ALTERNATIVES PLANNING STUDY
FINAL REPORT

Harlan to Hazard
Harlan, Leslie, Perry, and Letcher Counties, Kentucky

Item No.: 11-137.00

Prepared for:

KENTUCKY TRANSPORTATION CABINET
DIVISION OF PLANNING

Prepared by

Thomas H. Springer
David E. Smith

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KYTC Item No. 11-137.00

Project Initiation

In 2003 the KYTC initiated this Alternatives Planning Study to examine highway corridor options to improve access between Harlan and Hazard. The initial phase of the planning study included a review of previous planning reports, the existing highway network, traffic volumes and crash rates; an environmental overview; an Environmental Justice report; and a review of geotechnical opportunities and constraints. The collection of existing information involved meetings with the local Highway Districts (10, 11, and 12), the Kentucky River and Cumberland Valley Area Development Districts, and local elected officials; coordination with over 80 government agencies; and a set of three public workshops held in August 2003.

Project Goals

During the analysis and meetings five Project Goals were identified:

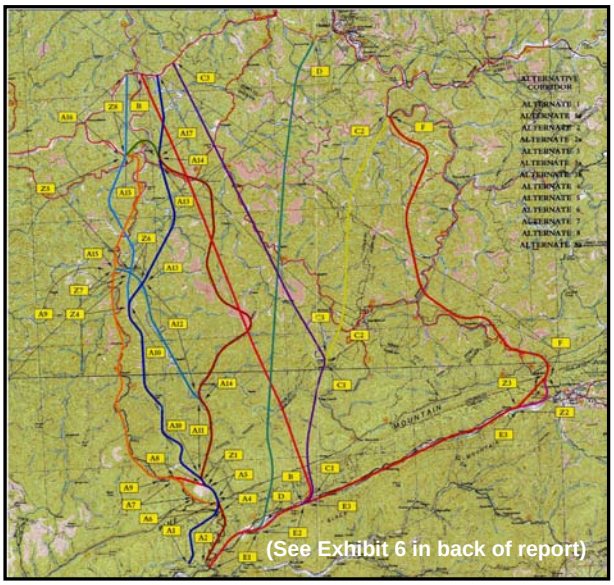
- Goal 1: Improve Safety
- Goal 2: Improve Travel Time
- Goal 3: Accommodate Traffic Demands
- Goal 4: Accommodate Large Trucks
- Goal 5: Accommodate Regional Tourism

And seven Planning Considerations were identified:

- PC 1: Meet current design standards
- PC 2: Be compatible with topography and geology
- PC 3: Be considerate of costs
- PC 4: Minimize impacts
- PC 5: Able to construct in usable sections
- PC 6: Serve existing communities
- PC 7: Be in concert with public opinion

Level-1 Analysis

At the August 2003 public workshops citizens were asked to identify potential corridors for a new road, or reconstruction of existing roads, that would meet the transportation objectives. A total of 13 corridors were identified (shown below). These 13 were studied in a Level-1 Corridor analysis that included traffic and travel time forecasts, a second round of coordination with 80-plus agencies, and a review of potential fatal flaws. The last step was a presentation of the 13 corridors, and the information about each, at a set of three public workshops held in December 2003.

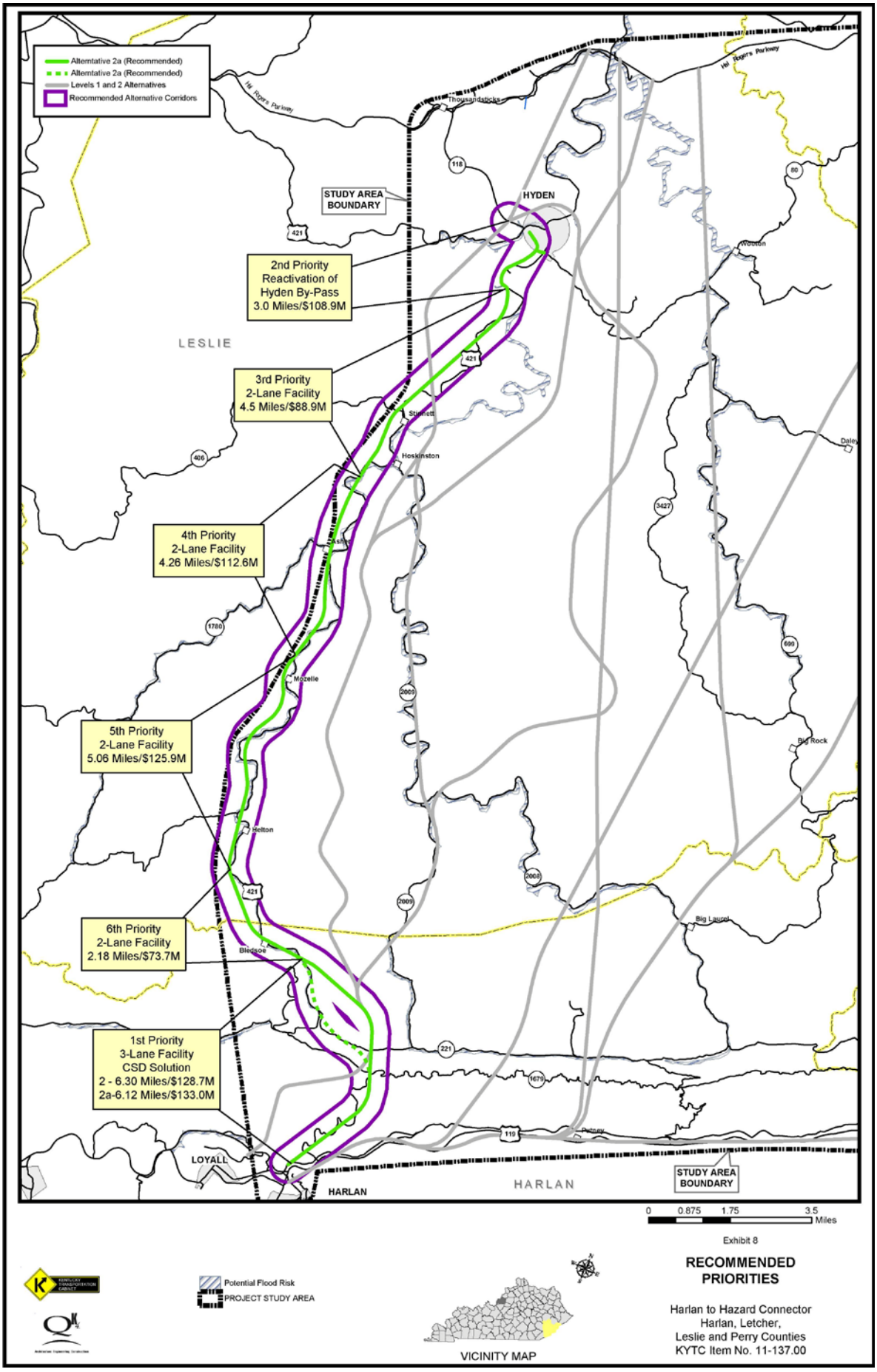


Level-2 Analysis

Five corridors were advanced to a Level-2 analysis. Each was generally along or parallel to US 421, linking Harlan and Hyden, and provided access to Hazard via the Hal Rogers Parkway. The Level-2 analysis included a detailed comparison of the corridors to the Project Goals and Planning Considerations, and concluded with a final recommended corridor.

Recommendations

The recommended corridor is the reconstruction of US 421 approximately 25 miles between Harlan and Hyden. Because reconstructing US 421 as one project is cost prohibitive, it is recommended that it be divided into six prioritized segments, beginning with the crossing of Pine Mountain in the south, followed by a western bypass of Hyden in the north, and then the remaining sections from north to south, as illustrated on the following page. For the Pine Mountain crossing, context sensitive design solutions are recommended to minimize costs and impacts while addressing the paramount safety issues.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1.0 INTRODUCTION

Citizens and local governments participating with the Kentucky Transportation Cabinet (KYTC) over many years have continually requested the need to study major improvements to the transportation network in Harlan, Leslie, Perry, and Letcher Counties. Specifically, the commute between the communities of Harlan and Hazard is notably substandard in terms of travel time, efficiency, convenience, and safety and has long been cited as a main reason for lack of economic development opportunities in the area. For east and west travel, it should be noted, there are adequate highway corridors — US 119 and the Hal Rogers Parkway. For north and south travel, on the other hand, the existing US and state roads are notably substandard. Understanding these long-identified needs, and the long-range goals and objectives of the local communities, in 2003 the KYTC initiated this Alternatives Planning Study to identify improvement options that will meet the objectives and can be considered for inclusion in future Six-Year Highway Plans.

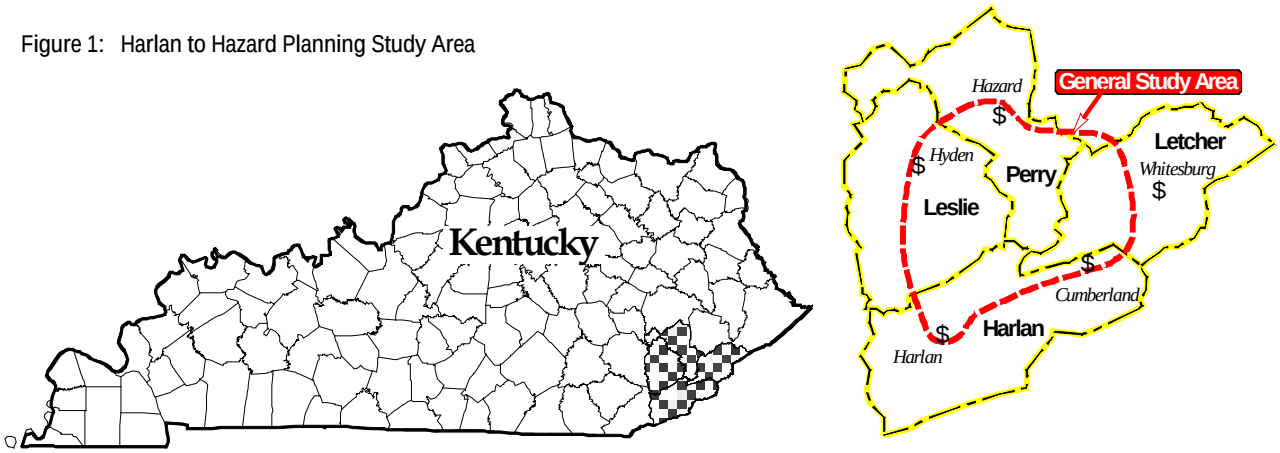
This study's intents are to 1) identify and collect critical information concerning the study area, 2) help the KYTC identify the need for transportation improvements, and 3) study potential roadway improvements that would meet those needs and better serve the area. The study will also assist the KYTC in addressing environmental considerations as defined in the National Environmental Policy Act (NEPA) during any future project development phases.

The study began with an assessment of existing conditions, which included a review of existing reports and plans; a series of meetings with the Project Team, Elected Officials, and the public; an analysis of existing and projected traffic volumes; and a crash history analysis of the area's roadways. An environmental overview/footprint was developed to highlight environmentally and culturally sensitive locations, and an Environmental Justice report was prepared to identify areas of low-income, minority, and elderly populations.

1.1 Study Area

The project study area is located in rural southeastern Kentucky, in the counties of Harlan, Leslie, Perry, and Letcher and concerns improving the connection between the cities of Harlan and Hazard. The study area, shown in Figure 1, is approximately 550 square miles and is generally bound by US 119 along the south; US 421 along the west; Hal Rogers Parkway, Hazard, and KY 15 along the north and KY 15, KY 7, and KY 160 along the east, between Hazard and Cumberland.

Figure 1: Harlan to Hazard Planning Study Area



1.2 Previous Studies

Past highway corridor or scoping studies that have been completed in the project study area include:

- 1994 US 421 Harlan to Hyden Scoping Report. This study investigated reconstructing US 421, as well as alternatives to the east or west of US 421. A public informational meeting was held June 16, 1994. The conclusion reached in the study was that the preferred alternative would generally follow the US 421 corridor, noting the primary advantage of using this corridor was the ability to construct short yet usable segments as funding becomes available. The first priority was noted to be the south face of Pine Mountain, between Harlan and the ridge. Public sentiment and traffic congestion in Hyden suggested that the Hyden bypass portion should be considered as the next most urgent need. The remainder of the US 421 route should then be constructed generally from north to south.

- 1995 KY 15 Letcher, Knott & Perry Counties Scoping Study. This project corridor followed KY 15 from south of Hazard, east into Knott County, and then south to Whitesburg, for a total of approximately 26 miles. Therefore, the southern portion was outside the Harlan to Hazard study area and the western portion traversed the study area boundary. The alternatives studied included reconstructing KY 15, and between two and three options on new alignment that are generally west and south of the existing road. The recommended alignment was a combination of using existing KY 15 from Hazard for approximately 8 miles (Line A), and traversing on new alignment for approximately 8 miles (Line B) and then reconstructing KY 15 for approximately 10 miles to Whitesburg (Line A). The recommended alignment was divided into 12 prioritized construction segments to be implemented as funds become available.

- 1996 KY 15 Jeff to Grapevine (Perry County) Scoping Study. This project corridor was approximately 15 miles long and included a study of short-term improvements to KY 15 and long term improvements that included a new road on new alignment. Regarding the long-term improvements, four corridors were studied — one bypassed Hazard to the west, two bypassed Hazard to the East, and one reconstructed KY 15. The reconstruction of KY 15 with a 40-foot depressed median was recommended as the long-term improvement project. However, the

short-term improvements were recommended to be the top priority because they could address safety and capacity problems in a relatively short period and for less cost.

- 2001 Hyden Bypass Intermediate Planning Study (Item 11-12.00). The study corridor began on US 421 south of Hyden and extended 2 miles north along new alignment to bypass Hyden to the west, and end where KY 118 (Hyden Spur) T-intersects with US 421. The project objective was to remove traffic from downtown Hyden. A public informational meeting was held October 24, 2000. The project was advanced to Phase I design as Item 11-12.00, but has not been advanced to final design due to funding constraints.

- 2001 US 119 (Letcher County) Safety Study. The study addressed safety issues for US 119 from the Harlan-Letcher County line east, then north over Pine Mountain to Whitesburg. The study noted significant accident rates and poor geometrics that led the state to forbid the use of the road to heavy trucks and school buses. Consequently, a project to reconstruct sections of the Pine Mountain crossing to allow opposing trucks to pass was let as a design-build project, most of which (as of this writing) has been constructed. The construction project did not add capacity or improve speed, and was therefore implemented as a short-term solution to allow trucks to use the route. The long-term solution has been identified as a tunnel through Pine Mountain.

2.0 EXISTING CONDITIONS

The current, most direct travel route between Harlan and Hazard is approximately 52 miles, takes approximately 1.5 hours and includes the Hal Rogers Parkway, KY 15, and US 421. US 421 has numerous steep grades and sharp curves, poor site distance, and little to no shoulders, especially as it crosses Pine Mountain, located just north of Harlan.

2.1 Geographic Characteristics

Terrain in eastern Kentucky is mountainous, with some sections of rolling hills. Daniel Boone National Forest encompasses the western half of the study area, and the Kentenia State Forest is located along the southern portion of the study area. Due to topographical features and the national forest location, building in these areas is restricted. Harlan (2000 population: 2,018) and Hazard (2000 population: 4,806) are the major population centers. Other population centers include Cumberland (2000 population: 2,611) and Hyden (2000 population: 204). The 2000 population of the study area counties was as follows: Harlan – 33,202 (down from 36,574 in 1990); Leslie – 12,401 (down from 13,642 in 1990); Letcher – 25,277 (down from 26,000 in 1990); and Perry – 29,390 (down from 30,282 in 1990). Collectively, the 2000 population is 100,270, down from 106,498 in 1990.

Residential/family housing is generally confined to the narrow valleys where the limited amounts of building sites are found. Small communities/towns are scattered throughout the study area, consisting of residential dwellings, small country stores, churches, and schools. The roadways serve the small towns, generally passing through the "downtown" area, with businesses along each side. Commercial development is typically small, single-family owned, grocery stores, gasoline service stations, and other service-type businesses. Coal mining is prevalent, along with several rock quarries, resulting in a high percentage of truck traffic on the highways.

2.2 Roadway Characteristics

Within the study area the following roads, which are shown on Exhibit 1, *Study Area Roads*, located in the back of this planning study, were analyzed for geometric characteristics and conditions, speed limits, classifications, pavement types, crashes, adequacy ratings, existing and projected traffic volumes, existing and projected Levels of Service (LOS), and other available information.

Most roadways generally traverse north to south, following meandering streams in narrow valleys. The area's terrain results in generally poor roadway geometrics (i.e., steep inclines, sharp curves). Table 1 presents a summary of the general characteristics of these roads.

