VE # 201201
US 641 Widening
Item #1-314.10 & # 1-314.20 Project
Calloway County, Kentucky
Value Engineering Study Report - Final

Study Dates: January 24-27, 2012
Final Report Date: April 20, 2012

Kentucky Transportation Cabinet
Division of Professional Services
200 Mero Street
Frankfort, KY 40622

Contact: Renee L. Hoekstra, CVS
(623) 266-3943

RH & Associates, Inc.

KENTUCKY TRANSPORTATION CABINET

RH & Associates, Inc.

"Partnering, Public Information & Value Specialists"

April 20, 2012

Mr. Brent Sweger
Kentucky Transportation Cabinet
Division of Professional Services
200 Mero Street
Frankfort, KY 40622

Re: US641 Widening Project Item # 1-314.10 and # 1-314.20
Final Value Engineering Study Report

Dear Brent:

Transmitted herewith is the pdf copy of the Final Value Engineering Study Report for the above referenced project. A single hard copy will be delivered.

RHA appreciates your assistance and cooperation as well as that from the KYTC design team including the consultants and all other stakeholders. Should you have any questions please telephone me at (623) 266-3943.

Sincerely,

RH & ASSOCIATES, INC.

Renee L. Hoekstra, CVS
President

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RH & Associates, Inc.

Value Engineering Study Draft Report
US641 Widening – Item # 1-314.10 and # 1-314.20
Calloway County, KY

February 2012

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INTRODUCTION

Value Engineering Study
Kentucky Transportation Cabinet
US 641 – Item #1-314.10 & #1-314.20
Calloway County

Introduction

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

Value Methodology

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

Report Content

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

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

Executive Summary – An overview which includes an overview of the VE process, the VE punch list to be used during the implementation meeting, a list of the VE study team members and the certification.

Project Description – This section describes each of the projects in more detail for the reader to gain a better understanding of the projects under study. Vicinity maps and photographs, where appropriate, are included showing where each of the projects are located.

VE Recommendations and Design Comments – each completed alternative and design suggestion has a separate workbook. Each workbook contains the following information:

Appendices

A – Study Participants
B – Pareto Cost Models
C – Function Analysis
D - Creative List and Evaluation – Two creative lists, one for each project, the performance attribute criteria and the performance matrices for each project.
E – Support Data
    i. Team Observations
    ii. Cost Estimate Comments
    iii. Constructability Comment

EXECUTIVE SUMMARY

Value Engineering Study
Kentucky Transportation Cabinet
US 641 – Item #1-314.10 & #1-314.20
Calloway County

Executive Summary

Background

A Value Engineering (VE) study was conducted from January 24-27, 2012 for the Kentucky Transportation Cabinet (KYTC) for two projects within the US 641 corridor. These projects included Item #1-314.10 and #1-314.20 as described below. The decision makers identified the project goals as improving the traffic flow and reducing initial project costs.

The workshop objectives were identified at the start of the workshop; to assure the efficient use of funds, both capital and life cycle costs, and to ensure the best value could be attained while meeting the project goals and performance attributes. The VE team identified the following goals and or opportunities for the workshop:

- The possibility of reducing the number of lanes
- Identify potential cost savings
- Review and look for possibilities with the tie-in costs
- Maintain safety on the roadway
- Consider impacts to the farms
- Consider impacts to the side roads
- Considerations for pedestrians and bicycles
- Define the bridge elements/requirements
- Identify value improvements
- Provide constructability comments

Project Constraints

The decision makers/stakeholders identified the project constraints for the VE team at the start of the VE study. The following are those constraints:

- US 641 – Item #1-314.10
  - Use the 5-lane standard
- US 641 – Item #1-314.20
  - None

Project Descriptions

The VE study for US 641 includes two projects. The overall purpose of these projects is to improve traffic flow by providing a safer and more efficient roadway while enhancing and promoting economic development in the area. The first project, Item #1-314.10, is a major widening project being designed by Florence and Hutcheson. The second project, Item #1-314.20, is within the US 641 corridor with a little over four miles in length generally paralleling the existing US 641. This project is being designed by Palmer Engineering.

Summary of Results

The VE team brainstormed 62 ideas for both projects. Of those, 19 ideas were identified for further development into VE proposals, including cost impacts. 10 Design Suggestions, without any cost impact were identified with 3 Design Suggestions written to provide additional information for KYTC and the designer to consider. The description and further discussion of these are included in the VE Workbooks section of this report. The following represents the alternatives developed and the cost impact, as necessary. The ideas developed are listed under the following functions or items of work Accommodate Vehicles (AV), Limit Access (LA), Ensure Connectivity (EC), Accommodate Multi-modal (AM), Accommodate Drainage (AD), and Minimize Impact (MI). The following lists shows the alternatives developed and the cost impacts. The costs shown in parenthesis represent an additional cost to the project. Those shown as positive numbers represent a savings. The total savings/costs listed on the next mage, does not take into account that several of the alternatives are mutually exclusive, where by, implementing one alternative will eliminate another. It is provided to show the total of savings/costs of all of the proposed ideas.

Item #1-314.10

No.	Alternative Description	Initial Costs	Life Cycle	Total Costs/ Savings
AV-01	Construct roadway profile closer to the existing profile	$170,000	--	$170,000
AV-04	Use a 2+1 cross section from the Middle Fork Bridge north to Riverwood Road	$270,000	$32,000	$302,000
AV-05	Eliminate curb and gutter between Tabbard Drive and Riverwood Road	$46,000	--	$46,000
AV-10	Change the asphalt binder from PG 76-22 to PG 64-22	$501,000	--	$501,000
LA-02	Develop an Access Management Plan and Memorandum of Understanding with local governments	--	--	DS
LA-03	Eliminate access to the gas station parcel off of US 641	$1,000	--	$1,000
LA-06	Build a roundabout at Peggy Ann Drive	($141,000)	--	($141,000)
AM-02	Add bike lanes	--	--	--

No.	Alternative Description	Initial Costs	Life Cycle	Total Costs/ Savings
AD-02	Keep the drainage pattern in the current location at Peggy Ann Road	$56,000	--	$56,000
MI-01	Eliminate the temporary easement behind the utility easement	$24,000	--	$24,000
	TOTAL ITEM # 1-314.10	$927,000	$32,000	$959,000

Item # 1-314.20

No.	Alternative Description	Initial Costs	Life Cycle	Total Costs/ Savings
AV-01	Reduce the median width to 30’	$352,000	--	$352,000
AV-02	Partially use the existing US 641 as Alternate 3	$7,511,000	$401,000	$7,912,000
AV-04	Use a 2+1 typical cross section and/or 2-lane with auxiliary lane	$5,065,000	$830,000	$5,895,000
AV-07	Use a 2-lane with the auxiliary lanes on Alternate 3	$28,910,000	$983,000	$29,893,000
AV-09	Provide a new alignment from Taylor Road to the bridge to lessen impacts on the gas line	$7,195,000	--	$7,195,000
AV-10	Tie into the top Old US 641 at KY 1828 to avoid the gas line	$11,579,00	$321,000	$11,900,000
AV-11	Eliminate side road approaches at Brandon and Barber Roads	$116,000	--	$116,000
AV-12	Tie-in at Stateline Road and eliminate the temporary tie-in	$450,000	--	$450,000
AV-17	Reduce the typical section lane width, ditch, etc.	$927,000	$50,000	$977,000

No.	Alternative Description	Initial Costs	Life Cycle	Total Costs/ Savings
AV-19	Provide an eastern alignment on the northern portion	$5,924,000	--	$5,924,000
AV22	Address working platform	--	--	DS
ED-04	Develop a Memorandum of Understanding with local agencies to develop an access management plan to control access	--	--	DS
	TOTAL ITEM # 1-314.20	$56,450,000	$2,585.000	$70,614,000

Team Observations

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

Constructability Comments

The US 641 widening project, Item# 1-314.10, project was described as being 90% designed. With that in mind, it was important for the team to look for potential construction impacts to the project based on the current design. The comments can be found in Appendix E.

Function Analysis

Function definition and analysis is the heart of Value Engineering. It is the primary activity that separates VE from all other “improvement” 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 data supporting the function analysis can be found in Appendix C.

The VE team identified the functions using active verbs and measurable nouns. This process allowed the team to truly understand all of the functions associated with the project. The basic function was defined as Improve Traffic Flow. A Function Analysis Systems Technique (FAST) diagram was not completed on this project.

Value Engineering Study
Kentucky Transportation Cabinet
US 641 – Item #1-314.10 & #1-314.20
Calloway County

VE Study Team

Renee Hoekstra, CVS, RH & Associates, Inc. – VE Team Leader
Brent Swegert, P.E., AVS, Kentucky Transportation Cabinet – Planning/Traffic Analysis
Kenneth Ott, P.E., American Engineering, Inc. - Transportation/Corridor Specialist
Robert Martin, P.E., Qk4 - Constructability
Peter Overmohle, P.E., American Engineering, Inc. – Civil/Roadway Specialist
Richard Tutt, P.E., American Engineering, Inc. – Pavement Specialist

Certification

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

Renee L. Hoekstra, CVS
RH & Associates, Inc.

PROJECT DESCRIPTION

Value Engineering Study
Kentucky Transportation Cabinet
US 641 – Item #1-314.10 & #1-314.20
Calloway County

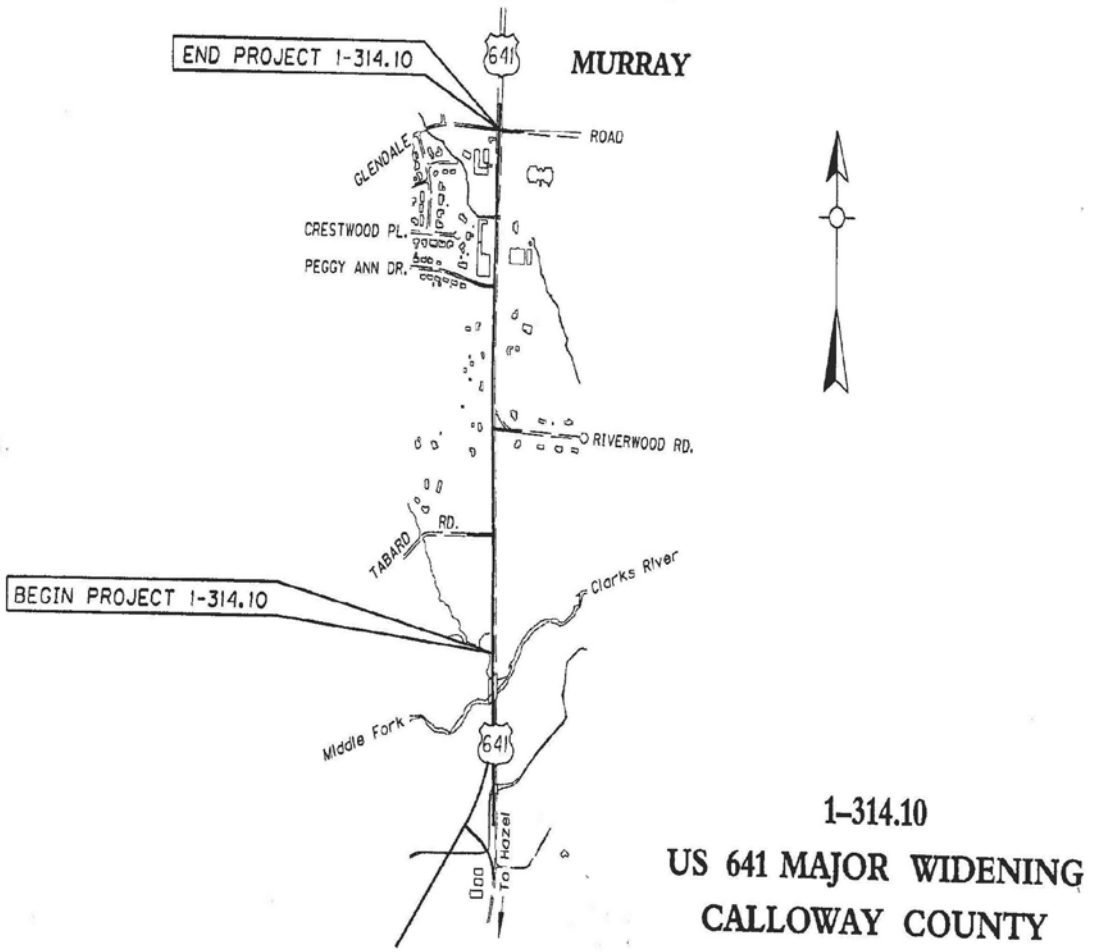
Introduction

The VE study was conducted on two projects on US 641. This included the widening project Item # 1-314.10 and the corridor study/design Item # 1-314.20. The project information is located below. The purpose of both projects is to improve traffic flow by providing a safer and more efficient roadway while enhancing and promoting economic development in the area.

Item # 1-314.10 – US 641 Widening

This project is located in Calloway County and is from approximately 0.08 miles north of the existing US 641 bridge over the Middle Fork of the Clarks River, extending northerly and generally paralleling the existing US 641 route approximately 0.87 miles to the existing signalized intersection at Glendale Road, which is an improved 5-lane intersection. The current level of design is approximately 90% and is being completed by Florence and Hutcheson.

Project Limits



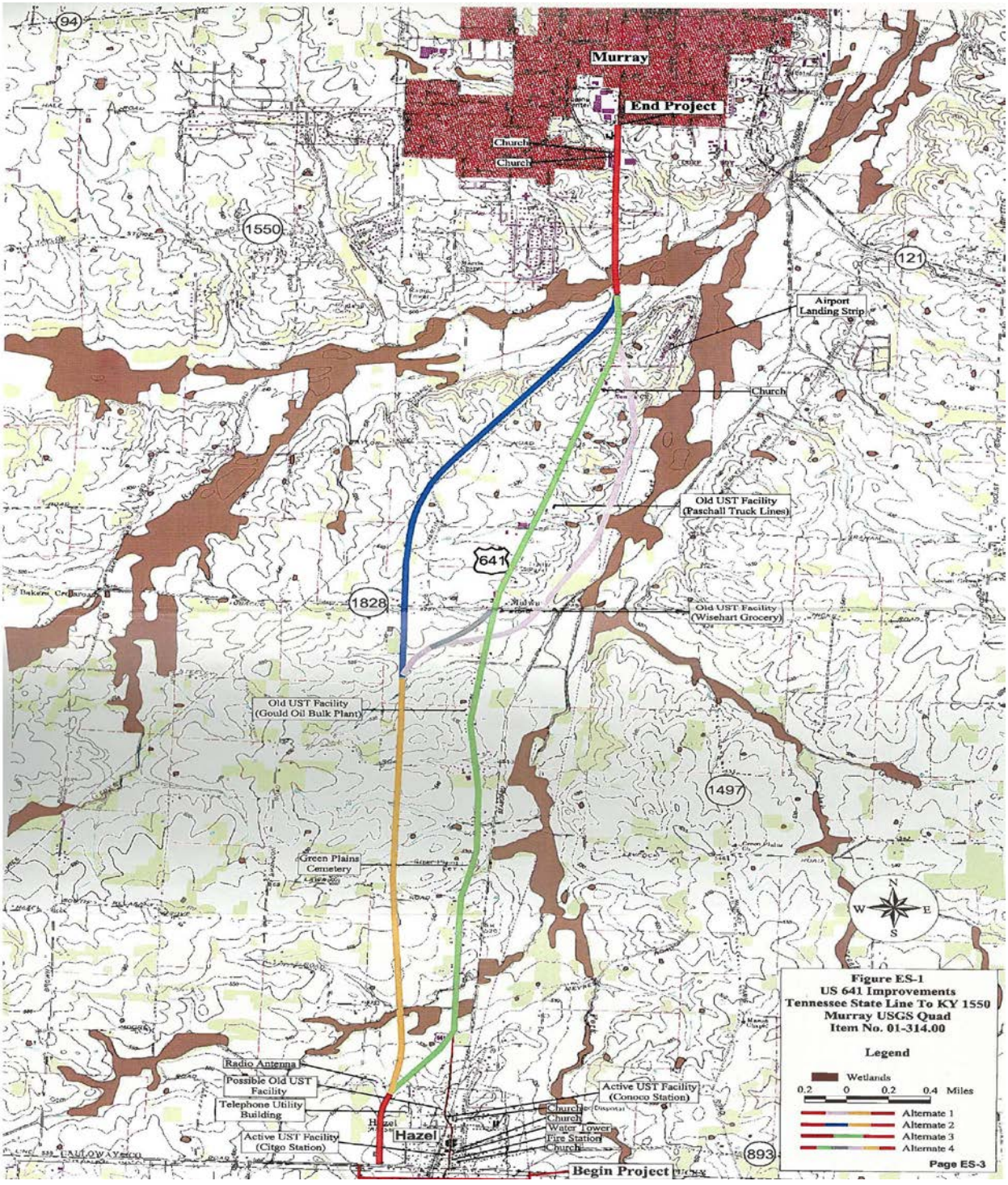
Item # 1-314.20

Existing US 641 between the Tennessee State Line (at Hazel) and the Clarks River (Middle Fork) Bridge south of Murray is a two lane road with 10-foot to 11-foot lanes and 2-to 3-foot shoulders. The need for improvement to US 641 in this area evolved from concerns expressed by local citizens about heavy truck traffic using US 641 and high crash occurrences, especially near the community of Hazel, KY. In 2002, an Alternatives Study was completed for US 641 in Calloway County from the Tennessee State Line to KY 1550 in Murray. The 2002 Alternatives Study recommended reconstructing US 641 as a 4-lane divided roadway using Alternate 2 – Reconstruction West of the existing alignment.

The purpose of this study (begun in February 2011) is to develop preliminary engineering studies for alignment and grade within the preferred corridor west of the existing alignment. With the selection of a preferred alignment, the project can then be advanced to final design for final drainage design, right-of-way, utility plans, and final roadway construction plans.

The Tennessee Department of Transportation (TDOT) also is studying improvement scenarios for US 641 from near Paris, Tennessee to the Kentucky state line. With the determination of a preferred alignment in Kentucky, coordination with TDOT can continue for improvements to US 641 in both states.

Project Limits



VE RECOMMENDATIONS & DESIGN COMMENTS

VE Recommendations & Design Suggestions

Introduction

The VE study evaluated the 62 ideas that were brainstormed during the Creative Phase for Items #1-314.10 and #1-314.20. The 19 completed alternatives and 3 design suggestions are located in this section of the report. The alternatives for each item are listed in separate sections. The alternatives develop included, as needed, the following information:

- Baseline Alternative
- Proposed Alternative
- Benefits and Challenges of the Proposed Alternative
- Discussion and Justification
- Implementation Requirements
- Detailed Cost Estimate
- Drawings and/or Sketches for the Baseline and the Proposed Alternative

Additionally, three Design Suggestions were developed to provide some additional design direction to the design team.

Results of the Study

The team developed the following Proposals and Design Suggestions:

VALUE ENGINEERING PROPOSAL AV-01

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Construct roadway profile closer to the existing profile**

FUNCTION: **Accommodate Vehicles**

BASELINE ASSUMPTION:

The current design, particularly between Station 125+00 to 145+00, utilizes significant vertical grade changes that introduce profile cuts near 6 ft and fills near 3 ft. It is understood that the profile is purposely elevated in some instances to salvage existing pavement and minimize leveling and wedging as well as improving the system fall for storm sewer systems. It is also the VE team's understanding that the profile cuts were used to dramatically improve intersection sight distance.

PROPOSED ALTERNATIVE:

The VE team recommends further consideration be given to increasing profile grades and reducing vertical curve lengths through the stationing provided, while still maintaining compliance with current standards, which allows (for a 45 mph design speed) a minimum stopping sight distance of 475 ft and profile grades of up to 7.5%.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 376,000	$ -	$ 376,000
PROPOSED ALTERNATIVE:	$ 206,000	$ -	$ 206,000
TOTAL (Baseline less Proposed)	$ 170,000	$ -	**$ 170,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-01

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

TITLE:	**Construct roadway profile closer to the existing profile**
BENEFITS	**RISKS/CHALLENGES**
• Reduces overall excavation and construction costs	• Requires redesign
• Narrower disturbed limits will lessen right-of-way impacts	• Reduces stopping and intersection sight distance
• Improves initial construction and maintenance of temporary access points	• Potentially could create a slight imbalance in earthwork, requiring a minimal amount of borrow. However, this can be adjusted to avoid borrow
• Potentially less impacts to utilities	•
• Increased grade potentially can move the catch basin inlets further down grade from the crest near Station 136+00 and allow for a minor reduction in storm sewer length	•
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VALUE ENGINEERING PROPOSAL AV-01

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

TITLE: **Construct roadway profile closer to the existing profile**

DISCUSSION/JUSTIFICATION:

Based on roadway class, function and a 45 mph design speed, the design parameters listed in the Design Executtive Summary (DES) allow for a maximum vertical grade of 7.5% and a stopping sight distance of 475 ft. Available profile information indicates the proposed grades are no steeper than 3.59%. Existing grades are approximately 5.8% or flatter. A key decision item on the current grade design was to provide for better intersection sight distance at the Riverwood Road access at Station 130+00 and the residential access between Station 135+00 and 137+40. A cursory review indicates that a redesign of the segment between 125+00 to 145+00 would allow for a significant reduction in excavation, provide adequate intersection sight distance, and lessen right of way impacts. The conceptual assumption is that the proposed fee simple right of way would not be affected significantly (if at all) but that the location of the disturbed limits would reduce the permanent easement quantity.

A review of the profile and a cursory design indicates that while a closer fit profile can be accomplished that better matches existing conditions and still provide the required sight distance, the estimated project cost gain is likely not enough to warrant a redesign.

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL AV-01

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

TITLE:	**Construct roadway profile closer to the existing profile**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Roadway excavation		CY	27,500	12.78	351,450	15000	12.78	191,700
Temporary easement		SF	42,000	0.58	24,360	25000	0.58	14,500
TOTAL COSTS*					**376,000**			**206,000**
							TOTAL (BASELINE LESS PROPOSED)	**170,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL AV-01

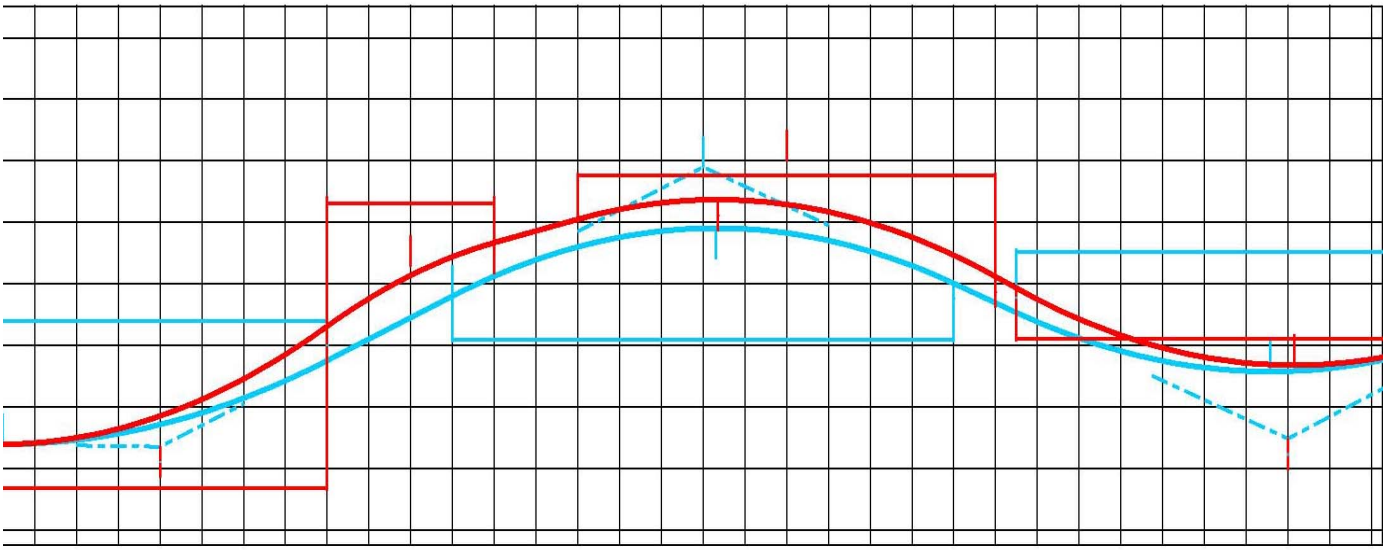
Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

TITLE: **Construct roadway profile closer to the existing profile**

SKETCH OF PROPOSED ALTERNATIVE



Key: Consultants Proposed Profile in Blue
VE Recommended Profile in Red

VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Use a 2+1 cross section from the Middle Fork Bridge of the Clarks River north to Riverwood Road**
FUNCTION:	**Accommodate Vehicles**

BASELINE ASSUMPTION:

The current design is a 4-lane rural section from Middle Fork Bridge of the Clarks River north to Tabbard Drive and then a 5-lane curb and gutter section from Tabbard Drive north to Glendale Road.

PROPOSED ALTERNATIVE:

Implement a 2+1 cross section design from the Middle Fork Bridge of the Clarks River to Riverwood Road.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 1,031,000	$ 160,000	$ 1,191,000
PROPOSED ALTERNATIVE:	$ 761,000	$ 128,000	$ 889,000
TOTAL (Baseline less Proposed)	$ 270,000	$ 32,000	**$ 302,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Use a 2+1 cross section from the Middle Fork Bridge of the Clarks River north to Riverwood Road**
BENEFITS	**RISKS/CHALLENGES**
• Eliminates the need to construct the northbound bridge	• This should only be used if 2+1 is used for the south section - Item #1-314.20
• Reduces right of way needs	• Does not provide an opportunity for left turns in this 2,300-ft section north of the bridge
• Reduces roadway earthwork and pavement	• Future development will require a frontage road to tie to Tabbard Drive or Riverwood Road for 1,200-ft access control
• Reduces operation and maintenance costs and completely eliminates future bridge maintenance	•
• Eliminates curb and gutter and storm drainage between Tabbard and Riverwood (1,000-ft)	•
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•	•
•	•
•	•

VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

TITLE:	**Use a 2+1 cross section from the Middle Fork Bridge of the Clarks River north to Riverwood Road**

DISCUSSION/JUSTIFICATION:

This alternative should be used with the 2+1 VE alternate that is proposed on the south (Item #1-314.20) section. (See AV-04 - Item #1-314.20) The 5-lane curb and gutter section at Riverwood Road (Station 128+28) will transition to one southbound lane and two northbound lanes with no median. The Middle Fork Bridge of the Clarks River (Station 105+25) should be re-striped to provide three 12-foot lanes (approximate) with 2-foot shoulders. This ensures that the future northbound bridge is never required in the ultimate design. Going south from the bridge (Item # 1-314.20), the 2+1 section would transition to two northbound lanes and one southbound lane to allow passing for northbound traffic since the southbound traffic has already had time to pass on the north side of the bridge. Based on both current and future traffic volumes, the 2+1 section can easily handle traffic allowing for passing for slow vehicles, such as farm equipment, throughout the entire corridor all the way to the Tennessee state line.

Although the initial constraints were to maintain the 5-lane section, this alternative provides significant cost savings and still accomplishes the goal of matching the existing 5-lane at Glendale Road and provides a desirable Level of Service.

IMPLEMENTATION CONSIDERATIONS:

Additional public meetings should be held to inform the local residents and to get their feedback on concerns, suggestions, and comments as well as local city and county officials. This would require redesign to accommodate this alternative.

Please note that the bridge for this project is not located in either Item #1-314.10 or Item #1-314.20. However, in order to implement the project, the bridge and the costs will need to be added to one of the projects. In doing so, this will increase the project by $1,500,000. To accommodate this in this alternative, no costs have been shown in the baseline project. However, if this alternative is implemented, it will avoid having to spend the $1,500,000 that will be necessary to accommodate the current 4-lane rural section. This will also reduce the future costs of maitenance that will be required on the new bridge. These costs are also not included in the life cycle cost sheet of this alternative, since it was not in the baseline approach. This would eliminate the need for a deck overlay in year 20, since the new bridge would not be built.

VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Use a 2+1 cross section from the Middle Fork Bridge of the Clarks River north to Riverwood Road**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Earthwork Sta 105+25 to Sta 128+28		CY	12,953	13.00	168,389	8500	13.00	110,500
Shoulder pavement		SY	3,000	36.00	108,000	5100	36.00	183,600
Mainline pavement		SY	14,100	45.00	634,500	9200	45.00	414,000
Curb and gutter		LF	1,000	14.00	14,000	50	14.00	700
18-inch pipe		LF	500	48.00	24,000	48	48.00	2,304
24-inch pipe		LF	35	55.00	1,925			
Right-of-way		AC	8	10,000.00	80,000	5	10,000.00	50,000
TOTAL COSTS*					**1,031,000**			**761,000**
							TOTAL (BASELINE LESS PROPOSED)	**270,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Use a 2+1 cross section from the Middle Fork Bridge of the Clarks River north to Riverwood Road**

Assumptions			
Interest/Discount Rate(%):	3%	**Economic Life (yrs):**	20

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Assumption**		**Proposed Alterative**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Asphalt milling and overlay ($7/SY)	15	250,000	160,465	200,000	128,372
2						
3						
4						
5						
Total Salvage & Replacement Costs			**250,000**	**160,465**	**200,000**	**128,372**

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)	160,000	128,000
RESULTS (Proposed less baseline)		

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

VALUE ENGINEERING PROPOSAL AV-04

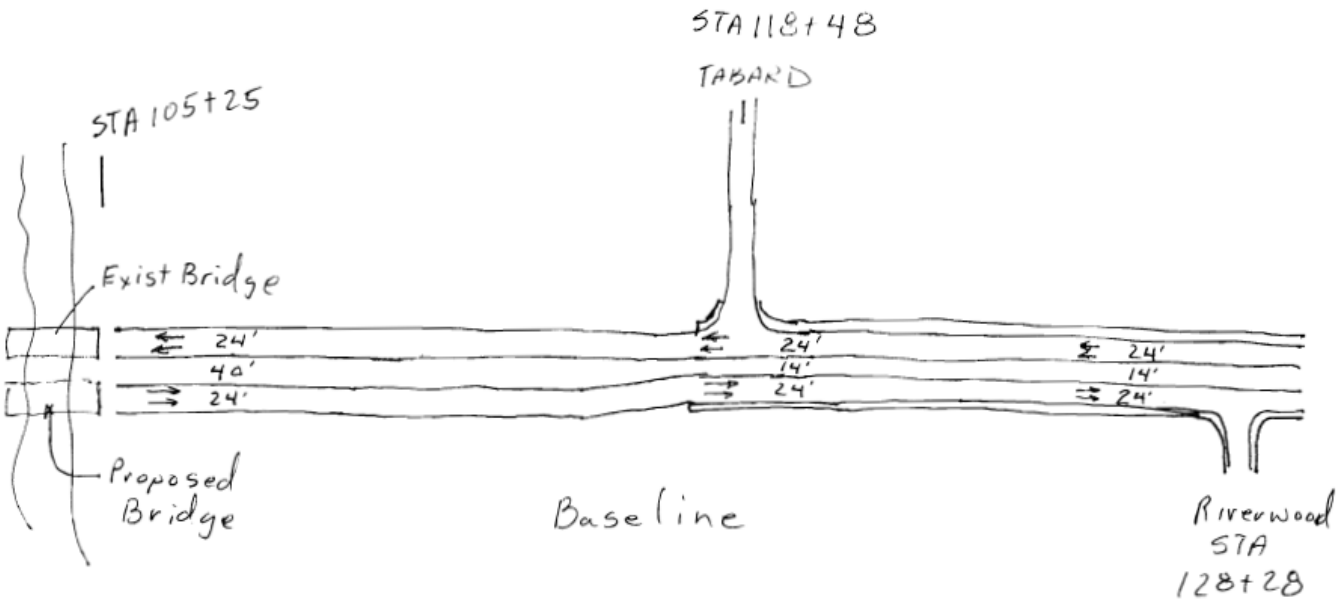
Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

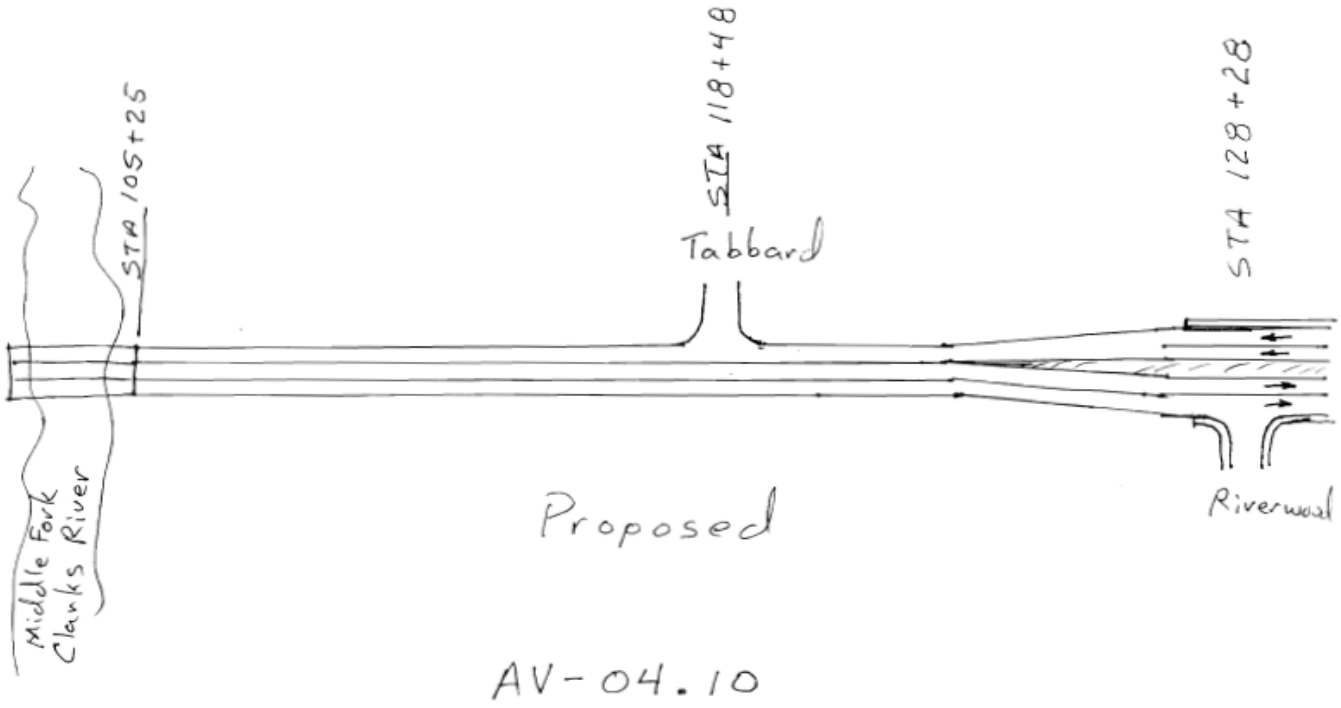
TITLE:	**Use a 2+1 cross section from the Middle Fork Bridge of the Clarks River north to Riverwood Road**

SKETCH OF BASELINE ASSUMPTION



TITLE: **Use a 2+1 cross section from the Middle Fork Bridge of the Clarks River north to Riverwood Road**

SKETCH OF PROPOSED ALTERNATIVE

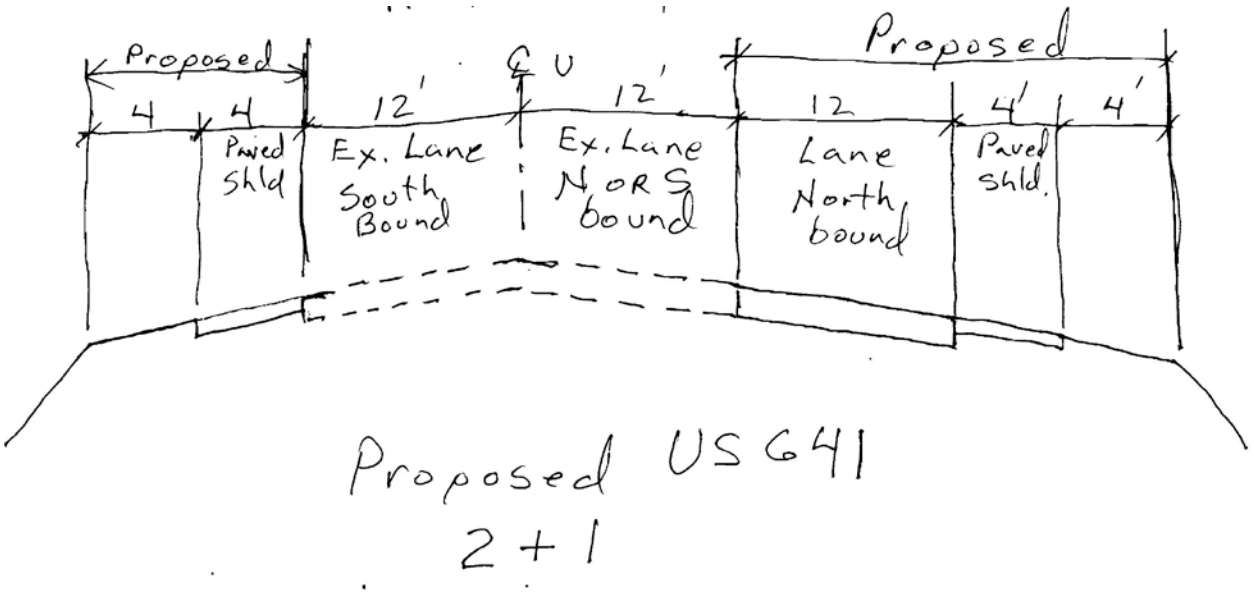


VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Use a 2+1 cross section from the Middle Fork Bridge of the Clarks River north to Riverwood Road**

SKETCH OF PROPOSED ALTERNATIVE



Proposed US 641
2 + 1

VALUE ENGINEERING PROPOSAL AV-05

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Eliminate curb and gutter between Tabbard Drive to Riverwood Road**
FUNCTION:	**Accommodate Vehicles**

BASELINE ASSUMPTION:

The original design is to install a 5-lane curb and gutter section between Tabbard Drive (118+48) and Riverwood Road (128+28).

PROPOSED ALTERNATIVE:

This alternative recommends using a rural section through this segment.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 118,000	$ -	$ 118,000
PROPOSED ALTERNATIVE:	$ 72,000	$ -	$ 72,000
TOTAL (Baseline less Proposed)	$ 46,000	$ -	**$ 46,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-05

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Eliminate curb and gutter between Tabbard Drive to Riverwood Road**
BENEFITS	**RISKS/CHALLENGES**
• Eliminates the cost of the curb and gutter associated with the storm sewer system and the sidewalk	• Potentially this impacts more utilities, particularly the 8-inch watermain on the west side
• Does not impact to the Level of Service	• Potentially increases roadway and ditch excavation
• Reduces embankment	• Potentially increases impacts to the right-of-way
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VALUE ENGINEERING PROPOSAL AV-05

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Eliminate curb and gutter between Tabbard Drive to Riverwood Road**

The elimination of the typical curb and gutter from Riverwood Drive, where the current city limits end, to the bridge at the Middle Fork of the Clarks River appears to be a feasible alternative. There would be no reduction in Level of Service, no apparent significant change to utilities and allows for the elimination of 6 to 8 curb boxes, 680 feet of storm sewer, four metal end sections, and over 1,300 feet of 5-foot sidewalk. The stormwater will go to a ditch similar to the remainder of the project.

This allows us to use the same typical section that is proposed for the other section of the road. This also makes construction easier with no additional impact to the community.

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL AV-05

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Eliminate curb and gutter between Tabbard Drive to Riverwood Road**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Std. Curb and Gutter		LF	1,360	13.53	18,401			
5' Sidewalk		SY	1,100	34.52	37,972			
18", 24", 30" Storm Sewer (Unit cost is Wt. Avg.)		LF	678	53.36	36,178			
Metal End Sections (Unit cost is Wt. Avg.)		EA	4	2,150.00	8,600			
CBI Type A		EA	6	2,878.19	17,269			
Shoulder Paving CL2AS		Ton				104	78.65	8,180
Shoulder Paving CL2AB		Ton				270	81.53	22,013
Shoulder Full Depth DGA		Ton				1,877	22.10	41,482
TOTAL COSTS*					**118,000**			**72,000**
							TOTAL (BASELINE LESS PROPOSED)	**46,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL AV-10

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Change asphalt binder from PG 76-22 to PG 64-22**

FUNCTION: **Accommodate Vehicles**

BASELINE ASSUMPTION:

A portion of the baseline pavement design for the project calls for the use of PG 76-22 asphalt binder for the top lift of base and the final surface.

PROPOSED ALTERNATIVE:

The proposed pavement design would be to use PG 64-22 asphalt binder for all lifts of the asphalt pavement to be used on the project.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 1,563,000	$ -	$ 1,563,000
PROPOSED ALTERNATIVE:	$ 1,062,000	$ -	$ 1,062,000
TOTAL (Baseline less Proposed)	$ 501,000	$ -	**$ 501,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-10

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Change asphalt binder from PG 76-22 to PG 64-22**
BENEFITS	**RISKS/CHALLENGES**
• Meets current KYTC pavement guidelines	• None apparent
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VALUE ENGINEERING PROPOSAL AV-10

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Change asphalt binder from PG 76-22 to PG 64-22**

DISCUSSION/JUSTIFICATION:

The asphalt binder type currently included in the plans calls for the use of PG 76-22. Based on the traffic volumes available, the Equivalent Single Axle Loads (ESAL's) (<10,000,000) for this project will not meet the current KYTC warrants for use of the higher grade asphalt binder. In review of the estimate prepared for the project, the costs shown are significantly higher for use of the PG 76-22 versus PG 64-22.

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL AV-10

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Change asphalt binder from PG 76-22 to PG 64-22**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
CL3 Asphalt Base 1.00D PG76-22		Tons	18,818	68.96	1,297,689			
CL3 Asphalt Surface 0.38B PG76-22		Tons	2,836	93.44	264,996			
CL3 Asphalt Base 1.00D PG64-22		Tons				18,818	44.57	838,718
CL2 Asphalt Surface 0.38B PG64-22		Tons				2,836	78.65	223,051
TOTAL COSTS*					**1,563,000**			**1,062,000**
							TOTAL (BASELINE LESS PROPOSED)	**501,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL LA-02DS

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Develop Access Management Plan and Memorandum of Understanding (MOU) with local governments**
FUNCTION:	**Limit Access**

BASELINE ASSUMPTION:

The current design uses by-permit access control with no additional access management measures.

PROPOSED ALTERNATIVE:

Develop an access management plan that identifies current and future allowable access points and potential signalized intersections. Enter into a MOU between KYTC and the local government.

DESIGN SUGGESTION

VALUE ENGINEERING PROPOSAL LA-02DS

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Develop Access Management Plan and Memorandum of Understanding (MOU) with local governments**
BENEFITS	**RISKS/CHALLENGES**
• Maximizes safety and traffic flow through well-planned access locations	• Consistency in future implementation of the plan and MOU
• Plans for appropriate future signal locations and avoids unwanted locations	•
• Encourages coordination between local Planning and Zoning and KYTC permitting staff	•
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TITLE: **Develop Access Management Plan and Memorandum of Understanding (MOU) with local governments**

DISCUSSION/JUSTIFICATION:

The current design includes constructing 23 access points, does not include median control and does not implement any spacing standards. Without additional measures, future access decisions could degrade the function of the road in terms of traffic flow and safety. Additional signals could be added at locations with poor spacing and the inability to coordinate timing with adjacent signals. Developing an access management plan that is adopted by both KYTC, the city and the planning commission will ensure that good, coordinated decisions are made in the development review process. An Access Management Plan would designate current and future allowable locations for both driveway access and signal locations. A plan may also include future construction of a non-traversable median if traffic volumes approach 20,000 vehicles per day.

Density of access points has a direct effect on the number of crashes on a roadway. The current design has an opening year access density of 23 points/mile. This is why it is critical to find a means to protect this section of road and to minimize the number of future entrances.

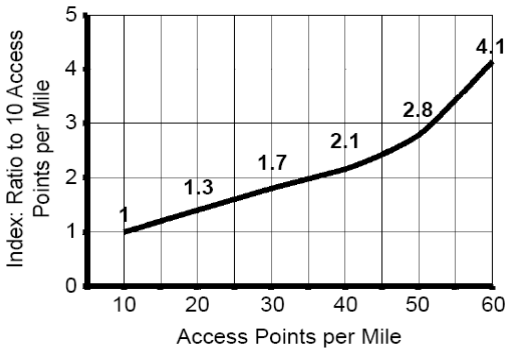


FIGURE 2-1 Composite crash rate indices (*1*).

TABLE 2-2 Representative Accident Rates (Crashes per Million Vehicle-Miles Traveled) by Type of Median—Urban and Suburban Areas (*1*)

Total Access Points per Mile[a]	Median Type		
	Undivided	Two-Way Left-Turn Lane	Non-Traversable Median
≤ 20	3.8	3.4	2.9
20.01-40	7.3	5.9	5.1
40.01-60	9.4	7.9	6.8
> 60	10.6	9.2	8.2
All	9.0	6.9	5.6

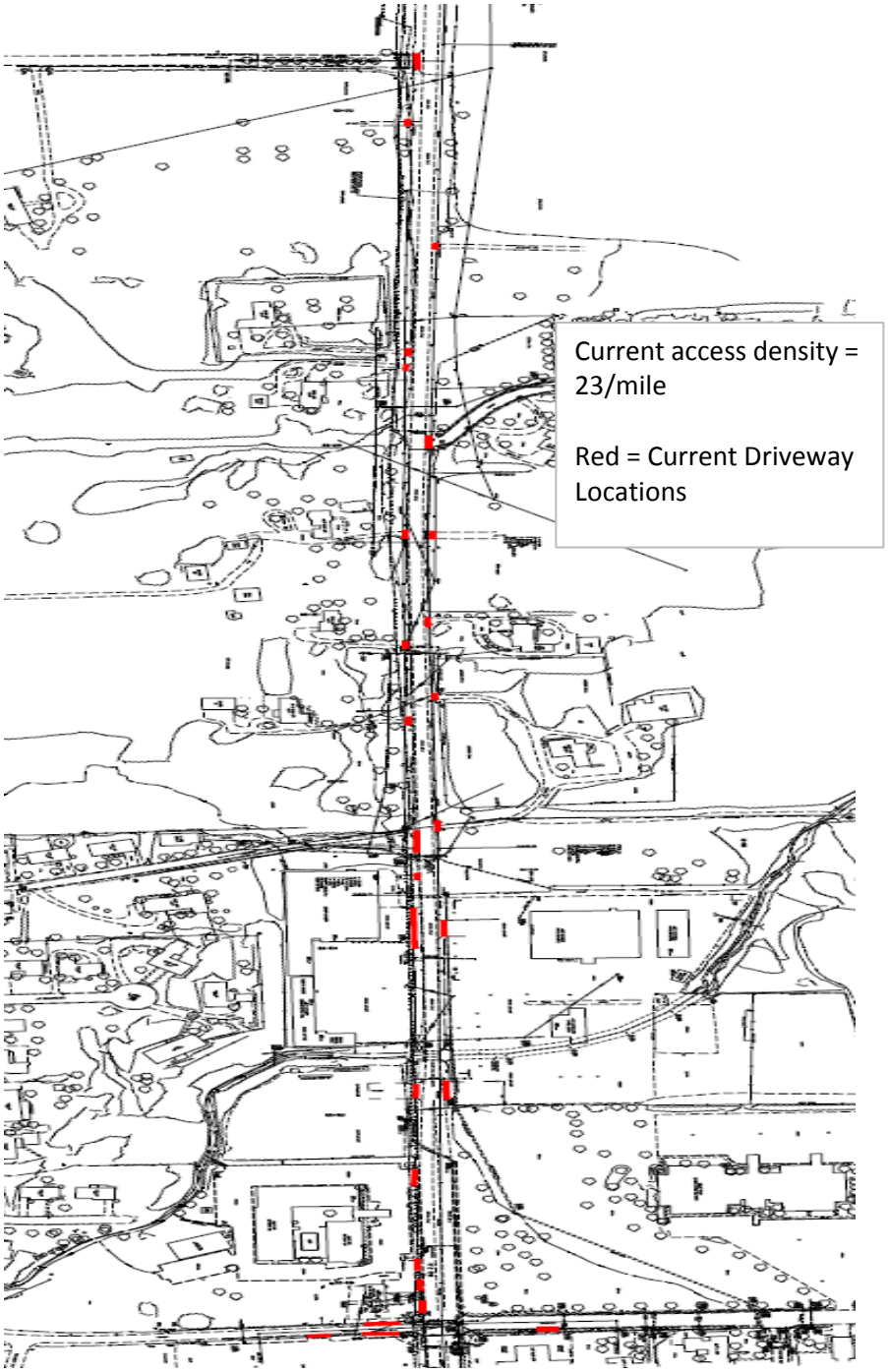
[a] Includes both signalized and unsignalized access points.

IMPLEMENTATION CONSIDERATIONS:

Developing an Access Management Plan for the corridor would be an additional effort beyond the current design. To be successful, it will be critical to have an MOU signed by the city, planning commission, and KYTC. In addition, it would be beneficial to have the plan adopted into the comprehensive plan's transportation section, so it becomes a visible reference for planning commissioners and staff.

TITLE:	**Develop Access Management Plan and Memorandum of Understanding (MOU) with local governments**

SKETCH OF BASELINE ASSUMPTION



VALUE ENGINEERING PROPOSAL LA-03

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Eliminate access to the gas station parcel off of US 641**
FUNCTION:	**Accommodate Vehicles**

BASELINE ASSUMPTION:

Construct two access points to parcel 33 left station 155+49 from US 641.

PROPOSED ALTERNATIVE:

Construct single access point to parcel 33 from US 641.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 5,000	$ -	$ 5,000
PROPOSED ALTERNATIVE:	$ 4,000	$ -	$ 4,000
TOTAL (Baseline less Proposed)	$ 1,000	$ -	**$ 1,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL LA-03

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Eliminate access to the gas station parcel off of US 641**
BENEFITS	**RISKS/CHALLENGES**
• Improves corner clearance and vehicular sight distance for the Glendale Road approach	• Property owner may have concerns related to the use of this parcel in the future
• Less vehicular conflicts adjacent to the signalized intersection	•
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VALUE ENGINEERING PROPOSAL LA-03

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Eliminate access to the gas station parcel off of US 641**

DISCUSSION/JUSTIFICATION:

Current plans call for the entrances to be reconstructed at the current locations for parcel 33 left station 155+49. The VE team did not visit the site, but recent aerial photos indicate that the service station has been removed and the lot is vacant. With this development, opportunities to restrict the access to the property should be considered. The northern most entrance is located very close to the Glendale Road intersection and creates sight distance problems and introduces vehicular conflict points into the roadway very close to the intersection. By eliminating this entrance, sight distance is improved and the vehicular conflict points are shifted away from the intersection, creating a safer condition for the motorist on US 641 as well as those entering and exiting the site.

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL LA-03

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Eliminate access to the gas station parcel off of US 641**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Cement Concrete Entrance Pavement - 8 inches		SY	76	64.40	4,894	38	64.40	2,447
Standard Header Curb		LF				34	15.43	525
5' Sidewalk-4 inches		SY				19	34.52	656
Standard Curb & Gutter		LF				34	13.53	460
TOTAL COSTS*					**5,000**			**4,000**
							TOTAL (BASELINE LESS PROPOSED)	**1,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL LA-06

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Build a roundabout at Peggy Ann Drive**
FUNCTION:	**Limit Access**

BASELINE ASSUMPTION:

There will be a two-way stop condition at Peggy Anne Drive.

PROPOSED ALTERNATIVE:

Build a roundabout at Peggy Ann Drive.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
PROPOSED ALTERNATIVE:	$ 141,000	$ -	$ 141,000
TOTAL (Baseline less Proposed)	$ (141,000)	$ -	**$ (141,000)**
			COST

VALUE ENGINEERING PROPOSAL LA-06

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Build a roundabout at Peggy Ann Drive**
BENEFITS	**RISKS/CHALLENGES**
• Accommodates traffic flow from neighborhoods to the west and better accommodates traffic as the area develops to the east	• Requires a little additional right-of-way
• Eliminates the need for a future traffic signal	• Eliminates a free flow movement
• Calms high speed traffic entering from the south	• Construction is a little more difficult
• Reduces conflict points	•
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VALUE ENGINEERING PROPOSAL LA-06

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

TITLE: **Build a roundabout at Peggy Ann Drive**

DISCUSSION/JUSTIFICATION:

The City of Murray's Comprehensive Plan shows a future land use map with potential multi-family residential and commercial growth in the area along US 641; including the area east of US 641 and south of Glendale Road. With neighborhoods nearly at full build-out to the west and potential development to the east, this intersection could handle moderately high turning volumes. This traffic pattern will likely warrant the need to add a traffic signal in the future, which will add delays to the mainline traffic.

Building a roundabout could facilitate both mainline and side road traffic through-put and turning movements. It would also help create a gateway to the southern side of the City of Murray, requiring vehicles to slow down as they enter the urban area. A roundabout will likely be a better solution long term for handling traffic and creating a safer condition than a signalized intersection.

IMPLEMENTATION CONSIDERATIONS:

This recommendation will require modification to the current design and the need to purchase additional right-of-way. A traffic turning movement forecast will be needed to show the performance of the roundabout.

VALUE ENGINEERING PROPOSAL LA-06

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

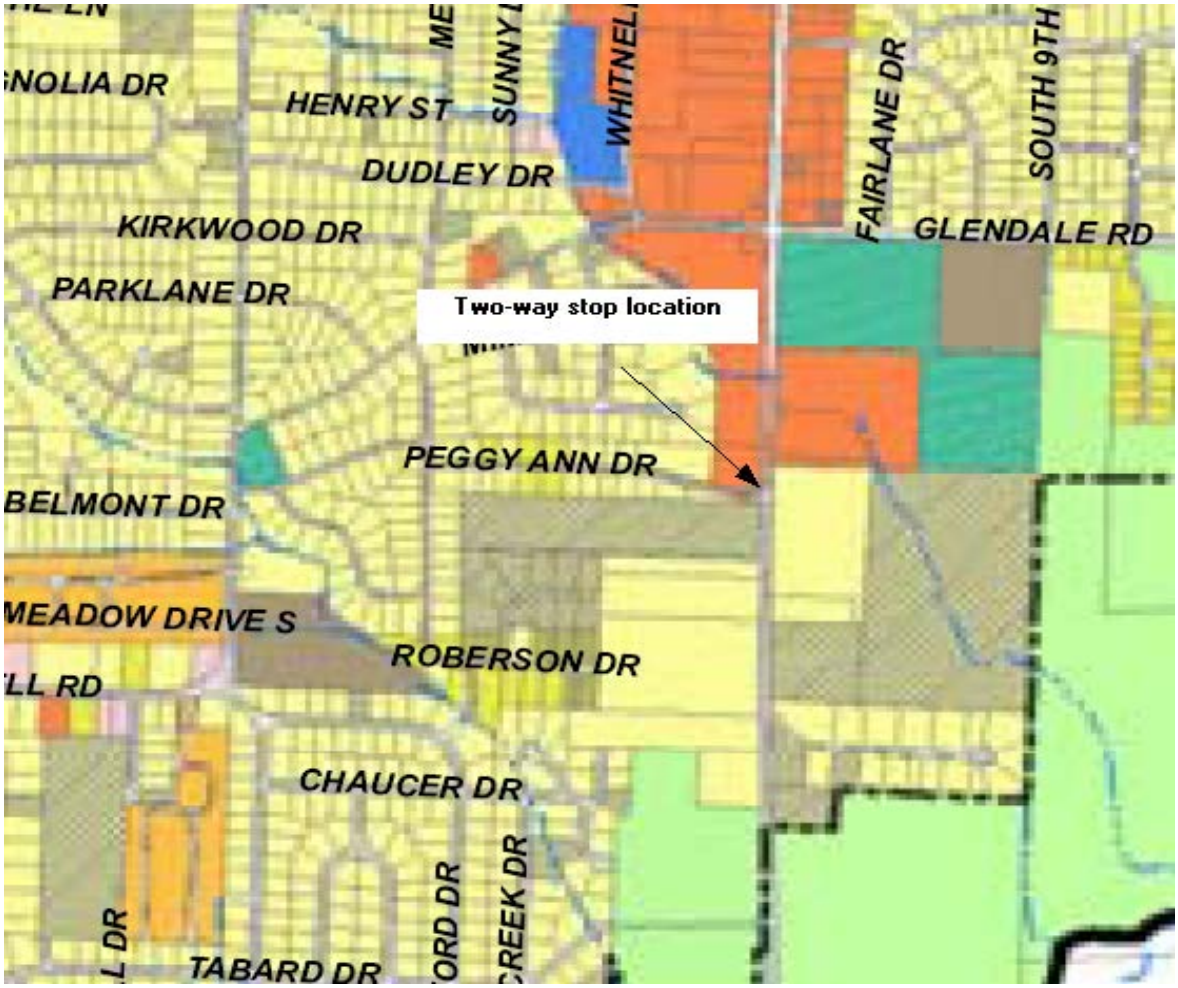
TITLE:	**Build a roundabout at Peggy Ann Drive**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Concrete Pavement (for truck apron)		SY				1,500	91.00	136,500
Right of Way		SF		1.15		4,100	1.15	4,715
TOTAL COSTS*								**141,000**
							TOTAL (BASELINE LESS PROPOSED)	**-141,000**

Note: Total Costs are rounded to nearest thousand dollars

COST

TITLE: **Build a roundabout at Peggy Ann Drive**

SKETCH OF BASELINE ASSUMPTION



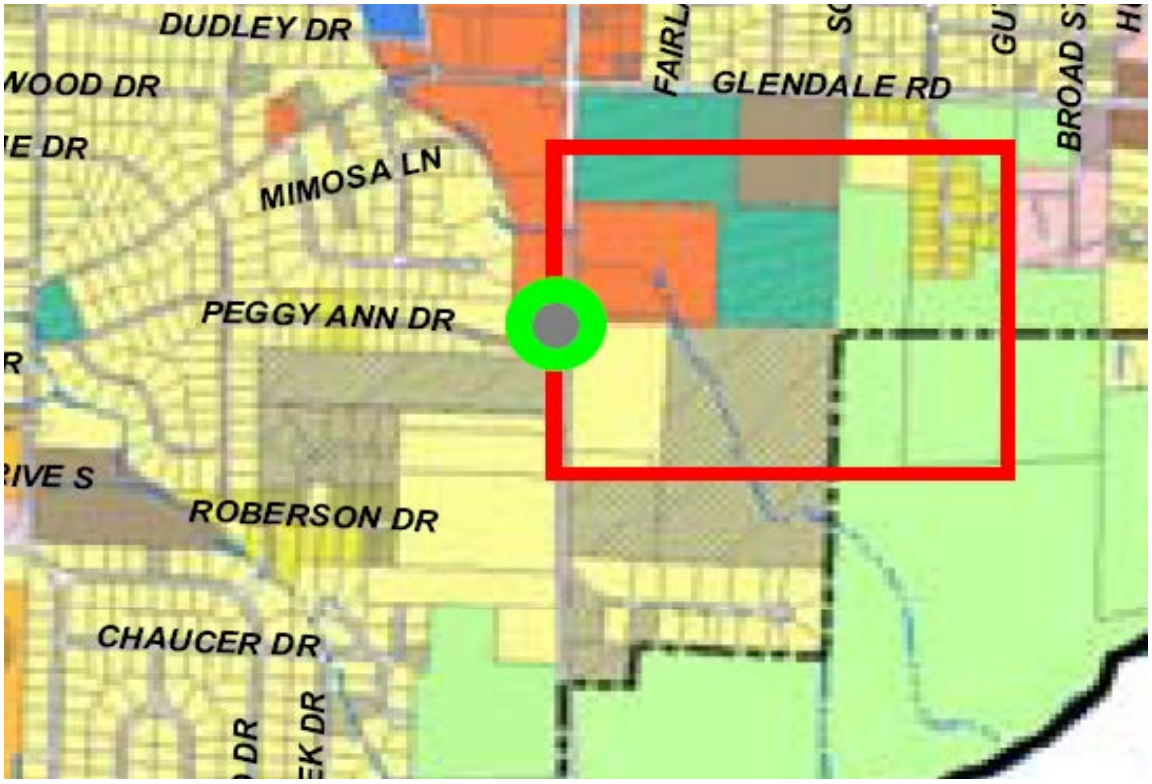
Potential growth area

VALUE ENGINEERING PROPOSAL LA-06

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Build a roundabout at Peggy Ann Drive**

