March, 2011

US-421 PROGRAMMING STUDY

Franklin County

ITEM NUMBER 05-8109.00

Prepared by:
Kentucky Transportation Cabinet
Division of Planning

EXECUTIVE SUMMARY

Programming Study
Franklin County - Item Number 05-8109.00
US-421 from Bald Knob Hill/End Re-construction (MP 5.390) to St. Johns Rd (MP 11.132)

This programming study was conducted to develop and to evaluate alternatives for improving US-421 in Franklin County, from the Top of Bald Knob Hill and to the intersection of US-421 with KY-12, which is also known as St. Johns Road. Given the previous re-construction along this route ended at mile point 5.390, the project team agreed to expand the study area in this rolling terrain back to the end of the reconstruction at mile point 5.390 from the original mile point of 6.700. See **Figure ES-1** for a graphic representation of the project area along with the project termini.

This study was developed using a project team approach, with the project team being composed of personnel from the Kentucky Transportation Cabinet's (KYTC) Central Office and Louisville Highway District Office, and the Bluegrass Area Development District. The process of developing this programming study included analyzing existing roadway and traffic conditions; developing a draft purpose and need statement; investigating environmental concerns in the area through an environmental overview; and developing and evaluating potential improvement alternatives. There was one local officials meeting but no public meetings were held as part of this study.

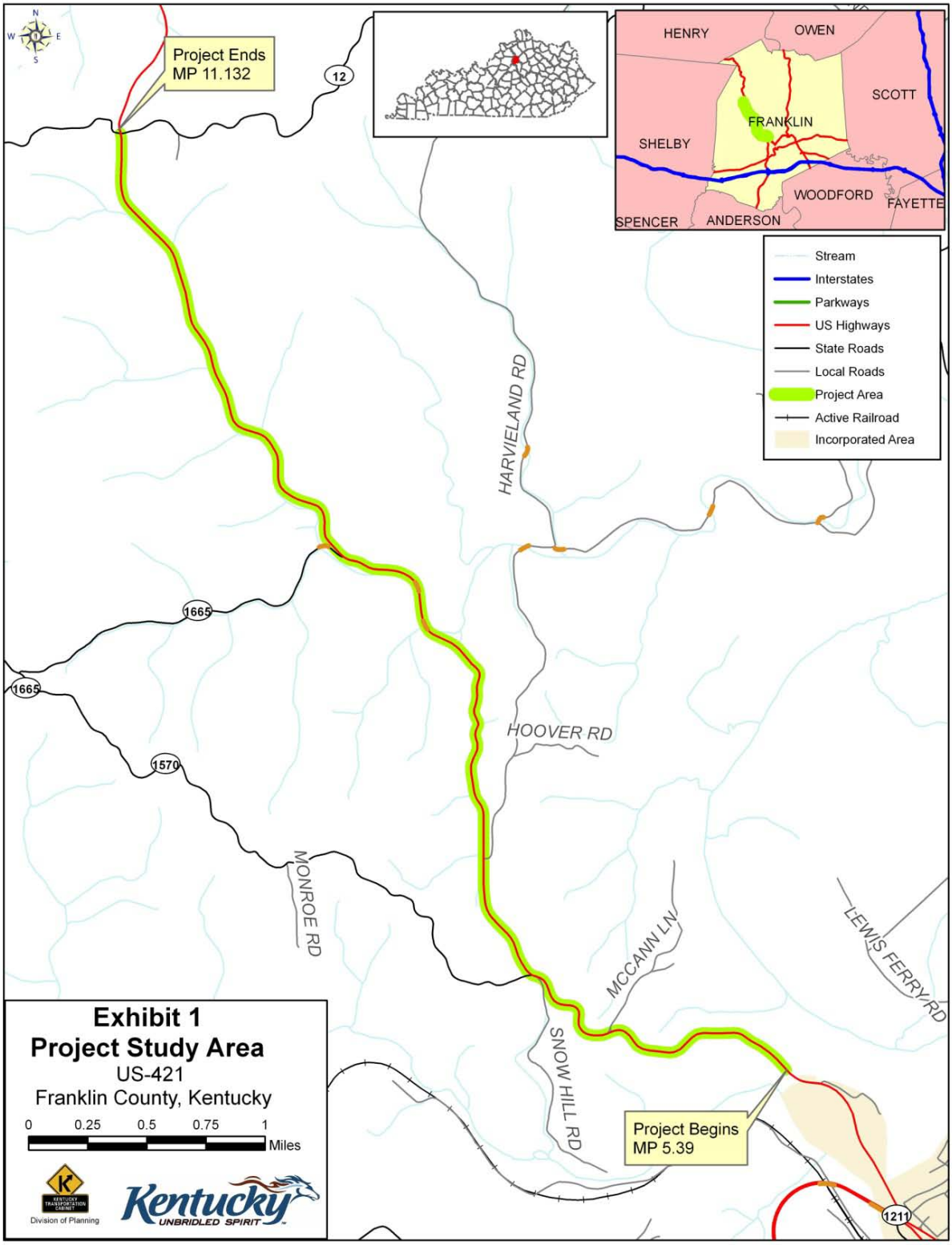
The entire length of this Rural Minor Arterial is an undivided two-lane highway with a lane width of 10 feet and an observed shoulder width of 1-3 feet. This section of US-421 had an average daily traffic (ADT) of 3,880 in 2009 with a continued drop in ADT as one approaches Henry County. Passing sight distance along this route was found to be zero percent with a total of 83 horizontal curves and 33 vertical curves. Of these curves, at least 48 horizontal curves and 10 vertical curves did not meeting the KYTC Common Geometric Practices for Rural Arterial Roads at a 60 mph design speed. The current and future level of service (LOS) for this portion of US-421 is rated D. Normally LOS C and above is considered acceptable for rural roads.

Existing conditions of interest along this US-421 study corridor include: limited sight distance, presence of utilities, possible flood zones, access management, possible underground storage tanks, variations in elevation and historically significant areas.

From January 1, 2004 through December 31, 2007, several high-crash locations with a Critical Rate Factor (CRF) greater than 1.0 were identified with no fatalities. A more recent review and crash analysis was also performed from January 1, 2007 through December 31, 2009 and concluded there were a few spot locations where the CRF exceeded 1.0 with no fatalities.

The need established for this project was to address safety concerns and geometric deficiencies for the purpose of reducing crashes along this corridor. Any improvements should also enhance interregional mobility and economic development with US-421 being a direct connection from the Milton-Madison Bridge and Interstate 71 to the City of Frankfort.

FIGURE ES-1
PROJECT STUDY AREA



Several alternative improvements for US-421 were initially considered by the project team to include: No-Build, Short-Term with Low-Cost, Long-Term Complete Rebuild and Long-Term Spot Improvements. The following **Table ES-1** shows a preliminary cost estimate from District 5 for those alternatives with an associated cost provided in 2010 dollars. This cost was developed on a cost per mile basis relative to similar projects in the area.

Of these options, the Short-Term, Low-Cost Alternative was considered favorable by the project team to address some safety concerns as part of the Purpose and Need Statement with a relatively quick approach given the limited funds available and construction dollars not yet being allocated for this project. The project team did not consider the Long-Term, Complete Rebuild Alternative to warrant further consideration due to geographic limitations, possible environmental concerns and significant cost given the relatively low ADT.

