL onto Hospital Drive. reduces congestion by allowing Emergency vehicles better access to the turn lanes. Inclusion of the raised median will aide in traffic delays by eliminating conflicting traffic movements, in particular the left turn movements into and out of businesses. In addition, the reduction in railroad bridge spans will allow the design team to utilize shorter beam heights which we are proposing to add to the bridge clearance rather than reduce the amount of railroad grade change.			
Schedule	Able to complete Right of Wat acquisition and utility plans	4.76%	**0**	0.0
Justification for Impact Score	Additional coordination that would need to be done with CSX to review/approve a new bridge configuration. The impact the Right of Way activity and utility location is negligible.			
Drainage	Impacts to flooding	9.52%	**0**	0.0
Justification for Impact Score	No impact to performance.			
Connectivity	Enhances community economy	14.29%	**5**	0.7
Justification for Impact Score	The improvement in overall safety of the corridor will enhance the community economy in addition to the increased access to the hospital by way of the adequately sized turn lanes on to Hospital Drive.			
Level of Service	Pedestrian access and comfort	21.43%	**10**	2.1
Justification for Impact Score	Supports the new sidewalks on both sides (as in Alt. 1 and Alt. 2) with an increase in width of the raised median for pedestrian protection. Re: The CSX tweaks -Having a median between two spans means 45-foot sections containing two lanes in one direction and a sidewalk on each side of the single pedestal (providing a buffer between the pedestrians and traffic).			
	OVERALL PERFORMANCE SCORE	**100.00%**		**6.8**

**Note: Although this performance attribute did not have any weight during the initial assessment, the VE team*

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 PROPOSAL
PP-08
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Alternative 5 – (Tweaks to Alternative #2)

DESIGN ELEMENT	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Crushed Stone Base	Ton	4,952	$ 23.88	$ 118,254	4,937	$ 23.88	$ 117,896
Crushed Aggregate Size No. 2	Ton	5,380	$ 23.30	$ 125,354	5,355	$ 23.30	$ 124,772
CL3 Asphalt Base	Ton	5,220	$ 71.51	$ 373,282	5,236	$ 71.51	$ 374,426
CL3 Asphalt Surface	Ton	1,866	$ 85.20	$ 158,983	1,904	$ 85.20	$ 162,221
Perforated Pipe (4 in)	LF	5,000	$ 7.41	$ 37,050	5,000	$ 7.41	$ 37,050
Std. Curb and Gutter	LF	2,500	$ 28.04	$ 70,100	2,500	$ 28.04	$ 70,100
Standard Header Curb	LF	975	$ 30.00	$ 29,250	975	$ 30.00	$ 29,250
Barrier Header Curb	LF	135	$ 35.00	$ 4,725	135	$ 35.00	$ 4,725
Mountable Median Type 2	SY	45	$ 80.00	$ 3,600	45	$ 80.00	$ 3,600
Cement Concrete Ent Pavement (8 in)	SY	2,815	$ 63.88	$ 179,822	2,815	$ 63.88	$ 179,822
Fabric - Geotextile Class 2	SY	18,750	$ 1.15	$ 21,563	18,750	$ 1.15	$ 21,563
Longintudinal Edge Key	LF	5,000	$ 2.84	$ 14,200	5,000	$ 2.84	$ 14,200
Sawcut Pavement	LF	5,000	$ 1.71	$ 8,550	5,000	$ 1.71	$ 8,550
Std Barrier Median Type 5					2,910	$ 75.00	$ 218,250
Removed Existing Structure	SF	954	$ 100.00	$ 95,400	954	$ 100.00	$ 95,400
Excavation	CY	2,310	$ 28.00	$ 64,680	1,617	$ 28.00	$ 45,276
Furnish & Drive Steel H-Piles	LF	410	$ 150.00	$ 61,500	410	$ 150.00	$ 61,500
Furnish & Drive Steel Pipe Piles	LF	300	$ 330.00	$ 99,000	150	$ 330.00	$ 49,500
Furnish & Erect Precast Concrete Substrusture	LS	1	$ 244,000.00	$ 244,000	1	$ 244,000.00	$ 195,200
Furnish & Erect Structural Steel	LBS	620,000	$ 2.25	$ 1,395,000	310,000	$ 2.25	$ 697,500
Bridge Deck Waterproofing	SY	330	$ 180.00	$ 59,400	198	$ 180.00	$ 35,640
Mobilization	LS	1	$ 100,000.00	$ 100,000	1	$ 100,000.00	$ 100,000
TOTAL				$ 3,264,000			$ 2,646,000
						CWE (BASELINE LESS PROPOSED)	$ 618,000

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

AVOID COST

			Total					
			Baseline			Proposed		
			$2,118,980.00			$1,292,457.06		
	Unit	Qty.	Unit Cost	Total	Qty.	Unit Cost	Total	Qty.
Crushed Stone Base	Ton	0	$23.88	$0.00	-15	$23.88	($358.20)	
Crushed Aggregate Size No. 2	Ton	0	$23.30	$0.00	-25	$23.30	($582.50)	
CL Asphalt Base	Ton	0	$71.51	$0.00	16	$71.51	$1,144.16	
CL 3 Asphalt Surface	Ton	0	$85.20	$0.00	38	$85.20	$3,237.60	
Perforated Pipe (4 in)	LF	0	$7.41	$0.00	0	$7.41	$0.00	
Std. Curb & Gutter	LF	0	$28.04	$0.00	0	$28.04	$0.00	
Standard Header Curb	LF	0	$30.00	$0.00	0	$30.00	$0.00	
Barrier Header Curb	LF	0	$35.00	$0.00	0	$35.00	$0.00	
Mountable Median Type 2	SQYd	0	$80.00	$0.00	0	$80.00	$0.00	
Coment Concrete Ent Pavement (8 in)	SQYd	0	$63.88	$0.00	0	$63.88	$0.00	
Fabric - Geotextile Class 2	SQYd	0	$1.15	$0.00	0	$1.15	$0.00	
Longitudinal Edge key	LF	0	$2.84	$0.00	0	$2.84	$0.00	
Sawcut Pavement	LF	0	$1.71	$0.00	0	$1.71	$0.00	
Std Barrier Median Type 5	SQYd	0	$75.00	$0.00	120	$75.00	$9,000.00	
Removed Existing Structure	SQFt	954	$100.00	$95,400.00	954	$100.00	$95,400.00	954
Excavation	CuYd	2,310	$28.00	$64,680.00	1617	$28.00	$45,276.00	2,310
Furnish & Drive Steel H-Piles	LF	410	$150.00	$61,500.00	410	$150.00	$61,500.00	410
Furnish & Drive Steel Pipe Piles	LF	300	$330.00	$99,000.00	150	$330.00	$49,500.00	300
Furnish & Erect Precast Concrete Substrusture	LS	1	$244,000.00	$244,000.00	0.8	$244,000.00	$195,200.00	1
Furnish & Erect Structural Steel	LBS	620,000	$2.25	$1,395,000.00	310000	$2.25	$697,500.00	620,000
Bridge Deck Waterproofing	SQYd	330	$180.00	$59,400.00	198	$180.00	$35,640.00	330
Mobilization	LS	1	$100,000.00	$100,000.00	1	$100,000.00	$100,000.00	1

	Baseline $2,118,980.00			Proposed $1,280,016.00			Baseline $0.00	
	Unit Cost	Total	Qty.	Unit Cost	Total	Qty.	Unit Cost	Total
Crushed Stone Base	$23.88	$0.00		$23.88	$0.00		$23.88	$0.00
Crushed Aggregate Size No. 2	$23.30	$0.00		$23.30	$0.00		$23.30	$0.00
CL Asphalt Base	$71.51	$0.00		$71.51	$0.00		$71.51	$0.00
CL 3 Asphalt Surface	$85.20	$0.00		$85.20	$0.00		$85.20	$0.00
Perforated Pipe (4 in)	$7.41	$0.00		$7.41	$0.00		$7.41	$0.00
Std. Curb & Gutter	$28.04	$0.00		$28.04	$0.00		$28.04	$0.00
Standard Header Curb	$30.00	$0.00		$30.00	$0.00		$30.00	$0.00
Barrier Header Curb	$35.00	$0.00		$35.00	$0.00		$35.00	$0.00
Mountable Median Type 2	$80.00	$0.00		$80.00	$0.00		$80.00	$0.00
Coment Concrete Ent Pavement (8 in)	$63.88	$0.00		$63.88	$0.00		$63.88	$0.00
Fabric - Geotextile Class 2	$1.15	$0.00		$1.15	$0.00		$1.15	$0.00
Longitudinal Edge key	$2.84	$0.00		$2.84	$0.00		$2.84	$0.00
Sawcut Pavement	$1.71	$0.00		$1.71	$0.00		$1.71	$0.00
Std Barrier Median Type 5	$75.00	$0.00		$75.00	$0.00		$75.00	$0.00
Removed Existing Structure	$100.00	$95,400.00	954	$100.00	$95,400.00		$76.00	$0.00
Excavation	$28.00	$64,680.00	1617	$28.00	$45,276.00		$77.00	$0.00
Furnish & Drive Steel H-Piles	$150.00	$61,500.00	410	$150.00	$61,500.00		$78.00	$0.00
Furnish & Drive Steel Pipe Piles	$330.00	$99,000.00	150	$330.00	$49,500.00		$79.00	$0.00
Furnish & Erect Precast Concrete Substrusture	$244,000.00	$244,000.00	0.8	$244,000.00	$195,200.00		$80.00	$0.00
Furnish & Erect Structural Steel	$2.25	$1,395,000.00	310000	$2.25	$697,500.00		$81.00	$0.00
Bridge Deck Waterproofing	$180.00	$59,400.00	198	$180.00	$35,640.00		$82.00	$0.00
Mobilization	$100,000.00	$100,000.00	1	$100,000.00	$100,000.00		$83.00	$0.00

	Raised Median			RC-15 - NB Right turn to Hospital Dr					
		Proposed $9,000.00			Baseline $0.00			Proposed $10,693.22	
	Qty.	Unit Cost	Total	Qty.	Unit Cost	Total	Qty.	Unit Cost	Total
Crushed Stone Base		$23.88	$0.00		$23.88	$0.00	53	$23.88	$1,265.64
Crushed Aggregate Size No. 2		$23.30	$0.00		$23.30	$0.00	87	$23.30	$2,027.10
CL Asphalt Base		$71.51	$0.00		$71.51	$0.00	88	$71.51	$6,292.88
CL 3 Asphalt Surface		$85.20	$0.00		$85.20	$0.00	13	$85.20	$1,107.60
Perforated Pipe (4 in)		$7.41	$0.00		$7.41	$0.00		$7.41	$0.00
Std. Curb & Gutter		$28.04	$0.00		$28.04	$0.00		$28.04	$0.00
Standard Header Curb		$30.00	$0.00		$30.00	$0.00		$30.00	$0.00
Barrier Header Curb		$35.00	$0.00		$35.00	$0.00		$35.00	$0.00
Mountable Median Type 2		$80.00	$0.00		$80.00	$0.00		$80.00	$0.00
Coment Concrete Ent Pavement (8 in)		$63.88	$0.00		$63.88	$0.00		$63.88	$0.00
Fabric - Geotextile Class 2		$1.15	$0.00		$1.15	$0.00		$1.15	$0.00
Longitudinal Edge key		$2.84	$0.00		$2.84	$0.00		$2.84	$0.00
Sawcut Pavement		$1.71	$0.00		$1.71	$0.00		$1.71	$0.00
Std Barrier Median Type 5	120	$75.00	$9,000.00		$75.00	$0.00		$75.00	$0.00
Removed Existing Structure		$100.00	$0.00		$76.00	$0.00		$100.00	$0.00
Excavation		$28.00	$0.00		$77.00	$0.00		$28.00	$0.00
Furnish & Drive Steel H-Piles		$150.00	$0.00		$78.00	$0.00		$150.00	$0.00
Furnish & Drive Steel Pipe Piles		$330.00	$0.00		$79.00	$0.00		$330.00	$0.00
Furnish & Erect Precast Concrete Substrusture		$244,000.00	$0.00		$80.00	$0.00		$244,000.00	$0.00
Furnish & Erect Structural Steel		$2.25	$0.00		$81.00	$0.00		$2.25	$0.00
Bridge Deck Waterproofing		$180.00	$0.00		$82.00	$0.00		$180.00	$0.00
Mobilization		$100,000.00	$0.00		$83.00	$0.00		$100,000.00	$0.00