Table 1: General Roadway Characteristics

Major Routes In Study Area Counties	Length In Study Area	Functional Classification	Number of Lanes	Average (Weighted) % Passing Sight Distance[1]	Average (Weighted) 2002 ADT
US 119 Harlan and Letcher	43.3	Rural Principal Arterial	2 (40.1 mi) 4 (3.2 mi)	41.3%	4,400
US 421 Harlan and Leslie	45.2	Rural Minor Arterial/Major Collector	2	9.6%	2,750
KY 160 Harlan and Letcher	25.4	Rural Minor Arterial/Major Collector	2	0%	1,600
KY 221 Harlan, Leslie, & Perry	20.3	Rural Major Collector	2	0%	920
KY 699 Leslie and Perry	28.5	Rural Major Collector	2	0.5%	1,750
KY 118 Leslie	3.5	Rural Minor Arterial	2	43.3%	4,500
KY 80 Leslie and Perry	17.6	Rural Major Collector	2	0%	3,800
Hal Rogers Parkway Leslie and Perry	8.1	Rural Principal Arterial	2 (7.2 mi) 4 (0.9 mi)	58.3%	6,250
KY 7 Letcher and Perry	27.7	Rural Principal Arterial/Major Collector	2	0%	3,250
KY 15 Letcher and Perry	26.0	Rural/Urban Principal Arterial	2 (15.9 mi) 3 (0.7 mi) 4 (9.4 mi)	42.9%	12,850
KY 463 Letcher and Perry	9.8	Rural Major Collector	2	0%	1,460

[1] Percent Passing Sight Distance is the percent of segment length (estimated to the nearest 10%) that has available passing sight distance (as measured from the driver's eye to the road surface) of at least 1,500 feet. This information is only available for Kentucky maintained roads classified as State Primary or State Secondary.

Appendix A, *Roadway Characteristics*, Tables A-1 and A-2, present an inventory of the roadways studied and their characteristics. The shaded boxes in those tables indicate roadway sections with less than 12-foot wide driving lanes and 2-foot wide shoulders. The roadways are typically narrow, 2-lane, undivided, and winding, with little to no shoulders. Some of the characteristics of these roads are as follows:

- US 421 has about 8 miles of roadway meeting current design standards; but the remaining 37 miles, approximately, have narrow driving lanes, narrow shoulders or poor percentages of passing sight distance.

- KY 699 is characterized by both narrow lane and shoulder widths, and/or virtually no percent passing sight distances.

- KY 7 is also characterized by both narrow lane and shoulder widths (percent passing sight distance is not available).

- KY 15 has about 9.5 miles of 4-lane roadway; all 26 miles within Perry and Letcher counties have 12-foot driving lanes, shoulder widths greater than 3-feet, and a 55-mph speed limit.

- The Hal Rogers Parkway meets current design standards for lane and shoulder widths, has a 55-mph speed limit, and most sections have a 50-percent or better passing sight distance.

2.3 Traffic and Level of Service

Detailed information on existing (2003) and future (2030) traffic volumes and Levels of Service can be found in Table A-2 of Appendix A. The existing LOS, and existing (2003) and future (2030) traffic volumes are illustrated on Exhibit 2, *Crash, Traffic and 2003 Level of Service*, located in the back of this planning document.[1] Both the future traffic and future LOS were based on the assumption that no major improvements would be made to the roadway network.

The following paragraphs provide summaries of traffic information and Level of Service analyses. Existing traffic volumes (year 2003) and truck percentages were obtained from the KYTC HIS database.

Methodology. Qk4, Inc. determined the Level of Service by using the methodologies in the *2000 Highway Capacity Manual*, published by the Transportation Research Board. Level of service (LOS) is a method commonly used to evaluate and describe roadway functions and is defined as a qualitative measure of operational conditions, and the motorists' perception of those conditions. The conditions are usually defined in terms such as speed, travel time, maneuverability, delay, and comfort and convenience. The letters "A" through "F" designate the six levels of service. LOS A represents the best operating conditions (*i.e.*, free flow conditions), while LOS F defines the worst (*i.e.*, severe congestion). According to the national standards, the lower levels of service (*i.e.*, D, E, and F) are unacceptable for safe and efficient operation. The lower levels generally involve unstable traffic flows, and drivers have little freedom to maneuver. Typically, LOS D is considered the minimum acceptable in urban areas, and LOS C in rural areas. Both the *Kentucky Transportation Cabinet Design Manual* and the American Association of State Highway and Transportation Official's (AASHTO) *A Policy on Geometric Design of Highways and Streets* state the desired LOS for a Principal Arterial highway in mountainous terrain is "C."

Findings. The LOS analysis performed on highways in the study area indicates the existing LOS ranges from A to E. Without any highway construction projects, the increasing traffic volume would eventually cause regularly occurring peak hour congestion and its associated delays in accessing businesses, along with increased driver frustration and the likelihood for higher accident rates.

[1] The 2003 existing traffic volumes were prepared as part of the traffic forecast for various build alternatives considered in this Alternatives Planning Study, and are therefore illustrated on Exhibit 2. The 2002 traffic volumes were obtained from the most recent KYTC HIS database as part of the collection of existing conditions on the study area roadways.

Major roadway segments with existing poor LOS (i.e., D, E or F) are as follow:

- US 421 through Hyden, from mile post (MP) 21.4 to 22.7 — LOS D
- US 421 over Pine Mountain, from mile post (MP) 17.9 to 24.9 — LOS D
- Hal Rogers Parkway, Perry County, from MP 51.0 to 58.2, the western urban boundary of Hazard — LOS D
- KY 15 in Letcher County, 8.8 of the 10.7 miles of KY 15 within Letcher County — LOS D/E
- KY 15 in Perry County, between Vicco and Jeff (MP 0.0 to 4.0 and 5.0 to 6.0) — LOS D; between MP 13.6 and 15.3 in Hazard — LOS F

Major roadway segments with future poor LOS (i.e., D, E or F), without any improvements to the road network (i.e., the No-Build option), are as follows — bulleted items with two circles indicated the stretch of road has an existing poor LOS as well as a future poor LOS:

- US 119, Harlan County, from MP 14.6 to 39.2 (expect for one 1.8 mile stretch) — LOS D/E;
- US 119, Letcher County, from MP 0.0 to 17.6 (expect for one 1.4 mile stretch) — LOS D
- ⦿ US 421, from south of Hyden and through Hyden, from mile post 15.2 to 22.7 — LOS D/E
- ⦿ US 421, over Pine Mountain, from mile post (MP) 17.9 to 24.9 — LOS D
- Hal Rogers Parkway, Leslie County, from MP 35.9 to 51.0 — LOS D/E
- ⦿ Hal Rogers Parkway, Perry County, from MP 51.0 to 59.1, through Hazard — LOS D/E
- ⦿ KY 15, Letcher County, 9.8 of the 10.7 miles of KY 15 that is within Letcher County — LOS E/F
- ⦿ KY 15, Perry County, between Vicco and Jeff (MP 0.0 to 4.0 and 5.0 to 6.0) — LOS E; between MP 13.4 and 15.3 in Hazard — LOS D/F

2.4 Crash Analysis

Crash data was used to identify roadway sections with abnormally high crash rates, thus indicating a possible need for safety improvements. Crash analysis was performed on the major sections of the roads in the study area. Reported crashes with valid mile points within the study area were researched for a five-year period from 1997 through 2001. Additional information was gathered from the KYTC HIS database.

Methodology. Crash analysis procedures involve assigning reported crashes to roadway locations by mile point. The crashes are normally classified by severity into one of three categories: fatal, injury, or property damage only (PDO). Then, the average crash rate for roadway sections of various lengths is determined. Generally, the analysis includes analyzing the entire roadway length under study, followed by analyzing successively smaller roadway sections, especially those

containing higher concentrations of crashes. Roadway sections are classified as either spots or segments depending on their length — sections less than 0.30 miles are classified as a spot location, and sections over 0.30 miles are classified as a segment. Roadway section crash rates were normalized for comparison by either hundred-million-vehicle-miles traveled (HMVM) for segments, or millions-of-vehicles (MV) for spots. Using the average crash rate, the critical crash rate was obtained from Kentucky Transportation Research Center's *Analysis of Traffic Crash Data in Kentucky (1996-2000)*. The critical crash rate is the maximum crash rate expected to randomly occur on a roadway section, given the statewide average crash rate for that functional road class, the average daily traffic (ADT) volume, and the roadway section length. The ratio of these two rates (*i.e.*, the actual annual crash rate to the critical crash rate) produces a critical rate factor (CRF), or a measure of crash frequency for each segment or spot location. If the roadway section's actual crash rate exceeds the critical rate (*i.e.*, the CRF is greater than 1.0), then that section is classified as a high crash location. In other words, if the CRF exceeds 1.0, then that highway section has more crashes occurring than is statistically probable in the absence of an unsafe condition or conditions. If the CRF is greater than 0.90, then that section is considered as a potentially high crash location.

Findings. Table A-3, *Crash Analysis,* in Appendix A lists the high crash locations for the study area, with the shaded cells indicating the high and potentially high crash locations. Exhibit 2 provides a graphic presentation of the crash locations. Table A-3 indicates numerous roadway sections in the study area that are experiencing crash rates higher than those for other similar Kentucky highway segments. In other words, these roadway sections have crash rates that are statistically higher than can be normally explained, and indicate other safety issues are involved in the high crash rates (*e.g.*, roadway geometrics, sight distances, traffic volumes, etc.). For the roadway length studied, 60 percent (or 164 miles of 271 miles studied) are located within high crash sections. And, nearly every road within the study area has at least one section with a high crash rating. Many of these same roadway sections, as well as some others, have recorded fatal accidents.

Following is a list of locations with notable "total" high accident rate factors:

- US 119 in eastern Letcher County — 2.7 miles
- US 421 in Harlan County on the south side of Pine Mountain — 7.1 miles, and in Leslie County in Hyden — 1.2 miles
- KY 80 throughout Perry County — 7.9 miles
- KY 15 throughout Letcher and Perry Counties — 3.8 miles and 13.1 miles, respectively

Sixty-two (62) fatal crashes occurred within the study area boundaries during the five-year period 1997–2001. However, it should be noted that the study area encompasses a large area with many road miles, and the fatalities are scattered throughout. Table A-3 indicates those highway locations with statistically high fatality rates (*i.e.*, the fatal CRF is 1.0 or greater). The following four highways contain six locations exhibiting high fatality rates:

- US 421, Leslie County — 12.7 miles, 5 fatalities
- KY 221, Perry County — 0.5 miles, 1 fatality

- KY 118, Leslie County — 3.5 miles, 4 fatalities
- KY 15, Letcher County — 3.8 miles, 9 fatalities (3 locations)

2.5 Bicycle and Pedestrian Facilities

There are two state designated bicycle routes in the study area — one is located in the northern portion of the study area in Hazard, using KY 28 and KY 80, and the other is US 119 between Harlan and Cumberland, which is the southern edge of the study area. Significant pedestrian facilities in the study area are located only within the urban areas of Hazard, Harlan, and Hyden.

2.6 Environmental Overview

Done early and continuously, the planning and designing of highways in compatibility with the human and natural environment results in projects that are the most beneficial for existing communities, ecosystems, the traveling public, and future generations. Therefore, the state and federal governments have passed a number of laws and adopted a number of policies to ensure an approach to highway planning and engineering that places the human and natural environment on equal footing with transportation needs. Key among these laws is the National Environmental Policy Act (NEPA). NEPA requires studying a comprehensive set of environmental factors for direct, indirect, and cumulative impacts. Key environmental elements include air quality, highway noise, water quality, wetlands, aquatic and terrestrial resources, endangered species, social and economic issues, land use, planning developments, local goals and objectives, communities, economics, archaeological and historical resources, hazardous materials, aesthetics, and construction impacts.

Methodology and Results. For the Environmental Overview, information was obtained through archival research, map reconnaissance, secondary sources, and correspondence with state and federal resource agencies. Limited amounts of fieldwork were conducted, consisting mainly of windshield surveys to confirm identified sites, and visually identify previously unknown areas of concern.

This preliminary overview summarizes the findings of various researches, and identifies study area issues likely to require consideration during the design and environmental documentation stages. The environmental findings were assembled and mapped in a Geographic Information Systems (GIS) file for the study area (see Exhibit 3, *Environmental Overview Footprint*).

2.6.1 Air Quality

Harlan, Leslie, Perry, and Letcher Counties are located within the Appalachian Region Interstate Air Quality Control Region. The study area is designated as an Attainment Area for all transportation-related pollutants, as per the 1990 Clean Air Act Amendments. The project is listed on pages 226 and 227, as Item No. 99-339 for various planning studies of the Kentucky Statewide Transportation Improvement Program (STIP), Fiscal Years 2003–2008, approved September 2002. Any road construction project would not be expected to adversely impact air quality in the region.

2.6.2 Aquatic and Terrestrial Resources and Impacts

2.6.2.1 Water Quality and Stream Impacts

Numerous jurisdictional streams cross the project study area that will require field investigations during any future preliminary design and environmental documentation stages for this project. In eastern Kentucky, streams significantly impacted must be evaluated using the US Army Corps of Engineers' *Eastern Kentucky Stream Assessment* protocol. The overview noted that Breeden's Creek and Watts Creek are Outstanding Resource Waters and located in the study corridor. The Middle Fork of the Kentucky River runs through much of the study area. Although previous mining and untreated domestic discharges have adversely affected the river for many years, sections of the stream above and near Hyden still provide good habitat for both native fishes and mussels.

The United States Department of the Interior recommends that all perennial stream crossings be bridged rather than culverted and that silt barriers be put in place when working adjacent to all streams to prevent runoff of sedimentation. Stream crossings should be accomplished during low flow periods and the stream banks reseeded with native vegetation beneficial to wildlife immediately following completion of work. And it is recommended that channelization or paralleling a steam for long sections should be avoided, if possible.

Should a construction alternative be advanced, the contractor will be required by the Kentucky Division of Water (KYDOW) to prepare a plan to control non-point source pollution and to effectively implement the erosion and control program. Application of the Kentucky Transportation Cabinet's *Standard Specifications for Road and Bridge Construction* and the Federal Highway Administration's *Best Management Practices for Erosion and Sediment Control* can be used to alleviate most sedimentation problems.

2.6.2.2 Terrestrial Resources

Forests within the study area are Appalachian mesophytic and hemlock-mixed forest types, which occur within the corridor along the Middle Fork of the Kentucky River. Along Trace Fork of the Cumberland River as well as the Middle Fork of the Kentucky River, Appalachian sub-xeric and pine-oak forest stands occur. Cumberland Mountains xeric Virginia pine woodland and xeric acidic forest communities are along Poor Fork and Trace Fork of the Cumberland River. These unique habitats often harbor state rare plant species.

State listed threatened and sensitive plant species occur within the study corridor. Areas of concentration of rare species are found on the slopes and faces of Pine Mountain and Black Mountain, and along forested slopes and within the floodplain of the Middle Fork of the Kentucky River.

2.6.2.3 Wetlands

Wetlands are not a predominant feature of the landscape in this part of southeastern Kentucky. The National Wetland Inventory (NWI) map reconnaissance revealed few wetlands except pond (PUB) and intermittently flooded forested bottomlands along streams (PF01A). Neither of these are jurisdiction wetlands in all cases. However, mined areas may have jurisdictional wetlands that are not indicated on NWI maps because of their small size and recent formation. Those wetlands

that provide sediment-trapping functions for previously or currently mined areas may provide important water quality functions.

More intensive field surveys will be required in subsequent project development phases to confirm and delineate NWI map wetlands, as well as identify any wetlands not appearing on the map.

2.6.2.4 Permits / Regulatory Issues

Any stream channelization, culverting, and/or filling of jurisdictional waters require notification and/or permitting with the Army Corps of Engineers (USACOE) and certification from the KYDOW. The USACOE, Louisville Regulatory District, Louisville, Kentucky is the agency responsible for regulating waters, waterways, and wetlands (i.e., "Waters of the United States").

A specific roadway design is needed before the type of USACOE permit required (i.e., Nationwide or Individual) can be determined, Depending on the future roadway design, the project may be permitted under *Nationwide Permit 14, Linear Transportation Crossings*, rather than an *Individual Permit (IP)*. The nationwide permit only authorizes activities with minimal adverse effects on the aquatic environment; the impact limit is usually 0.5 acres before requiring an IP. The permitee must notify the District Engineer in accordance with General Condition 13 if the work involves discharges of dredged or fill material into wetlands and/or results in the loss of greater than 1/19 acre of water of the United States.

The KYDOW will probably require a Kentucky Pollutant Discharge Elimination System (KPDES) General Stormwater Permit, a Floodplain Construction Permit if filling within a one-hundred-year floodplain, and a Water Quality Certification.

2.6.3 Special Designated Lands

Special designation lands within the study area include (see Exhibit 4, *Culturally Sensitive Areas and Historic Resources*, located in the back of this planning study):

- Daniel Boone National Forest (Redbird Ranger District, 145,834 acres, Leslie County)
- Kentenia State Forest (3,624 acres, Harlan County)
- Pine Mountain Settlement School (800 acres, Harlan County)
- Buckhorn Lake Wildlife Management Area (3,482 acres, Perry County)
- Redbird Wildlife Management Area (25,529 acres in Leslie and Clay counties, in Daniel Boone National Forest)
- Black Mountain Conservation Easement
- Pine Mountain Linear Park

State managed Nature Preserves within the study area include (see Exhibit 4):

- Blanton Forest State Nature Preserves (3,055 acres, Harlan County)
- Hi Lewis Pine Barrens Nature Preserve (146 acres, Harlan County)

- James E. Brickford State Nature Preserves (348 acres, Harlan County, with Pine Mountain Settlement School property)

The Nature Conservancy, Kentucky Chapter property in the study area includes (not mapped):

- Mary Breckenridge Memorial Nature Preserve (132 acres, Leslie County)
- Bad Branch Nature Preserve (2,343 acres, Letcher County)
- Pine Mountain-Mullins Preserve (215 acres, Letcher County)

Some of the above lands may be protected under Section 4(f) of the Department of Transportation Act. Section 4(f) states that projects using federal funding shall not use publicly owned parks, recreation areas, wildlife/waterfowl refuges, or land within an eligible historic site, unless there is no prudent and feasible alternative. Therefore, if such sites are used, Section 4(f) documentation would be necessary during the environmental documentation stage of the project.

