Kentucky
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March 2005

Item Number: 4-308.00

Leitchfield Northwest Bypass Study

Leitchfield, Kentucky
Grayson County

FINAL
REPORT

Summary of

Findings and Recommendations

KENTUCKY TRANSPORTATION CABINET

Prepared for:

Kentucky Transportation Cabinet

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100 YEARS

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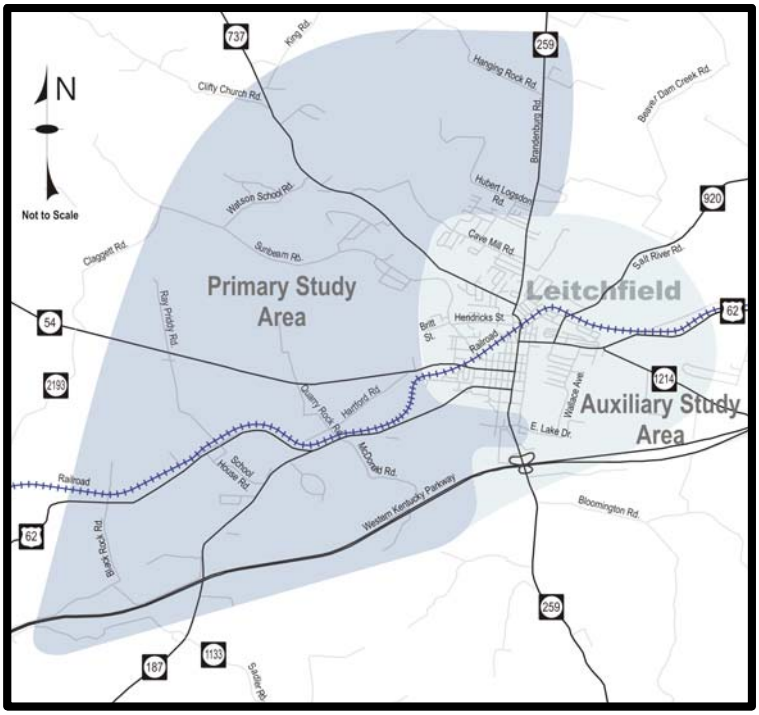
Study Background and Purpose

The Leitchfield Northwest Bypass Study is a planning study to evaluate the need for, feasibility of, and possible corridors for a western bypass around Leitchfield in Grayson County. The Kentucky Transportation Cabinet (KYTC) initiated the study in 2003 as part of the implementation of the KYTC Six-Year Highway Plan. The bypass project was proposed to address growing traffic congestion and development pressures in Leitchfield and surrounding portions of Grayson County. It was also proposed to promote continued economic development in Leitchfield, western Grayson County, and southern Breckinridge County.

Study Location and Limits

For this project, the study area is divided into two parts: (1) the primary study area for the development and evaluation of alternative corridors; and (2) the auxiliary study area to be included in the traffic analysis only. The primary study area runs from the Wendell H. Ford Western Kentucky Parkway (WKP) north about 4.5 miles along KY 259 to near Charlie Kiper Road. It extends west about three to four miles from KY 259 to just west of Black Rock Road, excluding the built up portion of the City of Leitchfield. The auxiliary study area runs from the eastern boundary of the primary study area to just west of Fountain View Drive, a distance of about three miles. **Figure ES 1** shows the specific study area boundary.

Figure ES 1: Study Area Boundary



No-Build Conditions Analysis

Overall, in 2003, average daily traffic volumes on the major study area highways ranged from a low of 2,700 on KY 54 near the western edge of the study area to a high of 19,600 on KY 259 on the south side of town. There are current poor traffic conditions (levels of service) on KY 259 and US 62 in both the primary and auxiliary study areas. Certain intersections in downtown Leitchfield also operate below the desired LOS C threshold. Some of these deficiencies will be addressed by projects that are currently planned or under construction (such as the eastern bypass and upgrades to US 62 East) while others could be addressed by projects currently on the unscheduled projects

list (such as upgrades to KY 259 north and US 62 West). However a western bypass may also alleviate traffic demand on some of these facilities by providing a new route (with possible new connections to either KY 259 or the WKP) that will divert traffic from other study area highways.

Connectivity and access in the study area were evaluated to identify any deficiencies in the roadway network. The current highway system west of Leitchfield is mainly a radial system with east-west highways running west from Leitchfield. There are few good north-south connections in the primary study area. The proposed western bypass would directly address this lack of system connectivity. It may also benefit the primary study area (and nearby areas of Grayson and Breckinridge Counties) through improved local and regional access. This would include local access to industry, schools, and developable land; and regional access to and from the WKP and the rest of the state.

Several other issues were identified during the study including truck traffic, highway geometrics, and bicycle and pedestrian facilities. There are a number of truck trip generators north and west of Leitchfield. This truck traffic currently passes through downtown Leitchfield. Even with the eastern bypass, the truck traffic from the west heading to points north and south of Leitchfield will have to pass through town. The proposal for a western bypass may address this issue. The current highway facilities in the primary study area are predominantly rural type roads with narrow lanes and shoulders. As the community develops and traffic volumes increase, these highways may become congested and experience safety issues. Again a new highway west of town may help this situation. Pedestrian facilities are generally in good condition and appear to have adequate connectivity in the major developed areas. There are no known bicycle facilities (bike lanes and/or paths). Many of the roads in the primary study area have relatively narrow lanes and shoulders making bicycling more difficult on these roadways. The same issue applies to pedestrians on these rural type highways.