Should enough funding become available through future programming, the Long-Term, Intersection Spot Improvement Alternative was considered more favorable in addressing the Purpose and Need Statement. The total preliminary cost for improving all three intersections as part of this alternative was estimated to be $7,250,000. Further review in Phase I Design is recommended if enough construction dollars become available to determine which intersection improvements would be most beneficial to the public given the allocated dollars for such improvement.

TABLE ES-1
PRELIMINARY COST ESTIMATE

Alternatives	Length (miles)	Phased Cost ($)				Total Cost* ($)
		Design	Right-of-Way	Utilities	Construction	
Short-Term, Low-Cost Spot Improvements						
Tyre Grip, Cut Trees Back, Shoulder Layback @ 4 areas, Chevrons and Reflectors to existing Guardrail.	5.742	$100,000	$200,000	$100,000	$805,000	$1,300,000
Long-Term Intersection Spot Improvements						
US-421 @ KY-12	0.100	$50,000	$100,000	$50,000	$200,000	$400,000
US-421 @ KY-1665	0.300	$450,000	$100,000	$265,000	$5,200,000	$6,050,000
US-421 @ KY-1570 & @ Snow Hill Rd	0.200	$300,000	$500,000	$100,000	$900,000	$1,800,000
Long-Term Complete Rebuild						
Complete Rebuild	5.742	$3,800,000	$6,650,000	$6,650,000	$35,150,000	$52,250,000

*-Total Cost is rounded up to nearest $50,000 in 2010 dollars.

Table of Contents

Figures

Tables

Appendix A

Appendix B

Appendix C

Appendix D

Appendix E

I. INTRODUCTION

A. Study Purpose

The purpose of this Programming Study was to complete tasks in order to: (a) develop information for a corridor along US-421 from the end of the previous realignment at mile point (MP) 5.390 to the intersection at KY-12 (MP 11.132), in Franklin County, which can be used for future programming documents; (b) make data available for use when, and if, the project enters the design phase; and, (c) provide background information that can be utilized in the National Environmental Policy Act (NEPA) documentation for the project. Tasks undertaken as part of this project were:

- Identifying project goals and issues
- Defining the need for the project
- Determining project termini
- Describing the conditions of the existing roadway
- Identifying preliminary environmental concerns
- Identifying priority segments for future programming activities
- Initiating contact with public officials and agencies

The project goals were defined early in the first project team meeting. The first goal was to improve safety along the route. The second goal was to eliminate geometric deficiencies to improve safety and reduce maintenance.

B. Programming and Schedule

The project was described in the 2002 Kentucky Six-Year Highway Plan (FY 2003-2008) as a "Scoping Study to widen US 421 from the top of Bald Knob Hill to St. Johns Rd. (MP 6.700 – 11.132) " and identified by Item No. 05-8109.00. This study was scheduled to be started in the year 2004. There are no other phases other than planning that are defined or scheduled at this time.

A Project Identification Form (PIF) was found as control number 05 037 B0421 16.10 and was updated August 15, 2008, and most recently on May 25, 2011. This PIF listed the construction cost from mile point 5.390 to mile point 11.132 to be $37,000,000 with a total project cost of approximately $55,000,000. See **Appendix A** for a copy of both the original and updated PIF for this project.

A separate project, "Reconstruct US-421 from top of Bald Knob Hill at end of Reconstructed Section to Harvieland Road (MP 5.809 – MP 7.309)", was identified for the design phase in The Kentucky 2008 Highway Plan. This separate project identified by Item No. 05-374.00 is located inside the project limits of this scoping study.

The following is a description of the project as it is listed in the 2010-2012 General Assembly's Enacted Roadway Plan.

Item #05-0374.00, Franklin County

Phase	Fund	Year	Estimate
D:	SP	2010	$680,000
R:	SP	2011	$2,810,000
U:	SP	2011	$1,240,000
C:			$0

DESCRIPTION:
FRANKFORT-NEWCASTLE: RECONSTRUCT US-421 FROM TOP OF BALD KNOB HILL AT END OF RECONSTRUCTED SECTION TO HARVIELAND ROAD.

II. PROJECT LOCATION, EXISTING CONDITIONS AND TRAFFIC

A. Project Location

The project is located on US-421 on the main corridor from New Castle in Henry County to Frankfort in Franklin County. The project termini as originally described in the 2002 Kentucky Six-Year Highway Plan, (see previous paragraph) were found to be in need of change. Upon inspection by the project team, the decision to move the start of the project back to MP 5.390 was made. A more detailed study area for the project is described as follows:

- The beginning of the project was moved to MP 5.390. This mile-point is the end of a previous improvement project on US 421.
- Just north of this point is the intersection with KY-1570 at MP 6.750
- The end of the project is located at the intersection of US-421 and KY-12 at MP 11.132

The project area is shown graphically in **Exhibit 1** in **Appendix B** along with the project termini. Photos are also provided for the project area in **Appendix C**.

B. Existing Conditions

Data describing the existing conditions of this specific corridor of US-421 was taken from the Division of Planning's Highway Information System (HIS) database. All data came from the online version of the database and data was current as of January 2008.

The US-421 corridor in question is completely located in rolling terrain. Passing sight distance along the route in question was found to be zero percent. There were a total of 83 horizontal curves and 33 vertical curves along this corridor. Among these, there were 48 horizontal curves with a degree of curve greater than 4.276. This is the greatest degree of curvature allowed with a 60 mph design speed that is assumed for this road, under the Common Geometric Practices for Rural Arterial Roads, used by the KYTC Division of Highway Design (Exhibit 700-03). This is also assuming a maximum super-elevation of 6%. **Table II-1** shows the curves that are not designed to specification. According to the same guide, the maximum grade for a rural arterial in rolling terrain with a design speed of 60 miles per hour is 4%. Due to the fact that the data for grade given in HIS is in ranges, vertical curves within the range that include 4% are included in the table. For this reason it is noted that there were ten vertical curves with a percent grade greater than 4.5 and 5 additional curves that fell within the initial range that could not be verified exactly if they were above or below 4% in grade. The data describing these curves is shown in **Table II- 2**.

The entire length of the US-421 corridor is an undivided two-lane highway with a constant lane width of 10 feet. The shoulders are also constant along the length of the corridor at a width of 3 feet as indicated in Highway Information System Database (HIS). Inspection of the corridor proved to show that this was a generous estimate for the shoulder in some areas. Some areas inspected were found to have almost non-existent shoulders. The driving surface is an entirely high flexible asphalt pavement. This information is summarized along with the latest resurfacing date in **Table II-3**.