2.6.4 Threatened and Endangered Species

Coordination with the Kentucky State Nature Preserves Commission (KSNPC) indicated the following three species are listed as threatened or endangered in the project study area: the backside dace (*Phoxinus cumberlandensis*), the gray bat (*Myotis grisescens*), and the Indiana bat (*Myotis sodalis).*

The backside dace was reported in Harlan and Letcher Counties. The backside dace is a fish typically inhabiting pools of small upland streams that are well shaded by dense riparian vegetation. It is located in the headwater streams of the Cumberland River, but does not occur in the Kentucky River drainage area. The backside dace is listed as threatened by KSNPC, as well as the U. S. Fish and Wildlife Service (USFWS).

The gray bat is a species that inhabits caves year round. Gray bats move from one cave to another seasonally—during the summer months males and young inhabit a different cave than maternal females. They may also be found roosting under bridges during the night where they may be taking a break from foraging. Gray bats forage for insects along river and stream corridors and may travel as far as 30 miles on any given night of foraging. This species has been reported in Harlan County and is listed as endangered by both KSNPC and USFWS.

The Indiana bat hibernates in caves, and sometimes old mine portals, but roosts in trees during the summer. Bachelors and maternal females form separate colonies, roosting under loose bark of dead or dying trees (sometimes in live shagbark hickory) or in cracks, crevices, or cavities of live or dead trees. It forages for insects along forest and stream corridors. The Indiana bat has been reported in Harlan and Letcher Counties and is listed as federally endangered by KSNPC and USFWS. There are caves in Newman limestone on Pine Mountain that provide winter hibernacula for the Indiana bat.

The USFWS recommends removing trees only between October 15 and March 31 to avoid impacting summer roosting Indiana bats. However, if any Indiana bat hibernacula are identified within the project area, or are known to occur within 10-miles of the study area, then the USFWS recommends removing trees only between November 15 and March 31 to avoid impacting the

species' "swarming" behavior. If the tree removal cannot be made during those times, then surveys must be conducted by a qualified biologist who holds the appropriate collection permits.

2.6.5 Culturally Sensitive Areas

The following areas were identified as Culturally Sensitive Areas during the planning process. It is interesting to note that several of these are also identified as Special Designated Lands for aquatic and terrestrial resources, listed in Section 2.6.3, above.

- Daniel Boone National Forest (Redbird Ranger District, 145,834 acres, Leslie County)
- Kentenia State Forest (3,624 acres, Harlan County)
- Pine Mountain Settlement School (800 acres, Harlan County)
- Kingdom Come State Park and Nature Preserve
- Pine Mountain Wildlife Management Area (800 acres, Harlan County)
- Blanton Forest State Nature Preserves (3,055 acres, Harlan County)
- Lilley Cornett Woods
- Pine Mountain Linear Park

In addition to the above areas, 24 schools, two hospitals, and numerous parks, churches, and cemeteries are culturally sensitive and should be avoided by any proposed highway construction project. These known resources, and the above bulleted items, are illustrated on Exhibit 4.

2.6.6 Cultural Historic Resources

Based on information on file at the Kentucky Heritage Council, which houses the State Historic Preservation Officer (SHPO), there are eight individual properties and three historic districts listed on the National Register (NR) within the study area in Harlan, Leslie, Letcher, and Perry Counties. Additionally, seven sites were determined to have NR potential. These 18 sites are illustrated on Exhibit 4 and briefly described below.

Use of, or direct or indirect impacts to, these sites should be avoided or minimized with the recommendation of any build alternative corridors, as per the requirements of Section 106 of the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act.

NR Listed Historic Districts:

- Site 1: Cumberland Central Business Historic District. Located in downtown Cumberland, the district includes 54 contributing structures and 29 non-contributing structures on West Main and Main Streets. The period of significance for the district is 1910 to 1930 related to the coal boom and consequent rapid development of the town of Cumberland. The district was placed on the NR in 1996.
- Site 3: Harlan Commercial District. The Harlan Commercial District includes the county courthouse and the nearby narrow streets that are lined with commercial buildings that date from 1910 to 1936. The district is eligible under criterion A (events) as the center of commerce, civic, and social activities during the early coal industry days in Harlan County, and C (architecture) as the buildings are a cohesive collection of

local examples of turn-of-the-century buildings, all completed over a 15 to 20 year period. The district was placed on the NR in 1986.

- Site 9: Pine Mountain Settlement School District. This district is also a listed National Historic Landmark (one of 30 in Kentucky). The school was established in 1913 as a rural settlement school — an outgrowth of the social reform movement of the late 19th and early 20th centuries to make school and medical assistance available to rural people. The school consists of a complex of 21 buildings completed between 1913 and 1938. The district was placed on the NR in 1978.

NR Listed Historic Sites:

- Site 6: Louisville and Nashville Railroad Station. This site was located along River Street in Harlan, and listed in the NR in 1985. Since that time it has been torn down and removed from the NR.
- Site 10: Frontier Nursing Service Complex. This site is located in Hyden and includes four buildings completed about 1928-1930. The site was placed on the NR in 1991.
- Site 11: Wooten Presbyterian Center. Established as a mission in 1917 by the United Presbyterian Church, the Wooten Presbyterian Center was under construction from 1919 to 1921. The Wooten Center is located in northeast Leslie County and provided medical service to local people from 1917 to 1950. In 1925, a hospital and high school were added.
- Site 12: John Shell Cabin. The John Shell Cabin is located on Shell Branch on the Laurel Fork of Greasy Creek in south central Leslie County. The cabin is a saddlebag log house with hand-hewn logs joined by half dovetail notching. Between the two log pens are a central stone chimney and central stairway.
- Site 13: Roderick McIntosh Farm, Dryhill. The McIntosh Farm has a boundary of 40 acres. The larger of the two pens of the saddlebag house was built between 1810 and 1830. The second, small pen is dated to 1830. The dwelling was restored in 1976 under Criterion A for the context "Exploration and Settlement of Eastern Kentucky, 1780-1830" and criterion C as a good example of log architecture. The site was placed on the NR in 1991.
- Site 14: Wendover Frontier Nursing Service. This site is located in north central Leslie County and is also a National Historic Landmark. Wendover is a two-and-one-half-story log building that overlooks the Middle Fork of the Kentucky River. It was completed in 1925 as a home for Mary Breckinridge (1881-1965), founder of the Frontier Nursing Service.
- Site 16: Kingdom Come Creek School. This school, built around 1910 was a frame, two-room school located on Kingdom Come Creek in southwest Letcher County. It is symbolic of the limited educational opportunities that were once offered to the people of the mountain region. It was reported the school was torn down in 1989.
- Site 17: C. B. Caudill Store, Blackey. The store was completed in 1933 as a general merchandise store selling dry goods and groceries. The store was in operation until

1997. In 2000, Appalshop Media and Arts Center acquired the property for use as a museum and history center.

NR Potential Sites:

- Site 2: Potential Historic Areas in Cumberland. In a 1998 study by the U.S. Army Corps of Engineers, 20 potential historic sites and/or districts were identified within Cumberland.
- Site 4: James Green House, Harlan. This house was built in 1936 and is potentially eligible under criteria B and C. It was built by a locally famed architect and engineer, Diamond Evert Perkins, and was owned by James Green, the local co-founder of the Green-Silvers Coal Company. Mr. Green was manager of the Harlan Refrigeration Company, Director of Harlan Bank, and owned a car dealership, and served as Harlan County Sheriff.
- Site 5: Green-Duffield Houses, Harlan. In 1902, local hotel owner Margaret and George Green commissioned local architect Fred Schraeder to design and build the house just outside Harlan. In 1909 they built another house approximately 50 feet from their original house for Mr. Duffield, who was the general manager of Kentenia, a large land holding company from Philadelphia. Kentenia began purchasing land in Harlan County in 1870 and made money through leasing land to coal mining and lumbering operations and had a great influence on the development of Harlan until 1980.
- Site 7: House, 403 Nallon Lane, Baxter. Both sites 7 and 8 are bungalow cottages made popular through mail order companies such as Sears, Montgomery Ward, and Aladdin. Coal companies purchased kit houses because they were easy, cheap, and quick to build for miners. Even if the dwellings are not mail-order houses, both dwellings' exemplify the early 20th century Craftsman bungalow style and form and retain architectural integrity.
- Site 8: House, KY 413, Baxter. (See site 7)
- Site 15: Jean Ritchie Log House. Although the house was built in 1970-71, it was determined to have exceptional significance under criterion B for its association with Jean Ritchie and her contributions to the field of old music. Ritchie, born in a nearby house in 1922, is know internationally as one of the superior mountain folk singers of the twentieth century who has produced more than 36 albums and books. Ritchie is also a scholar on the subject of mountain folk songs.
- Site 18: John D. Adams Building, Jeff. This house was determined eligible as part of a compliance project for the realignment of KY 7 from Jeff to Viper by the KYTC.

For each site a final determination of National Register eligibility will require additional research, photography, physical examination of the structures, a comparison to the standards established by similar properties on the NR in the area, and consultation with the SHPO.

2.6.7 Archaeological Resources

Two significant or potentially significant archaeology sites were identified in Letcher County (15Lr23 and 15 Lr24). The review also identified a number of sites whose National Register eligibility has not been assessed or is unknown. While it is presumed most of these sites are not significant, this cannot be determined without further study.

Using the existing data, it was determined that areas with slopes with a grade less than 11 percent, and those with a grade greater than 50 percent, have the highest potential to contain archaeological sites. While a variety of sites can be expected along the flat to gentle slopes, the steep slopes are most likely to contain rock shelters. More specific areas with a high potential to contain archaeological sites are cemeteries, areas around structures built before 1953, and level areas within 200 feet of roads that existed before 1953. Broad floodplains associated with larger streams and rivers have a high potential to contain sites both on the surface and deeply buried within the alluvium.

2.6.8 Land Use

The predominant land use within the proposed corridor is forest. Residential and commercial areas occur near the larger communities of Hazard, Hyden, and Harlan, and along US 421, US 119, and KY 15. Sites previously mined for coal, either by strip and auger, or mountaintop removal, are habitats for common plants and animals, especially in Perry, Leslie, and the northern section of Harlan and Letcher Counties.

2.6.9 Farmlands

According to the 1997 Census of Agriculture, the land acreage in farms in Perry, Leslie, Harlan, and Letcher counties ranges from 0.8 percent to 3.0 percent of the total land within the counties, whereas the state average is 52 percent. The relatively low percentage is attributed to the hilly and mountainous topography. Most of the farms in these counties are farmed by part-time farmers, and are family owned. Because of the low percentage of farmland within these counties, direct impacts to farmland should be minimized as much as possible.

2.6.10 Hazardous Materials Concerns

A hazardous materials environmental screening assessment was performed to identify constraints from recognized environmental conditions and hazardous materials that would inhibit the proposed project. The investigation included a site reconnaissance of the study area. Due to the extensive acreage and rural territory of the study area, there was not a government database search report prepared for this project. The entire study area was not included in the field reconnaissance due to the vast size and constraints from the mountainous terrain. The potential and recognized environmental conditions that could have an adverse impact to property in the project study area, including former and present underground storage tanks and hazardous materials, were included in the analysis. Following are the potential Hazardous Materials constraints that were identified in the corridor:

- Underground Storage Tanks USTs
- Aboveground Storage Tanks ASTs

- Asbestos-Containing Building Material (ACBM)
- Polychlorinated Biphenyls (PCB) (within pole-mounted electrical transformers)
- Waste Stockpiling / Illegal Dumping
- Superfund sites. Based on coordination with the Kentucky Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, Division of Waste Management, the following are the number of Superfund listed sites by County. These numbers are for the entire county, not just the county portion within the study area:
    - Leslie, 1 – The Hyden Dump, active
    - Letcher, 8 – 6 closed, 2 active; mostly petroleum spills
    - Perry, 14 – 7 closed, 7 active; a mix of hazardous substance and petroleum spills
    - Harlan, 46 – 34 closed, 12 active; a mix of hazardous substance and petroleum spills

The coordination also revealed 14 known orphan landfills within the study area: 8 in Harlan County, 2 in Leslie County, 3 in Perry County, and 1 on the Leslie/Perry county line.

2.6.11 Environmental Justice

The Cumberland Valley Area Development District (CVADD) and the Kentucky River ADD (KRADD) jointly prepared an environmental justice analysis for the project study area, which can be found in Appendix B, *Environmental Justice Report*.

For the study, data was collected by using the method outlined by the KYTC document, "Methodology for Assessing Potential Environmental Justice Concerns for KYTC Planning Studies." The primary sources of data were the US Census Bureau Census 2000, local leaders, and field observations. The information and results are intended to assist the Kentucky Transportation Cabinet in making informed and prudent transportation decisions in the project study area with regard to the requirements of Executive Order 12898[2], to ensure equal environmental protection to all groups potentially impacted by this project.

The analysis includes the percentages for minorities, low-income, and elderly populations at the following levels: Census Block Groups; Census Tracts; the Counties of Harlan, Leslie, Perry, and Letcher; Kentucky; and the Nation. Neither E. O. 12898 nor the U.S. Department of Transportation (DOT) Order 5610.2 requires consideration of the elderly population. However, this study includes statistics for persons age 62 and over in the project study area because the U.S. DOT encourages the consideration of elderly populations as part of the Environmental Justice process, and Title VI of the Civil Rights Act of 1964 encourages equal treatment of all persons.

Summary of Environmental Justice Findings

[2] Executive Order 12898 signed on February 11, 1994 states "…each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…"

Census Tract Block Groups with high concentrations of population of concern are illustrated on Exhibit 5, *Environmental Justice*, located in the back of this planning study.

Population by Race: No concentrations of minority populations were noted at this time.

Population by Poverty Level: Low-income is prevalent throughout the study area. Following is a synopsis of the percent of all people living below poverty level for the United States, Kentucky, and the counties in the study area. The percentage of people living below poverty in each of the study area counties is more than double that for the United States, and the average of the counties' percentage is almost double that of Kentucky's. In conclusion, it can be assumed each possible alternative corridor would have a high, yet relatively equal probability of impacting low-income individuals. Therefore, no disproportionate impacts are expected.

Area	Percentage Living Below Poverty Level	Range of Percentages Below Poverty Level, by Block Group in Study Area
United States	12.0%	N/A
Kentucky	15.3%	N/A
Harlan County	32.1%	17.5% – 39.1%
Perry County	28.6%	14.1% – 52.6%
Letcher County	26.7%	8.7% – 27.7%
Leslie County	32.2 %	23.4% – 48.8%

The following Block Groups (BG) were noted to have the highest concentration of low-income populations, with the percent living below poverty level noted:

- Perry County:
  - CT 9705, BG 2 – 37.6 percent (west of Hazard, borders Leslie County)
  - CT 9705, BG 3 – 52.6 percent (Hazard, west of KY 15)
  - CT 9705, BG 4 – 32.1 percent (southwest of Hazard)
  - CT 9707, BG 1 – 46.0 percent (south of Hazard, borders Knott County)
  - CT 9707, BG 2 – 51.4 percent (south of Viper)
- Leslie County:
  - CT 9801, BG 1 – 48.8 percent (north of Hal Rogers Parkway)
  - CT 9801, BG 4 – 31.1 percent (east of Hyden)
  - CT 9802, BG 1 – 45.3 percent (east of US 421, borders Harlan County)
  - CT 9802, BG 2 – 37.4 percent (west of US 421)
  - CT 9803, BG 1 – 39.1 percent (east of Hyden, borders Perry County)
- Harlan County:
  - CT 9702, BG 1 – 31.6 percent (eastern Harlan County, east of Cumberland)

- CT 9702, BG 2 – 39.1 percent (eastern Harlan County, east of Cumberland)
- CT 9702, BG 3 – 38.0 percent (eastern Harlan County, south of US 119)
- CT 9702, BG 5 – 32.4 percent (north of Pine Mountain, east-west along US 421)
- CT 9705, BG 2 – 30.9 percent (Harlan)
- CT 9707, BG 2 – 30.0 percent (west of study area)

It should be noted that a new road for these counties might have a positive impact on those Census Tracts with populations below poverty level.

Population by Age:

The following Block Groups were noted to have a high concentration of elderly:

- Perry County – CT 9705, BG 3 – 31.0 percent (Hazard, south of Hal Rogers Parkway, west of KY 15)
- Leslie County – CT 9801, BG 2 – 26.7 percent (north of Hal Rogers Parkway)
- Harlan County:
  - CT 9705, BG 2 – 27.1 percent (north of Pine Mountain, east-west along US 421)
  - CT 9705, BG 1 – 28.5 percent (north side of Pine Mountain, east of 9705:2)
  - CT 9707, BG 1 – 27.5 percent (south side of Pine Mountain, north of US 119)
  - CT 9702, BG 2 – 27.2 percent (eastern Harlan County, east of Cumberland)

Based on the data, discussions with local officials, and field observations there appear to be several small concentrations of low-income and elderly populations in Harlan, Perry, and Leslie counties. The elevated percentages in the populations below poverty level might be indicative of concentrations throughout the study area. However, based on the economic status of these rural depressed counties, these percentages are common for this area.