The safety analysis highlighted a number of high crash sections and issues in the study area. This included high crash sections on US 62 and portions of KY 259, KY 54, and KY 187 in the primary study area. Projects currently under consideration in the area will address many of these concerns. However, a western bypass may also be useful in promoting safe travel conditions in the area. It may also divert traffic from other highways with safety concerns.

Project Issues and Goals

The wide range of project issues to be considered in this study were developed through meetings held with the public, public officials, the project advisory committee, the project team, technical studies, and field reviews. These issues are listed below.

- Traffic in Town
- Vehicle Safety
- Truck Traffic
- New Business Development
- Farmland Impacts
- Construction Cost and Phasing
- Traffic West of Town
- Pedestrian and Bicycle Safety
- Residential Property Access
- Recreational Traffic

- Supporting Current Businesses
- Better Highway Connections
- Community Facility and School Access
- Business and Industrial Property Access
- Property Impacts
- Business Impacts
- Community Character
- Historic and Archeological Resources
- Low-Income, Senior or Minority Populations
- Environmental Issues
- New Residential Development
- Land Use / Zoning
- Mines and Geologic Issues

The goals for this study directly relate to the key issues listed above. These goals were developed with extensive input from the community as well as the project team and technical analysis. The key project goals include:

1. Improve Traffic Flow
2. Improve Safety
3. Economic Development
4. Improve Highway for Trucks
5. Improve Access
6. Enhance System Efficiency / Connections

Corridor Development

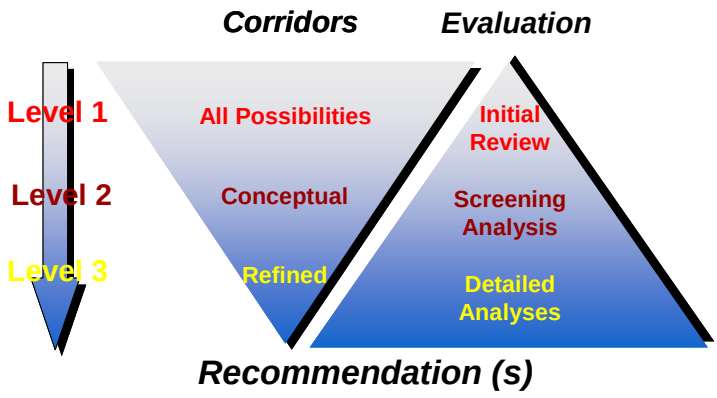
Based on comment form responses obtained from the first public meeting, sixteen corridors were provided by the public. These initial corridors comprise the initial set of corridors analyzed in this study. Several of the proposed corridors had both northern and southern end points on KY 259 at the eastern bypass. Other proposed corridors had a northern end point on KY 259 at the eastern bypass and southern end points at various locations along the Western Kentucky Parkway. A third group of corridors began at locations other than the eastern bypass on KY 259 in the north and ended at various locations along the WKP in the south.

Also included in the initial list of corridors was Alternative 1, the No-Build alternative (which included the eastern bypass). The No-Build alternative provided the baseline for comparison among the different western bypass corridors in addition to being a potential alternative.

Corridor Evaluation

The evaluation process used in this study is a three-step process (See **Figure ES 2**). The goal is to successively refine the list of corridors from all possible corridors, to a short list of promising corridors, and then finally to the recommended corridor. The evaluation begins at Level 1 with a qualitative analysis

Figure ES 2: Three-Level Process



applied to all possible corridors. Corridors advanced to Level 2 are subjected to a more detailed analysis that combines both qualitative and quantitative evaluation criteria. The final level, Level 3, uses the most detailed information about each of the remaining corridors to select the recommended corridor.

The first level of analysis for this study consisted of an evaluation of the initial set of sixteen western bypass options put forth by the public at the first public meeting. These sixteen corridors were refined or replaced by similar but better corridors based on project feasibility and an initial impacts assessment. This resulted in the advancement of fourteen corridors to the second level of evaluation. These fourteen corridors were further refined during the second stage based on public input and technical analysis which considered a broad range of traffic, community, environmental, and economic benefits and impacts. The result of the second level of analysis was the advancement of four preferred corridors to the third level of analysis.

