Value Engineering Study

Final Report

Kentucky Transportation Cabinet

KY 11 Relocation

Lee and Owsley Counties

Item No: 10-292.00, 10-292.1, 10-292.4

January 2008

Strategic Value Solutions, Inc.

Final

Value Engineering Study Report

for

KY 11 Relocation

Lee and Owsley Counties

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Kentucky Transportation Cabinet
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ACKNOWLEDGEMENTS

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In addition, we would like to thank the members of the GRW Engineers, Inc. design team for sharing their knowledge about the project and for their responsiveness to our questions and requests throughout this Value Engineering study.

We would also like to thank the KYTC design and construction staff for assisting us through our learning curve (since this is our first VE study for KYTC).

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SECTION 1

EXECUTIVE SUMMARY

SECTION 1
EXECUTIVE SUMMARY

This report presents the results of a Value Study conducted by Strategic Value Solutions, Inc. (SVS) on the design of the KY 11 Relocation project for the Kentucky Transportation Cabinet (KYTC). The project was reviewed at completion of the Phase I Design.

The project design being reviewed was developed by GRW Engineers, Inc. (GRW).

The Value Study included a 5-day (40-hour) value methodology workshop that was conducted with a multidisciplinary team in Frankfort, KY on January 14 - 18, 2008.

PROJECT DESCRIPTION SUMMARY

The proposed project is to partially reconstruct and to partially relocate approximately seven miles of KY 11 from KY 30 at Levi to the original KY 11 alignment north of Beattyville. The project corridor serves as a connection between I-75 and the Mountain Parkway. Beattyville is a small rural community located at the western edge of the Eastern Kentucky Coal Fields region, at the confluence of the South Fork Kentucky River and North Fork Kentucky River in Lee County.

The project proposes to relocate a portion of the KY 11 alignment between KY 587 and a point on the original alignment north of Beattyville. The new alignment is proposed to improve the river crossing and to improve adverse grades and horizontal geometry just south of the river. The recommended alternative is Alternate 2D which uses an alignment across a largely undeveloped section of land in Lee County. This alignment requires only one river crossing rather than the two crossings in the original alignment.

The proposed roadway improvements include construction of a two-lane roadway with 12-foot lanes and 12-foot shoulders. The new roadway geometry will meet the design speed criteria for 55 mph with truck climbing lanes where necessary. The project also includes improvements and realignments to various intersecting and connector roads along KY 11, including KY 30, KY 52, and KY 587, along with other local access roads.

A new 2,300 foot long bridge is required to cross the Kentucky River. The bridge typical section consists of two 12-foot lanes with 12-foot shoulders.

VALUE STUDY TEAM

The team members that comprised this multidisciplinary Value Study Team are listed on the introductory pages of this report. All other participants of the study are provided in Appendix A.

In general, the Value Study Team members were independent of the project development team. This ensured maximum objectivity towards identifying alternative solutions.

VALUE METHODOLOGY

This Value Study used the international standard Value Methodology established by SAVE International, the Value Society. The Value Methodology (VM) uses a six-phase process

executed in a workshop format with a multidisciplinary team. Value is expressed as the relationship between functions and resources where function is measured by the performance requirements of the customer and resources are measured in materials, labor, price, time, etc. required to accomplish that function. VM focuses on improving Value by identifying the most resource efficient way to reliably accomplish a function that meets the performance expectations of the customer.

With this process, the Value Team identifies the essential project functions and alternative ways to achieve those functions, and then selects the best alternatives to develop into workable solutions for value improvements.

Additional information about the Value Study processes used in the generation of the results presented is provided in Section 3 of this report.

Value Study Constraints

Often constraints or limits are imposed on the Value Study to define the boundaries between project aspects that the project stakeholders will consider changing and those that cannot be changed. These constraints may result from a variety of political, technical, schedule, or environmental causes. For this Value Study, no such constraints were placed on the team's ability to identify and pursue creative solutions for value improvements.

PROJECT COST ANALYSIS

The Value Team was provided a construction cost estimate as part of the project documentation. This estimate indicated an anticipated construction cost of $42,645,739 based on 2003 prices for the preferred Alternate 2D as well as estimated construction costs for Alternates 1, 2, 2A, 2B, 3 and 4. The project budget has not been set. The date of the construction start is not yet scheduled and the construction duration has not been set.

As a part of this workshop, the team reviewed this construction cost estimate. The review verified the estimated costs, ensuring that the Value Team had reliable data to use as the basis for cost comparisons of alternative concepts. The review also served as a check on the accuracy of the overall project cost.

The review concluded that:

- The unit costs were consistent across all the estimates. This provides an equal basis from which to compare alternatives, however it does not account for the increased diffculty between some work elements. For example the estimate for high steel plate girder/ PCI beam bridge over the Kentucky River in Alternate 2D does not include the additional costs that would be associated with coffer dams or the difficult access required to erect the main span beams.

- The costs should be updated to 2007 numbers, since no scheduled start date and duration has been set. The Unit Price Averages for 2007 were not yet available, so bid tabs from six 2007 projects were analyized to create the 2007 unit prices used in the Value Team's estimates.

- Bridge quantities warrant further review. For instance in Alternate 2D, the 16-span Kentucky River Bridge has slightly more than double the substructure concrete of the 4-span Crystal Creek Bridge. Other quantities had similar relationships.

- Detailed checks of the quantities were not performed.

- Guardrail quantities warrant further review. On the section from the County line to the river, Alternate 2D route is new terrain and more rugged that Alternate 1 which follows the existing KY 11 alignment. Alternate 2D has 41,000 feet of guardrail where as Alternate 1 has 38,000 feet.

- Right-of-way acreage between Alternate 2D (201 ac) and Alternate 1 (170 ac) seems disproportionate since Alternate 1 follows existing KY 11 and Alternate 2D has significant length of new terrain alignment.

- The 15% contingency seems light for a project at this stage of development. The Value Team recommends 20%.

- Utility costs must be developed to fully evaluate the program costs

    - It seems that all of the costs associated with Center Street Connector have not been accounted for.

    - The Value Team questioned the $3.50/cy unit price for roadway excavation-seemingly low considering the amount of rock. This number was verified with KYTC Central Office Construction Department

Any discrepancies between the Value Team's revised estimate and GRW's original cost estimate were not reconciled between the Value Team's cost estimator and GRW's cost estimator.

WORKSHOP RESULTS

Traffic Analysis

As part of the Value Study, the team evaluated the traffic forecast report dated February 18, 2005. This report provided traffic counts for 2004 and the projected traffic by 2025. This review highlighted three key issues:

1. The new KY 11 alignment using the Alternate 2D alignment is only projected to serve 4,000 vehicles for the average daily traffic (ADT). This includes 16% truck traffic. This is a low volume of traffic. To put it into perspective, if we consider the majority of this traffic will occur between 6:00 AM and 10:00 PM (16 hours) it averages to 250 cars in either direction within an hour. Therefore, a significant amount of the project cost is associated with bypassing a very low volume of traffic around the downtown Beattyville area.

2. Old KY 11 will continue to serve 4,300 ADT (2025). This is more traffic than the roadway serves today.

A comment was made to the Value Team that one objective of the project was to reduce congestion or improve the traffic situation in downtown Beattyville by bypassing a portion of the traffic. (It should be noted that this comment is not supported by the purpose and needs statement for the project). However, even if it is not a stated purpose, it should be a consideration. The downtown area is congested today and based on the traffic forecast it is going to be substantially more congested in the future. For example immediately south of the new KY 52 intersection with KY 11, there is a 6,500 ADT today and a 10,400 ADT for 2025 which is a 60% increase in traffic. These numbers consider that KY 11 is relocated using the Alternate 2D alignment. The traffic circulation is also going to be further complicated by the new connection with the Alternate 2D alignment to existing KY 11 and the close proximity to KY 52 intersection. The projected traffic counts for the connection from Alternate 2D alignment to KY 11 appears to be very low based on the traffic counts for the adjacent streets. Therefore there may be an even greater ADT on existing KY 11 than the projected 10,400 ADT.

Function Analysis

The purpose of the workshop is to identify and develop alternative concepts that will improve the overall value of the project. In order to be successful at identifying alternatives, it is essential that the Value Team first understand the project objectives and the problems that must be solved. For this reason, the workshop began with presentations by KYTC's project management to define the project objectives and to provide background information on the project. This was followed by a more detailed presentation of the project design by the project development team on how the design will accomplish the project's objectives. To give the Value Team a better perspective on the project the team participated in a site visit following the presentations.

This Information Phase of the workshop was followed by an in-depth analysis of the functional requirements of the project. A complete understanding of the basic functions that must be accomplished in order to successfully achieve the mission of the project is essential for the team to identify feasible alternatives to the current concept. From this Function Analysis Phase of the workshop the team gained the following understanding about the basic functions of the project.

Using function analysis and Function Analysis System Technique (FAST) diagramming, the team concluded the mission of this project is to improve system-to-system connectivity between I-75 and the Mountain Parkway by improving the KY 30 and KY 11 route. By doing so, we will improve the potential for economic development along the corridor. The basic function that must be accomplished in order to accomplish this mission is to increase safety by improving sight distances and by improving horizontal and vertical geometry. Analysis of the functions intended to be performed by the project, helped the team focus on the mission of the project and, consequently, how to identify alternative concepts that would still meet the mission while exploring opportunities for value enhancement.

Analyzing the functions of this project gave the team the following key insights:

- The project has two primary issues to resolve; one is to improve sight distances and the other is to improve horizontal and vertical geometry.

- A driver for shifting off the original alignment was to avoid the adverse geometry (horizontal curves and steep grade) immediately south of the South Fork of the Kentucky River.

- The majority of the project cost is consumed in constructing the relocation of KY 11 from KY 587 to a point on the original alignment north of downtown Beattyville. This new alignment will serve less than 50% of the traffic. The remainder of the traffic will continue to use the original alignment. The traffic count on the original alignment north of KY 587 is 4,100 ADT (2004). The traffic count after constructing Alternate 2D alignment shows a 2,700 ADT (2004) on the original alignment which will increase to 4,300 ADT (2025). This suggests 2025 traffic volumes that are slightly greater than today's volume on a roadway that is considered to have significant enough safety issues to warrant this project. If increasing safety is the mission of this project, we have perhaps not solved the problem with the proposed Alternate 2D alignment.

With an understanding of the functional requirements, the Value Team transitioned to the Creative Phase of the workshop and brainstormed on all of the possible ways to accomplish each of those functions. The team generated 40 ideas for potential changes to the current design.

Based on the team members' professional judgment and input from KYTC and GRW representatives, eight of these ideas were selected for developing into Value Alternatives.

Value Alternatives

Table 1-1, at the end of this section, includes a complete list of all the Value Alternatives developed. This table shows the number and title of each alternative as well as a summary of the cost savings. These savings include the capital or first cost savings as well as the present worth value of the savings associated with the long term owning and operating costs over the economic life of the project. The first cost savings and the present worth savings on operations and maintenance (O&M) sum to give the overall life cycle cost savings for each Value Alternative.

It should be noted that Value Studies are working sessions for the purpose of developing and recommending alternative approaches to the current design. As such, the results presented are of a conceptual nature and are not intended as a final design. Detailed feasibility assessment and final design development of any of the alternatives or suggestions presented herein, should they be accepted, remain the responsibility of KYTC and GRW.

Some alternatives presented in this report are variations of a common concept and others are alternatives to a specific aspect of the design. Thus, not necessarily all alternatives in this report can be implemented as selection of some may preclude or limit the use of others.

These potential savings do not reflect any costs for redesign, which must be considered. Moreover, the full benefit and impact of many of the alternatives goes beyond the cost savings to include improved project performance of required functions.

Optimum Combination of Alternatives

After completing the development of the Value Alternatives, the team reviewed the composite list of alternatives to identify what they believed to be the optimum combination of alternatives. This combination represents the best value solution for the project in the opinion of the Value Team. The review concluded that the maximum project benefits would be realized by combining the alternatives as detailed in Table 1-2 – Optimum Combination.

The Value Team identified two options. The first combination is focused on optimizing Alternate 2D and the second option addresses a total reconstruction and widening of the existing alignment all the way through downtown Beattyville.

Option 1 - Optimizing Alternate 2D, results in the following potential cost savings:

Capital Cost Savings	$ 13,416,000
Present Worth of O&M Cost Savings	$ 89,000
Life Cycle Cost Savings	$ 13,505,000

Option 2 - Total Reconstruction and Widening of Existing Alignment, results in the following potential cost savings:

Capital Cost Savings	$ 20,544,000
Present Worth of O&M Cost Savings	$ 879,000
Life Cycle Cost Savings	$ 21,423,000

The savings from some of the individual Value Alternatives have been adjusted to account for overlapping savings when combined with other Value Alternatives. The calculations for these savings can be found in the Cost Information Appendix to this report.

Design Suggestions

In addition to the Value Alternatives, the team also identified two design suggestions. These are suggestions for changes or clarifications to the project documents that did not have an identifiable or quantifiable cost impact that could be determined within the scope of the workshop. The design suggestions from this study are included in Section 5 of this report.

Validation of Design

In the process of identifying recommendations for change, the value team evaluated all aspects of the design. In general, an absence of recommendations pursuant to certain portions of the project investigated can serve as a validation of the design for those portions of the project. If a portion of the project is investigated and no recommendation for change results from that investigation, then it can be assumed that the Value Team agrees with the design as originally presented. Through this process, many of the current design decisions proved to be appropriate to accomplish the required functions. Some of the more significant decisions that were validated through the scrutiny of the Value Study include:

- The maintenance of traffic plan between KY 30 and KY 587 seems very appropriate and cost effective.
- Eliminating the adverse horizontal curves north of KY 587 and at County Line Road is appropriate and will reduce many of the accidents.

- If Alternate 2D is ultimately the selected solution, the team agrees that this is a good alignment for a new road and that GRW has done a good job of setting the profile and alignment.

Additional Benefits

A Value Study typically results in benefits beyond cost savings. These benefits are generated as a part of an alternative, design suggestion, or from an observation made by the team or one of the other participants during the workshop. Below are some of the benefits realized from this study, in addition to the cost savings discussed above.

- The Value Team updated the cost estimate for the project providing a more current estimate for planning and budgeting purposes.

- The Value Study has highlighted or raised KYTC's awareness to the fact that that there will continue to be significant traffic congestion in downtown Beattyville that will essentially be unaffected by this project.

RESOLUTION OF VALUE ALTERNATIVES

To finalize the Value Study it is essential that decisions are made on the resolution of each of the Value Alternatives and Design Suggestions presented in this report. This needs to be a collaborative effort between KYTC and GRW. The ultimate disposition of the Value Alternatives will be documented separately from this report.

CONCLUSIONS

In the team's analysis of the project as presented in the Phase I Design Report, we concluded that increasing safety along this corridor is the basic function of this project. The accident records indicate that the safety issues are caused by deficient sight distances, adverse geometry, and congestion. The Project Team and the community have recommended implementation of Alternate 2D which reconstructs a portion of the KY 11 alignment and relocates a portion to a new alignment in order to address these safety issues. While this alignment is a very good approach to addressing the sight distance and geometry concerns it is also very costly and it does not address the congestion in downtown Beattyville which is also an identified safety issue.

Alternate 2D is a $59 million solution which equates to $4.24 million/mile and only serves 4,000 ADT.

The objective of the value study was to

- Improve functional performance (Increase Safety)

- Identify opportunities to reduce cost without sacrificing the required functions

- Identify opportunities to optimize the recommended alignment (Alternate 2D)

- Explore other alternative alignments

- Identify Value Improvement Alternatives for implementation with any selected alignment

The Value Team believes that the functional performance of the project can be improved and the cost substantially reduced by implementing either of two combinations of the Value Alternatives in this report.

Optimum Combination 1 optimizes the Project Team's and the community's preferred alignment (Alternate 2D) and saves $13.8 million.

Optimum Combination 2 addresses the Value Team's concern with the substandard roadway that would remain with old KY 11 if Alternate 2D were to be implemented. This combination reconstructs existing KY 11 and widens the alignment downtown to improve safety and reduce congestion. This combination saves $20.8 million.

Table 1-1
Summary of Alternatives

Alt. No.	Description	First Cost Savings	Present Worth O&M Savings	Life Cycle Cost Savings
Alt 2D (AD)				
AD-4	Eliminate new Center Street alignment and provide a connection with existing KY11 north of Senior Center	$5,932,000	$89,000	$6,021,000
AD-6	Create a straight line connection (avoid reverse curve)	$1,782,000	$0	$1,782,000
AD-12	Create a connection from new Alt 2D to new KY 52	$1,137,000	$94,000	$1,231,000
Improve Route (IR)				
IR-1	Use Alt 1 and extend to the river bend north of town	($1,734,000)	$629,000	($1,105,000)
IR-2	Connect Alt 1 across South Fork and tie-in to Alt 3 alignment	$762,000	$768,000	$1,530,000
IR-9	Widen existing alignment in Beattyville and lower Alternative 1 alignment	$14,842,000	$879,000	$15,721,000
General (G)				
G-1	Reduce shoulder width to six-foot paved; eight-foot total	$5,431,000	$0	$5,431,000
G-4	Maximize PCI span length	$271,000	$0	$271,000

Table 1-2
Optimum Combination of Alternatives

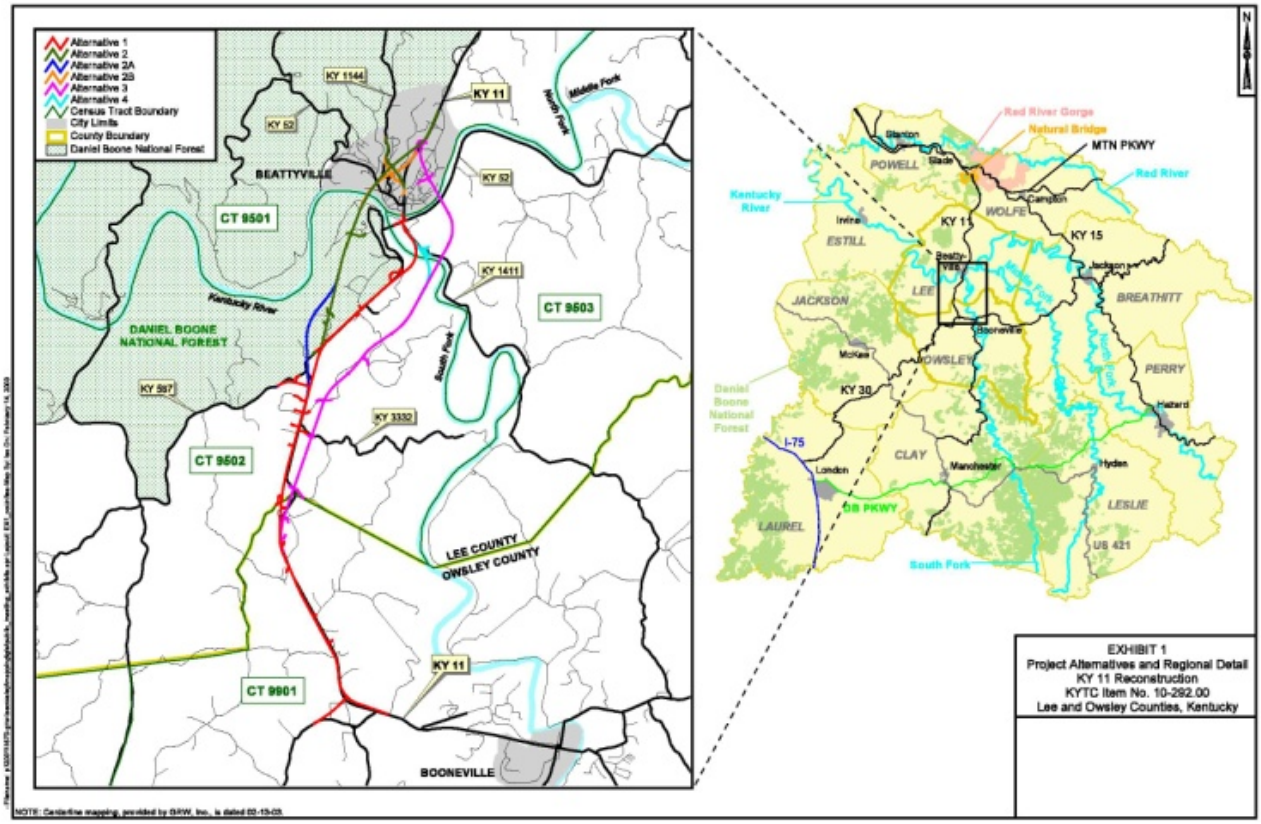
Alt. No.	Description	First Cost Savings	Present Worth O&M Savings	Life Cycle Cost Savings
Option 1				
AD-4	Eliminate new Center Street alignment and provide a connection with existing KY 11 north of Senior Center	$5,932,000	$89,000	$6,021,000
AD-6	Create a straight line connection (avoid reverse curve)	$1,782,000	$0	$1,782,000
G-1	Reduce shoulder width to six-foot paved; eight-foot total	$5,431,000	$0	$5,431,000
G-4	Maximize PCI span length	$271,000	$0	$271,000
	Total	**$13,416,000**	**$89,000**	**$13,505,000**
Option 2				
IR-9	Widen existing alignment in Beattyville and lower Alternative 1 alignment	$14,842,000	$879,000	$15,721,000
G-1	Reduce shoulder width to six-foot paved; eight-foot total	$5,431,000	$0	$5,431,000
G-4	Maximize PCI span length	$271,000	$0	$271,000
	Total	**$20,544,000**	**$879,000**	**$21,423,000**

SECTION 2

PROJECT DESCRIPTION

SECTION 2
PROJECT DESCRIPTION[1]

The proposed project involves the reconstruction and relocation of a 7.5 mile section of KY 11 near KY 30 at Levi to existing KY 11 north of Beattyville. Beattyville is a small rural community located at the western edge of the Eastern Kentucky Coal Fields region, at the confluence of the South Fork Kentucky River (South Fork) and North Fork Kentucky River (North Fork) in Lee County.



The posted speed limits on KY 11 range from 25 miles per hour (mph), as advisory speeds on horizontal curves, to 55 mph. The route's two lanes are 9 to 10 feet in width with 2- to 6-foot shoulders. This facility serves as a connection between I-75 and the Mountain Parkway. Grades and curves that do not meet current design standards are common along the project segment.

[1] This project description was excerpted from the Phase I Design Report and the Design Executive Summary.

The purpose of this project is to:

- provide increased safety along the corridor by increasing sight distances and correcting geometric deficiencies
- improve system connectivity and efficiency by providing a more reliable, high-quality roadway for commercial and passenger vehicle access to the corridor
- provide an improved north-south route for emergency and medical services
- support economic development along the corridor by increasing regional industrial accessibility to markets and suppliers.

The proposed improvements include construction of a two-lane roadway with 12-ft lanes and full-width shoulders. The proposed road geometry will meet the design speed criteria for 55 mph and truck climbing lanes are included where merited. The project also includes improvements and realignments to various intersecting and connector roads along KY 11, including KY 30, KY 52, and KY 587, along with other local access roads. The bridge typical section consists of two 12-ft lanes with 12-ft shoulders.

TRAFFIC AND CONNECTIVITY

An analysis of accident data for the project corridor was presented in the *Intermediate Planning Study (IPS),* issued in April 2001 (Bernardin, Lochmueller & Associates). Accidents listed in the Highway Information System (HIS) database between 1996 and 1998 were considered. A total of 77 crashes with two fatalities, 28 injuries, and 47 property-damage-only accidents occurred during the period.

Accident data was converted to accident rates for discrete segments of the corridor. The accident rates varied from a high of 3,548 accidents per 100 million vehicle miles at the edge of Beattyville to much lower rates in the remainder of the corridor. Two segments exceeded the critical rate factor of 1.0, a segment of KY 11 between KY 1411 and KY 52 and just north of the Lee-Owsley county line. The critical rate factors for these segments were 2.568 and 3.229 respectively.

An examination of 12 police accident reports was also conducted. Vehicles encountering stopped or slower moving vehicles caused the majority of the accidents. Nine of the accidents involved turning movements with poor sight distances as major contributing factors. Seven of the accidents were rear-end collisions or sideswipes, one was a head-on collision, and the balance were cars leaving the roadway.

The primary problem areas are at the Lee-Owsley county line, the junction of KY 11 and KY 587, and at Proctor Hill just west of South Fork Bridge. Each of the problem areas can be improved with improvements to the road geometrics.

A traffic study discussed in the *IPS* suggests that congestion has become a concern, limiting access and efficiency of travel through the corridor. Average daily traffic in the year 2000 ranged from 5,460 vehicles per day (vpd) on KY 11 just south of Beattyville, to 2,320 vpd at KY 11 near the KY 30 intersection at Levi, Kentucky. By the year 2025, those counts are expected to increase by 60-65 percent.

ALTERNATES

Eight build alternates ranging in length from 6.8 mi to 8.1 mi were developed for this project.

Alternate 1 follows the existing route but removes the curve at the county line, continues north along KY 11, and removes the curve at the intersection of KY 587. Continuing along the current KY 11 centerline, Alternate 1 leaves existing KY 11 to create a new bridge crossing over the South Fork and terminates at the existing North Fork Bridge.

Alternate 2 follows the same route as Alternate 1 until the KY 587 curve, where it continues north through Proctor Hill creating a new bridge crossing over the Kentucky River. This bridge crosses over KY 52 and returns to grade near KY 1144. The alternate takes a northeasterly route from KY 1144, crossing over Crystal Creek and ends at KY 11 just north of Beattyville. As additional information was gathered regarding public preference, property impacts, cultural-historic sites, archaeological data, etc., four more variations of Alternate 2 were developed.

Alternate No. 2A is the same as Alternate No. 2, but includes an alignment adjustment to the west to avoid the Baker Bar Subdivision and the Industrial Park.

Alternate No. 2B Revised was created by slightly adjusting Alternate No. 2B to provide increased clearance of the Beatty House (NRHP eligible). This alignment requires a continuous steel curved bridge over the Kentucky River and KY 52.

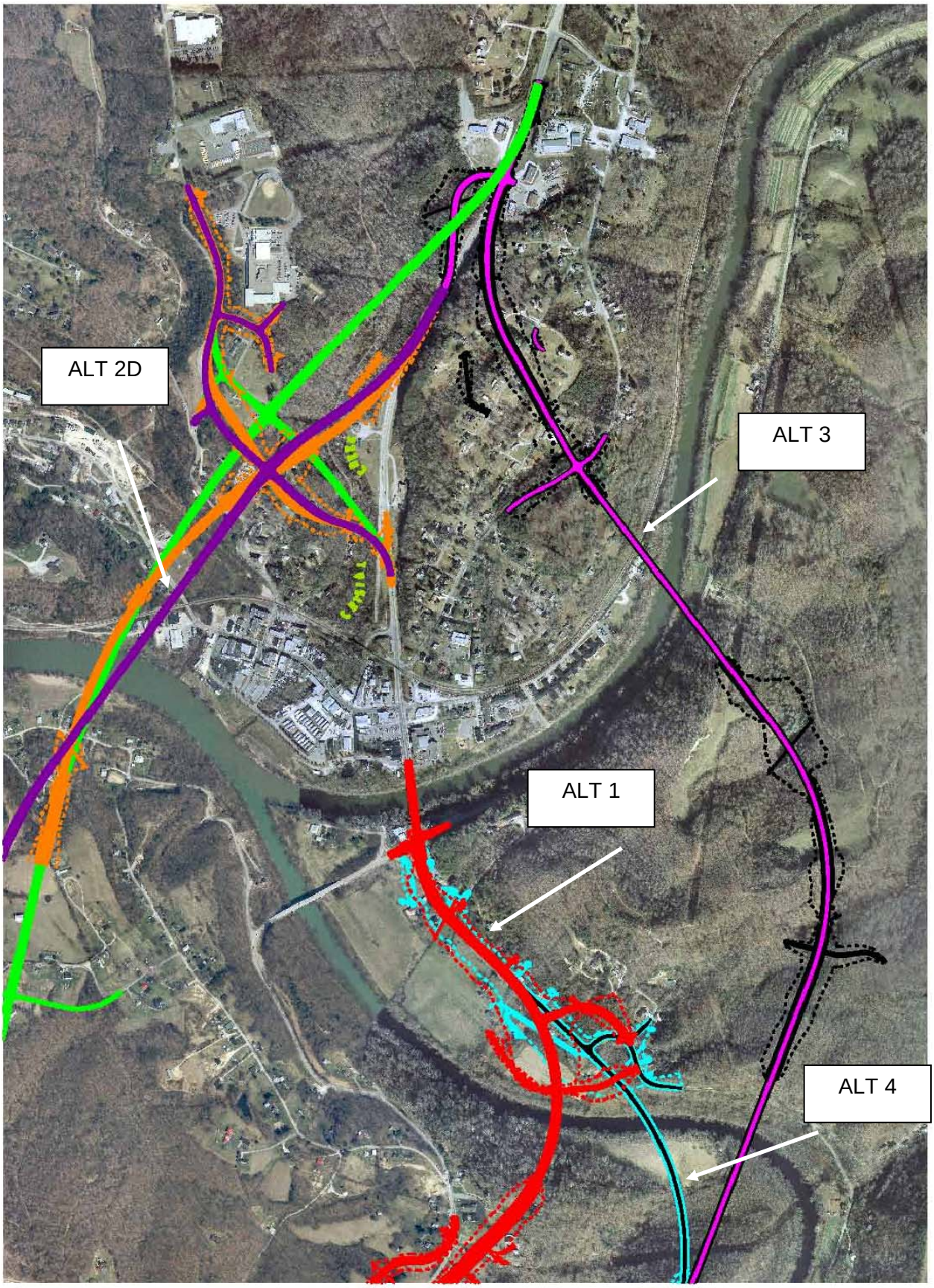
Alternate No. 2C avoids Parcel No. 113 (NRHP eligible) and the ACS Facility Support (large commercial structure) property, but used the same tangent as Alternate No. 2B approaching the Kentucky River from the south. A curve to the right moves the alignment further east of Alternate No. 2B and ends before the Kentucky River Bridge. The bridge is straight, normal crown and constant grade throughout its length. This alignment would affect two commercial structures as it enters Beattyville. The tangent of the Kentucky River Bridge through Beattyville required a low angle of approach to existing KY 11 for this alternate and caused prohibitive design difficulties with the bridge over Crystal Creek. *It was decided to abandon this alignment and develop Alternate No. 2D*.