Following the identification of a recommended alternative or alternatives for this proposed roadway, a subsequent review of existing conditions through field visits and public involvement within the affected project area should be undertaken to determine if concentrations of minorities, low-income, or elderly exist in the recommended project corridor. And, if so, take proactive measures to insure these groups are not disproportionately affected by the project.

2.7 Geotechnical Setting and Analysis

2.7.1 Geological and Topographic Setting

Elevation in the project study area ranges from about 1,050 to 3,500 feet above mean sea level. The project area is within the Cumberland Plateau of the Appalachian Plateaus Province. This area consists of layered sedimentary formations (such as shale and high quality coal) primarily of Mississippian and Pennsylvanian age. Faulting in the region lead to the formation of the Cumberland Mountain Section. This area was entirely unglaciated.

This project is on the Cumberland Plateau situated in the Kentucky and Cumberland River drainage basins. Drainage south of Pine Mountain, and in Straight Creek, flows into the Cumberland River. Drainage north of Pine Mountain follows the Middle and North Fork of the

Kentucky River. Portions of the western study area are in the Middle Fork of the Kentucky River basin and the headwaters of Buckhorn Lake. The city of Hyden's water intake is above this area. Portions of the eastern study area are in the North Fork of the Kentucky River basin and above the Hazard water intake.

2.7.2 Geotechnical Analysis

The KYTC Division of Materials, Geotechnical Branch, prepared a detailed analysis of the geotechnical and mineral consideration in a memorandum dated August 18, 2003. Their complete report can be found in Appendix C, *Resource Agency Coordination,* under the first round of public comments. In summary, geotechnical issues are of primary importance in recommending an alternative corridor in terms of both construction feasibility and costs, especially regarding crossing Pine Mountain, which runs east to west in the project corridor. The conclusions from the report are as follows:

Pine Mountain Crossing. It is recommended examining an alternative that would construct a 350-foot deep by 3,000-foot long cut on a bearing of North 70 degrees West, and above an elevation of 2,200 feet (which would be perpendicular to the Strike of Pine Mountain). The cut should begin in the headwaters of Tom Jones Branch and go through the existing US 421 road gap. The associated 400-foot fill with the cut to the north of Pine Mountain could occur at the top of a drainage divide making it unnecessary to place structures beneath the fill. The geotechnical advantage of this location is it avoids side hill conditions in the unstable slopes on the north side of Pine Mountain. At this roadway bearing, the through cut does not have rock dipping into the roadway, so a deeper excavation can be constructed taking advantage of the durable sandstones and limestones that are present. The US 421 location is the only place where all these conditions come together in this study area.

North of Pine Mountain. Using an alternative Pine Mountain crossing, one that parallels the mountain or uses side hills, the required fill would be large and intersect the adjacent hill at an elevation of 2,200 feet. However, this area is adjacent to several generally trending north-south mountain top removal strip mines that could be used to construct significant lengths of roadway with minor fills and cuts. The advantage of using these strip mines is it would not require construction of large fills, cuts, or structures.

In subsequent coordination with the Division of Materials, dated October 23, 2003, the following conclusions were also presented for the Alternatives Planning Study at hand:

From a geotechnical perspective, the existing US 421 location is the most practical location to cross Pine Mountain. The US 421 crossing near Harlan effectively traverses Pine Mountain with acceptable grades (i.e., less than seven percent), a cut depth of approximately 400 feet, and a required corresponding embankment of approximately 400 feet. According to a 1998 study, because this crossing occurs at the drainage divide, no bridges or other structures are needed in the fill and the adjacent embankment offers a place to put the almost 12.5 million cubic yards of excavated materials. Based on a 1992 geotechnical evaluation for US 119 crossing Pine Mountain, other potential Pine Mountain crossing locations considered east of US 421 (identified in this Planning Study) would prove difficult. Excavated quantities could total some 42.5 million cubic

yards, and only some 13 million cubic yards could be used in the adjacent fill areas. This would leave considerable amounts of materials to be disposed.

In addition to the comments from the KYTC Division of Materials, Geotechnical Branch, the Kentucky State Nature Preserves Commission (KSNPC) also provided comments specific to the crossing and approach to Pine Mountain. In a meeting with KYTC and KSNPC officials on December 10, 2003 (see meeting notes in Appendix C) the KSNPC noted a desire that any new highway construction use the existing US 421 crossing of Pine Mountain rather than a new crossing. Additionally, the KSNPC noted that the environmental impacts, especially to wildlife, of deep perpendicular cuts across Pine Mountain would be a major concern; rather, the KSNPC would desire switchbacks to lesson the depth of cuts. KSNPC seeks a more context sensitive solution to improving the Pine Mountain Crossing.

3.0 CABINET, AGENCY, AND PUBLIC INPUT

Cabinet, agency and public input has been an important component of this Alternatives Planning Study. At the onset of the study a Public Involvement Plan was prepared that has been initiated through the planning process.

- Two KYTC Project Team Meetings were held.
- Meetings with elected officials were held at two different locations — Harlan and Hazard.
- Two sets of public workshop meetings were held at three different locations — Hazard, Hyden, and Harlan — one in August 2003 and one in December 2003.
- Over 80 public resource agencies were contacted at two times during the study. The first time was to obtain information about the study area (see Section 3.4.1, below); the second was to receive comments on the preliminary alternative corridors (see Section 3.4.2, below).
- A project web site was developed at http://transportation.ky.gov/planning/pl_projects.shtm, under the link to District-11.

3.1 Project Team Meetings

The KYTC Project Team held two project team meetings (PTM) during the course of the study:

1st PTM — **Project Kick-off Meeting** — June 10, 2003 at District-10 in Jackson. The objective of this meeting was to introduce the project, the consultant team, the study area, and discuss the scope of work, public involvement tasks, project schedule, and existing conditions. The meeting also included a brainstorming session for cabinet officials to identify issues, problems, and needs that should be considered and addressed during the Alternatives Planning Study. The minutes from the meeting can be found in Appendix D, *Project Team and Elected Officials Meeting Minutes*, a summary of the results of the brainstorming session is as follows:

- Issues:
  - Safety of Area's Highways
  - Connectivity of Road Network
  - Lack of Economic Development Opportunities
- Major Considerations:
  - Construction Costs
  - Environmental Issues
  - Topography/Geology
  - Other Highway Projects
  - Public Opinion

2nd PTM — **Project Status Meeting** — November 18, 2003 at District-10 in Jackson. The items discussed at the second PTM were: the June 2003 Elected Officials Meetings, the August 2003 Public Workshops, the Draft Project Goals and Planning Considerations, the Environmental and Geotechnical Overviews, and the broad range of Preliminary Alternatives. Details of the discussion on these items can be found in the meeting minutes in Appendix D).

3.2 Elected Officials Meetings

Two meetings with local elected and agency officials were held during the course of the study. Both were on June 26, 2003, one in Hazard, and one in Harlan (see the meeting minutes in Appendix D). The objectives of the meetings were to introduce the project, the consultant team, the study area, the scope of work, the public involvement tasks, project schedule, and to obtain and discuss concerns of the elected and agency officials. The summaries of the issues and concerns identified during the respective meetings are as follows:

June 26, 2003, **Hazard**. Fifteen individuals attended the meeting in Hazard.

- Issues:
  - Safety of Area's Highways
  - Opportunities to improve economic development (including tourism)
  - Connectivity of Road Network

- Major Considerations:
  - Impacts Caused by Bypassing Existing Communities
  - Improving Access to Hal Rogers Parkway and future I-66
  - Construction Costs

June 26, 2003, **Harlan**. Eleven individuals attended the meeting in Harlan. The concerns and issues discussed at the meeting in Harlan are as follows:

- US 421 Corridor. Reconstructing this corridor is the local leaders top transportation priority.
- I-66. A decision on the location of the highway in the study area has not yet been studied or determined.
- Linear Park. A proposed linear park along Pine Mountain is in a preliminary stage, and will be researched during agency coordination.
- Industrial Park. Harlan County is constructing a 500-acre industrial park, and considering an additional 250-acre airpark.
- Tourism and Safety. Both are regional issues that would be improved with an upgraded road network.

3.3 Public Workshop Meetings

Two sets of Public Workshop Meetings were held during the course of this study — one during August 2003 and one during December 2003. For each set, three meetings were held — one in Hazard, one in Hyden, and one in Harlan. It can be summarized that nearly everyone believes "*something*" needs to be done; however, opinions differ with respect to how and where any new connection should be implemented.

1st Public Workshop Meetings — **Project Introduction** — August 2003

The objectives of the first set of meetings were to 1) inform the public about the study; 2) obtain feedback from the public on the need for the improvement and issues that should be considered; and 3) receive input on alternative corridors that should be studied. Each meeting was held from 5:00 to 7:00 pm and included a formal presentation followed by an "open house" meeting format.

Meeting	Location	Date	Number of Citizens	Number of Staff	Number of Written Comments Received
1-1	Hazard	August 12, 2003	16	16	5
1-2	Hyden	August 14, 2003	39	12	5
1-3	Harlan	August 26, 2003	83	11	33

The comment form had eight project-related questions. Below is a summary of the key themes identified from the answers. A more thorough summary of the comments received can be found in Appendix E, *Public Meeting Summaries*.

- Safety was the number one issue mentioned by citizens (26 responses).
- Safety and serving the highest volumes of traffic were the top objectives mentioned by citizens.
- Nearly all of the responses stated that any improvement should be along or close to existing US 421 connecting Harlan to Hyden (25 responses). Only two responses mentioned a road from Harlan connecting to Viper or Jeff.
- Areas that were mentioned to avoid include schools, parks, churches, and Blanton Forest. Also a few citizens stated that relocations and impacts to existing businesses should be minimized.
- Most citizens were interested in safety of the existing road, and getting a project done quickly. It was frequently noted that an improved highway would help economic development and tourism.

2nd Public Workshop Meetings — **Broad-Range of Alternative Corridors** — December 2003

The objectives of the second set of meetings were to 1) present the 13 Level-1, broad-range set of alternative corridors; and 2) obtain feedback on which alternative corridors should be removed from considerations and which should be advanced for further consideration. Each meeting was held from 4:00 to 6:00 pm and included both a formal presentation and an "open house" format that followed.

Meeting	Location	Date	Number of Citizens	Number of Staff	Number of Written Comments Received
2-1	Harlan	December 11, 2003	24	10	20
2-2	Hazard	December 15, 2003	11	12	8
2-3	Hyden	December 16, 2003	91	13	91

The comment form asked which alternative corridors should be advanced and which should be not recommended for further consideration, as well as for additional information regarding the 13 alternatives, and other issues and concerns regarding this study. Below is a summary of the key themes identified from the answers. A more thorough summary of the comments received can be found in Appendix E.

- The top alternative corridors identified for further study were those located either along or most near US 421 (i.e., Alternatives 1, 1a, 2, and 2a, described in Section 5.0, below). Combined, these alternative corridors received 84 percent of the comments submitted for the advancement of a build alternative.

- The top alternative corridors that were identified not to be advanced for further study were those located either along US 119 or cross-country between Harlan and Hazard (i.e., Alternatives 6, 7, 8, and 8a, described in Section 5.0, below). Combined, these alternative corridors received 81 percent of the comments submitted for the "not recommended for further consideration" of a build alternative.

It should be noted a petition was submitted at the Hyden public meeting containing 1,035 signatures. The petition stated: "…any upgrades and/or work on US 421 will improve the existing route and keep it in the general area of its current location."

3.4 Resource Agency Coordination

Appropriate state and federal resource agencies were identified and contacted on two separate occasions for their concerns associated with the study area. For the first mailing, the Division of Planning sent letters to 87 agencies and organizations requesting their input and comments on this Alternatives Planning Study in order to obtain their concerns early in the project development process (see Section 3.4.1, below). The second mailing went to the same agencies and organizations requesting their input and comments on the broad range of alternative corridors (see Section 3.4.2, below).

The agencies responding to the request for input and comments are listed below, along with a brief summary of their comments. Their complete response is included in Appendix C.

3.4.1 First Round of Agency Comments — re: Project Study Area

FEDERAL AGENCIES

U.S. Department of Fish and Wildlife Service: September 3, 2003 letter expressed concerns of degraded water quality and adverse aquatic environment impacts due to erosion, sedimentation, and turbidity, and requested a commitment to implement KYTC's Best Management Practice policies. Three federally listed endangered species may occur in the project area: Indiana bat, gray bat, and backside dace. It is recommended a qualified biologist survey the area for the backside dace and gray bat, and the Cabinet either commit to surveying for the Indiana bat, or limiting the tree removal to between November 15 and March 31 to avoid impacts to the Indian bat "swarming" behavior.

U.S. Center For Disease Control (responding for the Department of Health and Human Services (DHHS): September 3, 2003 letter cited no project specific concerns but requested that during the NEPA process a broad range of potential public health concerns be addressed.

U.S. Department of Agriculture, Natural Resources Conservation Service: August 6, 2003 letter noted a concern with potential impacts that the proposed highway project might have upon prime farmland soils and farmlands of statewide importance and requested that further coordination be conducted as the project develops into the preliminary design phase.

Appalachian Regional Commission: August 8, 2003 letter noted that US 119 is part of the Appalachian Development Highway System (ADHS) that was funded to promote economic and social development in the Appalachian Region, and requested that during the study process, the KYTC emphasize economic and social development in the region.

STATE AGENCIES

Kentucky Department of Agriculture: September 3, 2003 letter stated a general concern for impacting the limited agricultural land in the area, as well as impacts on forestland and forest production.

Kentucky Geological Survey, University of Kentucky: August 26, 2003 letter summarized geologic characteristics and concerns for the study area. Areas of concern include landslide hazards, especially along the southern flank of Pine Mountain. North of Pine Mountain, pre- or post-landslide hazards are likely in the large marine shale zones.

Kentucky Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, Division of Waste Management: August 20, 2003 correspondence provided information on the known landfills and underground storage tanks, and requested that during construction the KYTC use Pulverized Glass Aggregate (PGA) as much as possible.

Kentucky Natural Resources and Environmental Protection Cabinet, Department for Surface Mining Reclamation and Enforcement: September 2, 2003 letter provided

known mining locations, and noted that the agency, at this time, has not identified any specific issues or concerns regarding the proposed project.

Kentucky Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, Division of Air Quality: July 23, 2003 letter noted various regulations controlling fugitive emissions, open burning and conformity with the Clean Air Act, as amended, but no specific issues or concerns regarding the proposed project.

Kentucky Natural Resources and Environmental Protection Cabinet, State Nature Preserves Commission: July 21, 2003 correspondence noted the following concerns: numerous KSNPC-listed species and unique natural areas, the potential size of cut and quantity of fill material associated with constructing a new crossing of Pine Mountain, presence of the federally-endangered Indiana bat, presence of Appalachian rosinwee, and forest fragmentation.

On December 10, 2003, subsequent to the coordination, a meeting was held between the KYTC Division of Planning, KYTC Division of Environmental Analysis, and the KSNPC regarding the corridors proposed in and near the Blanton Forest State Nature Preserve located on two separate land tracks north and northeast of Harlan. The larger tract is located northwest of Harlan, and the smaller straddles US 421 north of Harlan. It was agreed that any corridor using land within the larger tract (to the northwest) should be avoided if at all possible, and any corridor using land in the smaller tract could be advanced, but measures should be made to avoid, minimize, or mitigate any impacts. It was agreed that future joint planning between the KYTC and KSNPC should be implemented to avoid any Section 4(f) involvement and identify an option considerate of both agencies' objectives.

Kentucky Department of Fish and Wildlife Service: July 22, 2003 letter noted the federally threatened backside dace and the federally-endangered Indiana bat were known to occur in Letcher, Harlan, and Perry Counties. The Service requested further coordination be made with them and the US Fish and Wildlife Service regarding threatened and endangered species as well as other environmental impacts. Additionally, best management practices for minimizing impacts to natural resources were noted, including stream crossings, erosion control, and replanting disturbed areas with native species.

Kentucky Department of Military Affairs, Boone National Guard Center: July 21, 2003 correspondence noted that any major improvements to the roadway network would improve safety and travel time for workers, troops, and the general public that use the Boone National Guard Center.

Kentucky Department of Parks: July 21, 2003 letter noted that the Department has no comments on the proposed project.

Kentucky Cabinet for Workforce Development: July 21, 2003 letter noted that a good transportation network is key to the goals of the agency — industrial growth and economic development through the Commonwealth. Generally, a new major north-south highway

would allow numerous opportunities to improve the quality of life in the region. Specifically, the Cabinet has four Technical School facilities in the area — one in Leslie, Letcher, Harlan, and Perry counties that would benefit from an improved roadway.

KYTC, Division of Multimodal Programs: September 12, 2003 memorandum encouraged the consideration of bicycle and pedestrian issues throughout the planning process. Specifically, shoulder bikeways, outside of the rumble strips, and scenic overlooks, if possible, are features that would enhance bicycle tourist activity in the region.