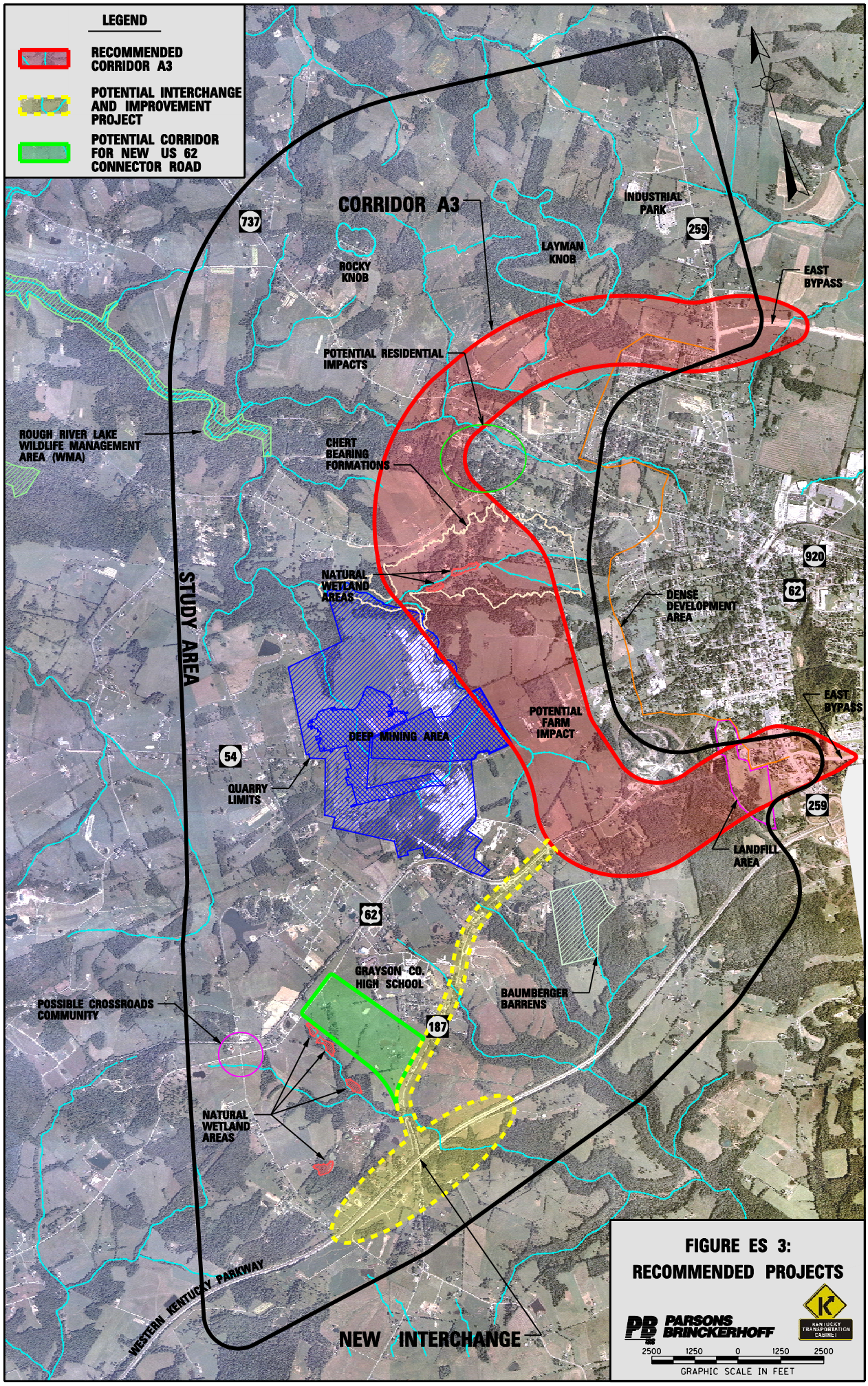
The final set of four corridors was analyzed in detail during the third, and final, level of analysis. This consisted of developing traffic forecasts for each corridor, evaluating specific impacts associated with each corridor such as property and archeological impacts, and developing detailed planning level cost estimates for each corridor. The corridor that appeared to best meet the project goals, with the fewest impacts, and in the most cost-effective manner was selected as the recommendation for the study.

Recommendation

The proposed final recommendation for this study is Bypass Corridor A3 with two additional potential projects; a new WKP interchange at KY 187 with upgrades to KY 187 and US 62, and a new connector road between US 62 and KY 187. **Figure ES 3** shows the recommended projects on a map.

Corridor A3 was selected as the recommended western bypass based on project team input, Project Advisory Committee input, public feedback, and the technical analysis. Overall, Corridor A3 was the most cost effective means of achieving the project goals, while minimizing impacts.

The construction of a new interchange and upgrades to KY 187 and US 62 between the interchange and the bypass is also recommended. This project was supported by the public and viewed as a good project to promote better local access and encourage development. The second project recommended by this study is construction of a new connector roadway between US 62 and KY 187 west of the high school. This would provide an optional route for traffic headed to the interchange from US 62 (west), thereby reducing through traffic on School House Road. Construction of this road is recommended to limit congestion and safety issues in the vicinity of the high school that are likely to result if a new interchange is constructed at the WKP and KY 187.


LEGEND
RECOMMENDED CORRIDOR A3
POTENTIAL INTERCHANGE AND IMPROVEMENT PROJECT
POTENTIAL CORRIDOR FOR NEW US 62 CONNECTOR ROAD
CORRIDOR A3
INDUSTRIAL PARK
LAYMAN KNOB
ROCKY KNOB
EAST BYPASS
POTENTIAL RESIDENTIAL IMPACTS
ROUGH RIVER LAKE WILDLIFE MANAGEMENT AREA (WMA)
CHERT BEARING FORMATIONS
STUDY AREA
NATURAL WETLAND AREAS
DENSE DEVELOPMENT AREA
POTENTIAL FARM IMPACT
DEEP MINING AREA
QUARRY LIMITS
LANDFILL AREA
GRAYSON CO. HIGH SCHOOL
BAUMBERGER BARRENS
POSSIBLE CROSSROADS COMMUNITY
NATURAL WETLAND AREAS
WESTERN KENTUCKY PARKWAY
NEW INTERCHANGE
737
259
920
62
54
187
FIGURE ES 3:
RECOMMENDED PROJECTS
PARSONS BRINCKERHOFF
KENTUCKY TRANSPORTATION CABINET
2500 1250 0 1250 2500
GRAPHIC SCALE IN FEET