SKETCH OF PROPOSED ALTERNATIVE



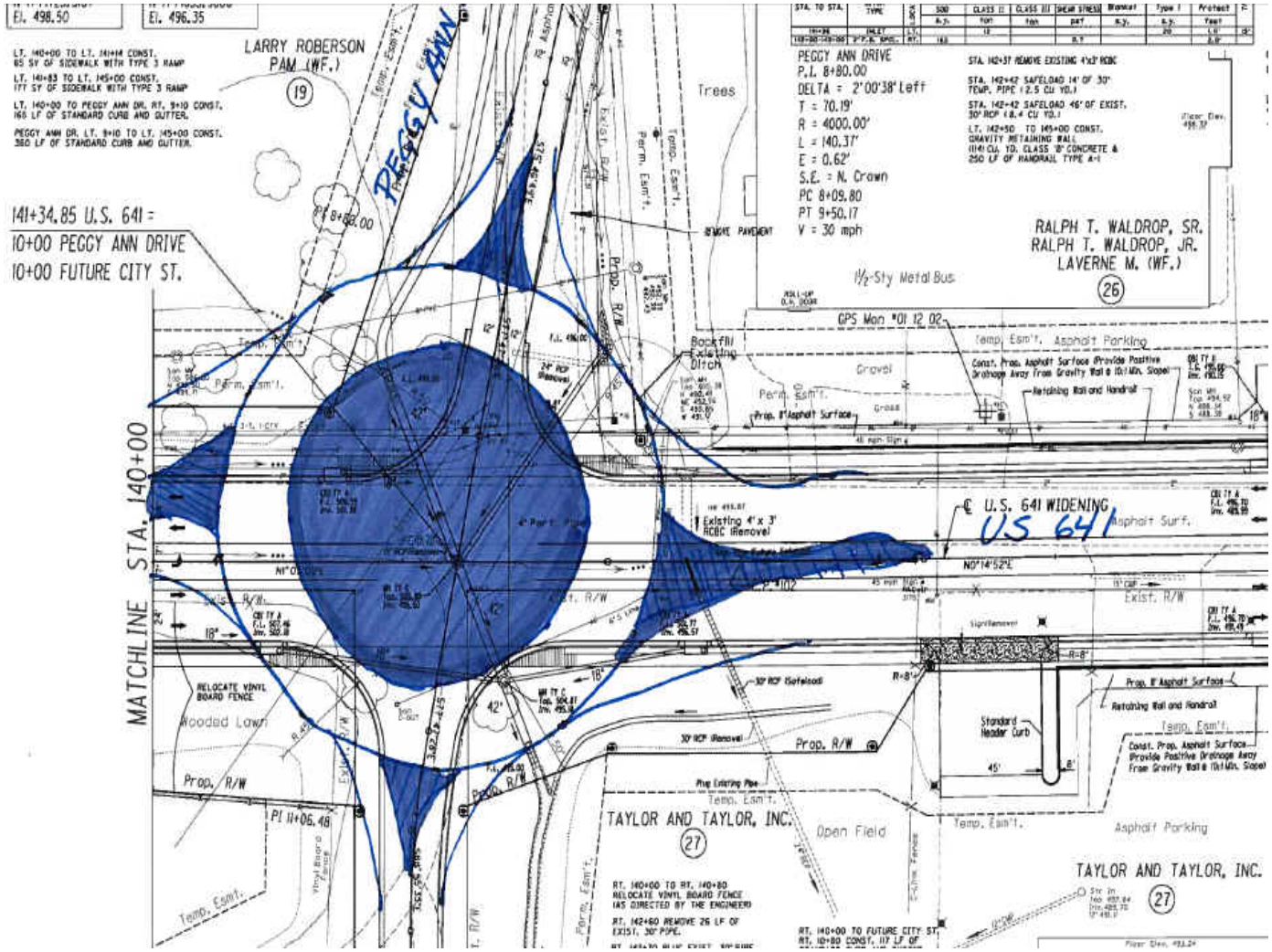
Roundabout location and area of future growth

VALUE ENGINEERING PROPOSAL LA-06

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Build a roundabout at Peggy Ann Drive**

SKETCH OF PROPOSED ALTERNATIVE



Roundabout location and area of future growth

VALUE ENGINEERING PROPOSAL AM-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Add bike lanes**
FUNCTION:	**Accommodate Multi-Modal**

BASELINE ASSUMPTION:

The current design calls for a five-lane section without separate accommodations for bicyclists.

PROPOSED ALTERNATIVE:

Reconfigure the lane widths (within the planned curb lines) to accommodate bicycle lanes.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ -	$ -	$ -
It is recommended that District 1 examine	$ -	$ -	$ -
TOTAL (Baseline less Proposed)	$ -	$ -	**$** -

NO CHANGE

VALUE ENGINEERING PROPOSAL AM-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Add bike lanes**
BENEFITS	**RISKS/CHALLENGES**
• Provides a safe location for bicyclists to ride	• Currently, there is not a connection for the bicycle lane to the north of Glendale Road
• Connects land uses along corridor for cyclists	•
• Does not change vehicular capacity and safety	•
• Does not require much change in the current design plans	•
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VALUE ENGINEERING PROPOSAL AM-02

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

TITLE: **Add bike lanes**

DISCUSSION/JUSTIFICATION:

The City of Murray Comprehensive Plan's future land use map shows potential multi-family residential and commercial growth in the area along US 641. Additionally, there are subdivisions of single family residential dwellings along the corridor. With this area being planned for growth, it is important for KYTC to plan for accommodating bicyclists in addition to pedestrians. The current design calls for sidewalks, but nothing for bicycle transportation.

A simple approach, not requiring significant modifications to the plans, is to reconfigure the lanes to narrower widths and to include bicycle lanes. This can be done by reducing the travel lanes to 11' wide and the TWLTL to 12' wide. This will not effectively change capacity or vehicular safety. The center turning lane would also need to be reduced by two feet. With this, five-foot bicycle lanes can be built; three feet would be on the apshalt and two feet would be within the gutter pan. This is an acceptable design, per the AASHTO Guide for the Development of Bicycle Facilities.

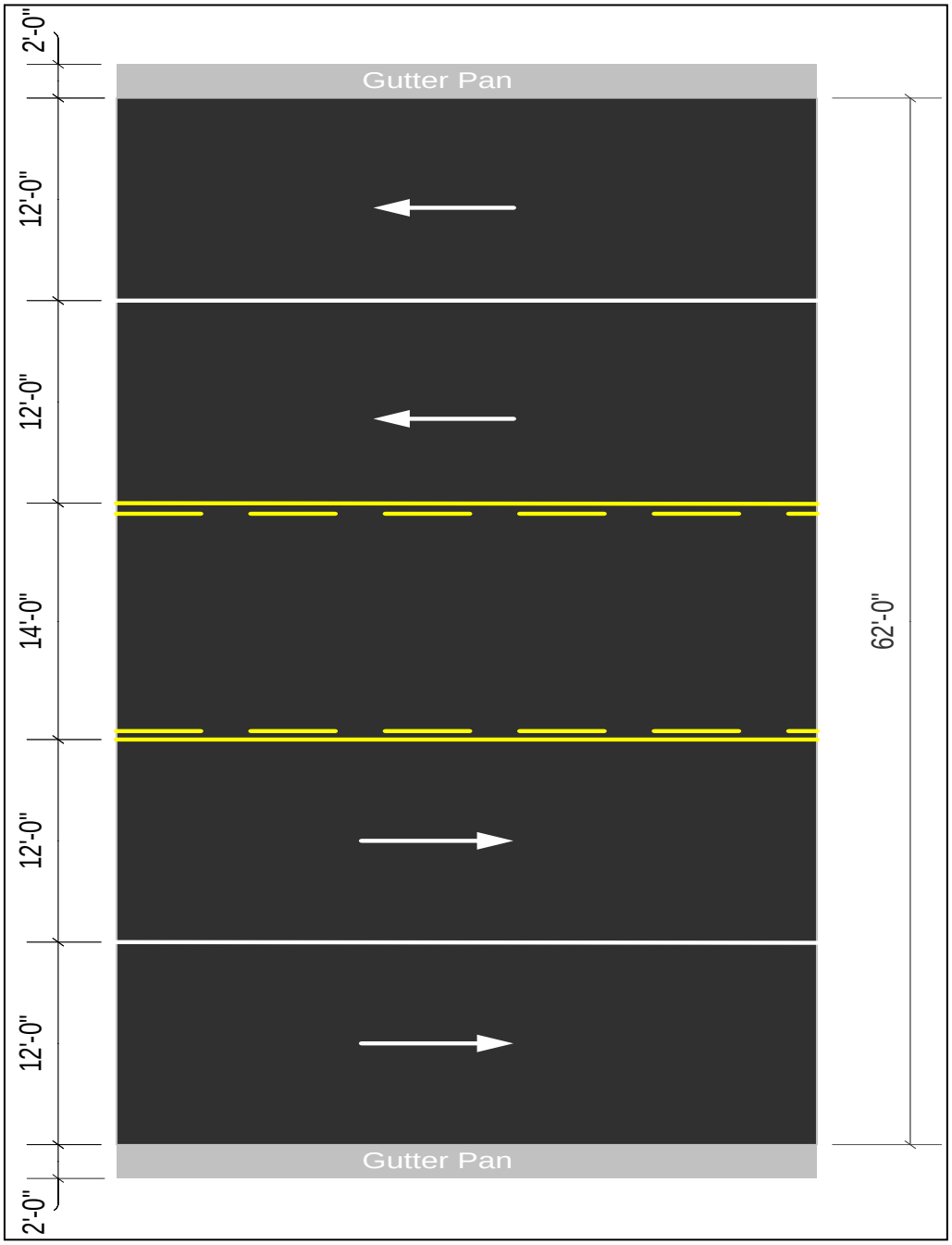
IMPLEMENTATION CONSIDERATIONS:

It is recommended that District 1 examine the feasibility of modifying US 641 striping to the north of the project so that there is continuity of the bicycle lane. This could be accomplished during the next resurfacing project.

The bicycle lane should be carried through the intersections, but should be to the left of any right-turn lanes that are built.

TITLE: **Add bike lanes**

SKETCH OF BASELINE ASSUMPTION

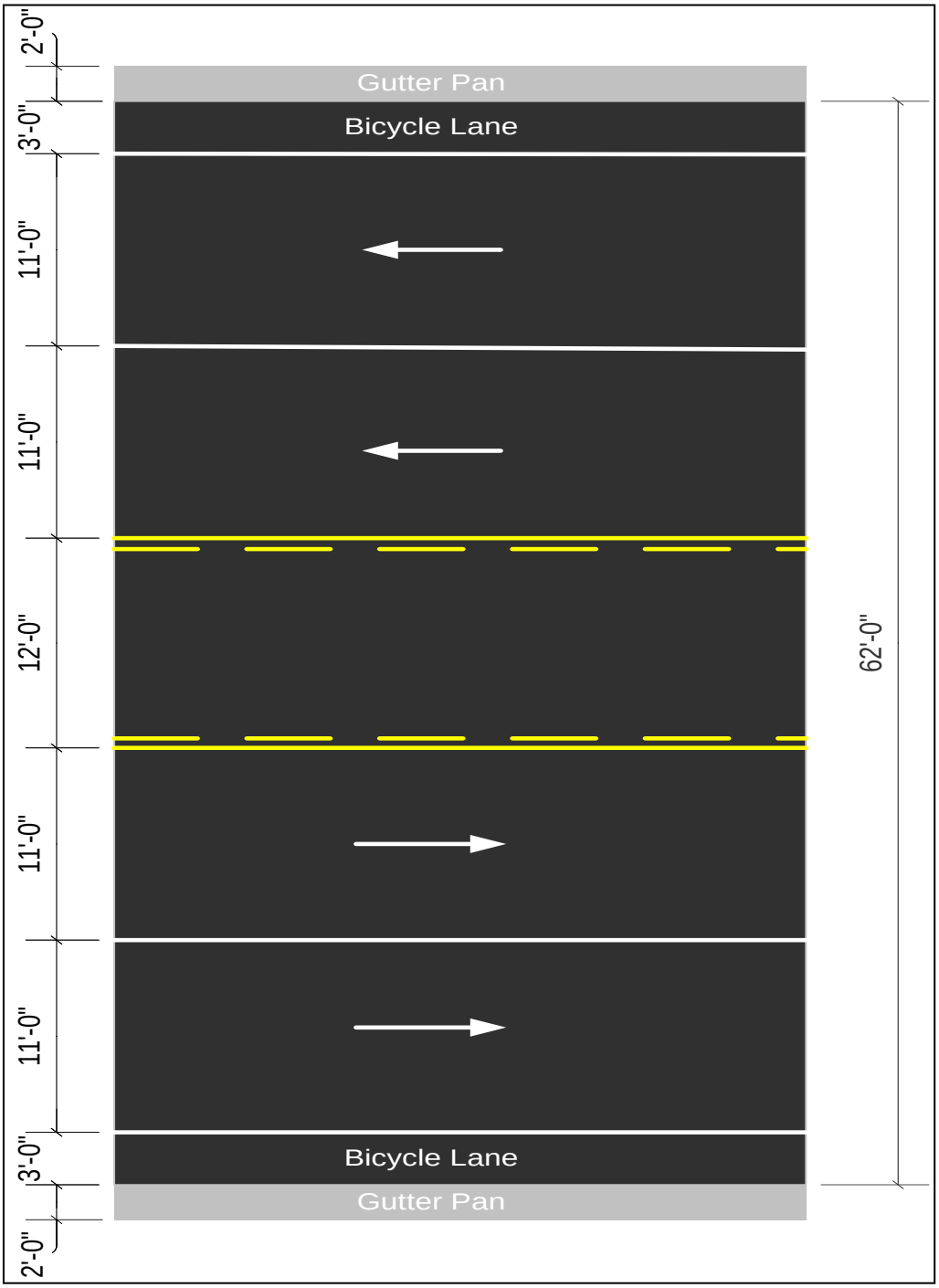


VALUE ENGINEERING PROPOSAL AM-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Add bike lanes**

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL AD-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Keep the drainage pattern in the same location at Peggy Anne Drive**

FUNCTION: **Accommodate Drainage**

BASELINE ASSUMPTION:

Current plans reroutes the existing drainage pattern to eliminate the existing 36-inch and 24-inch crossings under Peggy Anne Drive by constructing a new flat bottom ditch along the south side of Peggy Anne Drive to a new 42-inch pipe that skews across the intersection with US 641 from the SW corner to the NE corner. A new outlet will be provided to a new channel lined ditch along the north side of Future City Road. This also requires the addition of a 24-inch pipe to drain the NW corner that ties to the new 42-inch in the middle of the new intersection.

PROPOSED ALTERNATIVE:

The existing 36-inch and 24-inch pipes under Peggy Anne Drive are to remain as well as the current drainage patterns.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 67,000	$ -	$ 67,000
PROPOSED ALTERNATIVE:	$ 11,000	$ -	$ 11,000
TOTAL (Baseline less Proposed)	$ 56,000	$ -	**$ 56,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AD-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Keep the drainage pattern in the same location at Peggy Anne Drive**
BENEFITS	**RISKS/CHALLENGES**
• Eliminates the new ditch on the south side of Peggy Anne Drive	• The current condition of the existing 36-inch and 24-inch pipes is unknown and may need to be completely replaced versus just being able to extend them, as per plans
• Eliminates the 24-inch pipe and manhole at the center of the intersection	•
• Shortens the 42-inch pipe by crossing at 90-degress north of the intersection	•
• Lessens the disturbance to a blue line stream	•
• Reduces maintenance liability for workers having to conduct maintenance activities in the middle of the intersection	•
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VALUE ENGINEERING PROPOSAL AD-02

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

TITLE: **Keep the drainage pattern in the same location at Peggy Anne Drive**

DISCUSSION/JUSTIFICATION:

The current plan reroutes 300-ft of a blue line stream that will potentially require In-Lieu fees in excess of $210 per foot. Allowing the existing drainage pattern to remain as is may lessen or completely eliminate In-Lieu fees. This alternate assumes that the existing 36-inch pipe and 24-inch pipe are in good enough condition to be able to be extended. A 100-ft of the proposed 24-inch pipe, as well as the manhole at the middle of the intersection, will be completely eliminated and the proposed 42-inch pipe will be shortened from 140-ft to 110-ft by crossing at 90-degrees instead of a skewed crossing in the middle of the intersection. This not only saves some costs, but reduces the liability for maintenance workers by eliminating the potential risk of working while under traffic conditions.

The suggested alignment will be exactly inline and at the same bearing as the proposed outlet ditch along the north side of the Future City Street. The two CBI Type A's along the east side of US 641 will remain as shown and will tie-in in a similar fashion to the 42-inch via a manhole Type C. The CBI Type A at the SW corner of the intersection will outlet to the extended portion of the existing 24-inch pipe under Peggy Anne Drive. Note that the current plan shows this CBI with a T-intersection into the proposed 42-inch, which is not a common practice.

IMPLEMENTATION CONSIDERATIONS:

Need to verify that the existing 24-inch and 36-inch pipes under Peggy Anne Drive are in good enough condition to remain in place.

VALUE ENGINEERING PROPOSAL AD-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Keep the drainage pattern in the same location at Peggy Anne Drive**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
4-ft FB sod ditch		LF	200	10.00	2,000			
42-inch Storm sewer		LF	140	92.00	12,880	110	92.00	10,120
24-inch storm sewer		LF	100	55.00	5,500	24	55.00	1,320
Type C manhole		EA	1	4,800.00	4,800			
In-Lieu fees		LF	200	210.00	42,000			
TOTAL COSTS*					**67,000**			**11,000**
							TOTAL (BASELINE LESS PROPOSED)	**56,000**

Note: Total Costs are rounded to nearest thousand dollars

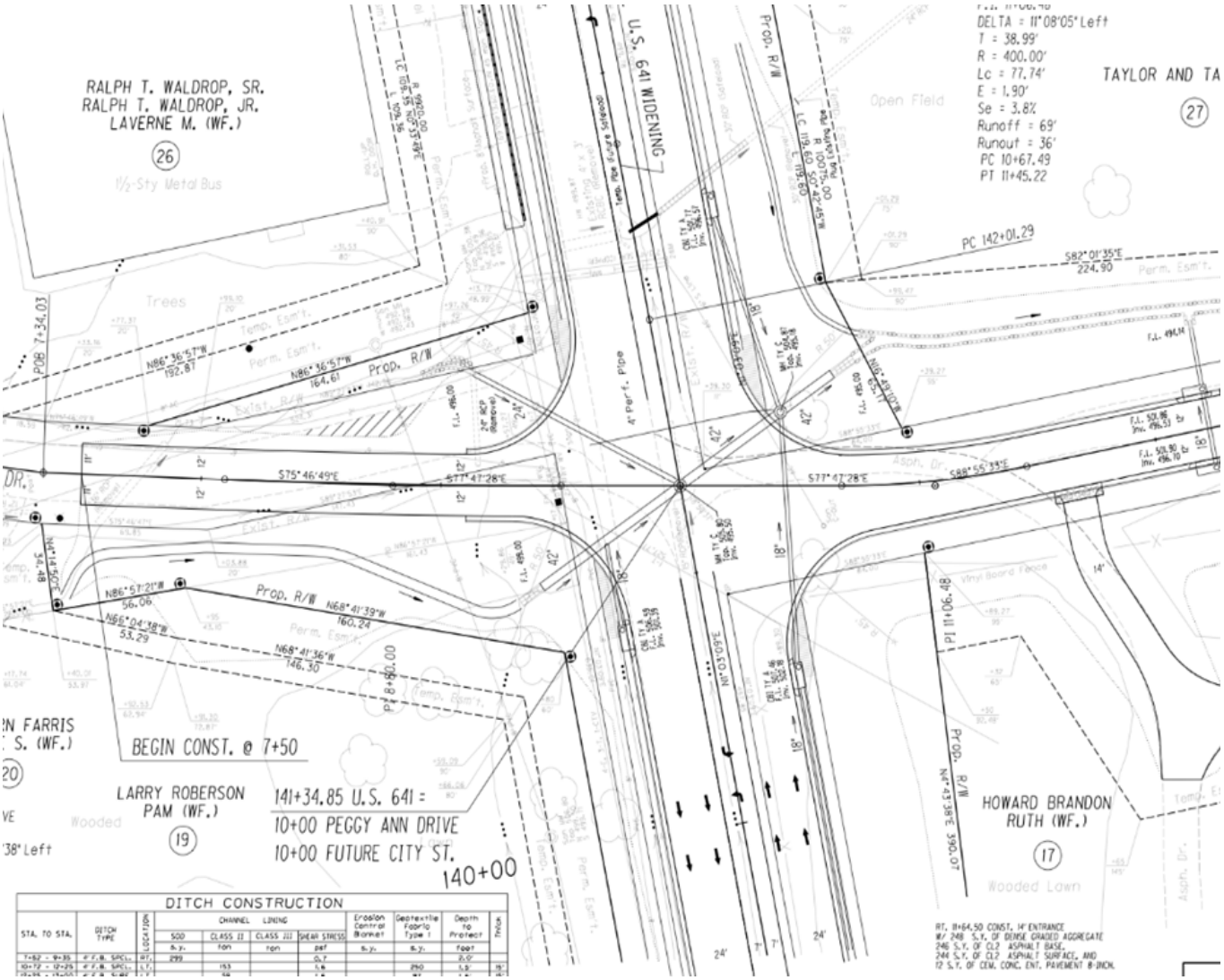
SAVINGS

VALUE ENGINEERING PROPOSAL AD-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Keep the drainage pattern in the same location at Peggy Anne Drive**

SKETCH OF BASELINE ASSUMPTION

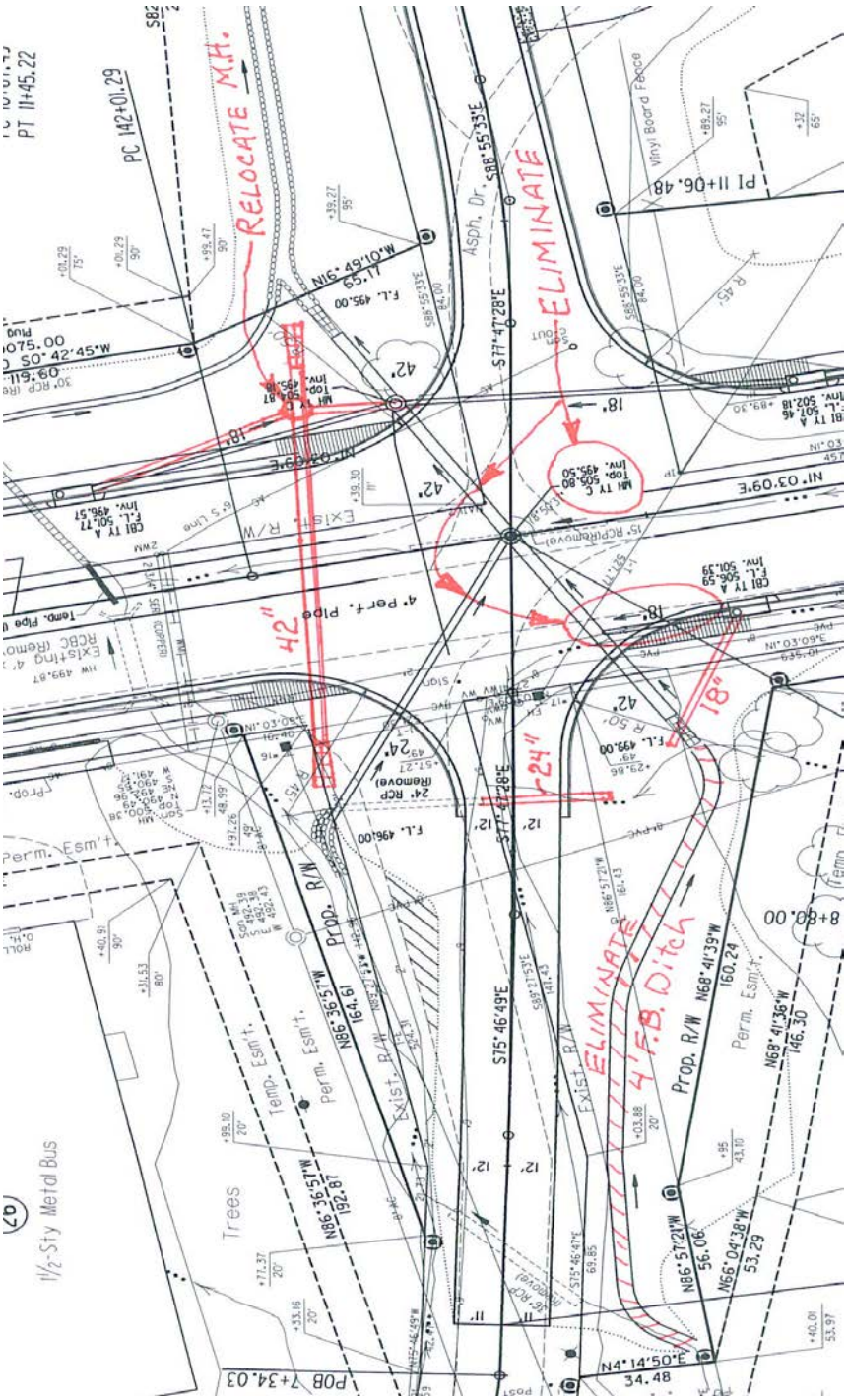


VALUE ENGINEERING PROPOSAL AD-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE: **Keep the drainage pattern in the same location at Peggy Anne Drive**

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL MI-01

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Eliminate the temporary easement behind the utility easement**
FUNCTION:	**Minimize Impacts**

Plans show obtaining a temporary easement along the west side of the project for the full length of the project, parallelling the permanent easement to be obtained for the utilities.

PROPOSED ALTERNATIVE:

Reduce the amount of temporary esement to be obtained to only areas a contractor may need for additional space to construct the project.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 24,000	$ -	$ 24,000
PROPOSED ALTERNATIVE:	$ -	$ -	$ -
TOTAL (Baseline less Proposed)	$ 24,000	$ -	**$ 24,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL MI-01

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Eliminate the temporary easement behind the utility easement**
BENEFITS	**RISKS/CHALLENGES**
• Reduces property owner impacts	• Potentially insufficient room for construction
• Reduces right-of-way costs	•
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VALUE ENGINEERING PROPOSAL MI-01

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.10

TITLE: **Eliminate the temporary easement behind the utility easement**

DISCUSSION/JUSTIFICATION:

Based upon the disturbance limits currently shown for the roadway construction, 95% of the temporary easement appears to be outside the normal limits needed for construction of the roadway. This includes left station 107+30 to 141+50 and 149+00 to 156+00. The assumption made is that the permanent easement shown is to be obtained for use as a utility relocation corridor. By combining the width of the permanent easement and the right-of-way to be obtained, the respective utility companies have sufficient space to perform their relocation work with no additional easements needed.

IMPLEMENTATION CONSIDERATIONS:

Review language in the permanent easement to ensure compatibility with anticipated future use. Review limits of construction at entrances to make sure no additional temporary easement is needed.

VALUE ENGINEERING PROPOSAL MI-01

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.10

TITLE:	**Eliminate the temporary easement behind the utility easement**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Temporary Easement		SF	42,000	0.58	24,360			
.								
TOTAL COSTS*					**24,000**			
							TOTAL (BASELINE LESS PROPOSED)	**24,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL AV-01

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Reduce the median width to 30'**

FUNCTION: **Accommodate Vehicles**

BASELINE ASSUMPTION:

The current median width proposed for the project is 48 feet. This width matches the median width proposed for TDOT SR 54, an extension of US 641 to the south. No final alignment for the SR 54 and US 641 connection has been established at this time.

PROPOSED ALTERNATIVE:

Construct roadway median using 30 feet median width.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 1,033,000	$ -	$ 1,033,000
PROPOSED ALTERNATIVE:	$ 681,000	$ -	$ 681,000
TOTAL (Baseline less Proposed)	$ 352,000	$ -	**$ 352,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-01

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Reduce the median width to 30'**
BENEFITS	**RISKS/CHALLENGES**
• Lower construction costs	• None apparent
• Less right of way impacts	•
• Less utility impacts	•
• Accommodates larger vehicles crossing traffic	•
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VALUE ENGINEERING PROPOSAL AV-01

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE: **Reduce the median width to 30'**

DISCUSSION/JUSTIFICATION:

The 48-foot median width proposed for the project is very conservative for the KYTC. Parkways constructed throughout the state use 40 feet, and on some occasions 30 feet, to reduce property impacts and construction costs. This alternative proposes that the costs associated with the use of the "TDOT" median be given a second look to determine how much value this adds to the overall long- term performance and safety for the users. For the purposes of this evaluation, a width of 48 feet was compared with 30 feet to determine cost differentials. Per the TRB Access Manual, 30 feet will provide desirable results. There will be enough space to accommodate offset left-turn lanes and provide a storage area for vehicles crossing US 641.

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL AV-01

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Reduce the median width to 30'**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Median Roadway Excavation		CY	50,286	5.00	251,430	37,613	5.00	188,065
Right of way (median width only)		AC	34	5,000.00	170,000	21	5,000.00	106,400
Utility (gas line median width only)		LF	204	3,000.00	612,000	129	3,000.00	387,000
TOTAL COSTS*					**1,033,000**			**681,000**
							TOTAL (BASELINE LESS PROPOSED)	**352,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL AV-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Partially use the existing US 641 as Alternate 3**

FUNCTION: **Accommodate Vehicles**

BASELINE ASSUMPTION:

The current design specifies a relocated US 641, from the bridge at the Middle Fork of the Clarks River, south to the community of Hazel. Two Alternatives, 1 and 2, are currently proposed, and both are located west of the existing US 641.