TABLE II-1
HORIZONTAL CURVES WITH DEGREE OF CURVE > 4.276

County Name	Route	Begin MP	End MP	Degree of Curve	Length (miles)	Radius (feet)
Franklin	US-421	5.243	5.407	4.5	0.164	1273.240
Franklin	US-421	5.570	5.635	14.5	0.065	395.143
Franklin	US-421	5.755	5.806	17.3	0.051	331.189
Franklin	US-421	5.878	5.925	13.6	0.047	421.292
Franklin	US-421	6.016	6.084	14.5	0.068	395.143
Franklin	US-421	6.124	6.206	18.7	0.082	306.395
Franklin	US-421	6.206	6.336	8.8	0.130	651.088
Franklin	US-421	6.336	6.393	19.6	0.057	292.325
Franklin	US-421	6.414	6.477	28.7	0.063	199.637
Franklin	US-421	6.503	6.586	16.6	0.083	345.155
Franklin	US-421	6.622	6.666	18.9	0.044	303.152
Franklin	US-421	6.701	6.773	8.4	0.072	682.093
Franklin	US-421	6.773	6.808	4.5	0.035	1273.240
Franklin	US-421	6.862	6.913	8.0	0.051	716.197
Franklin	US-421	6.978	7.125	6.8	0.147	842.585
Franklin	US-421	7.445	7.511	12.3	0.066	465.819
Franklin	US-421	7.511	7.572	9.8	0.061	584.651
Franklin	US-421	7.630	7.703	10.8	0.073	530.516
Franklin	US-421	7.735	7.776	16.4	0.041	349.365
Franklin	US-421	7.776	7.845	15.9	0.069	360.351
Franklin	US-421	7.845	7.870	51.5	0.025	111.254
Franklin	US-421	7.870	7.894	6.5	0.024	881.474
Franklin	US-421	7.894	7.936	24.6	0.042	232.910
Franklin	US-421	7.936	8.011	7.1	0.075	806.983
Franklin	US-421	8.011	8.066	5.8	0.055	987.858
Franklin	US-421	8.066	8.107	29.1	0.041	196.893
Franklin	US-421	8.107	8.160	4.5	0.053	1273.240
Franklin	US-421	8.207	8.264	5.6	0.057	1023.139
Franklin	US-421	8.328	8.460	9.5	0.132	603.113
Franklin	US-421	8.535	8.707	9.2	0.172	622.780
Franklin	US-421	8.749	8.811	9.5	0.062	603.113
Franklin	US-421	8.811	8.890	6.3	0.079	909.457
Franklin	US-421	8.890	8.917	12.1	0.027	473.519
Franklin	US-421	8.917	8.939	9.9	0.022	578.745
Franklin	US-421	9.004	9.068	15.5	0.064	369.650
Franklin	US-421	9.100	9.201	15.9	0.101	360.351
Franklin	US-421	9.311	9.402	13.6	0.091	421.292
Franklin	US-421	9.467	9.514	12.3	0.047	465.819
Franklin	US-421	9.569	9.621	13.4	0.052	427.580
Franklin	US-421	9.675	9.770	13.5	0.095	424.413
Franklin	US-421	9.828	9.876	4.9	0.048	1169.302
Franklin	US-421	9.937	9.985	4.4	0.048	1302.177
Franklin	US-421	10.039	10.114	5.4	0.075	1061.033
Franklin	US-421	10.170	10.245	6.3	0.075	909.457
Franklin	US-421	10.476	10.559	7.0	0.083	818.511
Franklin	US-421	10.761	10.909	6.8	0.148	842.585
Franklin	US-421	11.074	11.099	7.6	0.025	753.892
Franklin	US-421	11.099	11.177	10.6	0.078	540.526

Source: Highway Information System (HIS) Database KYTC

TABLE II-2
VERTICAL CURVES WITH GRADE > 4%

County Name	Route	Begin MP	End MP	Length (miles)	Percent Grade (Range)
Franklin	US-421	6.039	6.339	0.300	2.5 - 4.4 Percent
Franklin	US-421	6.339	6.449	0.110	2.5 - 4.4 Percent
Franklin	US-421	7.805	8.219	0.414	2.5 - 4.4 Percent
Franklin	US-421	8.219	8.276	0.057	2.5 - 4.4 Percent
Franklin	US-421	8.678	8.790	0.112	2.5 - 4.4 Percent
Franklin	US-421	5.609	5.719	0.110	4.5 - 6.4 Percent
Franklin	US-421	6.449	6.549	0.100	4.5 - 6.4 Percent
Franklin	US-421	6.549	6.734	0.185	4.5 - 6.4 Percent
Franklin	US-421	6.734	6.898	0.164	4.5 - 6.4 Percent
Franklin	US-421	7.098	7.344	0.246	4.5 - 6.4 Percent
Franklin	US-421	8.855	9.020	0.165	4.5 - 6.4 Percent
Franklin	US-421	5.449	5.609	0.160	6.5 - 8.4 Percent
Franklin	US-421	5.779	6.039	0.260	6.5 - 8.4 Percent
Franklin	US-421	6.898	7.098	0.200	6.5 - 8.4 Percent
Franklin	US-421	10.752	11.132	0.380	6.5 - 8.4 Percent

Source: Highway Information System (HIS) Database KYTC

TABLE II-3
ROADWAY CROSS-SECTION

County	Begin MP	End MP	Length (miles)	Lane Width	Year Resurfaced	Shoulder Width (HIS)	Shoulder Width (INS)
Franklin	5.390	5.504	0.114	10 Feet	2005	3 feet	1-3 feet
	End of Prev. Reconstruction						
Franklin	5.504	6.750	1.246	10 Feet	2005	3 feet	1-3 feet
		@ KY-1570					
Franklin	6.750	11.132	4.382	10 Feet	2005	3 feet	1-3 feet
	@ KY-1570	@ KY-12					

Source: Highway Information System (HIS) Database KYTC. Inspection (INS) in Field.

The corridor has two bridges which both have high sufficiency ratings of over 95. Both structures are classified as culverts and both are made of reinforced concrete. Neither structure was listed as structurally deficient or functionally obsolete. Neither was listed as having any historical significance. There was no speed reduction on any of the approach roads due to the presence of these structures. More detailed information is located in **Table II-4**.

TABLE II-4
BRIDGES

County	MP	Crossing	Length	Width	Type	Bridge Description	Sufficiency Rating
Franklin	8.438	Tucker Creek	25 feet	28 feet	Concrete Culvert	DBL 12X6X65 RC CLVT -3.5 FT FILL	97.5%
Franklin	8.600	Stoney Creek	100 feet	28 feet	Concrete Culvert	QUAD 15X7X163 RC CLVT -2 FT FILL	97.5%

Source: Highway Information System (HIS) Database KYTC

There are three major crossroads along this corridor of US-421. There were also three minor side roads listed in the HIS route log. The major crossroads are shown in **Table II-5** and the route log from the HIS is shown in **Table II-6**.