	RC-17 - Additional SB thru lane through Hospital Dr Int. - NOT IMPLMENTED						RC-23 - SB Left turn to Ho			
	Baseline $0.00			Proposed $0.00			Baseline $0.00			
	Qty.	Unit Cost	Total	Qty.	Unit Cost	Total	Qty.	Unit Cost	Total	Qty.
Crushed Stone Base		$23.88	$0.00		$23.88	$0.00		$23.88	$0.00	
Crushed Aggregate Size No. 2		$23.30	$0.00		$23.30	$0.00		$23.30	$0.00	
CL Asphalt Base		$71.51	$0.00		$71.51	$0.00		$71.51	$0.00	10
CL 3 Asphalt Surface		$85.20	$0.00		$85.20	$0.00		$85.20	$0.00	10
Perforated Pipe (4 in)		$7.41	$0.00		$7.41	$0.00		$7.41	$0.00	
Std. Curb & Gutter		$28.04	$0.00		$28.04	$0.00		$28.04	$0.00	
Standard Header Curb		$30.00	$0.00		$30.00	$0.00		$30.00	$0.00	
Barrier Header Curb		$35.00	$0.00		$35.00	$0.00		$35.00	$0.00	
Mountable Median Type 2		$80.00	$0.00		$80.00	$0.00		$80.00	$0.00	
Coment Concrete Ent Pavement (8 in)		$63.88	$0.00		$63.88	$0.00		$63.88	$0.00	
Fabric - Geotextile Class 2		$1.15	$0.00		$1.15	$0.00		$1.15	$0.00	
Longitudinal Edge key		$2.84	$0.00		$2.84	$0.00		$2.84	$0.00	
Sawcut Pavement		$1.71	$0.00		$1.71	$0.00		$1.71	$0.00	
Std Barrier Median Type 5		$75.00	$0.00		$75.00	$0.00		$75.00	$0.00	
Removed Existing Structure		$76.00	$0.00		$100.00	$0.00		$76.00	$0.00	
Excavation		$77.00	$0.00		$28.00	$0.00		$77.00	$0.00	
Furnish & Drive Steel H-Piles		$78.00	$0.00		$150.00	$0.00		$78.00	$0.00	
Furnish & Drive Steel Pipe Piles		$79.00	$0.00		$330.00	$0.00		$79.00	$0.00	
Furnish & Erect Precast Concrete Substrusture		$80.00	$0.00		$244,000.00	$0.00		$80.00	$0.00	
Furnish & Erect Structural Steel		$81.00	$0.00		$2.25	$0.00		$81.00	$0.00	
Bridge Deck Waterproofing		$82.00	$0.00		$180.00	$0.00		$82.00	$0.00	
Mobilization		$83.00	$0.00		$100,000.00	$0.00		$83.00	$0.00	

	ıspital Dr			MA-22 - Right turn lanes for higher volume driveways - NOT IMPLMENTED					
	Proposed			Baseline			Proposed		
	$1,567.10			$0.00			$0.00		
	Unit Cost	Total	Qty.	Unit Cost	Total	Qty.	Unit Cost	Total	Qty.
Crushed Stone Base	$23.88	$0.00		$23.88	$0.00		$23.88	$0.00	
Crushed Aggregate Size No. 2	$23.30	$0.00		$23.30	$0.00		$23.30	$0.00	
CL Asphalt Base	$71.51	$715.10		$71.51	$0.00		$71.51	$0.00	
CL 3 Asphalt Surface	$85.20	$852.00		$85.20	$0.00		$85.20	$0.00	
Perforated Pipe (4 in)	$7.41	$0.00		$7.41	$0.00		$7.41	$0.00	
Std. Curb & Gutter	$28.04	$0.00		$28.04	$0.00		$28.04	$0.00	
Standard Header Curb	$30.00	$0.00		$30.00	$0.00		$30.00	$0.00	
Barrier Header Curb	$35.00	$0.00		$35.00	$0.00		$35.00	$0.00	
Mountable Median Type 2	$80.00	$0.00		$80.00	$0.00		$80.00	$0.00	
Coment Concrete Ent Pavement (8 in)	$63.88	$0.00		$63.88	$0.00		$63.88	$0.00	
Fabric - Geotextile Class 2	$1.15	$0.00		$1.15	$0.00		$1.15	$0.00	
Longitudinal Edge key	$2.84	$0.00		$2.84	$0.00		$2.84	$0.00	
Sawcut Pavement	$1.71	$0.00		$1.71	$0.00		$1.71	$0.00	
Std Barrier Median Type 5	$75.00	$0.00		$75.00	$0.00		$75.00	$0.00	
Removed Existing Structure	$100.00	$0.00		$76.00	$0.00		$100.00	$0.00	
Excavation	$28.00	$0.00		$77.00	$0.00		$28.00	$0.00	
Furnish & Drive Steel H-Piles	$150.00	$0.00		$78.00	$0.00		$150.00	$0.00	
Furnish & Drive Steel Pipe Piles	$330.00	$0.00		$79.00	$0.00		$330.00	$0.00	
Furnish & Erect Precast Concrete Substrusture	$244,000.00	$0.00		$80.00	$0.00		$244,000.00	$0.00	
Furnish & Erect Structural Steel	$2.25	$0.00		$81.00	$0.00		$2.25	$0.00	
Bridge Deck Waterproofing	$180.00	$0.00		$82.00	$0.00		$180.00	$0.00	
Mobilization	$100,000.00	$0.00		$83.00	$0.00		$100,000.00	$0.00	

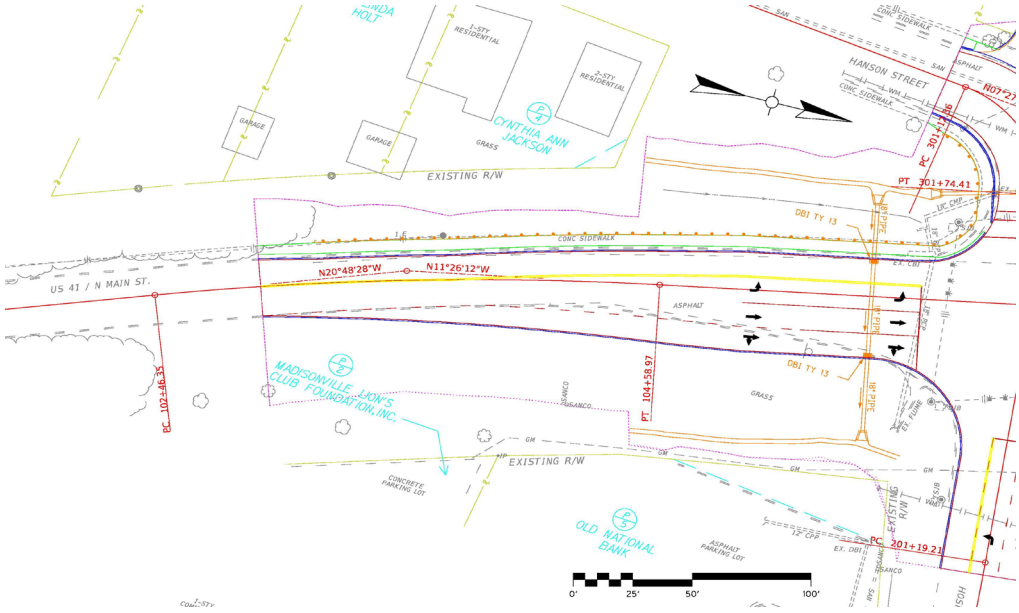
MA-27 - Leave Hanson Street open

	Baseline			Proposed	
	$0.00			($8,819.26)	
	Unit Cost	Total	Qty.	Unit Cost	Total
Crushed Stone Base	$23.88	$0.00	-68	$23.88	($1,623.84)
Crushed Aggregate Size No. 2	$23.30	$0.00	-112	$23.30	($2,609.60)
CL Asphalt Base	$71.51	$0.00	-82	$71.51	($5,863.82)
CL 3 Asphalt Surface	$85.20	$0.00	15	$85.20	$1,278.00
Perforated Pipe (4 in)	$7.41	$0.00		$7.41	$0.00
Std. Curb & Gutter	$28.04	$0.00		$28.04	$0.00
Standard Header Curb	$30.00	$0.00		$30.00	$0.00
Barrier Header Curb	$35.00	$0.00		$35.00	$0.00
Mountable Median Type 2	$80.00	$0.00		$80.00	$0.00
Coment Concrete Ent Pavement (8 in)	$63.88	$0.00		$63.88	$0.00
Fabric - Geotextile Class 2	$1.15	$0.00		$1.15	$0.00
Longitudinal Edge key	$2.84	$0.00		$2.84	$0.00
Sawcut Pavement	$1.71	$0.00		$1.71	$0.00
Std Barrier Median Type 5	$75.00	$0.00		$75.00	$0.00
Removed Existing Structure	$76.00	$0.00		$100.00	$0.00
Excavation	$77.00	$0.00		$28.00	$0.00
Furnish & Drive Steel H-Piles	$78.00	$0.00		$150.00	$0.00
Furnish & Drive Steel Pipe Piles	$79.00	$0.00		$330.00	$0.00
Furnish & Erect Precast Concrete Substrusture	$80.00	$0.00		$244,000.00	$0.00
Furnish & Erect Structural Steel	$81.00	$0.00		$2.25	$0.00
Bridge Deck Waterproofing	$82.00	$0.00		$180.00	$0.00
Mobilization	$83.00	$0.00		$100,000.00	$0.00