PROPOSED ALTERNATIVE:

This alternative proposes using the existing US 641 corridor from Tobacco Road (KY 1828) south to Hazel, (approximately 2.8 miles), and using a five-lane curb and gutter section south from the bridge at Clarks River to Tobacco Road, as considered in the 2002 Planning Study as part of Alternative 3.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 24,422,000	$ 1,203,000	$ 25,625,000
PROPOSED ALTERNATIVE:	$ 16,911,000	$ 802,000	$ 17,713,000
TOTAL (Baseline less Proposed)	$ 7,511,000	$ 401,000	**$ 7,912,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Partially use the existing US 641 as Alternate 3**
BENEFITS	**RISKS/CHALLENGES**
• Reduces the amount of new right-of-way needed	• Increases the number of relocations
• Eliminates the need to maintain the old US 641 over approximately 5 miles and lessens life cycle maintenance costs	• Increases the amount of standard utility relocations
• Avoids impact to the high pressure gas lines at Taylor Road	• Requires consideration for a combination of access by permit and access control and/or the potential for frontage roads
• Allows utilization of the existing bridge at the tributary at the Middle Fork of the Clarks River and the one just north of Brandon Road (South Fork Brushy Creek)	• Does not accommodate buses and trucks
• Less farmland impacts	•
• Less wetlands and stream impacts	•
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VALUE ENGINEERING PROPOSAL AV-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Partially use the existing US 641 as Alternate 3**

DISCUSSION/JUSTIFICATION:

There was an Alternative 3 that was suggested in the Planning Study which proposed a 5-lane curb and gutter roadway along the existing US 641 to Tobacco Road (KY 1828) where it then moves west to the new 4-lane divided alignment.

This alternative considers the reevaluation of Alternate 3 (from the Planning Study) as a viable option, if a reduced median is considered (possibly as narrow as 20') from Tobacco Road south to Hazel, a distance of approximately 2.8 miles. This alternative would use existing US 641 over its entire length until near Hazel (approximately 5 miles), where it would move west of the existing alignment to match back with the segments for Alternatives 1 and 2. Existing US 641 geometrics over this segment appears to meet 55 mph design standards. Traffic volumes are reduced approximately 20% for the segment south of KY 1828.

Key advantages of this scenario are the use of the existing bridges at the Middle Fork of the Clarks River; the unidentified bridge immediately south, at South Fork Brushy Creek; and the avoidance of the HP gas line crossings at Taylor Road.

Over the 2.8 mile segment south of Tobacco Road (KY 1828), there are approximately 65 developed properties adjacent to the existing US 641. Approximately 50 of the 65 are beyond 100 feet of the existing centerline. It appears a divided section, particularly a reduced one to 40 feet or less, could be designed to reduce the number of relocations as estimated in the Planning Study.

A reconstruction cost was derived by using half of the four-lane cost per mile ($2,500,000) plus an estimated reconstruction cost for the existing two-lane US 641 at $1,000,000/mile. For the segment between the Middle Fork Bridge of the Clarks River and Tobacco Road, it is assumed that the 5-lane curb and gutter cost per mile is $5,500,000/mile (estimated at approximately 10% higher than the provided cost estimate for Section .10, which was 1.01 miles in length).

It appears reconsideration of this Alternative is viable and could realize a 5% to 15% cost savings over the new route construction.

IMPLEMENTATION CONSIDERATIONS:

Utility impacts on existing US 641 alignment segment.

VALUE ENGINEERING PROPOSAL AV-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Partially use the existing US 641 as Alternate 3**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Proposed construction for new route segment		MILES	3	5,000,000.00	14,000,000			
Reconstruct US 641 over same segment length		MILES				3	3,500,000.00	9,800,000
Right-of-way new alignment segment		AC	80	20,000.00	1,600,000			
Right-of-way along existing US 641 segment		AC				35	40,000.00	1,400,000
Utility impact new alignment segment (gas line key cost driver)		LS	1	7,000,000	7,000,000			
Utility impacts on existing US 641 alignment segment		LS				1	4,300,000.00	4,300,000
New route bridge cost		SF	21,440	85.00	1,822,400			
US 641 reconstruction bridge cost		SF				10,720	85.00	911,200
Five-lane curb and gutter cost premium over new route 4-lane divided between Clark River and Tobacco Road		LS				1	500,000.00	500,000
TOTAL COSTS*					**24,422,000**			**16,911,000**
							TOTAL (BASELINE LESS PROPOSED)	**7,511,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL AV-02

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Partially use the existing US 641 as Alternate 3**

Assumptions			
Interest/Discount Rate(%):	3%	**Economic Life (yrs):**	20

LIFE CYCLE COST ANALYSIS

This alternative proposes using the existing US 641 c			**Baseline Assumption**		**Proposed Alterative**	
Righ	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Overlay (1.5") on reconstructed US 641	15	1,875,000	1,203,491	1,250,000	802,327
2						
3						
4						
5						
Total Salvage & Replacement Costs			**1,875,000**	**1,203,491**	**1,250,000**	**802,327**

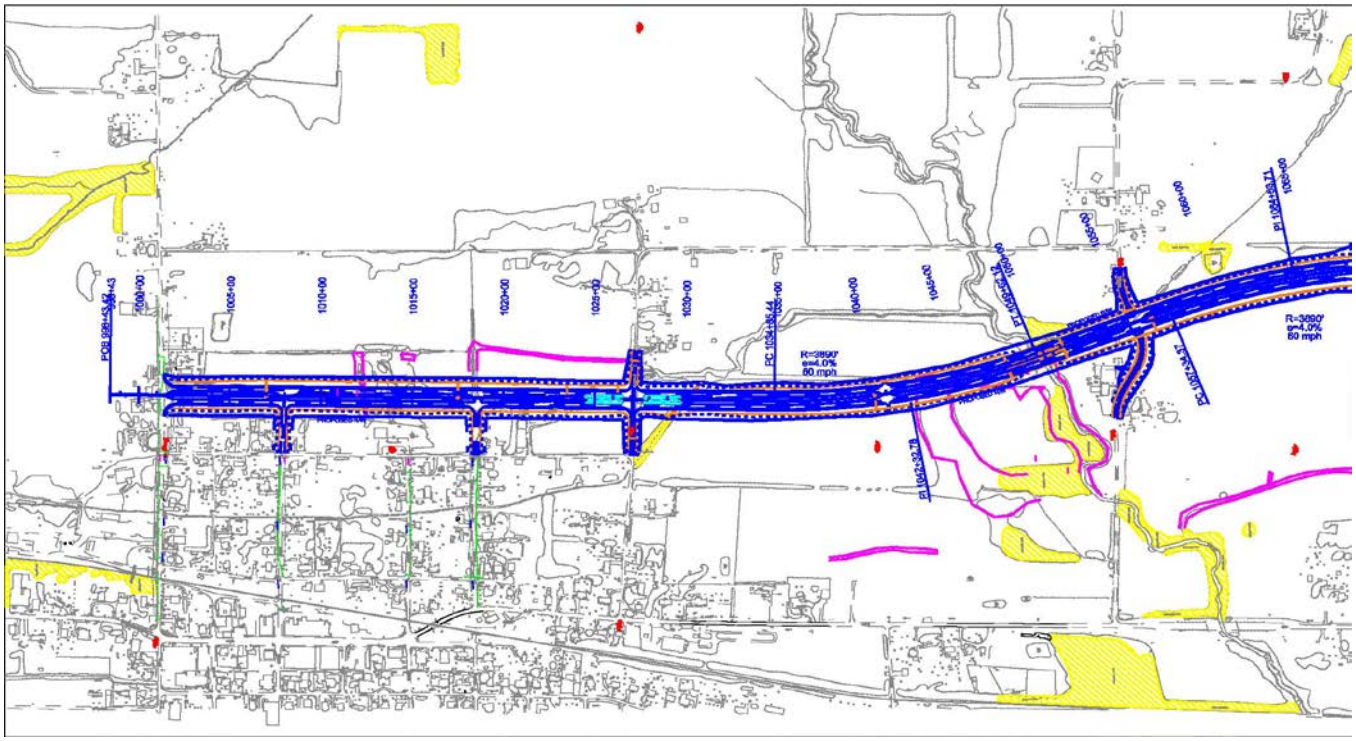
Annual Costs (pres worth calculated over 20 yrs)		**Baseline Assumption**		**Proposed Alternative**	
Item	**Description**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1					
2					
3					
4					
5					
Total Annual Costs					

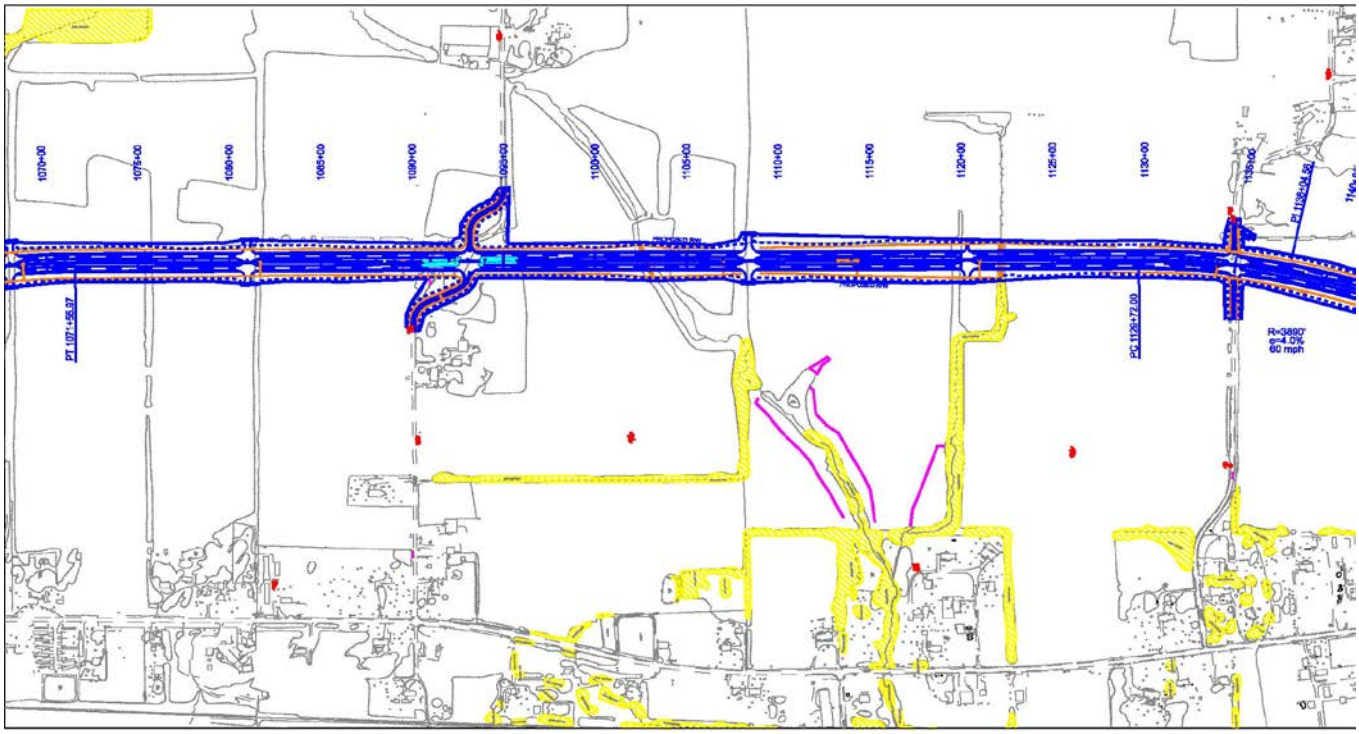
SUMMARY	**Baseline Present Worth**	**Proposed Present Worth**
Total Present Worth (salvage+annual pres worth)	1,203,000	802,000
RESULTS (Proposed less baseline)		

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

TITLE: **Partially use the existing US 641 as Alternate 3**

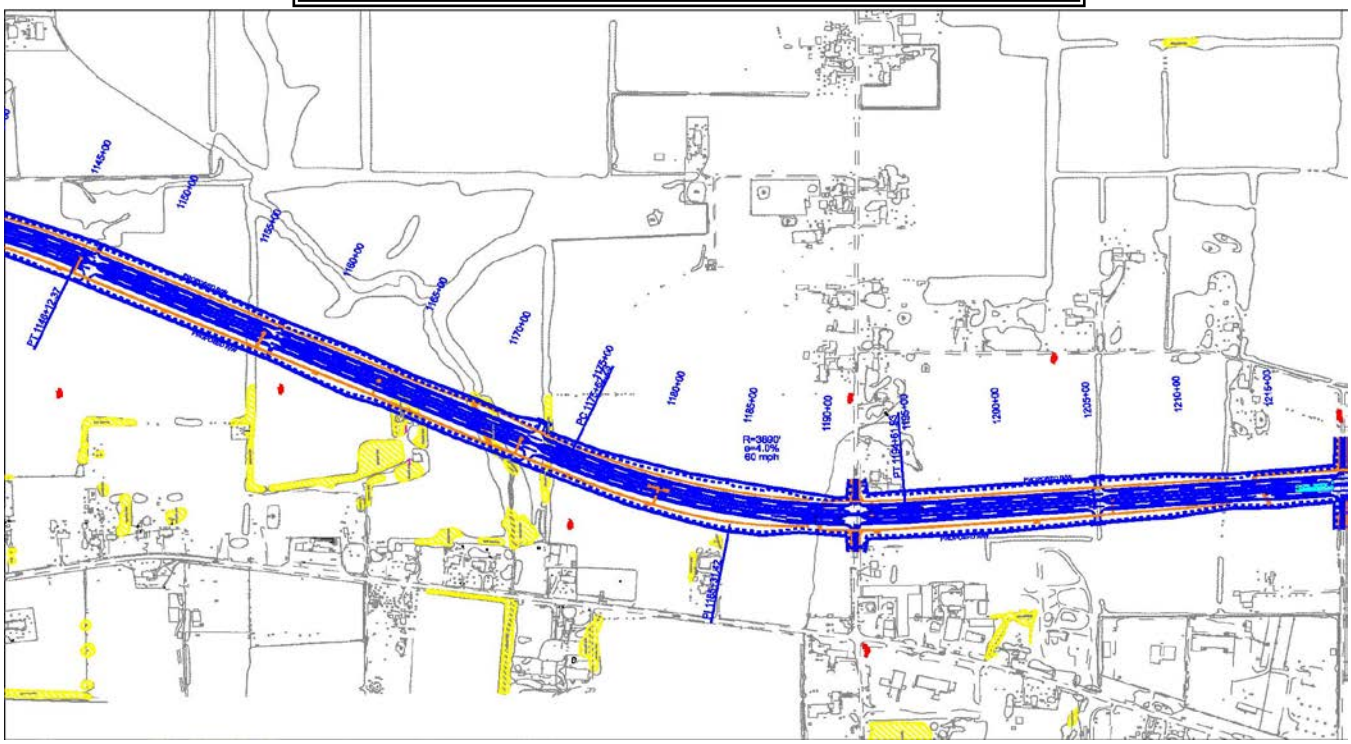
SKETCH OF BASELINE ASSUMPTION

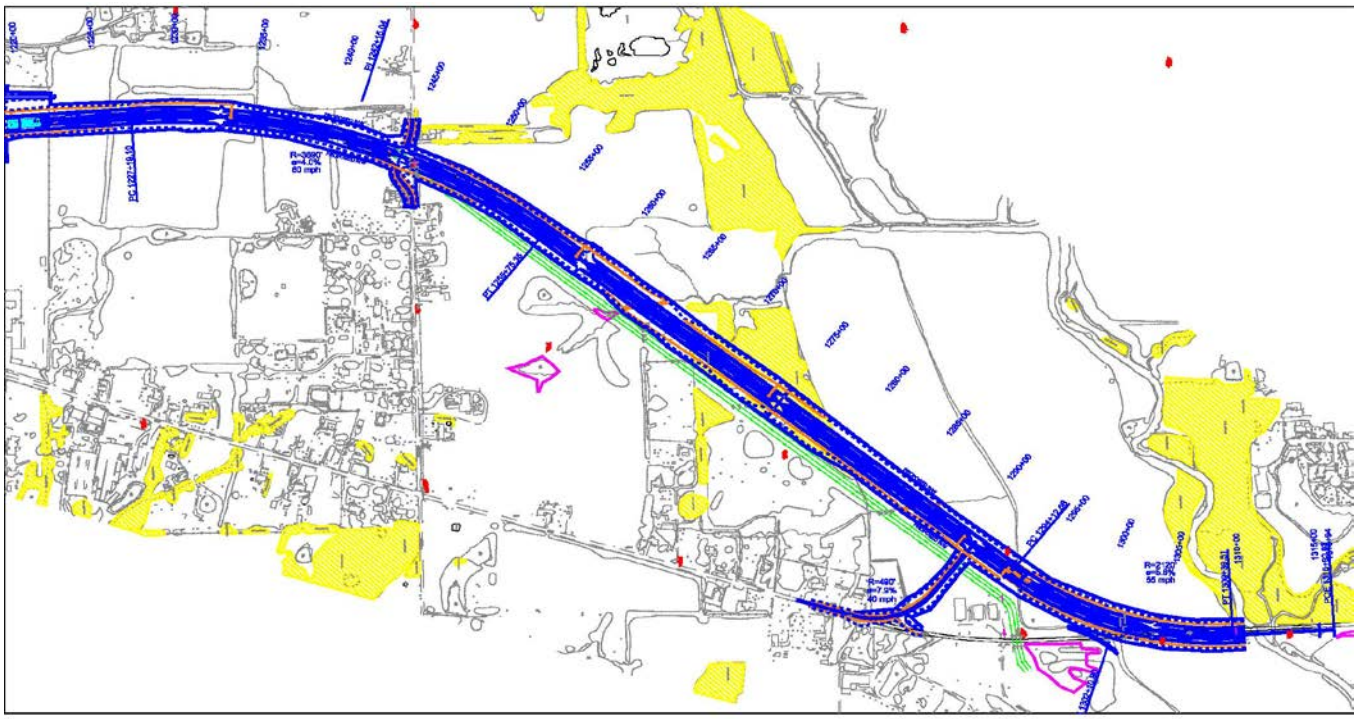




TITLE: **Partially use the existing US 641 as Alternate 3**

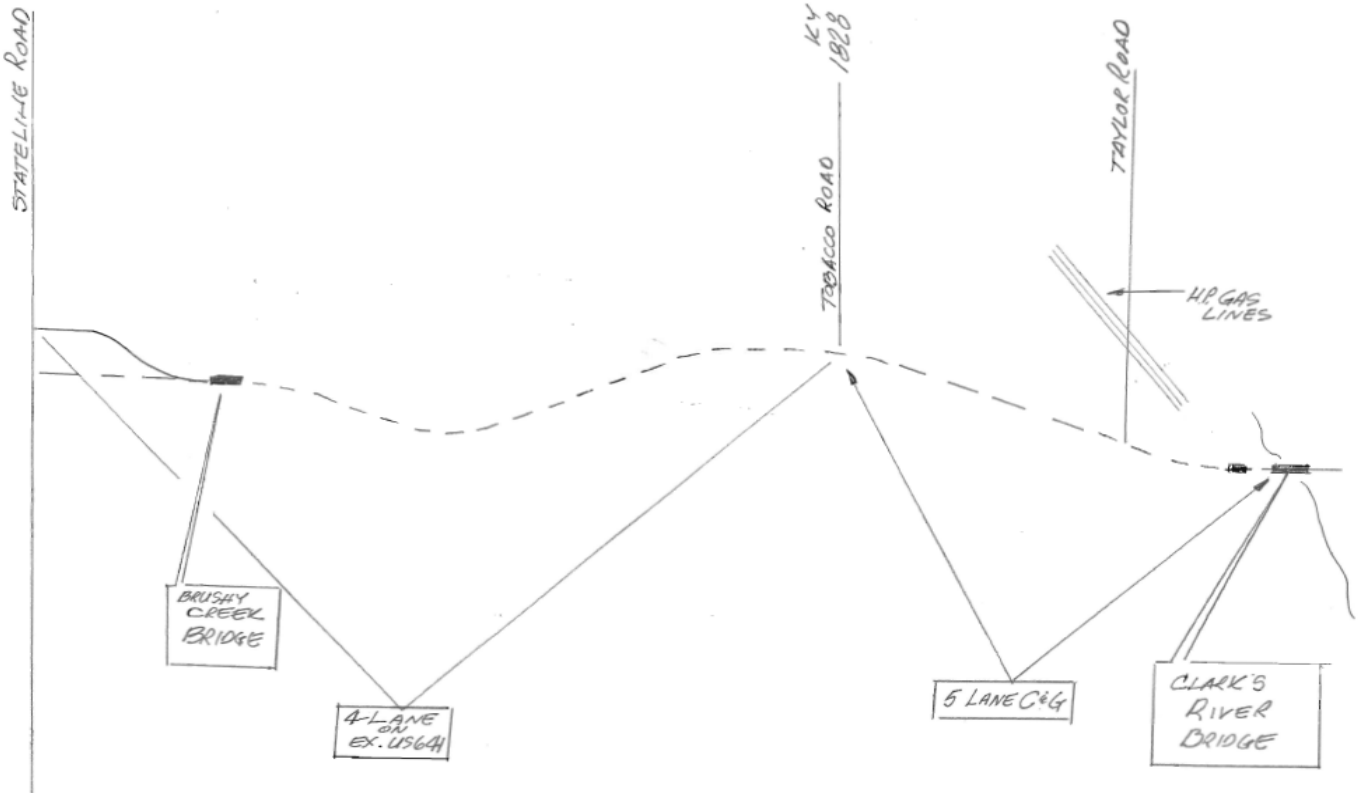
SKETCH OF BASELINE ASSUMPTION





TITLE: **Partially use the existing US 641 as Alternate 3**

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE:	**Use a 2+1 typical section and/or 2-Lane with auxillary lanes**
FUNCTION:	**Accommodate Vehicles**

BASELINE ASSUMPTION:

The existing design includes a 4-lane, 48-foot, depressed median typical section.

PROPOSED ALTERNATIVE:

Use a new typical section with either a 2+1 (2-lanes in either direction with a center lane that is used as a passing lane) typical section or use a new typical section with 2-lanes and the use of auxiliary lanes where applicable. Both options are proposed to use 12-foot lanes and 12-foot shoulders (10-foot paved).

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 34,120,000	$ 1,664,000	$ 35,784,000
PROPOSED ALTERNATIVE:	$ 29,055,000	$ 834,000	$ 29,889,000
TOTAL (Baseline less Proposed)	$ 5,065,000	$ 830,000	**$ 5,895,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE:	**Use a 2+1 typical section and/or 2-Lane with auxillary lanes**
BENEFITS	**RISKS/CHALLENGES**
• Reduces overall construction cost	• Slight reduction in Level of Service
• Reduces Right of way costs	•
• Reduces life cycle costs	•
• Reduction in gas line encasement costs	•
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VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use a 2+1 typical section and/or 2-Lane with auxillary lanes**

DISCUSSION/JUSTIFICATION:

The current typical section is a 4-lane depressed median. This proposal reduces the typical section to either a 2 + 1 (1-lane in both directions with a third middle lane used for passing) or using a 2-lane with auxiliary lanes as needed. This typical section will have sufficient capacity for the projected 10,200 ADT (2035) traffic projections. The auxiliary lanes will be designed to allow passing at strategic locations.

The reduced section will allow for reduced costs in right of way, construction and life cycle.

The gas line crossing will be reduced as well. Encasement pipe for the 3 - 30"+ gas mains is estimated to be $3000/ft. Conservatively, using a 2-lane with auxiliary lanes on each side reduces the shoulder-to-shoulder width from 112 feet to 72 feet (40-foot reduction for 3 gas lines, or 120 feet overall reduction).

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use a 2+1 typical section and/or 2-Lane with auxillary lanes**

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Pavement		LS	1	14,500,000.00	14,500,000	1	11,632,000.00	11,632,000
Right of way		LS	1	4,870,000.00	4,870,000	1	4,500,000.00	4,500,000
Gas Line		LF	2,250	3,000.00	6,750,000	2,130	3,000.00	6,390,000
Earthwork		LS	1	2,300,000.00	2,700,000	1	2,200,000.00	2,200,000
Miscellaneous (25%)		LS	1	5,300,000.00	5,300,000	1	4,333,000.00	4,333,000
TOTAL COSTS*					**34,120,000**			**29,055,000**
							TOTAL (BASELINE LESS PROPOSED)	**5,065,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use a 2+1 typical section and/or 2-Lane with auxillary lanes**

Assumptions			
Interest/Discount Rate(%):	3%	**Economic Life (yrs):**	20

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			Baseline Assumption		Proposed Alterative	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Pavement Overlay	15	2,592,000	1,663,706	1,300,000	834,421
2						
3						
4						
5						
Total Salvage & Replacement Costs			**2,592,000**	**1,663,706**	**1,300,000**	**834,421**

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)	1,664,000	834,000

RESULTS (Proposed less baseline)

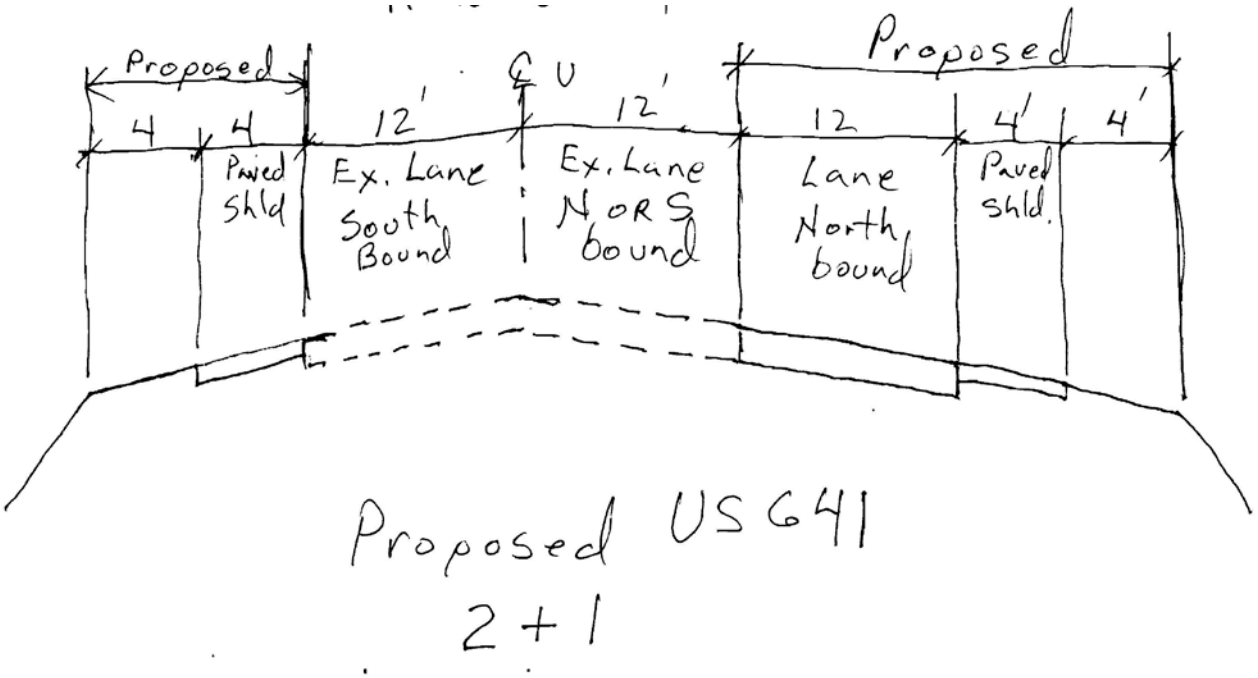
Notes: 1) Total Present Worth is rounded to the nearest thousand dollars, 2) Initial costs are covered in the Detail sheet.

VALUE ENGINEERING PROPOSAL AV-04

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use a 2+1 typical section and/or 2-Lane with auxillary lanes**

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE:	**Use 2-Lane with auxillary lane on Alternate 3**
FUNCTION:	**Accommodate Vehicles**

BASELINE ASSUMPTION:

Currently, a 4-lane typical section with a 48 ft, depressed median is being used on the new alignments.

PROPOSED ALTERNATIVE:

Use a 2-lane typical section with auxiliary lanes on a new Alternate 3. The new alternate will incorporate a portion of the existing US 641 and keep the termini the same.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 45,490,000	$ 1,664,000	$ 47,154,000
PROPOSED ALTERNATIVE:	$ 16,580,000	$ 681,000	$ 17,261,000
TOTAL (Baseline less Proposed)	$ 28,910,000	$ 983,000	**$ 29,893,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE:	**Use 2-Lane with auxillary lane on Alternate 3**
BENEFITS	**RISKS/CHALLENGES**
• Less roadway and bridges to maintain. (existing US 641 would not be a separate roadway to maintain)	• 1200 ft Access Control would not be maintained
• Less right-of-way to purchase	• Level of Service would be slightly less, however it would be sufficient
• No residential or commercial relocations along the new alignment	• Constructability would be more difficult with more traffic
• Better land compatibility - (farm land is not divided)	• Increase of traffic along the existing roadway
• Construction cost is significantly less	• Frontage roads may need to be included to limit access to residential and commercial entrances (not included in the cost)
• Connectivity along the existing corridor would be improved	• Increase in utility relocations and possible delay of project, but with less gas line encasement
• The temporary tie-in required for the new alignments is not required	•
• Less wetland impacts	•
• Less impacts to the gas line	•
•	•
•	•

VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use 2-Lane with auxillary lane on Alternate 3**

DISCUSSION/JUSTIFICATION:

A new alternate is presented that will encompass a majority of existing US 641 and will have the same termini locations as Alternates 1 and 2. A reduction in the typical section to 2-lanes with auxiliary lanes is proposed. This typical will have sufficient capacity for the 10,200 ADT (2035) traffic projections. The auxiliary lanes will be designed to allow passing at strategic locations.

The proposed Alternate 3 will begin at the same tie-in location, along Stateline Road, as Alternates 1 and 2. The alignment follows Alternate 1 and 2 north to Miller Road and then turns west and ties into existing US 641 just south of Brushy Creek Bridge. Alternate 3 will continue north along the existing route to the Middle Fork Bridge at the Clarks River.

The new alternate will have a significant construction cost reduction and the amount of right-of-way required will be significantly reduced. It also improves the connectivity to the new route for the residents and the existing commercial properties. Alternates 1 and 2 requires the traffic along existing US 641 to access the new alignments via existing county roads that may be deficient for the increased traffic. Alternate 3 keeps the compatibility of land the same for the majority of the parcels. In particular several of the farm land parcels will not be severed by the new alignment.