Proposed Design and Design Issues, Cost Estimates, and Phasing

For initial planning and cost estimating purposes, conceptual cross-sections were assumed for Corridor A3 based on the forecasted traffic volumes. These are similar to the typical sections used for the eastern bypass to provide appropriate design and continuity between the two highways. The typical sections are:

- KY 259 (south) to US 62 – typical four lane urban section
- US 62 to KY 54 – typical two lane urban section
- KY 54 to KY 259 (north) – typical two lane rural section

For the two lane urban section, right-of-way could be purchased for a four lane ultimate section. The urban typical sections employed for this planning study included sidewalks and the rural sections included paved shoulders wide enough for use by bicyclists.

There are several issues associated with the implementation of Corridor A3 that will likely need to be addressed during the design phase of the project. The first relates to the ownership of mineral rights in the area of Corridor A3, east of the existing mine. Ragland Quarry currently owns the mineral rights in this area with plans to expand its mine to the east and south over the next ten years. Depending on the sequence of events (i.e. whether or not the bypass reaches the right-of-way phase before the mine is expanded into the corridor), potential routes for the new highway could become limited, the Cabinet may have to purchase a portion of the mineral rights, or a corridor or route may need to be preserved if possible. The second issue relates to ongoing development in the corridor, specifically in the vicinity of Sunbeam Road and the area south of US 62. This development may increase the future property impacts and costs for the bypass in these locations.

Environmental mitigation, including dealing with the old Leitchfield landfill, is a third important design issue. The old Leitchfield landfill is located near Corridor A3's southern terminus. While it would be beneficial to completely avoid the landfill, it may be difficult to do so. Efforts should be made to avoid or minimize landfill impacts during the alignment selection. Overall, for the recommended projects, there appear to be three main environmental mitigation costs – archeological resources, potential wetlands, and the crossing of the old municipal landfill. Cost estimates for impacts to these features have been developed and are included in the right-of-way cost. The mitigation estimates are order of magnitude costs based on past experience and professional judgment.

Final planning level cost estimates have been developed for each of the three proposed projects and are listed in the following table (**Table ES 1**). These cost estimates are for planning purposes only and are subject to further refinement during the design phase.

Table ES 1: Recommended Projects Cost Estimates

Project		Length (miles)	Construction	ROW & Project Mitigation	Utilities	Design	Total
Western Bypass A3		6.95	$21.4 million	$14.6 million ($6 million is mitigation cost)	$850,000	$2.6 million	**$39.5 million**
Western Bypass A3 (Phased Project Costs)	Phase 1: KY 259 S to KY 54	2.46	$11.3 million	$10.2 million ($4.5 million is mitigation cost)	$600,000	$1.4 million	$23.5 million*
	Phase 2: KY 259 N to KY 737	1.70	$4.4 million	$1.1 million	$130,000	$600,000	$6.2 million*
	Phase 3: KY 54 to KY 737	2.79	$9.1 million	$3.5 million	$120,000	$1.1 million	$13.8 million*
New Interchange/Upgrades to KY 187 from Interchange to Bypass		2.78	$14.0 million	-	$1.8 million	$1.7 million	**$17.5 million (w/o ROW)**
New Connector between KY 187 and US 62		0.67	$1.6 million	-	$80,000	$400,000	**$2.1 million (w/o ROW)**

Note: All costs are in 2004 dollars
*The sum of the phasing costs is higher than the total cost for Western Bypass A3 because of imbalance between cut and fill.

The Corridor A3 bypass project could be divided into multiple phases if, as a result of funding or other limiting factors, it was determined that construction of the full western bypass was not feasible at one time. A proposed project phasing plan for the bypass is given below in order of project importance (i.e. the first project listed has the highest priority). Costs for each phase are presented in **Table ES 1**.

- Phase 1: Construct portion of western bypass between US 62 and KY 259. If possible, complete construction of western bypass to KY 54 at same time to finish the railroad crossing at US 62.
- Phase 2: Construct portion of western bypass between KY 259 and KY 737.
- Phase 3: Construct portion of western bypass between US 62 and KY 737 if not completed as part of the first phase.

It is recommended that the WKP / KY 187 interchange project (including upgrades to KY 187 and US 62 between the interchange and the Corridor A3 bypass) be constructed separately from and after construction of at least the first phase of the bypass. The second project recommended by this study is construction of a new connector roadway between US 62 and KY 187 west of the high school. If sufficient

funding is available, it is desirable to complete this project as part of the interchange project. However, it could be completed as a separate project at a later date if necessary.

Next Steps / Implementation

Following approval of this report by KYTC, the Project Advisory Committee and the general public will be notified of the final study recommendation. Next, funding could be allocated for the design and implementation of Corridor A3 (phased as necessary based on funding availability). The two additional projects recommended (new interchange at WKP/KY 187 and new connector road between KY 187 and US 62) should be included in the district's long range plan for future construction.

1.0 INTRODUCTION

The Kentucky Transportation Cabinet (KYTC) initiated the Leitchfield Northwest Bypass Study to evaluate the need for, feasibility of, and possible corridors for a western bypass around Leitchfield in Grayson County. The bypass project was proposed to address growing traffic congestion and development pressures in Leitchfield and surrounding portions of Grayson County. It was also proposed to promote continued economic development in Leitchfield, western Grayson County, and southern Breckinridge County. The project was included in the Statewide Transportation Improvement Program (STIP) that was current at the beginning of the study.