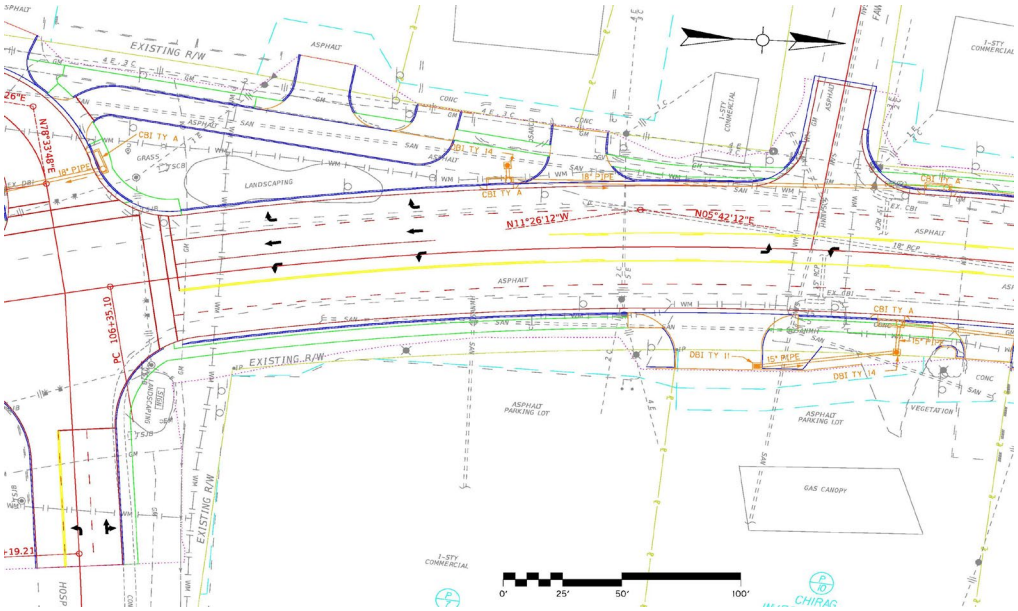
VALUE ENGINEERING PROPOSAL
PP-08
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Alternative 5 – (Tweaks to Alternative #2)

SKETCH OF BASELINE ASSUMPTION



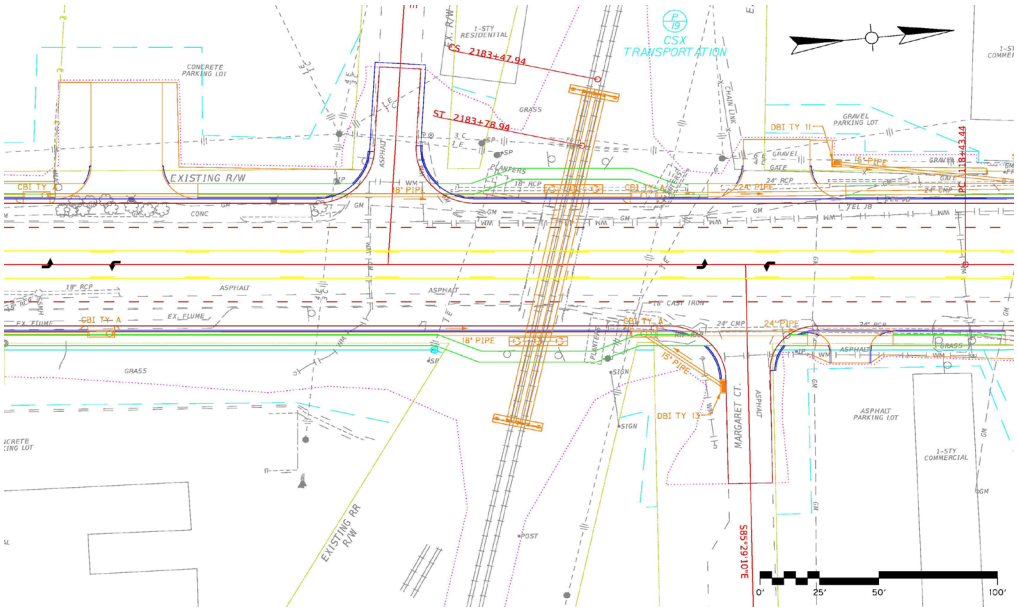
The baseline alternative (above) closes the Hason St frontage access to the dry cleaners from the US 41 SB right lane. The baseline alternative adds a right turn only lane at the Hospital Dr. intersection. The baseline alternative (below) has a 75 ft storage in the RTL (US 41 NB) at the Hospital Dr. intersection.



VALUE ENGINEERING PROPOSAL
PP-08
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Alternative 5 – (Tweaks to Alternative #2)

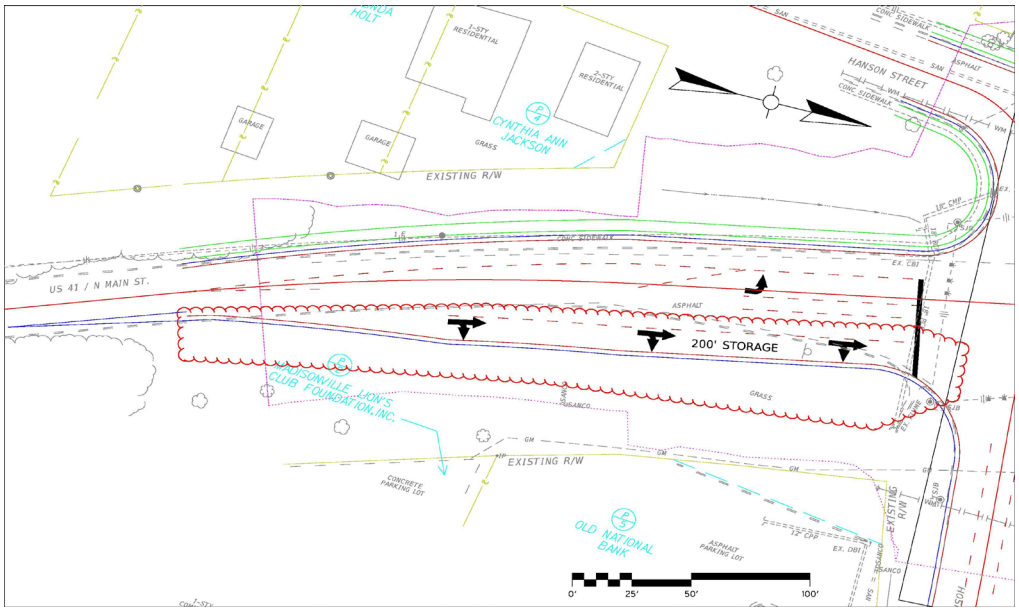
SKETCH OF BASELINE ASSUMPTION



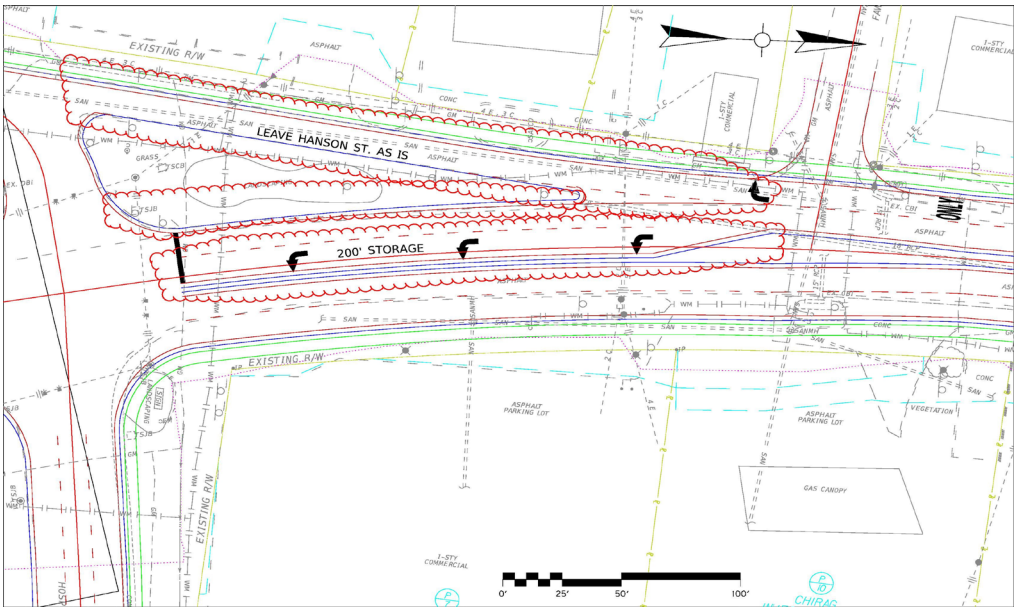
The baseline proposal has 3 span structure with a 71 ft main span over the roadway that includes a 5 ft sidewalk on each side.

TITLE	Alternative 5 – (Tweaks to Alternative #2)

SKETCH OF PROPOSED ALTERNATIVE

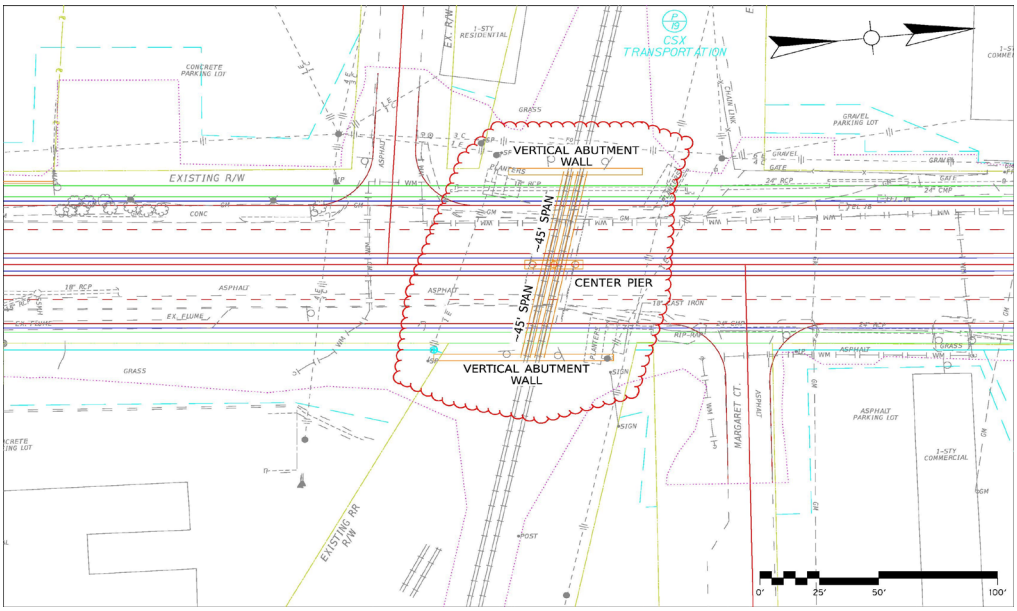


Alt. 5 proposes the extension of the NB RT/ thru lane onto Hospital Dr. (above) 125 ft (making the final storage 200 ft). In the photo below, Alt. 5 proposes extended the LTL onto Hospital Dr. 110 (making the final storge 200 ft as well). Alt. 5 proposes to leave Hanson Street open (using it as a lane-drop location for the right lane (SB on US 41). This eliminates the need for the SB RTL at Hospital Dr as in the baseline.



TITLE	Alternative 5 – (Tweaks to Alternative #2)

SKETCH OF PROPOSED ALTERNATIVE



Alt. 5 proposes a 2 span structure with 45 ft spans and a center pier and vertical abutement walls.

VALUE ENGINEERING PROPOSAL
PP-09
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Replace signals with roundabouts and use quick-curb between intersections
FUNCTION	

BASELINE ASSUMPTION:

The baseline, Alternative 1, includes a 5 lane cross section with traffic signals replaced at Hospital Drive and Briarwood Drive and a TWLTL in middle with no left turn restrictions.