The new alignment will increase the Right of Way impacts to parcels along the existing route, however, Alternate 3 would not take any residential homes and only one storage building is being relocated.(assuming a 100 ft right-of-way width) Access points along the existing route will need to be considered and frontage roads may need to be constructed. An MOU will need to be put in place to limit additional access points in the future.

Maintainability is a key issue as well. Construction of Alternates 1 and 2 would increase long term maintenance costs for the maintenance of the new 4-lane facility along with still having to maintain the existing US 641.

Using Alternate 3 will reduce the cost for structures. The bridges for Brushy Creek and the creek just south of the Middle Fork Bridge at Clarks River will be eliminated along with the new reinforced concrete box culvert (RCBC's) at Stations 1122+00, 1214+00, 1264+00, and 1770+00.

IMPLEMENTATION CONSIDERATIONS:

Additional design requirements.

A MOU would have to be in place to limit further access locations.

The detailed cost estimate on the next page shows the updated costs for the gas line which shows the actual 2,250 feet versus the 950 feet that were calculated in the cost estimate provided to the team. Right of Way calculations assumed an existing 64 feet, with the overall need of 100 feet for the build out.

VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet

U.S. 641

Item # 1-314.20

TITLE: **Use 2-Lane with auxillary lane on Alternate 3**

DESIGN ELEMENT	Markup	BASELINE ASSUMPTION				PROPOSED ALTERNATIVE		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Pavement		LS	1	14,500,000.00	14,500,000	1	6,644,000.00	6,644,000
Earthwork		LS	1	2,300,000.00	2,300,000	1	800,000.00	800,000
Structures		LS	1	6,300,000.00	6,300,000	1	300,000.00	300,000
Gas line		FT	2,250	4,000.00	9,000,000	240	4,000.00	960,000
Other utilities		LS	1	2,720,000.00	2,720,000	1	5,440,000.00	5,440,000
Miscellaneous (25%)		LS	1	5,800,000.00	5,800,000	1	1,936,000.00	1,936,000
Right of Way		LS	1	4,870,000.00	4,870,000	1	500,000.00	500,000
TOTAL COSTS*					**45,490,000**			**16,580,000**
							TOTAL (BASELINE LESS PROPOSED)	**28,910,000**

Note: Total Costs are rounded to nearest thousand dollars SAVINGS

VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use 2-Lane with auxillary lane on Alternate 3**

Assumptions			
Interest/Discount Rate(%):	3%	**Economic Life (yrs):**	20

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			Baseline Assumption		Proposed Alterative	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Pavement Overlay	15	2,592,000	1,663,706	1,061,000	681,016
2						
3						
4						
5						
Total Salvage & Replacement Costs			**2,592,000**	**1,663,706**	**1,061,000**	**681,016**

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)	1,664,000	681,000

RESULTS (Proposed less baseline)

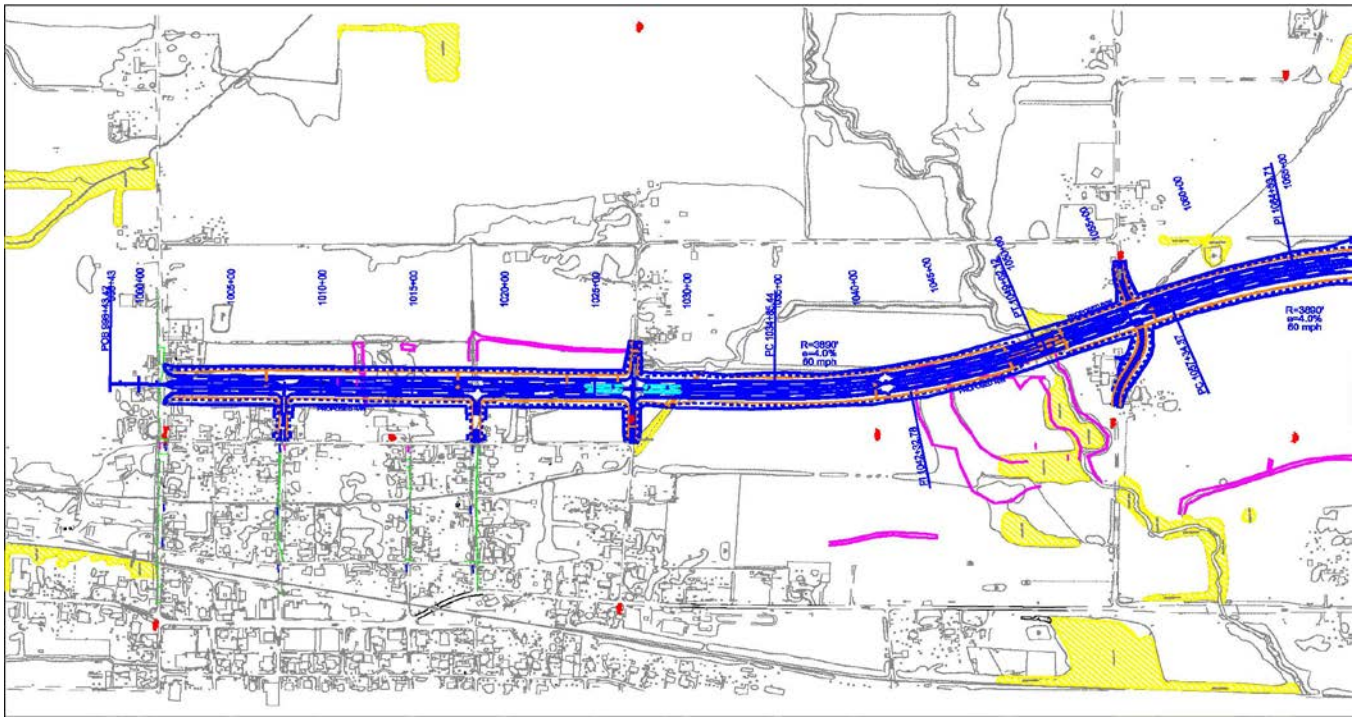
Notes: 1) Total Present Worth is rounded to the nearest thousand dollars, 2) Initial costs are covered in the Detail sheet.

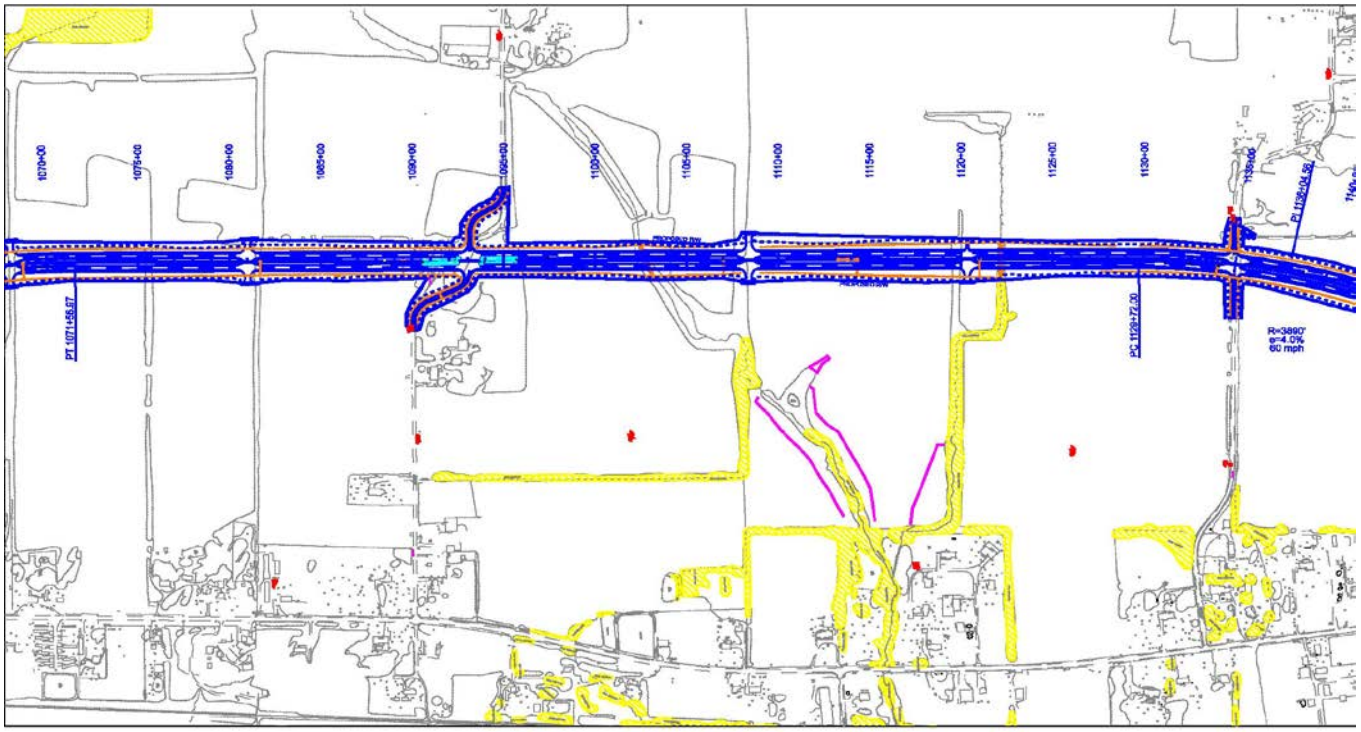
VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use 2-Lane with auxillary lane on Alternate 3**

SKETCH OF BASELINE ASSUMPTION



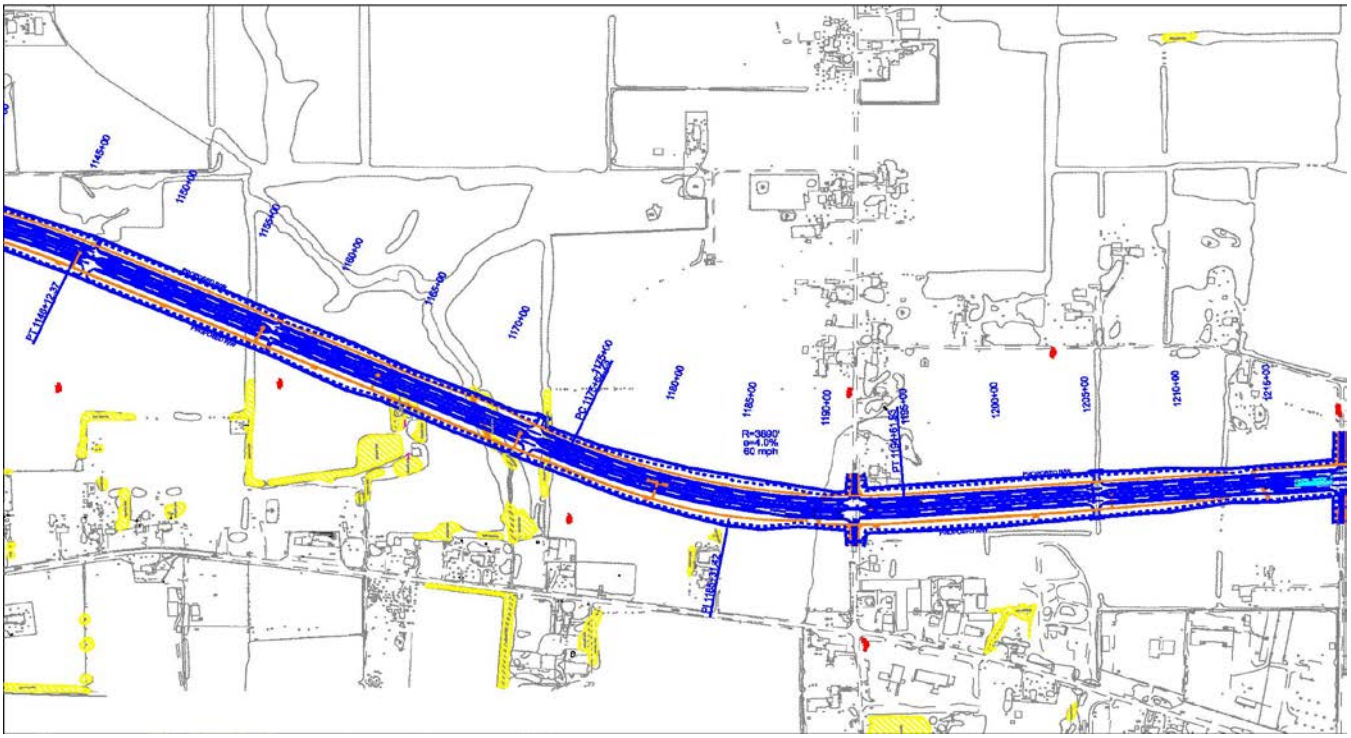


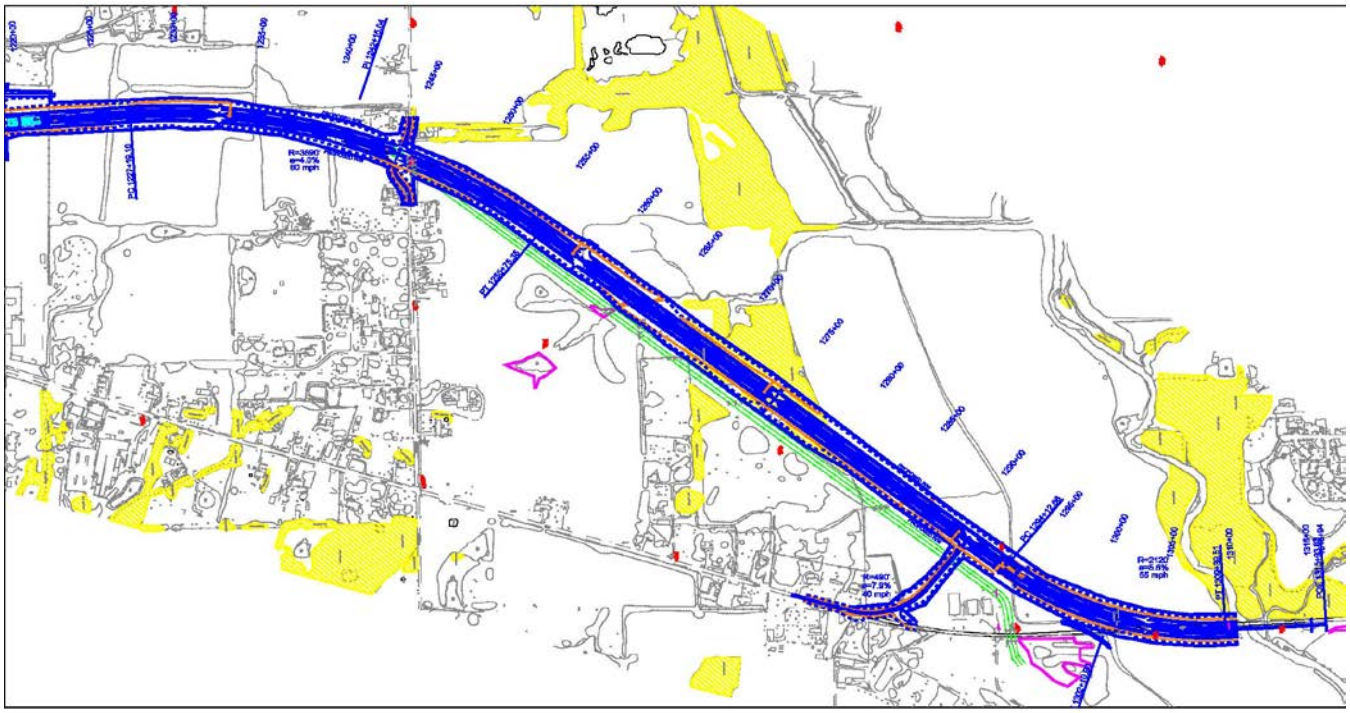
VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use 2-Lane with auxillary lane on Alternate 3**

SKETCH OF BASELINE ASSUMPTION



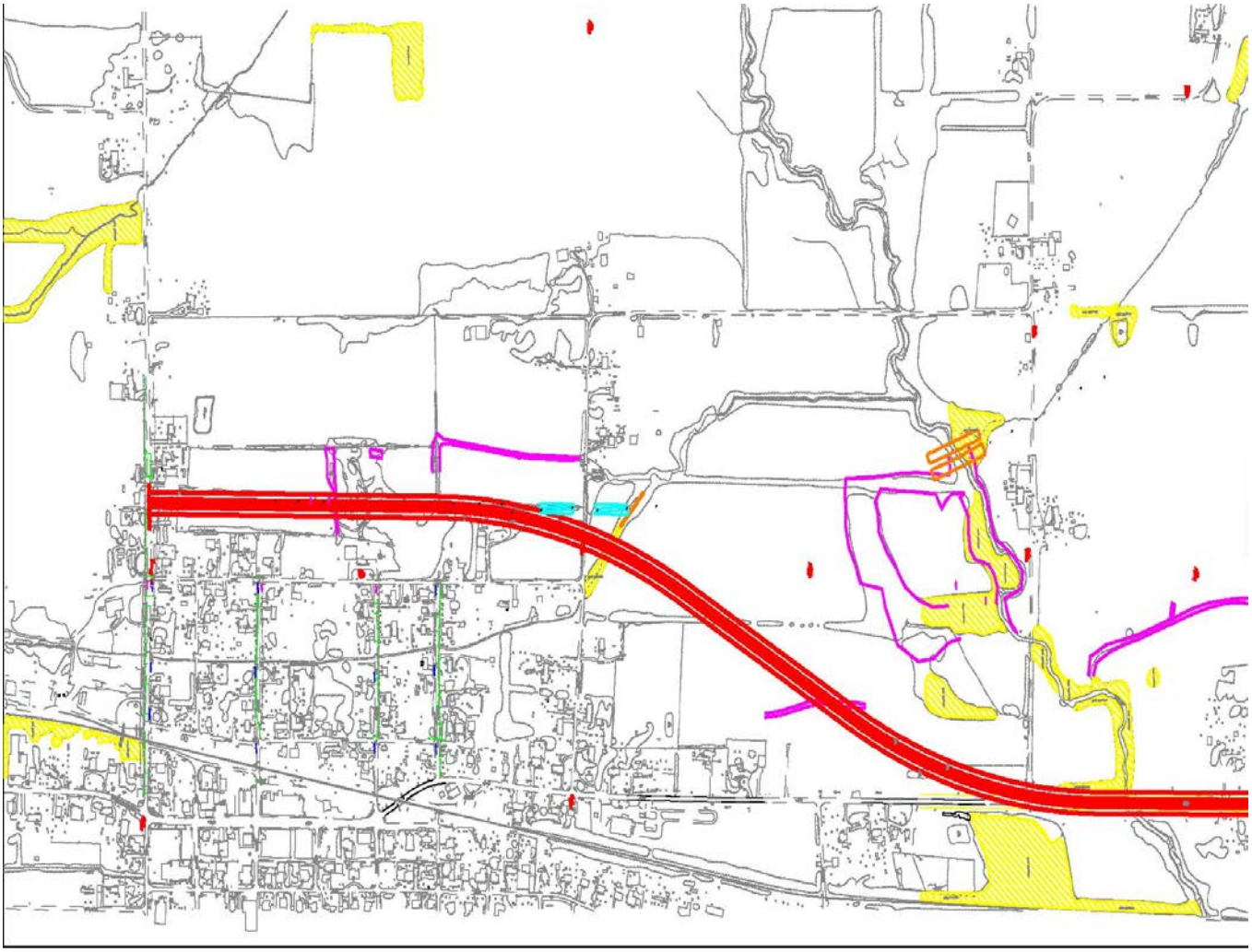


VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use 2-Lane with auxillary lane on Alternate 3**

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use 2-Lane with auxillary lane on Alternate 3**

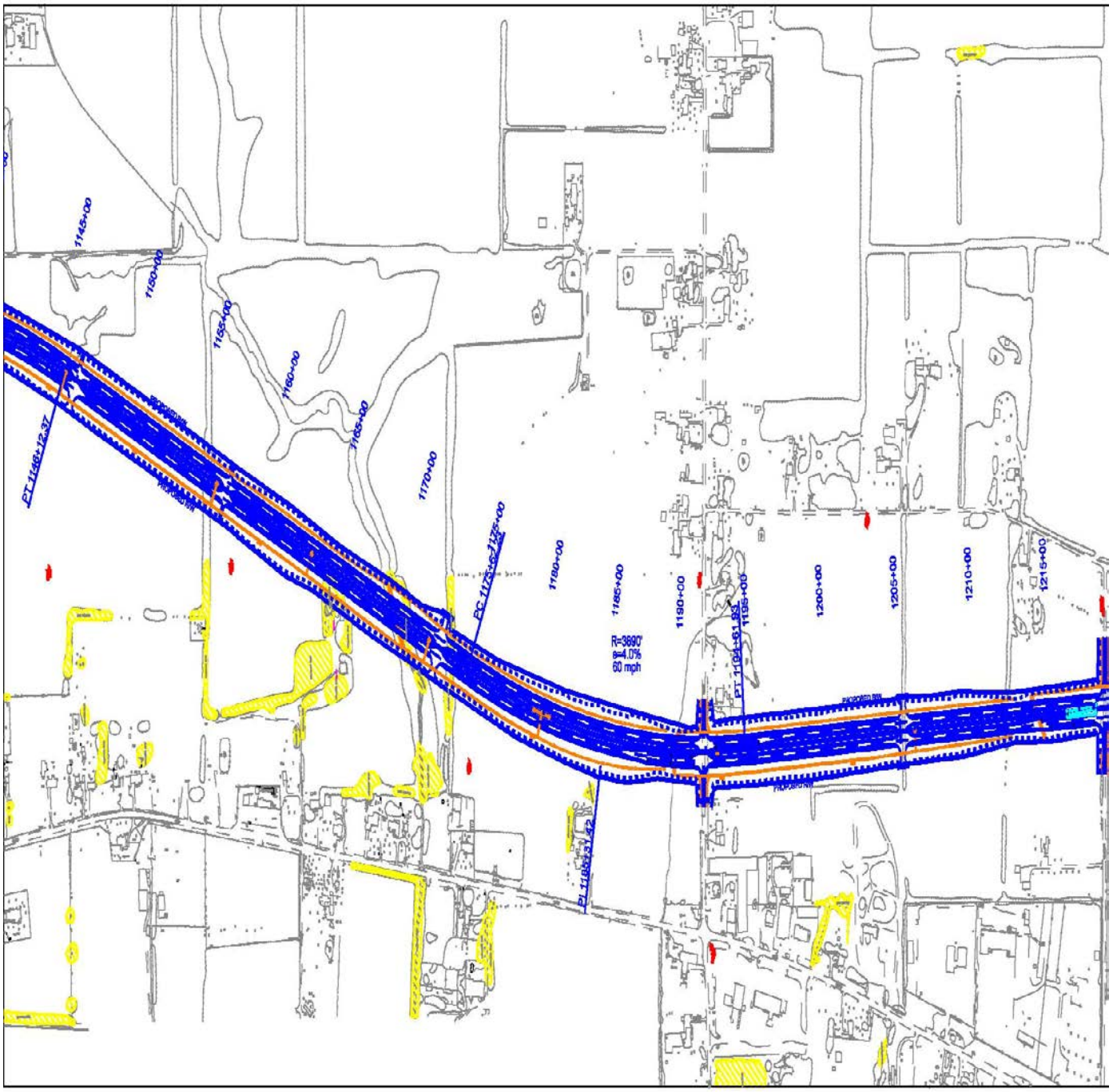
SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use 2-Lane with auxillary lane on Alternate 3**

SKETCH OF PROPOSED ALTERNATIVE

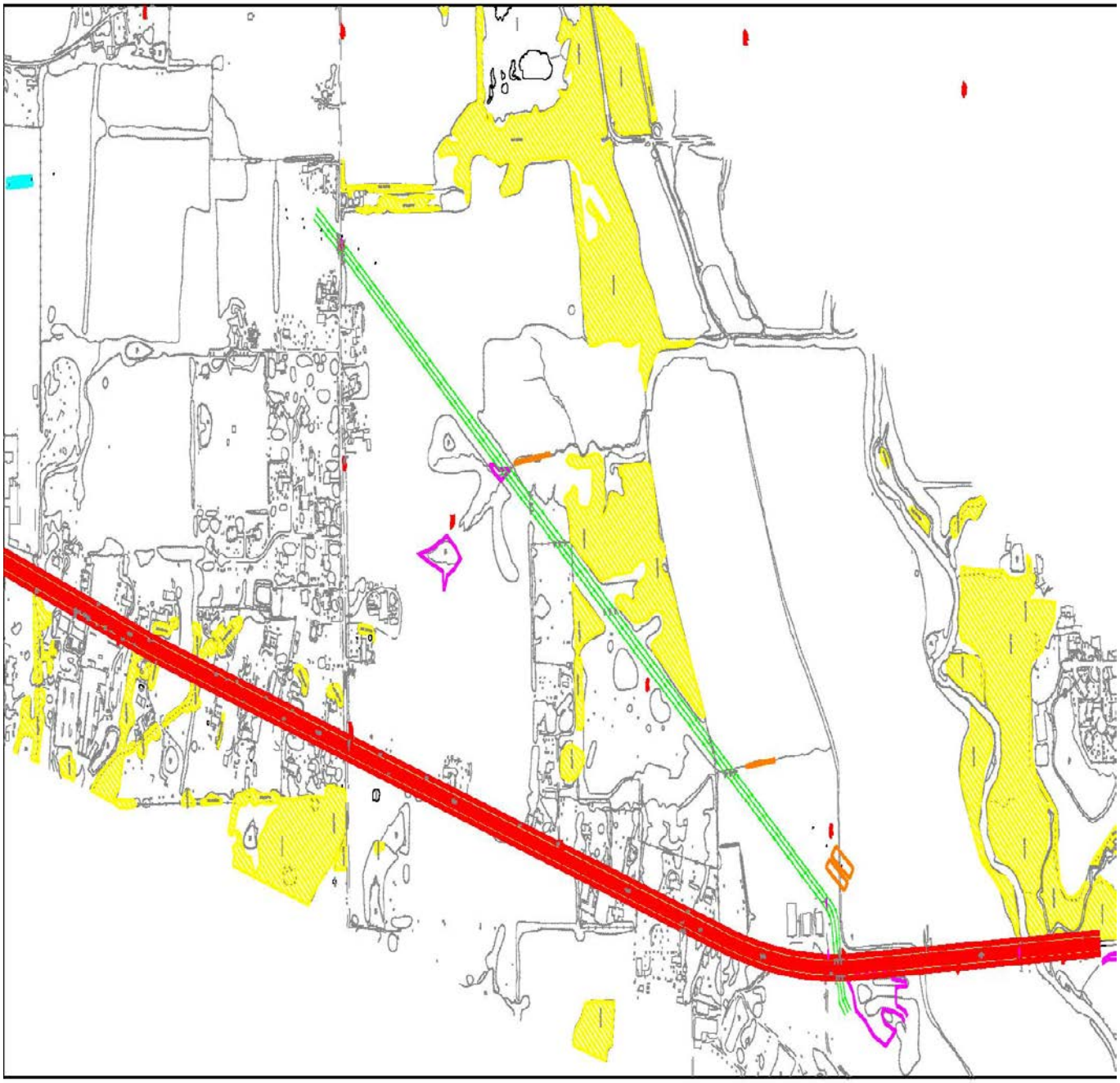


VALUE ENGINEERING PROPOSAL AV-07

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Use 2-Lane with auxillary lane on Alternate 3**

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL AV-09

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE:	**Provide a new alignment from Taylor Road to bridge to lessen impacts on the gas line**
FUNCTION:	**Accommodate Vehicles**

BASELINE ASSUMPTION:

Both Alternates 1 and 2 cross 3 gas transmission lines near Taylor Road and run parallel with the gas lines on the west side.

PROPOSED ALTERNATIVE:

Develop an alternate alignment that crosses Taylor Road to the east of the gas transmission lines and run parallel to the gas lines on the east side, crossing the gas lines near existing the US 641.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 8,328,000	$ -	$ 8,328,000
PROPOSED ALTERNATIVE:	$ 2,633,000	$ -	$ 2,633,000
TOTAL (Baseline less Proposed)	$ 5,695,000	$ -	**$ 5,695,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-09

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE:	**Provide a new alignment from Taylor Road to bridge to lessen impacts on the gas line**
BENEFITS	**RISKS/CHALLENGES**
• Lessen encasement pipes for gas mains from 2,250 lin. ft. to 750 lin. ft.	• Two additional residential relocations
• Allows use of the existing bridge (south of the Middle Fork Clarks Bridge) for two lanes	• Three storage buildings impacted
• Would not have to demo the existing bridge south of the Middle Fork Bridge	•
• Less impacts to stream disturbance due to bridge demo	•
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VALUE ENGINEERING PROPOSAL AV-09

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Provide a new alignment from Taylor Road to bridge to lessen impacts on the gas line**

DISCUSSION/JUSTIFICATION:

The two main reasons for the new alignment east of the gas line are to reduce the gas line impacts and to use the existing bridge south of the Middle Fork Clarks River Bridge. The estimated costs for encasement pipes for a large gas main is $3,000/ft. These costs were estimated based on a similar project that was just completed for Meade County KY 313. The assumption the VE team has made is that the costs shown in the estimate are a little low. Additionally, the cost estimate shows 920 feet of gas line; however, there are 3 gas lines which total 2,250 feet. Based on this information, the new alignment would have a total of 750 feet. However, in order to show the costs of the alternative compared to the baseline, in the detailed cost sheet, the VE team has used the figures provided. We did, however, update the shown lineal feet to be able to compare the two costs.

The ability to use the existing bridge has several benefits as well. Cost and environmental concerns to demolish the existing bridge will be reduced. In the existing cost estimate, there did not appear to be costs for demolishing the existing bridge even though it is included in the scope. So, we have shown them as existing costs. Using the existing bridge for 2-lanes and constructing an additional bridge for the other 2-lanes versus constructing all new bridges for 4-lanes is a cost savings. The new alignment would also have a shorter approach for the tie-in to existing US 641. Both alignments have a channel change requirement; however, they both have approximately the same lengths and they are both in the same general area.

IMPLEMENTATION CONSIDERATIONS:

The cost estimate needs to be changed to reflect the actual costs and linear feet.