Alternate No. 2D includes the alignment change to avoid Parcel No. 113 and the ACS facility and differs from the other variations on Alternate No. 2 by swinging further west as it

approaches the Kentucky River through Proctor. This allows room for superelevation runoff and runout prior to the beginning of the bridge and a better tangent through Beattyville.

Alternate 3 deviates from the existing KY 11 route moving off to the northeast along a ridge on the east side of Long Branch, then on to South Fork to a new bridge crossing. Alternate 3 then turns to the northwest along a new bridge crossing of North Fork and on to the terminus at KY 11 north of Beattyville.

Alternate 4 follows the same route as Alternate 3 until the approach to the South Fork crossing. Alternate 4 moves to the northwest to cross the South Fork in a more westerly location and then joins the Alternate 1 route with the terminus at the existing North Fork Bridge.


ALT 2D
ALT 3
ALT 1
ALT 4

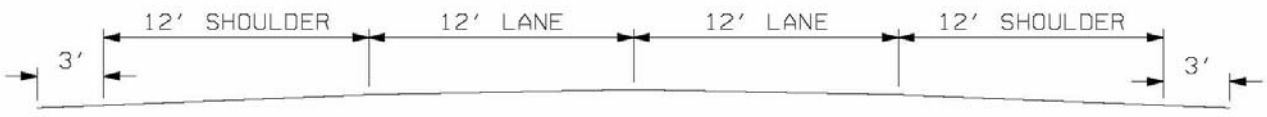
Recommended Alternative

It was agreed by the Project Team that Alternates No. 1 & No. 4 did not adequately satisfy the purpose of the project because they tie to the existing bridge at the North Fork and would leave a significant length of substandard roadway in use through Beattyville. Alternates No. 1 and No. 4 do not include crossings of the North and South Forks of the Kentucky River. If these crossings were included their crossing totals would match the Alternate 2 variations.

Alternate No. 3 was considered undesirable due to having the highest construction cost, the uncertainty of the presence of the underground coal mines and the lack of connectivity west of Long Branch. Alternate No. 3 also provides the least connectivity and travel efficiency for the communities and development along existing KY 11. It was generally agreed by the Project Team that the Alternate No. 2 variations best met the projects needs and objectives. Of the Alternate No. 2 variations, Alternate No. 2D provides the most desirable design and environmental results including public approval, Beattyville access and bridge geometry. It is the recommendation of the Project Team that Alternate No. 2D be advanced as the Selected Alternate for this project.

Summary Information for Alternate 2D

Length	7.52 miles
Roadway Typical	two 12-foot lanes with two 12-foot shoulders
Pavement Section	10.25 inches asphalt on 4 inches of rock base
Bridge Length	2,300 feet (approximate)
Bridge Type	Hybrid (concrete for shorter spans and steel girder for river crossing)



Roadway Typical

SECTION 3

VALUE STUDY PROCESS

SECTION 3
VALUE STUDY PROCESS

This section describes the process used to conduct this Value Study and the significant findings of the Value Team. This Value Study used the international standard Value Methodology established by SAVE International, the Value Society. The standard establishes the specific 6-Phase, sequential process, and the objectives of each of those phases, but does not standardize the specific activities in each phase.

Value Methodology (VM) is the general term that describes the structure and process for executing the Value Workshop. This systematic process was used with a multidisciplinary team to improve the value of the project through the analysis of functions and the identification of targets of opportunity for value improvement.

The **VM Job Plan** provides the structure for the activities associated with the Value Study. These activities are further organized into three major stages:

1. Pre-Workshop preparation
2. VM Workshop
3. Post-Workshop documentation and implementation

Figure 3-2 at the end of this section shows a diagram of the VM Job Plan used for this Value Study.

DEFINING VALUE

Within the context of VM, Value is commonly represented by the following relationship:

$$\text{Value} \approx \frac{\text{Functions}}{\text{Resources}}$$

In this expression, functions are measured by the performance requirements of the customer, such as mission objectives, risk reduction and quality improvements. Resources are measured in materials, labor, price, time, etc. required to accomplish the specific function. VM focuses on improving Value by identifying the most resource efficient way to reliably accomplish a function that meets the performance expectations of the customer.

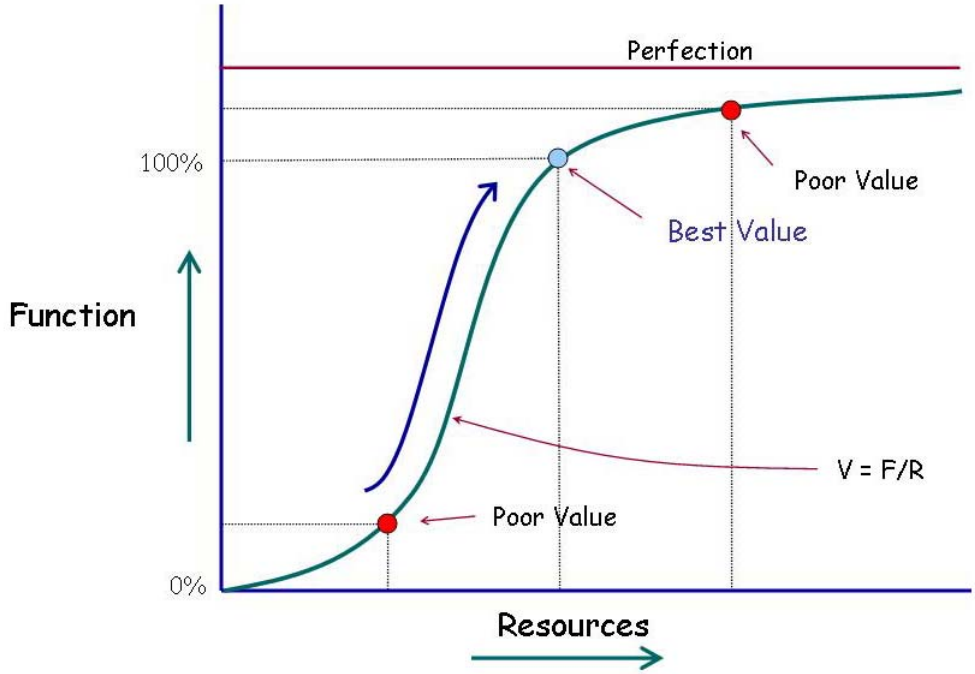
It can be seen from this relationship that Value is improved or increased by:

1. Increasing function without increasing resource consumption. Some increase in resources is acceptable as long as there is a greater increase in function performance.
2. Decreasing resources without decreasing function. Again, some decrease in function may be acceptable if the corresponding decrease in resources is significant enough.

Ideally, the Value Team looks for opportunities to increase function and concurrently decrease resource requirements. This will achieve the best value solution.

This Value concept is illustrated in the Figure 3-1, The Value Curve. This figure shows a hypothetical curve from plotting the value expression above. This curve will asymptotically approach perfection. The best value solution for a given project or project element will be found at the knee of the curve. At this point the required function or functions have been achieved to 100% of the required level with a corresponding minimum resource commitment. To attempt to increase the function performance beyond this level will result in a resource consumption that has a higher worth than the marginal increase in function. This results in a poor value solution. Conversely, a poor value solution can also be the result of not achieving the function to 100% of the requirement. In this case, an incremental increase in resources delivers significant increase in function performance. The Value Methodology is used to identify the poor value decisions in a project and then develop alternative solutions to better align the project along this curve to achieve a best value solution.

Figure 3-1
The Value Curve



This understanding how Value is affected by changes in function or resources provides the foundation for all SVS Value Studies. The following paragraphs describe the process we used to understand the functional requirements and how we identified value improvement alternatives.

PRE-WORKSHOP

Prior to the start of the workshop, the team was tasked with reviewing the most current documentation on the project development. This was done to familiarize them with the project design and to prepare them for asking questions of the project stakeholders during the project presentations at the beginning of the workshop. Much of the background information for this study was generated by GRW. Other pre-workshop activities included:

- Coordinating workshop logistics and communicating those to the various participants
- Providing guidance to KYTC and GRW on presentation content for the project introduction
- Scheduling workshop participants and assigning tasks to ensure the team is prepared for the workshop
- Gathering necessary background information on the project and making sure project documentation is distributed to the team members

Materials furnished to the team by KYTC and GRW are listed in the Appendix.

Site Visit

Due to the remote location of the site relative to the location for the VM Workshop, a site visit was conducted during the Pre-Workshop stage prior to the workshop. This site visit was attended by the Value Team without any representation from KYTC or GRW. The purpose of the site visit was to give the team members a first-hand opportunity to see the physical features of the project site that influenced the design development.

From this site visit, the team made the following observations:

- The terrain is very rugged and rocky
- The intersection of KY 11 and KY 587 is very dangerous
- Numerous driveways
- Access to the site with long bridge sections will be challenging; could possibly float sections in on the river
- Very steep grades to access the school complex
- Does not appear to be as infeasible to widen the alignment north of KY 587 as suggested by the Phase I Design Report.

VM WORKSHOP

The VM workshop was an intensive session during which the project design was analyzed to optimize the balance between functional requirements and resource commitments (primarily capital and O&M costs).

The VM Job Plan used by SVS includes the execution of the following phases during the workshop:

1. Information Phase
2. Function Analysis Phase
3. Creative Phase
4. Evaluation Phase
5. Development Phase
6. Presentation Phase

Information Phase

At the beginning of the workshop, it was important to understand the background of the project from which the design was developed. This background was provided in an oral overview by KYTC and GRW. The overview and subsequent project analysis provided information on the following topics:

- Rationale why this project is necessary
- Project objectives that have governed the proposed design
- Rationale for the proposed design configuration
- Explanation of design features, criteria, and assumptions
- Value Study constraints
- Project cost

The KYTC project management presentation provided the team with an overview of the goals, issues, and expectations for the project. KYTC and the Value Team also finalized the Value Study constraints. This was followed by GRW's more detailed presentation on the project design and an explanation of the rationale behind key design level decisions. Further, this gave GRW an opportunity to share their issues and concerns about the project from their perspective.

From these presentations, the Value Team noted the following key information:

- Community preferred Alternate 2D because it opens up more opportunities for development and improves access to the high school area
- Community does not want to have all the traffic "bypass" downtown; therefore, they want a direct connection from the new alignment to downtown
- Community is concerned about congestion in downtown Beattyville. This congestion may drive business away from downtown

- The project focus is on improving the safety of the corridor making it an improved route between I-75 and the Mountain Parkway. The northern portion of KY 11 through the Natural Bridge Park will remain an obstacle but there is another location study underway to evaluate the KY 715 corridor for the continuation of the route to the Mountain Parkway.

- The team questioned the unit cost for roadway excavation and was told by Steve Criswell in the Construction Division that based on numerous large excavation projects that approximately $3/cy was a good budgeting number. They realize that there is significant rock in these excavations but the high volume and the presence of coal is keeping the unit cost low.

- The team questioned the unit cost for bridges and was told by Mark Hite in Bridge Design that 100 foot tall piers in Eastern Kentucky is not unusual and does not seem to be adding significant cost to other projects. He said for the long/high bridge associated with Alternate 2D that we should use a cost of $110/sf for a concrete structure and $125/sf for a steel structure. The smaller bridges should use a concrete structure and these smaller bridges have been recently getting bid prices of approximately $100/sf.

- Scott Thomson from Transportation Planning assisted the Value team in conducting a cursory traffic analysis from the Lee and Owsley Counties Traffic Forecasts, KY 11 from KY 30 to Levi at Beattyville. The conclusions of this analysis are:

    - The new KY 11 alignment using the Alternate 2D alignment is only projected to serve 4,000 vehicles for the average daily traffic (ADT). This includes 16% truck traffic. This is a low volume of traffic.

    - The downtown area is congested today and based on the traffic forecast it is going to be substantially more congested in the future. For example immediately south of the new KY 52 intersection with KY 11, there is a 6,500 ADT today and a 10,400 ADT for 2025 which is a 60% increase in traffic. These numbers consider that KY 11 is relocated using the Alternate 2D alignment. The traffic circulation is also going to be further complicated by the new connection with the Alternate 2D alignment to existing KY 11 and the close proximity to KY 52 intersection. The projected traffic counts for the connection from Alternate 2D alignment to KY 11 appears to be very low based on the traffic counts for the adjacent streets. Therefore there may be an even greater ADT on existing KY 11 than the projected 10,400 ADT.

Project Cost Analysis

The VE team's review of the estimate verified the reasonableness of the:

- Estimated unit costs

- Estimated contingencies

This was done to ensure that the value team had reliable data to use as the basis for cost comparisons of alternatives.

The review of the project cost estimate resulted in a recommended increase/decrease of the estimated project costs from $42,646,000 to $58,779,000. This is approximately a 38% increase over the cost estimate dated April 2004, prepared by GRW.

Review of the costs included comparison of unit prices to recently received prices for similar projects and to published unit price indices. Unit prices for unique project elements were compared to prices based on applicable crew compositions and production rates. Vendor quotations were obtained for unique and/or major equipment and compared to those in the project cost estimate. Adjustments were made where appropriate to bring unit prices and quantities into conformance with the current design documents and presentation information provided to the value team.

A complete review all of the estimate's supporting backup data was not attempted due to time limitations and availability of information; however, limited reviews were made of some quantities for the larger cost items within the estimate.

Economic Data for Life Cycle Cost Analysis

To express life cycle costs, the Value Alternatives have been presented based on discounted present worth cost. The economic criteria used by the team were as follows:

Year of Analysis: 2008

Analysis Period: ..... 25 years

Gross Discount Rate: ..... 7% per year

Inflation Rate: ..... 3% per year

Net Discount Rate: ..... 4% per year

Present Worth Factors:

- Annual: 15.622
- Year 10: 0.6756

Fuel Cost:

- Gasoline: $3.00/gallon
- Diesel: $3.00/gallon

Labor:

- Operations (fully burdened): $75/hr
- Maintenance (fully burdened): $75/hr

Generalized O&M:

Civil Infrastructure: ..... 1%/year of capital cost

Function Analysis Phase

Function Analysis is the heart of the VM process and is the key activity that differentiates the VM process from other problem solving or improvement practices. During the Function Analysis Phase of the VM Job Plan, functions are identified that describe the expected outcomes of the project under study. Function Analysis also defines how those outcomes are expected to be accomplished by the design. These functions are described using a two-word, active verb and measurable noun pairing.

This identification and naming convention of project functions enables a more precise understanding by limiting the description of a function to an *active verb* that operates on a *measurable noun* to communicate what work an item or activity performs. This naming convention also helps multidisciplinary teams to build a shared understanding of the functional requirements of the project.

Project Mission Statement

To help focus discussion for a better understanding of the project requirements, a mission statement was developed for the project. The Value Team addressed the question, "Why is this project being proposed in the current form?" The mission for *this project*, from the team's perspective, based on what was explained by KYTC and GRW, is as follows:

> *The mission of this project is to improve the system-to-system connectivity between I-75 and the Mountain Parkway by improving the KY 30 and KY 11 route. To improve this route the project must increase safety by upgrading the route to current design standards. Improving the route will improve economic development along the corridor.*

In developing this mission statement, the team identified all the purposes the project has to address. The discussions during this development helped the team members gain a more thorough understanding of the project.

The mission statement was later referenced in the more detailed function analysis of the project. The team returned to this mission statement to test the appropriateness of the project element functions as they were developed to assure validity and focus.

Function Determination

Defining functional requirements for the project allowed KYTC to be sure that the facility, as the design, would fulfill the needed purposes. The entire project was analyzed to determine what functions are being accomplished by the current design. Required functions were retained. Some functions were not necessary to accomplish the mission of the project and thus became candidates for deletion.

During the Function Analysis Phase, the Value Team used various function analysis techniques to analyze the project. This analysis helped the team confirm its understanding of the overall project objectives and analyzed the functions of key project elements. The Value Team Leader

led the team through an in-depth discussion of the possible functions of each key project element to clearly and precisely identify the purposes of each.

FAST Diagram

Function analysis was enhanced by using a graphical mapping tool known as the *Function Analysis System Technique* (FAST), which allows team members to understand how the functions of a project relate to each other. The resulting FAST Diagram allowed quick visualization of the logical relationship between project functions and the project as a whole. The FAST diagram is in the Function Analysis section of the Appendix.

The FAST Diagram is structured such that moving to the right of any function answers the question, "How are we accomplishing this function?" Moving to the left of any function answers the question, "Why are we accomplishing this function?" Elements that are vertically connected occur "When" or as a consequence of the function it is connected to on the horizontal path.

The diagram shows on the far left that the ultimate function or the mission that must be accomplished by this project is to improve system-to-system connectivity. This is accomplished by improving the route. When we improve the route we will improve economic development along the corridor. The project is improving the route by increasing safety by increasing sight distances and improving geometry.

Function Findings

From the function analysis of this project, the team concluded that:

- The project has two primary issues to resolve; one is to improve sight distances and the other is to improve horizontal and vertical geometry.

- A driver for shifting off the original alignment was to avoid the adverse geometry (horizontal curves and steep grade) immediately south of the South Fork of the Kentucky River.

- The majority of the project cost is consumed in constructing the relocation of KY 11 from KY 587 to a point on the original alignment north of downtown Beattyville. This new alignment will serve less than 50% of the traffic. The remainder of the traffic will continue to use the original alignment. The traffic count on the original alignment north of KY 587 is 4,100 ADT (2004). The traffic count after constructing Alternate 2D alignment shows a 2,700 ADT (2004) on the original alignment which will increase to 4,300 ADT (2025). This suggests 2025 traffic volumes that are slightly greater than today's volume on a roadway that is considered to have significant enough safety issues to warrant this project. If increasing safety is the mission of this project, we have perhaps not solved the problem with the proposed Alternate 2D alignment.

In addition to identifying the essential project functions, this phase of the workshop also serves two other objectives:

1. The unification of the individual Value Team members into a synergistic, cohesive team, and

2. The stimulation of creative ideas prior to beginning the subsequent creative phase.

The function analysis worksheets are included in the Appendix.

Creative Phase

This step in the VM process involved generating ideas using creativity techniques. The team recorded all ideas regardless of their feasibility. In order to maximize the Value Team's creativity, evaluation of the ideas was not allowed during the creative phase. The team's effort was directed toward a large quantity of ideas. These ideas were later screened in the Evaluation Phase of the workshop.

The creative ideas generated by the team are included in the Appendix. The list also includes ratings for each idea based on the Evaluation Phase of the workshop. These lists should be carefully reviewed, as there may be other good ideas not developed by the team because of time constraints. These should be further evaluated or modified to gain the maximum benefit for the project.

Evaluation Phase

In this phase of the workshop, the team selected the ideas with the most merit for further development.

After an initial vote, the Value Team Leader assessed how many ideas could be developed into Value Alternatives within the remaining duration of the workshop. From this assessment, all ideas with a certain number of votes were selected for development. However, prior to the final selection, the results were revisited collectively by the Value Team to ensure that those selected by the voting process truly represented the best ideas for development. This gave the team the opportunity to down-rate some ideas and to up-rate other ideas based upon team discussion of the ideas.

The criteria used for selection were:

1. The inherent value, benefit and technical appropriateness of the idea
2. The expected magnitude of the potential cost savings, both capital and life cycle
3. The potential for KYTC and GRW acceptance of the idea

Ideas were selected for development as Value Alternatives based on all three criteria.

Other ideas were selected for development as design suggestions based primarily on the first and third criteria rather than for cost savings. Some design suggestions may save costs, others may increase costs, and the cost impact of some could not be predicted adequately with information and time available to the team. Not all ideas were developed. This evaluation process is designed to identify those ideas with the greatest potential for value improvement that can be developed into Value Alternatives within the time constraints of the workshop and the production capacity of the team.

The remaining ideas were eliminated from further consideration by the team; however, the ideas not developed should also be reviewed, as there may still be other good ideas not developed by

the team because of time constraints or other factors. These could be further evaluated or modified to gain the maximum benefit for the project.

To further ensure the Value Team is focused on developing the best ideas, a mid-point review meeting is conducted with the Value Team Leader, KYTC, and GRW representatives. This mid-point review allowed KYTC and GRW to identify any fatal flaws in the ideas that were not apparent to the Value Team but were apparent to KYTC and GRW project team because of their greater institutional knowledge of the project. These fatal flaws may be technical, operational, political, etc.

Development Phase

During the Development Phase of the workshop, each idea was expanded into a workable alternative to the original project concept. Development consisted of preparing a description of the value alternative, evaluating advantages and disadvantages, and making cost comparisons.

Each alternative is presented with a brief narrative to compare the original concept and the alternative concept. Sketches and brief calculations were also developed, if needed, to clarify and support the alternative. The value alternatives developed during the workshop are presented in Section 4 – Value Improvement Alternatives.

The Value Team Leader and, to the extent possible, other team members reviewed each alternative to improve completeness and accuracy.

Redesign costs are not included in the cost comparison of alternatives. The responsibility for determining these costs is between KYTC and GRW. Redesign costs, if any, should be addressed by GRW in their response to KYTC on the alternatives.

Presentation Phase

The last phase of this workshop was the presentation of the Value Alternatives. The presentation was made by the Value Team on January 18, 2008 to representatives of KYTC's and GRW's project team. The Value Team described each Value Alternative and the rationale that went into the development. This was followed by answering the audience's questions. The acceptability of the Value Alternatives was deferred pending KYTC's and GRW's review of our Final Report.

From this presentation, the following key points of discussion were noted:

- Discussion on accuracy of the traffic analysis. There were questions about whether or not the traffic on the Center Street Connector would actually make traffic worse downtown.

- Value Alternative AD-4 introduces an extra 2,900 ADT downtown at the KY 52 intersection. This seems to compound the concerns with traffic congestion downtown.

- Value Alternative AD-6 would save the property take of a relatively expensive residence

- Value Alternative AD-12 there were concerns raised that the grade of the Center Street Connector may be too steep

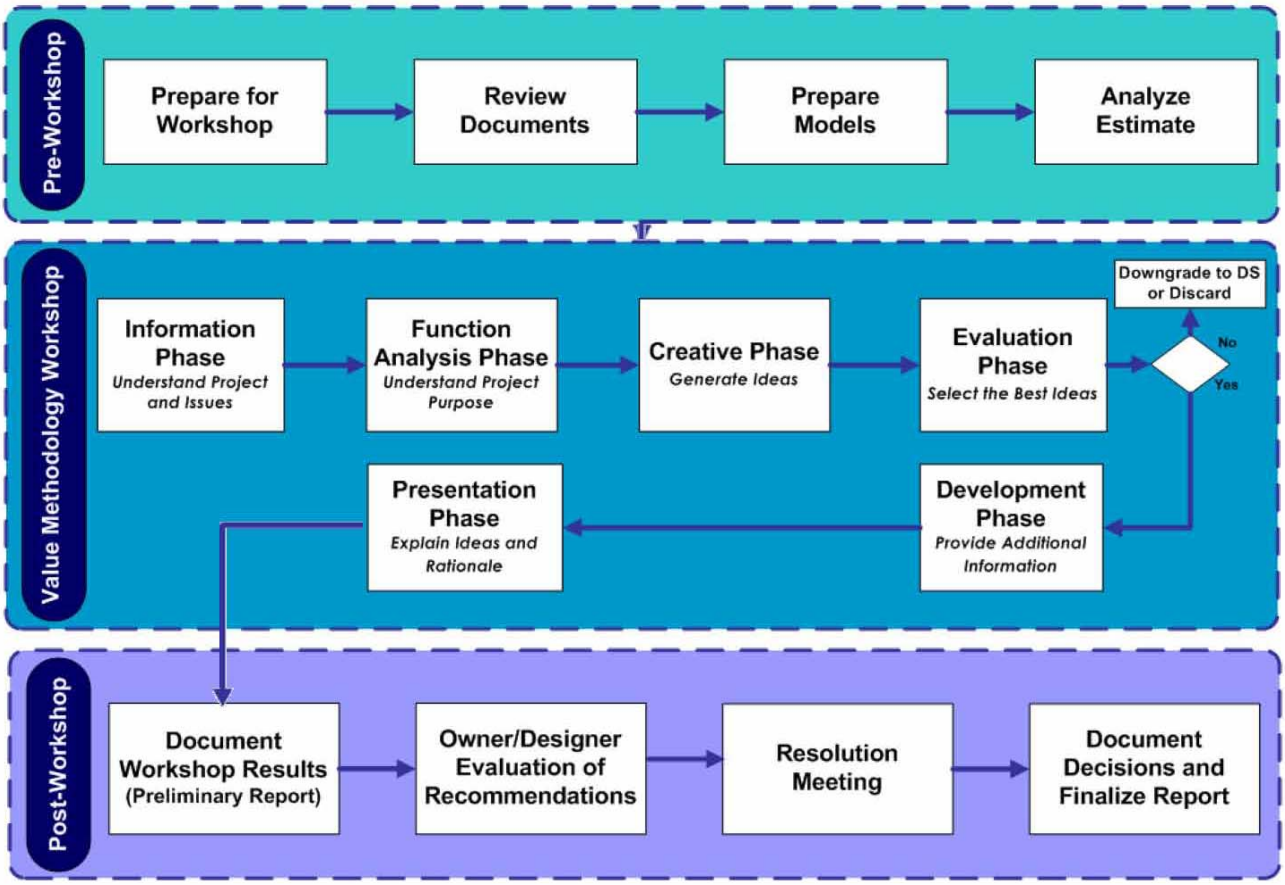
- Value Alternative IR-1 losses connectivity with downtown

- Value Alternative IR-9 concerns with making all of the improvements on KY 11 including downtown Beattyville and still maintain an at-grade railroad crossing

POST-WORKSHOP

The Post-Workshop activities of this Value Study consisted of preparing the Value Study Report. This Final Value Study Report includes documentation of the Value process, as well as, the Value Alternatives developed during the workshop. The decisions regarding implementation of the alternatives are documented outside this report.

Figure 3-2
Value Engineering Process Diagram



SECTION 4

VALUE IMPROVEMENT ALTERNATIVES

SECTION 4
VALUE IMPROVEMENT ALTERNATIVES

The results of this Value Study represent the value improvement opportunities that can be realized on this project. They are presented as individual alternatives for specific changes to the current design.

Each alternative includes:

- A summary of the original concept
- A description of the alternative concept
- A brief narrative comparing the original design and the recommended change
- Sketches, where appropriate, to further explain the alternative
- Calculations, where appropriate, to support the technical adequacy of the alternative
- A capital cost comparison
- And a life cycle cost analysis, if appropriate

Cost was the primary resource that was compared to the functions being accomplished in the project. To ensure that costs were compatible within the Value Alternatives proposed by the team, the validated cost estimate was used as the basis of cost.

EVALUATING THE VALUE ALTERNATIVES

Each part of a Value Alternative should be evaluated on its own merit, rather than discarding an entire Value Alternative because of concern over a particular aspect of the proposed change. Furthermore, KYTC and GRW are encouraged to review all of the ideas shown in the creative idea listing in the Appendix. Since the Value Team was constrained by a finite duration for the workshop and the production capacity of the team not all ideas were developed. Therefore there may be other ideas in that list that would provide additional value improvement opportunities for the project.