Members of the project team included: KYTC District 4, KYTC Central Office Division of Planning, Federal Highway Administration, and the Lincoln Trail Area Development District. KYTC selected the consulting firm of Parsons Brinckerhoff (PB) to lead the study effort. Three specialty subconsultant firms were also employed: Third Rock Consultants for the environmental overview; Cultural Resource Analysts for the cultural historic overview; and Fuller, Mossbarger, Scott, & May for the geotechnical overview.

1.1 Study Objectives

Based on the initial direction provided by the KYTC Division of Planning, the project team developed six primary study objectives as summarized below.

1. Define project issues and goals;
2. Examine environment, traffic, and highway conditions in the study area;
3. Determine where (or if) there are problems or deficiencies;
4. Develop a range of alternative corridors to satisfy the project goals and address the identified problems;
5. Evaluate and compare the proposed alternative corridors (including the no-build option), considering public input as well as transportation, community, environmental, and economic benefits and impacts; and
6. Recommend an alternative corridor or set of alternative corridors for implementation.

While KYTC has the ultimate responsibility for constructing and maintaining safe and efficient highways, KYTC desires to incorporate public and agency input into the evaluation and decision making process. Therefore, all six of these study objectives were completed in coordination with a comprehensive public and agency involvement program.

1.2 Project Location and Study Area

Figure 1: Location of Study Area in Kentucky

The town of Leitchfield is located in Grayson County as shown in Figure 1.

For this project, the study area is divided into two parts: (1) the primary study area for the development and evaluation of alternative corridors; and (2) the auxiliary study area to be included in the traffic analysis only. Figure 2 (Appendix B) shows the specific study area boundary. (Large tables and figures are in Appendices A and B for reference.) The primary study area runs from the Wendell H. Ford Western Kentucky Parkway north about 4.5 miles along KY 259 to near Charlie Kiper Road. It extends west about three to four miles from KY 259 to just west of Black Rock Road, excluding the built up portion of the City of Leitchfield. The auxiliary study area runs from the eastern boundary of the primary study area to just west of Fountain View Drive, a distance of about three miles.

1.3 Study Process

The study process used to evaluate the potential for a western bypass around the City of Leitchfield consisted of four major elements: 1) Define project issues and goals, 2) Develop alternative corridors, 3) Evaluate the alternative corridors, and 4) Recommend an alternative corridor(s).

The subsequent chapters in this report follow these steps, beginning with the development of the key project issues and goals. The following six chapters contain the technical analysis and documentation used to confirm the issues and goals and then develop the corridors. These chapters include an analysis of existing and future no-build highway conditions, a review of related studies, an overview of past and future transportation projects, a summary of the human environment, a summary of the natural environment, and a geotechnical overview. In addition to the technical analysis, public input and feedback was gathered throughout the study process. The framework for including the public in the study process, and agency coordination efforts are presented in the section following the technical analysis. Next, the discussion of the corridor development procedure is presented. Once defined, the initial corridors were subjected to a three-level evaluation procedure. The goal of the three-level evaluation process was to successively refine the list of corridors from all possible corridors (Level 1), to a short list of promising corridors (Level 2), and then finally to the recommended corridor(s) (Level 3). Each of these evaluation levels is presented in the report. The final stage in the study process was to recommend a corridor(s), which is also the final section in this report.

2.0 STUDY ISSUES AND GOALS

Identifying the project issues and goals is critical at the beginning stages of the study process. They provide the initial focus of the study, are used throughout the study to keep it on track, and ultimately form part of the corridor evaluation process used to select the preferred corridor. The initial set of project issues and goals were developed through meetings held with the project team. They were subsequently refined through meetings with the public, public officials, the Project Advisory Committee, field reviews, and technical analysis. The project issues and goals presented below represent the final version.

2.1 Project Issues

The project issues are described below with the issues identified by the public as being most important presented in bold.

Traffic in Town – Currently, there are poor traffic conditions on sections of KY 259 and US 62 in Leitchfield. Certain downtown intersections also operate below the desired Level of Service threshold. Some of the factors contributing to this congestion include: a lack of north-south routes; a radial roadway network; and the fact that all northbound traffic from the Western Kentucky Parkway (WKP) funnels onto KY 259. Some of these deficiencies will be addressed by projects that are currently under construction (such as the eastern bypass, upgrades to US 62 east, and the completion of the Clarkson interchange) while others could be addressed by projects currently on the unscheduled needs list (such as upgrades to KY 259 north and US 62 west). However a western bypass may also alleviate traffic demand on some of theses facilities by providing a new route (with possible new connections to either KY 259 or the WKP) that will divert some traffic from other study area roadways.

Other traffic issues relate to traffic patterns and trip purposes. A few examples follow: There is the potential for significant changes in local traffics patterns due to the new and upgraded highways as well as new development (such as the new Super Wal-Mart on US 62). Commuters from Breckinridge County use KY 737 to access jobs in the Leitchfield area including industrial jobs north of town. At lunchtime employees from the north drive to restaurants located on KY 259 south of town. The relationship between a proposed western bypass and these travel pattern issues was considered during the analysis portion of the study process.