KYTC, Division of Environmental Analysis: August 15, 2003 correspondence noted that during future design and environmental investigations, historic and UST/Hazmat resources will be top concerns and baseline studies for each will be required. It was also stated that channel changes should be avoided, as stream mitigation sites are difficult to find in this area of the state.

KYTC, Division of Materials, Geotechnical Branch: August 8 and October 23, 2003 letters stated geotechnical issues are of primary importance in recommending an alternative corridor in terms of both feasible construction and costs, and the most feasible and desirable location to cross Pine Mountain was within the existing US 421 corridor, north of Harlan. The letters also include a significant amount of information on the geological and mineral elements in the study area that should be taken into consideration during the engineering phases of the project.

KYTC, Permits Branch: July 18, 2003 letter requested the KYTC consider constructing the new road as a partially controlled access facility, with access control fencing, and place it on the National Highway System in order to regulate the placement of outdoor advertising devices.

LOCAL AGENCIES

Harlan County Public Schools, Transportation Department: August 26, 2003 letter stressed significant hazards for school bus travel on US 421 up Pine Mountain toward Leslie County. It stated the numerous curves create poor sight distance for oncoming traffic when the busses are stopped, and during the winter months, US 421 is the most dangerous school bus route and is the first road assessed when determining whether or not to hold classes.

Harlan County Public Schools, Superintendent: August 26, 2003 letter cited the numerous curves and heavy truck traffic, coupled with the frequent snowy conditions through the winter, and cited it as the top safety concern for travel to and from the schools. It stated that in the recent past the Board of Education adopted a resolution calling for improvements to US 421, which was submitted to former-Governor Patton, the House, and the Senate. And, the letter noted that many of the extracurricular activities, including athletic and academic competitions, cultural and educational enrichment activities, and many others, required travel on US 421 over Pine Mountain, and have often been canceled due to inclement weather.

Hazard, Kentucky, Mayor: July 17, 2003 letter noted the current drive between Harlan and Hazard is long, dangerous, and inconvenient. Further, the two communities are closely intertwined, especially regarding health care services and industrial employment. It noted the Perry, Harlan, Leslie, and Breathitt Industrial Authority operates the Coalfields Industrial Park in Perry County. The industrial park employs hundreds of people, but none are from Harlan County because of the poor travel conditions between the two areas.

3.4.2 Second Round of Agency Comments — re: Level-1 Alternative Corridors

The second mailing was to obtain agency comments on the broad-range (i.e., Level-1) alternative corridors. Several corridors are mentioned by name. For a description of those alternatives, see Section 5.0, Development and Analysis of Alternatives, below.

FEDERAL AGENCIES

U.S. Department of Fish and Wildlife Service: February 2, 2004 letter expressed concerns about federally threatened and endangered species; degraded water quality; and adverse aquatic environmental impacts due to erosion, sedimentation, and turbidity. It was requested the KYTC implement Best Management Practice policies, and several specific activities were itemized.

U.S. Department of the Army, Nashville District, Corps of Engineers: January 7, 2004 letter cited concern over discharge into waters of the United States and the requisite permits (either an Individual 404 Permit, or a Nationwide Permit).

U.S. Department of Agriculture, Natural Resources Conservation Service: In a letter received January 21, 2004, the NRCS noted a concern with potential impacts the proposed highway project might have upon prime farmland, wetlands, or any type of cultural resource.

Appalachian Regional Commission: December 19, 2003 letter noted the proposed project could connect two Appalachian Development Highway Systems (ADHS) — Corridor F (US 119) and Corridor I (KY 15). The ARC noted that Alternative 7 would provide a direct connection between the two cities; however, all alternatives should be evaluated for the beneficial economic and social impacts in the region.

STATE AGENCIES

Kentucky Department of Agriculture: December 15, 2003 letter stated a general concern for impacting the limited agricultural land in the area, as such impacts would affect the large economy of the region.

Kentucky Geological Survey, University of Kentucky: December 24, 2003 letter notes the same geologic concerns mentioned in the August 26, 2003 letter. Specifically, a key area of concern includes potential landslide hazards along the southern flank of Pine Mountain. North of Pine Mountain, pre- or post-landslide hazards are likely in the large marine shale zones.

Kentucky Natural Resources and Environmental Protection Cabinet, Department for Natural Resources, Division of Forestry: January 20, 2004 letter noted that impacts to the unique natural areas found on Pine Mountain and within Kentenia State Forest should be avoided. Specifically, Alternatives 4, 5, 6, and 7 would impact the State Forest and would therefore be less desirable than other options.

Kentucky Environmental and Public Protection Cabinet, Department for Surface Mining Reclamation and Enforcement: January 12, 2004 letter noted two active rock quarries in the area — one along US 421 in Harlan County and one along KY 160 in Letcher County. Both generate a substantial amount of heavy truck traffic.

Kentucky Environmental and Public Protection Cabinet, Department for Surface Mining Reclamation and Enforcement: January 21, 2004 memorandum provided a map of some 130 surface mine permits. The sites range from active mining to reclaimed.

Kentucky Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection, Division of Air Quality: December 22, 2003 letter mentioned the same air quality issues as the July 23, 2003 letter (see Section 3.4.1, above), which noted various regulations controlling fugitive emissions, open burning and conformity with the Clean Air Act, as amended, but noted no specific issues or concerns regarding the proposed project.

Kentucky State Police, Post 10, Harlan (Bell, Harlan, and Knox Counties): December 23, 2003 correspondence noted no concerns with the planning process or alternative corridors.

Kentucky State Police Post 13, Hazard (Breathitt, Knott, Leslie, Letcher, and Perry Counties): January 28, 2004 letter simply stated corridors 7 and 1 seemed best.

Kentucky Natural Resources and Environmental Protection Cabinet, State Nature Preserves Commission: January 23, 2004 correspondence noted the following concerns: numerous KSNPC-listed species, a crossing (or tunneling) of Pine Mountain that minimized impacts to the natural environment, minimizing impacts to the Blanton Forest State Nature Preserve, and the use of the US 421 corridor as much as possible. Additionally, it was urged that the need for the project be well justified.

Kentucky Department of Fish and Wildlife Service: December 19, 2003 letter noted concern over federally-threatened and endangered species; and requested best management practices for minimizing impacts to natural resources be used.

Kentucky Secretary for Health Services: December 16, 2003 letter noted that the proposed highway project would not impact the operation of the Cabinet for Health Services.

Kentucky Commerce Cabinet, Department of Travel: December 16, 2003 memorandum noted that Alternative 8 or 8a appear to be the best from a tourism development perspective. It was also noted that the use of the US 421 corridor (i.e., Alternatives 1 through 4) would be more advantageous to tourism efforts than corridors that traversed

cross-country (Alternatives 5 through 7). Alternatives 8 and 8a, or Alternatives 1 through 4, would create a loop between the Corbin/London area east to Hazard, then south to Cumberland, then west to Harlan, and continuing west to Middlesboro and Cumberland Gap, and then back to I-75.

Kentucky Department of Parks: In a letter received December 22, 2003, the Department of Parks expressed an overall concern to preserve the existing mountainous view sheds and beauty and therefore favors using the US 421 corridor over one on new alignment.

KYTC, Division of Aeronautics: December 17, 2003 correspondence noted the only possible adverse effects of Alternative 1 and 1a would be the Harlan Tucker-Guthrie Airport. (Note: this airport is located west of the project corridor and would not be impacted by any of the proposed corridor options.)

LOCAL AGENCIES

Hazard, Kentucky, Mayor: December 12, 2003 letter expressed interest in seeing the highway project complete in a timely manner and ensured support toward whichever alternative was ultimately selected.

Appalachian Regional Healthcare, Hazard: February 3, 2004 letter noted that Alternative 7 would best meet their needs to travel between the two cities of Hazard and Harlan.

Harlan County Chamber of Commerce: March 31, 2004 resolution endorses Alternative routes 1, 1a, 2, or 2a for a variety of reasons.

Cumberland, Kentucky, Mayor: January 18, 2004 letter noted support for Alternative Corridor 8 for a variety of reasons.

4.0 PROJECT GOALS AND PLANNING CONSIDERATIONS

The project goals, objectives, and planning considerations were developed through a series of meetings with local governmental and elected officials, and public meetings. They are also based on existing available studies and plans for the area, and a review of the information on the existing conditions of the highway. The goals and objectives for the future road network in the study area are as follows:

- Goal 1: Improve safety
  - Objective: Provide a roadway network that meets current safety design standards

    Tactics:
    - Provide adequate travel lane and shoulder widths
    - Provide adequate sight distances at all intersections
    - Provide acceptable horizontal and vertical alignments
  - Objective: Provide a roadway that either bypasses or improves existing hazardous roadway conditions

  Note: Goal 1, and the subsequent objectives, can only be fully addressed during the future stages of the project development — namely, the preliminary and final engineering preconstruction phases, rather than this planning phase. It has remained as the first goal because of the significance of the safety issue.

- Goal 2: Improve travel time between major population centers
  - Objective: Make access to employment centers, attractions, and public services (i.e., educational facilities, hospitals, etc.) more economical

    Tactic:
    - Improve the transportation network linkages and connections that will provide more route options for travelers

- Goal 3: Accommodate existing and future traffic demands
  - Objective: Reduce congestion, delay and improve the Levels of Service

- Goal 4: Provide a roadway network that will accommodate large truck traffic
  - Objective: Support existing and future industrial developments. Improving travel time and safety for large trucks will increase the locational advantage of the study area regarding the attraction of new industry developments

- Goal 5: Provide a roadway network that accommodates regional tourist traffic
  - Objective: Increase the amount of tourists and visitors to the numerous attractions in the area

Also identified were the major planning considerations to be addressed during this Alternatives Planning Study while identifying new road alternative options to meet the above goals and objectives, as follows:

1. Meets current design standards, including travel lane and shoulder widths, sight distances at all intersection, and horizontal and vertical alignments
2. Compatible with the existing topography and geology of the area
3. Considerate of costs
4. Minimize impacts to the human and natural environment
5. Can be constructed in usable and independent sections

   This planning consideration is important because it will not be economical to build any of the entire corridors as one project. Therefore, the more sections a project can be divided into, the more likely the transportation needs can be met. However, the National Environmental Policy Act (NEPA) could require an environmental document for a larger corridor than just construction sections. Specifically, NEPA requires projects to have independent utility and logical termini, and discourages the segmentation of a corridor into small non-independent sections — where individually each may have insignificant impacts, but collectively they may have significant impacts.
6. Serve, rather than bypass, existing communities
7. In concert with public opinion

5.0 DEVELOPMENT AND ANALYSIS OF ALTERNATIVE CORRIDORS

The development of alternative corridors began with a review of planning studies previously conducted in the area (see Section 1.2, page 6). These previous studies had identified corridor options, which totaled three, that were illustrated on base mapping at the first round of public workshops (which included three different meetings held in August 2003.) Although the maps included the corridors from the previous planning studies, they were essentially "blank maps," whereas participants were provided markers and encouraged to draw other corridors options. At the conclusion of the first set of public workshops, 13 different corridors had been identified. Following the workshops each corridor was delineated by the planning and engineering teams in computer mapping software (i.e. ArcGIS and Microstation) and studied to the same degree during the Level-1 analysis. At the conclusion of the Level-1 analysis, a short-list of alternative corridors was advanced to the Level-2 analysis, which concluded with a recommended corridor and implementation strategies.

5.1 Level-1 Alternative Corridors

The thirteen build alternative corridors identified in the previous planning studies and this study, and the No-Build alternative, were considered during the Level-1 analysis. For each of these corridors, traffic and travel time forecast and construction cost estimates were prepared, which have been summarized in the following descriptions. Each alignment is illustrated on Exhibit 6, *Study Area with Level-1 Alternatives* as well as on the smaller maps below.

Each of the thirteen build alternatives ultimately improves the connection between Harlan and Hazard, although they do not all begin nor end in each respective city. In the south, each corridor begins in Harlan, either at the US 421/US 119 intersection or at a point along US 119 east of Harlan. In the north, there are four different termini options, from west to east they are: KY 118 (Hyden Spur) in Hyden, the Hal Rogers Parkway north of Hyden, KY 461 near Hazard, and KY 7 in Viper. KY 118 provides access to the Hal Rogers Parkway, which provides access to Hazard, as does KY 461 and KY 7.

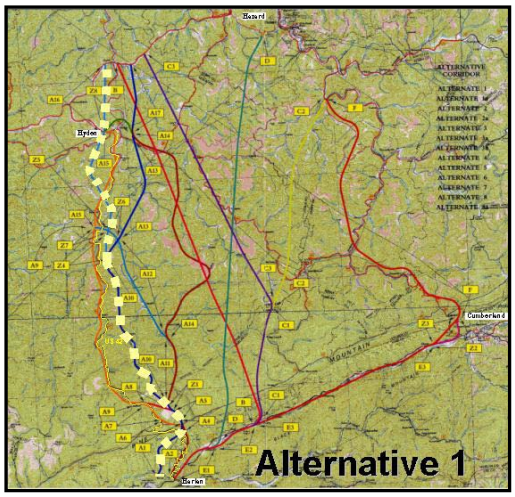
No-Build Alternative

This alternative involves no action to construct a new facility, or reconstruct existing highways, that will ultimately improve the connection between the two cities. With this option, only routine roadway maintenance (*e.g.*, resurfacing, restriping, patching, etc.) would be performed. Existing and future traffic would continue to use the existing roadways. The No-Build Alternative would leave the area with deficient roadways that will progressively worsen as traffic demands grow and the roadways age. This alternative would not improve safety; reduce travel time; nor accommodate existing and future traffic volumes, large trucks, or tourism traffic. This alternative was presented to and discussed by the project team members, who concluded it was not in the public's best interests. However, for comparative purposes the No-Build alternative must be advanced to the final level of analysis, including future studies of alternative options.

The thirteen build alternatives as presented below:

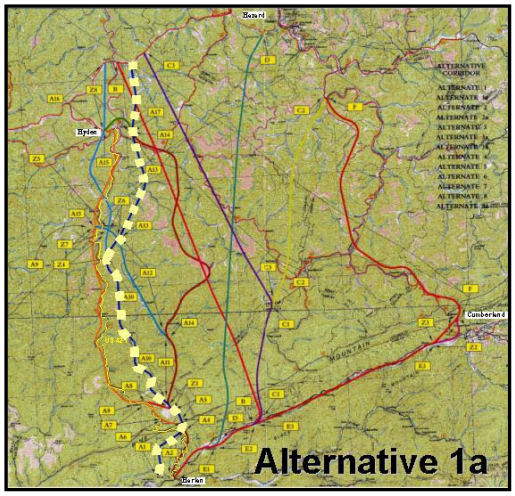
Alternative Corridor 1

- Begins west of Harlan
- Continues west of Harlan up Pine Mountain
- Crosses Pine Mountain at US 421
- Goes around east and north side of the rock quarry
- Follows Gray Mountain ridge top 13.6 miles
- Crosses to the west side US 421
- Continues cross-country 4.4 miles to KY 118
- Continues cross-country 4.0 miles to the Hal Rogers Parkway
  - Length of new construction: 28.8 miles
  - Total length between Harlan and Hazard: 40.1 miles
  - Future ADT Range: 1,500 to 8,500 vpd
  - Weighted Avg. Future ADT: 4,150 vpd
  - Construction Costs: $560M to $590M



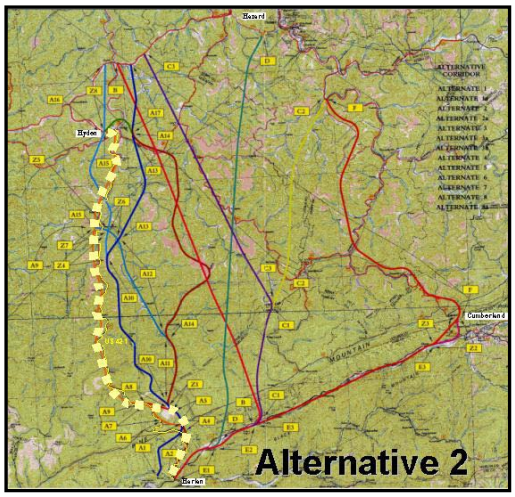
Alternative Corridor 1a

- Same as Alt. 1 for southern 17.5 miles
- Continues cross-country east of US 421
- Intersects KY 80, east of Hyden
- Continues cross-country 4.0 miles to the Hal Rogers Parkway
  - Length of new construction: 27.1 miles
  - Total length between Harlan and Hazard: 37.1 miles
  - Future ADT Range: 900 to 2400 vpd
  - Weighted Avg. Future ADT: 1860 vpd
  - Construction Costs: $540M to $570M



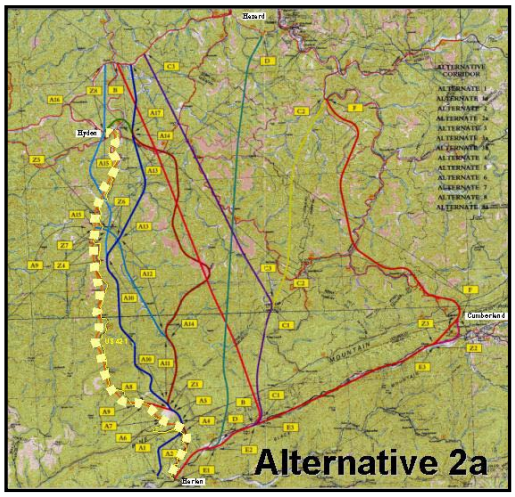
Alternative Corridor 2

- Begins on US 421 in Harlan
- Continues along US 421 up Pine Mountain
- Crosses Pine Mountain at US 421
- Goes around east and north side of the rock quarry
- Follows US 421 18.7 miles to Hyden
- Ends at KY 118 in Hyden
  - Length of new construction: 24.8 miles
  - Total length between Harlan and Hazard: 43.3 miles
  - Future ADT Range: 3900 to 7800 vpd
  - Weighted Avg. Future ADT: 5715 vpd
  - Construction Costs: $530M to $560M