ORGANIZATION OF ALTERNATIVES

The alternatives presented on the following pages are organized by project or functional categories, and then numerically within each of those categories. The divisions used to organize the alternatives are as follows:

Alt 2D (AD)

Improve Route (IR)

General (G)

These designations have been used throughout the VE process to organize the ideas.

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ALT 2D (AD)

Value Alternative

Project: KY 11 Relocation
Location: Lee and Owsley Counties

Alternative No:
AD-4

Title:
Eliminate new Center Street alignment and provide a connection with existing KY 11 north of Senior Center

Description of Original Concept:

The original concept constructs KY 11 Relocation north from the Kentucky River bridge tying into the existing KY 11 on the north side of Beattyville (Sta. 486+00.00 to Sta. 510+00.00).

It constructs a four leg intersection (KY 11 Relocation to Center Street connection/KY 11 Connection No. 3) at Sta. 490+00.00. The Center Street connection extends west and north of the intersection to the Lee County School Board Administration Building and the Lee County Schools tying into existing KY 1144. KY 11 Connection No. 3 extends east and south of the intersection across Crystal Creek tying into the existing KY 11.

Description of Alternative Concept:

In the alternative concept construct KY 11 Relocation north from the Kentucky River bridge tying into the existing KY 11 on the north side of Beattyville (Sta. 486+00.00 to Sta. 510+00.00). Construct a tee intersection on the north side of the Lee County Senior Citizens Center connecting KY 11 Relocation to the existing KY 11 around Sta. 501+00.00. Construct the Center Street Extension from the terminus of KY 52/Center Street project north to the Lee County School Board Administration Building and the Lee County Schools tying into the existing KY 1144.

Value Improvement

$$\text{Value} \approx \frac{\text{Function}}{\text{Resources}}$$

Function	Resources
☐ Increased	☐ Increased
☑ Maintained	☐ Maintained
☐ Decreased	☑ Decreased

Cost Savings Summary

First Cost Savings:	$ 5,932,000
O&M Savings:	$ 89,000
Life Cycle Cost Savings:	$ 6,021,000

Advantages/Disadvantages

Alternative No.: AD-4

Advantages of Alternative Concept

- Eliminates four leg intersection on KY 11 Relocation along with associated turn lanes in close proximity to the north end of the Kentucky River bridge
- Reduces accident potential of traffic on KY 11 Relocation due to elimination of traffic crossing or entering onto KY 11 Relocation in close proximity to the north end of the Kentucky River bridge
- Reduces the length and grade of roadway required to construct KY 11 Connection No. 3
- Reduces the length of the roadway required to construct the Center Street Extension
- Reduces right-of-way required to construct KY 11 Connection No. 3 and Center Street Extension
- Eliminates the KY 11 Connection No. 3 Bridge over Crystal Creek
- Eliminates tapers on Kentucky River Bridge allowing for constant bridge deck width which simplifies construction of the bridge
- Will eliminate a stop situation for traffic traveling through Beattyville

Disadvantages of Alternative Concept

- Routes KY 11 Relocation traffic from the south and existing KY 11 traffic from the north with destinations to the schools and community access to west side of Beattyville to KY 52

Discussion

Alternative No.: AD-4

The original concept KY 11 Relocation Alternate 2D construction provides fairly easy access to both existing KY 11 on the east side of the alignment and to Center Street on the west side of the alignment. This concept also allows traffic from the south on existing KY 11 to have fairly easy access to Center Street. One drawback to this concept is the potential for accidents on KY 11 Relocation due to traffic entering or crossing the roadway at an intersection location in close proximity to the north end of the Kentucky River Bridge. The intersection's close proximity to the north end of the Kentucky River Bridge also results in another concept drawback with tapers required on the bridge resulting in a variable width bridge deck at the north end.

The original concept Alternate 2D construction proposed through Beattyville north of the Kentucky River bridge includes the following: 1,900 lineal feet of KY 11 Relocation mainline pavement and associated turn lanes; a 4-span 500 ft long mainline bridge over Crystal Creek, 1,425 lineal feet of KY 11 Connection No. 3 pavement; a 4-span 230 ft long bridge on KY 11 Connection No. 3 over Crystal Creek; and 3,718 lineal feet of Center Street Connection pavement.

In order to reduce the accident potential on KY 11 Relocation at the north end of the Kentucky River Bridge and to remove the required tapers on the bridge, the alternative concept is proposed with the replacement of the 4 leg intersection at Sta. 490+00.00 with a tee intersection at around Sta. 501+00.00 along with construction of Center Street Extension as described above in "Description of Alternative Concept". The primary drawback associated with this alternate is that KY 11 Relocation traffic whose destinations are the Lee County schools and the west sides of Beattyville are routed to KY 52.

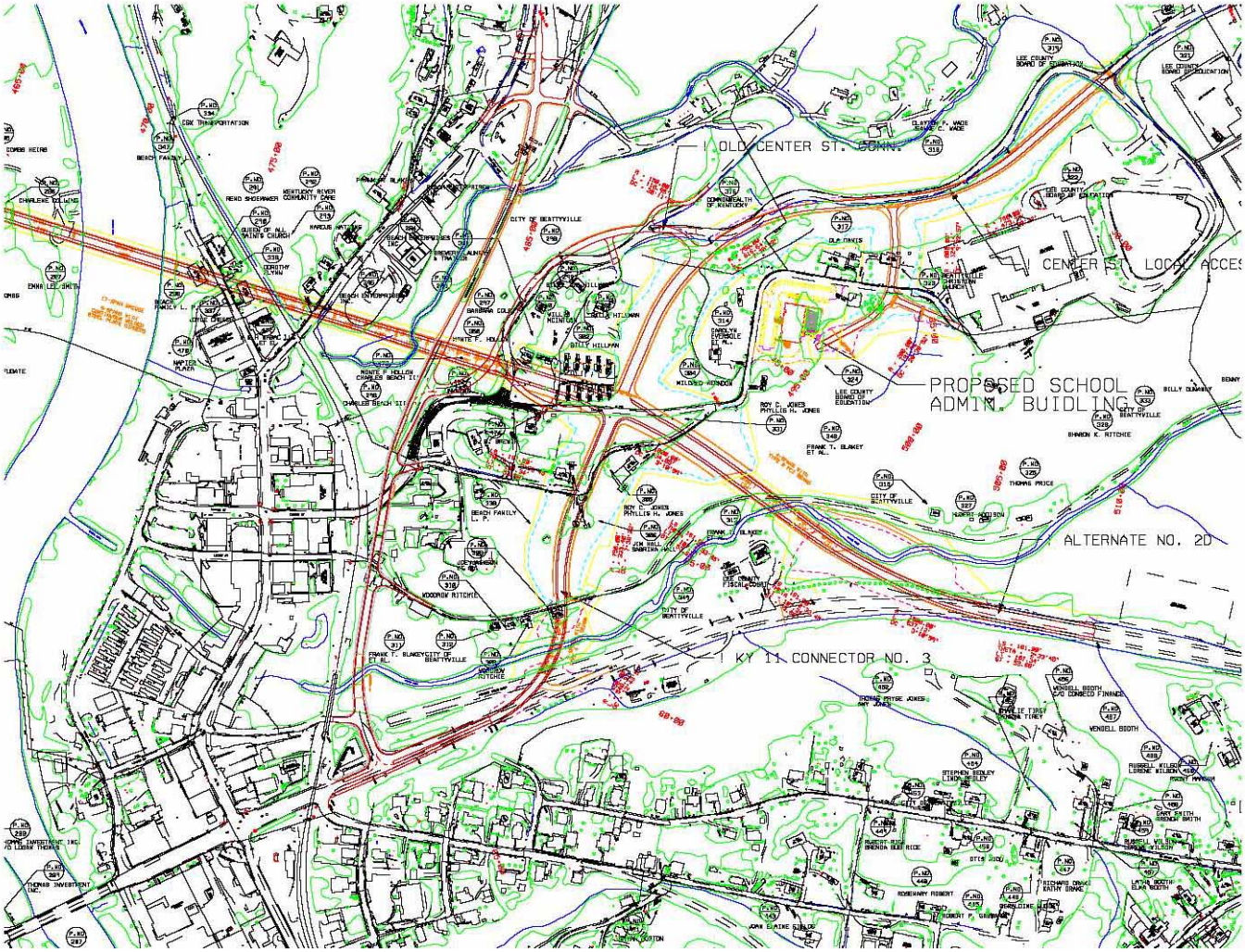
The alternative concept construction includes the following: 1,900 lineal feet of KY 11 Relocation mainline pavement; a 4-span 500 ft long mainline bridge over Crystal Creek, 300 lineal feet of KY 11 Connection No. 3 pavement, and 3,068 lineal feet of Center Street Extension pavement. Turn lanes may be required at the tee intersection due to future traffic volumes.

The alternative concept results in the following: reduction of 1,775 lineal feet of pavement construction for KY 11 Connection No. 3 and for Center Street Extension; elimination of a 4-span 230 ft long bridge over Crystal Creek; elimination of tapers on the Kentucky River bridge at the north end; reduction of 425,600 cubic yards of excavation; reduction of 13,800 cubic yards of embankment; and reduction of 6.9 acres of right-of-way.

Sketch

Alternative No.: AD-4

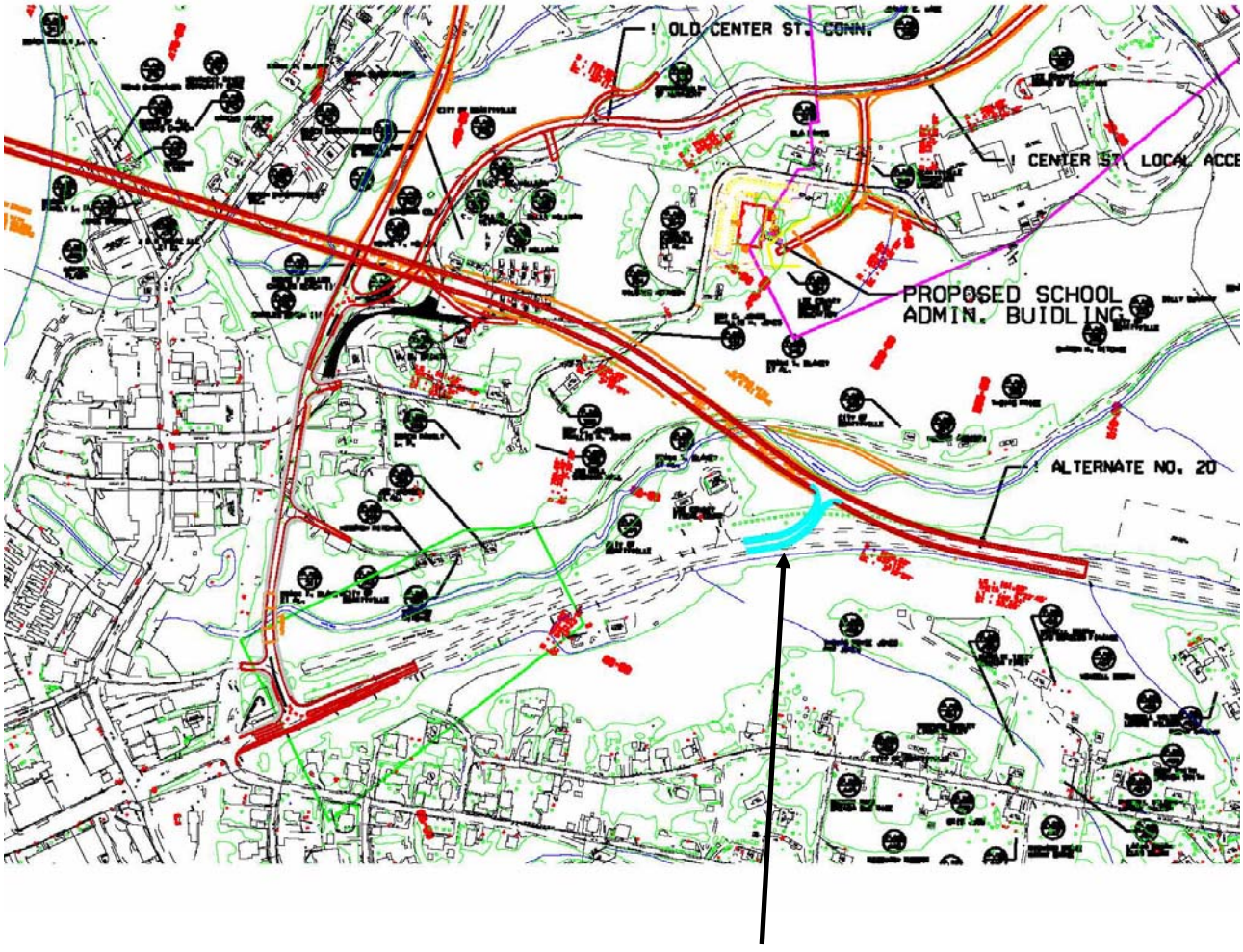
☑ Original ☐ Alternative



Sketch

Alternative No.: AD-4

☐ Original ☑ Alternative



VE Study Alternative

Calculations

Alternative No.: AD-4

☑ Original ☐ Alternative

KY 11 Mainline Roadway Widths:

Station 495+00 — 500 foot bridge, 62 feet wide
Station 486+00 — not included in length
900 feet — 62 foot roadway

Station 510+00
Station 500+00
1,000 feet — 62 foot to 28 foot roadway

Center Street Roadway Widths:

Center Street

Station 50+00
Station 43+50
650 feet — 40 foot roadway

Station 43+50
Station 25+33
1,817 feet — 28 foot roadway

School Board

Station 50+00
Station 42+50
750 feet — 24 foot roadway

School Connection

Station 53+01
Station 50+00
301 feet — 24 foot roadway

Old Center Street Connection

Station 50+00
Station 48+00
200 feet — 24 foot roadway

Calculations

Alternative No.: AD-4

☑ Original ☐ Alternative

KY 11 Connection No. 3 Roadway Widths:

Station 66+55	
Station 50+00	
1,655 feet	
230 feet	bridge
1,425 feet	40 foot roadway

Summary of Roadway Widths:

KY 11 Mainline

900 feet	62 foot roadway
1,000 feet	62 foot to 48 foot roadway
650 feet	40 foot roadway

Connectors - 40 Foot Roadway

650 feet	Center Street
1,425 feet	KY 11 Conn No. 3
2,075 feet	

Connectors - 28 Foot Roadway

1,817 feet	Center Street

Connectors - 24 Foot Roadway

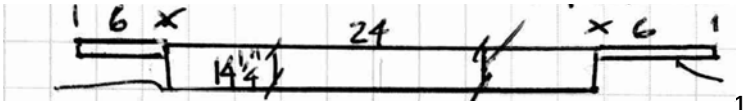
750 feet	School Board
301 feet	School Connection
200 feet	Old Center Street Connection
1,251 feet	

Calculations

Alternative No.: AD-4

☑ Original ☐ Alternative

1 ¼ surf on 9” NAC base on 4” CA



1 ¼ surf, 10” CA

Asphalt 140#/CF
Aggregate Base 120#/CF

Asphalt

$24 \times \frac{14\ 1/4"}{12"} \times 1$ LF = 28.50 CF/F

$6' \times 2 \times \frac{1\ 1/4"}{12"} \times 1$ LF = 1.25 CF/F

29.75 CF/LF Section

29.75 CF/LF (140#/CF)/2,000#/TN x $53.18 = $110.74/LF

Aggregate

$24 \times \frac{14}{12"} + 2\ (6' \times \frac{10"}{12"})$ = 28.50 CF/F

7.92 + 9.96 = 1.25 CF/F

17.88 CF/LF Section

(17.88 CF/LF x 140#/CF)/2,000#/TN x $20.00/TN = $ 21.46/LF

Pavement Section	=	$132.20/LF
Add 5% for Drainage Features	=	$ 6.61/LF
Pavement and Drainage	=	$138.81/LF

Calculations

Alternative No.: AD-4

☑ Original ☐ Alternative

General Roadway Maintenance	=	$2,500 / Lane Mile
Roadway Length	=	$1,775 LF
Lane Miles = $\frac{1{,}775 \text{ LF X } 2}{5{,}280}$	=	0.67 Lane Miles
Annual Maintenance Cost = 0.67 x $2,500	=	$1,680 / Year
Assume Overlay at Year 10 Mill and 1.25 in Overlay	=	$52.50 / LF of 24-foot roadway
Overlay Cost= 1,775 LF x $52.50	=	$93,200

Calculations

Alternative No.: AD-4

☐ Original ☑ Alternative

KY 11 Mainline Roadway Widths:

Even though intersection moved from Station 490+00 to around Station 501+00 use the same widths as the original concept.

900 feet	62 foot roadway
1,000 feet	62 foot to 48 foot roadway

Center Street Roadway Widths:

1,817 feet	
200 feet	
2,017 feet	28 foot roadway, ignore 200 foot increase, consider 1,817 feet

750 feet	
301 feet	
200 feet	
1,251 feet	24 foot roadway

KY 11 Connection No. 3 Roadway Widths

300 feet	40 foot roadway

Right-of-Way

Deduct
300 feet wide x 500 feet length = 150,000 SF Center
300 feet wide x 500 feet length = 150,000 SF KY 11 Connection
300,000 SF/43,560 = 6.89 acres, 6.9 acre decrease

Bridge Deck Taper

(62 – 48)((3)(120)+(2)(75)+80) = 8,260 SF at $110 SF

Bridge Removed From Contract

(70 + 90 + 70) (43) = 9,890 SF at $110 SF
18,150 SF at $110 SF decrease

Calculations

Alternative No.: AD-4

☐ Original ☑ Alternative

Roadway Widths Net Lengths:

40 foot roadway widths
2,075 – 300 = 1,775 foot decrease

Roadway Excavation Differential:

KY 11 Mainline
No Change

KY 11 Connector No. 3

Original	334,584 CY Excavation	14,549 CY Embankment
Alt -10%	33,458 CY Excavation	1,455 CY Embankment
	301,126 CY Excavation	13,094 CY Embankment

Center Street Connector

Original	248,944 CY Excavation	7,177 CY Embankment
Alt -50%	124,472 CY Excavation	6,459 CY Embankment
	124,472 CY Excavation	718 CY Embankment
	425,598 CY Excavation	13,812 CY Embankment
	say, 425,600 CY decrease	say 13,800 CY decrease

Life Cycle Cost Analysis

Alternative No.: AD-4

LIFE CYCLE PERIOD 25 YEARS

ANNUAL PERCENTAGE RATE 4.000%

CAPITAL COST			ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Capital Cost Savings								$0
ANNUAL EXPENDITURE	**%**	**PRESENT WORTH FACTOR**	**ORIGINAL CONCEPT**			**ALTERNATIVE CONCEPT**		
			CAPITAL COST	ANNUAL COST	PRESENT WORTH	CAPITAL COST	ANNUAL COST	PRESENT WORTH
General Roadway Maintenance		15.6221		1,680	26,000			
Generalized (% of Capital Cost)								
SUB-TOTAL					$26,000			$0

SINGLE EXPENDITURE (REPLACEMENT)	YEAR	PRESENT WORTH FACTOR	ORIGINAL CONCEPT		ALTERNATIVE CONCEPT	
			ESTIMATE	PRESENT WORTH	ESTIMATE	PRESENT WORTH
Overlay	10	0.6756	93,200	63,000		0
Salvage Value at End of Economic Life						
SUB-TOTAL				$63,000		$0
TOTAL PRESENT WORTH				$89,000		$0
				PRESENT WORTH SAVINGS ON O&M		$89,000
				LIFE CYCLE COST SAVINGS		$89,000

Construction Cost Estimate

Alternative No.: AD-4

Item	Unit of Meas.	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Roadway Length	LF	138.81	1,775	$246,388		
Roadway Excavation	CY	3.50	425,600	$1,489,600		
Right-of-Way Costs	AC	75,000.00	7	$517,500		
Bridge Deck Taper	SF	110.00	8,260	$908,600		
Delete Bridge over Crystal Creek	SF	110.00	18,150	$1,996,500		
Subtotal				$5,158,588		
Contingency		15.00%		$773,788		
TOTALS				$5,932,000		
NET SAVINGS						$5,932,000

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Value Alternative

Project: KY 11 Relocation
Location: Lee and Owsley Counties

Alternative No:
AD-6

Title:
Create a straight line connection (avoid reverse curve)

Description of Original Concept:

In the original concept the layout provides a horizontal curve to bypass the Baker Bar Subdivision and a horizontal curve to align the north end of the alignment to provide a straight bridge across the Kentucky River.

Description of Alternative Concept:

The alternative concept provides a tangential connection for these two from approximately Station 380+00 to 450+00.

Value Improvement

$$\text{Value} \approx \frac{\text{Function}}{\text{Resources}}$$

Function		Resources	
☐	Increased	☐	Increased
☑	Maintained	☐	Maintained
☐	Decreased	☑	Decreased

Cost Savings Summary

First Cost Savings:	$ 1,782,000
O&M Savings:	$ 0
Life Cycle Cost Savings:	$ 1,782,000

Advantages/Disadvantages

Alternative No.: AD-6

Advantages of Alternative Concept

- Eliminates roadway curvature to provide a safer roadway
- Reduces the length of the road by approximately 700 feet, thereby reducing the amount of paving materials required
- Reduces excavation
- Provides more area for placement of excess excavation

Disadvantages of Alternative Concept

- May cause some sliver fills on side hills which would require benching
- Length of 5% slope may increase
- Impacts 3 additional properties, including a church

Discussion

Alternative No.: AD-6

The original concept layout provides a horizontal curve to bypass the Baker Bar Subdivision and a horizontal curve to align the north end of the alignment to provide a straight bridge across the Kentucky River. In between these two horizontal curves, the alignment returns to the original Alternate 2 alignment.

The alternative concept creates a tangent section of roadway between these two horizontal curves that is approximately 6,300 feet in length from existing Station 379+00 to existing Station 449+00.

By eliminating the reverse curvatures of the Alternate 2D alignment, intuitively the revised alignment would be safer. Also, by replacing one curve with a tangent, the overall length of the roadway will be reduced by 700 feet, reducing the amount of pavement required. This revised alignment moves the roadway down a slope, that is, the existing ground is lower while roadway remains essentially at the same elevation. This could potentially reduce the amount of excavation required and also increase the area where excess excavation could be used.

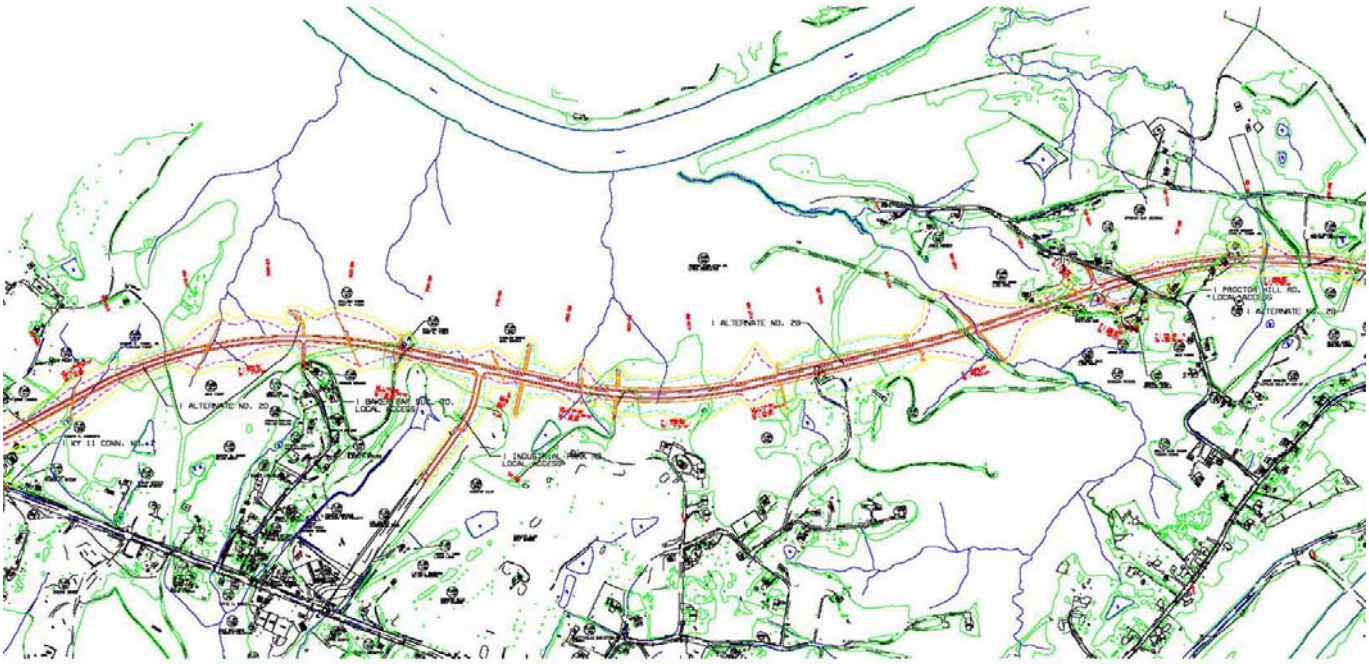
The profile for Alternate 2D has two 5% slopes broken by a 1,700-foot length of flatter slope (1%). A consequence of reducing the overall roadway length is that the length of 5% slope required may be increased. Since the Alternate 2D alignment has a continuous 6,800-foot southbound truck climbing lane increasing the amount of 5% slope will not result in additional pavement over the Alternate 2D alignment.

Since the alignment is moved down the slope, there is a potential for sliver fills, which could require benching to construct a stable roadway. This revised alignment also impacts three additional properties along Proctor Hill Road that were not impacted by the Alternate 2D alignment, two residences and a church. The new tie to Proctor Hill Road will have to be evaluated.

Sketch

Alternative No.: AD-6

☑ Original ☐ Alternative



Sketch

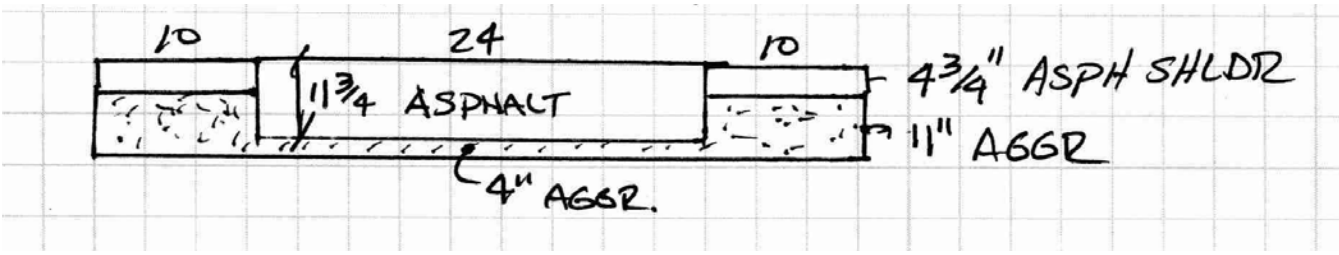
Alternative No.: AD-6

☐ Original ☑ Alternative

Calculations

Alternative No.: AD-6

☑ Original ☐ Alternative



Asphalt 140#/CF
Aggregate Base 120#/CF

Asphalt

$11\,{}^{3}/_{4}"/_{12"}$ x 24' $\frac{140\ {}^{\#}/_{CF}}{2{,}000\ {}^{\#}/_{TN}}$ x \$53/TN = 87.19

$4\,{}^{3}/_{4}"/_{12"}$ x $(10+10)$ x $\frac{140\ {}^{\#}/_{CF}}{2{,}000\ {}^{\#}/_{CF}}$ x \$53/TN = 25.17

Aggregate

${}^{4"}/_{12"}$ x 24' $\frac{120\ {}^{\#}/_{CF}}{2{,}000\ {}^{\#}/_{TN}}$ x \$20/TN = 9.50

${}^{11"}/_{20"}$ x $(10+10)$ x $\frac{120\ {}^{\#}/_{CF}}{2{,}000\ {}^{\#}/_{CF}}$ x \$20/TN = 22.00

143.86 LF

Length of Roadway Deleted = \$132.20/700 LF
Measured via Inroads

Roadway Excavation
New Horizontal and Vertical Alignment = 414,000 CY reduction

Embankment Total for This Section = 406,000 CYS

Construction Cost Estimate

Alternative No.: AD-6

Item	Unit of Meas.	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
KY 11 Roadway pavement (asphalt+agg)	LF	143.86	700	$100,702		
Roadway Excavation	CY	3.50	414,000	$1,449,000		
Subtotal				$1,549,702		
Contingency		15.00%		$232,455		
TOTALS				$1,782,000		
NET SAVINGS						$1,782,000

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Value Alternative

Project: KY 11 Relocation
Location: Lee and Owsley Counties

Alternative No:
AD-12

Title:
Create a connection from new Alt 2D to new KY 52

Description of Original Concept:

The original concept constructs KY 11 Relocation north from the Kentucky River bridge tying into existing KY 11 on the north side of Beattyville (Sta. 486+00.00 to Sta. 510+00.00).