Vehicular Safety – The safety analysis conducted for the study highlighted a number of high crash sections on US 62 and portions of KY 259, KY 54, and KY 187 in the study area. Some of the safety issues identified on these and other study area highways included poor lines of sight, narrow lanes, narrow shoulders, steep grades, curves, lack of turn lanes, limited right-of-way, and angled intersections. Safety is a concern at the at-grade railroad crossings, especially on KY 259 on the north side of town. Grade separation will be proposed for any future crossings. Access control is another potential safety issue in the study area. Projects currently under consideration in the area will

address some of these concerns. However, the proposed western bypass may also be useful in improving safe travel conditions in the area. It may also divert traffic from other highways with safety concerns.

Truck Traffic – Truck traffic is an important part of the state, local and regional economies. However, the truck traffic presents issues for the local transportation system and the community in the areas of: access, highway geometry, safety, and truck noise. There are a number of quarries and industrial sites north and west of Leitchfield. Truck access to these businesses from the WKP and other study area highways (such as US 62) was identified as an issue. This truck traffic currently passes through downtown Leitchfield. Even with the eastern bypass the truck traffic from the west will have to pass through town. The proposal for a western bypass may address this issue. The importance of assessing truck origin / destination patterns generally in the study area was also discussed.

New Business Development / Supporting Current Businesses – Economic growth was an issue that was raised by both the public and community leaders. One major focus for economic development in Grayson County is manufacturing and industrial growth. Several industrial plants are located north of town with surrounding parcels still available for future businesses and development. Access for both truck and automobile traffic is viewed as important for expansion of the existing economic base. In addition, residential development is occurring throughout the study area, with new subdivisions under construction in several locations west of Leitchfield. New commercial development in Leitchfield is occurring primarily east of town on US 62 (i.e. Super Wal-Mart), with some development in other areas.

Improving access and mobility for current businesses was a related issue raised by the pubic. Overall, the preservation of current businesses is desired, as is the attraction and development of new businesses in the area. Both of these objectives will be more achievable with improved access to and from key regional and local highways. The project should consider both ongoing and future economic development.

Farmland Impacts – Avoiding or minimizing impacts to farmland is another issue highlighted by many members of the public. There are a number of farming operations in the western part of the study area. These farm operations will be considered in the evaluation.

Better Highway Connections / Traffic in the West – Connectivity and system efficiency is an issue. The current highway system west of Leitchfield is mainly a radial system with east-west highways running west from Leitchfield. There are few good north-south connections in the primary study area. The proposed western bypass would directly address this lack of system connectivity. The bypass could also improve traffic flow in the west. A related issue, to be considered for maintaining traffic speeds and flows, is access control, especially on new highways.

Local and Regional Access – Improving access in the study area for business, industry, schools, residential areas, developable land, recreational facilities, and other public facilities (such as the National Guard Armory) is an issue. Improved local and regional

access may also benefit nearby areas of Grayson and Breckinridge Counties. This could include improved access to and from the WKP and thereby the rest of the state. Grayson County High School, located between US 62 and KY 187, is a major traffic generator. It is expected that a new western bypass could benefit traffic associated with the school.

Property and Business Impacts – The potential for impacts to residences, businesses, community facilities, as well as other potential property impacts will be assessed in the evaluation phase of the study.

Construction Cost and Phasing – Construction cost and project phasing were highlighted as key issues. This includes the issue of whether a proposed new highway might be built in sections with the highest priority section being built first.

Pedestrian and Bicycle Safety – Pedestrian and bicycle safety was identified primarily as an issue in the auxiliary study area. Pedestrian facilities are primarily limited to the town of Leitchfield and are not likely to have a major impact on this study outside of this area. However, bicycle use occurs throughout the study area and is promoted by the Grayson County Bicycle Club. Therefore, at the request of the public and in keeping with current KYTC policy, bicycle facilities will be considered for any new roadway(s) proposed by the study.

Recreational Traffic / Destinations – Both Nolin Lake State Park in the south and Rough River State Park in the north are major recreational destinations with access via KY 259. Recreational traffic (RVs and vehicles pulling boats) was presented as an issue for consideration in the study.

Community Character / Quality of Life – Another issue is maintaining and preferably enhancing the community character and quality of life in Leitchfield. This includes building on the attributes of the community that make it appealing, while also facilitating new development. Understanding the impacts of new projects on the community will be an important aspect of the study. Related to this topic, the fact that Grayson County does not have local zoning, while the City of Leitchfield does have zoning, will be considered in the examination of the corridors because of the interaction between land use and transportation.

Historic and Archeological Resources and Cultural / Archeological Preservation – There are no known sites that are or potentially are eligible for the National Register of Historic Places. There is one archeologically significant site known as the Day Cliffs. This area is known to contain rock shelters and is located in the vicinity of the quarry. Preservation of this site and other potential significant historic or archeological sites scattered throughout the study area is important.

Mines, Geology, and Hazardous Materials – The study area contains two large rock quarries, with major underground and above ground mining operations. The underground mines are extensive, and there are significant issues related to ground stability in the vicinity of the quarries. Sink holes are reported to be common around the quarries. There are also junkyards, old quarries, one landfill, and a transfer station

located within the study area. Avoidance, minimization, and/or mitigation should be pursued with respect to these sites.

Other Environmental Issues – There are a number of natural areas located within the study area that may contain threatened or endangered species. The northwest corner of the study area contains a small portion of the Rough River Wildlife Management Area. Wetlands and blue line streams are also present in the study area.