VALUE ENGINEERING PROPOSAL AV-09

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE:	**Provide a new alignment from Taylor Road to bridge to lessen impacts on the gas line**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Gas Line		LF	2,250	3,000.00	6,750,000	750	3,000.00	2,250,000
Bridge		SF	18,334	85.00	1,558,390	4,500	85.00	382,500
Bridge Demolition		LS	1	20,000.00	20,000	-		
TOTAL COSTS*					**8,328,000**			**2,633,000**
							TOTAL (BASELINE LESS PROPOSED)	**5,695,000**

Note: Total Costs are rounded to nearest thousand dollars

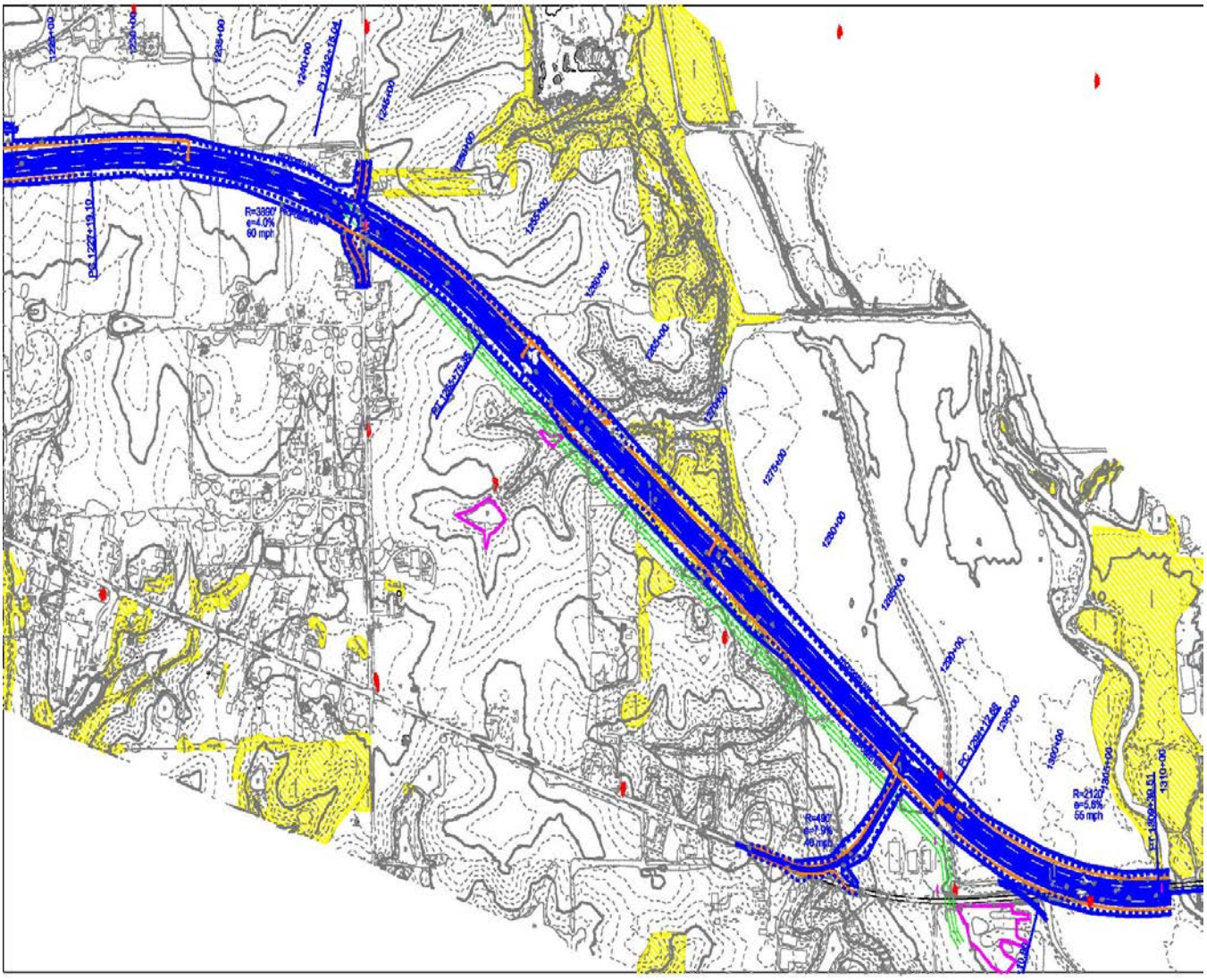
SAVINGS

VALUE ENGINEERING PROPOSAL AV-09

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Provide a new alignment from Taylor Road to bridge to lessen impacts on the gas line**

SKETCH OF BASELINE ASSUMPTION

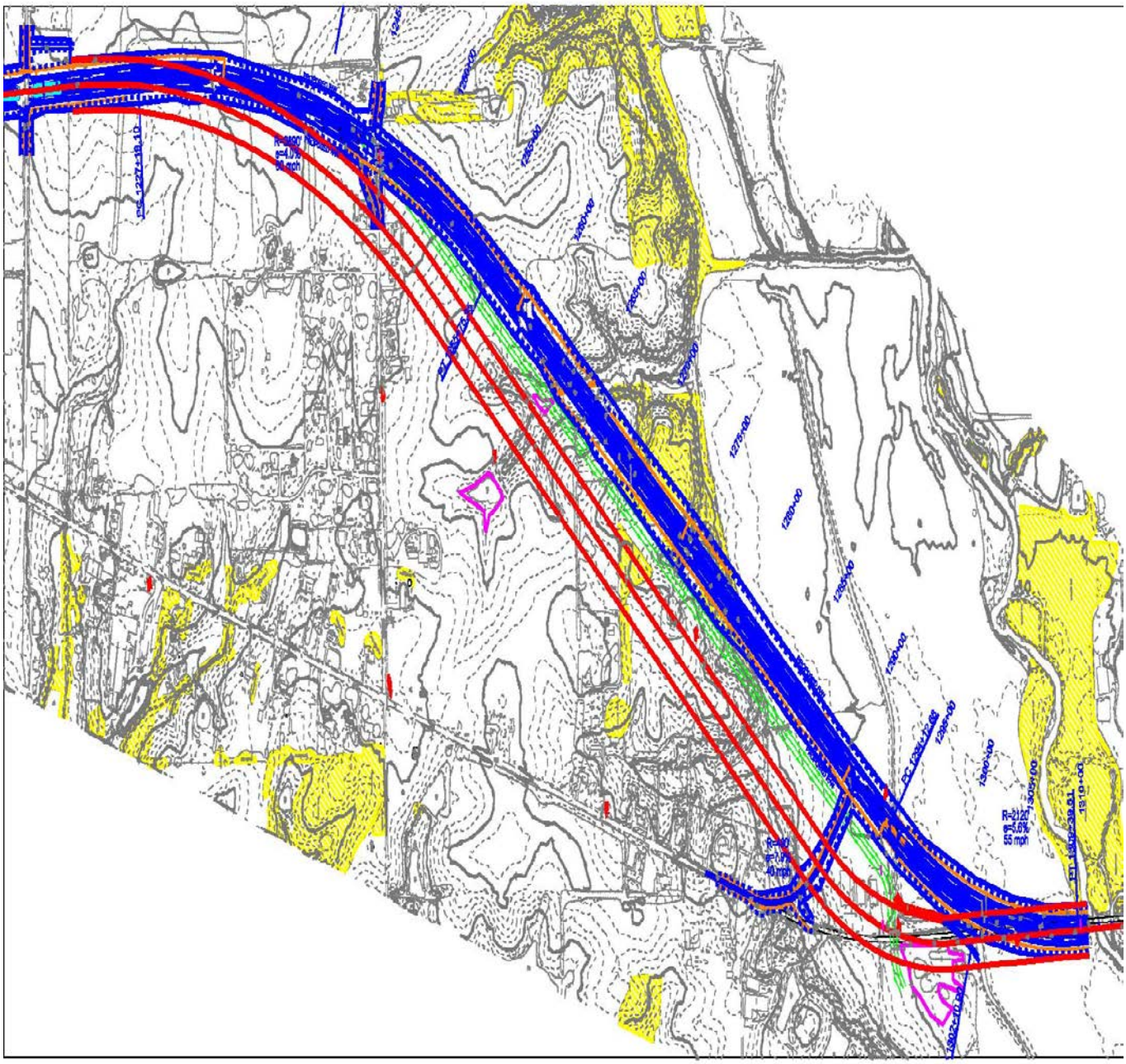


VALUE ENGINEERING PROPOSAL AV-09

Kentucky Transportation Cabinet
U.S. 641
Item # 1-314.20

TITLE: **Provide a new alignment from Taylor Road to bridge to lessen impacts on the gas line**

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL AV-10

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Tie-in to Old US 641 at KY 1828 to avoid the gas line**

FUNCTION: **Accommodate Vehicles**

BASELINE ASSUMPTION:

Alternates 1 and 2 are identical from KY 1828 to the Middle Fork Bridge at Clarks River and traverse through farm land west of the existing US 641. These alignments cross the triple gas mains along a curve at about a 45-degree skew.

PROPOSED ALTERNATIVE:

The alignment stays on the existing US 641 using a 2+1 cross section with 4-foot shoulders (2 feet on both Middle Fork Bridge at Clarks River and the bridge just south over the blue line) to eliminate any disturbance to the existing gas lines. In general, this alternate adds the third lane along the east side of the existing US 641 and then cuts over to the west at KY 1828. It then continues along either the Alternate 1 or Alternate 2 alignment from this point until the end of the project at the Tennessee state line.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 20,130,000	$ 642,000	$ 20,772,000
PROPOSED ALTERNATIVE:	$ 8,551,000	$ 321,000	$ 8,872,000
TOTAL (Baseline less Proposed)	$ 11,579,000	$ 321,000	**$ 11,900,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-10

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Tie-in to Old US 641 at KY 1828 to avoid the gas line**
BENEFITS	**RISKS/CHALLENGES**
• Eliminates the need for gas line steel encasement	• Relocating existing utilities along US 641 along the northern portion of the alignment
• Eliminates constructing a twin bridge at a 45-degree skew to the existing blue line stream	• Disturbance and possible acquisition of several houses, businesses and one church
• Eliminates bisecting the farm land for most of the northern half of both Alternates 1 and 2	• Access spacing reduced to 600 feet needing frontage roads or MOU for access
• Eliminates wetland impacts	•
• Eliminates stream relocation and large In-Lieu fees	•
• Eliminates the need for northbound bridge over Middle Fork at the Clarks River	•
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•	•
•	•

VALUE ENGINEERING PROPOSAL AV-10

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Tie-in to Old US 641 at KY 1828 to avoid the gas line**

DISCUSSION/JUSTIFICATION:

Based on a recently identified cost of $3,000 per foot to steel encase gas lines on KY 313, cost savings of approximately $6.75 million can be realized by using the existing US 641 and adding a 12-foot lane along the east side to achieve a 2+1 cross section. This will completely eliminate disturbance to the existing gas mains, eliminate the need to build a new twin bridge at the blue line stream and add a northbound bridge at the Middle Fork of the Clarks River. In-Lieu fees associated with rerouting the blue line stream as well as impacts to wetlands are also completely eliminated.

The existing bridges on US 641 at both the Middle Fork Bridge of the Clarks River and the blue line have 12-foot lanes and 8-foot shoulders. The concept is to use (3)-12 ft lanes with 2 ft shoulders so both bridges remain as-is and then transition to 8 ft shoulders (4-foot paved) north and south of each of these bridges. Alternates 1 and 2 require the channel to be relocated and will cross the relocated channel at 45 degrees, thus the currently proposed twin bridge needs to be 115 feet long. Also, the current alternate requires the construction of a twin northbound bridge at the Middle Fork of the Clarks River with a length of 238 feet and a clear width of 40 feet.

This VE alternative completely eliminates any bridge construction and rerouting 900 feet of blue line stream at an In-Lieu fee cost of $210 per foot ($189,000). The negatives for this alternate, as outlined in the risks/challenges, are the utility relocations that will be required along US 641, impacts to houses, businesses, and one church.

Horizontally and vertically, the existing US 641 appears to be in good shape, so horizontal and vertical improvements will not be required. This alternative will simply be a widening and overlay project with improved shoulders. The only acquisition that is anticipated is near Midway where this alternate leaves the existing US 641 and ties back into either Alternate 1 or Alternate 2.

IMPLEMENTATION CONSIDERATIONS:

A more thorough evaluation of utility and right of way impacts to determine feasibility of this alternate are necessary. Otherwise, since it is along the existing US 641, environmental issues should not be a problem and should be significantly less than the current Alternatives 1 and 2.

VALUE ENGINEERING PROPOSAL AV-10

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Tie-in to Old US 641 at KY 1828 to avoid the gas line**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Gas line encasement		LF	2,250	3,000.00	6,750,000			
New twin bridge at 45-degree skew over blue		SF	9,900	85.00	841,500			
In-Lieu Fee for stream relocation		LF	900	210.00	189,000			
Earthwork		CY	100,000	13.00	1,300,000	50,000	13.00	650,000
Utilities		LS	1	2,700,000.00	2,700,000	1	5,500,000.00	5,500,000
Right of way		LS	1	2,500,000.00	2,500,000	1	1,250,000.00	1,250,000
New northbound bridge over N. Frk Clark River		SF	10,000	85.00	850,000			
Mainline pavement		SY	66,700	45.00	3,001,500	16,700	45.00	751,500
Shoulder pavement		SY	55,500	36.00	1,998,000	11,100	36.00	399,600
TOTAL COSTS*					**20,130,000**			**8,551,000**
							TOTAL (BASELINE LESS PROPOSED)	**11,579,000**

Note: Total Costs are rounded to nearest thousand dollars SAVINGS

VALUE ENGINEERING PROPOSAL AV-10

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Tie-in to Old US 641 at KY 1828 to avoid the gas line**

Assumptions			
Interest/Discount Rate(%):	3%	**Economic Life (yrs):**	20

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Assumption**		**Proposed Alterative**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Milling and overlay (current will also have to mill and overlay existing US 641)	15	1,000,000	641,862	500,000	320,931
2						
3						
4						
5						
Total Salvage & Replacement Costs			**1,000,000**	**641,862**	**500,000**	**320,931**

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)	642,000	321,000
RESULTS (Proposed less baseline)		

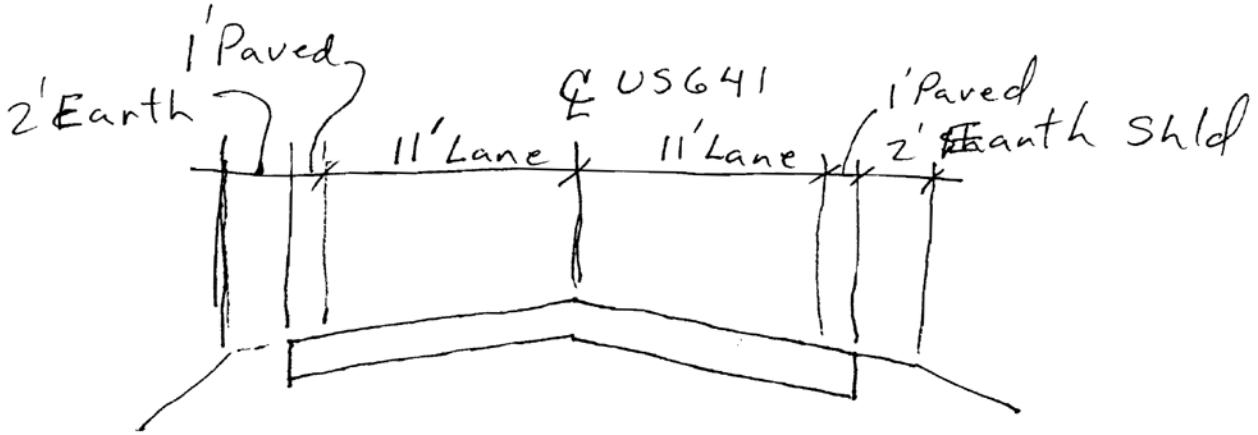
Notes: 1) Total Present Worth is rounded to the nearest thousand dollars, 2) Initial costs are covered in the Detail sheet.

VALUE ENGINEERING PROPOSAL AV-10

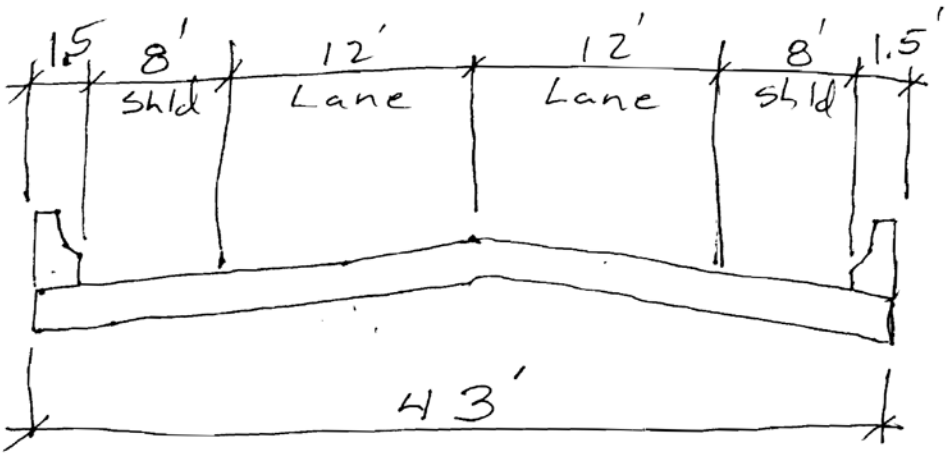
Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Tie-in to Old US 641 at KY 1828 to avoid the gas line**

SKETCH OF BASELINE ASSUMPTION



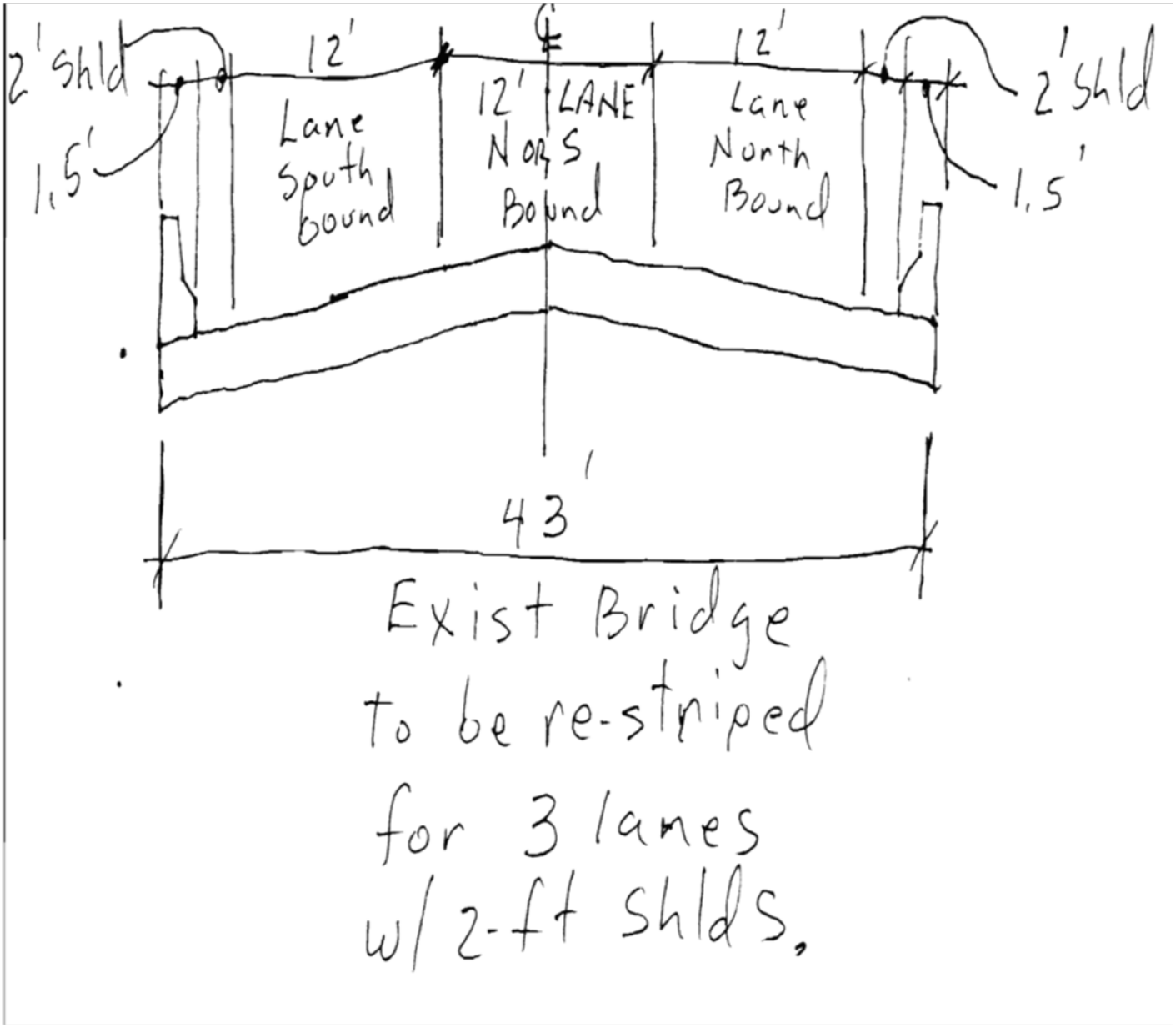
Exist. US 641



Exist. Bridges

TITLE: **Tie-in to Old US 641 at KY 1828 to avoid the gas line**

SKETCH OF PROPOSED ALTERNATIVE



VALUE ENGINEERING PROPOSAL AV-11

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Eliminate side road approaches at Brandon Road and Barber Road**
FUNCTION:	**Accommodate Vehicles**

BASELINE ASSUMPTION:

Brandon Road and Barber Road will have a connection to the new US 641. Each approach will be built on a new alignment to meet spacing needs and for ease of construction.

PROPOSED ALTERNATIVE:

Close Brandon Road and Barber Road with a cul-de-sac close to the new US 641 alignment.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 116,000	$ -	$ 116,000
PROPOSED ALTERNATIVE:	$ -	$ -	$ -
TOTAL (Baseline less Proposed)	$ 116,000	$ -	**$ 116,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-11

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Eliminate side road approaches at Brandon Road and Barber Road**
BENEFITS	**RISKS/CHALLENGES**
• Eliminates two significant conflict points along the corridor	• May have moderate public resistance
• Removes some traffic off of the new US 641	•
• Allows for a better access management plan along the corridor	•
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VALUE ENGINEERING PROPOSAL AV-11

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Eliminate side road approaches at Brandon Road and Barber Road**

DISCUSSION/JUSTIFICATION:

Access to the new US 641 at both of these locations can be removed because there is convenient access for traffic on these roads at other locations. Removing these two points eliminates two conflict points, potentially improving and preserving the future safety and traffic operations of this principal arterial.

Alternate Access:

Brandon Road: West - can use access at Miller Road
East - can use old US 641 and access at Stateline Road (south end) or tie-in (north end)

Barber Road: West - can use Tobacco Road (KY 1828) or Taylor Road
East - can use old US 641 and access at Stateline Road (south end) or tie-in (north end)

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL AV-11

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Eliminate side road approaches at Brandon Road and Barber Road**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Side road pavement		SY	3,422	30.00	102,660			
Earthwork		CY	2,600	5.00	13,000			
TOTAL COSTS*					**116,000**			
							TOTAL (BASELINE LESS PROPOSED)	**116,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL AV-12

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Tie-in at Stateline Road and eliminate the temporary tie-in**

FUNCTION: **Limit Access**

BASELINE ASSUMPTION:

The current design is considering the use of a temporary tie-in to existing US 641 just north of Hazel between Miller and Brandon Roads.

PROPOSED ALTERNATIVE:

Tie-in the project at Stateline Road and do not build a temporary tie-in.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 500,000	$ -	$ 500,000
PROPOSED ALTERNATIVE:	$ 50,000	$ -	$ 50,000
TOTAL (Baseline less Proposed)	$ 450,000	$ -	**$ 450,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-12

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Tie-in at Stateline Road and eliminate the temporary tie-in**
BENEFITS	**RISKS/CHALLENGES**
• Eliminates the costs of the temporary tie-in	• Making traffic flow successfully at the intersection of Stateline Road
• Creates a clear connection point for TDOT when they reconstruct from the south	• Railroad crossing at Stateline Road needs to be considered
• Can be used with either Alternate 1 or Alternate 2 alignment	•
• The entire roadway project can be built at one time rather than in phases	•
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VALUE ENGINEERING PROPOSAL AV-12

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Tie-in at Stateline Road and eliminate the temporary tie-in**

DISCUSSION/JUSTIFICATION:

One of the big challenges that was identified by the project design team was how to tie-in the new alignment to existing US 641 if the Kentucky project advances to construction prior to Tennessee DOT advancing their project around Hazel. Since traffic volumes are relatively low (under 7,000 ADT) and appear to be growing at a very slow rate, using Stateline Road would appear to be a viable temporary option. Using this option will allow the elimination of the temporary tie-ins north of Hazel. Not building a temporary tie-in also eliminates the need to remove it when the connection with Tennessee's project is made.

Current volumes on KY 893 are only 657 ADT. To improve this option, it is recommended to make the turn from the new project onto Stateline Road as the main movement and create a stop condition for the traffic coming from the north. The turning radius at the existing US 641 may need to be increased to accommodate truck traffic. It appears that upgrades (widening) to the existing road would not be needed.

The total distance on Stateline Road is only 1/3 mile. Travel time will be increased, but just slightly with the delay of one left turn. Total delay compared to baseline design is expected to be less than 20 seconds.

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL AV-12

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Tie-in at Stateline Road and eliminate the temporary tie-in**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Temporary tie-in		LS	1	500,000.00	500,000			
Stateline Road tie-in						1	50,000.00	50,000
TOTAL COSTS*					**500,000**			**50,000**
							TOTAL (BASELINE LESS PROPOSED)	**450,000**

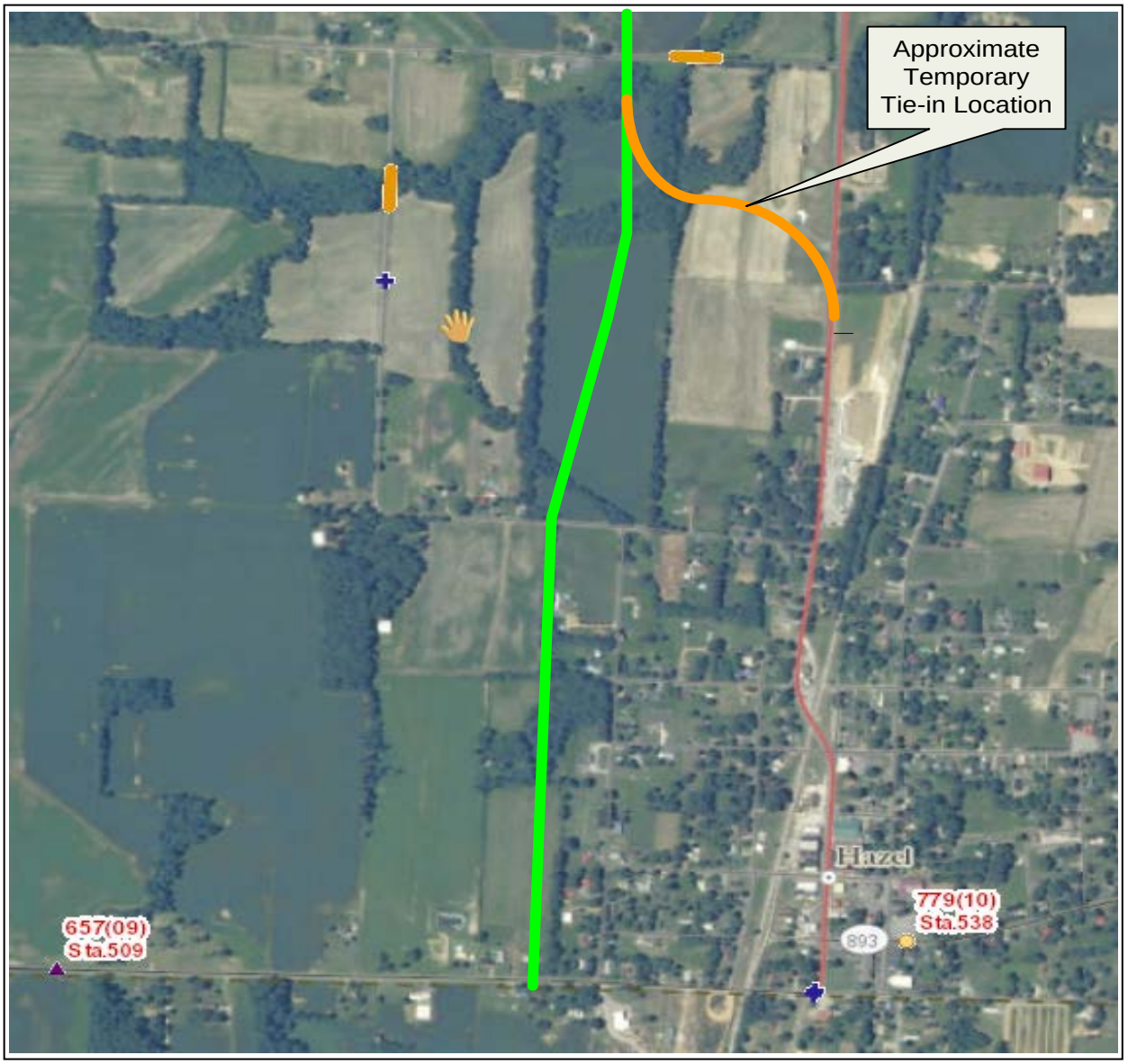
Note: Total Costs are rounded to nearest thousand dollars SAVINGS

VALUE ENGINEERING PROPOSAL AV-12

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Tie-in at Stateline Road and eliminate the temporary tie-in**

SKETCH OF BASELINE ASSUMPTION



VALUE ENGINEERING PROPOSAL AV-12

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Tie-in at Stateline Road and eliminate the temporary tie-in**

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL AV-17

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Reduce the typical section lane widths, ditch, etc.**

FUNCTION: **Accommodate Vehicles**

BASELINE ASSUMPTION:

The baseline roadway template for the project calls for two 12-foot lanes in each direction, 10-foot wide paved outside shoulders, and a 4-foot wide paved inside (median shoulders).