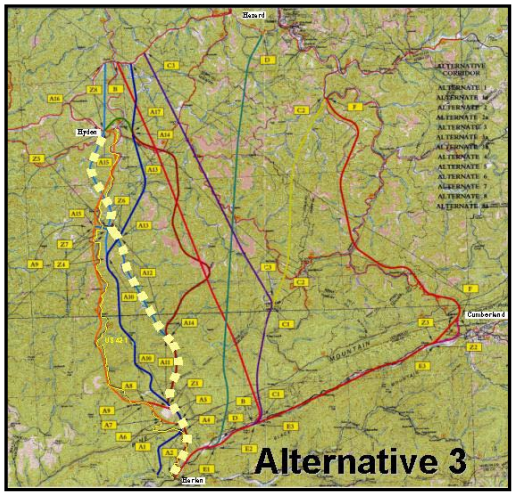
Alternative Corridor 2a

- Same as Alternative 2, except:
- Goes around west side of rock quarry, along US 421
  - o Length of new construction: 24.6 miles
  - o Total length between Harlan and Hazard: 43.1 miles
  - o Future ADT Range: 3900 to 7800 vpd
  - o Weighted Avg. Future ADT: 5715 vpd
  - o Construction Costs: $530M to $560M



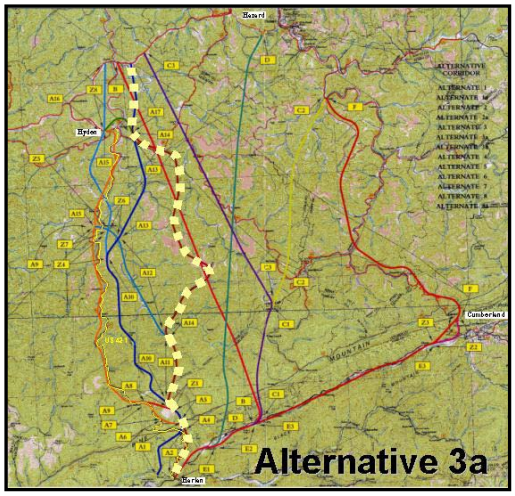
Alternative Corridor 3

- Begins on US 421 in Harlan
- Continues along US 421 up Pine Mountain
- Crosses Pine Mountain at US 421
- Goes around east side of the rock quarry
- Follows KY 2009 and then Greasy Creek corridor 12.2 miles to US 421
- Crosses to the west side of US 421
- Continues cross-country 4.4 miles to KY 118
  - o New Construction Length: 22.6 miles
  - o Total length between Harlan and Hazard: 41.1 miles
  - o Future ADT Range: 2,200 to 6,000 vpd
  - o Weighted Avg. Future ADT: 3,320 vpd
  - o Construction Costs: $460M to $490M



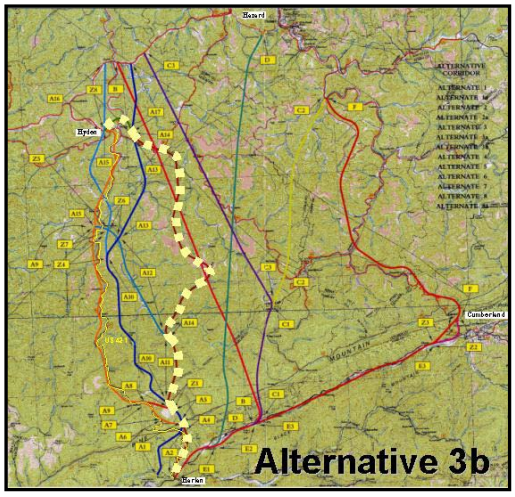
Alternative Corridor 3a

- Same as Alternative 3 until the KY 2009/Greasy Creek junction
- North of Greasy Creek follows White Creek corridor, traversing former strip mined/mountain top removal areas 14.5 miles to KY 80
- Follows KY 80 1.7 miles
- Goes north cross-country 1.7 miles to the Hal Rogers Parkway
- Entire corridor remains east of US 421 and Hyden
  - o Length of new construction: 28.4 miles
  - o Total length between Harlan and Hazard: 38.8 miles
  - o Future ADT Range: 300 to 5,800 vpd
  - o Weighted Avg. Future ADT: 2,470 vpd
  - o Construction Costs: $430M to $460M



Alternative Corridor 3b

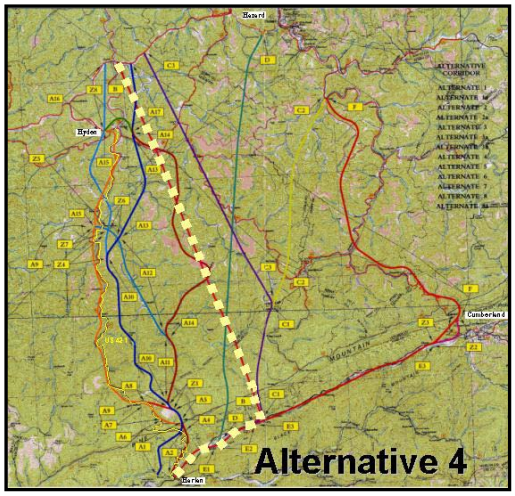
- Same as Alternative 3a until north of KY 80
- North of KY 80 provides a 2.0-mile northern bypass around Hyden
- Terminates at KY 118 in Hyden
  - o New Construction Length: 26.8 miles
  - o Total length between Harlan and Hazard: 45.9 miles
  - o Future ADT Range: 2,200 to 8,200 vpd
  - o Weighted Avg. Future ADT: 3,690 vpd
  - o Construction Costs: $410M to $440M



Alternative Corridor 4

- Begins on US 119 in Harlan
- Continues along US 119 for 5.8 miles
- Turns north for a new crossing over Pine Mountain
- Continues 23.4 miles cross-country northwest to the Hal Rogers Parkway

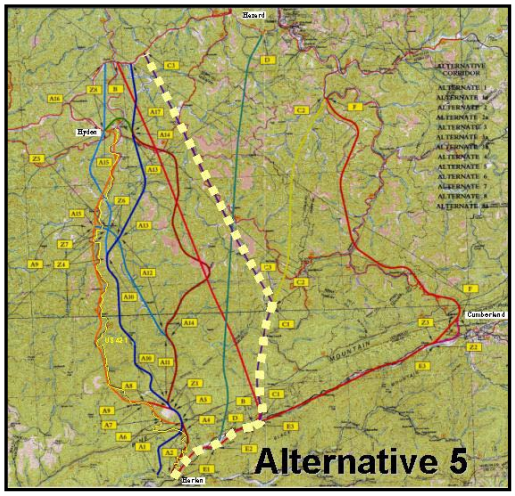
  Note: following data does not include US 119:
  - o New Construction Length: 23.4 miles
  - o Total length between Harlan and Hazard: 40.4 miles
  - o Future ADT Range: 700 to 2,400 vpd
  - o Weighted Avg. Future ADT: 1,975 vpd
  - o Construction Costs: $450M to $480M



Alternative Corridor 5

- Same as Alternative Corridor 4 until just north of Pine Mountain
- North of Pine Mountain, goes northeast to near KY 699
- Uses KY 699 corridor approximately 12 miles to KY 80
- North of KY 80 continues northwest 4.5 miles to the Hal Rogers Parkway

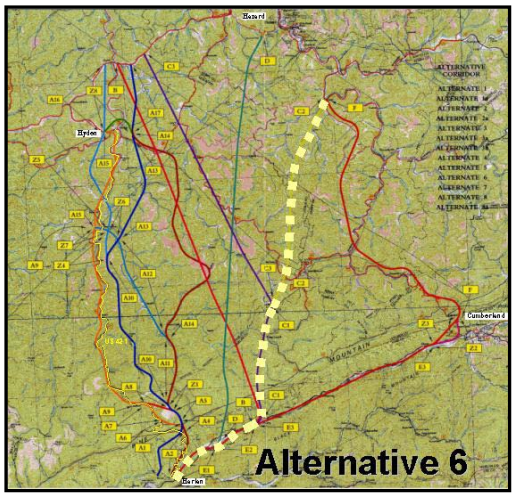
  Note: following data does not include US 119:
  - o New Construction Length: 23.7 miles
  - o Total length between Harlan and Hazard: 39.2 miles
  - o Future ADT Range: 600 to 2400 vpd
  - o Weighted Avg. Future ADT: 1950 vpd
  - o Construction Costs: $470M to $500M



Alternative Corridor 6

- Same as Alternatives Corridor 5 to near KY 699
- From south of KY 699, traverses 13.2 miles northeast cross-country to KY 7 in Viper, south of Hazard

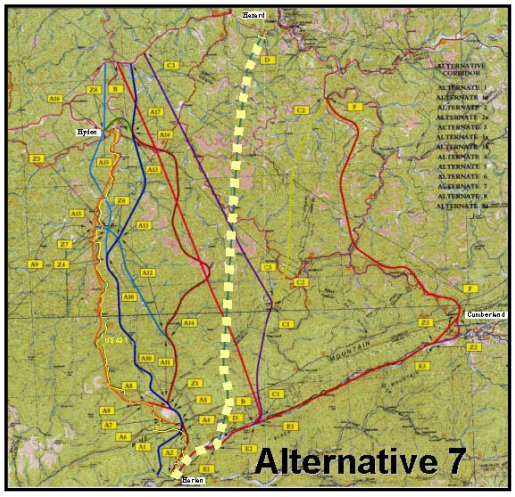
  Note: following data does not include US 119:
  - o New Construction Length: 20.4 miles
  - o Total length between Harlan and Hazard: 30.4 miles
  - o Future ADT: 1,000 vpd
  - o Construction Costs: $400M to $430M



Alternative Corridor 7

- Begins on US 119 in Harlan
- Continues along US 119 for 2.8 miles
- Turns north for a new crossing over Pine Mountain
- Continues 25.3 miles cross-country north, then east to KY 451 just west of Hazard

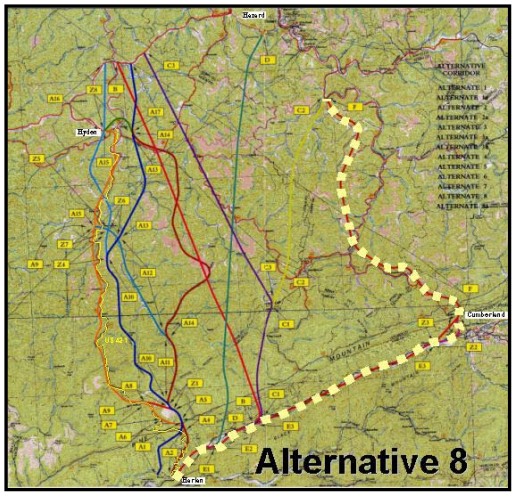
  Note: following data does not include US 119:
  - o New Construction Length: 25.3 miles
  - o Total length between Harlan and Hazard: 26.3 miles
  - o Future ADT: 1,000 vpd
  - o Construction Costs: $490M to $520M



Alternative Corridor 8

- Begins in Harlan and uses US 119 for 26 miles to KY 160 just west of Cumberland
- Turns north for a new crossing over Pine Mountain east of KY 160
- Follows KY 463 corridor approximately 8.0 miles to KY 699
- Runs parallel and west of the KY 699 and KY 7 corridors for approximately 10.2 miles
- Terminates at KY 7 in Viper

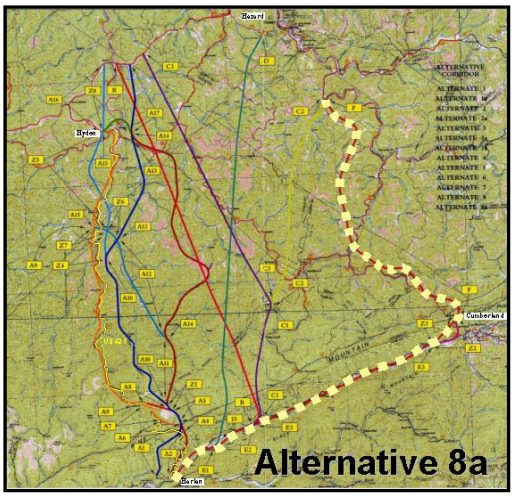
  Note: following data does not include US 119:
  - o New Construction Length: 21.1 miles
  - o Total length between Harlan and Hazard: 52.8 miles
  - o Future ADT Range: 3,000 to 5,800 vpd
  - o Weighted Avg. Future ADT: 4,050 vpd
  - o Construction Costs: $450M to $480M



Alternative Corridor 8a

- Is same as Alternative Corridor 8, except in Cumberland
- West of Cumberland it traverses up Pine Mountain approximately 1 mile west of KY 160, and does so with a northeast corridor.

  Note: following data does not include US 119:
  - o New Construction Length: 20.1 miles
  - o Total length between Harlan and Hazard: 52.3 miles
  - o Future ADT Range: 3,000 to 5,800 vpd
  - o Weighted Avg. Future ADT: 4,050 vpd
  - o Construction Costs: $450M to $480M



5.1.1 Level-1 Corridor Analysis

The Level-1 corridor analysis included a review of the thirteen options as compared to following decision-making criteria: known fatal flaws and key planning consideration, including the geological constraints of crossing Pine Mountain and the potential to divide the corridor into a high number of usable construction segments. Other information analyzed included traffic forecast, travel time savings between Harlan and Hazard, and public comments. The traffic and travel time forecasts for the Level-1 corridors that were prepared by the KYTC and are located in Appendix F, *Traffic and Travel Time Forecasts*. The public comments on the Level-1 corridors were obtained during the second round of public workshops held in December 2003. The alternative corridors as compared to these criteria are shown in Table 2, *Level-1 Evaluation Matrix,* on page 46.

At the December workshops, the KYTC did not identify any of the alternative corridors as preferred or recommended. Two items were provided as handouts: the evaluation matrix shown on page 45 (minus the public comments, Fatal Flaws, and Key Planning Considerations), and the maps and bulleted information describing each of the Level-1 alternative corridors that is included in subsection 5.1, above. In addition to the public information meetings, a map of the alternative corridors was provided to other federal, state, and local agencies, and comments were requested. Comments received from the agencies are summarized in Section 3.4.2.

Fatal Flaws

Fatal flaws are foreseeable significant negative effects or impacts to legally protected resources that cannot be avoided with the proposed location of the corridor, and therefore render the option not feasible. For the Level-1 Alternative Analysis, the only fatal flaw that was identified is the use of Section 4(f) resources.

Section 4(f) of the U.S. Department of Transportation Act of 1966 stipulates that the Federal Department of Transportation, including the Federal Highway Administration (FHWA), cannot use land from a significant publicly owned park, recreation area, wildlife or waterfowl refuge, or historic site unless there is no feasible and prudent alternative to the use of the land; and if there is no alternative, then the action must include all possible planning to minimize harm to the property.

The Blanton Forest State Nature Preserve, which is located along the south side of Pine Mountain on two separate tracts, is considered a Section 4(f) resource. The larger track is the most significant, and would have been bisected by Corridors 1 and 1a. Since this tract can be avoided by the use of the US 421 corridor, then in accordance with Section 4(f), it must be. However, it should be noted that the use of the US 421 corridor has the potential to impact the smaller, less significant tract of the resource. To avoid future Section 4(f) involvement caused by using the small portion of the Forest, early coordination and planning between the KSNPC and the KYTC has been initiated. As a result, south of Pine Mountain, 2.5 miles of Alternative Corridors 1 and 1a have been redrawn (see Exhibit 7) to follow the US 421 corridor and renamed Alternative Corridors 1b and 1c, respectively. This alignment is the same that is used by corridors 2, 2a, and 3 and avoids the significant and larger portion of the resource. For corridors 1b, 1c, 2, 2a, and 3, coordination and planning will be made to avoid or minimize harm to the smaller, less significant tract of the Forest that is located along US 421.

Key Planning Considerations

For this Alternatives Planning Study, Key Planning Considerations are significant fiscal or environmental issues that cannot be avoided with the proposed corridor, and therefore render the option not prudent, especially when compared to other available options. For the Level-1 Alternative Analysis, only two Key Planning Consideration were identify—Planning Consideration #2: compatibility with existing topography and geology (specifically, the crossing of Pine Mountain); and Planning Consideration #5: the ability to construct the project corridor in usable and independent sections, as described below.

Pine Mountain Crossing. The crossing of Pine Mountain is a significant issue. Crossing in a location other than an existing corridor would have fiscal, natural environment, and geotechnical constraints that could be minimized by using an existing corridor crossing. These issues are reflected in the above Planning Considerations 2, 3, and 4 (see Section 4), and were also expressed through agency comments from the KYTC and KSNPC (see Section 3.4). Specifically, the KSNPC and the KYTC Geotechnical Branch expressed significant concerns (but for different reasons) over using any corridor other than the existing US 421. Using a new corridor also would have safety issues, as it would leave in place the existing high-crash and substandard US 421 crossing over Pine Mountain. For these reasons, any alternative corridor not replacing the existing US 421 corridor (i.e., 4, 5, 6, 7, 8, and 8a) was not advanced for further consideration.