It constructs a four leg intersection (KY 11 Relocation to Center Street Connection/KY 11 Connection No. 3) at Sta. 490+00.00. The Center Street Connection extends west and north of the intersection to the Lee County School Board Administration Building and the Lee County Schools tying into existing KY 1144. KY 11 Connection No. 3 extends east and south of the intersection across Crystal Creek tying into existing KY 11.

Description of Alternative Concept:

The alternative concept constructs KY 11 Relocation north from the Kentucky River bridge tying into existing KY 11 on the north side of Beattyville (Sta. 486+00.00 to Sta. 510+00.00).

It constructs a four leg intersection (KY 11 Relocation to Center Street Connection/KY 11 Connection No. 3) at Sta. 490+00.00. The Center Street Connection extends west and north of the intersection to the Lee County School Board Administration Building and the Lee County Schools tying into existing KY 1144. KY 11 Connection No. 3 extends east and south of the intersection avoiding Crystal Creek by tying into the KY 52 alignment in lieu of existing KY 11.

Value Improvement

$$\text{Value} \approx \frac{\text{Function}}{\text{Resources}}$$

Function	Resources
☑ Increased	☐ Increased
☐ Maintained	☐ Maintained
☐ Decreased	☑ Decreased

Cost Savings Summary

First Cost Savings:	$ 1,137,000
O&M Savings:	$ 94,000
Life Cycle Cost Savings:	$ 1,231,000

Advantages/Disadvantages

Alternative No.: AD-12

Advantages of Alternative Concept

- Routes portion of KY 11 Relocation traffic to KY 52 eliminating congestion on existing KY 11 downtown Beattyville
- Eliminates KY 11 Connection No. 3 bridge over Crystal Creek

Disadvantages of Alternative Concept

- Increases traffic on KY 52 in Beattyville

Discussion

Alternative No.: AD-12

The original concept provides fairly easy access to both existing KY 11 on the east side of the alignment and to Center Street on the west side of the alignment. The concept also allows traffic from the south on existing KY 11 to have fairly easy access to Center Street. One drawback to the concept is the traffic exiting from KY 11 Relocation to the existing KY 11 contributes to the traffic congestion in downtown Beattyville. The intersection's close proximity to the north end of the Kentucky River Bridge also results in another concept drawback with tapers required on the bridge resulting in a variable width bridge deck at the north end.

The original concept Alternate 2D construction proposed through Beattyville north of the Kentucky River bridge includes the following: 1,900 lineal feet of KY 11 Relocation mainline pavement and associated turn lanes; a 4-span 500 ft long mainline bridge over Crystal Creek, 1,425 lineal feet of KY 11 Connection No. 3 pavement; a 4-span 230 ft long bridge on KY 11 Connection No. 3 over Crystal Creek; and 3,718 lineal feet of Center Street Connection pavement.

In order to reduce traffic on the existing KY 11 downtown Beattyville, the alternative concept is proposed with the replacement of the terminus of the KY 11 Connection No. 3 to the existing KY 11 with terminus to KY 52 as described above in "Description of Alternative Concept" and as shown in the attached sketch. The primary drawback associated with the alternative concept is an increase in traffic to KY 52 with a secondary drawback being the tapers on the north end of the Kentucky River Bridge.

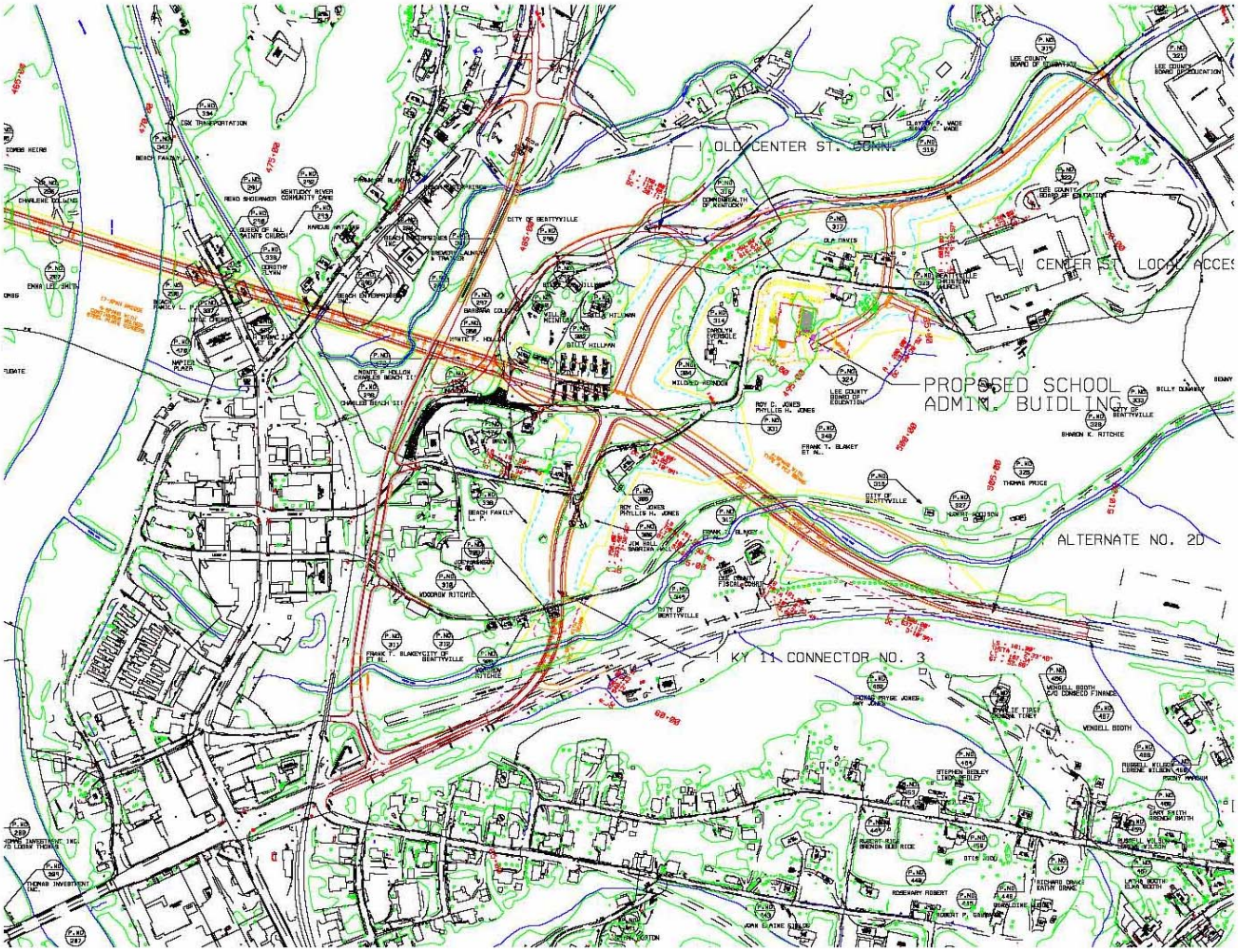
The alternative concept construction includes the following: 1,900 lineal feet of KY 11 Relocation mainline pavement; a 4-span 500 ft long mainline bridge over Crystal Creek, 1,425 lineal feet of KY 11 Connection No. 3 pavement, and 3,718 lineal feet of Center Street Extension pavement.

The alternative concept results in elimination of a 4-span 230 ft long bridge over Crystal Creek. Roadway pavement, excavation, embankment, and right-of-way quantities are essentially the same.

Sketch

Alternative No.: AD-12

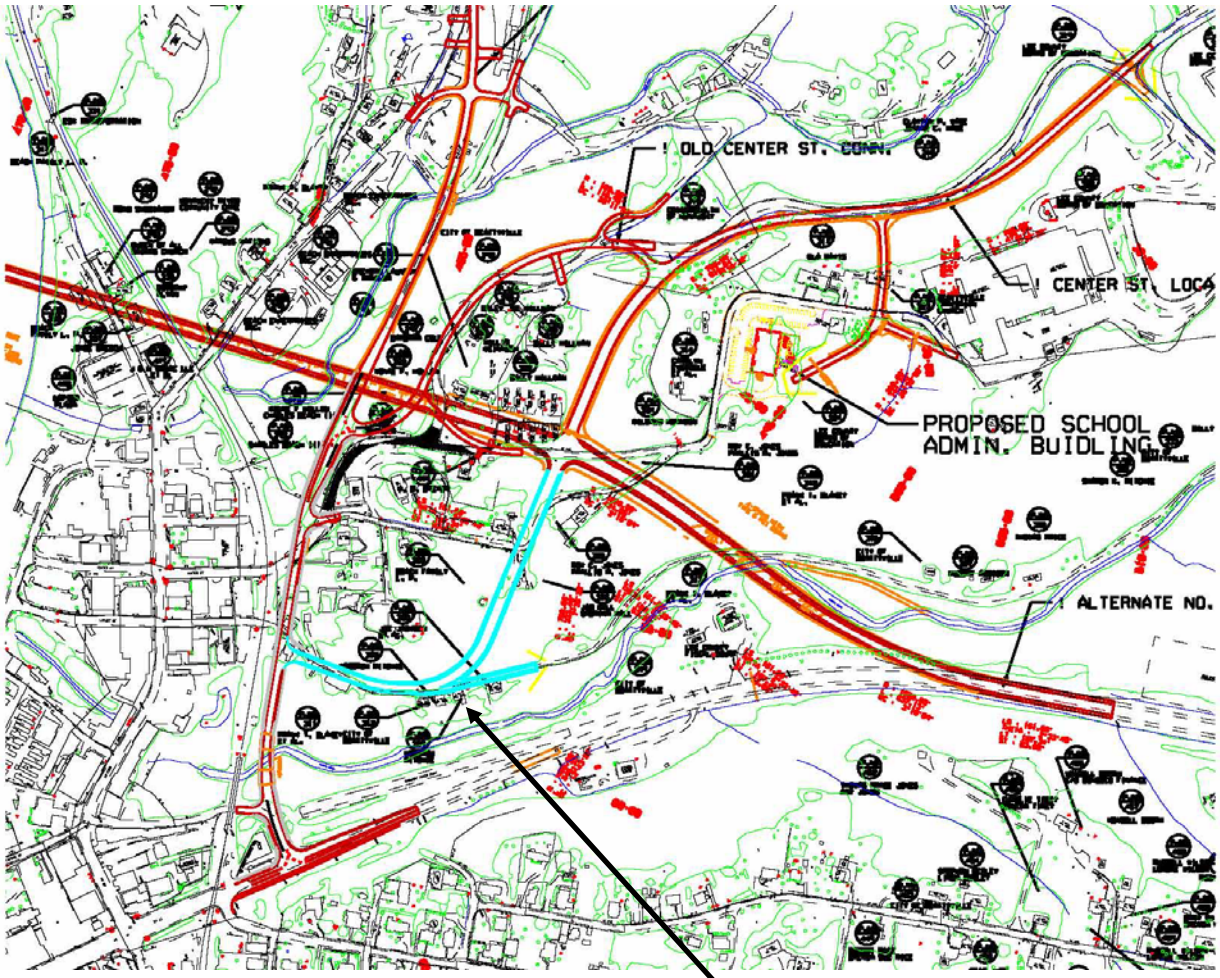
☑ Original ☐ Alternative



Sketch

Alternative No.: AD-12

☐ Original ☑ Alternative



VE Study Alternative

Calculations

Alternative No.: AD-12

☑ Original ☐ Alternative

KY 11 Connection No. 3 Roadway Widths:

Station 66+55	
Station 50+00	
1,655 feet	
230 feet	bridge
1,425 feet	40 foot roadway

Calculations

Alternative No.: AD-12

☐ Original ☑ Alternative

KY 11 Connection No. 3 Roadway Widths

1,400 feet 40 foot roadway

Net Roadway Length

1,425 feet – 1,400 feet =25 feet , 40 foot roadway (negligible)

Bridge

(230 feet) (43) = 9,890 SF

Life Cycle Cost Analysis

Alternative No.: AD-12

LIFE CYCLE PERIOD 25 YEARS

ANNUAL PERCENTAGE RATE 4.000%

CAPITAL COST			ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Capital Cost Savings								$0
ANNUAL EXPENDITURE	**%**	**PRESENT WORTH FACTOR**	**ORIGINAL CONCEPT**			**ALTERNATIVE CONCEPT**		
			CAPITAL COST	ANNUAL COST	PRESENT WORTH	CAPITAL COST	ANNUAL COST	PRESENT WORTH
Generalized (% of Capital Cost)								
General Maintenance	0.5%	15.6221	1,137,350	6,000	94,000			
		SUB-TOTAL			$94,000			$0

SINGLE EXPENDITURE (REPLACEMENT)	YEAR	PRESENT WORTH FACTOR	ORIGINAL CONCEPT		ALTERNATIVE CONCEPT	
			ESTIMATE	PRESENT WORTH	ESTIMATE	PRESENT WORTH
Salvage Value at End of Economic Life						
		SUB-TOTAL		$0		$0
		TOTAL PRESENT WORTH		$94,000		$0
				PRESENT WORTH SAVINGS ON O&M		$94,000
				LIFE CYCLE COST SAVINGS		$94,000

Construction Cost Estimate

Alternative No.: AD-12

Item	Unit of Meas.	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Bridge, PCI Beam	SF	100.00	9,890	$989,000		
Subtotal				$989,000		
Contingency		15.00%		$148,350		
TOTALS				$1,137,000		
NET SAVINGS						$1,137,000

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IMPROVE ROUTE (IR)

Value Alternative

Project: KY 11 Relocation
Location: Lee and Owsley Counties

Alternative No:
IR-1

Title:
Use Alt 1 and extend to the river bend north of town

Description of Original Concept:

In the original concept Alternate 1 removes the curve at the county line, continues north along KY 11, and removes the curve at the intersection of KY 587. Continuing along the current KY 11 centerline, Alternate 1 leaves existing KY 11 to create a new bridge crossing over the South Fork and terminates at the existing North Fork Bridge.

Description of Alternative Concept:

In the alternative concept Alternative 1 removes the curve at the county line, continues north along KY 11, and removes the curve at the intersection of KY 587. Continuing along the current KY 11 centerline, the alternative alignment leaves existing KY 11 to create a new bridge crossing over the South Fork and North Fork of the Kentucky River. This alternative removes the curve south of the South Fork and creates alternate roadway alignment connecting into KY 11 north of Beattyville approximately 7,500 lf (1.5 miles).

Value Improvement

$$\text{Value} \approx \frac{\text{Function}}{\text{Resources}}$$

Function	Resources
☑ Increased	☑ Increased
☐ Maintained	☐ Maintained
☐ Decreased	☐ Decreased

Cost Savings Summary

First Cost Savings:	($ 1,734,000)
O&M Savings:	$ 629,000
Life Cycle Cost Savings:	($ 1,105,000)

Advantages/Disadvantages

Alternative No.: IR-1

Advantages of Alternative Concept

- Reduces the construction schedule by being able to work multiple bridge sites
- Reduces property right-of-way acquisition
- Reduces maintenance cost due to less roadway
- Simplifies construction by nature of access
- Less disruption to downtown businesses along with congestion

Disadvantages of Alternative Concept

- Adds one additional river crossing bridge
- Could bring on design problems due to historic coal mining operation on the north end of the project between the south and north river edges
- Does not increase business traffic through downtown, if desired

Discussion

Alternative No.: IR-1

The Original Concept Alternate 2D follows along existing KY 11 from the junction with KY 30 to approximately the county line where it diverges to the west along a new terrain route through a mostly undeveloped area. The alignment crosses the Kentucky River on a 16-span bridge in the western part of downtown Beattyville. Alternate 2D will construct and connect to Center Street, in a large cut section, that provides access to the school complex on the west and downtown to the east. Relocated KY 11 continues to the north to tie into the existing KY 11 alignment 6,500 feet north of downtown.

The alternative concept creates an alignment that follows the original concept Alt 1 along the existing KY 11 to the curve near the top of the hill just south of the South Fork of the Kentucky River, where it leaves existing KY 11 following along the tangent across the South Fork, eventually crossing the North Fork approximately 6,000 feet upstream of the existing North Fork Bridge to create a new bridge over the South Fork and continuing on to tie into existing KY 11 north of town, approximately 6,500 feet.

This alignment provides a number of advantages as compared to the original concept.

The alternative concept reduces the construction schedule by reducing the amount of roadway excavation. The cuts along the existing alignment of KY 11 from the county line to the South Fork Bridge would be much less than cuts required for the same section of roadway along Alternate 2D. The terrain along the existing KY 11 is clearly not as rugged as Alternate 2D. Vertical alignment changes to correct sight distance deficiencies will not require as severe cuts as Alternate 2D

The terrain between the two rivers is generally at a higher elevation allowing the proposed alignment to be adjusted during final design to minimize the amount of cut.

This alignment will allow relocated KY 11 to tie-in at a higher elevation to existing KY 11, reducing the total grade change across the Kentucky River Valley, and resulting in a free flowing route without traffic signals or stop signs, providing easier travel through the area and improved access to markets and suppliers.

Right-of-way impacts will be minimized by the alternative concept, primarily due to use of existing right-of-way along the KY 11 from the county line north to the river, whereas the Alternate 2D alignment through this section is all on new terrain with a large foot print.

The alternative concept provides enhanced safety as compared to original concept Alternate 2D. If Alternate 2D is constructed deficiencies on the existing KY 11 section between the county line and Beattyville will not be improved. It is projected that approximately one half of the KY 11 traffic will use the Alternate 2D Relocated KY 11 section, while the other half will remain on the old KY 11. That means that approximately 2,700 vehicles (2004 counts) will be traveling each day on the deficient existing KY 11. The alternative concept would bring this section up to standard and provide a safe route for the local traffic as well as the through traffic.

Discussion

Alternative No.: IR-1

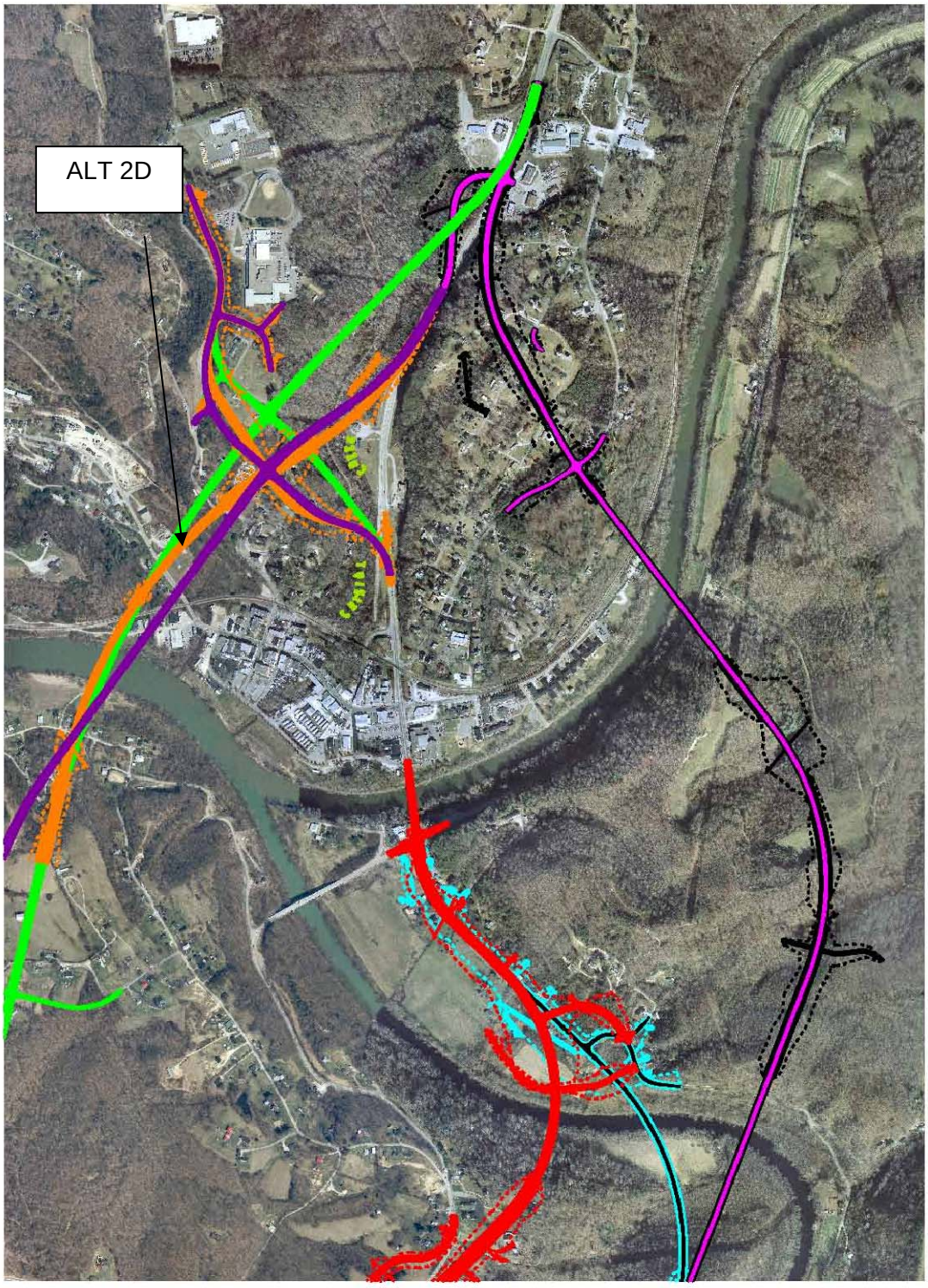
If Alternate 2D is constructed 7.52 miles of new roadway will be constructed. This new roadway as well as the existing KY 11 section between the county line and Beattyville will require plowing and maintenance. The alternative concept only results in 2.6 miles of new roadway to maintain and reducing the annual maintenance costs as compared to the original concept Alternate 2D. The alternative concept has a longer bridge and has 4 more plate girder spans than the original concept Alternate 2D, resulting in an increased maintenance cost. It is expected that these costs would be more than offset by the maintenance savings resulting from having 5 less road miles to maintain.

The design report indicated concern regarding the bridge foundations for the original concept Alternate3 due to suspected underground mining. The alternative concept alignment minimizes the number of the South Fork Bridge foundations in that area and the south end of the North Fork Bridge will be located upstream of the suspected area.

Sketch

Alternative No.: IR-1

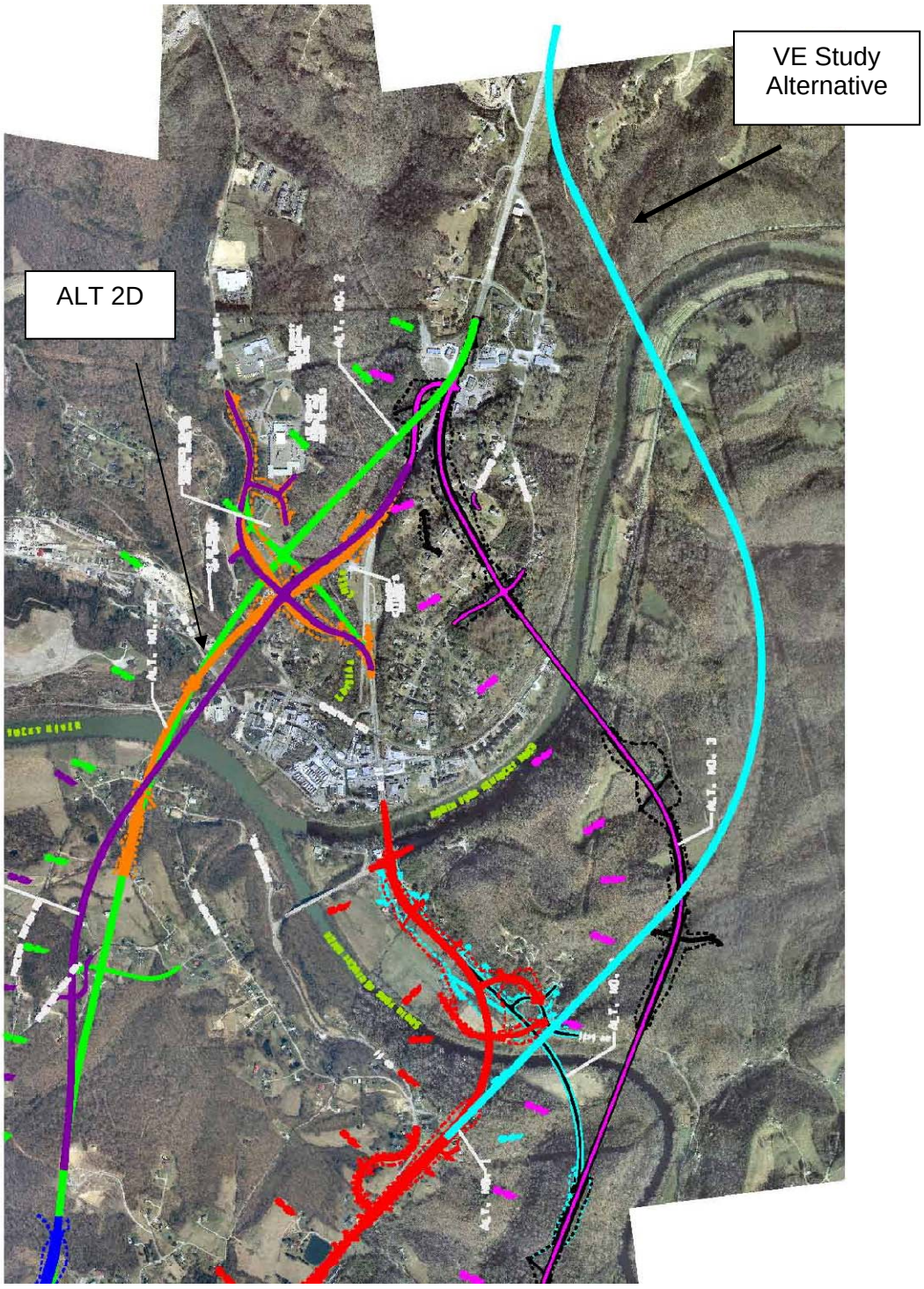
☑ Original ☐ Alternative



Sketch

Alternative No.: IR-1

☐ Original ☑ Alternative



Calculations

Alternative No.: IR-1

☑ Original ☐ Alternative

	Total	Owned	Purchase
Alternate 2D	201 Acre	38.57	162.43

Residential $15,000 - $20,000 per acre

Commercial – Business $25,000 - $50,000 per acre

Beattyville $100,000 - $165,000 per acre

County $5,000 per acre

From Nancy Albright, Maintenance Division, general maintenance cost for Lee and Owsley Counties is $2,500 per lane mile.

Alternate 2D alignment	=	15.04 lane miles		
Remaining KY 11 alignment	=	6.14 lane miles		
Total	=	21.18 lane miles		
Annual Maintenance	=	21.18 x $2,500	=	$52,950 / year

Assume overlay at year 10 for 24-foot roadway section

Mill Pavement	=	$ 2.50 / LF
1.25 Inch Pavement	=	$50.00 / LF
	=	$52.50 / LF

Length - 10.59 miles x 5,280 LF/Mile = 55,915 FT

Cost for Overlay – 55,915 x $52.50 / LF = $2,935,500

Calculations

Alternative No.: IR-1

☐ Original ☑ Alternative

	Total	Owned	Purchase
Alternate 2D	201 Acre	38.57	162.43
Alternative Concept	218 Acre	67.95	150.05

Residential $15,000 - $20,000 per acre

Commercial – Business $25,000 - $50,000 per acre

Beattyville $100,000 - $165,000 per acre

County $5,000 per acre

Alternate alignment = 16.44 lane miles

Annual Maintenance = 16.44 x $2,500 = $41,100 / year

Assume overlay at year 10 for 24-foot roadway section

Mill Pavement = $ 2.50 / LF

1.25 Inch Pavement = $50.00 / LF

= $52.50 / LF

Length - 8.22 miles x 5,280 LF/Mile = 43,400 FT

Cost for Overlay – 43,400 x $52.50 / LF = $2,278,500

Life Cycle Cost Analysis

Alternative No.: IR-1

LIFE CYCLE PERIOD 25 YEARS ANNUAL PERCENTAGE RATE 4.000%

CAPITAL COST			ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
		Capital Cost Savings						$0
ANNUAL EXPENDITURE	**%**	**PRESENT WORTH FACTOR**	**ORIGINAL CONCEPT**			**ALTERNATIVE CONCEPT**		
			CAPITAL COST	ANNUAL COST	PRESENT WORTH	CAPITAL COST	ANNUAL COST	PRESENT WORTH
General Roadway Maintenance		15.6221		52,950	827,000		41,100	642,000
Generalized (% of Capital Cost)								
		SUB-TOTAL			$827,000			$642,000

SINGLE EXPENDITURE (REPLACEMENT)	YEAR	PRESENT WORTH FACTOR	ORIGINAL CONCEPT		ALTERNATIVE CONCEPT	
			ESTIMATE	PRESENT WORTH	ESTIMATE	PRESENT WORTH
Overlay	10	0.6756	2,935,500	1,983,000	2,278,500	1,539,000
Salvage Value at End of Economic Life						
		SUB-TOTAL		$1,983,000		$1,539,000
		TOTAL PRESENT WORTH		$2,810,000		$2,181,000
				PRESENT WORTH SAVINGS ON O&M		$629,000
				LIFE CYCLE COST SAVINGS		$629,000

Construction Cost Estimate

Alternative No.: IR-1

Item	Unit of Meas.	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Alternate 2D	LS	51,112,542.00	1	$51,112,542		
VE Alignment	LS	52,793,725.00			1	$52,793,725
Property Acquisition	AC	5,000.00	162	$810,000	150	$750,000
Guard Rail	LF	25.25	41,300	$1,042,825	36,790	$928,948
Subtotal				$52,965,367		$54,472,673
Contingency		15.00%		$7,944,805		$8,170,901
TOTALS				$60,910,000		$62,644,000
NET SAVINGS						($1,734,000)

Value Alternative

Project: KY 11 Relocation
Location: Lee and Owsley Counties

Alternative No:
IR-2

Title:
Connect Alt 1 across South Fork and tie-in to Alt 3 alignment

Description of Original Concept:

In the original concept Alternate 1 removes the curve at the county line, continues north along KY 11, and removes the curve at the intersection of KY 587. Continuing along the current KY 11 centerline, Alternate 1 leaves existing KY 11 to create a new bridge crossing over the South Fork and terminates at the existing North Fork Bridge.