TABLE II-5
MAJOR CROSSROADS

County	MP	Description	State System	Functional Classification	ADT	
					Eastern side	Western Side
Franklin	6.750	KY-1570	Rural Secondary	Rural Local	*	383
Franklin	8.957	KY-1665	Rural Secondary	Rural Minor Collector	*	148
Franklin	11.132	KY-12	Rural Secondary	Rural Minor Collector	168	347

Source: Highway Information System (HIS) Database KYTC, 2010 ADT
* denotes T-intersection

TABLE II-6
ROUTE LOG

County	Route	Milepoint	Description
Franklin	US-421	5.390	End of Previous Reconstruction
Franklin	US-421	6.268	MCCANN LANE
Franklin	US-421	6.730	SNOW HILL ROAD
Franklin	US-421	6.750	KY-1570
Franklin	US-421	7.288	PLUM CREEK CULVERT
Franklin	US-421	7.309	HARVIELAND ROAD
Franklin	US-421	8.438	TUCKER CREEK CULVERT - B00084
Franklin	US-421	8.597	STONEY CREEK CULVERT - B00085
Franklin	US-421	8.957	KY-1665
Franklin	US-421	11.132	KY-12

Source: Highway Information System (HIS) Database KYTC

C. Highway Systems

US-421 in the study segment is functionally classified as a Rural Minor Arterial. According to the KYTC Planning website, this functional classification is used to describe a highway segment that: "Supplements the rural principal arterial system by providing inter-state and inter-county service, linking cities, large towns, major resort areas and other major traffic generators. This system is spatially distributed according to population density so all developed areas are within reasonable distance of an arterial highway."

For maintenance purposes, it is classified as a State Primary Route. US-421 in the study segment has a Truck Weight Class of "AAA" (80,000 pounds gross load limit), and is not part of the Coal Haul or of the Extended Weight Systems. It is not part of the National Highway System, the National Truck Network, the Forest Highway System, the Appalachian Development Highway System, the Bike Route System, or the National or Kentucky Scenic Byway System for the segment in question.

D. Vehicle Crash Analysis

A total of 114 vehicle crashes were recorded with valid reference points on US-421 within the study segment during the four (4) year period between January 1, 2004 and December 31, 2007. There were thirty (30) crashes with at least one person injured, and among those, there were seven (7) crashes with multiple people injured. There were no fatalities among any of these crashes. Crash analysis was performed for both "Segments" and "Spots". The summaries from these analyses are presented in **Table II-7** and **Table II-8** respectively.

TABLE II-7
US-421 SEGMENT CRASH ANALYSIS

Begin MP	End MP	Length (mi.)	ADT	Years	HMVM	Functional Class Rate	Total No. Crashes	Most Frequent Crash Type	Crash Rate/Total Accident Rate	RC/ Critical Accident Rate	Critical Rate Factor
5.390	6.750	1.360	3520	2005-2007	0.0699	**217**	**32**	Single Vehicle	379	458	1.209
6.751	8.957	2.206	2630	2005-2007	0.0847	**217**	**22**	Single Vehicle	363	260	0.715
8.958	11.132	2.174	1840	2005-2007	0.0584	**217**	**32**	Single Vehicle	395	548	1.388

Source: Highway Information System (HIS) Database KYTC
KTC Analysis of Traffic Crash Data in Kentucky (2003-2007)
KSP Collision Report Analysis for Safer Highways (CRASH) Database

TABLE II-8
US-421 ORIGINAL SPOT CRASH ANALYSIS

Begin MP	End MP	Length (mi.)	ADT	Years	HMVM	Functional Class Rate	Total No. Crashes	Total Accident Rate	RC	Critical Rate Factor
9.0	9.1	0.1	1840	2006-2008	2.69	0.22	10	3.7	1.17	3.18
10.6	10.7	0.1	1840	2006-2008	2.69	0.22	4	1.5	1.17	1.27

Source: Highway Information System (HIS) Database KYTC
KTC Analysis of Traffic Crash Data in Kentucky (2002-2006)
KSP Collision Report Analysis for Safer Highways (CRASH) Database

In the "Segment" analysis, the length of the study was divided into three segments, defined by the different average daily traffic counts. A summary of the segments and all associated data can be seen in **Table II-7**.

Of the three segments, two had a critical rate factor greater than 1.00. The first segment was 1.36 miles long and a total of 32 crashes occurred along its length. This resulted in a critical rate factor of 1.209. Of these crashes, thirteen involved two vehicles. Eight crashes resulted in injuries, three of which had multiple injuries. Twenty of the crashes were on wet pavement and one was in icy conditions. All but three of the crashes occurred on a curve. There were no fatalities in these or any other segments in the study.

The last segment in the study area had a critical rate factor of 1.388. It had a length of 2.174 miles and a total of 32 crashes. Of these crashes, six involved two vehicles. Twelve crashes resulted in injuries, one of which resulted in two injuries. Fourteen of the crashes occurred on wet pavement. Twenty-two (22) of the crashes occurred in a curve, and of the crashes that were in a straight portion of the road, six occurred on either a grade or hillcrest.

The "Spot" rate analysis was performed for one tenth mile spots. While analyzing the data, it was determined there were only two spots where the critical rate factor was over 1.00. There were ten and four crashes respectively giving critical rate factors of 3.18 and 1.27. A summary of the two high crash spots is in **Table II-8,** and the location can be viewed in **Exhibit 2** located in **Appendix B**.

For the first spot of interest, nine of the ten crashes were in a curve and grade section of the road and all were single vehicle crashes. There were five injuries but no fatalities in these incidences.

One of the four crashes at the second site was in a curve and grade section of roadway. Three involved two vehicles and the last one involved a single vehicle. None of the accidents resulted in death or injury. Only one occurred under wet roadway conditions.

The first spot described is located just north (0.2 mi.) of the intersection of US-421 and KY-1665 northbound. This section of the road had noticeable geometric deficiencies, as there was little or no shoulder on either side of the road. On the northbound side of the road there was only the cut rock-face and on the southbound side of the road there was little vegetation on the shoulder before a steep drop-off.

As we move southward along US-421, the next area of concern has a 0.1 mile spot CRF of 1.270 and is located between mile point 10.700 and 10.600. This portion of roadway appears to be the only straight section along the corridor where there is enough sight distance to allow for passing. Upon further review of the crash data at this location, no one particular type of crash indicated a consistent cause for the high CRF.

There was also an investigation into the crash history of the routes that intersected US-421, including KY-1570, KY-1665, and KY-12. One tenth mile spots of the route on either side of US-421 were investigated for possible intersection related crashes not included in the crash data for US-421. There were no crashes in the first 0.1 miles on any of the intersecting highways.

At the request of the final project team, all the segment and spot locations with high Critical Rate Factors (CRF) listed above were reviewed again from January 1, 2007 through December 31, 2009 to determine if there is current consistency in the crash analysis. Upon completion of this review, no segments were found to have a CRF greater than 1.0, which means the frequency of occurrence is not great enough to rule out coincidence during this time frame.

However, there were several areas where 0.10 or 0.30 mile spot CRFs exceeded 1.0 and are listed below in **Table II-8A**, and the location can be viewed in **Exhibit 2A** located in **Appendix B**.