Construction Segments. This planning consideration is important because it would not be fiscally possible to build any of the entire corridors as one project—the construction costs alone range from $400 to $590 million, depending on the alternative corridor. Therefore, the more sections a project can be divided into, the more realistically it can be implemented. However, in order to segment a corridor, each of the smaller sections must have independent utility and logical termini. In other words, they must be able to stand alone as separate projects and end at justifiable locations.

Table 2: Level-1 Evaluation Matrix – Comparison of Alternative Corridors to Key Criteria and Fatal Flaws

COMPARISON OF ALTERNATIVES	No-Build	1	1a	2	2a	3	3a	3b	4	5	6	7	8	8a
Length of new construction Resulting total length between Harlan and Hazard (miles)	0 43.1	28.8 40.1	27.1 37.1	24.8 43.3	24.6 43.1	22.6 41.1	28.8 38.8	27.4 45.9	23.5 40.4	24.4 39.2	20.4 30.4	25.3 26.3	21.1 52.8	20.1 52.3
Reduction in travel time between Harlan and Hazard (in minutes) (see Appendix F)	0	39.9	42.7	27.1	26.9	23.3	32.8	28.1	30.5	32.3	31.3	39.0	17.1	18.6
Average weighted daily traffic on new alignment (excluding US 119 and Hal Rogers Parkway)	N/A	4,150	1,860	5,715	5,715	3,320	2,470	3,690	1,975	1,950	1,000	1,000	4,050	4,050
Preliminary Construction costs (in millions)	$0	$560 to $590	$540 to $570	$560 to $590	$560 to $590	$460 to $490	$430 to $460	$410 to $440	$450 to $480	$470 to $500	$400 to $430	$490 to $520	$450 to $480	$450 to $480
Number of Sections In Which Corridor Can be Constructed	N/A	4	4	7	7	4	3	3	2	2	1	1	4	4
Public Comment Supporting / Public Comments Opposing (from Dec 2003 workshops)	0 / 0	81 / 4	81 / 5	79 / 3	39 / 3	16 / 5	10 / 5	9 / 6	7 / 24	4 / 33	2 / 92	3 / 102	2 / 108	1 / 74
Fatal Flaws (NO = Fatal Flaw)														
Avoids Section 4(f) Involvement		NO	NO											
Key Planning Considerations (NO = Does Not Meet Objective)														
Crosses Pine Mountain at an Existing Corridor									NO	NO	NO	NO	NO	NO
Able to Divide into a High Number (i.e. At Least Four) of Usable Construction Segments							NO	NO	NO	NO	NO	NO		

5.1.2 Level-1 Conclusions

At the conclusion of the Level-1 analysis, the following eight alternative corridors were identified to not be advanced for further study: 3a, 3b, 4, 5, 6, 7, 8, and 8a. And as described above, Alternative corridors 1 and 1a were revised to avoid the main portion of the Blanton Forest State Nature Preserve and renamed 1b and 1c, respectively. The reasons for these decisions are as follows.

Alternative Corridors 3a and 3b were not advanced because the number of sections each alternative could be logically divided into is only three, one of which is 19.1 miles long, as follows:

- Harlan north 3.3 miles (along the US 421 corridor over Pine Mountain) to KY 221
- KY 221 north 19.1 miles to KY 80
- Corridor 3a: Reconstruction of KY 80 for 1.5 miles and then on new alignment for 4.5 miles to the Hal Rogers Parkway. Corridor 3b: from KY 80 north and west around Hyden 4.4 miles to KY 118

Also, neither corridors 3a nor 3b received notable support from the public or other agencies. During the second round of public meetings 3a received 10 comments to advance the alternative, and 5 to not advance it; 3b received 9 and 6 comments, respectively.

Alternative Corridors 4 and 5 were not advanced because for the following reasons:

- Each required a crossing over Pine Mountain outside of an existing corridor.
- Each would have required the use of land within the Kentenia State Forest, a specific concern noted by the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Forestry.
- The number of sections each alternative could be logically divided into is only two.
  - Corridor 4: US 119 north over Pine Mountain for 17.3 miles to KY 80, then from KY 80 north 5.9 miles to the Hal Rogers Parkway.
  - Corridor 5: US 119 north over Pine Mountain for 19.2 miles to KY 80, then from KY 80 north 4.5 miles to the Hal Rogers Parkway.
- Neither corridor received notable support from the public or other agencies. During the second round of public meetings Corridor 4 received 7 public comments to advance the alternative, and 24 to not advance it, Corridor 5 received 4 and 33, respectively.

Alternative Corridors 6 and 7 were not advanced for further consideration for the following reasons:

- Each required a crossing over Pine Mountain outside of an existing corridor.

- Each would require the use of land within the Kentenia State Forest, a specific concern noted by the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Forestry.

- Neither of the alternative corridors can be divided into any construction sections. For Corridor 7, to serve traffic it must be constructed from US 119 northeast to KY 7 in Viper, a distance of approximately 20.4 miles, and at a one-time cost of approximately $490 to $520 million. For Corridor 8, it must be constructed from US 119 northeast to KY 451 in Hazard, a distance of approximately 25.3 miles, and at a one-time cost of approximately $450 to $480 million.

- Neither corridor received support from the public or other agencies. During the second round of public meetings Corridor 6 received 2 public comments to advance the alternative, and 92 to not advance it; Corridor 7 received 3 public comments to advance it, and 102 to not advance it.

Alternative Corridors 8 and 8a were not advanced for further consideration for the following reasons:

- Each required a crossing over Pine Mountain outside of an existing corridor.

- Each would not improve travel time between Harlan and Hazard as effectively as the alternatives advanced for further consideration. It was estimated to reduce travel time by an estimated 17.1 or 18.6 minutes, respectively, verses 23.3 to 42.7 minutes for the alternatives advanced.

- Regarding public support, during the second round of public meetings Alternative Corridors 8 and 8a received only 1 and 2 public comments, respectively, in support of it, and 108 and 74 comments, respectively, in opposition to it. Regarding agency comments, both received some agency support, but neither received as much as the alternatives along the US 421 corridor.

5.2 Level-2 Alternative Corridors

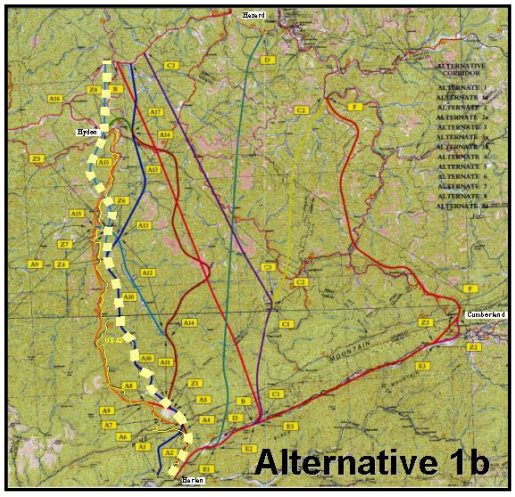
The Level-2 corridors included the five options recommended to be advanced from the Level-1 corridor analysis—1b, 1c, 2, 2a, and 3—each of which are illustrated on Exhibit 7, *Level-2 Build Alternatives, Culturally Sensitive Areas, and Historic Resources*. During this stage of the alternatives analysis, these five corridors were compared to the Project Goals and Planning Considerations presented in Section 4.0, above, including detailed cost estimates, feasibility of construction, environmental impacts, likely land use impacts, service to communities, reduction in travel time, service to future traffic including heavy trucks, and public and agency comments. The alternative corridors as compared to these Project Goals and Planning Considerations are summarized in Section 5.2.1, and shown in Table 3, *Level-2 Evaluation Matrix,* on page 52.

Each of the five corridors studied in the Level-2 analysis begin in the south in Harlan at the US 421 and US 119 intersection. In the north, there are three different termini options, one is at KY 118 (Hyden Spur) on the west side of Hyden, and the other two are on the Hal Rogers Parkway north of Hyden, east of the KY 118 intersection with the Hal Rogers Parkway. The Hal Rogers Parkway provides direct access to Hazard to the east and London and Interstate-75 to the west.

5.2.1 Level-2 Corridor Analysis

Alternative Corridor 1b (modified Alternative 1) addressed the Project Goals and Planning Considerations in the following ways:

- It would use an existing corridor over Pine Mountain (Planning Considerations 2, 3, and 4)
- It would reduce the travel time between Harlan and Hazard an estimated 34.3 minutes (Goal 2).
- It would attract a weighted estimate of 4,150 vehicles per day.
- It would link the major population centers of Hyden and Harlan (Planning Consideration #6), which supports tourism goals and objectives (Goal 5) by connecting major cities along the Hal Rogers Parkway and US 119.
- The number of usable sections the alternative could be constructed into is four (Planning Consideration #5):
    - o Harlan north 3.3 miles (along the US 421 corridor over Pine Mountain) to KY 221
    - o KY 221 north 13.1 miles along the Gray Mountain ridge to KY 2009, near US 421 in Hoskinston
    - o KY 2009, near US 421 in Hoskinston, north 2.3 miles to US 421



- US 421 north 4.4 miles to KY 118 in Hyden

- Alternative Corridor 1b received notable support from the public or other agencies (Planning Consideration #7). During the second round of public meetings it received 81 public comments to advance the alternative, and 4 to not advance it.

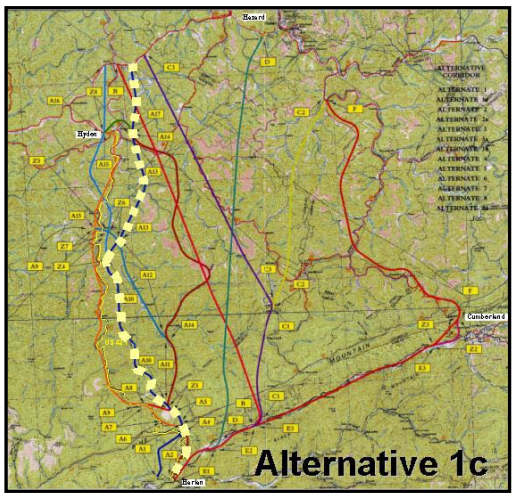
Alternative Corridor 1c (modified Alternative 1a) addressed the Project Goals and Planning Considerations in the following ways:

- It would an existing corridor over Pine Mountain (Planning Considerations 2, 3, and 4).

- It would reduce the travel time between Harlan and Hazard an estimated 36.4 minutes (Goal 2).

- It would link the major population centers of Hyden and Harlan (Planning Consideration #6), which supports tourism goals and objectives (Goal 5) by connecting major cities along the Hal Rogers Parkway and US 119.

- The number of usable sections the corridor could be constructed into is four (Planning Consideration #5):



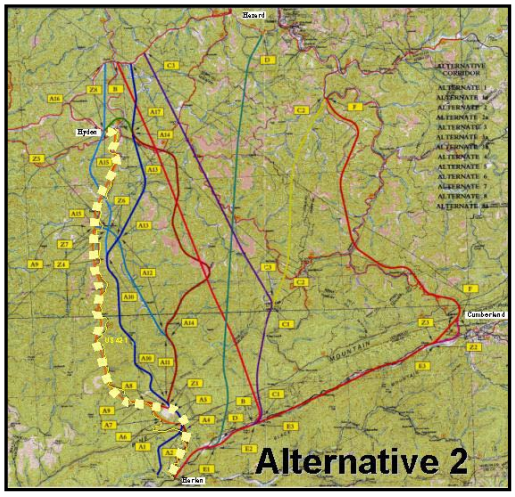
  - Harlan north 3.3 miles (along the US 421 corridor over Pine Mountain) to KY 221
  - KY 221 north 12.4 miles along the Gray Mountain ridge to KY 2009, west of US 421 and Hoskinston
  - KY 2009 north 6.4 miles to KY 80 near Hyden
  - KY 80 north 4.9 miles to the Hal Rogers Parkway

- Alternative Corridor 1c received notable support from the public or other agencies (Planning Consideration #7). During the second round of public meetings it received 81 public comments to advance the corridor, and 5 to not advance it.

Alternatives Corridors 2 and 2a addressed the Project Goals and Planning Considerations in the following ways:

- Each would use an existing corridor over Pine Mountain (Planning Considerations 2, 3, and 4).

- Each alternative would provide the best opportunity to replace existing high crash areas along US 421 with a new roadway section that meets current design standards (Goal 1).

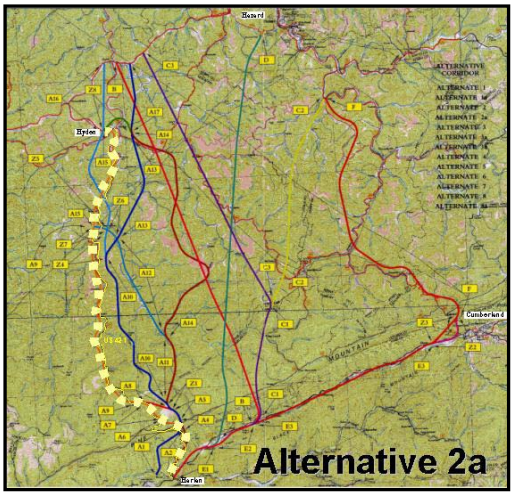


- Each would tie into the planned Hyden Bypass that begins on US 421 and bypasses Hyden to the west and terminates at KY 118.

- Each would attract a weighted estimate of 5,715 vehicles per day, which is the highest estimated daily volume of the alternatives studied. And, each would attract approximately 1,045 heavy trucks per day.

- Each would link the major population centers of Hyden and Harlan (Planning Consideration #6), which supports tourism goals and objectives (Goal 5) by connecting major cities along the Hal Rogers Parkway and US 119.

- The number of usable sections both corridors could be constructed into is at a minimum six (Planning Consideration #5). Because each would involve reconstruction of the existing US 421, the opportunities to segment the project are numerous and can be more specifically identified in subsequent studies of the project.



  - Harlan north 6.1 to 6.3 miles (along the US 421 corridor over Pine Mountain) to north of KY 221 and south of Bledsoe; Corridor 2: goes around the east side of a rock quarry Corridor 2a: goes around the west side of the rock quarry
  - US 421 from south of Bledsoe north 2.8 miles to a straight portion of US 421 south of Helton
  - US 421 from south of Helton, north 5.0 miles to north of Mozelle
  - US 421 from north of Mozelle north 4.3 miles north to near Hoskinston
  - US 421 from south of Hoskinston north 5.0 miles to south of Hyden,
  - US 421 from south of Hyden around the west side of Hyden 2.0 miles to KY 118

- Alternative Corridors 2 and 2a received notable support from the public or other agencies (Planning Consideration #7). During the second round of public meetings each received 79 and 39 public comments, respectively, to advance the corridor option, and 3, each to not advance it.

Alternative 3 addressed the Project Goals and Planning Considerations in the following ways:

- It would use an existing corridor over Pine Mountain (Planning Considerations 2, 3, and 4)

- Each would tie into the planned Hyden Bypass that begins on US 421 and bypasses Hyden to the west and terminates at KY 118.

- It would link the major population centers of Hyden and Harlan (Planning Consideration #6), which supports tourism goals and objectives (Goal 5) by connecting major cities along the Hal Rogers Parkway and US 119.

- The number of usable sections the corridor could be constructed into is four (Planning Consideration #5).

  - Harlan north 3.3 miles (along the US 421 corridor over Pine Mountain) to KY 221
  - KY 221 north 5.6 miles to the junction of KY 2008 and KY 2009
  - KY 2009/Greasy Creek corridor north 8.9 miles to US 421 north of Stinnett
  - US 421 north 4.4 miles to KY 118 in Hyden

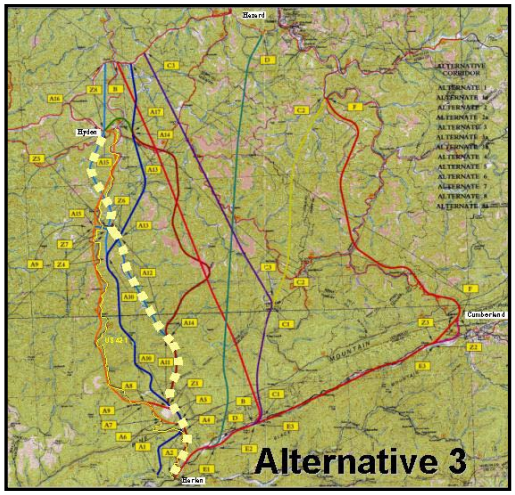


Table 3: Level-2 Evaluation Matrix – Comparison of Alternative Corridors to the Project Goals and Planning Considerations

Alternative Corridor:	No-Build	1b	1c	2	2a	3
Length of New Construction (miles) Resulting Total Length between Harlan and Hazard (miles)	0 43.1	28.8 40.1	27.1 37.1	24.8 43.3	24.6 43.1	22.6 41.1
COMPARISON OF PROJECT **GOALS**						
Goal 1. Provides a roadway network that meets current safety design standards and replaces the high accident locations along US 421 (Goal 1, and Planning Consideration #1)	No	Avg.[3]	Avg.	**Good**	**Good**	Avg.
Goal 2. Improves travel time between Harlan and Hazard Time in minutes (Note: depending on the routes chosen, the travel time for the No-Build can be different (see Appendix F). Reduction in travel time in minutes, as compared to the same routes chosen for the No-Build.)	No 71 to 81	**Good** 46.9 (34.3)	**Good** 44.8 (36.4)	Avg. 52.9 (27.1)	Avg. 53.1 (26.9)	Avg. 53.5 (26.5)
Goal 3. Accommodates traffic demands						
3.1 ADT on Corridor (Excluding US 119 and Hal Rogers Parkway) (weighted average by length of segments)	No	Avg. 4150	Avg. 1860	**Good** 5715	**Good** 5715	Avg. 3320
3.2 Attracts Traffic from US 421 (western north-south corridor) (percentage remaining on corridor)	No	Avg. 58%	Avg. 65%	**Good** 0%	**Good** 0%	Avg. 60%
3.3 Attracts Traffic from KY 7, 699, 436, 160 (eastern north-south corridor) (percentage remaining on corridor)	No	Poor 93%	Avg. 88%	Poor 93%	Poor 93%	Poor 93%
Goal 4. Accommodates large truck and school bus traffic (weighted average number of trucks using corridor during ADT)	No	Avg. 344	Poor 242	**Good** 1045	**Good** 1045	Avg. 362
Goal 5. Accommodates regional tourist traffic	No	Avg.	Avg.	**Good**	**Good**	Avg.
COMPARISON OF **PLANNING CONSIDERATIONS**						

[3] **Good** Favors the corridor over all other options, including Level-1 corridors; Avg. neither notably favors nor disfavors the corridor, Poor disfavors the corridor.