PROPOSED ALTERNATIVE:

The proposed roadway template for the project would use two 11-foot lanes in each direction, 10-foot wide paved outside shoulders, and a 3-foot wide paved inside shoulders (median shoulders). Normally in KYTC projects, the inside shoulder has the same pavement depth as the mainline.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 8,652,000	$ 467,000	$ 9,119,000
PROPOSED ALTERNATIVE:	$ 7,725,000	$ 417,000	$ 8,142,000
TOTAL (Baseline less Proposed)	$ 927,000	$ 50,000	**$ 977,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-17

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Reduce the typical section lane widths, ditch, etc.**
BENEFITS	**RISKS/CHALLENGES**
• Reduces construction costs	• None apparent
• No measurable change in operational performance	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•

VALUE ENGINEERING PROPOSAL AV-17

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE: **Reduce the typical section lane widths, ditch, etc.**

DISCUSSION/JUSTIFICATION:

The current design for the roadway template uses lane and shoulder widths which are considered optimum and in many cases would be applicable for use on the KYTC's interstate highway system. Based on the anticipated traffic volumes, this alternative suggests that the mainline lane widths and the interior paved shoulder widths be reduced by 1 foot each (a total of 3 feet in each direction, 6 feet total for the project) as a means of reducing construction costs. No changes are suggested to the outside shoulder width as a means of addressing the Design Team's concern regarding the need for additional width for large farm vehicles to use the shoulders to move from field to field. Recent research supports that the use of 11-foot lane widths versus 12-foot lane widths has negligible effects to capacity and safety for roadway users.

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL AV-17

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Reduce the typical section lane widths, ditch, etc.**

DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Full depth pavement		SY	192,267	45.00	8,652,015	171,667	45.00	7,725,015
TOTAL COSTS*					**8,652,000**			**7,725,000**
							TOTAL (BASELINE LESS PROPOSED)	**927,000**

Note: Total Costs are rounded to nearest thousand dollars SAVINGS

VALUE ENGINEERING PROPOSAL AV-17

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Reduce the typical section lane widths, ditch, etc.**

Assumptions			
Interest/Discount Rate(%):	3%	**Economic Life (yrs):**	20

LIFE CYCLE COST ANALYSIS

Salvage & Replacement Costs			**Baseline Assumption**		**Proposed Alterative**	
Item	**Description**	**Yr**	**Est Cost**	**Pres Worth**	**Est Cost**	**Pres Worth**
1	Overlay	15	727,000	466,634	649,000	416,568
2						
3						
4						
5						
Total Salvage & Replacement Costs			**727,000**	**466,634**	**649,000**	**416,568**

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)	467,000	417,000
RESULTS (Proposed less baseline)		

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

VALUE ENGINEERING PROPOSAL AV-19

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Provide an eastern alignment on the northern portion**

FUNCTION: **Accommodate Vehicles**

BASELINE ASSUMPTION:

Baseline alignments currently under consideration are to the west of the existing US 641.

PROPOSED ALTERNATIVE:

Consider alignments to the east of US 641, paralleling the railroad and existing US 641 in portions of the northern section of the project. The southern section tie-in at Stateline Road would remain at the current location proposed.

COST SUMMARY	Initial Costs	O&M Costs	Total Life Cycle Cost
BASELINE ASSUMPTION:	$ 18,044,000	$ -	$ 18,044,000
PROPOSED ALTERNATIVE:	$ 12,120,000	$ -	$ 12,120,000
TOTAL (Baseline less Proposed)	$ 5,924,000	$ -	**$ 5,924,000**
			SAVINGS

VALUE ENGINEERING PROPOSAL AV-19

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE:	**Provide an eastern alignment on the northern portion**
BENEFITS	**RISKS/CHALLENGES**
● Minimzes impacts and costs where the road crosses the gas line	● Potential residential relocations
● Minimizes impacts to large farm tracts	● Potential residential impacts
● Incorporates the two existing bridges into the alignment (minimizes water related impacts)	● Managing access control
● Maintains connectivity with more of the existing transporation corridor	●
● Reduces the overall length of roadway to be maintained	●
●	●
●	●
●	●
●	●
●	●
●	●

VALUE ENGINEERING PROPOSAL AV-19

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE: **Provide an eastern alignment on the northern portion**

DISCUSSION/JUSTIFICATION:

The baseline alignments under consideration are all along the western side of US 641. The planning study prepared for the project did consider eastern alignments. However, this alternative suggests an alignment with less of a shift to the east in the northern section. This would potentially allow the continued use of two of the existing structures in the final roadway template. Also, this alignment would cross the high pressure gas lines in a perpendicular fashion, minimizing encasement requirements.

This alternative essentially uses the same alignment for the start of the project (west of Hazel), then shifts to parallel the existing US 641, then shifts to follow the railroad in the northern section. The northern termini would remain in the same location. By following the existing alignment and the railroad, the overall scope and character of the project would need to be reconsidered. Access control provisions and median widths would need to be adjusted to minimize impact to properties. Also, a reduction in the design speed for the project would also need to be considered to minimize impacts.

The overall connectivity to the existing development along US 641 will be enhanced. Large farm land tract impacts are greatly reduced. First estimates for the number of relocations is comparable to initial estimates for the current alternates. This alternative potentially impacts approximately eight houses and two warehouse type structures.

IMPLEMENTATION CONSIDERATIONS:

Please note, on the detailed cost information for this alternative, the estimate for the gas lane from the original cost estimate provided to the team is 950 lineal feet of pipeline to be encased. However, there are three gas lines, equaling 2,250 lineal feet.

VALUE ENGINEERING PROPOSAL AV-19

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE:	**Provide an eastern alignment on the northern portion**							
DESIGN ELEMENT	**Markup**	**BASELINE ASSUMPTION**				**PROPOSED ALTERNATIVE**		
Description	%	Unit	Qty	Unit Cost $	TOTAL $	Qty	Unit Cost $	TOTAL $
Brushy Creek Bridge		SF	19,000	85.00	1,615,000	9,500	85.00	807,500
Middle Fork Tributary Bridge		SF	10,000	85.00	850,000	3,500	85.00	297,500
Gas line encasement		LF	2,250	3,000.00	6,750,000	750	3,000.00	2,250,000
In-Lieu fee for stream relocation		LF	900	210.00	189,000			
Mainline pavement		SY	192,000	45.00	8,640,000	177,000	45.00	7,965,000
Utilities along 5600-ft of US 641		LS				1	800,000.00	800,000
TOTAL COSTS*					**18,044,000**			**12,120,000**
							TOTAL (BASELINE LESS PROPOSED)	**5,924,000**

Note: Total Costs are rounded to nearest thousand dollars

SAVINGS

VALUE ENGINEERING PROPOSAL AV-19

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE: **Provide an eastern alignment on the northern portion**

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL AV-19
Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Provide an eastern alignment on the northern portion**

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL AV-19

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE: **Provide an eastern alignment on the northern portion**

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL AV-19

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE: **Provide an eastern alignment on the northern portion**

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL AV-19

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE: **Provide an eastern alignment on the northern portion**

SKETCH OF PROPOSED ALTERNATIVE

VALUE ENGINEERING PROPOSAL AV-22DS

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Address working platform**
FUNCTION:	**Accommodate Vehicles**

BASELINE ASSUMPTION:

The baseline profile design closely follows the existing terrain in certain sections.

PROPOSED ALTERNATIVE:

Review soil profiles to determine the minimum depth of embankment or excavation needed to develop a working platform for sub-grade and compare to profiles proposed.

DESIGN SUGGESTION

VALUE ENGINEERING PROPOSAL AV-22DS

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Address working platform**
BENEFITS	**RISKS/CHALLENGES**
• Minimizes undercut costs during construction	• Increases initial earthwork costs
• Reduces initial pavement structure costs	• Potential wider excavation and embankment limits
• Improves long-term performance of roadway pavement (longer lasting ride quality)	•
• Reduces maintenance costs	•
•	•
•	•
•	•
•	•
•	•
•	•
•	•

VALUE ENGINEERING PROPOSAL AV-22DS

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE: **Address working platform**

DISCUSSION/JUSTIFICATION:

The proposed alignments for this project pass through multiple farm fields. It is anticipated that these fields will have a very high organic content in the soils near the existing surface. Also, with the flat terrain and constant manipulation as a part of normal farm operations, it is anticipated that moisture contents will be well above optimum. This alternative proposes that prior to finalizing the preliminary line and grade, the KYTC would benefit from performing some preliminary geotechnical studies. The purpose of this study is to determine the minimum excavation and embankment requirements needed to develop a working platform to construct the roadway sub-grade without the need for extensive undercut and other stabilization techniques. Per KYTC, previous projects on US 641 north of this location required additional stabilization to create a working platform to construct the roadway pavement structure. The preliminary geotechnical information will allow the design team to further investigate alternatives and perform analysis to determine if the proposed profiles provide a best fit for the soil conditions to be encountered. Cost estimates can then be developed to determine if additional earthwork versus other means of stabilization are appropriate for the project.

IMPLEMENTATION CONSIDERATIONS:

VALUE ENGINEERING PROPOSAL EC-04DS

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Develop a Memorandum of Understanding (MOU) with local agencies to develop an Access Management Plan to control access**
FUNCTION:	**Ensure Connectivity**

BASELINE ASSUMPTION:

The project was designed as partial control of access with approximately 1,200 ft access spacing throughout the corridor with full median openings. However, during the kick-off presentation, it was mentioned that design team is considering that Hazel be designed with 600' access spacing.

PROPOSED ALTERNATIVE:

Modify the access design by minimizing full access openings at strategic intersections and design partial openings between them and keep the 1,200 ft spacing at Hazel. Develop a MOU between KYTC and the local government that specifies current and future access locations and design a process for future modifications.

DESIGN SUGGESTION

VALUE ENGINEERING PROPOSAL EC-04DS

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE:	**Develop a Memorandum of Understanding (MOU) with local agencies to develop an Access Management Plan to control access**
BENEFITS	**RISKS/CHALLENGES**
● Protects the long-term access and corridor functionality	● Creating the understanding for the need of a MOU with local government
● Eliminates through and left-turn conflicts throughout the corridor.	●
● Provides consistency throughout the project, including through Hazel	●
● Simplifies construction	●
●	●
●	●
●	●
●	●
●	●
●	●
●	●

VALUE ENGINEERING PROPOSAL EC-04DS

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE:	**Develop a Memorandum of Understanding (MOU) with local agencies to develop an Access Management Plan to control access**

DISCUSSION/JUSTIFICATION:

Partial access openings may have a full median allowing right-in/right-out of entrances only or may have a partial median opening allowing right-in/right-out/left-in movements, depending on the need.

The main reason for reconstructing US 641 is to improve travel times and ensure free flow, safe movement of vehicles, primarily long distances, between Murray and locations in Tennessee. To protect this function of the primary arterial, access must be strictly managed. This means minimizing conflict points and traffic signals that create delays and potential crash locations. In a rural setting such as this location that has little development, it will be relatively simple now to develop a design with strong access management. To maintain this design and control future access, it is important to develop a binding agreement between the state and county in the form of a MOU. There are several examples of this type of access management MOU that have been done in Kentucky.

Another strategy that has been done, is to separate conflict points even higher than the 1,200 ft outlined in the Kentucky access control law. Spacing can be increased to approximately 2,000 ft to ensure that an access point can not be inserted without an engineering study to support the decision.

Potential revised access locations, by type, have been included in the sketch.. The total access points have been reduced from 25 to 18 and a total number of full access points have been reduced from 25 to 9.

One of the best ways to control or manage access is to limit the number of median openings and control the design of median openings. Certain median designs eliminate movements, such as left turns or through from the access point, in order to remove the potential for T-bone crashes.

Access spacing at Hazel should remain at 1,200 or more; however, it is recommended that full access be provided both at Stateline Road and Miller Road to provide good connectivity to the downtown and commercial area of Hazel.

IMPLEMENTATION CONSIDERATIONS:

The MOU will need to be developed outside of the normal design contract through discussions and negotiations with officials from Calloway County. Barry House with the KYTC Division of Planning has experience in working with local governments and Districts to create access management MOUs and may be able to help with implementation.

VALUE ENGINEERING PROPOSAL EC-04DS

Kentucky Transportation Cabinet

U.S. 641

Item #1-314.20

TITLE:	**Develop a Memorandum of Understanding (MOU) with local agencies to develop an Access Management Plan to control access**

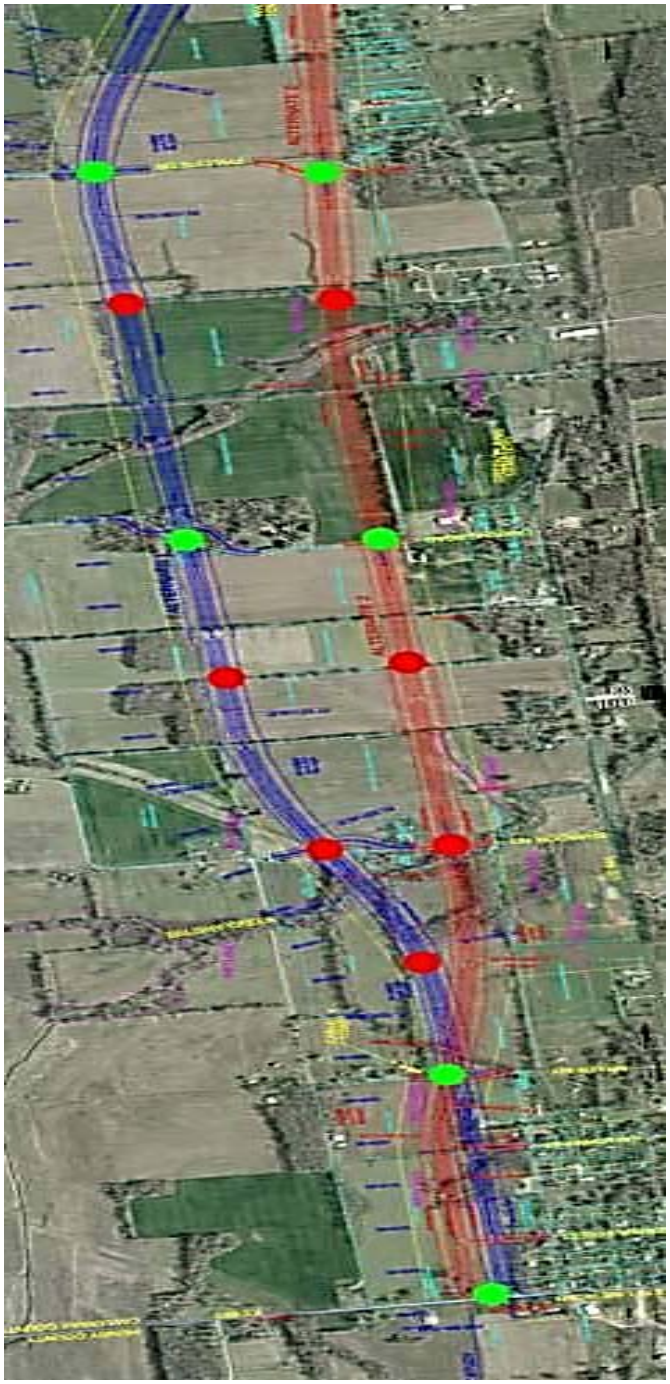
SKETCH OF BASELINE ASSUMPTION

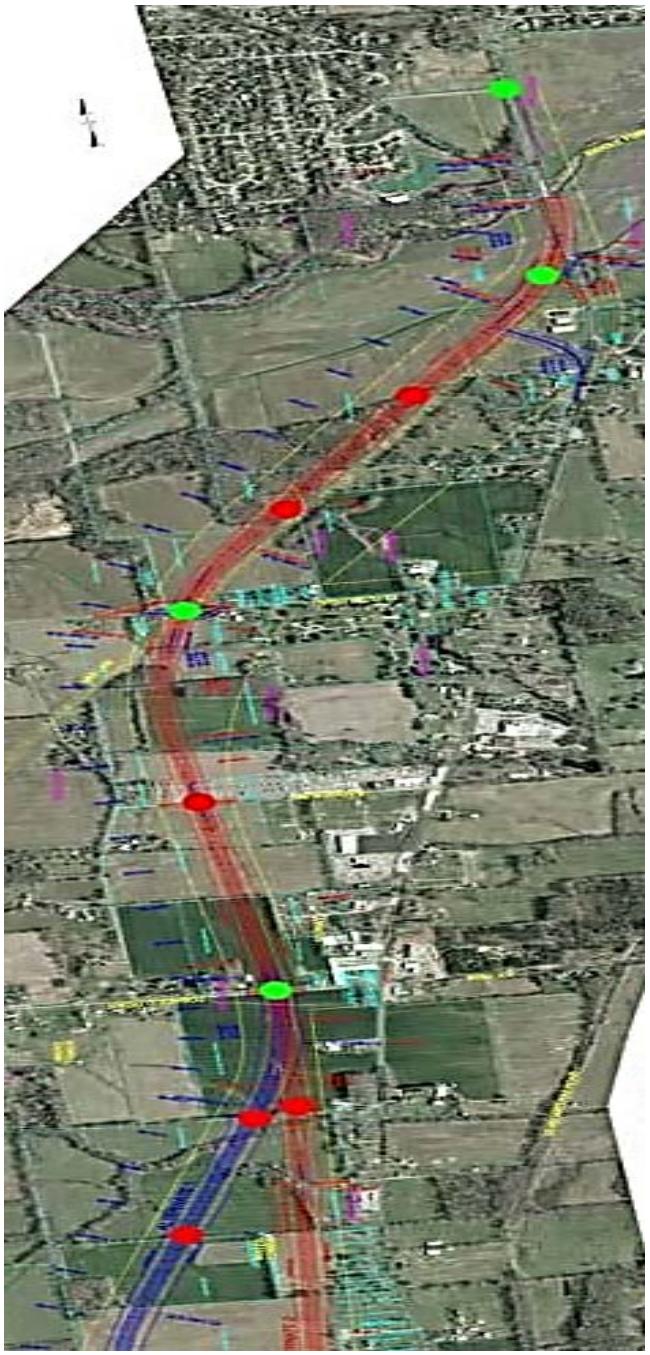
VALUE ENGINEERING PROPOSAL EC-04DS

Kentucky Transportation Cabinet
U.S. 641
Item #1-314.20

TITLE:	**Develop a Memorandum of Understanding (MOU) with local agencies to develop an Access Management Plan to control access**

SKETCH OF PROPOSED ALTERNATIVE





Green = Full access median location
Red = Partial access median location

VALUE ENGINEERING PROPOSAL EC-04DS

Kentucky Transportation Cabinet

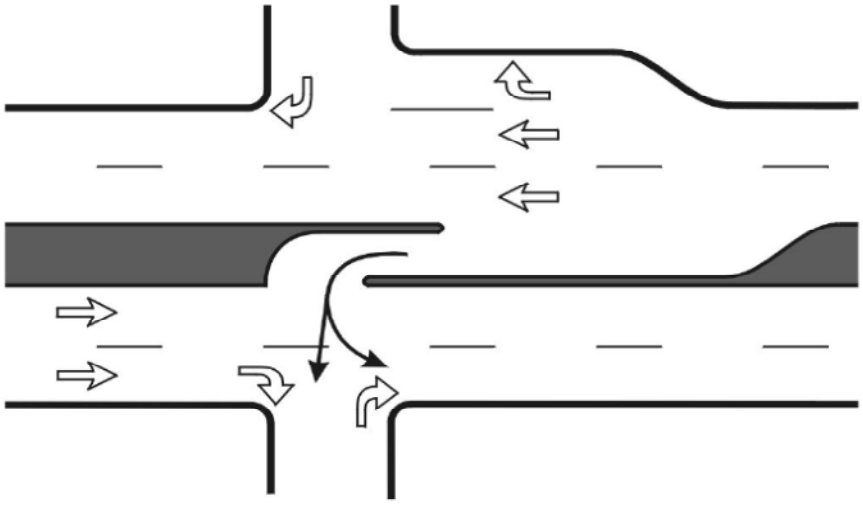
U.S. 641

Item #1-314.20

TITLE:	**Develop a Memorandum of Understanding (MOU) with local agencies to develop an Access Management Plan to control access**

SKETCH OF PROPOSED ALTERNATIVE

Partial Median Opening



APPENDICES

APPENDIX A
Study Participants

VE STUDY ATTENDEES

US 641 Widening, Item #1-314.10 & .20, Calloway County

RH & Associates, Inc.

January 2012					NAME	ORGANIZATION	POSITION	TELEPHONE		CELL	
24	25	26	27					E-MAIL			
X	X	X	X		Renee Hoekstra	RH & Associates, Inc.	Team Leader	623	266-3943	623	764-7490
								rhpartnering@earthlink.net			
			X		Boday Borres	KTC	Transportation Engineering Branch Manager	502	564-3280	502	229-5737
								boday.borres@ky.gov			
X	X	X	X		Brent Sweger	KTC	VE Coordinator	502	564-9900		
								brent.sweger@ky.gov			
					Mike McGregor	KTC	TEBM	270	898-2431	270	994-1908
								mike.mcgregor@ky.gov			
X	X	X	X		Rob Martin	Qk4	Constructability Team Member	502	585-2222	502	435-2140
								rmartin@qk4.com			
X	X	X	X		Peter Overmohle	AEI	Roadway Design Team Member	270	651-7220	270	670-5394
								povermohle@aei.cc			
X	X	X	X		Richard Tutt	AEI	Pavement Design Team Member	502	245-3813		
								rtutt@aei.cc			
X	X	X	X		Kenneth Ott	AEI	Corridor Design Team Member	502	245-3813	502	807-8198
								kott@aei.cc			
am X			X		David Martin	KTC	Location Engineer District 1 – Paducah	502	564-3280	502	352-8651
								charles.martin@ky-gov			
			X		Kevin Damron	KTC	DSHE	502	564-3730		
								kevin.damron@ky.gov			

F = Full Time, P = Part Time

VE STUDY ATTENDEES

US 641 Widening, Item #1-314.10 & .20, Calloway County

RH & Associates, Inc.

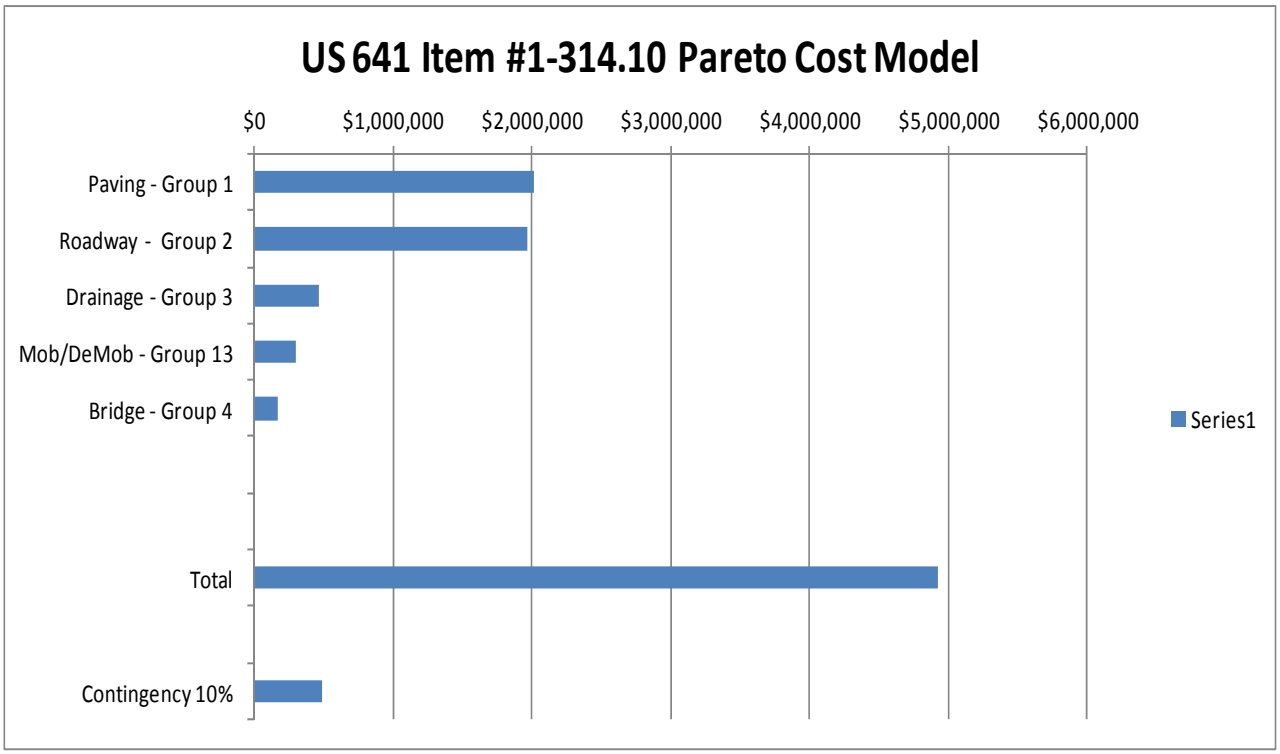
January 2012					NAME	ORGANIZATION	POSITION	TELEPHONE		CELL	
24	25	26	27					E-MAIL			
			X		Gary Sharpe	Palmer Engineering	Project Manager	859	744-1218	859	221-6912
								gsharpe@palmernet.com			
			X		Stephen Sewell	Palmer Engineering	Project Engineer	859	744-1218	859	492-0199
								ssewell@palmernet.com			
			X		Lynn Soporowski	KTC	Planning TEBM	502	564-7183		x 3298
								lynn.soporowski@ky.gov			
			X		Rick Sullivan	F&H					
			X		Chad Stopper	F&H					
			X		Doug Moore	F&H					

F = Full Time, P = Part Time

APPENDIX B
Pareto Cost Models

Appendix B – Cost Models

The team studied two projects. Item #1-314.10 has a cost model showing the Pareto breakdown. Item #1-314.20 provides a comparison of the costs of Alternative 1 and Alternative 2. Since these costs are very preliminary in nature, a cost model was not completed. Both items are included in the report.



Item #1-314.20 Cost Summary

The following represents the cost summary for Alternatives 1 and 2.

US 641 - Calloway County, KY Alternative Evaluation Matrix December 2011		
	Alternative 1	**Alternative 2**
Construction		
Pavement	$14,500,000	$15,000,000
Earthwork	$2,300,000	$2,700,000
Structures	$6,300,000	$3,500,000
Miscellaneous (25%)	$5,800,000	$5,300,000
Total Construction Cost	$28,900,000	$26,500,000
Total Right of Way Cost	$4,870,000	$4,870,000
Total Utility Cost	$5,480,000	$5,480,000
Initial Tie Down Construction		
Northbound Free Flow	$500,000	$500,000
Southbound Free Flow	$500,000	$600,000
Northbound Tee	$300,000	$400,000
Southbound Tee	$300,000	$400,000
Enviornmental		
Wetland Impacts (Acres)	1.98	4.76
# Stream Crossings	9	10
Blue Line Stream Crossing (LF)	2400	2600
Right of Way		
# Parcels	51	56
Estimated Right of Way (Acres)	178	180
# Houses	8	9
# Businesses	0	0
Design		
Maximum Grade	1.27%	1.27%
Minimum Grade	0.5%	0.5%
MOT (1=Easy, 5=Hard)	3	3
Utilities		
Gas Line (LF)	920	815

Unit Costs	
Mainline Pavement ($/SY)	$45
Shoulder Pavement ($/SY)	$30
Approach Pavement ($/SY)	$30
Excavation ($/CU YD)	$5
Box Culverts ($/CU FT)	$16.50
Bridges ($/SF)	$85

APPENDIX C
Function Analysis

Appendix C – Function Analysis

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 641 Projects based on the entire corridor using active verbs and measurable nouns. This process allowed the team to truly understand all of the functions associated with the project.

Function	Classification
Satisfy Users	***Higher Order***
Improve Traffic Flow	***Basic***
Identify Right-of-Way	Secondary
Improve Safety	Secondary
Minimize Impacts	Secondary
Limit Access	Secondary
Accommodate Vehicles	Secondary
Accommodate Farm Vehicles	Secondary
Ensure Connectivity	Secondary
Accommodate Multi-Modal	Secondary
Support Communities	Secondary
Span River	Secondary
Achieve Rideability	Secondary
Accommodate Drainage	Secondary

The definitions of the classifications are:

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

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

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

A Function Analysis Systems Technique (FAST) Diagram was not complete on this project.

APPENDIX D
Creative Idea List & Evaluation

Appendix D – Creative List and Evaluation Process

Creative Idea List

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

Performance Attributes

The project manager helped to define the key performance attributes for the team members to use for evaluation. The following key attributes were used to score the ideas (see below):

- **Construction Impacts –** Temporary impacts during construction; maintenance of traffic, dust, noise, etc.
- **Maintainability** – Impacts to maintenance costs; ease of maintenance
- **Level of Service** – Maintaining a "C" or better
- **Access Control/Local Operations** – Impacts to permanent impacts to the local roads
- **ROW/Land-use Compatibility**– Impacts to required ROW and the impacts to the existing farm lands
- **Connectivity**– Impacts to the connectivity to the current landowners and Hazel

Rating and Ranking of Performance Attributes

The team used a pared comparison table to rate and rank the performance attributes. A separate table was completed for each project as shown below.

US 641 Widening, Item #1-314.10

Construction Impacts		**A**	b	c	a/d	e									0.5	5%
	Maintainability		**B**	c	b	b									3.0	30%
		Level of Service		**C**	c	c									4.0	40%
			ROW Impacts		**D**	e									0.5	5%
				Connectivity		**E**									2.0	20%
	a	More Important													10.0	100%
	a/b	Equal Importance														

US 641 Corridor, Item #1-314.20

Construction Impacts			**A**	b	c	d	e								0.5	5%
	Maintainability			**B**	c	d	e								1.0	10%
		Level of Service			**C**	c	c								3.5	35%
			ROW/Land-use Compatability			**D**	d/e								2.5	25%
				Connectivity			**E**								2.5	25%
	a	More Important													10.0	100%
	a/b	Equal Importance														

Evaluation Process

To aid in the evaluation of the ideas, a two-step process was used. First, the team scored the ideas using a nominal group technique. The ideas were scored relative to the performance attributes as described above. The next step was to select those ideas which received votes and conduct a detailed evaluation on each idea based on the performance attribute and the specific ranking as shown above.