TABLE II-8A
US-421 UPDATED SPOT CRASH ANALYSIS

Begin MP	End MP	Length (mi.)	ADT	Years	HMVM	Functional Class Rate	Total No. Crashes	Total Accident Rate	RC	Critical Rate Factor
5.670	5.770	0.1	3,880	2007-2009	4.25	0.21	4	0.9	0.9	1.05
8.111	8.211	0.1	2,590	2007-2009	2.84	0.21	5	1.8	1.09	1.62
8.111	8.411	0.3	2,590	2007-2009	2.84	0.64	6	2.1	2.04	1.04
9.571	9.671	0.1	1,650	2007-2009	1.81	0.21	3	1.7	1.36	1.22

Source: Highway Information System (HIS) Database KYTC
KTC Analysis of Traffic Crash Data in Kentucky (2007-2009)
KSP Collision Report Analysis for Safer Highways (CRASH) Database

E. Traffic and Level of Service

The counts utilized for this study that were taken for this section of road occurred in three different segments of the road and also occurred in three different years, as indicated in **Table II-9**. There was a variation in average daily traffic along this road from just fewer than 1800 vehicles per day near KY-12 to slightly more than 3500 vehicles per day near the end of the previous construction near the KY-1570 intersection with US-421. The projected future year (2035) average daily traffic volumes were based on an annual growth rate of 2.8% and ranged from 3990 to 7630 at the same spots along the corridor. The growth rate used came from the 2006 Traffic Forecasting Report published by the KYTC Division of Multimodal Programs.

For the purpose of Level of Service (LOS) determination, the study segment of US-421 is considered to be a Class I Highway. Highway Capacity Software (HCS) was used to calculate the LOS of the segments of roadway within this study. As shown in **Table II-10** and **Table II-11**, respectively, the LOS was found for the year 2007 and also for the data projected in **Table II-9** for the year 2035. This information can also be viewed in **Exhibit 3** and **Exhibit 4** in **Appendix B**. The LOS was found to be D for both time frames and thus the increase in traffic did not change the results. A LOS of D is considered to be below acceptable for this type of road. One thing that changed over the time frame is an increase in the percent time

spent following. The percent time spent following is a factor that contributes to the LOS determination and usually would be a factor in the decline of the LOS from acceptable standards.

TABLE II-9
AVERAGE DAILY TRAFFIC (ADT)

Begin Mile point	End Mile point	Traffic Count		Estimated 2007 ADT	Estimated 2035 ADT*
		ADT	Year		
4.523	6.750	3516	2007	3520	7630
6.750	8.957	2487	2006	2630	5700
8.957	11.132	1726	2005	1840	3990

Source: Highway Information System (HIS) Database KYTC
*2.8% growth rate

TABLE II-10
EXISTING LEVEL OF SERVICE (2007)

Section	Begin Mile point	End Mile point	Length	Average Travel Speed	Percent Time Spent Following	Volume /Service Flow	LOS
1	5.390	6.750	1.360	44.4	45.8	0.11	D
2	6.750	8.957	2.207	43.2	53	0.16	D
3	8.957	11.132	2.175	44.4	45.8	0.11	D

Source: Highway Capacity Manual 2000 Chapter 20
*Based on BFFS of 60 and 20 access points per mile

TABLE II-11
FUTURE LEVEL OF SERVICE (2035 WITH NO IMPROVEMENTS)

Section	Begin Mile point	End Mile point	Length	Average Travel Speed	Percent Time Spent Following	Volume /Service Flow	LOS
1	5.390	6.750	1.360	40.0	72.8	0.37	D
2	6.750	8.957	2.207	41.3	67.3	0.29	D
3	8.957	11.132	2.175	43.1	56.7	0.16	D

Source: Highway Capacity Manual 2000 Chapter 20
*Based on BFFS of 60 and 20 access points per mile

On the segments of US-421 north of the corridor being studied, it can be observed that there is a continuous decrease for ADT as one approaches Henry County. Also, once in Henry County there is another considerable decrease in traffic to the point that the volume drops below 600 ADT before there is an increase in volume further north on US-421. It can be concluded that this portion of US-421 is not currently being extensively used as a commuter route from Henry County to Franklin County.

F. Additional Information

Other existing conditions of interest along the study corridor include: limited sight distance, variations in elevation, presence of utilities, possible flood zones, access management, and historically significant areas. Some of these issues are discussed in greater detail below.

A major goal of this project would be to improve sight distance along the route, with attention being paid to the intersections of other routes with US-421. The intersections that appear to need the most improvement include KY-12, KY-1665, KY-1570, and Snow Hill Road.

The intersection of US-421 and KY-12, at mile point 11.132, presents a concern with sight distance and access management. There is a large earthen bank in the southwest corner of the intersection. From the west leg (KY-12) of the intersection, the driver's view to the south (US-421) is obstructed by this earthen bank. At the southeast corner, there is a grocery store with one fuel pump and paved parking with continuous access along US-421 and KY-12. There is no delineation between the parking and KY-12. Parked vehicles can block views to the south from this east leg of the intersection. See **Figure II-1**. This intersection is a part of the segment with a 1.388 Critical (Crash) Rate Factor (CRF) as previously shown in **Table II-7**.

FIGURE II-1
US-421 AND KY-12 INTERSECTION, NORTHBOUND ON US-421

The intersection of KY-1665 and US-421, at mile point 8.957, has sight distance concerns as well as issues with a steep grade when approaching the "Y" intersection from KY-1665. This variation in elevation and a very acute "Y" angle of the intersection all contribute to an obstructed view to the north when approaching this intersection from KY-1665. An added level of concern is the inability for a motorist traveling southbound on US-421 to turn right onto KY-1665 without having to backup their vehicle to make a skewed turn onto KY-1665. See **Figure II-2**. This turning movement is also assuming no vehicles are at or approaching the intersection from KY-1665. Otherwise, the vehicle traveling southbound on US-421, wanting to turn right onto KY-1665 would have to stop on US-421 and wait in the curve until the motorist on KY-1665 has cleared the intersection. This intersection is the location of the highest CRF for 0.10 mile spots with a 3.18 rating as previously shown in **Table II-8**.

FIGURE II- 2
US-421 AND KY-1665 INTERSECTION, SOUTHBOUND ON US-421

The intersection of US-421 with KY-1570, at mile point 6.750, also shares the issue of sight distance limitations. When approaching this intersection from KY-1570, a combination vertical and horizontal curve limits your sight distance when looking northbound on US-421. When looking southbound onto US-421 from KY-1570, the view of US-421 and adjacent Snow Hill Road intersection to US-421 is obstructed by an earthen bank and utilities. See **Figure II-3**. At the North West corner, motorists going southbound on US-421, turning right onto KY-1570, currently use a right turn approach constructed through a small embankment in the northwest corner of the intersection in an effort to increase the turning radius onto KY-1570 at the entrance. See **Appendix C** for more photos of this intersection. This intersection is located at the end of the segment originally identified from mile point 5.390 to 6.750 with a 1.209 CRF as previously shown in **Table II-7**.

FIGURE II-3
US-421 AND KY-1570 INTERSECTION, ON KY-1570 LOOKING SOUTH

The Snow Hill Road and US-421 intersection, at mile point 6.600, has many of the same sight distance issues as the KY-1570 intersection with US-421. When looking northbound onto US-421 from Snow Hill Road, the view of the adjacent intersection at KY-1570 is limited by the same earthen bank and utilities. See **Figure II-4**. However, this Snow Hill Road intersection with US-421 has the added issue of a steep grade when approaching the intersection from Snow Hill Road. The motorist's view is limited when looking southbound onto US 421 due to a steep grade when approaching this "Y" intersection at a skewed angle from Snow Hill Road. This intersection is located just south of US-421 and KY-1570 and in the same segment with a CRF greater than 1.0 as previously shown in **Table II-7**. This area was also closely approaching that threshold between mile points 6.646 to mile point 6.746, which includes the intersection of Snow Hill Road and KY-1570.