Alternative Corridor:	No-Build	1b	1c	2	2a	3
Construction Feasibility (Planning Considerations #1, #2, and #5)						
1. Is compatible with geotechnical issues and constraints (Planning Consideration #2)	N/A	Avg.	Avg.	**Good**	**Good**	Avg.
2. Project can be easily constructed in usable and independent sections (Planning Consideration #5)	N/A	Avg. (4)	Avg. (4)	**Good** (6)	**Good** (6)	Avg. (4)
Relative Cost (Planning Consideration #3)						
1. Has Comparatively Lower Costs (as compared to broad range of Alternatives presented in Table 2, page 46)		Poor	Poor	Poor	Poor	Avg.
Construction Costs (Grade, Drain, and Surface)	N/A	$577.6	$554.3	$574.4	$578.4	$475.3
Right-of-way and Utility Costs		$ 33.1	$ 31.2	$ 46.9	$ 47.2	$ 26.0
Total Costs		$610.7	$585.5	$621.3	$625.6	$501.3
2. Costs can be programmed in phases for construction	N/A	Avg.	Avg.	**Good**	**Good**	Avg.
Relative Impacts to the Human and Natural Environment (Planning Consideration #4)						
1. Potential to Avoid Impacts to Residential Land Uses	N/A	**Good**	**Good**	Avg.	Avg.	**Good**
2. Potential to Avoid Impacts to commercial Land Uses	N/A	**Good**	**Good**	Avg.	Avg.	**Good**
3. Potential to Avoid Impacts to Environmental Justice Communities	N/A	**Good**	**Good**	Avg.	Avg.	**Good**
4. Potential to Avoid Impact on the Natural Environment	N/A	Poor	Poor	Avg.	Avg.	**Good**
Use of Protected Resources						
1. Potential to Avoid Section 106 (Historic Resource) Impacts	N/A	**Good**	**Good**	Avg.	Avg.	Avg.
2. Potential 4(f) Involvement (Historic Sites, Wildlife Refuges or Public Parks)	N/A	Avg.	Avg.	Avg.	Avg.	Avg.
Serves Communities within Study Area (Planning Consideration #6)						
1. Provides access to/from population centers	N/A	Avg.	Avg.	**Good**	**Good**	Avg.
In Concert With Public and Agency Input (Planning Consideration #7)						
1. Public Comments Support Alternative (number of comments supporting / opposing corridor)	H	**Good** 81 / 4	**Good** 81 / 5	**Good** 79 / 3	Avg. 39 / 3	Avg. 16 / 5
2. Local Officials Support Corridor Option	Poor	Avg.	Avg.	**Good**	**Good**	Avg.
3. Local And State Agencies Support Corridor Option	N/A	Avg.	Avg.	**Good**	**Good**	Avg.

5.2.2 Level-2 Conclusions

At the conclusion of the Level-2 analysis, the following alternative corridors were not recommended: 1b, 1c, and 3. Alternatives Corridors 2 and 2a— the reconstruction of US 421—are recommended to be advanced as the final corridor. These two alternatives differ only as they go around the rock quarry on the north side of Pine Mountain.

Alternatives Not Recommended

Corridor 1b was not recommended because of the likely effects from being on new alignment for the entire corridor except the Pine Mountain crossing. Corridor 1b would attract only 42 percent of the existing traffic from US 421. The remaining 58 percent would remain on US 421, a facility that has substandard (10-foot wide) travel lanes and for injury crashes, a high crash rate. Regarding

construction, the opportunities to divide the corridor into usable construction segments with independent utility are less (i.e., only four sections) and therefore make implementation cost prohibitive. One segment of this corridor would be approximately 13.1 miles before a logical connection with an existing road can be made. Regarding environmental considerations, as a road on a new alignment, Corridor 1b would have a higher potential to divide existing wildlife habitat areas and increase runoff in a mostly wooded area.

Corridor 1c was not recommended for the same reasons as for Corridor 1b. Corridor 1c as compared with the other Level-2 corridors would attract the least amount of traffic—only 1,860 vehicle per day—and only 35 percent of the existing traffic from US 421. The remaining 65 percent would remain on US 421. This corridor attracts less traffic because it remains to the east of US 421, and east of Hyden. Corridor 1b, on the other hand, crossed to the west side of US 421 south of Hyden, and intersected with KY 118, and therefore attracted slightly more traffic. Corridor 1c would also be cost prohibitive because it could be implemented in only four constructions segments, and it would have the higher potential for impacts to existing habitat areas.

Corridor 3 was not recommended for the same general reasons—it would not attract a significant amount of traffic from the substandard US 421, it could be divided into only four construction segments (vs. six for Corridors 2 and 2a), and it would have greater impacts to the natural environment.

Alternatives Recommended

Of the Level-2 alternatives, Corridors 2 and 2a prove more advantageous in meeting the Project Goals and Planning Considerations for the reasons given in Section 5.2.1, above. Although Corridors 2 and 2a are the most expensive ($540.4 and $544.4 million, respectively), they can be implemented in the most number of independent and useful sections. This will allow the opportunity to prioritize segments and implement them as funding becomes available. This allows these options to be the least cost prohibitive for addressing more urgent safety and traffic needs. Because Corridors 2 and 2a would reconstruct US 421, rather than bypass it, they would attract the most traffic and heavy trucks, as compared to the other options. Regarding heavy trucks, Corridors 2 and 2a would attract three to four times more volume than the other Level-2 corridors. The reconstruction of US 421 also offers the best opportunity to promote tourism by linking existing communities with a safe corridor for recreational vehicles.

In regard to the other Level-2 alternatives, Corridors 2 and 2a take advantage of the existing, relatively new KY 118 Hyden Spur, and avoid a costly new connection to the Hal Rogers Parkway to the northeast of Hyden, which was part of Alternatives 1, 1a, and 3.

6.0 RECOMMENDATIONS

The conclusions of the Level-2 Analysis include not only the identification of a recommended corridor—2 and 2a—but also specific implementation strategies to address the Project Goals and Planning Considerations and other key issues identified throughout the planning process. A key advantage Corridors 2 and 2a provide over the other options is the ability to implement it in independent and usable construction sections. Therefore, the recommendation is to divide the final corridor into priorities, as illustrated on Exhibit 8, *Recommended Priorities,* and described as follows:

Priority 1 – Pine Mountain Crossing

The recommended top priority is the reconstruction of US 421 from Harlan north over Pine Mountain. The length of this section would be between 6.1 and 6.3 miles, depending on the corridor selected, and the preliminary construction cost ranges from $113.4 to $117.4 million. The section is located within Harlan County and the beginning and ending mileposts are 17.8 (at US 119) and approximately 26.0 south of Bledsoe. The southern portion of this section—the south side of Pine Mountain—is common to each of the Level-2 alternatives and has both the highest concentration of substandard sections, and a high crash rate. The northern portion could be either located west of the rock quarry (Corridor 2a), or east of it (Corridor 2).

The crossing of Pine Mountain has consistently been the top concern of the leadership of the city of Harlan and Harlan County. In the 1994 *US 421 Harlan to Hyden Scoping Report* (described in Section 1.2, on page 6), improvements to the US 421 corridor, rather than an alternative in a new corridor, were recommended. The 1994 Study also recommended that the corridor between Harlan and Hyden be divided into sections for implementation purposes, and noted that the Pine Mountain crossing from Harlan north to KY 221 was given the top priority. In these regards, the recommendations of this 2004 Alternatives Planning Study and the 1994 Study are very similar. The 1994 Study, however, recommended a typical section over Pine Mountain that has two 12-foot travel lanes in each direction and a 14-foot center turn lane. The 1994 Scoping Study also recommended a 60-MPH design speed. Following this study the KYTC initiated the preliminary engineering and environmental documentation stage of the project (Item 11-267.00). But because of the numerous topographic, geotechnical and environmental issues in the corridor, the cost of that solution was prohibitive, and the project was stopped in March 2000 and not included in the next (2000) Six-Year Highway Plan.

The issues associated with reconstructing this section of US 421 are numerous and include the significant topographic and geotechnical constraints, excellent wildlife habitat (including an isolated section of the Blanton Forest State Nature Preserve and the Pine Mountain Trail crossing at the Little Shepard Trail/US 421 intersection), impressive view sheds, steep grades, and sharp curves. Therefore, to best address these numerous issues and avoid the excessive impacts and costs associated with the recommendations from the 1994 study, the recommendations from this (2004) Alternatives Planning Study include two options: 1) address both speed and safety needs through a context sensitive design (CSD) reconstruction options, or 2) address safety needs, only, through context sensitive design options, much like those recently implemented on US 119 in Letcher County.

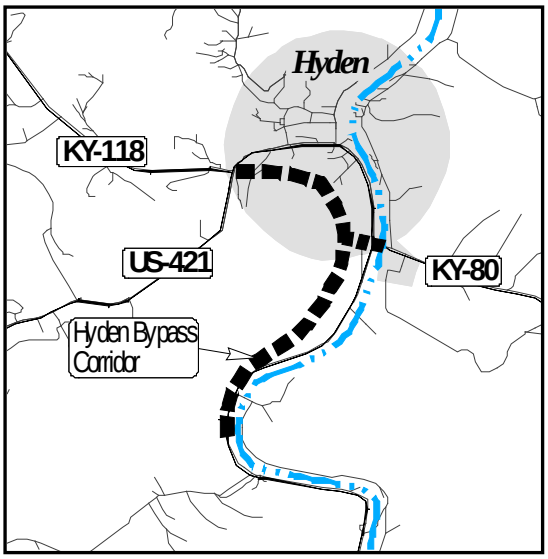
Option 1: A CSD Approach to Safety and Speed – The CSD approach necessary to address both safety and speed is to reconstruct the Pine Mountain crossing with an adjusted typical section and a relaxed design speed. A center lane could be used as a turn lane or a truck-climbing lane depending on the grades and access locations. A smaller typical section and relaxed design speed are recommended to provide flexibility to minimize right-of-way impacts, cuts and fills, slopes, and, consequently, costs.

Option 2: A CSD Approach to Safety, Only – Specific CSD recommendations that could be explored to address safety issues are to simply widen curves and use non-conventional striping to allow opposing trucks to pass, rather then reconstructing curves to meet a higher design speed. This approach would minimize right-of-way impacts to the natural and built environment. Regardless of the specific design elements, the objectives of the reconstruction would be safety, rather than improved capacity and speed. These design approaches were recently used on the reconstruction of the US 119 Pine Mountain crossing in Letcher County, between Whitesburg and Partridge (Item 12-311), as a cost effective solution to addressing a similar safety concern.

Because of the excellent wildlife habitat of Pine Mountain, including the Blanton Forest Nature Preserve, and the goal of safety, consideration should be given for providing opportunities to keep wildlife out of the existing road. Possible solutions could include oversized culverts to allow wildlife to cross the corridor and fencing to keep wildlife out of areas with poor sight distance. These solutions must also take into consideration the location and needs of the Pine Mountain Trail, which is being managed by the Kentucky Department of Parks.

Priority 2 – Hyden Bypass

The second priority section is the northern end of corridors 2 and 2a. It consists of a bypass around the west side of Hyden, beginning on US 421 at milepost 20.0, approximately, and extending north, west of the central business district, to KY 118 (mile post 22.5). The section would be approximately 2.0 miles in length



This section is a priority because it contains the highest traffic volumes and poorest levels of service in corridor 2 and 2a, and it also contains sections of US 421 with high critical crash rates. The corridor along the west side of Hyden was studied in a 2001 Intermediate Planning Study (IPS), in which it was named the Hyden Bypass, and was followed by the preliminary design of several build alternative alignments. The preliminary engineering was initiated as Item 11-12.00 in the 2002 KYTC Six-Year Highway Plan.

Remaining Priorities – From Hyden South to Pine Mountain

Following the reconstruction of US 421 over Pine Mountain (Priority 1), and the reactivation of the Hyden Bypass (Priority 2), the remainder of the US 421 corridor should be implemented from north

to south, beginning at the southern terminus of the Hyden Bypass. The recommendations begin in the north because the traffic volumes are higher near Hyden and generally decrease as US 421 approaches Pine Mountain. For example, the 2003 average daily volume from Hyden south to Stinnett is 5,000 vpd, from Stinnett south to Asher is 2,800 vpd, from Asher south to Helton is 1,600, and from Helton south to Bledsoe it increases to 2,500 vpd.

The 1994 *US 421 Harlan to Hyden Scoping Report* recommended two 12-foot lanes with 12-foot shoulders between Pine Mountain and Hoskinston, and a five-lane facility between Hoskinston and Hyden. In contrast to that specific proposal, the recommendations of this 2004 Alternatives Planning Study for priorities 3, 4, 5, and 6 are to be more flexible. Even though a relaxed design speed and context sensitive solutions are less critical than for the crossing of Pine Mountain, they could be implemented to minimize impacts to the natural and built environment. As noted in the Phase-2 analysis above, Corridors 2 and 2a have the highest potential, as compared to the other corridors, to have more impacts to historical resources, and residential, commercial, and Environmental Justice areas. Therefore, avoidance and minimization of these impacts should be a main concern when delineating specific alignment alternatives. Regarding the natural environment, Corridors 2 and 2a are parallel to the Beech Fork stream and Kentucky River Middle Fork from the north side of Pine Mountain to Hyden. Therefore, best management practices to avoid and minimize impacts to these streams should be used.

Summary of Recommended Priorities

Table 4: Recommended Section Priorities

Priority	Description	Approx. New Length (miles)	Existing US 421 Mile Post	Estimated Costs (Costs in Millions)	Existing and Project Average Daily Traffic (ADT)
1	Pine Mountain Crossing	6.12 to 6.3	17.9 to 26.0 (Harlan County)	D $5.5 R $8.0 to $8.2 U $1.8 to $1.9 C-G&D $100.9 to 104.1 C-Sur $12.5 to $13.3 Total $128.7 to $133.0	2003 = 2,000 vpd 2030 = 2,920 vpd
Note: Recommended use of "context sensitive design and construction" solutions with adjusted typical sections and relaxed design speed; reactivate Item 12-267					
2	Hyden Bypass	3.0	20.0 to 22.5 (Leslie County)	D $3.5 R $4.5 U $0.9 C-G&D $90.0 C-Sur $10.0 Total $108.9	2003 = 5,000 vpd 2030 = 7,470 vpd
3	From Hyden Bypass south of Hoskinston	4.5	13.6 to 20.0 (Leslie County)	D $2.7 R $6.8 U $1.4 C-G&D $70.2 C-Sur $7.8 Total $88.9	2003 = 5,000 vpd 2030 = 7,470 vpd
4	South of Hoskinson south to Mozelle	4.26	7.7 to 13.6 (Leslie County)	D $3.0 R $6.4 U $1.3 C-G&D $93.7 C-Sur $8.2 Total $112.6	2003 = 1,600 to 2,800 vpd 2030 = 2,390 to 4,190 vpd
5	Mozelle south to south of Helton	5.06	2.0 to 7.7 (Leslie County)	D $3.4 R $7.6 U $1.5 C-G&D $104.3 C-Sur $9.1 Total $125.9	2003 = 1,600 to 2,500 vpd 2030 = 2,390 to 3,740 vpd
6	South of Helton to south of Bledsoe	2.18	26.0 to 2.0 (Harlan and Leslie Counties)	D $2.0 R $3.3 U $0.7 C-G&D $63.0 C-Sur $4.7 Total $73.7	2003 = 2,500 vpd 2030 = 3,740 vpd

D=Design, R=Right-of-Way, U=Utilities, C-G&D=Construction-Grade and Drain, C-Sur=Construction-Surfacing, ADT=Average Daily Traffic, vpd=vehicles per day