PROPOSED ALTERNATIVE:

This proposal replaces traffic signals with single lane roundabouts. Narrow center median from 12 feet to 2 feet and install quick-kurb (lane separator system). No other improvements. This would be a more minimalistic approach to the design.

BENEFITS	RISKS/CHALLENGES
● Improves intersection capacity and efficiency	● Public acceptance
● Reduces crash rates at intersections and mid-block	● At the two intersections, significant construction and Right of Way cost compared to signals
● Does not replace RR bridge	● No pedestrian accommodation along the roadway or Railroad underpass
● No roadway reconstruction other than intersections	● Less of convenient left turns to businesses due to left restrictions
● Significant resilience and recovery to adverse weather conditions	● Increased out of direction travel and U-turn activity
● No traffic signal replacements, no annual signal maintenance or 24/7 on-call services. No power requirements	● Needs backage circulation for best performance
●	●

		Performance Score	**5.0**
COST SUMMARY	**Initial Costs**	**O&M Costs**	**Total Life Cycle Cost**
BASELINE ASSUMPTION:	$ 8,190,000	$ 532,000	$ 8,722,000
PROPOSED ALTERNATIVE:	$ 2,876,000	$ 284,000	$ 3,160,000
TOTAL (Baseline less Proposed)	$ 5,314,000	$ 248,000	$ 5,562,000
			AVOID COST

VALUE ENGINEERING PROPOSAL
PP-09
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Replace signals with roundabouts and use quick-curb between intersections

DISCUSSION/JUSTIFICATION:

This proposal, unlike Alternative 4, would be a relatively minimalistic approach to this project to reduce congestion and reduce crashes. This approach to the project will not include sidewalks, railroad bridge replacement, or backage road circulation improvements. It is entirely focused on two main problems US 41 is experiencing; a high crash rate due in part to frequent left turns and long roadway queues due to single lane intersection capacity, using traffic signal control. This alternative allows project phasing. Each roundabout can be designed and constructed separately if desirable. The centerline quick-curb would not be installed until both roundabouts were available to support U-turns. Roundabouts support U-turns of larger vehicles, whereas the proposed loons only accommodate passenger vehicles. This alternative would not interfere with improving the US 41 roadway to 2 lanes with median and pedestrian accommodation at a future time.

Absent a widening project as proposed in Alternative 1, there will be room on the outside of the current pavement to build sidewalks.

SPECIAL IMPLEMENTATION CONSIDERATIONS:

None apparent.

VALUE ENGINEERING PROPOSAL
PP-09
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Replace signals with roundabouts and use quick-curb between intersections

IMPACT TO PERFORMANCE

Performance Attribute	Definition	Weight	Impact (use Scale)	Score
Local Operations	Access to businesses and properties while minimizing impacts	21.43%	5	1.1
Justification for Impact Score	No changes to driveways. Absent left turn delay, no turning (egress) delays. Driveways will be safer. The out-of-direction circulation to make a U-turn at the nearest roundabout could be considered a negative for travel time, however, during Alternative 1 peak flows, Roundabout U-turns take less time than waiting for left turn gaps.			
Mainline Operations	Capacity, congestion, traffic delays, conflicts	28.57%	10	2.9
Justification for Impact Score	Eliminating left turn reduces congestion, conflicts and increases capacity. Eliminating signals eliminates signal related delays. There will be some geometric delay (RBT yields) during peak flows and very little during 22 to 23 hours of non-peak volume.			
Schedule	Able to complete Right of Way acquisition and utility plans	4.76%	0	0.0
Justification for Impact Score	No mid-block acquisitions for Alternative 1 widening. New acquisitions needed for both roundabout footprints. No takes of structures is anticipated at roundabouts.			
Drainage	Impacts to flooding	9.52%	0	0.0
Justification for Impact Score	No changes other than roundabout related drainage systems. Centerline curb will not interfere with surface flow.			
Connectivity	Enhances community economy	14.29%	0	0.0
Justification for Impact Score	Should enhance economy by improving the capacity and efficiency of US 41. The public made comments about avoiding US 41 due to its congestion. However, those motorists not liking RBTs may avoid the corridor.			
Level of Service	Pedestrian access and comfort	21.43%	5	1.1
Justification for Impact Score	While this alternative provides no roadside sidewalks, it does significantly improve the ease and safety to cross US 41 at the two intersections.			
	OVERALL PERFORMANCE SCORE	**100.00%**		**5.0**

**Note: Although this performance attribute did not have any weight during the initial assessment, the VE team*

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 PROPOSAL
PP-09
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Replace signals with roundabouts and use quick-curb between intersections

DESIGN ELEMENT	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Center median "quick-curb" system					2,300	$ 120.00	$ 276,000
Two roundabouts lump sum using national average					1	$ 2,600,000.00	$ 2,600,000
Alternative 1 as lump sum Includes total project	LS	1		$ 8,190,000			
TOTAL				$ 8,190,000			$ 2,876,000
						CWE (BASELINE LESS PROPOSED)	$ 5,314,000

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

AVOID COST

VALUE ENGINEERING PROPOSAL
PP-09
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Replace signals with roundabouts and use quick-curb between intersections

Assumptions			
Interest/Discount Rate(%):	**2.4%**	**Economic Life (yrs):**	20

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Assumption**		**Proposed Alternative**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Center line curb and bollards					
2	Resurfacing	10	$ 675,000	$ 532,481	$ 360,000	$ 283,990
3						
4						
5						
6						
7						
8						
9						
10						
Total Salvage & Replacement Costs			**$ 675,000**	**$ 532,481**	**$ 360,000**	**$ 283,990**

Annual Costs (pres worth calculated over 20 yrs)		**Baseline Assumption**		**Proposed Alternative**	
Item	**Description**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1					
2					
3					
4					
5					
Total Annual Costs		**$ -**	**$ -**	**$ -**	**$ -**

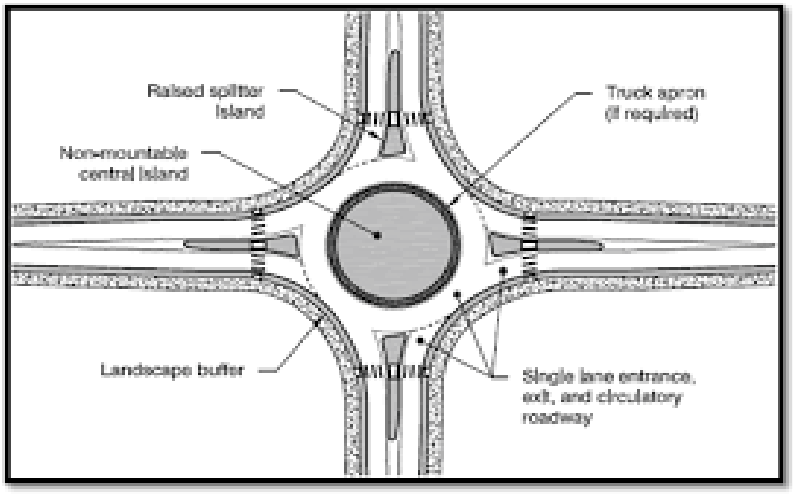
SUMMARY	**Baseline Present Worth**	**Proposed Present Worth**
Total Present Worth (salvage+annual pres worth)	$ 532,000	$ 284,000
RESULTS (Proposed less Baseline)	**AVOID COST of $248,000**	

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

VALUE ENGINEERING PROPOSAL
PP-09
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Replace signals with roundabouts and use quick-curb between intersections

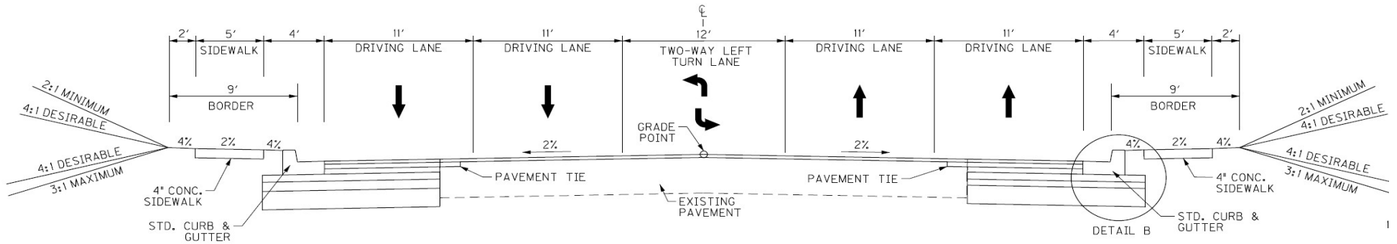
SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL
PP-09
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Replace signals with roundabouts and use quick-curb between intersections

SKETCH OF BASELINE ASSUMPTION

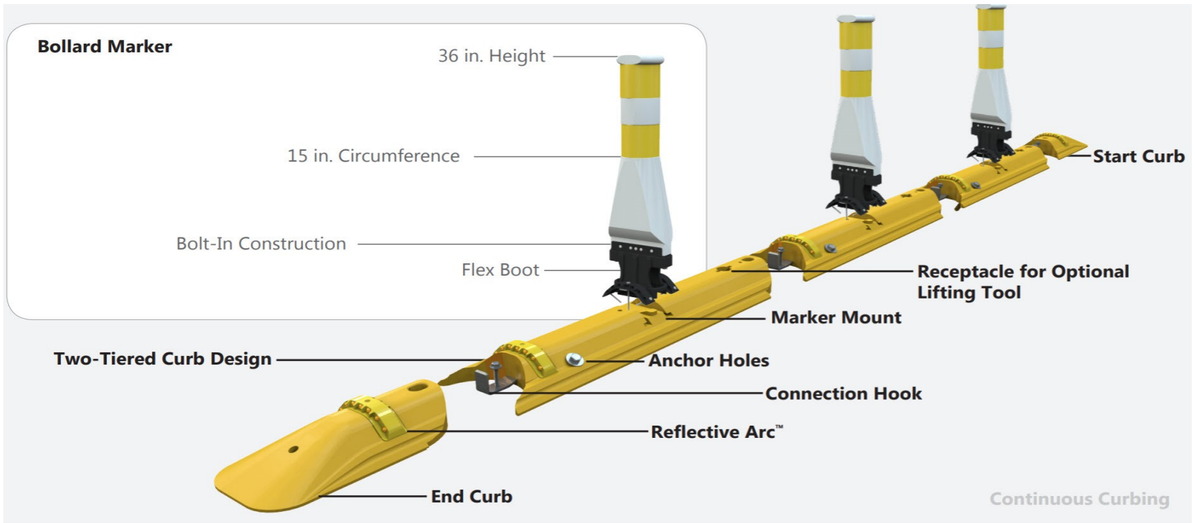


N MAIN ST. OVERLAY AND WIDENING
HANSON ST./HOSPITAL DR. TO END CONSTRUCTION

VALUE ENGINEERING PROPOSAL
PP-09
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Replace signals with roundabouts and use quick-curb between intersections