FIGURE II-4
US-421 AND SNOW HILL ROAD INTERSECTION, NORTHBOUND ON US-421

There are also multiple places where the route is very close to a cliff on either side of the road and the rock appears to be in a deteriorating condition. At many of these same places along the route, there are also drop-offs on the opposite side of the road.

Other segments of the roadway are very near the same level as the waterways that run alongside parts of the road and are prone to flooding in moderate to heavy rains. Attention would need to be given in later project phases to avoid damage to houses and property because of the construction or relocation of part of the route.

Utilities would be another concern that would need to be investigated in future phases of this project. Overhead lines do appear to follow the majority of the route and would be involved with most improvements. It was noticed that city water lines ran at least part of the way along the route as well. An investigation will be needed to see how far along and how close to the road the underground pipes are placed. A unique possible problem is the obvious presence of towers along the route. Although the exact nature of the towers is unknown, many appear to be radio or cellular telephone towers. Depending upon final design, companies that own and maintain these structures will need to be contacted.

III. PRELIMINARY ENVIRONMENTAL & SOCIOECONOMIC OVERVIEW

A Cultural Historic Overview for Improvements to US-421 in Franklin County, Kentucky was completed for Item No. 05-8109.00 in May 2005 by the Kentucky Transportation Cabinet. This was completed for District 5 with Rebecca Horn Turner being the Principal Investigator from the Division of Environmental Analysis. This study covers the entire area defined in this US-421 Programming Study. Although a complete historical review has not been conducted, there were two places of note that would need special attention in the process of design and construction. There is a graveyard with a single headstone near the intersection of US-421 with McCann Lane. Also, just north of the intersection of Harvieland Road and US-421, there is a church with a sizeable cemetery surrounding the church on the East Side of US-421.

A brief environmental analysis was conducted to locate places of significant historical or cultural value as well as places of potential hazards. An environmental footprint can be seen in **Exhibit 5** located in **Appendix B**. No environmental issues are expected to be encountered as a result of this project. However, further consideration should be given to the two older convenient store properties located along the US-421, at mile points 11.132 and 6.710, as they may have the potential to contain underground storage tanks.

An Environmental Overview by District 5 is pending completion during the early phase of engineering.

IV. PROJECT TEAM, LOCAL OFFICIALS AND PUBLIC INVOLVEMENT

A. KYTC Initial Project Team

A project team meeting for the US-421 (Franklin County) programming study was held in the Transportation Cabinet Office Building, Room 506 on January 20th, 2005. Those attending the meeting were as follows:

Robert Farley	FHWA
Chris Phillips	District 5 – Planning
Greg Groves	District 5 – Pre-Construction
Craig Myatt	District 5 – Maintenance
Gary Bunch	KYTC – Environmental Analysis
Ananias Calvin III	KYTC – Design
Daryl Greer	KYTC – Planning
Jim Wilson	KYTC – Planning
David Martin	KYTC – Planning
Robert Brown	KYTC – Planning

Minutes were developed for this meeting and are provided in **Exhibit 1** of **Appendix D**. As stated in these minutes, the project team agreed that the termini for this project should be at the intersection with KY-12. They also identified the benefits of this study being to help improve safety and reduce maintenance costs in part through improved geometrics. Overall data analysis information was provided to the project team. Two problem areas were identified in this meeting with crash rate factors (CRF) greater than 1.0 but no fatalities were identified throughout the corridor study area. These areas of interest will be discussed in greater detail within this report.

B. Local Officials

A local officials meeting was also held for this US-421 Study at the Capitol Annex, 4th Floor Conference Room on April 1st, 2005. The meeting was held to receive feedback and local direction in the development of the programming study. Minutes for this meeting are included in **Appendix E**.

Minutes from the project team meeting were distributed in this meeting along with data collection and analysis information. The goal of this project was also noted to be improvement of safety and reduction of maintenance costs. Those in attendance of this meeting are listed as follows:

Julian Carroll	State Senator – District 7
Derrick Graham	State Representative – District 57
Bob Roach	Franklin County Judge Executive
Howard Dawson	Franklin County Fiscal Court
Lambert Moore	Franklin County Fiscal Court
Jewel Johnson	Representative Graham - LRC
Jim Wilson	KYTC – Planning
David Martin	KYTC – Planning
Joe Tucker	KYTC – Planning

C. Public Involvement

No public meetings are anticipated during this phase of the project. However, there will be at least one public meeting should any identified project move into the design phase. This will provide ample opportunity for the public to provide their input and comments on the project.

D. KYTC Final Project Team

A second project team meeting for the US-421 (Franklin County) programming study was held in the Transportation Cabinet Office Building, Room 503 on June 15th, 2010. The following people attended this meeting:

Brian Meade – District 5 Project Development
Dane Blackburn – District 5 Planning
Keith Damron – Central Office Planning
Steve Ross – Central Office Planning
Jill Asher – Central Office Planning
Tonya Higdon – Central Office Planning

The primary initiative for holding this meeting was to update everyone on the history of this project and to determine the future course for this study. Meeting Minutes were developed for this meeting and are provided in **Exhibit 2** of **Appendix D**. As stated in these minutes, the Division of Planning provided additional information and developed recommendations for this draft study. The results of the 2nd Project Team Meeting for Item # 05-8109.00 concluded the following:

- The draft study shall be utilized "As Is" with references to any further data collected and/or analyzed.
- A "1st Look/DNA Pre-design Scoping" Study should be performed for Item # 05-0374.00

Design funds are not yet authorized for Item # 05-0374.00 with a Highway Plan design year of 2010.

The First Project Team Meeting on Item #05-0374.00 was combined with the Third Project Team Meeting for this study and held at the Transportation Cabinet Office Building, Room 512 on July 30th, 2010. Those attending the meeting were as follows:

Brian Meade – District 5 Project Development
Cathy Cornish – District 5 Utilities
Dane Blackburn – District 5 Planning
Greg Garner – District 5 Project Delivery & Preservation
Robert (Bob) Farley – Central Office Design
Ron Matar – Central Office Design Drainage
Tala Quinio – District 5 Design
Tom Hall – District 5 Planning
Keith Damron – Central Office Planning
Steve Ross – Central Office Planning
Jill Asher – Central Office Planning
Sreenu Gutti – Central Office Planning
Tonya Higdon – Central Office Planning

The goal for this meeting was to update new team members and identify possible alternatives for improvement along this route. The final options for this project identified during this meeting are summarized as follows:

A. No Build
B. Improve roadway through practical solutions following the centerline of the roadway
C. Improve roadway through reconstruction to current design standards with preliminary line and grade but will divide up into sections
D. Improve roadway through intersection and spot improvements, which may require phasing

Meeting minutes were developed for this Third Project Team Meeting and can be reviewed in **Exhibit 3** of **Appendix D**.