Description of Alternative Concept:

In the alternative concept Alternate 1 removes the curve at the county line, continues north along KY 11, and removes the curve at the intersection of KY 587. Continuing along the current KY 11 centerline, Alternate 1B leaves existing KY 11 to create a new bridge crossing over the South Fork and North Fork of the Kentucky River, removes the curve south of the South Fork, creates an alternate roadway alignment connecting into Alternate 3 south of the North Fork and retains balance of the Alternate 3 to the KY 11 tie-in.

Value Improvement

$$\text{Value} \approx \frac{\text{Function}}{\text{Resources}}$$

Function		Resources	
☑	Increased	☐	Increased
☐	Maintained	☐	Maintained
☐	Decreased	☑	Decreased

Cost Savings Summary

First Cost Savings:	$ 762,000
O&M Savings:	$ 768,000
Life Cycle Cost Savings:	$ 1,530,000

Advantages/Disadvantages

Alternative No.: IR-2

Advantages of Alternative Concept

- Reduces the construction schedule by reducing roadway excavation quantity
- Reduces the construction schedule by being able to work multiple bridge sites
- Reduces property right-of-way acquisition
- Reduces maintenance cost due to less roadway
- Simplifies construction by nature of access
- Less disruption to downtown businesses along with reduced congestion

Disadvantages of Alternative Concept

- Adds one additional river crossing bridge
- Could bring on design problems due to historic coal mining operation on the north end of the project between the south and north river edges
- Does not increase business traffic through downtown, if desired

Discussion

Alternative No.: IR-2

The original concept Alternate 2D follows along existing KY 11 from the junction with KY 30 to approximately the county line where it diverges to the west along a new terrain route through a mostly undeveloped area. The alignment crosses the Kentucky River on a 16 span bridge in the western part of downtown Beattyville. Alternate 2D will construct and connect to Center Street, in a large cut section that provides access to the school complex on the west and downtown to the east. Relocated KY 11 continues to the north to tie into the existing KY 11 alignment approximately 5,000 feet north of downtown.

The alternative concept would create an alignment that follows the original concept Alternate 1 along existing KY 11 to the curve near the top of the hill just south of the South Fork of the Kentucky River where it leaves existing KY 11 following along the tangent across the South Fork, where it will join the original concept Alternate 3 to cross the North Fork and tie-in to the existing KY 11 alignment at approximately the same location as Alternate 2D north of downtown.

The alternative concept provides a number of advantages as compared to the original concept and shares many advantages with Value Alternative IR-1.

It reduces the construction schedule by reducing the amount of roadway excavation. The cuts along the existing alignment of KY 11 from the county line to the South Fork Bridge would be much less than cuts required for the same section of roadway along Alternate 2D. The terrain along existing KY 11 is not as rugged as Alternate 2D. Vertical alignment changes to correct sight distance deficiencies will not require as severe cuts as Alternate 2D.

The terrain between the two rivers is generally at a higher elevation allowing the proposed alignment to be adjusted during final design to minimize the amount of cut.

This alignment will allow relocated KY 11 to tie-in at a higher elevation to existing KY 11, reducing the total grade change across the Kentucky River Valley, and resulting in a free flowing route without traffic signals or stop signs, providing easier travel through the area and improved access to markets and suppliers.

Right-of-Way impacts will be minimized by the proposed alignment, primarily due to use of existing right-of-way along KY 11 from the county line north to the river, whereas the Alternate 2D alignment through this section is all on new terrain with a large foot print.

The alternative concept provides enhanced safety as compared to the original concept Alternate 2D. If Alternate 2D is constructed, deficiencies on the existing KY 11 section between the county line and Beattyville will not be improved. It is projected that approximately one half of the KY 11 traffic will use the Alternate 2D relocated KY 11 section, while the other half will remain on the original KY 11 alignment. That means that approximately 2,700 vehicles (2004 counts) will be traveling each day on the deficient existing KY 11. The alternative concept will bring this section up to standard and provide a safe route for the local traffic as well as the through traffic.

Discussion

Alternative No.: IR-2

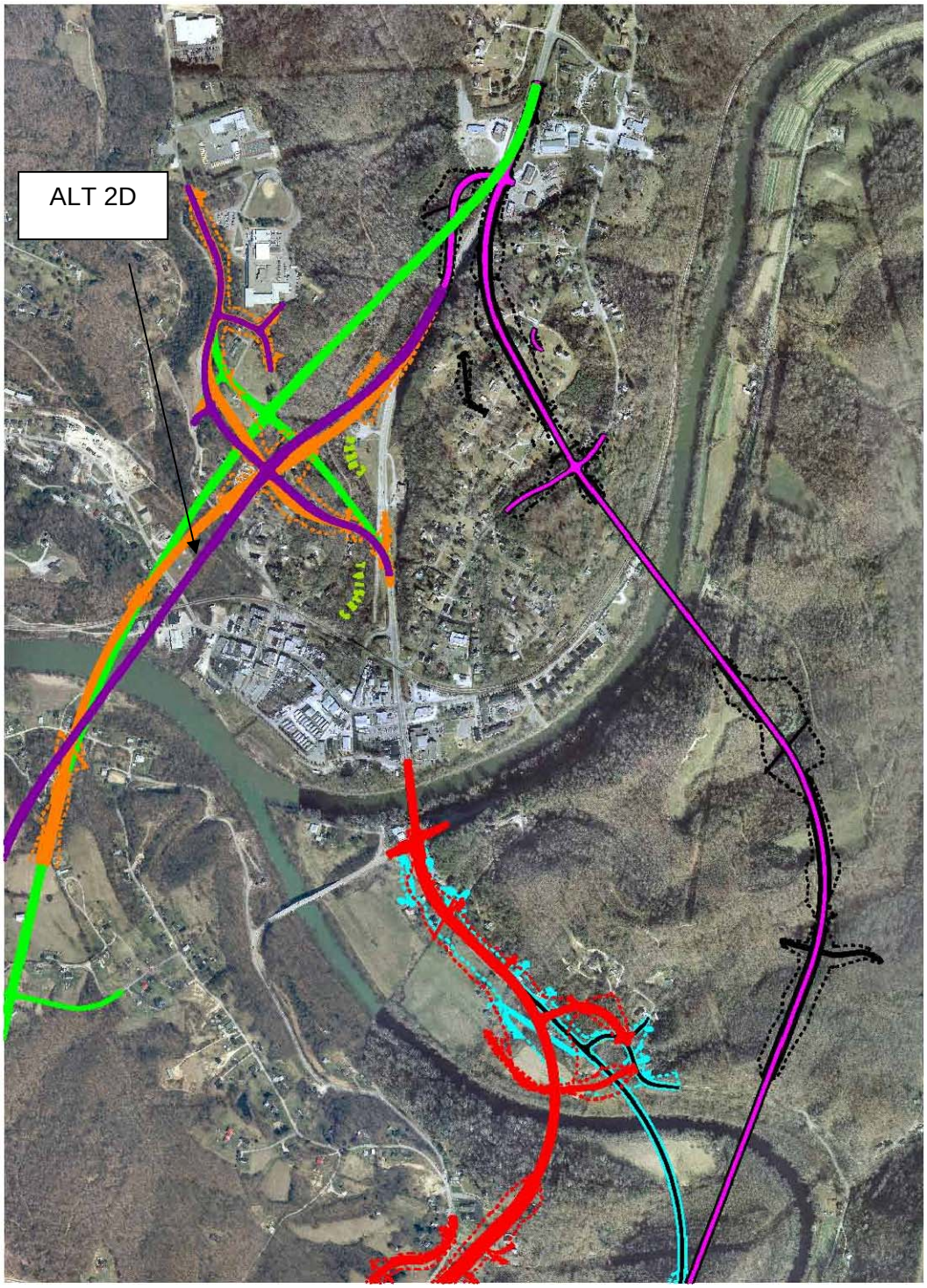
If the original concept Alternate 2D is constructed 7.52 miles of new roadway will be constructed. This new roadway as well as the existing KY 11 section between the county line and Beattyville will require plowing and maintenance. The alternative concept only results in approximately 2 miles of new roadway to maintain and reduces the annual maintenance costs as compared to Alternate 2D.

The alternative concept will have approximately the same length of river crossing bridge structures as the original concept Alternate 2D for a total of 16 spans each. The design report indicated concern regarding the bridge foundations for the original concept Alternate 3 due to suspected underground mining. The design report did not include any estimated additional cost for this challenge and this estimate likewise does not. However the risk of encountering these conditions in the alternative concept is reduced as compared to original concept Alternate 3 due to the South Fork Bridge being located outside of the suspected area.

Sketch

Alternative No.: IR-2

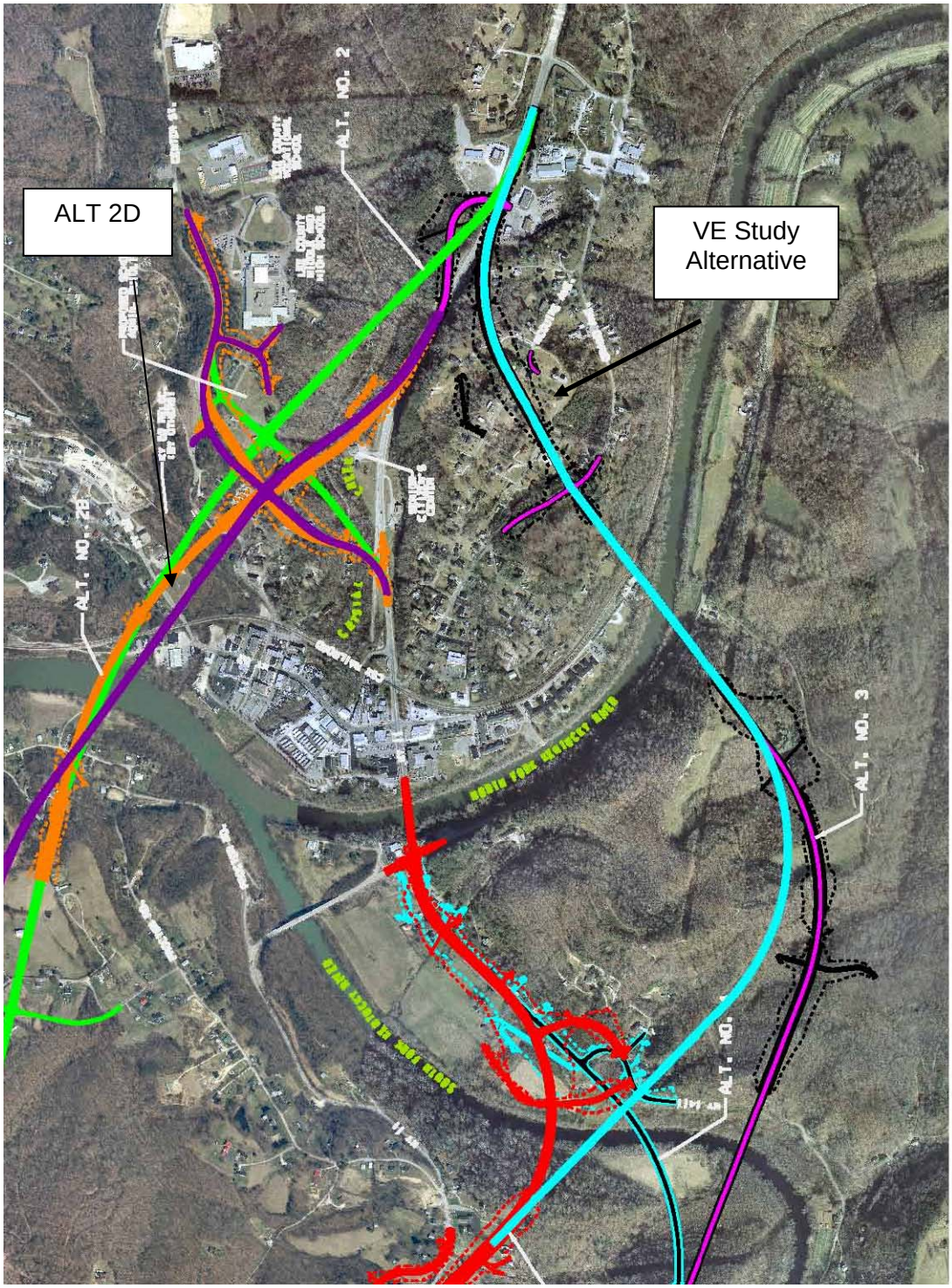
☑ Original ☐ Alternative



Sketch

Alternative No.: IR-2

☐ Original ☑ Alternative



Calculations

Alternative No.: IR-2

☑ Original ☐ Alternative

	Total	Owned	Purchase
Alternate 2D	201 Acre	38.57	162.43

Residential $15,000 - $20,000 per acre

Commercial – Business $25,000 - $50,000 per acre

Beattyville $100,000 - $165,000 per acre

County $5,000 per acre

From Nancy Albright, Maintenance Division, general maintenance cost for Lee and Owsley Counties is $2,500 per lane mile.

Alternate 2D alignment = 15.04 lane miles

Remaining KY 11 alignment = 6.14 lane miles

Total = 21.18 lane miles

Annual Maintenance = 21.18 x $2,500 = $52,950 / year

Assume overlay at year 10 for 24-foot roadway section

Mill Pavement = $ 2.50 / LF

1.25 Inch Pavement = $50.00 / LF

= $52.50 / LF

Length - 10.59 miles x 5,280 LF/Mile = 55,915 FT

Cost for Overlay – 55,915 x $52.50 / LF = $2,935,500

Calculations

Alternative No.: IR-2

☐ Original ☑ Alternative

	Total	Owned	Purchase
Alternate 2D	201 Acre	38.57	162.43
Alternative Concept	200 Acre	67.95	132.05
			30.38

Residential $15,000 - $20,000 per acre

Commercial – Business $25,000 - $50,000 per acre

Beattyville $100,000 - $165,000 per acre

County $5,000 per acre

Alternate Alignment = 15.38 lane miles

Annual Maintenance = 15.38 x $2,500 = $38,450 / year

Assume overlay at year 10 for 24-foot roadway section

Mill Pavement = $ 2.50 / LF

1.25 Inch Pavement = $50.00 / LF

= $52.50 / LF

Length - 7.69 miles x 5,280 LF/Mile = 40,600 FT

Cost for Overlay – 40,600 x $52.50 / LF = $2,132,500

Life Cycle Cost Analysis

Alternative No.: IR-2

CAPITAL COST			ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Capital Cost Savings								$0
ANNUAL EXPENDITURE	**%**	**PRESENT WORTH FACTOR**	**ORIGINAL CONCEPT**			**ALTERNATIVE CONCEPT**		
			CAPITAL COST	ANNUAL COST	PRESENT WORTH	CAPITAL COST	ANNUAL COST	PRESENT WORTH
General Roadway Maintenance		15.6221		52,950	827,000		38,450	601,000
Generalized (% of Capital Cost)								
		SUB-TOTAL			$827,000			$601,000
SINGLE EXPENDITURE (REPLACEMENT)	**YEAR**	**PRESENT WORTH FACTOR**	**ORIGINAL CONCEPT**			**ALTERNATIVE CONCEPT**		
			ESTIMATE	PRESENT WORTH		ESTIMATE	PRESENT WORTH	
Overlay	10	0.6756	2,935,500	1,983,000		2,132,500	1,441,000	
Salvage Value at End of Economic Life								
		SUB-TOTAL			$1,983,000			$1,441,000
		TOTAL PRESENT WORTH			$2,810,000			$2,042,000
					PRESENT WORTH SAVINGS ON O&M			$768,000
					LIFE CYCLE COST SAVINGS			$768,000

Construction Cost Estimate

Alternative No.: IR-2

Item	Unit of Meas.	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Alternate 2D	LS	51,112,542.00	1	$51,112,542		
VE Alignment	LS	50,713,605.00			1	$50,713,605
Property Acquisition	AC	5,000.00	162	$810,000	132	$660,000
Guard Rail	LF	25.25	41,300	$1,042,825	36,790	$928,948
Subtotal				$52,965,367		$52,302,553
Contingency		15.00%		$7,944,805		$7,845,383
TOTALS				$60,910,000		$60,148,000
NET SAVINGS						$762,000

Value Alternative

Project: KY 11 Relocation
Location: Lee and Owsley Counties

Alternative No:
IR-9

Title:
Widen existing alignment in Beattyville and lower Alternative 1 alignment

Description of Original Concept:

The original concept provides two 12-foot lanes and 12-foot shoulders (10-foot paved). Alternate 1 removes the curve at the county line, continues north along KY 11, and removes the curve at the intersection of KY 587. Continuing along the current KY 11 centerline, Alternate 1 leaves existing KY 11 to create a new bridge crossing over the South Fork and terminates at the existing North Fork Bridge.

Description of Alternative Concept:

The alternative concept lowers the elevation of the profile starting at approximately Station 410+00 to the end of the alignment to the north. In addition, KY 11 is widened through Beattyville to reduce the congestion. As part of this widening, River Street will be made into a cul-de-sac, eliminating one access/conflict point onto KY 11.

Value Improvement

$$\text{Value} \approx \frac{\text{Function}}{\text{Resources}}$$

Function	Resources
☐ Increased	☐ Increased
☑ Maintained	☐ Maintained
☐ Decreased	☑ Decreased

Cost Savings Summary

First Cost Savings:	$ 14,842,000
O&M Savings:	$ 879,000
Life Cycle Cost Savings:	$ 15,721,000

Advantages/Disadvantages

Alternative No.: IR-9

Advantages of Alternative Concept

- Lowers the approach grade to the KY 52 intersection
- Reduces the congestion within Beattyville
- Keeps the existing connectivity to Beattyville
- Potentially reduces the impact on historic locations
- Reduces bridge length

Disadvantages of Alternative Concept

- Increases the volume of excavation in order to lower the grade south of the river
- Keeps the at-grade railroad crossing
- Through traffic must still enter Beattyville and negotiate the signalized intersections
- Adversely impacts more properties on existing KY 11

Discussion

Alternative No.: IR-9

The features of the original Alternative 1 addressed by this Value Alternative are the 5% slope on the northbound approach to Beattyville and the congestion within Beattyville.

This Value Engineering Alternative reduces the slope of the approach grade to approximately 4% by lowering the proposed roadway elevation approximately 20-25 feet starting near Station 411+00. This will require the acquisition of additional right-of-way and two entire property takes. The lowering of the roadway in this location does not adversely affect the existing cemetery adjacent to West Ridge Road. By lowering the grade, the bridge length is also reduced by approximately 40 feet.

The existing KY 11 in Beattyville has a stretch of 2 lane roadway that is approximately 1800 feet in length. To improve the traffic flow within Beattyville, this Value Engineering Alternative calls for widening this existing 2-lane section of KY 11 to a minimum 3-lane section with curb and gutter. This will require the installation of a storm sewer system to collect the rainfall runoff. Additionally, River Street will be made to cul-de-sac prior to KY 11, eliminating one access point. Traffic on River Street will be able to access KY 11 from Main Street via Lumber Street.

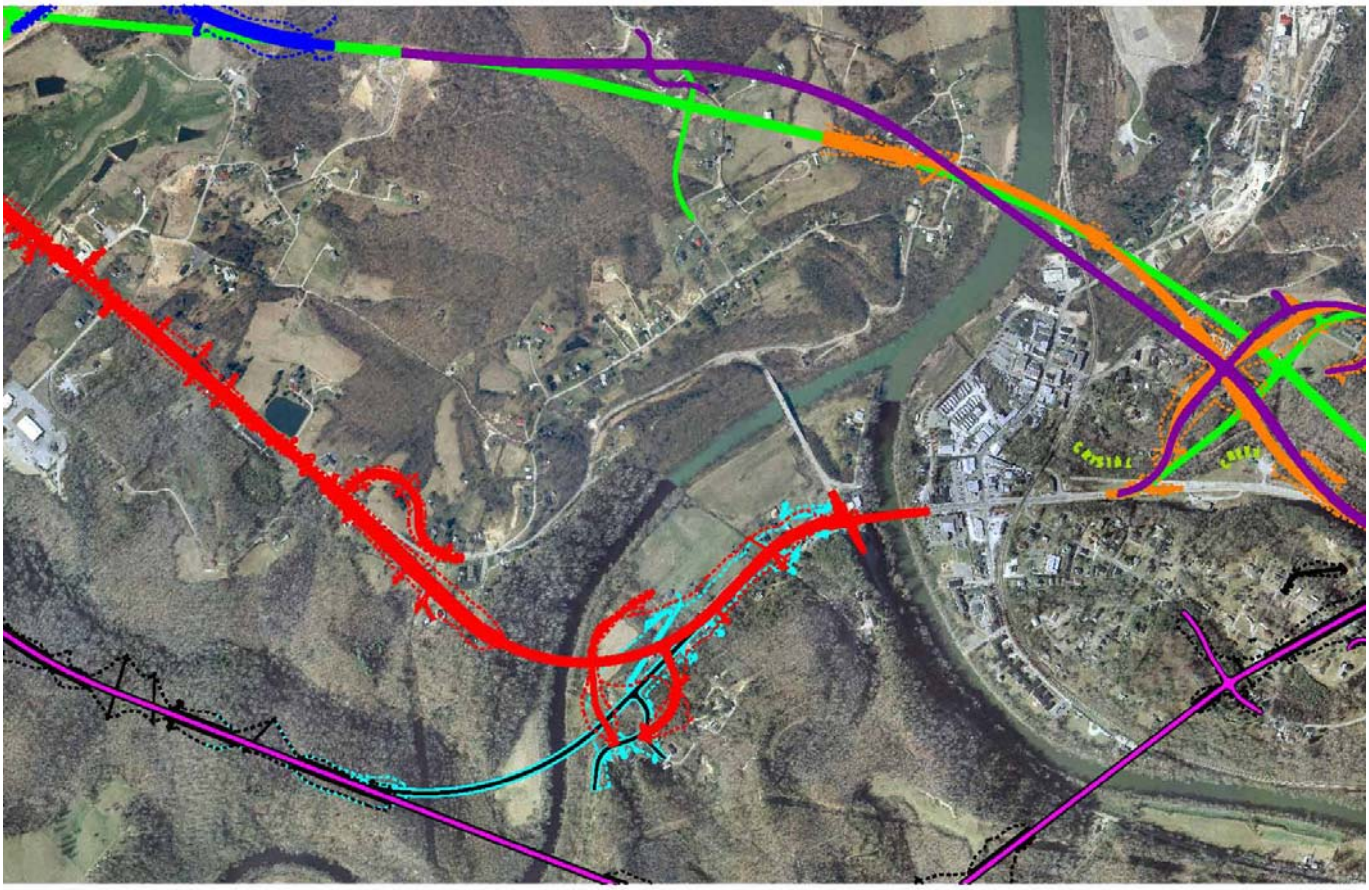
The horizontal curvature of the bridge remains unchanged. Although not an ideal geometric configuration, a curved structure should not be summarily dismissed. Curved structures on slopes exist on flyover ramps and perform very well.

Finally, by using this alignment, the potential impacts, both physical and visual, will be minimized to the historical sites due to the alignment remaining on the existing alignment near Beattyville. Widening or replacement of the existing North Fork Bridge will be necessary. This cost was not taken into account in the original estimate and has not been accounted for in this alternative.

Sketch

Alternative No.: IR-9

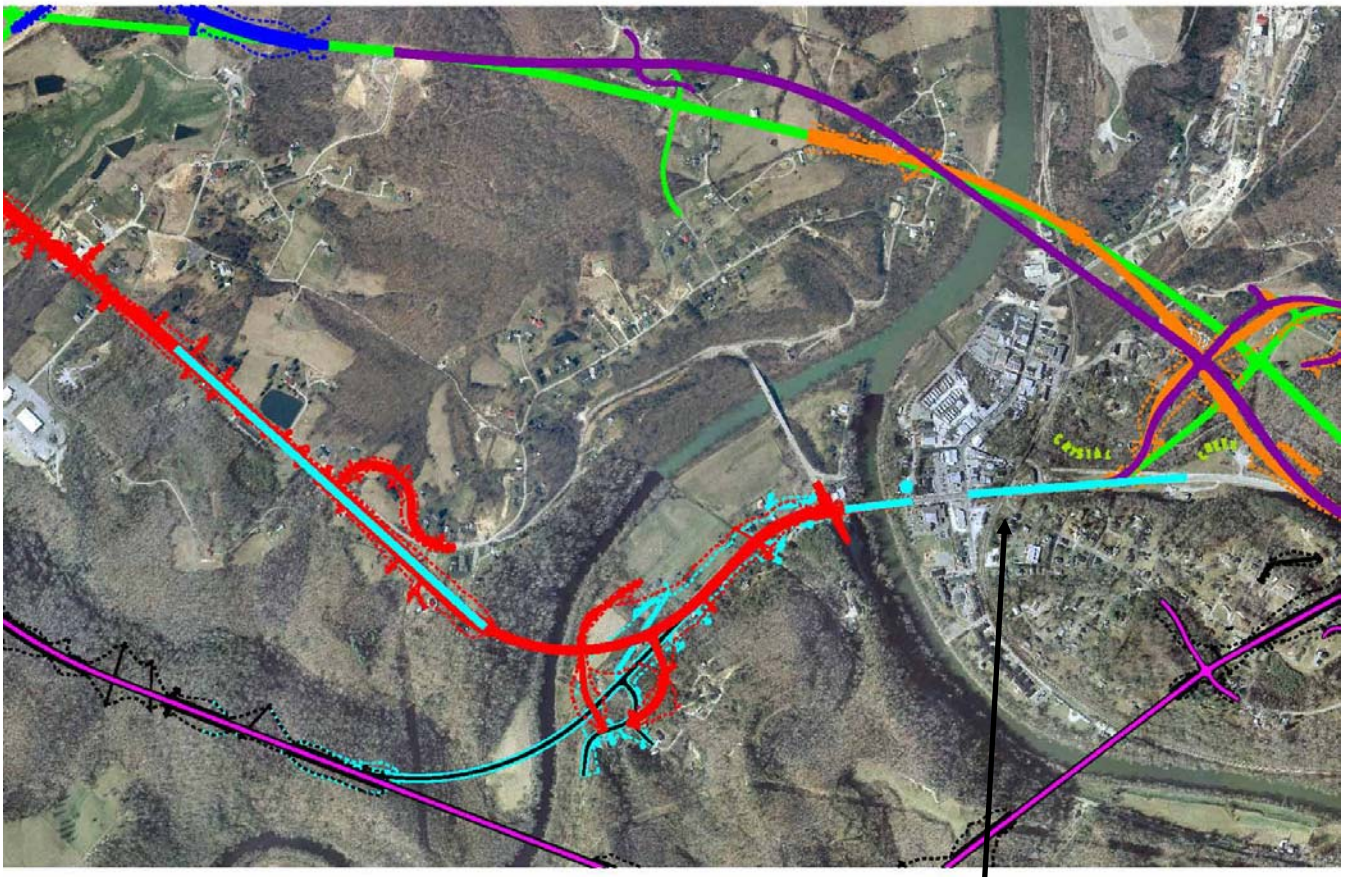
☑ Original ☐ Alternative



Sketch

Alternative No.: IR-9

☐ Original ☑ Alternative



Calculations

Alternative No.: IR-9

☑ Original ☐ Alternative

From Nancy Albright, Maintenance Division, general maintenance cost for Lee and Owsley Counties is $2,500 per lane mile.