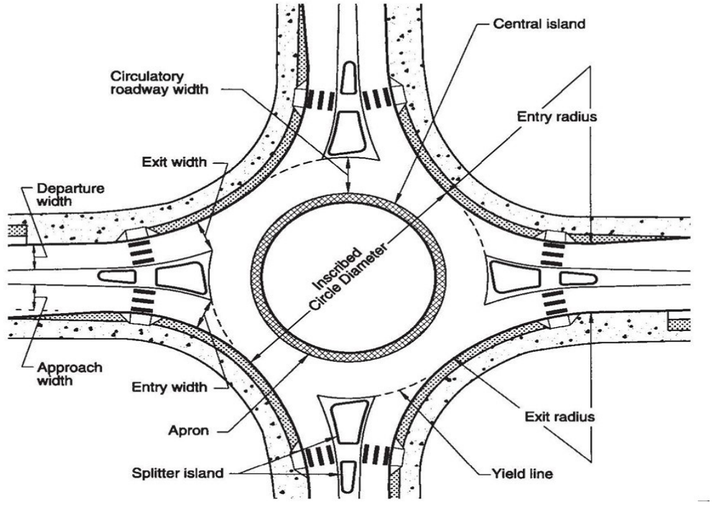
SKETCH OF PROPOSED ALTERNATIVE

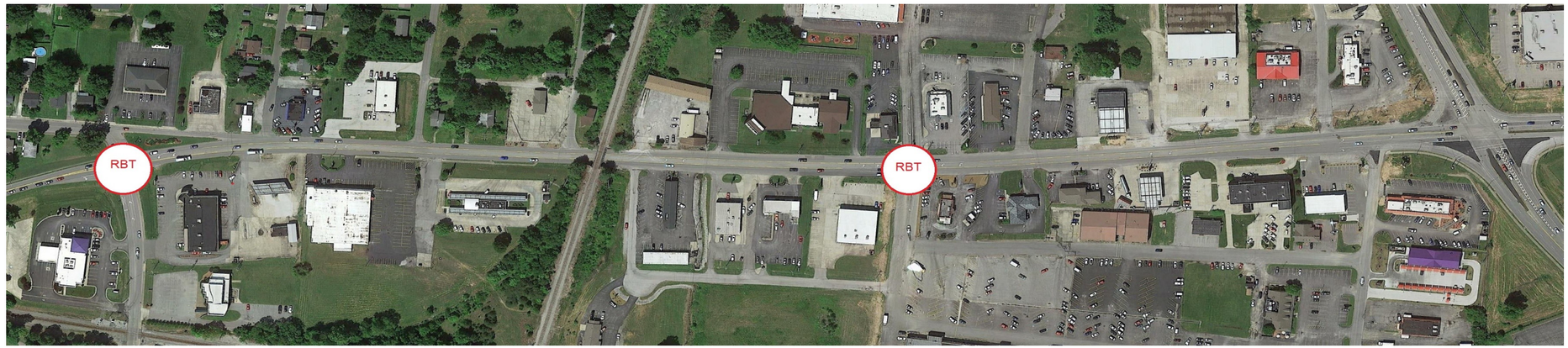


VALUE ENGINEERING PROPOSAL
PP-09
Kentucky Transportation Cabinet
US 41 - North Main Street, Hopkins County

TITLE	Replace signals with roundabouts and use quick-curb between intersections

SKETCH OF PROPOSED ALTERNATIVE





SECTION 6 APPENDICES

Section 6: Appendices

Appendix A - Study Participants

VALUE ENGINEERING STUDY

US 41 - North Main Street, Hopkins County

Workshop Location: Virtual

Workshop Dates: 16-20 August 2021

Workshop Attendee List

	16-20 August 2021										Name	Organization
	16		17		18		19		20			
DR	am	pm	am	pm	am	pm	am	pm	am	OBP		
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Renee Hoekstra, CVS	RHA
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Kaitlyn Stewart, VMA	RHA
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Andrew Brown	Palmer
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Phil Demosthenes	
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Jason Littleton	AEI
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Jerry Leslie	AEI
☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Sandra Affare	UTC
☐	☑	☑	☑	☑	☐	☐	☑	☐	☑	☑	Justin Harrrod	KYTC
☐	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	Brent Sweger	KYTC
☐	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	David Otte	KYTC
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑	Tonya Higdon	KYTC
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Larry Krueger	KYTC
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑	Renee Boucherie	KYTC
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑	Tim Layson	KYTC
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	John Moore	KYTC
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑	Catherine Davis	Prime Eng
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑	Andy Layson	Prime Eng
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑	Brett Malloy	Prime Eng
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☑	Jill Asher	FHWA
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	Eileen Vaughan	FHWA
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Blake Brown	
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Deneatra Henderson	KYTC
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Keith Lovan	KYTC
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Miles Puckett	KYTC
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Nick Hall	KYTC
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Patrick Perry	KYTC
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	Tom Hines	KYTC
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		

Appendix B - Function Analysis

Function definition and analysis is the heart of Value Engineering. It is the primary activity that separates VE from all other "improvement" programs. The objective of this phase is to ensure the entire team agrees upon the purposes for the project elements. Furthermore, this phase assists with development of the most beneficial areas for continuing study. The VE team identified the functions of the US 41 – Main Street Project using active verbs and measurable nouns. This process allowed the team to truly understand the functions associated with the project.

The definitions of the classifications are:

- **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 expertise. A function model, or Function Analysis System Technique (FAST) diagram, was not developed for this project. The VE study team identified "**Increase Capacity**" and **"Reduce Congestion"** as the basic functions of the project. The Function Analysis Worksheet, available on the next page, shows the complete list of functions.

FUNCTION ANALYSIS WORKSHEET					
IDENTIFY FUNCTIONS		CLASSIFY FUNCTIONS	PRIORITIZE FUNCTIONS		
Active Verb	Measurable Noun	Higher Order Basic Secondary	COST	RISK	SELECT FOR CREATIVE PHASE
Manage	Access			High	Y
Reduce	Flooding				
Reduce	Conflicts				
Enhance	Safety			High	

Active Verb	Measurable Noun	Higher Order Basic Secondary	COST	RISK	SELECT FOR CREATIVE PHASE
Increase	Efficiency	Basic			
Reduce	Delay				
Ensure	Access				
Reduce	Congestion				Y
Meet	Standards				
Span	Highway		High	High	
Accommodate	Railroad			High	
Control	Traffic				Y
Accommodate	Pedestrians				
Improve	Walkability				Y
Improve	Circulation			High	
Enhance	Connectivity	Higher Order			
Reduce	Risk				
Accommodate	Emergency-Response				
Avoid	Utilities				
Accommodate	Utilities		High		
Acquire	ROW		High		
Enhance	Aesthetics				
Illuminate	Travelled-way				
Support	Economy				
Move	Traffic	Higher Order			

Appendix C - Creativity Phase

The objective of the Creative Phase is to generate a large quantity of ideas on alternate ways to perform each function selected for study. It uses common 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 Creative 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 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.

The list of ideas is shown below and on the following pages.

Idea No.	Idea Title
MA	**Manage Access**
MA-01	Use shared entrances to reduce total number of entrances to frontage parcels
MA-02	Limit access to two entry/exit points per lot (business/building) with one being on US 41
MA-03	Provide left in and right in, right out only, no left out onto US 41
MA-04	NE - Delineate (curb/sidewalk/trees) package on access road connecting Chelsea Road and Margaret Court (eastside of the project)
MA-05	NE - Upgrade existing Thornberry Drive and Margaret Court backage roads to handle higher traffic volumes/loads and eliminate direct driveways to US 41
MA-06	SE - Construct backage road from Hospital Drive to the railroad bridge to allow businesses access on the eastside of US 41 and eliminate direct access to US 41
MA-07	Eliminate all redundant driveways, consolidate driveways where possible
MA-08	NW - Allow the church entrances to include their private driveway and back roads in to US 41
MA-09	NW - Condemn the driveway on the north side of the church and make a public street

Idea No.	Idea Title
MA-10	Restrict driveways to a right-in and right-out with a median barrier
MA-11	NW - Purchase Right of Way and construct backage road on the westside of US 41, north of the railroad, to tie to US 41 at existing Briarwood Drive signal
MA-12	NW - Upgrade backage roads north of CSX to handle any additional traffic from the new circulation
MA-13	NE - By using and improving the cross streets of Chelsea Drive and Briarwood Drive, also improve the backage road (Thornberry Drive) to reduce access to US 41
MA-14	SW - Extend Briarwood Drive to Hopewell / Railroad Street
MA-15	Correct the labelling of Hopewell Road to W Railroad Street on the existing documents
MA-16	NE - Add a Frontage Road on the eastern side of US 41 north of the CSX Bridge
MA-17	Widen local street approaches to a minimum of 22 feet to accommodate two-way traffic to reduce driver hesitation
MA-18	Use a Qwick Kurb median barrier in lieu of a raised median
MA-19	SW - Develop Alley 1 as a backage road system to anticipate future zoned commercial use area
MA-20	Develop an Access Management Plan for the project
MA-21	Address driveway corner clearance at all intersections, both on US 41 and on side streets
MA-22	Require dedicated right turn lane for higher volume driveways
MA-23	Align Chelsea Road and unnamed road to make a 4-legged intersection on the west side of US 41
MA-24	Connect the west side industrial area to US 41
MA-25	Eliminate Hanson Street frontage road from the project
MA-26	Widen the Hanson frontage road to two lanes with a continuous right thru lane and a dedicated left turn lane at Hospital Drive intersection
MA-27	Leave Hanson Street open in front of real estate office and dry-cleaners and change right-turn only to a through lane at the intersection
MA-28	Reconfigure intersection at US 41 and Hanson Street frontage road
MA-29	Acquire dry cleaner and real estate office and eliminate the related driveways and Hanson Street frontage road
MA-30	Close W Railroad Street access at US 41

Idea No.	Idea Title
MA-31	Close Margaret Court access at US 41
RC	**Reduce Congestion**
RC-01	Use dedicated turn lanes rather than TWLTL
RC-02	Keep US 41 as two lanes but introduce roundabouts for efficiency
RC-03	Put sidewalks only on one side of the road
RC-04	Increase the sidewalk offset from the travelled way
RC-05	Leave sidewalks on both sides of the road
RC-06	Coordinate signal timing and have interconnect master controller
RC-07	Leave the west side of the road alone to protect utilities; Expand US 41 to the east
RC-08	Install a raised median, per Alternative 2 but increase the width (min. 6ft) of the raised median for pedestrian protection
RC-09	Increase the width of the TWLTL to 14 feet
RC-10	Install a raised median with roundabouts throughout entire corridor
RC-11	New alternative 4. A roundabout corridor. single lane in each direction with single lane roundabouts and a continuous raised median
RC-12	Construct dedicated right turn lanes at higher volume driveways to separate slower turning vehicles from through traffic
RC-13	Add a dedicated right-hand turn lane on the south side of US 41 downstream of the Briarwood Drive intersection for church access
RC-14	Increase the width of the TWLTL to 22 feet
RC-15	Lengthen the right lane northbound at US 41 and Hospital Road
RC-16	Eliminate the lane drop on southbound US 41 to Hanson Street by merging southbound traffic into a single lane prior to intersection and redevelop a dedicated right turn lane onto Hanson Street
RC-17	Continue two-lanes southbound through the Hospital Drive intersection
RC-18	Use an R-cut intersection at Hospital Drive in lieu of signals
RC-19	Use an R-cut intersection at Briarwood Drive in lieu of signals
RC-20	Tighten the radius for eastbound US 41A to southbound US 41
RC-21	Obtain crash data for the Hanson Street frontage road to determine final design requirements
RC-22	Extend the raised median to the US 41A intersection
RC-23	Extend the southbound US 41 to eastbound Hospital Drive left-hand turn lane