Low-Income, Senior or Minority Populations – A preliminary analysis of the study area revealed that there are potential high concentrations of low-income, senior citizen and minority populations in the southeastern part of the study area when compared to the county and state. Because of these relatively high concentrations, the potential exists for an Environmental Justice community within this area. The study includes the identification of impacts to residents of this area as a result of the proposed corridors and efforts have been made to reach out and engage them in public involvement activities throughout the study process.

Local Highway Projects in Planning or Under Construction – Several improvement projects have been identified that are on-going within the study area. These include upgrading the Clarkson Interchange, upgrading the KY 259 / WKP Interchange, US 62 widening from KY 259 to the eastern bypass, a hazard elimination project at US 62 / KY 187, and completing the eastern bypass. A portion of the eastern bypass has already been constructed with work underway to finish the remaining sections. These projects are included in the planning process for this study.

2.2 Project Goals

The goals for projects to be evaluated in the Leitchfield Northwest Bypass Study directly relate to the issues discussed above. The goals are presented below in the order in which they were ranked by the public, with number one being the most important.

1. Improve Traffic Flow
2. Improve Safety
3. Economic Development
4. Improve Highway for Trucks
5. Improve Access
6. Enhance System Efficiency and Connections

Overall, the project goals and issues were critical to the success of the study. The issues were referred to during the study to make sure that all key aspects were given proper attention. They were also used to develop the project corridors. The goals were used to focus the study and to bring it to completion. They were also used to evaluate the corridors and to make sure the final recommendations achieved the goals set for the project.

3.0 EXISTING AND FUTURE NO-BUILD CONDITIONS

To determine if there are deficiencies or problems with the existing highway, a detailed analysis was completed looking at traffic volumes, highway geometrics, truck traffic, levels of service, crash rates, and other key issues. The analysis considered current and future traffic conditions assuming no changes to the current highway except for projects currently in the KYTC Six-Year Highway Plan. In support of the analysis, highway and traffic data was collected from a variety of sources including:

- KYTC Highway Information System database
- KYTC District 4 data sources
- Study area field reviews
- Peak period turning movement traffic counts
- 24-hour vehicle classification counts

3.1 Highway Characteristics and Average Daily Traffic Volumes

Within the study area there are six major state highways. They include:

- KY 259 (Main Street/Brandenburg Road)
- US 62 (Beaver Dam Road/West White Oak Street/Main Street/Mill Street/Elizabethtown Road)
- KY 54 (West Main Street./Owensboro Road)
- KY 737 (Lilac Road)
- KY 187
- Wendell H. Ford Western Kentucky Parkway (WKP)

Average daily traffic volumes for these highways are given in Figure 3 (Appendix B). A highway characteristics summary is included as Table 1 (Appendix A). The characteristics are listed by highway section as shown on Figure 4 (Appendix A). This figure can be found with Table 1 in Appendix A since they are directly related.

KY 259 is the major north-south route through the study area. It also is one of the two most heavily traveled highways in the study area with an average daily traffic volume of 19,600 just south of town. Volumes outside of town however, drop to below 5,000 vehicles per day. KY 259 is a rural minor arterial with 2 to 5 lanes depending on location. It has a posted speed limit of 35 miles per hour (mph) in town and 55 mph north and south of town. It has narrow (9-foot) lanes north and south of town. It provides the most direct connection between the study area and the Western Kentucky Parkway. At East Lake Drive, a short first section of a new eastern KY 259 bypass route has been constructed. It is five lanes and provides access to the local hospital.

US 62 is a major east-west route through the study area. Is carries over 19,000 vehicles per day in town, as well as considerable volumes east of town, but at the far west edge of the study area, traffic drops to below 4,000 vehicles per day. US 62 is classified as a rural major collector east and west of town and as a rural minor arterial in town (where US 62 supercedes KY 259 as the lower numbered route through town as shown on Figure 4). It is a two-lane road over most of its length, with a posted speed

limit of 35 mph in town and 55 mph in the rural areas. Lane widths are 10-feet through most of the study area. West of town, US 62 provides access to Caneyville, many local businesses, the Grayson County High School, and a quarry.

KY 54 is the other major east-west route in the study area, though it carries less traffic than US 62 (peaking at 6,300 near town). It is classified as a rural major collector. It is a two-lane road with 10-foot lanes and a posted speed of 55 in the rural areas and 35 in town. It provides access for quarry traffic and other business and residential traffic west of Leitchfield. It connects to US 62 at the courthouse square.

KY 737 is a two-lane minor collector running northwest from KY 259 into Breckinridge County. It carries modest traffic volumes (3,000 to 4,000 vehicles per day) and has a posted speed limit of 55 mph over most of its length. It is important, however, as a commuter route for some of the 600 - 700 daily commuters from Breckinridge County into Grayson County.

KY 187 is another rural two-lane minor collector, with an average traffic volume of 3,800 vehicles per day in 2003. It has 9-foot lanes and a posted speed limit of 55 mph. It provides access from the study area southwest toward KY 70 in Edmonson County. It also provides access to the Grayson County High School and the National Guard Armory.