V. PROJECT DRAFT PURPOSE AND NEED STATEMENT

Existing conditions along US-421 need improvement to address geometric deficiencies and safety concerns for the purpose of reducing crashes along this corridor. These improvements should also enhance interregional mobility and economic development with US-421 being a direct connection from the Milton-Madison Bridge and Interstate 71 to the City of Frankfort.

VI. POSSIBLE ALTERNATIVES

The project team considered several alternatives for US-421 in Franklin County from mile point 5.390 at the end of the previous reconstruction to mile point 11.132 at KY-12 to include the No-Build Alternative. These alternatives are discussed in detail below. Cost estimates for the design, right-of-way, utilities, and construction phases for each of the viable build alternatives were also provided below.

A. No-Build Alternative

This option would be the No-Build alternative. This approach would be to wait and see what happens under current conditions into the near future before proceeding with any further significant financial investment in this portion of US-421. This alternative would be the least expensive in terms of up-front costs and would have the least community and environmental impacts. Still, this approach would not adequately address the Purpose and Need of this project, which is to improve safety and address geometric concerns.

B. Short-Term, Low-Cost Alternative

This short term alternative is to primarily address concerns along the curves and intersections of US-421 through a low cost, quick improvement approach. The improvements in this alternative would include the addition of chevrons on curves where the advised speed is more than 10 miles per hour lower than the 55 miles per hour posted speed limit. This alternative would also include the addition of reflector tabs in the "W" of existing guardrail throughout the entire length of the US-421 project area from MP 5.390 to MP 11.132.

There were several areas throughout US-421 that could be addressed with one or more of the following items: clearing trees and vegetation, laying back slopes, providing a high friction surface and adding chevrons and reflectors. Another field visit is recommended closer to the time of implementing any portion of the listed improvement to better identify the current needs along this corridor. Near the end of this study, the application of the high friction surface material was further reviewed along this route by the District. This has resulted in a contract being developed to implement this improvement between mile point 5.68 and mile point 6.25 and mile point 6.27 to mile point 6.75. However, poor pavement conditions relative to this application existing around mile point 6.4, and as such, this section may need to be repaved and repaired prior to applying the high friction surface material. Drainage ditches along this route where the roadway comes next to a hillside, should also be inspected as well and in some instances cleaned out or possibly even enlarged to meet runoff demands.

There are a few disadvantages to this approach. This option will require the purchasing of some additional right-of-way to remove enough trees and vegetation to improve sight distance and allow for proper layback of shoulder at select locations, which includes but is not limited to mile point 5.825, mile point 5.985, mile point 6.740, and mile point 11.130. This will also require the temporary relocation of some utilities. Also, geometric deficiencies throughout the route will not be addressed.

There were several advantages identified for this alternative as well. The primary advantage to this alternative is the relatively quick implementation of this alternative in the short term due in part to a much lower cost than other alternatives. This approach will improve safety through increased sight distance and enhance traction around curves while bringing added awareness to these curves with reflectors and chevrons. These improvements should be implemented without having to close the roadway or to displace anyone from their homes to minimize community impacts. Environmental impacts would also be kept to a minimum.

The following **Table VI-1** shows a preliminary cost estimate from District 5 for this alternative provided in 2010 dollars. This cost was developed on a cost per mile basis relative to similar projects in the area. KYTC will look at using other funding sources.

TABLE VI-1
SHORT-TERM, LOW COST IMPROVEMENT ALTERNATIVE – PRELIMINARY COST ESTIMATE

Short-Term Alternative	Length (miles)	Phased Cost ($)				Total Cost* ($)
		Design	Right-of-Way	Utilities	Construction	
Shoulder Layback		$100,000	$200,000	$100,000	$550,000	$950,000
Tyre Grip	1.62				$230,000	$230,000
Cut Back Trees						$40,000
Reflectors on Guardrail**					$5,000	$5,000
Chevrons**					$20,000	$20,000
TOTAL (Rounded up)	—	—	—	—	—	$1,300,000

*-Total Cost is rounded up to nearest 50,000.
**-Assumes labor cost for state forces.

C. Long-Term Complete Rebuild Alternative

During the final project team meeting, the project team discussed alternatives to address the purpose and need for this project. A total rebuild option was considered and later concluded that the updated Project Information Form (PIF) as previously discussed in the Introduction Section of this report and provided in **Appendix A** identified this cost throughout the corridor from mile point 5.309 to mile point 11.132 at KY-12.

In reviewing this alternative, some drawbacks were noted. Due to topographic limitations, a considerable amount of cut and fill material would be anticipated. As a result, the construction cost for this project would be considerable, especially given the relatively low ADT counts. This cost would require this project to be divided up into sections. Another impact would be the construction time due to the massive amounts of earthwork anticipated. The massive amounts of cut and fill material to be moved would also lead to potential environmental impacts. The local community would also be impacted by road closures wherever the existing roadway footprint matches or crosses with the proposed roadway. Considerable right-of-way would need to be purchased and a large number of homes would be removed relative to the total number of homes existing along this route. Significant utility relocation would need to occur and all these factors will tie into the extended construction time to complete the project.

There were also several benefits identified for this option. This approach would address geometric deficiencies along this route, drainage issues and sight distance limitations by bringing the roadway to current design standards and thus eliminating current safety concerns.

The following **Table VI-2** shows the preliminary cost estimate from District 5 for the Complete Rebuild Alternative in 2010 dollars. This cost was developed on a cost per mile basis relative to similar projects in the area. The right of way cost for this alternative includes an estimated cost to relocate several possible houses. Future project development phases may provide a way to avoid or reduce this cost.

TABLE VI-2
LONG-TERM, COMPLETE REBUILD ALTERNATIVE –
PRELIMINARY COST ESTIMATE

Long-Term Complete Rebuild	Length (miles)	Phased Cost ($)				Total Cost* ($)
		Design	Right-of-Way	Utilities	Construction	
	5.742	$3,800,000	$6,650,000	$6,650,000	$35,150,000	$52,250,000

*-Total Cost is rounded up to nearest 50,000.

D. Long-Term, Intersection Spot Improvement Alternative

When traveling this corridor, several areas of concern were initially identified. Due to the natural terrain having significant contour variations coupled with a relatively low average daily traffic count, improvement to the entire corridor system was not considered feasible given the current financial climate and cost per utilized vehicle. Upon further review, some recommendations were developed to help address those areas with the greatest need for improvement utilizing a practical solutions methodology with 11 ft lanes and 4 ft shoulders. The following identifies those areas of concern and provides long-term recommendations for each on a spot improvement basis.

a. US-421 & KY-12 Intersection

At the northernmost point of this corridor study is the intersection of US-421 with KY-12, at mile point 11.132. As with most intersections along this route, sight distance is a safety concern as previously shown in **Figure II-1**. This particular intersection has a very large earthen bank that significantly obstructs your view from the west leg of KY-12 when looking southbound onto US-421. It is recommended that the earthen bank be laid back to increase the sight distance at the intersection assuming an optimal grade of 4:1. This would require rock removal and given the location of nearby structures such as monitoring wells and underground utilities, District 5 does not recommend the use of blasting as a form of rock removal.

The southeast quadrant of the US-421 and KY-12 intersection would benefit from access management improvements to define entrances and delineate between the roadway and parking areas for the grocery at this location.