Idea No.	Idea Title
IW	**Improve Walkability**
IW-01	Increase the width of the sidewalks
IW-02	Build sidewalks along Briarwood Drive (east) to connect to US 41
IW-03	Build sidewalks from US 41 back along residential roads to tie into neighborhoods
IW-04	Plant street trees along sidewalks
IW-05	Provide pedestrian crossing island (or refuge areas) along US 41
IW-06	Build sidewalks along Chelsea Drive
IW-07	Build sidewalks along Thornberry Road
IW-08	Envision Complete Streets for US 41
IW-09	Build a shared-use path on one side in lieu of a sidewalk
IW-10	Consider transit stops within the project limits
IW-11	Install grass medians in lieu of concrete medians
M	**Miscellaneous**
M-01	Design a single-span railroad bridge in lieu of three-span bridge
M-02	Add mural or decorative treatment on/around railroad bridge

Evaluation Phase

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:

Evaluation Score	Definition	Key
Out-of-Scope	Not a part of this project	OS
Already Being Considered	Included in the baseline project	ABC
Design Comment	Stand-alone comment that needs no further explanation; a list of these will be given to the design team	DC
Design Suggestion	More than a DC, requires further explanation	DS
Fatal Flaw	Violates a code or standard	FF

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:

Score =

- 5 – Great Value meeting the criteria (A Workbook is prepared)
- 4 – Good Value meeting the criteria (A Workbook is prepared)
- 3 – Moderate Value meeting the criteria (No Workbook will be prepared)
- 2 – Poor Value (No Workbook will be prepared)

Rating

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

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

VALUE CUE KEY – MAGNITUDE OF CHANGE

F = No impact to function	**C** = No impact to cost
F- = Small negative impact to function	**C-** = Small decrease in cost (Less than $50K)
F-- = Large negative impact to function	**C--** = Large decrease in cost (More than $50K)
F+ = Small increase in function	**C+** = Small increase in cost
F++ = Large increase in function	**C++** = Large increase in cost

The following table lists the scored creative ideas with those ideas scoring a “5,” “4,” or “DS” moving forward into the next phase, Development.

Idea No.	Idea Title	Package	Score
MA	**Manage Access**		
MA-01	Use shared entrances to reduce total number of entrances to frontage parcels	5	w/MA-07

Idea No.	Idea Title	Package	Score
MA-02	Limit access to two entry/exit points per lot (business/building) with one being on US 41	5	4
MA-03	Provide left in and right in, right out only, no left out onto US 41		3
MA-04	NE - Delineate (curb/sidewalk/trees) package on access road connecting Chelsea Road and Margaret Court (eastside of the project)	2	w/MA-05
MA-05	NE - Upgrade existing Thornberry Drive and Margaret Court backage roads to handle higher traffic volumes/loads and eliminate direct driveways to US 41	2	4
MA-06	SE - Construct backage road from Hospital Drive to the railroad bridge to allow businesses access on the eastside of US 41 and eliminate direct access to US 41	4	4
MA-07	Eliminate all redundant driveways, consolidate driveways where possible	5	5
MA-08	NW - Allow the church entrances to include their private driveway and back roads in to US 41	1	w/MA-11
MA-09	NW - Condemn the driveway on the north side of the church and make a public street	1	w/MA-11
MA-10	Restrict driveways to a right-in and right-out with a median barrier	5	5
MA-11	NW - Purchase Right of Way and construct backage road on the westside of US 41, north of the railroad, to tie to US 41 at existing Briarwood Drive signal	1	4
MA-12	NW - Upgrade backage roads north of CSX to handle any additional traffic from the new circulation	1	w/MA-11
MA-13	NE - By using and improving the cross streets of Chelsea Drive and Briarwood Drive, also improve the backage road (Thornberry Drive) to reduce access to US 41	2	w/MA-05
MA-14	SW - Extend Briarwood Drive to Hopewell / Railroad Street	3	FF
MA-15	Correct the labelling of Hopewell Road to W Railroad Street on the existing documents		DC
MA-16	NE - Add a Frontage Road on the eastern side of US 41 north of the CSX Bridge	2	2

MA-17	Widen local street approaches to a minimum of 22 feet to accommodate two-way traffic to reduce driver hesitation	5	4
MA-18	Use a Qwick Kurb median barrier in lieu of a raised median		5
MA-19	SW - Develop Alley 1 as a backage road system to anticipate future zoned commercial use area	3	4
Idea No.	**Idea Title**	**Package**	**Score**
MA-20	Develop an Access Management Plan for the project		DS
MA-21	Address driveway corner clearance at all intersections, both on US 41 and on side streets	5	w/MA-07
MA-22	Require dedicated right turn lane for higher volume driveways	5, 7, 8,	4
MA-23	Align Chelsea Road and unnamed road to make a 4-legged intersection on the west side of US 41		OS
MA-24	Connect the west side industrial area to US 41		OS
MA-25	Eliminate Hanson Street frontage road from the project		3
MA-26	Widen the Hanson frontage road to two lanes with a continuous right thru lane and a dedicated left turn lane at Hospital Drive intersection		3
MA-27	Leave Hanson Street open in front of real estate office and dry-cleaners and change right-turn only to a through lane at the intersection	8	4
MA-28	Reconfigure intersection at US 41 and Hanson Street frontage road	8	w/MA-27
MA-29	Acquire dry cleaner and real estate office and eliminate the related driveways and Hanson Street frontage road		FF
MA-30	Close W Railroad Street access at US 41		DC
MA-31	Close Margaret Court access at US 41		DC
RC	**Reduce Congestion**		
RC-01	Use dedicated turn lanes rather than TWLTL		3
RC-02	Keep US 41 as two lanes but introduce roundabouts for efficiency	7	w/RC-11
RC-03	Put sidewalks only on one side of the road		2
RC-04	Increase the sidewalk offset from the travelled way		4
RC-05	Leave sidewalks on both sides of the road		ABD
RC-06	Coordinate signal timing and have interconnect master controller		DC

Idea No.	Idea Title	Package	Score
RC-07	Leave the west side of the road alone to protect utilities; Expand US 41 to the east		ABC
RC-08	Install a raised median, per Alternative 2 but increase the width (min. 6ft) of the raised median for pedestrian protection	8	4
RC-09	Increase the width of the TWLTL to 14 feet		DC
RC-10	Install a raised median with roundabouts throughout entire corridor	7	w/RC-11
RC-11	New alternative 4. A roundabout corridor. single lane in each direction with single lane roundabouts and a continuous raised median	7	5
RC-12	Construct dedicated right turn lanes at higher volume driveways to separate slower turning vehicles from through traffic	5	w/MA-22
RC-13	Add a dedicated right-hand turn lane on the south side of US 41 downstream of the Briarwood Drive intersection for church access		3
RC-14	Increase the width of the TWLTL to 22 feet		DC
RC-15	Lengthen the right lane northbound at US 41 and Hospital Road	7, 8,	4
RC-16	Eliminate the lane drop on southbound US 41 to Hanson Street by merging southbound traffic into a single lane prior to intersection and redevelop a dedicated right turn lane onto Hanson Street		3
RC-17	Continue two-lanes southbound through the Hospital Drive intersection	7, 8,	4
RC-18	Use an R-cut intersection at Hospital Drive in lieu of signals		3
RC-19	Use an R-cut intersection at Briarwood Drive in lieu of signals		3
RC-20	Tighten the radius for eastbound US 41A to southbound US 41		DC
RC-21	Obtain crash data for the Hanson Street frontage road to determine final design requirements		DC
RC-22	Extend the raised median to the US 41A intersection		4
RC-23	Extend the southbound US 41 to eastbound Hospital Drive left-hand turn lane	7, 8,	4
IW	**Improve Walkability**		
IW-01	Increase the width of the sidewalks		3
IW-02	Build sidewalks along Briarwood Drive (east) to connect to US 41	2	4

Idea No.	Idea Title	Package	Score
IW-03	Build sidewalks from US 41 back along residential roads to tie into neighborhoods	1, 2, 3, 4,	4
IW-04	Plant street trees along sidewalks	6	w/IW-08
IW-05	Provide pedestrian crossing island (or refuge areas) along US 41		DC
IW-06	Build sidewalks along Chelsea Drive	2	w/IW-02
IW-07	Build sidewalks along Thornberry Road	2	w/IW-02
IW-08	Envision Complete Streets for US 41	6	4
IW-09	Build a shared-use path on one side in lieu of a sidewalk		3
IW-10	Consider transit stops within the project limits		DC
IW-11	Install grass medians in lieu of concrete medians	6	w/IW-08
M	**Miscellaneous**		
M-01	Design a single-span railroad bridge in lieu of three-span bridge	7, 8,	w/RC-11
M-02	Add mural or decorative treatment on/around railroad bridge		DC

Appendix D - Supporting Data

Traffic Analysis

A copy of the Traffic Analysis is included for reference.

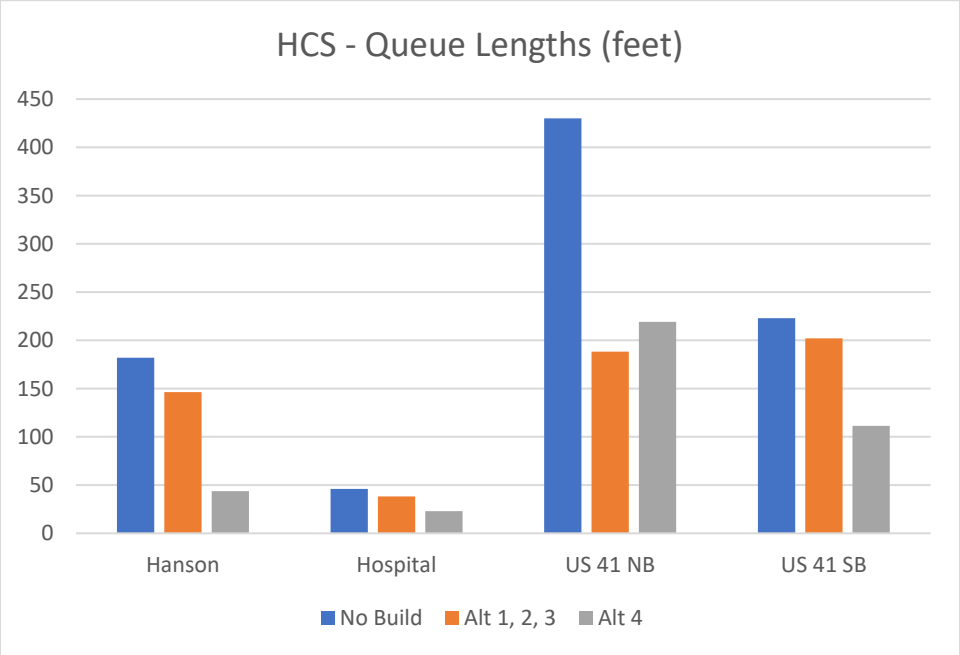
Traffic:

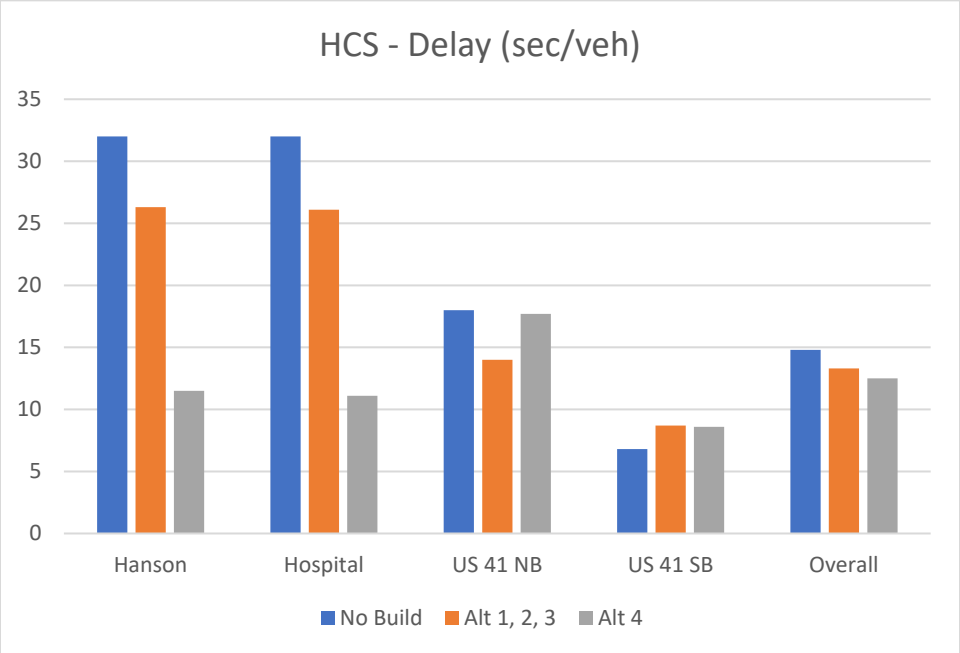
1. The Capacity Analysis for Planning of Junctions (CAP-X) software product was used for preliminary overview of capacity analysis at the intersection of US 41 at Hospital Drive and for US 41 at Briarwood Drive.
    a. The Input Worksheet that included Traffic Volume Demand for each approach turning movement, truck percentage and volume growth was completed. The "Hopkins County US 41 Traffic Forecast 1_19_2021" was used for inputs.
    b. Each design sheet was adjusted for number of lanes
    c. Results noted below:

US 41 at Hospital Dr. and Hanson St.	
PM Design Hour	
Type of Intersection	**Overall Volume / Capacity Ratio**
Conventional Signalized Intersection (Alt 1, 2, 3)	0.68
Conventional Signalized Intersection Shared Right (Alt 1, 2, 3, 5)	0.50
Single Lane Roundabout (1x1)	Overall: 0.99 Zone 1: 1.02 Zone 2: 1.03 Zone 3: 0.41 Zone 4: 0.26
Two-Lane Entry US 41 – Single Lane Entry Side Streets (2 North South x 1 East West) (Alt 4)	Overall: 0.61 Zone 1 - L1: 0.41 L2: 0.61 Zone 2 - L1: 0.49 L2: 0.54 Zone 3: 0.32 Zone 4: 0.20

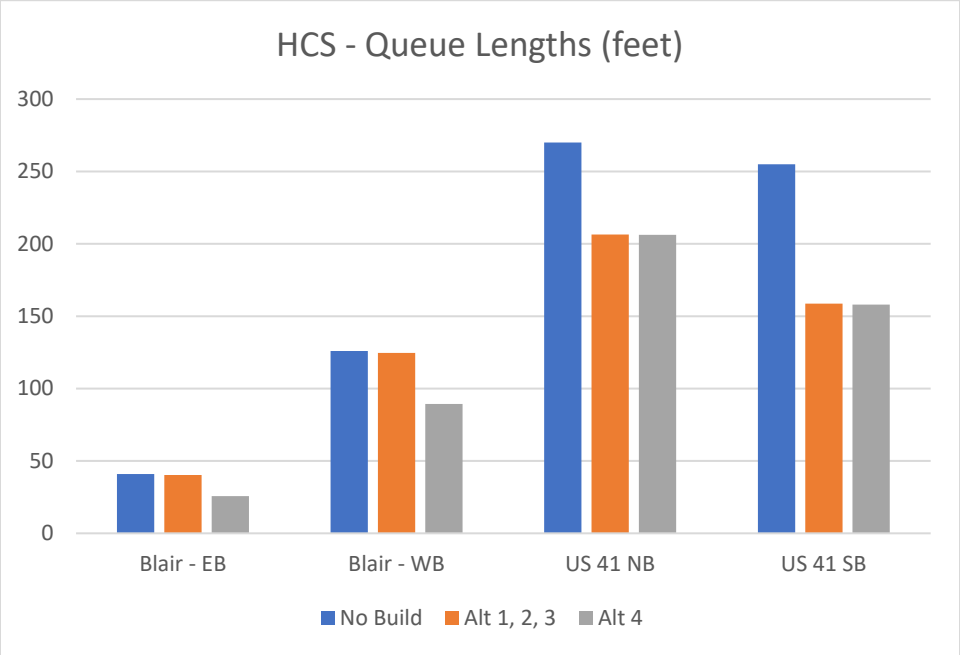
US 41 at Briarwood Drive	
PM Design Hour	
Type of Intersection	**Overall Volume / Capacity Ratio**
Conventional Signalized Intersection Shared Right (Alt 1, 2, 3, 5)	0.50
Single Lane Roundabout (1x1)	Overall: 1.02 Zone 1: 0.85 Zone 2: 1.02 Zone 3: 0.27 Zone 4: 0.62
Two-Lane Entry US 41 – Single Lane Entry Side Streets (2 North South x 1 East West) (Alt 4)	Overall: 0.55 Zone 1 - L1: 0.43 L2: 0.43 Zone 2 - L1: 0.46 L2: 0.55 Zone 3: 0.21 Zone 4: 0.46

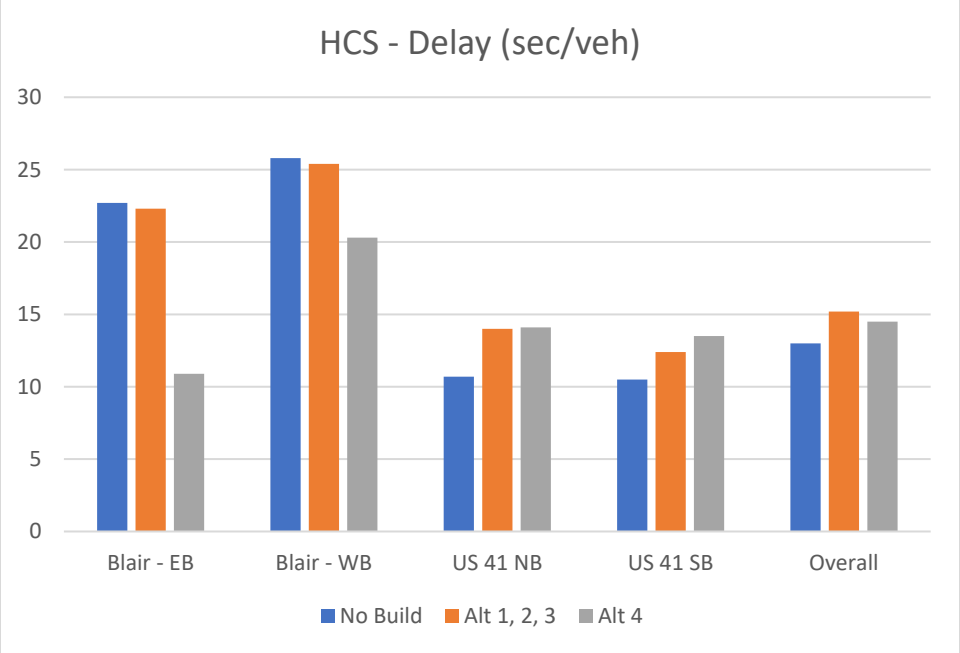
2. Downloaded the HCS files from the Design Team
3. Compiled and analyzed HCS Data for the Hospital Drive Intersection
    a. Existing Condition
    b. 5-Lane Section (ALT 1, 2, and 3)
    c. Single Lane Roundabout and variations
        i. Assumed 20 vehicles make the US 41 SB U-Turn to return north on US 41





4. Compiled and analyzed HCS Data for Briarwood Drive Intersection
    a. Existing Condition
    b. 5-Lane Section (ALT 1, 2, and 3)
    c. Single Lane Roundabout and variations
        i. Assumed 10 vehicles make the US 41 NB U-Turn to return south on US 41
        ii. Assumed 30 vehicles make the US 41 SB U-Turn to return north on US 41





This is for the PM Design Hour. We do not have traffic data for non-peak hours.

Safety Analysis

A copy of the Safety Analysis is included for reference.

Safety:

1. The project length from Hospital Drive Intersection to the tie in at the US 41A Intersection project experienced 105 total crashes from May 1, 2016 to May 1, 2021. Of the 105 total crashes, four crashes involved injury collision and zero crashes involved a fatal collision. There were 73 crashes that involved rear end collisions (70% of total crashes) and 17 crashes that involved angle collisions (16% of total crashes). 49 crashes (47% of total crashes) occurred during the PM Peak Period from 3:00 to 5:59 PM.

   The Crash Rate for the project was calculated and compared to the Kentucky Statewide Average for Urban – Minor Arterial Roadway according to Table 23: Statewide Crash Rates by Functional Class (5-Year) in the "Analysis of Traffic Crash Data in Kentucky 2015-2019" Research Report by Kentucky Transportation Center. AADT, project length, and crash data was used in calculated the Crash Rate.

	Crash Rate (per 100 MVM)	Injury Crash Rate (per 100 MVM)
Statewide Avg. for Urban – Minor Arterial	556	95
Hopkins Co. – US 41 from MP 16.98 to MP 17.43	605.6	23.1

2. The Safety Performance for Intersection Control Evaluation (SPICE) software product was used for a preliminary overview of a safety analysis at the intersection of US 41 at Hospital Drive and for US 41 at Briarwood Drive. The SPICE Tool utilizes Safety Performance Functions (SPFs) and Crash Modification Factors (CMFs) primarily from the AASHTO Highway Safety Manual and the FHWA Crash Modification Factor Clearinghouse.
   a. The Project Information, Control Strategy Selection, and At-Grade Inputs that included AADT, number of approaches with left turn lanes, number of approaches with right turn lanes, uncontrolled approaches, and Facility Type were completed. The "Hopkins County US 41 Traffic Forecast 1_19_2021" was used for inputs.
   b. Results noted below:

US 41 at Hospital Drive and Hanson Street

PM Design Hour

Crash Prediction Summary				
Control Strategy	**Crash Type**	**Opening Year**	**Design Year**	**Total Project Life Cycle**
1-lane Roundabout	Total	2.31	2.31	48.61
	Fatal & Injury	0.48	0.48	10.13
2-lane Roundabout	Total	2.53	2.53	53.21
	Fatal & Injury	0.31	0.31	6.53
Traffic Signal	Total	3.13	3.13	65.69
	Fatal & Injury	1.07	1.07	22.51
Traffic Signal (Alt)	Total	3.00	3.00	62.96
	Fatal & Injury	1.03	1.03	21.58

In summary, the proposed Alternate 1 – Signalized Intersection of US 41 at Hospital Drive is predicted to experience 65.69 total crashes and 22.51 Fatal and Injury Crashes over the 20-year project life. The proposed Alternate 4 – Roundabout intersection of US 41 at Hospital Drive is predicted to experience 50.91 total crashes and 8.33 Fatal and Injury Crashes over the 20-year

project life. Alternate 4 is showing a 22% reduction in total crashes and a 63% reduction in fatal and injury crashes when compared to Alternate 1.