Alternate 2D alignment	=	15.04 lane miles		
Remaining KY 11 alignment	=	6.14 lane miles		
Total	=	21.18 lane miles		
Annual Maintenance	=	21.18 x $2,500	=	$52,950 / year

Assume overlay at year 10 for 24-foot roadway section

Mill Pavement	=	$ 2.50 / LF
1.25 Inch Pavement	=	$50.00 / LF
	=	$52.50 / LF

Length - 10.59 miles x 5,280 LF/Mile = 55,915 FT

Cost for Overlay – 55,915 x $52.50 / LF = $2,935,500

Calculations

Alternative No.: IR-9

☐ Original ☑ Alternative

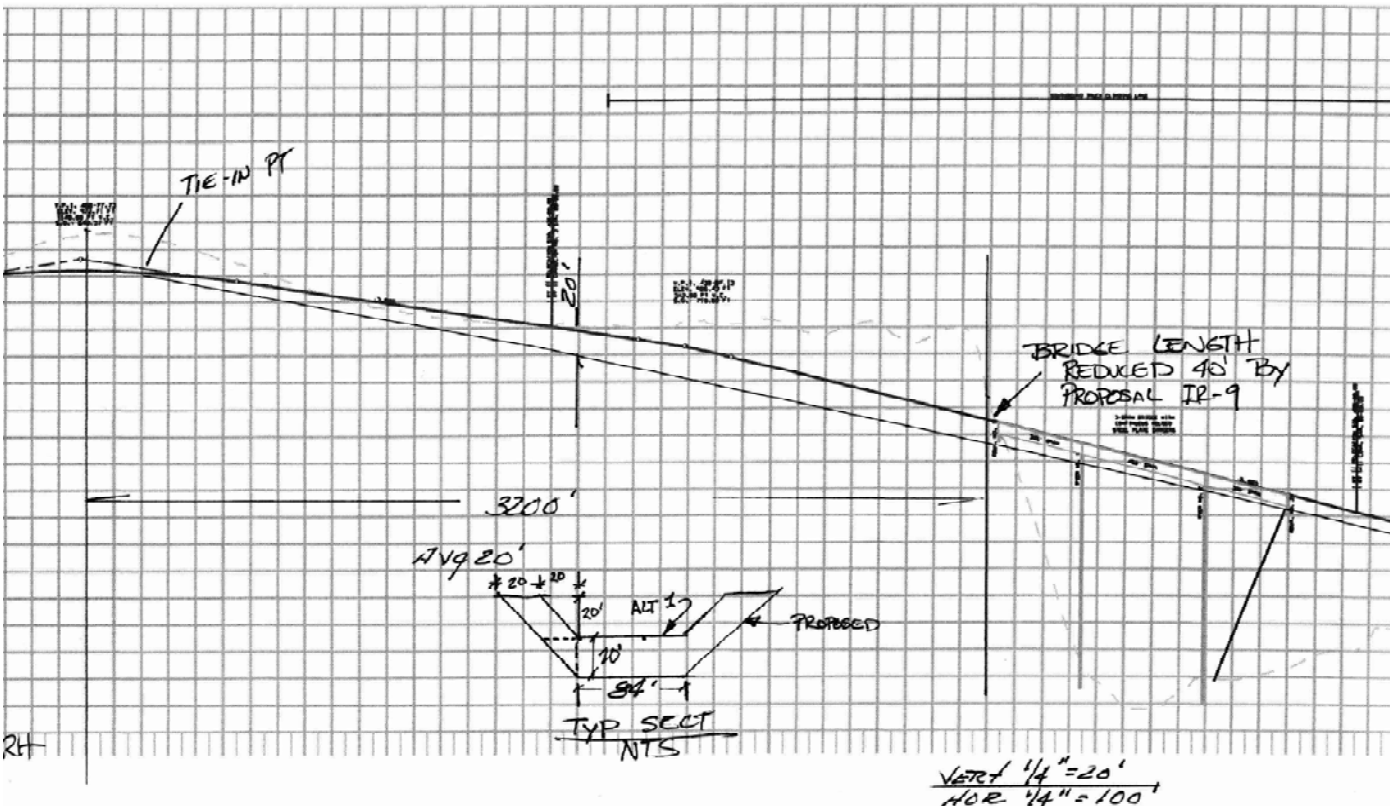
Alternate 1 alignment	=	13.88 lane miles	
Additional Length	=	0.68 lane miles	
Annual Maintenance	=	(13.88 + 0.68) x $2,500=	$36,400 / year

Assume overlay at year 10 for 24-foot roadway section

Mill Pavement	=	$ 2.50 / LF
1.25 Inch Pavement	=	$50.00 / LF
	=	$52.50 / LF

Length - 7.28 miles x 5,280 LF/Mile = 38,400 FT

Cost for Overlay – 38,400 x $52.50 / LF = $2,016,000



Calculations

Alternative No.: IR-9

☐ Original ☑ Alternative

Roadway Excavation:

(20 x 84) + 2 [½ (40)(40) – ½ (20)(20)]	=	
1,680 + 2 [800 – 200]	=	2,880 CF/LF
	=	106.6 CYS/LF
3,200 LF x 106.6 CYS/LF	=	341,120

Right-of-Way

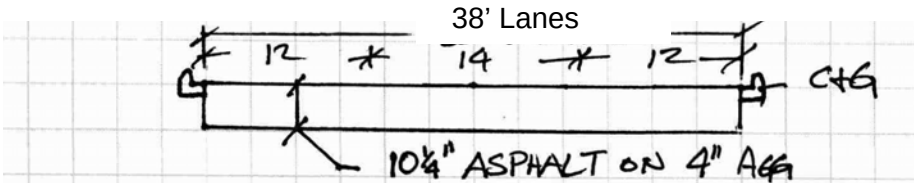
Additional right-of-way required varies from 0 feet at south tie-in to say 40 feet at bridge end

Say need 20 feet average along entire 3,200 LF stretch

20' (3,200')/43,560	=	1.46 Acres
Estimate 4 total takes and 1.46 acres	=	say 15 acres

Additional MOT

Required to maintain two-way traffic on half section, say $200,000



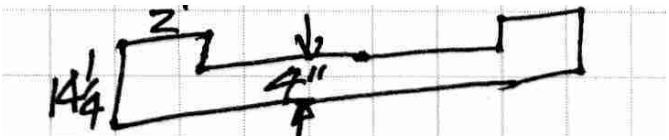
$$\frac{10\frac{1}{4}"/12" \times 140\ \frac{LB}{LF} \times 38'}{2{,}000\ \#/TN} = 2.3\ TN/LF \times 53.18\ \$/TN = \$120.24 / LF\ Asphalt$$

Calculations

Alternative No.: IR-9

☐ Original ☑ Alternative

Aggregate



0.33 FT x (36 + 2 + 2) + 2 (2 FT x 10 ¼ IN/12 IN)		=	
13.2 + 3.41		=	16.6 CF
16.6 CF x 108 #/CF/2,000 #/TN x $20/TN		=	$ 17.92 / LF

Curb and Gutter

$10 / LF x 2 sides		=	$ 20.00 / LF

Drainage

12 Inch Pipe: 1 FT/Side x 2 Sides x $22		=	$ 44.00 / LF

Inlets

2 Inlets / 100 LF x $1,000 / Inlet/FT		=	$ 20.00 / LF
Total 3 lane section with drainage and curb and gutter		=	$222.16 / LF

Bridge length reduced by 40 foot

From Alternate 1 – Bridge Width		=	61 FT 2 IN, say 61 FT
61 FT x 40 FT		=	2,440 SF

Replace KY 11 Bridge over North Fork Kentucky River

Widen to match 3 lane curbed section propped for downtown

From Bridge estimated Alt	L	=	412 FT
Required Width	W	=	50
		=	20,600 SF

Life Cycle Cost Analysis

Alternative No.: IR-9

CAPITAL COST			ORIGINAL CONCEPT			ALTERNATIVE CONCEPT		
Capital Cost Savings								$0
ANNUAL EXPENDITURE	**%**	**PRESENT WORTH FACTOR**	**ORIGINAL CONCEPT**			**ALTERNATIVE CONCEPT**		
			CAPITAL COST	ANNUAL COST	PRESENT WORTH	CAPITAL COST	ANNUAL COST	PRESENT WORTH
General Roadway Maintenance		15.6221		52,950	827,000		36,400	569,000
Generalized (% of Capital Cost)								
		SUB-TOTAL			$827,000			$569,000
SINGLE EXPENDITURE (REPLACEMENT)	**YEAR**	**PRESENT WORTH FACTOR**	**ORIGINAL CONCEPT**			**ALTERNATIVE CONCEPT**		
			ESTIMATE		PRESENT WORTH	ESTIMATE		PRESENT WORTH
Overlay	10	0.6756	2,935,500		1,983,000	2,016,000		1,362,000
Salvage Value at End of Economic Life								
		SUB-TOTAL			$1,983,000			$1,362,000
		TOTAL PRESENT WORTH			$2,810,000			$1,931,000
					PRESENT WORTH SAVINGS ON O&M			$879,000
					LIFE CYCLE COST SAVINGS			$879,000

Construction Cost Estimate

Alternative No.: IR-9

Item	Unit of Meas.	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Construct 3 lane C&G section KY11 dwntown	LF	222.16			1,800	$399,888
Roadway Exc	CY	3.50			341,120	$1,193,920
Right-of-Way (res/commercial mix)	AC	20,000.00			15	$300,000
MOT	LS	200,000.00			1	$200,000
Alternate 1Total Cost	LS	33,842,361.00			1	$33,842,361
Alternate 2D Total Cost	LS	51,112,542.00	1	$51,112,542		
Bridge Length Reduction	SF	125.00	2,440	$305,000		
Replace & widen North Fork Bridge	Sf	125.00			20,600	$2,575,000
Subtotal				$51,417,542		$38,511,169
Contingency		15.00%		$7,712,631		$5,776,675
TOTALS				$59,130,000		$44,288,000
NET SAVINGS						$14,842,000

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GENERAL (G)

Value Alternative

Project: KY 11 Relocation
Location: Lee and Owsley Counties

Alternative No:
G-1

Title:
Reduce shoulder width to six-foot paved; eight-foot total

Description of Original Concept:

The original concept provides two 12-foot lanes with 12-foot shoulders (10-foot paved).

Description of Alternative Concept:

The alternative concept provides shoulders that are eight-foot wide (six-foot paved).

Value Improvement

$$\text{Value} \approx \frac{\text{Function}}{\text{Resources}}$$

Function	Resources
☐ Increased	☐ Increased
☑ Maintained	☐ Maintained
☐ Decreased	☑ Decreased

Cost Savings Summary

First Cost Savings:	$ 5,431,000
O&M Savings:	$ 0
Life Cycle Cost Savings:	$ 5,431,000

Advantages/Disadvantages

Alternative No.: G-1

Advantages of Alternative Concept

- Reduces excavation volume
- Reduces pavement quantities

Disadvantages of Alternative Concept

- Reduces the width usable for disabled vehicles; however, it meets current KYTC design standards for rural arterials

Discussion

Alternative No.: G-1

The alternative concept consists of reducing the shoulder width by four feet. This is consistent with the current design standards for a rural arterial roadway.

By reducing the shoulder width, excavation quantities for the entire project are reduced by 308,000 CY. In addition to the roadway excavation, pavement quantities will be reduced, as well.

Presently, the existing shoulder pavement section consists of:

1-1/4” of Cl 1 Asphalt Surface 0.38D PG 64-22

3-1/2” of Cl 1 Asphalt Base 1.00D PG 64-22

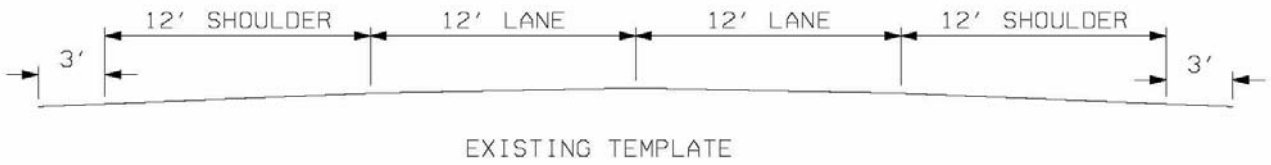
11” of Crushed Stone Base (CSB)

Eight feet is sufficient for a disabled auto to pull mostly off of the road, leaving room for other vehicles to pass.

Sketch

Alternative No.: G-1

☑ Original ☐ Alternative

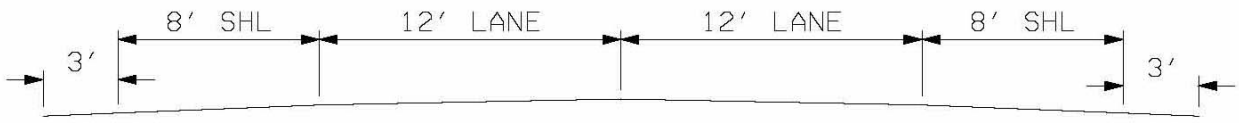


EXISTING TEMPLATE

Sketch

Alternative No.: G-1

☐ Original ☑ Alternative



PROPOSED TEMPLATE

Calculations

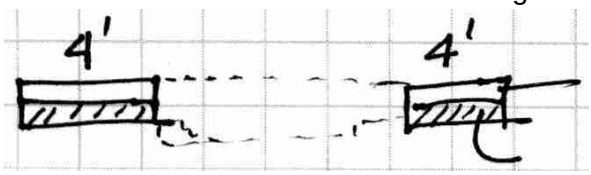
Alternative No.: G-1

☑ Original ☐ Alternative

Original Concept Alternate 2D Mainline Length

7.52 MI x 5,280 MI	=	39,705 LF
- 2D Bridge L	=	2,935 LF
Pavement	=	36,770 LF

Delete four-foot of shoulder from the original concept



4 ¾ Inch Asphalt at 140 #/CF
11 Inch Aggregate Typ at 120 #/CF

Asphalt

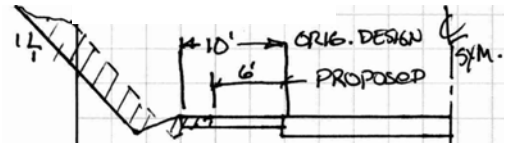
$4\,{}^{3}/_{4}{}''/_{12''}$ x 4' x 2 sides x $\frac{140\ {}^{\#}/_{CF}}{2{,}000\ {}^{\#}/_{TN}}$ x $53/TN = 11.75 / LF

Aggregate

$11''/_{12''}$ x 4' x 2 sides x $\frac{120\ {}^{\#}/_{CF}}{2{,}000\ {}^{\#}/_{TN}}$ x $20/TN = 8.80 / LF

Total = $20.55 / LF

In cuts, roadway excavation will decrease



Inroads calcs = 308,000 CYS

SYM about centerline

Reducing Roadway Template Width 8 foot

Alternate 2D	2,303 FT	KY River Bridge	x	8 FT	=	18,424 FT
	499 FT	Crystal Creek Bridge	x	8 FT	=	3,992 FT
	233 FT	Center St Connection Bridge	x	8 FT	=	1,864 FT

Construction Cost Estimate

Alternative No.: G-1

Item	Unit of Meas.	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Reduce Shoulder Pvmnt Width 4' each side	LF	20.55	36,770	$755,624		
Roadway Excavation	CY	3.50	308,000	$1,078,000		
Bridge over KY River Width	SF	125.00	18,424	$2,303,000		
Bridge over Crystal Creek	SF	100.00	3,992	$399,200		
Center Street Connector Bridge	SF	100.00	1,864	$186,400		
Subtotal				$4,722,224		
Contingency		15.00%		$708,334		
TOTALS				$5,431,000		
NET SAVINGS						$5,431,000

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Value Alternative

Project: KY 11 Relocation
Location: Lee and Owsley Counties

Alternative No:
G-4

Title:
Maximize PCI span length

Description of Original Concept:

In the original concept the three bridges are constructed as follows: KY 11 Relocation over the Kentucky River; KY 11 Relocation over Crystal Creek; and KY 11 Connection No. 3 over Crystal Creek. All three bridges incorporate pre-stressed concrete beams with maximum spans around 120 feet on 8-foot to 9-foot spacing on tall piers.

Description of Alternative Concept:

In the alternative concept, due to the excessive vertical clearances available for all of pre-stressed concrete beam spans included with the three bridges, the maximum pre-stressed beam span should be increased to 150 ft with the beams spaced on or around 10 ft centers. Where possible, the bridges should also be shortened.

Value Improvement

$$\text{Value} \approx \frac{\text{Function}}{\text{Resources}}$$

Function	Resources
☐ Increased	☐ Increased
☑ Maintained	☐ Maintained
☐ Decreased	☑ Decreased

Cost Savings Summary

First Cost Savings:	$ 271,000
O&M Savings:	$ 0
Life Cycle Cost Savings:	$ 271,000

Advantages/Disadvantages

Alternative No.: G-4

Advantages of Alternative Concept

- Eliminates the number of tall piers required to construct the bridges
- Reduces the length of the bridges

Disadvantages of Alternative Concept

- Longer pre-stressed concrete beams are more difficult to ship to the project site

Discussion

Alternative No.: G-4

The original concept bridges will be constructed partially or fully with pre-stressed concrete beams. The maximum span lengths of the pre-stressed beams will be around 120 ft and the beams will be spaced on approximately 8-foot to 9-foot spacing. Pre-stressed concrete beam types proposed are Types 3, 4, 5, and 6.

The original concept geometrics result in an additional number of tall piers that need to be constructed.

Since excessive vertical clearance are provided at all of the pre-stressed concrete beam spans, the maximum beam span length should be increased to around 150 ft and the beam spacings should be increased to around 10-foot to 11-foot. Where possible, the bridge lengths should be reduced at the abutments.

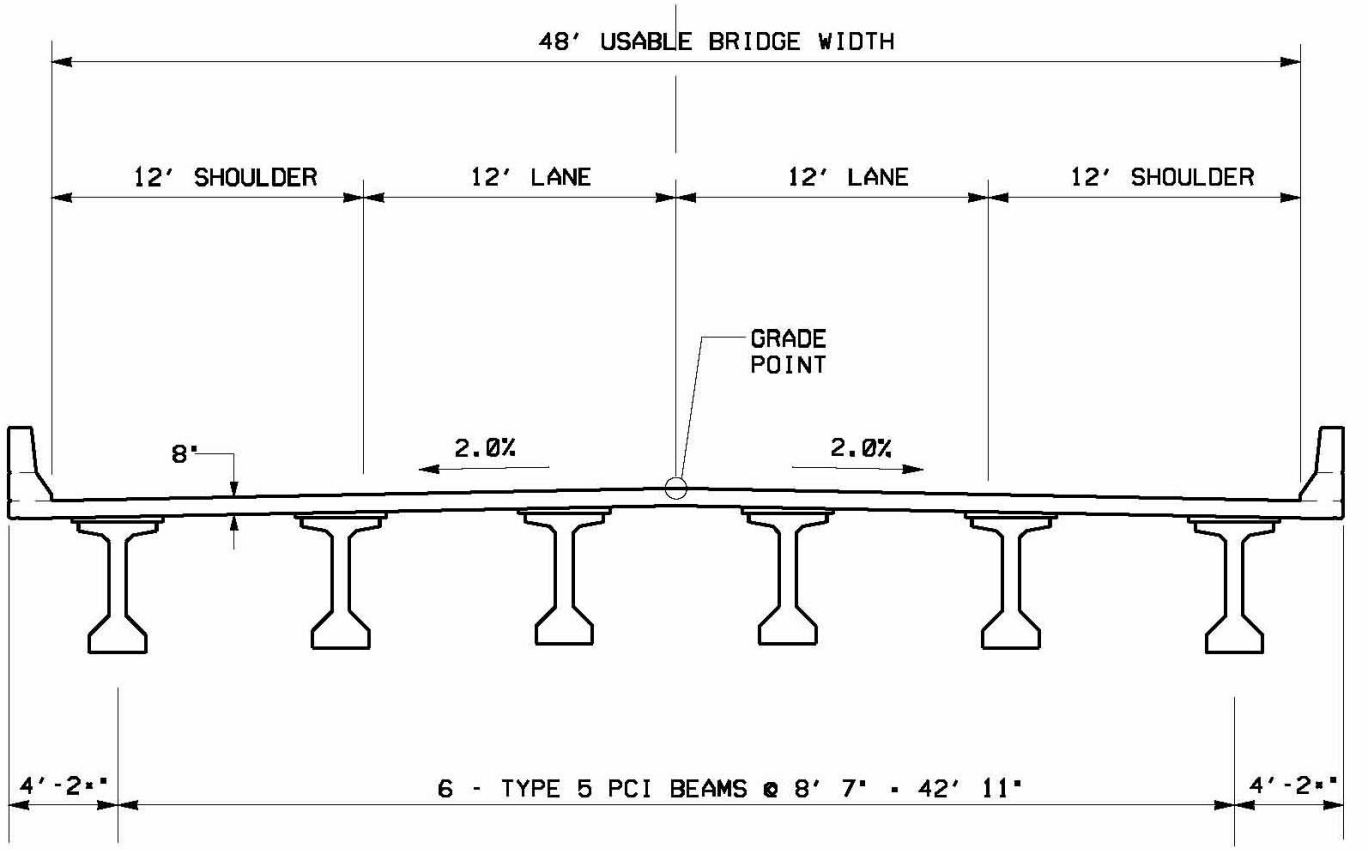
This results in fewer of tall piers, fewer pre-stressed concrete beams to erect, and shorter bridge lengths.

The alternative concept, by increasing the pre-stressed concrete beam span lengths in both the north and south approach spans, results in a reduction of two tall piers for this bridge.

Sketch

Alternative No.: G-4

☑ Original ☐ Alternative

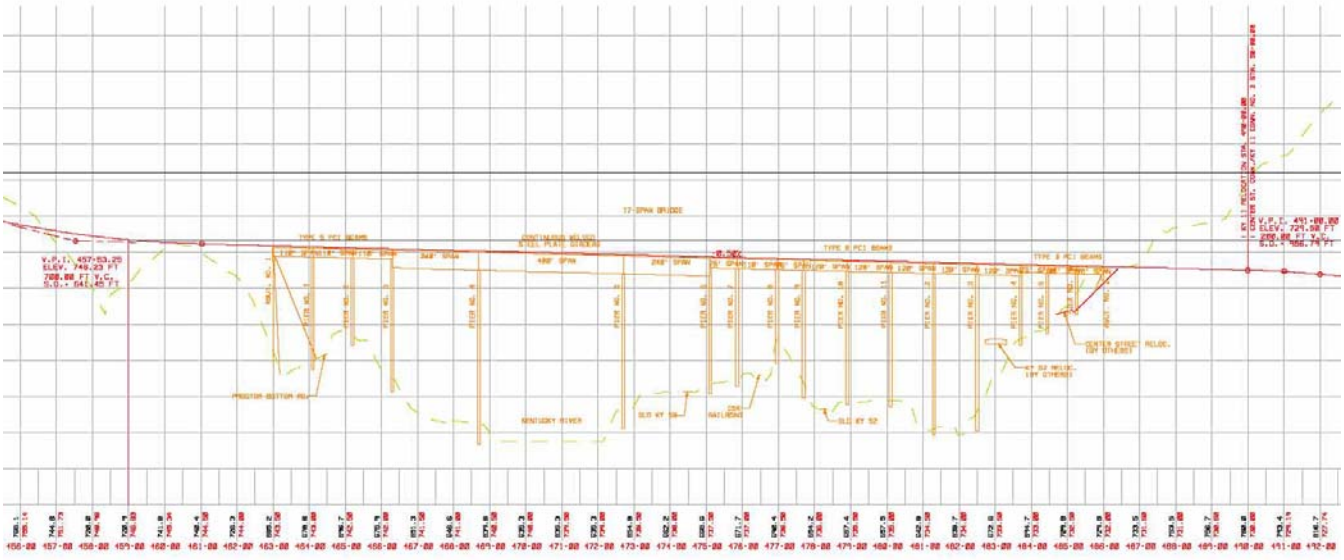


TYPICAL SECTION SPANS 1-3, 7-11

Sketch

Alternative No.: G-4

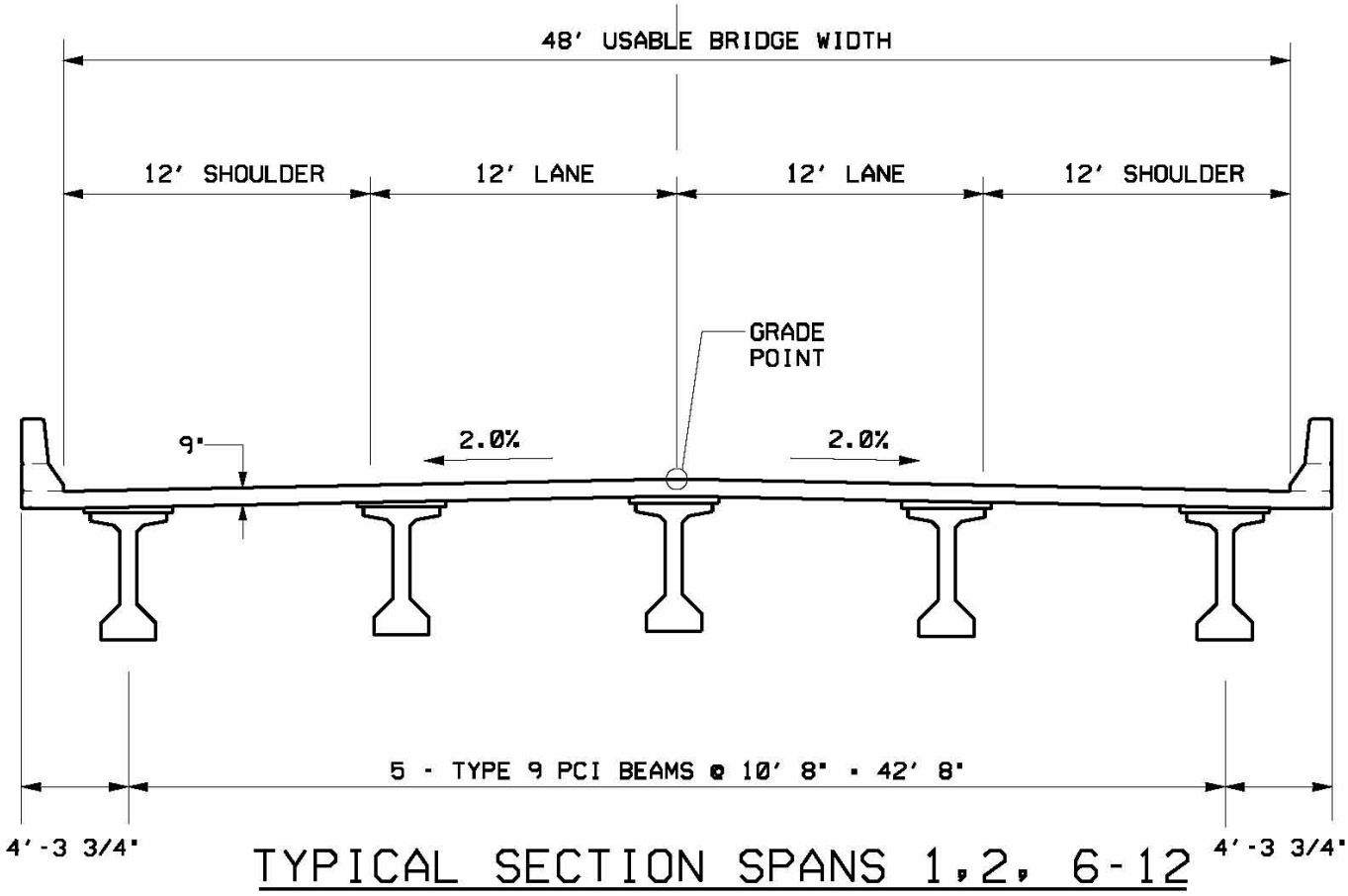
☑ Original ☐ Alternative



Sketch

Alternative No.: G-4

☐ Original ☑ Alternative



TYPICAL SECTION SPANS 1, 2, 6-12

Calculations

Alternative No.: G-4

☑ Original ☐ Alternative

Alternate 2D Structures Quantities

		All Mainline Steel	Mainline Hybrid	Mainline	Conn 3
Option		Kentucky River	Kentucky River	Crystal Creek	Crystal Creek
No Spans	EA	9	17	4	3
Deck Area	SF	144, 842	119,832	32,019	10,097
Deck Width	LF	62	48 to 62	62	42
Bridge Length	LF	2,290	2,300	496	230
No. Piers	EA	8	16	3	2
Average Pier Ht	LF	78	70	64	37
Conc AA	CY	5,123	4,490	1,367	398
Reinf E	LB	1,152,675	942,900	307,575	79,600
PCIB 3	LF		1,840		
PCIB 4	LF				1,150
PCIB 5	LF		1,980		
PCIB 6	LF		5,670	2,976	
Abut HT	LF	12	9	12	8
Structural Steel	LB	9,477,000	2,950,000		
Conc A	CY	3,046	4,305	1,453	265
Conc AA	CY	129	51	81	12
Reinf	LB	583,400	836,600	253,600	25,500
Reinf E	LB	20,100	17,300	26,600	9,125
Piles F & D	LF	1,177	962	1,379	270
Test Piles	LF	68	121	65	30
Pile Points	EA	36	18	22	20
Str Exc Com	CY	3,191	3,412	1,393	149
Str Exc S/R	CY	322	329	172	5
Backfill	CY	120	110	130	42
Spans		3 @ 190	3 @ 110	4 @ 124	
		1 @ 400	240		
		2 @ 220	400		
		1 @ 400	240		
		2 @ 240	75		
			110		
			75		
			5 @ 120		
			75		
			80		
			75		