Group Nominal Technique Evaluation Results Score

The prioritization for further development and documentation is as follows:

Score =

- 1-5 – Number of votes meeting the criteria (Workbook)
- 0 – Number of votes meeting the criteria (No workbook)
- DS – Design Suggestion (No workbook)
- DS* – Design Suggestion (Workbook)

Performance Ratings

The second step in the rating used the performance criteria above and each idea was compared to the baseline and rated as follows:

10 = Idea is extremely preferred
9 = Idea is very strongly preferred
8 = Idea is strongly preferred
7 = Idea is slightly preferred
6 = Idea is slightly preferred
5 = Baseline & Idea are equal
4 = Baseline is slightly preferred
3 = Baseline is moderately preferred
2 = Baseline is strongly preferred
1 = Baseline is extremely preferred

The ratings for each performance measure are shown on the next several pages and a summary sheet is provided to show the total ratings compared to the baseline. In addition, the summary sheet shows a rating for cost in comparison to the baseline cost.

The creative idea list represents the overall scoring for the ideas that were rated using the group nominal technique and the performance ratings.

Creative Idea List

No.		Cost Rating	Performance Rating	Group Scoring (Prior to Performance Rating)
	ACCOMMODATE VEHICLES			
AV-01	Construct roadway profile closer to the existing profile	1	570	4
AV-02	Reduce design speed	--	NR	0
AV-03	Maintain access during construction	--	NR	C
AV-04	Use a 2+1 cross section from Middle Fork Clarks River Bridge north to Riverwood Road	1	500	2
AV-05	Eliminate curb and gutter between Tabbard Drive to the Riverwood Road	1	500	2
AV-06	Build a 3-lane rural typical/Right of Way for 5-lane	1	490	1
AV-07	Reduce lane width to 11' 11' 13' - 11' 11'	0	500	w/AM-02
AV-08	Build the sidewalk on one side of the road only	0	530	1
AV-09	Build a shared-use path in lieu of sidewalk	--	NR	0
AV-10	Change the asphalt binder from PG 76-22 to PG 64-22	1	NR	4
	LIMIT ACCESS			
LA-01	Build a non-traversable median	-1	495	3
LA-02	Develop an Access Management Plan and Memorandum of Understanding (MOU) with local governments	--	NR	DS*
LA-03	Eliminate access to the gas station parcel off of US 641	0	615	1
LA-04	Uses a non-traversable median at the gas station parcel	--	NR	0
LA-05	Re-use the existing signal at Glendale Road in lieu of installing a new one	--	NR	0
LA-06	Use a roundabout at Peggy Anne Drive	-1	530	1
	ACHIEVE RIDEABILITY			
AR-01	Confirm the uses of alternate pavement types	--	NR	0
AR-02	Use concrete at the Glendale intersection only	-1	550	1
	ACCOMMODATE MULTI-MODAL			
AM-01	Eliminate the sidewalk	--	NR	0
AM-02	Add bike lanes	--	550	1
AM-03	Ensure that the sidewalk grade is no more than 1.5% grade to meet ADA	--	NR	DS*
AM-04	Eliminate mailboxes along US 641	--	NR	w/AM-05
AM-05	Provide strategic pullouts with consolidated mailboxes to accommodate mail trucks	0	535	1

Creative Idea List

	SPAN RIVER			
SR-01	Use the existing bridge with no expansion	--	NR	0
SR-02	Replace the double barrel box with a precast 3-sided culvert	0	570	2
	ACCOMMODATE DRAINAGE			
AD-01	Use DBI 13x16 vs. CBI storm inlets/catch basins	0	505	1
AD-02	Keep the drainage pattern in the same location at Peggy Anne Drive	0	600	4
AD-03	Change the ditch protection type to high velocity mat with grass	--	NR	DS*
AD-04	Combine drop boxes with junction boxes	--	NR	DS
OG-34	Must deal with safety issues related to access (i.e., fall protection)	--	NR	DS
	MINIMIZE IMPACT			
MI-01	Eliminate the temporary easement behind the utility easement	1	515	4

PERFORMANCE & IDEA RATING MATRIX

US 641 Widening (.10)

Criteria	Criteria Weight	Idea No.	Description	Performance Rating										Total Performance
				1	2	3	4	5	6	7	8	9	10	
Construction Impacts	5	Bseline						5						25
		AV-01	Construct roadway profile closer to the existing profile								8			40
		AV-04	Use a 2+1 cross section from the Middle Fork of the Clarks River Bridge not to Riverwood Road					5						25
		AV-05	Eliminate curb and gutter between Tabbard Drive to Riverwood Road						6					30
		AV-06	Build a 3-lane rural typical/right of way for 5-lanes				4							20
		AV-07	Reduce lane width to 11' 11' 13' - 11' 11'					5						25
		AV-08	Build the sidewalk on one side of the road only					5						25
		LA-01	Build a non-traversable median				4							20
		LA-03	Eliminate access to the gas station parcel off of US 641					5						25
		LA-06	Use a roundabout at Peggy Anne Drive				4							20
		AR-02	Use concrete at the Glendale intersection only			3								15
		AM-05	Provide strategic pullouots with consolidated mailboxes to accommodate mail trucks					5						25
		AD-01	Use DBI 13x16 vs CBI storm inlets/catch basins						6					30
		AD-02	Keep the drainage pattern in the currrent location at Peggy Anne Drive							7				35
		MI-01	Eliminate the temporary easement behind the utility easement					5						25
														0
														0
														0
														0
														0

PERFORMANCE & IDEA RATING MATRIX

US 641 Widening (.10)

Maintainability	30	**Baseline**						5							150
		AV-01	Construct roadway profile closer to the existing profile					5							150
		AV-04	Use a 2+1 cross section from the Middle Fork of the Clarks River Bridge not to Riverwood Road						6						180
		AV-05	Eliminate curb and gutter between Tabbard Drive to Riverwood Road					5							150
		AV-06	Build a 3-lane rural typical/right of way for 5-lanes					5							150
		AV-07	Reduce lane width to 11' 11' 13' - 11' 11'					5							150
		AV-08	Build the sidewalk on one side of the road only						6						180
		LA-01	Build a non-traversable median				4								120
		LA-03	Eliminate access to the gas station parcel off of US 641					5							150
		LA-06	Use a roundabout at Peggy Anne Drive					5							150
		AR-02	Use concrete at the Glendale intersection only							7					210
		AM-05	Provide strategic pullouots with consolidated mailboxes to accommodate mail trucks					5							150
		SR-03								7					210
		AD-01	Use DBI 13x16 vs CBI storm inlets/catch basins					5							150
		AD-02	Keep the drainage pattern in the currrent location at Peggy Anne Drive								8				240
		MI-01	Eliminate the temporary easement behind the utility easement					5							150
															0
															0

PERFORMANCE & IDEA RATING MATRIX

Criteria	Criteria Weight	Idea No.	Description	Performance Rating										Total Performance
				1	2	3	4	5	6	7	8	9	10	
Level of Service	40	**Baseline**						5						200
		AV-01	Construct roadway profile closer to the existing profile					5						200
		AV-04	Use a 2+1 cross section from the Middle Fork of the Clarks River Bridge not to Riverwood Road				4							160
		AV-05	Eliminate curb and gutter between Tabbard Drive to Riverwood Road					5						200
		AV-06	Build a 3-lane rural typical/right of way for 5-lanes					5						200
		AV-07	Reduce lane width to 11' 11' 13' - 11' 11'					5						200
		AV-08	Build the sidewalk on one side of the road only					5						200
		LA-01	Build a non-traversable median						6					240
		LA-03	Eliminate access to the gas station parcel off of US 641								8			320
		LA-06	Use a roundabout at Peggy Anne Drive						6					240
		AR-02	Use concrete at the Glendale intersection only					5						200
		AM-05	Provide strategic pullouots with consolidated mailboxes to accommodate mail trucks						6					240
		AD-01	Use DBI 13x16 vs CBI storm inlets/catch basins					5						200
		AD-02	Keep the drainage pattern in the currrent location at Peggy Anne Drive					5						200
		MI-01	Eliminate the temporary easement behind the utility easement					5						200
														0
														0
														0
														0
														0

PERFORMANCE & IDEA RATING MATRIX

Criteria	Criteria Weight	Idea No.	Description	Performance Rating										Total Performance
				1	2	3	4	5	6	7	8	9	10	
ROW Impacts	5	**Baseline**						5						25
		AV-01	Construct roadway profile closer to the existing profile								8			40
		AV-04	Use a 2+1 cross section from the Middle Fork of the Clarks River Bridge not to Riverwood Road							7				35
		AV-05	Eliminate curb and gutter between Tabbard Drive to Riverwood Road				4							20
		AV-06	Build a 3-lane rural typical/right of way for 5-lanes				4							20
		AV-07	Reduce lane width to 11' 11' 13' - 11' 11'					5						25
		AV-08	Build the sidewalk on one side of the road only					5						25
		LA-01	Build a non-traversable median			3								15
		LA-03	Eliminate access to the gas station parcel off of US 641				4							20
		LA-06	Use a roundabout at Peggy Anne Drive				4							20
		AR-02	Use concrete at the Glendale intersection only					5						25
		AM-05	Provide strategic pullouots with consolidated mailboxes to accommodate mail trucks				4							20
		SR-03						5						25
		AD-01	Use DBI 13x16 vs CBI storm inlets/catch basins					5						25
		AD-02	Keep the drainage pattern in the currrent location at Peggy Anne Drive					5						25
		MI-01	Eliminate the temporary easement behind the utility easement								8			40
														0
														0
														0
														0
														0

PERFORMANCE & IDEA RATING MATRIX

Criteria	Criteria Weight	Idea No.	Description	Performance Rating 1	2	3	4	5	6	7	8	9	10	Total Performance
Connectivity	20	**Baseline**						5						100
		AV-01	Construct roadway profile closer to the existing profile							7				140
		AV-04	Use a 2+1 cross section from the Middle Fork of the Clarks River Bridge not to Riverwood Road					5						100
		AV-05	Eliminate curb and gutter between Tabbard Drive to Riverwood Road					5						100
		AV-06	Build a 3-lane rural typical/right of way for 5-lanes					5						100
		AV-07	Reduce lane width to 11' 11' 13' - 11' 11'					5						100
		AV-08	Build the sidewalk on one side of the road only					5						100
		LA-01	Build a non-traversable median					5						100
		LA-03	Eliminate access to the gas station parcel off of US 641					5						100
		LA-06	Use a roundabout at Peggy Anne Drive					5						100
		AR-02	Use concrete at the Glendale intersection only					5						100
		AM-05	Provide strategic pullouots with consolidated mailboxes to accommodate mail trucks					5						100
		AD-01	Use DBI 13x16 vs CBI storm inlets/catch basins					5						100
		AD-02	Keep the drainage pattern in the currrent location at Peggy Anne Drive					5						100
		MI-01	Eliminate the temporary easement behind the utility easement					5						100
														0
														0
														0
														0
														0

PERFORMANCE & IDEA RATING MATRIX

Idea No.		Total Performance	Cost Rating
Baseline		**500**	
AV-01	Construct roadway profile closer to the existing profile	570	1
AV-04	Use a 2+1 cross section from the Middle Fork of the Clarks River Bridge not to	500	1
AV-05	Eliminate curb and gutter between Tabbard Drive to Riverwood Road	500	1
AV-06	Build a 3-lane rural typical/right of way for 5-lanes	490	1
AV-07	Reduce lane width to 11' 11' 13' - 11' 11'	500	0
AV-08	Build the sidewalk on one side of the road only	530	0
LA-01	Build a non-traversable median	495	-1
LA-03	Eliminate access to the gas station parcel off of US 641	615	0
LA-06	Use a roundabout at Peggy Anne Drive	530	-1
AR-02	Use concrete at the Glendale intersection only	550	-1
AM-05	Provide strategic pullouots with consolidated mailboxes to accommodate mail trucks	535	0
AD-01	Use DBI 13x16 vs CBI storm inlets/catch basins	505	0
AD-02	Keep the drainage pattern in the currrent location at Peggy Anne Drive	600	0
MI-01	Eliminate the temporary easement behind the utility easement	515	1
		0	
		0	
		0	
		0	

Cost Rating

2 = ($500,000+ Cost Savings)
1 = ($100,000-$499,999 Cost Savings)
0 = Minimal or No impact
-1 = ($100,000 - $499,999 Added Cost)
-2 = ($500,000 + - Added Cost)

Creative Idea List

No.		Cost Rating	Performance Rating	Group Scoring (Prior to Performance Rating)
	ACCOMMODATE VEHICLES			
AV-01	Reduce the median width to 30'	1	525	4
AV-02	Partially use the existing US 641 as Alternate 3	1	550	3
AV-03	Reduce the median from 48' to 20'	2	565	w/AV-01
AV-04	Use a 2+1 typical cross section and/or 2-land with auxiliary lanes	2	540	2
AV-05	Build a 3-lane rural typical - 2 lanes with an auxiliary lane	2	540	w/AV-04
AV-06	Use a 2+1 cross section on Alternate 3	--	NR	0
AV-07	Use a 2-lane with auxilliary lanes on Alternate 3	2	550	1
AV-08	Build 2 lanes initially, defer the other 2 lanes until later	--	NR	0
AV-09	Provide a new alignment from Taylor Road to the bridge to lessen impacts on the gas line	2	480	3
AV-10	Tie into Old US 641 at KY 1828 to avoid the gas line	2	520	1
AV-11	Eliminate side road approaches at Brandon Road and Barber Road	0	575	2
AV-12	Tie-in at Stateline Road and eliminate the temporary tie-in	1	530	1
AV-13	Identify a major street into Hazel and widen as part of this project	--	NR	0
AV-14	Allow full median openings at Stateline and Miller with right-in and right-out at Center and Calloway	--	NR	DS*
AV-15	Eliminate Barber Road Access	--	NR	w/AV-11
AV-16	Reduce design speed	1	490	1
AV-17	Reduce the typical section lane widths, ditch, etc.	2	530	1
AV-18	Use Miller Road as the temporary tie-in and eliminate the planned temporary tie-in	1	530	1
AV-19	Provide an eastern alignment on the northern portion	2	520	3
AV-20	Allow skews at crossroads	--	455	0
AV-21	Use existing US 641 as a 1-way only and build just 2-lanes for the other direction (divided highway)	2	535	
AV-22	Address working platform	-	NR	DS*
AV-23	Change the asphalt binder from 76-22 to 64-22	-	NR	DS
	ENSURE CONNECTIVITY			
EC-01	End the project at Brandon and defer the remainder until TDOT is ready	--	NR	w/AV-18
EC-02	Increase coordination with TDOT and pursue the project as a joint effort	--	NR	DS
EC-03	Develop a Memorandum of Understanding (MOU) with local agencies on corridor preservation	--	NR	DS*

Creative Idea List

EC-04	Develop a Memorandum of Understanding (MOU) with local agencies to develop an access management plan to control access	--	NR	DS*
EC-05	Use the 1,200 ft standards in Hazel	0	535	w/EC-04
	MINIMIZE IMPACTS			
MI-01	Move the corridor from station 1255+00 to station 1275+00 to reduce the impacts to the landowner	--	NR	0
MI-02	Follow the NEPA process to ensure that federal funds could be used in the future	--	NR	DS
MI-03	Use a bridge in lieu of box at Brushy Creek to eliminate the in-lieu fees	--	NR	1

PERFORMANCE & IDEA RATING MATRIX

US 641 Widening (.20)

Criteria	Criteria Weight	Idea No.	Description	Performance Rating 1	2	3	4	5	6	7	8	9	10	Total Performance
Construction Impacts	5	**Bseline**						5						25
		AV-01	Reduce the median width to 30'					5						25
		AV-02	Partially use the existing US 641 as Alternate 3			3								15
		AV-03	Reduce the median from 48' to 20'						6					30
		AV-04	use a 2+1 typical cross section and or 2-lane with auxiliary						6					30
		AV-05	Build a 3-lane rural typical - 2 lanes with an auxiliary lane						6					30
		AV-07	Use a 2-lane with auxiliary on Alternate 3			3								15
		AV-09	Provide a new alignment from Taylor Road to the bridge to lessen the impact on the gas line						6					30
		AV-10	Tie into old US 641 at KY 1828 to avoid the gas line				4							20
		AV-11	Eliminate side road approaches at Brandon and Barber Roads						6					30
		AV-12	Tie-in at Stateline Road and eliminate the temporary tie-in						6					30
		AV-16	Reduce design speed					5						25
		AV-17	Reduce typical section lane widths, ditch, etc.						6					30
		AV-18	Use Miller road as the temporary tie-in and eliminate the planned temporary tie-in				4							20
		AV-19	Provide an eastern alignment on the northern portion o US 641				4							20
		AV-21	Use existing US 641 as a 1-way only and build just 2-lanes for the other direction (divided highway)				4							20
		EC-05	Use the 1,200 ft standards in Hazel					5						25

PERFORMANCE & IDEA RATING MATRIX

US 641 Widening (.20)

Maintainability	10	**Baseline**						5							50
		AV-01	Reduce the median width to 30'					5							50
		AV-02	Partially use the existing US 641 as Alternate 3							7					70
		AV-03	Reduce the median from 48' to 20'						6						60
		AV-04	use a 2+1 typical cross section and or 2-lane with auxiliary							7					70
		AV-05	Build a 3-lane rural typical - 2 lanes with an auxiliary lane							7					70
		AV-07	Use a 2-lane with auxiliary on Alternate 3							7					70
		AV-09	Provide a new alignment from Taylor Road to the bridge to lessen the impact on the gas line					5							50
		AV-10	Tie into old US 641 at KY 1828 to avoid the gas line						6						60
		AV-11	Eliminate side road approaches at Brandon and Barber Roads						6						60
		AV-12	Tie-in at Stateline Road and eliminate the temporary tie-in					5							50
		AV-16	Reduce design speed					5							50
		AV-17	Reduce typical section lane widths, ditch, etc.					5							50
		AV-18	Use Miller road as the temporary tie-in and eliminate the planned temporary tie-in						6						60
		AV-19	Provide an eastern alignment on the northern portion o US 641					5							50
		AV-21	Use existing US 641 as a 1-way only and build just 2-lanes for the other direction (divided highway)						6						60
		EC-05	Use the 1,200 ft standards in Hazel					5							50
															0

PERFORMANCE & IDEA RATING MATRIX

Criteria	Criteria Weight	Idea No.		Performance Rating										Total Performance
				1	2	3	4	5	6	7	8	9	10	
Level of Service	35	**Baseline**						5						175
		AV-01	Reduce the median width to 30'					5						175
		AV-02	Partially use the existing US 641 as Alternate 3				4							140
		AV-03	Reduce the median from 48' to 20'					5						175
		AV-04	use a 2+1 typical cross section and or 2-lane with auxiliary				4							140
		AV-05	Build a 3-lane rural typical - 2 lanes with an auxiliary lane				4							140
		AV-07	Use a 2-lane with auxiliary on Alternate 3				4							140
		AV-09	Provide a new alignment from Taylor Road to the bridge to lessen the impact on the gas line					5						175
		AV-10	Tie into old US 641 at KY 1828 to avoid the gas line				4							140
		AV-11	Eliminate side road approaches at Brandon and Barber Roads						6					210
		AV-12	Tie-in at Stateline Road and eliminate the temporary tie-in					5						175
		AV-16	Reduce design speed				4							140
		AV-17	Reduce typical section lane widths, ditch, etc.					5						175
		AV-18	Use Miller road as the temporary tie-in and eliminate the planned temporary tie-in					5						175
		AV-19	Provide an eastern alignment on the northern portion o US 641					5						175
		AV-21	Use existing US 641 as a 1-way only and build just 2-lanes for the other direction (divided highway)					5						175
		EC-05	Use the 1,200 ft standards in Hazel						6					210
														0
														0
														0
														0

PERFORMANCE & IDEA RATING MATRIX

Criteria	Criteria Weight	Idea No.		Performance Rating										Total Performance
				1	2	3	4	5	6	7	8	9	10	
ROW/Land-Use Compatibility	25	**Baseline**						5						125
		AV-01	Reduce the median width to 30'						6					150
		AV-02	Partially use the existing US 641 as Alternate 3							7				175
		AV-03	Reduce the median from 48' to 20'							7				175
		AV-04	use a 2+1 typical cross section and or 2-lane with auxiliary							7				175
		AV-05	Build a 3-lane rural typical - 2 lanes with an auxiliary lane							7				175
		AV-07	Use a 2-lane with auxiliary on Alternate 3							7				175
		AV-09	Provide a new alignment from Taylor Road to the bridge to lessen the impact on the gas line				4							100
		AV-10	Tie into old US 641 at KY 1828 to avoid the gas line						6					150
		AV-11	Eliminate side road approaches at Brandon and Barber Roads						6					150
		AV-12	Tie-in at Stateline Road and eliminate the temporary tie-in						6					150
		AV-16	Reduce design speed						6					150
		AV-17	Reduce typical section lane widths, ditch, etc.						6					150
		AV-18	Use Miller road as the temporary tie-in and eliminate the planned temporary tie-in						6					150
		AV-19	Provide an eastern alignment on the northern portion o US 641						6					150
		AV-21	Use existing US 641 as a 1-way only and build just 2-lanes for the other direction (divided highway)				4							100
		EC-05	Use the 1,200 ft standards in Hazel						6					150
														0
														0
														0
														0

PERFORMANCE & IDEA RATING MATRIX

Criteria	Criteria Weight	Idea No.		Performance Rating										Total Performance
				1	2	3	4	5	6	7	8	9	10	
Connectivity	25	**Baseline**						5						125
		AV-01	Reduce the median width to 30'					5						125
		AV-02	Partially use the existing US 641 as Alternate 3						6					150
		AV-03	Reduce the median from 48' to 20'					5						125
		AV-04	use a 2+1 typical cross section and or 2-lane with auxiliary					5						125
		AV-05	Build a 3-lane rural typical - 2 lanes with an auxiliary lane					5						125
		AV-07	Use a 2-lane with auxiliary on Alternate 3						6					150
		AV-09	Provide a new alignment from Taylor Road to the bridge to lessen the impact on the gas line					5						125
		AV-10	Tie into old US 641 at KY 1828 to avoid the gas line						6					150
		AV-11	Eliminate side road approaches at Brandon and Barber Roads					5						125
		AV-12	Tie-in at Stateline Road and eliminate the temporary tie-in					5						125
		AV-16	Reduce design speed					5						125
		AV-17	Reduce typical section lane widths, ditch, etc.					5						125
		AV-18	Use Miller road as the temporary tie-in and eliminate the planned temporary tie-in					5						125
		AV-19	Provide an eastern alignment on the northern portion o US 641					5						125
		AV-21	Use existing US 641 as a 1-way only and build just 2-lanes for the other direction (divided highway)				4							100
		EC-05	Use the 1,200 ft standards in Hazel				4							100
														0
														0
														0
														0

PERFORMANCE & IDEA RATING MATRIX			
Idea No.		**Total Performance**	**Cost Rating**
Baseline		**500**	
AV-01	Reduce the median width to 30'	525	1
AV-02	Partially use the existing US 641 as Alternate 3	550	1
AV-03	Reduce the median from 48' to 20'	565	2
AV-04	Use a 2+1 typical cross section and or 2-lane with auxiliary	540	2
AV-05	Build a 3-lane rural typical - 2 lanes with an auxiliary lane	540	2
AV-07	Use a 2-lane with auxiliary on Alternate 3	550	2
AV-09	Provide a new alignment from Taylor Road to the bridge to lessen the impact on the gas line	480	2
AV-10	Tie into old US 641 at KY 1828 to avoid the gas line	520	2
AV-11	Eliminate side road approaches at Brandon and Barber Roads	575	0
AV-12	Tie-in at Stateline Road and eliminate the temporary tie-in	530	1
AV-16	Reduce design speed	490	1
AV-17	Reduce typical section lane widths, ditch, etc.	530	2
AV-18	Use Miller road as the temporary tie-in and eliminate the planned temporary tie-in	530	1
AV-19	Provide an eastern alignment on the northern portion o US 641	520	2
AV-21	Use existing US 641 as a 1-way only and build just 2-lanes for the other direction (divided highway)	455	2
EC-05	Use the 1,200 ft standards in Hazel	535	0

Cost Rating

+2 = ($1,000,000+ Cost Savings)
+1 = ($250,000-$999,999 Cost Savings)
0 = Minimal or No impact
-1 = ($250,000 - $999,999 Added Cost)
-2 = ($1,000,000+ Added Cost)

APPENDIX E
Supporting Data

Appendix E – Supporting Data

Team Observations

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

Item #1-314.10

1. The project looked at 3 options and the eastern alignment was selected.
2. The project is 90% designed.
3. Utilities are to be authorized for construction in 2013.
4. The project provides for a utility corridor in the right of way.
5. The roadway profile appears to be rather conservative on a 5% grade which means there will be significant cuts.
6. The design team identified significant line of sight issues at the intersections.
7. The drainage pattern on the project goes from west to east.
8. The current design is using some urban design standards, much of the area is in a rural section.
9. The Middlefork Bridge of the Clarks River is not currently in either project.
10. The north end tie-in is to Glendale Road, which is already a constructed 5-lane roadway.
11. On the north end, access control is by permit, which means anyone can get access, this creates challenges.

Item #1-314.20

1. The access control at Hazel recommends 45 mph.
2. There appear to be pavement design opportunities.
3. There are only two alignments being shown.
4. Using the existing US 641 as an alternative was eliminated out early in the project based on an "intuition" decision.
5. The Tennessee section is not currently being planned up to the state line, but they are planning for the corridor on the west side.
6. One of the decisions for a 48" median is because of Tennessee's design, which includes a 48' median.
7. There is currently a low traffic projection with very little growth projected.
8. There is a potential that the pavement may be overdesigned due to the volumes of traffic.
9. There doesn't appear to be any geotechnical information available in the corridor.
10. Typical sections are 12' lanes and 10' shoulders.
11. The 4-lane design may be too many based on projected traffic volumes.
12. US 641 needs to tie-in at some location at Hazel.
13. There is a major gas main crossing at Taylor Road, and there appears to be three lines.
14. There are no funds for the project, however the goal is to use state funds. If federal funds are going to be used in the future, it is important the processes are followed to not preclude the use of federal funds.
15. Coordination with TDOT is important for the success of this project.
16. There was a concern as to whether the wetlands have been addresses appropriately.

Cost Estimate Comments

The VE team identified a couple of areas within the cost estimate that are noted here.

- The structures cost between Alternative 1 and Alternative 2 do not seem appropriate considering one is a bridge and one is a box culvert.
- The right of way costs are shown as the same, but there seems to be more costs in one Alternative than the other.
- There is nothing being shown for any wetlands mitigation.
- The traffic signal at Glendale Road is missing from the estimate.
- The bridge at the Middlefork of the Clarks River does not appear to be included in either estimate.

Constructability Comments

As part of the Value Engineering Study conducted for this project, the VE Team observed several plan details that may need additional clarification prior to letting the contract out for bid.

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PLAN SHEET	ITEM DESCRIPTION	COMMENT
R2	ASPHALT BINDER TYPE	Review the use of PG 76-22 as you may be able to use PG 64-22
R2	EDGE DETAIL	Address saw cut edge requirements(need and payment for) - suggest adding longitudinal edge key requirement *(comment applicable to all typicals)*
R2B	PLAN NOTE 2	Suggest using 1" per 5' (1.67%) rather than 2% desirable: ADA tolerance is "2% max" - no construction tolerance for greater than 2% - use of 1.67% would allow for minor fluctuations and still remain within ADA specifications *(comment applicable to all sidewalk typicals)* – **This comment has been provided because of current projects where FHWA required the sidewalks to be torn up during construction.**
R2B	PLAN NOTE 3	"10:1" slope seems steep - suggest using 4%
R2B	EDGE DETAIL	Clarify the depth of #57 stone backfill *(comment applicable to all typicals)*
R2C	EDGE DETAIL	See sheet "R2B"
R2D	DGA DEPTH	Suggest using 4" increments - adjust surface or curb height to match up
R2H	ADA PAVERS	Add as bid item for ramps
R2H	WITNESS POSTS	Urban job – determine if these are needed

PLAN SHEET	ITEM DESCRIPTION	COMMENT
R2H	CHANNEL LINING	Consider using more turf mats rather than channel lining- "green solution" and better received by property owners
R5	JPC-8"SHOULDER	Consider mill and overlay shoulders rather than dig out and replace shoulders with concrete, use integral header curb for the type at the bridge end treatments. Improves ease of construction and MOT
R9	18"PIPE CROSSING	Consider tying the new pipe to the new curb box on Tabbard Drive rather than cutting across the road. Improves ease of construction, MOT, and improves long term maintenance
R21	RELOCATE BRICK COLUMN	Suggest that KYTC pay the property owner to move it as part of right of way requirements
R21	RELOCATE VINYL BOARD FENCE	Suggest that KYTC pay the property owner to move it as part of right of way requirements
R21	TREES IN EASEMENT	Several significant trees along the left side 135+00 to 140+00 (parcel 13 & 19): are shown within the permanent easement area. Clarify if they are to be removed or "do not disturb" on the plans
R22	RIGHT OF WAY	The Right of Way Summary Sheet needs to be updated to reflect the temporary easement
R24	MANHOLE IN STREET	Consider eliminating the use of "t", are able to clean from the inlets
R30	RT 150+85	Consider using a modified box to eliminate the need for a junction box
R33	TRAFFIC SIGNAL	Relocation of the signal is not included in the plans or estimate. Take out the poles in the SW and SE quadrants
R76	NOTE 9	Provide anchor detail
R76 & R77	NOTE 12 & NOTE 1	Define "low volume hours"
R78	LANE WIDTH AND DRUM	No minimum lane width has been defined. Suggest allowing the use of grabber cones in lieu of drums to allow for a minimum of 10'
R78	TEMPORARY WALL STABILIZATION MATERIALS	Clarify how this material is paid for
R84	TEMPORARY DRAINAGE DURING CONSTRUCTION	Review temporary ditch between phase 1 and 2 construction 113+00-118+00. This may need temporary pipe installed in phase 1 to allow adequate drainage

PLAN SHEET	ITEM DESCRIPTION	COMMENT
R81&R82	ACCESS ISSUES: 124+00 TO 145+00	Grade differentials between proposed and existing appears to be significant. The need to maintain access during construction will require temporary roadways to be constructed multiple times. Suggest reviewing the amount of DGA set up for this purpose and add note in the plans that “contractor must salvage DGA for reuse for maintenance of access at the direction of the engineer”. This is incidental to MOT.