The following **Table VI-3** shows the preliminary cost estimate from District 5 for improvements to the intersection of US-421 and KY-12 in 2010 dollars. This cost was developed through bid tabulations on a cost per quantity basis relative to similar projects in the area. Further design may provide a way to avoid or reduce this cost.

TABLE VI-3
US-421 & KY-12 INTERSECTION IMPROVEMENTS-
PRELIMINARY COST ESTIMATE

Spot Intersection Improvement	Length (miles)	Phased Cost ($)				Total Cost* ($)
		Design	Right-of-Way	Utilities	Construction	
US-421 & KY-12	0.100	$50,000	$100,000	$50,000	$200,000	$400,000

*-Total Cost is rounded up to nearest 50,000.

b. US-421 & KY-1665 Intersection

The next location of note is the KY-1665 and US-421 intersection. This location is within a 0.1 mile spot with a CRF of 3.18. As previously noted and shown in **Figure II-2**, sight distance is the primary issue at this location. Longer term improvements would involve addressing the "Y" intersection and steep grades of the KY-1665 eastbound approach to the intersection. It is noted that such improvements would involve significant amounts of earthwork and expense given the topography and potential environmental issues associated with an adjacent stream.

One option proposes improving the intersection of US-421 and KY-1665 through the realignment of US-421 northeast into the current mountainside, thus leaving KY-1665 undisturbed except for improving the turning radii and realigning to allow for a perpendicular intersection with US-421. This option was considered most viable at this point in preliminary design for the following reasons: no dwellings required relocation, the proposed improvements stayed away from a stream that runs along the west side of US-421 at this location, and this option did not disturb the newly constructed bridge on KY-1665. As an added result, this design would likely straighten out the US-421 alignment. This alternative for the intersection also appears to be easier to maintain traffic during construction.

The obvious downside would initially be the earthwork required (particularly the amount of rock that would need to be removed) and the utility relocation and right-of-way to be purchased. There are also overhead lines in the woods that would likely require relocation.

The following **Table VI-4** provides a preliminary cost estimate from District 5 for this option to improve the intersection of US-421 and KY-1665 in 2010 dollars. This cost was developed through bid tabulations on cost per quantity basis relative to similar projects in the area.

Table VI-4
US-421 & KY-1665 INTERSECTION IMPROVEMENTS-
PRELIMINARY COST ESTIMATE

Spot Intersection Improvement	Length (miles)	Phased Cost ($)				Total Cost* ($)
		Design	Right-of-Way	Utilities	Construction	
US-421 & KY-1665	0.300	$450,000	$100,000	$265,000	$5,200,000	$6,050,000

*-Total Cost is rounded up to nearest 50,000.

c. US-421 with KY-1570 and Snow Hill Road Intersections

The intersection of US-421 with KY-1570 also has issues with sight obstruction and is a part of a crash segment with a CRF of 1.209. The sight line looking south from KY-1570 could be improved by cutting back the embankment in the southeast corner as previously shown in **Figure II-3**. Besides blocking views of US-421 southbound, the embankment also obscures the entrance to Snow Hill Road which intersects US-421 immediately south of KY-1570. The radius of the intersection when entering KY-1570 from US-421 southbound can be improved as motorists have already created an alternate dirt right turn approach that serves this very purpose.

An adjacent intersection along this corridor just south of the US-421 and KY-1570 intersection is that of Snow Hill Road and US-421. This intersection also has similar sight obstruction issues as those of the adjacent US-421 and KY-1570 intersection. The same earthen bank and utilities that block your view when looking southbound on US-421 from KY-1570 obstruct the motorists' view when looking northbound on US-421 from Snow Hill Road as previously shown in **Figure II-4**. The immediate grade change on Snow Hill Road as you approach the intersection with US-421 creates an added safety concern for motorist by further limiting sight distance, which is compounded during wet and icy weather conditions.

Both intersection concerns may best be addressed long-term together by realigning US-421 further east due to the earthen bank and stream on the west side of US-421 and the steep grade on Snow Hill Road. This would allow motorists on Snow Hill Road to extend and stop on an even grade (the original US-421 alignment) perpendicular to the "proposed" US-421 alignment before entering the intersection with the re-aligned US-421.

The downside to this option is the large amount of earthwork that would be required along with the significant amount of right-of-way associated with implementing this spot improvement for both intersections.

The following **Table VI-5** provides a preliminary cost estimate for this option to improve the intersection of US-421 with that of KY-1570 and Snow Hill Road provided by District 5 in 2010 dollars. This cost was developed through bid tabulations on cost per quantity basis relative to similar projects in the area.

TABLE VI-5
US-421 WITH KY-1570 & SNOW HILL ROAD INTERSECTION IMPROVEMENTS-PRELIMINARY COST ESTIMATE

Spot Intersection Improvement	Length (miles)	Phased Cost ($)				Total Cost* ($)
		Design	Right-of-Way	Utilities	Construction	
US-421 with KY-1570 & Snow Hill Rd	0.200	$300,000	$500,000	$100,000	$900,000	$1,800,000

*-Total Cost is rounded up to nearest 50,000.

Further in depth review of the most appropriate connection for these intersections is warranted during Phase I Design. The preferred choice from a design standpoint would be in an area with the least grade variation at the approach, while still allowing motorist's enough sight distance at the proposed intersection. An environmental review should also be performed in concert with this design review to identify impacts of new tie-ins to US-421. This is a long-term recommendation given the required undertaking to re-route this low ADT roadway due to the topographical limitations of a steep hillside and meandering creek as well as associated cost and time to address possible environmental concerns such as underground storage tanks. The total cost to make the proposed spot improvements to all three intersections is approximately $8,250,000.

VII. RECOMMENDATIONS

The No-Build Alternative does not address the Purpose and Need Statement for the project previously discussed in Section VI of this report. The Short-Term, Low-Cost Alternative, however, would address some safety concerns in a relatively quick approach to meet a portion of the Purpose and Need Statement. This alternative was considered favorable by the project team given the limited funds available and construction dollars not yet being allocated for this project in the approved highway plan. The project team did not consider the Long-Term, Complete Rebuild Alternative to warrant further consideration due to geographic limitations, possible environmental concerns and significant cost given the relatively low ADT.

If enough funding were to become available through future programming, the Long-Term, Intersection Spot Improvement Alternative was considered most favorable to address the Purpose and Need Statement. Further review in Phase I Design is recommended should construction dollars become available to determine which intersection improvement would be most beneficial to the public given the allocated dollars for such improvement.

VIII. CONTACTS

The following persons may be contacted if additional information is needed concerning the project or the study process:

Keith Damron, Director, Division of Planning.

Steve Ross, Transportation Engineer Branch Manager, Strategic Planning Activity Center, Division of Planning.

Jill Asher, Corridor Team Leader, Strategic Planning Activity Center, Division of Planning.

Tonya Higdon, Corridor Team, Strategic Planning Activity Center, Division of Planning.

The following address and phone number may be used:

Phone: (502) 564-7183
Address: Division of Planning
Kentucky Transportation Cabinet
Transportation Office Building
200 Mero Street, 5th Floor West
Frankfort, KY 40622