Alternative No.: G-4

☑ Original ☐ Alternative

KY 11 Relocation Over Kentucky River Alternate 2D

Estimate Pier Quantities Per Each and Unit:

Conc A / Pier

(4,305 +51) / 16 piers = 272.25 CY, say 275 CY/ Pier

Reinf / CY

(836,600 + 17,300) / (4,305+51) = 196 LB / CY, say 200 LB / CY

STR Exc Comm / Pier

(3,412) / 16 = 213.25 CY / Pier, say 215 CY / Pier

STR Exc S/R / Pier

(329) / 16 = 20.6 CY / Pier, say 21 CY / Pier

Backfill / Pier

(110) / 16 = 6.9 CY / Pier, say 7 CY / Pier

Calculations

Alternative No.: G-4

☑ Original ☐ Alternative

South Approach: 3 Spans @ 110 Ft and 6 Beams (PCIB 5)

PCIB 5	=	(6) (3) (110)	=	1,980 LF
Conc AA	=	(330) (51.3) (8/12) /27	=	418 CY
Rebar Epoxy	=	(418) (210 / CY)	=	87,780 LB
Conc A	=	(2) (275)	=	550 CY
Rebar	=	(550) (200)	=	110,000 LB
STR Exc Com	=	(2) (215)	=	430 CY
STR Exc S/R	=	(2) (21)	=	42 CY
Backfill	=	(2) (7)	=	14 CY

North Approach: 5 Spans @ 120 Ft and 6 Beams (PCIB 6)

PCIB 6	=	(6) (5) (120)	=	3,600 LF
Conc AA	=	(600) (51.3) (8/12) /27	=	760 CY
Rebar Epoxy	=	(760) (210 / CY)	=	159,600 LB
Conc A	=	(4) (275)	=	1,100 CY
Rebar	=	(1,100) (200)	=	220,000 LB
STR Exc Com	=	(4) (215)	=	860 CY
STR Exc S/R	=	(4) (21)	=	84 CY
Backfill	=	(4) (7)	=	28 CY

Calculations

Alternative No.: G-4

☐ Original ☑ Alternative

South Approach: 2 Spans @ 150 Ft and 5 Beams (PCIB 9)

PCIB 9	=	(5) (2) (150)	=	1,500 LF
Conc AA	=	(300) (51.3) (9/12) /27	=	428 CY
Rebar Epoxy	=	(428) (210 / CY)	=	89,880 LB
Conc A			=	275 CY
Rebar	=	(275) (200)	=	55,000 LB
STR Exc Com			=	215 CY
STR Exc S/R			=	21 CY
Backfill			=	7 CY
Embankment	=	(30) (51.3) (12-1) / 27	=	627 CY
Mainline Pavement Section			=	30 LF

North Approach: 4 Spans @ 150 Ft and 5 Beams (PC2B 9)

PC2B 9	=	(4) (5) (150)	=	3,000 LF
Conc AA	=	(600) (51.3) (9/12) /27	=	855 CY
Rebar Epoxy	=	(855) (210 / CY)	=	179,550 LB
Conc A	=	(3) (275)	=	825 CY
Rebar	=	(825) (200)	=	165,000 LB
STR Exc Com	=	(3) (215)	=	645 CY
STR Exc S/R	=	(3) (21)	=	63 CY
Backfill	=	(3) (7)	=	21 CY

Construction Cost Estimate

Alternative No.: G-4

			Original Concept (Deletions)		Alternative Concept (Additions)	
Item	**Unit of Meas.**	**Unit Cost**	**Qty**	**Total**	**Qty**	**Total**
NORTH APPROACH						
PCI Beams	LF	249.00	3,600	$896,400		
Deck Conc	CY	450.00	760	$342,000		
Rebar	LB	1.20	159,600	$191,520		
Pier Conc	CY	350.00	1,100	$385,000		
pier rebar	LB	1.00	220,000	$220,000		
Str Ex, Common	CY	30.00	860	$25,800		
Str Ex, Rock	CY	60.00	84	$5,040		
Backfill	CY	27.00	28	$756		
SOUTH APPROACH						
PCI Beams	LF	232.00	1,980	$459,360		
Deck Conc	CY	450.00	418	$188,100		
Rebar	LB	1.20	87,780	$105,336		
Pier Conc	CY	350.00	550	$192,500		
Pier rebar	LB	1.00	110,000	$110,000		
Str Ex, Common	CY	30.00	430	$12,900		
Str Ex, Rock	CY	60.00	42	$2,520		
Backfill	CY	27.00	14	$378		
SOUTH APPROACH						
PCI Beams	LF	300.00			1,500	$450,000
Deck Conc	CY	450.00			428	$192,600
Rebar	LB	1.20			89,880	$107,856
Pier Conc	CY	350.00			275	$96,250
Pier rebar	LB	1.00			55,000	$55,000
Str Ex, Common	CY	30.00			215	$6,450
Str Ex, Rock	CY	60.00			21	$1,260
Backfill	CY	27.00			7	$189
Mainline Pavement	LF	143.86	30	$4,316		
Embankment	CY	15.00			627	$9,405
Subtotal				$3,141,926		$919,010
TOTALS				$3,142,000		$928,000
NET SAVINGS						

Construction Cost Estimate

Alternative No.: G-4

Item	Unit of Meas.	Unit Cost	Original Concept (Deletions) Qty	Original Concept (Deletions) Total	Alternative Concept (Additions) Qty	Alternative Concept (Additions) Total
Subtotal from page 1				$3,142,000		$928,000
NORTH APPROACH						
PCI Beams	LF	300.00			3,000	$900,000
Deck Conc	CY	450.00			855	$384,750
Rebar	LB	1.20			179,550	$215,460
Pier Conc	CY	350.00			825	$288,750
Pier rebar	LB	1.00			165,000	$165,000
Str Ex, Common	CY	30.00			645	$19,350
Str Ex, Rock	CY	60.00			63	$3,780
Backfill	CY	27.00			21	$567
Subtotal				$3,142,000		$2,905,657
Contingency		15.00%		$471,300		$435,849
TOTALS				$3,613,000		$3,342,000
NET SAVINGS						$271,000

SECTION 5

DESIGN SUGGESTIONS

SECTION 5
DESIGN SUGGESTIONS

In addition to the Value Alternatives in the previous section, the team generated several other ideas that we have termed design suggestions. These are presented to bring attention to areas of the design which, in the opinion of the team, should be changed. In general these ideas were designated as design suggestions rather than Value Alternatives for one of two reasons:

1. The value improvement opportunity is relatively small
2. The concept could not be adequately evaluated or developed within the constraints of the workshop resources

Design suggestions typically are associated with issues such as:

Improved operation

Ease of maintenance

Easier construction

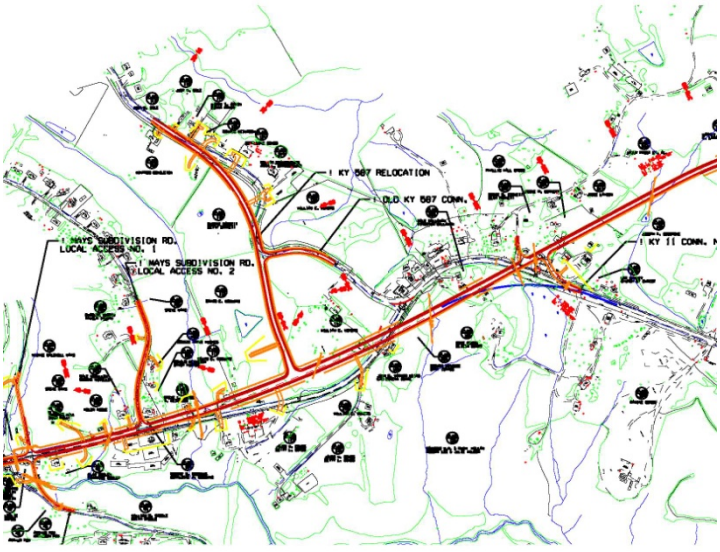
Reduced risk of construction claims

Clarification of construction documents

Or safer working conditions

AD-7 Realign KY 587 to align with existing KY 11

If Alternate 2D is the selected plan, KY 587 should be realigned to create an intersection that coincides with the intersection with the original KY 11 alignment. This will eliminate a hazardous situation with traffic turning north from KY 587 and then immediately turning on to existing KY 11. The projected traffic on KY 587 is 2,400 ADT (2025).



AD-15 Reduce congestion downtown by reducing intersections

Downtown Beattyville experiences a relatively significant amount of traffic congestion throughout the weekdays and during vacation season. The proposed project is going to provide very little, if any relief to this congestion. Some issues to consider include:

- With Alternate 2D alignment and its new connector to existing KY 11 alignment, additional traffic will be introduced to the downtown area in very close proximity to the new KY 52 intersection with KY 11

- The new KY 52 intersection is in very close proximity to the at-grade railroad crossing

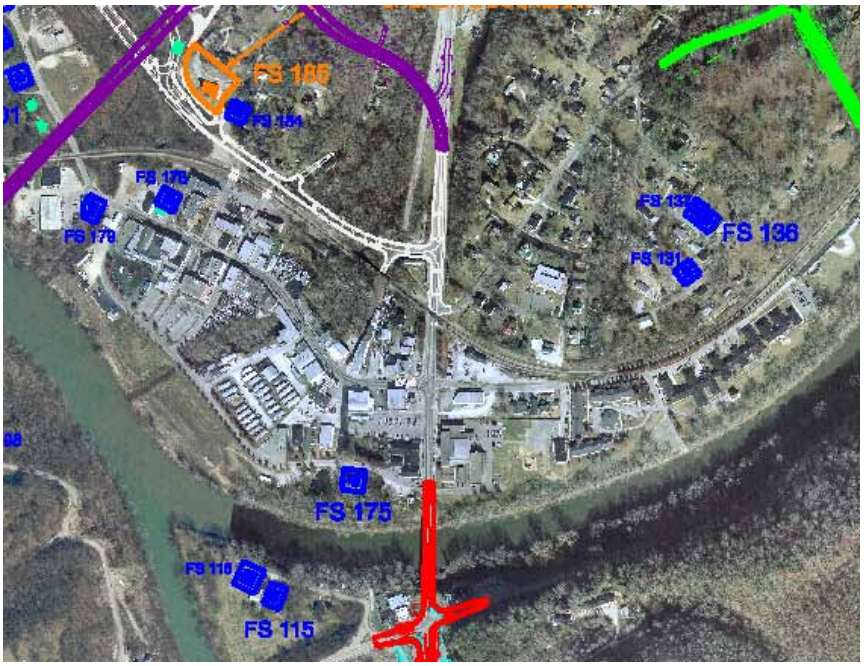
- Including the KY 52 intersection and the new KY 11 Relocation Connector No. 3, there will be five intersections within a 2,000 foot section of KY 11 downtown. In this same section of KY 11 the projected 2025 traffic count is 10,400 ADT.

- According to the traffic forecast, the new KY 11 Relocation Connector No. 3 will only have 600 ADT. According to Scott Thomson of the KYTC Transportation Planning Division, this number looks very low and needs to be re-evaluated. Mr. Thomson speculated that 6,000 ADT would look more accurate based on the connecting roadway traffic counts.

In order to improve the downtown traffic congestion consideration should be given to closing some streets in order to better manage the downtown circulation patterns. For an example:

- Align the residential street on the east side of KY 11 with the new KY 52 intersection (eliminates an intersection)

- Close the River Street intersection by creating a cul-de-sac (eliminates an intersection)



APPENDICES

APPENDIX
A – PARTICIPANTS

PARTICIPANTS

KY 11 Relocation

Lee and Owsley Counties

January 14 – 18, 2008

Name:	Discipline:	E-Mail:	Introduction	Mid-Point Review	VE Presentation
John Robinson	Team Leader	John@StrategicValueSolutions.com	X	X	X
Company: Strategic Value Solutions, Inc.	Address: 3100 S. Crenshaw Road	City, State, Zip: Independence, MO 64057			
Phone: 816-228-6160	Fax: 816-220-3050	Cell: 816-853-3128			
Name: Dawn Marie Bennett	Discipline: Administrative Assistant	E-Mail: Dawn@StrategicValueSolutions.com		X	X
Company: Strategic Value Solutions, Inc.	Address: 3100 S. Crenshaw Road	City, State, Zip: Independence, MO 64057			
Phone: 816-224-3955	Fax: 816-224-3945 / 816-222-0453 efax	Cell: 816-853-9151			
Name: Kevin Hall, PE	Discipline: Cost Estimator	E-Mail: khall@hntb.com	X		X
Company: HNTB Corporation	Address: 111 Monument Circle, Suite 1200	City, State, Zip: Indianapolis, IN 46204			
Phone: Use Cell	Fax: 317-917-5211	Cell: 765-426-4244			
Name: Lance McAfee	Discipline: Construction Expert	E-Mail: mcafee@varietyinternet.com	X		
Company: National Constructors Group	Address: 31543 County Road 5.5	City, State, Zip: Las Animas, CO 81054			
Phone: 719-456-2202	Fax: 719-456-2202	Cell: 719-469-8243			
Name: John Moss, PE	Discipline: Roadway Geometrics	E-Mail: jmoss@hntb.com	X		X
Company: HNTB Corporation	Address: 401 West Main Street, Suite 601	City, State, Zip: Louisville, KY 40202			
Phone: 502-581-0985 x15707	Fax: 502-581-0987	Cell:			

KY 11 Relocation

Lee and Owsley Counties

January 14 – 18, 2008

			Introduction	Mid-Point Review	VE Presentation
Name: Gaylen Perkuhn	Discipline: HNTB Corporation	E-Mail: gperkuhn@hntb.com	X		X
Company: HNTB Corporation	Address: 111 Monument Circle, Suite 1200	City, State, Zip: Indianapolis, IN 46204			
Phone: 317-917-5336	Fax: 317-917-5211	Cell:			
Name: Greg Gabbard	Discipline: Highway	E-Mail: ggabbard@grwinc.com	X		X
Company: GRW Engineers, Inc.	Address: 801 Corporate Drive	City, State, Zip: Lexington, KY 40503			
Phone: 859-223-3999	Fax: 859-223-8917	Cell:			
Name: Mindy Rockwell	Discipline: Administrative Specialist III	E-Mail: mindy.rockwell@ky.gov	X		X
Company: Kentucky Transportation Cabinet	Address: 200 Mero Street	City, State, Zip: Frankfort, KY 40622			
Phone: 502-564-4555	Fax: 502-564-4422	Cell:			
Name: Robert Semones	Discipline: VE Coordinator	E-Mail: robert.semones@ky.gov	X		X
Company: Kentucky Transportation Cabinet	Address: 200 Mero Street	City, State, Zip: Frankfort, KY 40622			
Phone: 502-564-4555	Fax: 502-564-4422	Cell:			
Name: Charles Allen	Discipline: Construction Engineer	E-Mail: charles.allen@ky.gov	*		X
Company: Kentucky Transportation Cabinet, Dist 10	Address: 473 KY Hwy 15 South	City, State, Zip: Jackson, KY 41339			
Phone: 606-666-8841	Fax: 606-666-7074	Cell:			

KY 11 Relocation

Lee and Owsley Counties

January 14 – 18, 2008

Name:	Discipline:	E-Mail:	Introduction	Mid-Point Review	VE Presentation
John Slugartz	Highway	jslugartz@grwinc.com	X		X
Company: GRW Engineers, Inc.	Address: 801 Corporate Drive	City, State, Zip: Lexington, KY 40503			
Phone: 859-223-3999	Fax: 859-223-8917	Cell:			
Name: Mark Hite	Discipline: Bridge Design - Transp. Eng. Specialist	E-Mail: mark.hite@ky.gov	X		
Company: Kentucky Transportation Cabinet	Address: 200 Mero Street	City, State, Zip: Frankfort, KY 40622			
Phone: 502-564-4560	Fax: 502-564-2581	Cell:			
Name: Scott Thomson	Discipline: Planning - Transportation Engineer	E-Mail: scott.thomson@ky.gov	X		
Company: Kentucky Transportation Cabinet	Address: 200 Mero Street	City, State, Zip: Frankfort, KY 40622			
Phone: 502-564-7183	Fax: 502-564-2865	Cell:			
Name: Steve Criswell	Discipline: Div. of Const. - Transp. Eng. Specialist	E-Mail: steve.criswell@ky.gov	X		
Company: Kentucky Transportation Cabinet	Address: 200 Mero Street	City, State, Zip: Frankfort, KY 40622			
Phone: 502-564-4780	Fax: 502-564-8388	Cell:			
Name: Nancy Albright	Discipline: Maintenance - Engineer Director	E-Mail: nancy.albright@ky.gov	X		
Company: Kentucky Transportation Cabinet	Address: 200 Mero Street	City, State, Zip: Frankfort, KY 40622			
Phone: 502-564-4556 x3925	Fax: 502-564-3532	Cell:			

KY 11 Relocation

Lee and Owsley Counties

January 14 – 18, 2008

Name:	Discipline:	E-Mail:	Introduction	Mid-Point Review	VE Presentation
Bruce Napier	Right-of-Way - Supervisor	bruce.napier@ky.gov	X		
Company: Kentucky Transportation Cabinet	Address: 473 KY Hwy 15 South	City, State, Zip: Jackson, KY 41339			
Phone: 606-666-8841	Fax: 606-666-7074	Cell:			
Name: Keith Caudill	Discipline: Highway Design - Location Engineer	E-Mail: keith.caudill@ky.gov			X
Company: Kentucky Transportation Cabinet	Address: 200 Mero Street, 5th Floor	City, State, Zip: Frankfort, KY 40622			
Phone: 502-564-3280	Fax:	Cell:			
Name: Mary Wade	Discipline: TEMB	E-Mail: mary.wade@ky.gov			X
Company: Kentucky Transportatin Cabinet	Address: 200 Mero Street, 3rd Floor	City, State, Zip: Frankfort, KY 40622			
Phone: 502-564-4555	Fax:	Cell:			
Name: Michael Hill	Discipline: Professional Services	E-Mail: michael.hill@ky.gov			X
Company: Kentucky Transportation Cabinet	Address: 200 Mero Street	City, State, Zip: Frankfort, KY 40622			
Phone: 502-564-4555	Fax:	Cell:			

* Attended via teleconference

APPENDIX
B – COST INFORMATION

VE TEAMS REVISED ESTIMATE

ITEM	**ALT 2D** DESCRIPTION	Unit	Qnty		2007 Est Unit Price	Extension	
3	Crushed Stone Base	ton	106383		20	$ 2,127,660.00	
100	Asphalt Seal Aggr	ton	314		80	$ 25,120.00	
212	CL2 Asph Base 1.00D PG64-22	ton	106130		53	$ 5,624,890.00	
220	CL1 Asph Base 0.75D PG64-22	ton	6108		57	$ 348,156.00	
291	Emulsiifed Ashplat RS-2	ton	38		600	$ 22,800.00	
300	CL1 Asph Surf 0.38D PG64-22	ton	3010		58	$ 174,580.00	
304	CL1 Asph Surf 0.38D PG64-22	ton	16506		58	$ 957,348.00	
						$ -	
440	Entrance Pipe- 15 in	LF	2200		30	$ 66,000.00	
441	Entrance Pipe- 18 in	lf	1050		31	$ 32,550.00	
443	Entrance Pipe- 24 in	lf	176		32	$ 5,632.00	
445	Entrance pipe- 30 in	lf	180		35	$ 6,300.00	
462	Culvert Pipe- 18 in	lf	1105		52	$ 57,460.00	
464	Culvert Pipe- 24 in	lf	2290		54	$ 123,660.00	
466	Culvert pipe-30 in	lf	803		56	$ 44,968.00	
468	culvert pipe-36 in	lf	785		75	$ 58,875.00	
469	CULVERT PIPE-42 IN	LF	290		85	$ 24,650.00	
470	CULVERT6 PIPE- 48 IN	LF	490		95	$ 46,550.00	
471	CULVERT PIPE- 54 IN	LF	225		120	$ 27,000.00	
1433	SLOPED BOX OUTLET TYPE 1-18 IN	EA	7		1550	$ 10,850.00	
1334	SLOPED BOX OUTLET TYPE 1-24 IN	EA	2		2200	$ 4,400.00	
1450	S&F BOX INLET-OUTLET- 18 IN	EA	4		2250	$ 9,000.00	
1451	S&F BOX INLET-OUTLET- 24 IN	EA	2		2750	$ 5,500.00	
1452	S&F BOX INLET-OUTLET-30 IN	EA	2		3700	$ 7,400.00	
8100	CONCRETE- CLASS A	CY	116		450	$ 52,200.00	
8150	STEEL REINFORCEMENT	LB	6869		1.2	$ 8,242.80	
						$ -	$ 9,871,791.80
						$ -	
						$ -	
2091	REM PAVEMENT	SY	12856		6	$ 77,136.00	
2200	ROADWAY EXCAVATION	CY	3899471		3.5	$ 13,648,148.50	
2242	WATER	m GAL	16667		1	$ 16,667.00	
2351	GAUARDRAIL-Stl w-beam-s face	LF	41307		15.6	$ 644,389.20	
2360	GUARDRAIL TERMINAL SECT NO1	EA	100		60	$ 6,000.00	
2363	GUARDRAIL CON TO BR END TYPE A	EA	12		23	$ 276.00	
2367	GUARDRAIL END TREATMENT TYPE 1	EA	28		900	$ 25,200.00	
2381	REMOVE GUARDRAIL	LF	7420		1.25	$ 9,275.00	
2391	GUARDRAIL END TREATMENT TY 4A	EA	68		1700	$ 115,600.00	
2397	TEMPORARY GUARDRAIL	LF	4034		60	$ 242,040.00	
2434	R/W MARKER RURAL TYPE 1	EA	576		80	$ 46,080.00	
2483	CHANNEL LINING CLASS II	TON	35987		18	$ 647,766.00	
2484	CHANNEL LINING CLASS III	TON	3995		20	$ 79,900.00	

2545	CLEARING & GRUBBING	LSUM	1			$ 340,000.00

ITEM	**ALT 2D** DESCRIPTION	Unit	Qnty		2007 Est Unit Price	Extension
2568	MOBILIZATION	LSUM	1			$ 2,550,000.00
2569	DEMOBE	LSUM	1			$ 1,275,000.00
2650	MAINTAIN AND CONTROL TRAFFIC	LSUM	1		500000	$ 500,000.00
2701	TEMP SILT FENCE	LF	41757		2.5	$ 104,392.50
2704	SLIT TRAP TYPE B	EA	42		100	$ 4,200.00
2705	SILT CHECK	EA	1758		100	$ 175,800.00
2726	STAKING	LSUM	1		500000	$ 500,000.00
5953	TEMP SEEDING AND PROTECTION	SY	317900		0.25	$ 79,475.00
5966	TOPDRESSING FERTILIZER	TON	119		600	$ 71,400.00
5985	SEEDING AND PROTECTION	SY	635925		0.35	$ 222,573.75
5989	SPEC SEEDING CROWN VETCH	SY	187520		0.35	$ 65,632.00
6510	PVMNT STRIPING -TEMP PAINT- 4IN	LF	64100		0.18	$ 11,538.00
6514	PAVE STRIPING PERM PAINT- 4 IN	LF	256300		0.19	$ 48,697.00

DECSPT	LSUM	SF	$/SY		EXTENSION
KY11 OVER KY R. & CSX & KY52		119832	$ 125.00		$ 14,979,000.00
KY11 RELOCATION OVER CRYSTAL CRK	LSUM	32019	$ 100.00		$ 3,201,900.00
KY11 CONN NO. 3 OVER CRYSTAL CRK		10097	$ 100.00		$ 1,009,700.00
10'x7' RCBC 184+39	LF	90	$ 387.00		$ 34,830.00
10'x6' RCBC 430+18	LF	597	$ 363.00		$ 216,711.00
9'x8' RCBC KY30 STA 45+32	LF	440	$ 332.00		$ 146,080.00
10'x6' RCBC ELK LICK STA 48+00	LF	43	$ 363.00		$ 15,609.00
10'x7' RCBC KY3332 STA 52+31	LF	160	$ 387.00		$ 61,920.00
10'x8' RCBC LONGBRANCH STA 51+58	LF	165	$ 411.00		$ 67,815.00

Estimated Costs 2007

$ 51,112,542.75

W/ 15 % CONTIN.