The Crash Reduction Benefit of Alternate 4 compared to Alternate 1 at the Hospital Drive Intersection is approximately **$756,000** over the 20-year project life. This was developed using the crash reductions mentioned above and existing crash data. The US 41 at the Hospital Drive Intersection experienced 19 total crashes with one of those crashes involving an injury collision over the 5-year crash data.

US 41 at Briarwood Dr.

PM Design Hour

Crash Prediction Summary				
Control Strategy	**Crash Type**	**Opening Year**	**Design Year**	**Total Project Life Cycle**
1-lane Roundabout	Total	2.25	2.25	47.35
	Fatal & Injury	0.47	0.47	9.89
2-lane Roundabout	Total	2.47	2.47	51.83
	Fatal & Injury	0.30	0.30	6.38
Traffic Signal	Total	3.05	3.05	63.99
	Fatal & Injury	1.05	1.05	21.99
Traffic Signal (Alt)	Total	2.80	2.80	58.89
	Fatal & Injury	0.96	0.96	20.25

In summary, the proposed Alternate 1 – Signalized Intersection of US 41 at Hospital Drive is predicted to experience 63.99 total crashes and 21.99 Fatal and Injury Crashes over the 20-year project life. The proposed Alternate 4 – Roundabout intersection of US 41 at Hospital Drive is predicted to experience 49.59 total crashes and 8.13 Fatal and Injury Crashes over the 20-year project life. Alternate 4 is showing a 23% reduction in total crashes and a 63% reduction in fatal and injury crashes when compared to Alternate 1.

The Crash Reduction Benefit of Alternate 4 compared to Alternate 1 at the Briarwood Drive Intersection is approximately **$513,000** over the 20-year project life. This was developed using the crash reductions mentioned above and existing crash data. The US 41 at Briarwood Drive Intersection experienced 21 total crashes with none of those crashes involving an injury collision over the 5-year crash data.

The table below uses the Comprehensive Cost based on recent research by VHB for Fatal, Suspected Serious Injury, Suspected Minor Injury, Possible Injury, and No Apparent Injury and weighted by the total number of crashes for each category for the state of Kentucky in 2019.

Crash Costs based on Recent Research by VHB		
Description	**Code**	**Comprehensive Cost**
Fatality	K	**$9,281,571**
Suspected Serious Injury	A	**$537,913**
Suspected Minor Injury	B	**$162,885**
Possible Injury	C	**$102,957**
No Apparent Injury	O	**$9,689**

3. The Highway Safety Manual 1st Edition, Volume 2, Chapter 12 – Predictive Method for Urban and Suburban Arterials – Analysis Spreadsheet was used to develop predictive crash models.
    a. Models were developed for No Build, Alternative 1, Alternative 2, Alternative 3, and Alternative 4 using base conditions. Then models were developed for each scenario with updated Access Management (reduction in driveways) that is presented in Proposal 5.

		Base Model				Proposal 5			
			Expected Crashes (per year)				Expected Crashes (per year)		
No-Build	3 Lane w/ TWLTL	Total	17.190			Total	16.227		
		Fatal & Injury	6.147			Fatal & Injury	5.908		
		Property Damage	11.043			Property Damage	10.319		
				Baseline to No Build	Crash Reduction Benefit			% Reduction Crashes f/ Baseline	Crash Reduction Benefit
Alt 1	5 Lane w/ TWLTL	Total	19.697	-14.6%	Baseline	Total	17.977	8.7%	$ 790,209.37
		Fatal & Injury	6.901	-12.3%		Fatal & Injury	6.402	7.2%	
		Property Damage	12.796	-15.9%		Property Damage	11.575	9.5%	
				% Reduction Crashes f/					
Alt 2	4 Lane Divided	Total	15.670	20.4%	$ 1,836,184.53	Total	15.206	22.8%	$2,053,794.90
		Fatal & Injury	5.759	16.5%		Fatal & Injury	5.616	18.6%	
		Property Damage	9.911	22.5%		Property Damage	9.590	25.1%	
Alt 3	Mix 5 Lane & 4 Lane	Total	17.468	11.3%	$ 1,014,177.13	Total	16.429	16.6%	$1,494,465.74
		Fatal & Injury	6.273	9.1%		Fatal & Injury	5.966	13.5%	
		Property Damage	11.195	12.5%		Property Damage	10.463	18.2%	
Alt 4	2 Lane Divided w/ Roundabout	Total	12.344	37.3%	$ 5,052,699.23	Total	11.325	42.5%	$5,725,814.15
		Fatal & Injury	3.537	48.7%		Fatal & Injury	3.270	52.6%	
		Property Damage	8.254	35.5%		Property Damage	7.594	40.7%	

Performance Criteria Matrix

A copy of the Performance Criteria Matrix is included for reference.

PERFORMANCE CRITERIA MATRIX

US 41 - North Main Street, Hopkins County
Kentucky Transportation Cabinet
Value Engineering (VE) Study

							TOTAL	%
Local Operations- Access to businesses and properties while minimizing impacts	**A**	b	a	a	a	a/f	**4.5**	**21.43%**
Mainline Operations - Capacity, congestion, traffic delays, conflicts		**B**	b	b	b	b	**6.0**	**28.57%**
Schedule- Able to complete ROW acquisition and utility plans			**C**	d	e	f	**1.0**	**4.76%**
Drainage - Impacts to flooding				**D**	e	f	**2.0**	**9.52%**
Connectivity - Enhances community economy					**E**	f	**3.0**	**14.29%**
Level of Service - Ped access and comfort						**F**	**4.5**	**21.43%**
							21.0	**100.00%**

a	More Important
a/b	Equal Importance

***Note:** 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.

Agenda

A copy of the workshop agenda is included for reference.

Value Engineering (VE) Workshop Agenda

Project Name: Kentucky Transportation Cabinet
US 41-North Main Street
Item No. #2-8305.00
Hopkins County

Dates: VE Workshop
August 16-20, 2021 (see detailed times below)

Study Location: Virtual

Day 0: Thursday, August 5, 2021, 2:00 PM – 3:00 PM EST

Time EST	VE Activity	Participants	Comments
2:00-3:00	Technical Dry Run; introduction to the workroom, Webex and Sharepoint	VE Team Members	

Day 1: Monday, August 16, 2021, 9:00 AM – 5:00 PM EST

Time EST	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		
3:15	Finalize Function Analysis	VE Team	
	CREATIVE PHASE		
4:15	Brainstorm Ideas / Alternatives	VE Team	
5:00	Adjourn		

Day 2: Tuesday, August 17, 2021, 9:00 AM – 5:00 PM EST

Time EST	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, August 18, 2021, 9:00 AM – 5:00 PM EST

Time EST	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, August 19, 2021, 9:00 AM – 5:00 PM EST

Time EST	VE Study Activity	Participants	Comments
9:00	Check-in	VE Team	
DEVELOPMENT PHASE - continued			
9:10	Develop / Cost Alternatives - Complete	VE Team	
11:30	Check-in		
12:00	Long Break		
1:00	Peer Review Workbooks Identify Alternatives to Present Prepare Presentation	VE Team	
3:00	Author Review	VE Team	
4:00	Run-through Presentation	VE Team	
5:00	Adjourn		

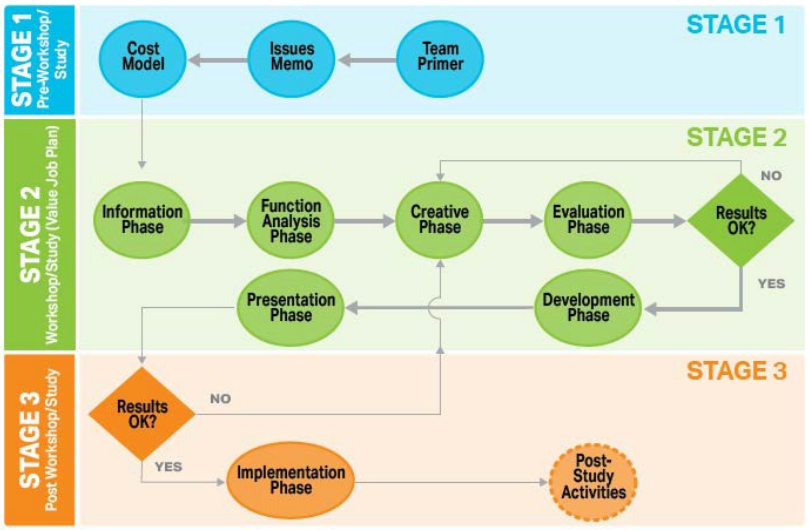
Day 5: Friday, August 20, 2021, 8:00 AM – Noon EST

Time EST	VE Study Activity	Participants	Comments
8:00	Check-in	VE Team	
DEVELOPMENT PHASE - continued			
8:05	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

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. The workshop is conducted in accordance with the methodology as established by SAVE International, the value society, and is structured using the value methodology as illustrated at right and outlined in the table below.



Value Methodology Stage / Phase	VM Phase Functions Achieved	Objectives of this Phase	Outcomes of this Phase
Stage 1: Pre-workshop Study (Preparation)	Initiate Study Organize Study Prepare Data	▪ Identify study project ▪ Identify study roles and responsibilities ▪ Define study scope, goals and objectives ▪ Select team leader ▪ Conduct pre-study meeting ▪ Select value study 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 virtual workshop ▪ Send team primer to value study team ▪ Value team members to complete Key Issues Memos (KIM)	▪ Fosters understanding of value study priorities ▪ Defines and manages expectations ▪ Organizes the value study ▪ Offers a thorough review of the project ▪ Tests meeting platform and virtual tools to maximize engagement and collaboration ▪ Primes the team for the value workshop
Stage 2: Workshop Study			
Phase 1: Information Phase	Inform Team	▪ 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	▪ Brings all value study 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 foundation for function analysis

Value Methodology Stage / Phase	VM Phase Functions Achieved	Objectives of this Phase	Outcomes of this Phase
Function Analysis Phase	Analyze 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
Creative Phase	Create Ideas	▪ Brainstorm to generate performance-focused ideas for alternative ways to perform functions ▪ Discuss, build-on and clarify ideas	▪ Value team develops a broad array of ideas that provides a wide variety of possible alternative components or methods to improve project value
Evaluation Phase	Evaluate 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 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
Development Phase	Develop Alternatives Critique Alternatives	▪ Validate and refine idea concepts ▪ Compare to original design concept ▪ Define implementation considerations ▪ Prepare sketches and calculations ▪ Measure performance ▪ Estimate costs, life-cycle cost benefits/costs	▪ Provides side-by-side comparison of baseline and alternative—concepts, initial costs, life-cycle costs, sketches, performance metrics
Presentation Phase	Present Alternatives	▪ 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
Stage 3: Post-workshop Study (Implementation)	Document VE Study Assess Alternatives Resolve Alternatives Finalize Alternatives Publish Results	▪ 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 implementation plan with project manager ▪ Project manager sign-off on VE implementation plan ▪ Final presentation of study results	▪ Involves those who will implement and increases likelihood of implementation ▪ Improves actual value of the project