$ 58,779,424.16

ORIGINAL COST ESTIMATE

COST ESTIMATE KY 11 RELOCATION
LEE & OWSLEY COUNTIES
ITEM NUMBER 10-292.00
PRELIMINARY DESIGN - ALTERNATE NO. 2D - DEC. 10, 2003 - UPDATED APRIL 2004
SHEET 1 OF 2

PAVEMENT & DRAINAGE ITEMS 2003

ITEM CODE	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
3	CRUSHED STONE BASE	TON	**106383**	14.62	**$1,554,830**
100	ASPHALT SEAL AGGREGATE	TON	**314**	52.71	**$16,550**
212	CL2 ASPH BASE 1.00D PG64-22	TON	**106130**	36.34	**$3,857,072**
220	CL1 ASPH BASE 0.75D PG64-22	TON	**6108**	42.59	**$260,129**
291	EMULSIFIED ASPHALT RS-2	TON	**38**	346.14	**$13,153**
300	CL1 ASPH SURF 0.38D PG64-22	TON	**3010**	39.81	**$119,822**
304	CL2 ASPH SURF 0.38C PG64-22	TON	**16506**	30.12	**$497,118**
440	ENTRANCE PIPE-15 INCH	LIN FT	**2200**	24.51	**$53,916**
441	ENTRANCE PIPE-18 INCH	LIN FT	**1050**	24.84	**$26,082**
443	ENTRANCE PIPE-24 INCH	LIN FT	**176**	27.42	**$4,826**
445	ENTRANCE PIPE-30 INCH	LIN FT	**180**	34.48	**$6,207**
462	CULVERT PIPE-18 INCH	LIN FT	**1105**	55.40	**$61,221**
464	CULVERT PIPE-24 INCH	LIN FT	**2290**	54.94	**$125,808**
466	CULVERT PIPE-30 INCH	LIN FT	**803**	64.28	**$51,613**
468	CULVERT PIPE-36 INCH	LIN FT	**785**	70.90	**$55,659**
469	CULVERT PIPE-42 INCH	LIN FT	**290**	92.61	**$26,856**
470	CULVERT PIPE-48 INCH	LIN FT	**490**	96.69	**$47,376**
471	CULVERT PIPE-54 INCH	LIN FT	**225**	76.01	**$17,101**
1433	SLOPED BOX OUTLET TYPE 1-18 IN	EACH	**7**	1239.29	**$8,675**
1434	SLOPED BOX OUTLET TYPE 1-24 IN	EACH	**2**	1700.00	**$3,400**
1450	S & F BOX INLET-OUTLET-18 INCH	EACH	**4**	2081.15	**$8,325**
1451	S & F BOX INLET-OUTLET-24 INCH	EACH	**2**	2475.50	**$4,951**
1452	S & F BOX INLET-OUTLET-30 INCH	EACH	**2**	2862.78	**$5,726**
8100	CONCRETE-CLASS A	CU YD	**116**	337.69	**$39,172**
8150	STEEL REINFORCEMENT	LB	**6869**	0.57	**$3,907**
			SUBTOTAL		$6,869,495

COST ESTIMATE KY 11 RELOCATION
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GENERAL ITEMS

ITEM CODE	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2091	REMOVE PAVEMENT	SQ YD	**12856**	7.07	**$90,919**
2200	ROADWAY EXCAVATION	CU YD	**3,899,471**	3.02	**$11,764,315**
2242	WATER	M GAL	**16667**	1.20	**$19,952**
2351	GUARDRAIL-STEEL W BEAM-S FACE	LIN FT	**41307**	9.97	**$411,864**
2360	GUARDRAIL TERMINAL SECT NO 1	EACH	**100**	46.55	**$4,655**
2363	GUARDRAIL CON TO BR END TYPE A	EACH	**12**	1334.38	**$16,013**
2367	GUARDRAIL END TREATMENT TYPE 1	EACH	**28**	2486.06	**$69,610**
2381	REMOVE GUARDRAIL	LIN FT	**7420**	1.43	**$10,592**
2391	GUARDRAIL END TREATMENT TY 4A	EACH	**68**	1494.35	**$101,616**
2397	TEMPORARY GUARDRAIL	LIN FT	**4034**	8.31	**$33,519**
2434	R/W MARKER RURAL TYPE 1	EACH	**576**	78.22	**$45,054**
2483	CHANNEL LINING CLASS II	TON	**35987**	22.01	**$792,211**
2484	CHANNEL LINING CLASS III	TON	**3995**	21.43	**$85,611**
2545	CLEARING AND GRUBBING	LP SUM	**1**	236800.00	**$236,800**
2568	MOBILIZATION	LP SUM	**1**	1064590.94	**$1,064,591**
2569	DEMOBILIZATION	LP SUM	**1**	532295.47	**$532,295**
2650	MAINTAIN AND CONTROL TRAFFIC	LP SUM	**1**	400000.00	**$400,000**
2701	TEMPORARY SILT FENCE	LIN FT	**41757**	2.52	**$105,370**
2704	SILT TRAP TYPE B	EACH	**42**	311.83	**$13,097**
2705	SILT CHECK	EACH	**1758**	93.01	**$163,520**
2726	STAKING	LP SUM	**1**	200,000.00	**$200,000**
5953	TEMP SEEDING AND PROTECTION	SQ YD	**317900**	0.28	**$88,726**
5966	TOPDRESSING FERTILIZER	TON	**119**	393.27	**$46,799**
5985	SEEDING AND PROTECTION	SQ YD	**635925**	0.34	**$213,416**
5989	SPECIAL SEEDING CROWN VETCH	SQ YD	**187520**	0.28	**$52,806**
6510	PAVE STRIPING-TEMP PAINT-4 IN	LIN FT	**64100**	0.15	**$9,615**
6514	PAVE STRIPING-PERM PAINT-4 IN	LIN FT	**256300**	0.18	**$46,134**
	KY 11 OVER KY RIVER & CSX RR & KY 52	LP SUM	**1**	9572959.00	**$9,572,959**
	KY 11 RELOCATION OVER CRYSTAL CREEK	LP SUM	**1**	2209654.00	**$2,209,654**
	KY 11 CONN. NO. 3 OVER CRYSTAL CREEK	LP SUM	**1**	560299.00	**$560,299**
	KY 11 RELOCATION STA. 184+39 10'x7' RCBC	LP SUM	**1**	65636.00	**$65,636**
	KY 11 RELOCATION STA. 430+18 10'x6' RCBC	LP SUM	**1**	569382.00	**$569,382**
	KY 30 STA. 45+32 9'x8' RCBC	LP SUM	**1**	362008.20	**$362,008**
	ELK LICK STA. 48+00 10'x6' RCBC	LP SUM	**1**	35886.50	**$35,887**
	KY 3332 STA. 52+31 10'x7' RCBC	LP SUM	**1**	104926.50	**$104,927**
	LONG BRANCH STA. 51+58 10'x8' RCBC	LP SUM	**1**	113907.00	**$113,907**
			SUBTOTAL		$37,083,251
			CONT. (15%)		$5,562,487.64
			TOTAL		**$42,645,739**

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PAVEMENT & DRAINAGE ITEMS

ITEM CODE	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
3	CRUSHED STONE BASE	TON	**68059**	14.62	**$994,710**
100	ASPHALT SEAL AGGREGATE	TON	**199**	52.71	**$10,489**
212	CL2 ASPH BASE 1.00D PG64-22	TON	**69031**	36.34	**$2,508,787**
220	CL1 ASPH BASE 0.75D PG64-22	TON	**3739**	42.59	**$159,238**
291	EMULSIFIED ASPHALT RS-2	TON	**24**	346.14	**$8,307**
300	CL1 ASPH SURF 0.38D PG64-22	TON	**1952**	39.81	**$77,705**
304	CL2 ASPH SURF 0.38C PG64-22	TON	**10750**	30.12	**$323,762**
440	ENTRANCE PIPE-15 INCH	LIN FT	**1430**	24.51	**$35,045**
441	ENTRANCE PIPE-18 INCH	LIN FT	**683**	24.84	**$16,953**
443	ENTRANCE PIPE-24 INCH	LIN FT	**114**	27.42	**$3,137**
445	ENTRANCE PIPE-30 INCH	LIN FT	**117**	34.48	**$4,035**
462	CULVERT PIPE-18 INCH	LIN FT	**99**	55.40	**$5,485**
464	CULVERT PIPE-24 INCH	LIN FT	**665**	54.94	**$36,534**
466	CULVERT PIPE-30 INCH	LIN FT	**290**	64.28	**$18,640**
468	CULVERT PIPE-36 INCH	LIN FT	**625**	70.90	**$44,315**
469	CULVERT PIPE-42 INCH	LIN FT	**290**	92.61	**$26,856**
470	CULVERT PIPE-48 INCH	LIN FT	**360**	96.69	**$34,807**
471	CULVERT PIPE-54 INCH	LIN FT	**225**	76.01	**$17,101**
1433	SLOPED BOX OUTLET TYPE 1-18 IN	EACH	**4**	1239.29	**$4,957**
1434	SLOPED BOX OUTLET TYPE 1-24 IN	EACH	**2**	1700.00	**$3,400**
1450	S & F BOX INLET-OUTLET-18 INCH	EACH	**0**	2081.15	**$0**
1451	S & F BOX INLET-OUTLET-24 INCH	EACH	**0**	2475.50	**$0**
1452	S & F BOX INLET-OUTLET-30 INCH	EACH	**1**	2862.78	**$2,863**
8100	CONCRETE-CLASS A	CU YD	**86**	337.69	**$29,041**
8150	STEEL REINFORCEMENT	LB	**6404**	0.57	**$3,643**
			SUBTOTAL		**$4,369,809**

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GENERAL ITEMS

ITEM CODE	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2091	REMOVE PAVEMENT	SQ YD	12779	7.07	$90,374
2200	ROADWAY EXCAVATION	CU YD	1,928,225	3.02	$5,817,263
2242	WATER	M GAL	10833	1.20	$12,969
2351	GUARDRAIL-STEEL W BEAM-S FACE	LIN FT	26850	9.97	$267,711
2360	GUARDRAIL TERMINAL SECT NO 1	EACH	65	46.55	$3,026
2363	GUARDRAIL CON TO BR END TYPE A	EACH	12	1334.38	$16,013
2367	GUARDRAIL END TREATMENT TYPE 1	EACH	18	2486.06	$45,246
2381	REMOVE GUARDRAIL	LIN FT	4823	1.43	$6,885
2391	GUARDRAIL END TREATMENT TY 4A	EACH	44	1494.35	$66,050
2397	TEMPORARY GUARDRAIL	LIN FT	2622	8.31	$21,787
2434	R/W MARKER RURAL TYPE 1	EACH	374	78.22	$29,285
2483	CHANNEL LINING CLASS II	TON	23392	22.01	$514,937
2484	CHANNEL LINING CLASS III	TON	2597	21.43	$55,647
2545	CLEARING AND GRUBBING	LP SUM	1	118400.00	$118,400
2568	MOBILIZATION	LP SUM	1	386952.89	$386,953
2569	DEMOBILIZATION	LP SUM	1	193476.44	$193,476
2650	MAINTAIN AND CONTROL TRAFFIC	LP SUM	1	200000.00	$200,000
2701	TEMPORARY SILT FENCE	LIN FT	27142	2.52	$68,490
2704	SILT TRAP TYPE B	EACH	27	311.83	$8,513
2705	SILT CHECK	EACH	1143	93.01	$106,288
2726	STAKING	LP SUM	1	100000.00	$100,000
5953	TEMP SEEDING AND PROTECTION	SQ YD	206635	0.28	$57,672
5966	TOPDRESSING FERTILIZER	TON	77	393.27	$30,419
5985	SEEDING AND PROTECTION	SQ YD	413351	0.34	$138,721
5989	SPECIAL SEEDING CROWN VETCH	SQ YD	121888	0.28	$34,324
6510	PAVE STRIPING-TEMP PAINT-4 IN	LIN FT	41665	0.15	$6,250
6514	PAVE STRIPING-PERM PAINT-4 IN	LIN FT	166595	0.18	$29,987
	KY 11 RELOCATION STA. 184+39 10'x7' RCBC	LP SUM	1	65636.00	$65,636
	KY 30 STA. 45+32 9'x8' RCBC	LP SUM	1	362008.20	$362,008
	ELK LICK STA. 48+00 10'x6' RCBC	LP SUM	1	35886.50	$35,887
	KY 3332 STA. 52+31 10'x7' RCBC	LP SUM	1	104926.50	$104,927
	LONG BRANCH STA. 51+58 10'x8' RCBC	LP SUM	1	113907.00	$113,907
			SUBTOTAL		$13,478,859
			CONT. (15%)		$2,021,828.84
			TOTAL		$15,500,688

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PAVEMENT & DRAINAGE ITEMS 2003

ITEM CODE	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
3	CRUSHED STONE BASE	TON	**38325**	14.62	**$560,135**
100	ASPHALT SEAL AGGREGATE	TON	**116**	52.71	**$6,114**
212	CL2 ASPH BASE 1.00D PG64-22	TON	**37099**	36.34	**$1,348,285**
220	CL1 ASPH BASE 0.75D PG64-22	TON	**2369**	42.59	**$100,892**
291	EMULSIFIED ASPHALT RS-2	TON	**14**	346.14	**$4,846**
300	CL1 ASPH SURF 0.38D PG64-22	TON	**1058**	39.81	**$42,117**
304	CL2 ASPH SURF 0.38C PG64-22	TON	**5755**	30.12	**$173,326**
440	ENTRANCE PIPE-15 INCH	LIN FT	**770**	24.51	**$18,871**
441	ENTRANCE PIPE-18 INCH	LIN FT	**368**	24.84	**$9,129**
443	ENTRANCE PIPE-24 INCH	LIN FT	**62**	27.42	**$1,689**
445	ENTRANCE PIPE-30 INCH	LIN FT	**63**	34.48	**$2,173**
462	CULVERT PIPE-18 INCH	LIN FT	**940**	55.40	**$52,079**
464	CULVERT PIPE-24 INCH	LIN FT	**1625**	54.94	**$89,274**
466	CULVERT PIPE-30 INCH	LIN FT	**513**	64.28	**$32,973**
468	CULVERT PIPE-36 INCH	LIN FT	**160**	70.90	**$11,345**
469	CULVERT PIPE-42 INCH	LIN FT	**0**	92.61	**$0**
470	CULVERT PIPE-48 INCH	LIN FT	**130**	96.69	**$12,569**
471	CULVERT PIPE-54 INCH	LIN FT	**0**	76.01	**$0**
1433	SLOPED BOX OUTLET TYPE 1-18 IN	EACH	**3**	1239.29	**$3,718**
1434	SLOPED BOX OUTLET TYPE 1-24 IN	EACH	**0**	1700.00	**$0**
1450	S & F BOX INLET-OUTLET-18 INCH	EACH	**4**	2081.15	**$8,325**
1451	S & F BOX INLET-OUTLET-24 INCH	EACH	**2**	2475.50	**$4,951**
1452	S & F BOX INLET-OUTLET-30 INCH	EACH	**1**	2862.78	**$2,863**
8100	CONCRETE-CLASS A	CU YD	**27**	337.69	**$9,118**
8150	STEEL REINFORCEMENT	LB	**449**	0.57	**$255**
			SUBTOTAL		$2,495,045

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GENERAL ITEMS

ITEM CODE	ITEM	UNIT	QUANTITY	UNIT PRICE	AMOUNT
2091	REMOVE PAVEMENT	SQ YD	6881	7.07	$48,663
2200	ROADWAY EXCAVATION	CU YD	1,971,246	3.02	$5,947,053
2242	WATER	M GAL	5833	1.20	$6,983
2351	GUARDRAIL-STEEL W BEAM-S FACE	LIN FT	14457	9.97	$144,152
2360	GUARDRAIL TERMINAL SECT NO 1	EACH	35	46.55	$1,629
2363	GUARDRAIL CON TO BR END TYPE A	EACH	12	1334.38	$16,013
2367	GUARDRAIL END TREATMENT TYPE 1	EACH	10	2486.06	$24,363
2381	REMOVE GUARDRAIL	LIN FT	2597	1.43	$3,707
2391	GUARDRAIL END TREATMENT TY 4A	EACH	24	1494.35	$35,565
2397	TEMPORARY GUARDRAIL	LIN FT	1412	8.31	$11,731
2434	R/W MARKER RURAL TYPE 1	EACH	202	78.22	$15,769
2483	CHANNEL LINING CLASS II	TON	12595	22.01	$277,274
2484	CHANNEL LINING CLASS III	TON	1398	21.43	$29,964
2545	CLEARING AND GRUBBING	LP SUM	1	118400.00	$118,400
2568	MOBILIZATION	LP SUM	1	679301.72	$679,302
2569	DEMOBILIZATION	LP SUM	1	339650.86	$339,651
2650	MAINTAIN AND CONTROL TRAFFIC	LP SUM	1	200000.00	$200,000
2701	TEMPORARY SILT FENCE	LIN FT	14615	2.52	$36,879
2704	SILT TRAP TYPE B	EACH	15	311.83	$4,584
2705	SILT CHECK	EACH	615	93.01	$57,232
2726	STAKING	LP SUM	1	100000.00	$100,000
5953	TEMP SEEDING AND PROTECTION	SQ YD	111265	0.28	$31,054
5966	TOPDRESSING FERTILIZER	TON	42	393.27	$16,380
5985	SEEDING AND PROTECTION	SQ YD	222574	0.34	$74,696
5989	SPECIAL SEEDING CROWN VETCH	SQ YD	66382	0.28	$18,693
6510	PAVE STRIPING-TEMP PAINT-4 IN	LIN FT	22435	0.15	$3,365
6514	PAVE STRIPING-PERM PAINT-4 IN	LIN FT	89705	0.18	$16,147
	KY 11 OVER KY RIVER & CSX RR & KY 52	LP SUM	1	9572959.00	$9,572,959
	KY 11 RELOCATION OVER CRYSTAL CREEK	LP SUM	1	2209654.00	$2,209,654
	KY 11 CONN. NO. 3 OVER CRYSTAL CREEK	LP SUM	1	560299.00	$560,299
	KY 11 RELOCATION STA. 430+18 10'x6' RCBC	LP SUM	1	565137.00	$565,137
			SUBTOTAL		$23,662,343
			CONT. (15%)		$3,549,351.50
			TOTAL		$27,211,695

KY 11 RELOCATION - ALTERNATE NO. 2D
SUMMARY OF EARTHWORK

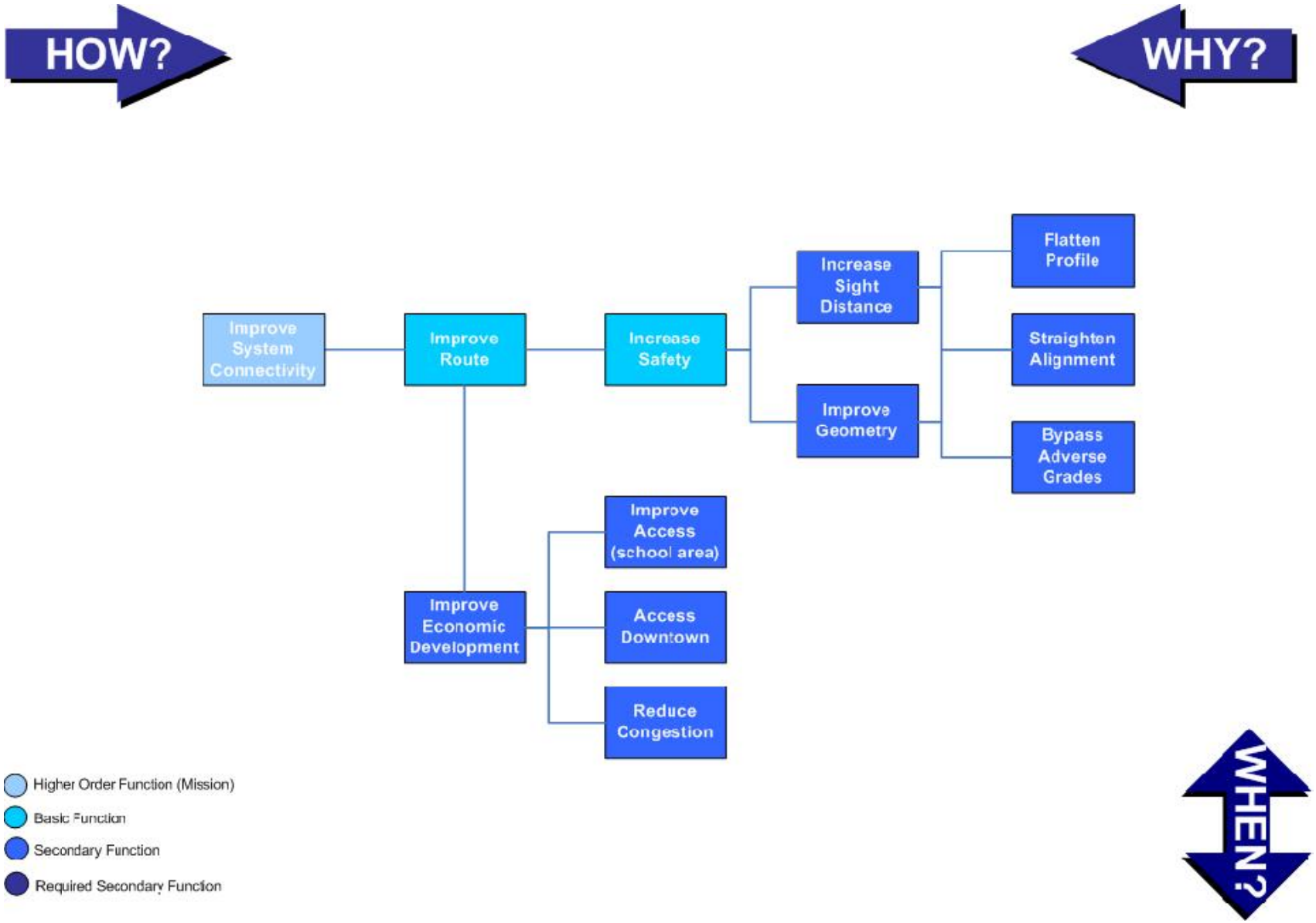
	VOLUMES, CUBIC YARDS							
ROADWAY	SURF. DT. LT.	ROCK	COM	EMB	REFILL	SURF. DT. RT.	EMB BENCH	TRANS BENCH
KY 11 RELOCATION - ALT. 1	0	0	1,135,307	166,287	0	0	0	0
KY 11 RELOCATION - ALT. 2C	0	0	114,089	85,763	0	0	0	0
KY 11 RELOCATION - ALT. 2A	0	0	280,439	544,528	0	0	0	0
KY 11 RELOCATION - ALT. 2	0	0	194,478	11,008	0	0	0	0
KY 11 RELOCATION - ALT. 2D	0	0	635,920	674,773	0	0	0	0
KY 30	0	0	230,161	322,844	0	0	0	0
OLD KY 30 CONN.	0	0	2,005	392	0	0	0	0
PLEASANT GROVE RD. LOC. ACC.	0	0	734	33	0	0	0	0
MAYERS RD. LOC. ACC.	0	0	302	192	0	0	0	0
ELK LICK RD. LOC. ACC.	0	0	63	1,609	0	0	0	0
HUMMINGBIRD LANE LOC. ACC.	0	0	10	3,727	0	0	0	0
KY 11 CONN. #1	0	0	3,308	6,187	0	0	0	0
COUNTY LINE RD. LOC. ACC.	0	0	8,112	43,080	0	0	0	0
SILO RD. LOC. ACC.	0	0	883	1,417	0	0	0	0
KY 3332	0	0	466	23,693	0	0	0	0
ROCKY HILL LOC. ACC. RD.	0	0	32,817	55	0	0	0	0
MAYS SUBDIV. RD. LOC. ACC. #1	0	0	95	6,087	0	0	0	0
LONG BRANCH RD. LOC. ACC.	0	0	1	12,805	0	0	0	0
MAYS SUBDIV. RD. LOC. ACC. #2	0	0	41,909	2	0	0	0	0
KY 587 RELOC.	0	0	182,572	353	0	0	0	0
OLD KY 587 CONN., OLD KY 11 LAR's A & B	0	0	98	4,612	0	0	0	0
KY 11 CONN. #2	0	0	303	6,590	0	0	0	0
BAKER BAR SUB. RD. LOC. ACC.	0	0	673	727	0	0	0	0
INDUSTRIAL PARK RD. LOC. ACC.	0	0	26,295	1,094	0	0	0	0
PROCTOR HILL RD. LOC. ACC.	0	0	1,219	4,523	0	0	0	0
CENTER STREET LOC. ACC.	0	0	248,943	7,177	0	0	0	0
KY 11 CONN. #3	0	0	334,584	14,549	0	0	0	0
LEE, SCHOOL & OLD CENTER	0	0	69,188	3,624				
ENTRANCES (ASSUME 10%)	0	0	354,497	194,773	0	0	0	0
TOTALS	**0**	**0**	**3,899,471**	**2,142,504**	**0**	**0**	**0**	**0**

TOTAL PROJECT EARTHWORK CALCULATIONS

EXCAVATION	EMBANKMENT
3,899,471 CU. YD. COMMON	2,142,504 CU. YD. EMBANKMENT
0 CU. YD. ROCK	0 CU. YD. REFILL
0 CU. YD. SURF. DTS.	2,142,504 CU. YD.
0 CU. YD. EMB. BENCHES	0 CU. YD. EMB. BENCHES
0 CU. YD. TRANS. BENCHES	0 CU. YD. TRANS. BENCHES
3,899,471 CU. YD.	2,142,504 CU. YD.

WASTE: 1,756,967 CU. YD.

APPENDIX
C – FUNCTION ANALYSIS


HOW?
WHY?
Improve System Connectivity
Improve Route
Increase Safety
Increase Sight Distance
Improve Geometry
Flatten Profile
Straighten Alignment
Bypass Adverse Grades
Improve Economic Development
Improve Access (school area)
Access Downtown
Reduce Congestion
WHEN?
Higher Order Function (Mission)
Basic Function
Secondary Function
Required Secondary Function

APPENDIX
D – CREATIVE IDEA LISTING

CREATIVE IDEA LISTING

Idea No.	Description	Votes
Alt 2D (AD)		
AD-1	Eliminate intersection with Center Street	0
AD-2	Replace large box culvert with a bridge	0
AD-3	Lower the grades to lower the bridge height	0
AD-4	Eliminate new Center Street alignment and provide a connection with existing KY 11 north of Senior Center	3
AD-5	Realign Alt 2D between Industrial Park and the Golf Course	2
AD-6	Create a straight line connection (avoid reverse curve)	4
AD-7	Realign KY 587 to align with existing KY 11	DS
AD-8	Optimize profile between Station 350 to 405	2
AD-9	Tunnel south of bridge to reduce 5% grade	0
AD-10	Align subdivision street with new KY 52 intersection	1
AD-11	Create a grade separation on KY 11 downtown	0
AD-12	Create a connection from new Alt 2D to new KY 52	3
AD-13	Close the street downtown closest to the river	0
AD-14	Relocate railroad on south side of downtown	0
AD-15	Reduce congestion downtown by reducing intersections	DS
AD-16	Use new alignment for Center Street and connect to Alt 2D alignment for Center Street	0
Improve Route (IR)		
IR-1	Use Alt 1 and extend to the river bend north of town	4
IR-2	Connect Alt 1 across South Fork and tie-in to Alt 3 alignment	4
IR-3	Widen the existing alignment	2
IR-4	Build new road from existing KY 11 to Alt 2D parallel to Proctor Road	2
IR-5	Extend KY 11 west on a tangent with South Fork Bridge	0
IR-6	Extend Alt 2D west of schools and further north of town	0
IR-7	Extend Alt 2A and connect to KY 52	0
IR-8	Create a KY 52 bypass on the north end of town with an intersection with KY 11	0
IR-9	Widen existing alignment in Beattyville and lower Alternative 1 alignment	3
IR-10	Use Alt1 with a revised (straightened) river crossing	2
IR-11	Use existing alignment and straighten curves south of the river	0
IR-12	Build a new alignment from KY 30 to north of Town-Cross Country	0
IR-13	Extend a tangent section from existing KY 11 through downtown and cross river at the confluence	0

Idea No.	Description	Votes
IR-14	Connect KY 11 to Center Street then cross river and align roadway back to existing KY 11	0
General (G)		
G-1	Reduce shoulder width to six-foot paved; eight-foot total	4
G-2	Reduce bridge width	0
G-3	Minimize structure length	0
G-4	Maximize PCI span length	4
G-5	Use steel for long spans	0
G-6	Use steel for entire bridge	RR
G-7	Use MSE walls	0
G-8	Use two-foot shoulders	2
G-9	Remove taper from bridge	1

DS – Indicates the Idea was selected to be written as a Design Suggestion and is included in the Design Suggestion Section of this report

RR – Indicates the Idea received enough votes by the Value Team to be developed. However, during the Development Phase the team found that the Idea was not feasible. Therefore, it has been designated RR indicating that it was Reviewed and Rejected by the Value Team.

APPENDIX
E – MATERIALS PROVIDED

MATERIALS PROVIDED

Ref#	Document	Prepared by	Date
1	KY 11 Relocation - Phase I Design Report – Lee and Owsley Counties	GRW Engineers, Inc.	May 2004
2	Plans of Proposed Project - KY 11 Relocation – Preliminary Line and Grade Plans Recommended Alternate	GRW Engineers, Inc.	
3	Intermediate Planning Study – Lee & Owsley Counties, KY – KY 11 Reconstruct from KY 30 at Levi to Beattyville Ieam 10-292.00	Bernardin, Lochmueller & Associates, Inc.	April 2001
4	Lee and Owsley Counties Traffic Forecasts KY 11 from KY 30 at Levi to Beattyville Item #10-292.00	Kentucky Transportation Cabinet	February 18, 2005
5	Topographic Map of Project Area		
6	KYTC Department of Highways – Unit Bid Tab Sheet for Letting – Contract ID: 07-1149	Kentucky Transportation Cabinet	August 28, 2007
7	KYTC Department of Highways – Unit Bid Tab Sheet for Letting – Contract ID: 07-1151	Kentucky Transportation Cabinet	October 1, 2007
8	KYTC Department of Highways – Unit Bid Tab Sheet for Letting – Contract ID: 07-1161	Kentucky Transportation Cabinet	October 1, 2007
9	KYTC Department of Highways – Unit Bid Tab Sheet for Letting – Contract ID: 07-1164	Kentucky Transportation Cabinet	October 19, 2007
10	KYTC Department of Highways – Unit Bid Tab Sheet for Letting – Contract ID: 07-1167	Kentucky Transportation Cabinet	October 19, 2007
11	KYTC Department of Highways – Unit Bid Tab Sheet for Letting – Contract ID: 07-1176	Kentucky Transportation Cabinet	November 19, 2007
12	Cross Sections – Owsley & Lee – KY 11 Relocation	GRW Engineers, Inc.	
13	Lee County Traffic Forecasts – Realignment of KY 52 North of Beattyville – Item #10-274.00	Kentucky Transportation Cabinet	June 5, 2002
14	Sperling's Best Places – Zip Code Search Pages and Census Bureau information for Population	Internet	January 15, 2008
15	Plan and Profile of Proposed State Highway – Lee County 577(1)	Department of Commerce – Bureau of Public Roads	August 18, 1953

Ref#	Document	Prepared by	Date
16	Plan View – KY 11 Relocation – Lee/Owsley Counties – Alternate 2D (Recommended)	GRW Engineers, Inc.	March 2001
17	Profile – KY 11 Relocation – Lee/Owsley Counties – Alternate 2D (Recommended)	GRW Engineers, Inc.	March 2001
18	Value Engineering Plans CD (Mapping, Plans, X sections, Support Documents)	GRW Engineers, Inc.	December 14, 2007
19	Photographic Map of Project Location	GRW Engineers, Inc.	
20	Report of Geotechnical Overview – KY 11 Relocaton from KY 30 at Levi to Beattyville	FMSM Engineers	November 2002