The Wendell H. Ford Western Kentucky Parkway (WKP) is the major regional facility serving the study area. It is an east-west, four-lane divided highway and is classified as a rural principal arterial. It carries approximately 8,000 vehicles per day in the study area and has a posted speed limit of 65 mph. It has interchanges at Caneyville west of the study area, at KY 259 (serving Leitchfield), and at Clarkson east of the study area. The Clarkson interchange also provides access to the study area from the east via US 62.

It is important to note that all but one of the major highways in the primary study area are east-west routes. There are few north-south routes in the primary study area, leading to a lack of north-south connectivity between the various portions of the area. This situation is further exacerbated by the presence of the railroad line running parallel to US 62. This lack of connectivity causes drivers to travel longer distances (often through downtown Leitchfield) to reach their desired destinations.

Overall, in 2003, average daily traffic volumes on the major study area highways ranged from a low of 2,700 on KY 54 near the western edge of the study area to a high of 19,600 on KY 259 on the south side of town. The posted speed limit ranges from 55 mph on the outskirts of town to 35 mph in the center of town. The Western Kentucky Parkway has a posted speed limit of 65 mph.

Many of the area highways have lane widths of 9 and 10 feet (with the notable exception of the WKP and the in town portions of KY 259). The average shoulder width throughout most of the primary and auxiliary study area is 3 feet (combination type shoulders) with the exception of the Western Kentucky Parkway, which is 10 feet (paved shoulders).

The majority of highways in the study area have adequate geometric conditions, but there are several locations with limited sight distance, narrow lanes and inadequate shoulders. There are also no turn lanes on most of the highways outside of town and even KY 259 / US 62 in town does not have turn lanes at all of the major intersections.

Narrow Lanes and Shoulders

Field observations have revealed that heavy trucks experience difficulties navigating some roadways in Leitchfield. For example, the intersection of KY 54 and US 62 / KY 259 (at the courthouse square) is a traffic circle and can sometimes restrict truck traffic flow through town. The narrow lanes and shoulders are also an issue for local truck traffic.

The Paducah and Louisville Railway (P&L) runs through the study area, paralleling US 62. It is a Class II railroad (the only one in Kentucky) as defined by the Surface Transportation Board. The primary commodity hauled is coal with some chemicals and clay, limestone, and rock hauled as well. Annual carloads on this line range from 150,000 to 200,000.

RR Crossing in Town

An at-grade railroad crossing is located on the north side of town where the P&L crosses KY 259. The crossing is on the crest of a hill with a steep grade on one side. Sight distances are limited.

3.2 Truck Volumes

Vehicle classification counts on major study area roadways were obtained to examine recent truck percentages as well as historic trends. They are also useful in determining truck origin / destination patterns. Classification counts were taken on various highways between 1981 and 2001 as shown in Table 2. Between 1981 and 2001, truck percentages ranged from a low of 2.9% on

Large Truck at Courthouse Traffic Circle

KY 259 in 1986 to a high of 38.2% on the Western Kentucky Parkway in 1998. 2002 Statewide averages for similar highway facilities are shown for reference. The count station locations are shown in Figure 5 (Appendix B).

Table 2: Historic Vehicle Classification Counts on Study Area Roadways and Average Statewide Truck Percentages

Route	Milepoint	Count Station	General Location	Year	ADT	Axles per Truck	Percent Trucks	2002 Statewide Average Truck %
KY 259	12.3	A45	KY 259 at Sunrise Dr.	1995	10,500	3.509	7.4%	14.0%
	15.0	A01	KY 259 at Kenneth H. Goff Rd.	1984	1,606	2.483	9.0%	
	15.0	A01	KY 259 at Kenneth H. Goff Rd.	1986	1,800	2.350	2.9%	
US 62	20.5	A43	US 62 at Henninger Dr.	1998	8,140	2.959	8.4%	12.4%
	21.6	A11	US 62 at KY 920	1991	12,100	2.959	3.5%	
	21.6	A11	US 62 at KY 920	1998	14,100	3.118	6.5%	
	22.3	321	US 62 at Shaw Station Rd.	1991	6,850	3.114	4.2%	
	22.3	321	US 62 at Shaw Station Rd.	1998	8,200	3.325	4.4%	
	23.2	313	US 62 at Fountain View Dr.	1981	4,195	2.471	6.2%	
	23.2	313	US 62 at Fountain View Dr.	1985	4,838	2.719	6.8%	
	23.2	313	US 62 at Fountain View Dr.	1989	5,200	2.527	5.9%	
	23.2	313	US 62 at Fountain View Dr.	1989	5,200	2.579	5.9%	
	23.2	313	US 62 at Fountain View Dr.	1997	8,680	3.180	5.0%	
	23.2	313	US 62 at Fountain View Dr.	1998	7,770	3.357	4.4%	
	23.2	313	US 62 at Fountain View Dr.	2001	7,930	3.219	6.2%	
KY 54	14.3	530	KY 54 Between Emmett Gray Rd. and Clifty Creek Culvert	1998	2,640	2.818	6.7%	12.4%
KY 187	9.7	257	KY 187 at Brother Cann Rd.	1990	3,562	2.594	7.1%	10.3%
WKP	91.0	560	WKP at Dog Creek Culvert	1992	3,790	4.384	28.7%	17.8%
	91.0	560	WKP at Dog Creek Culvert	1998	7,820	4.327	38.2%	
	91.0	560	WKP at Dog Creek Culvert	2001	7,590	4.093	31.0%	
	-	A63	Ramp	2000	1,290	3.697	13.3%	
	-	A64	Ramp	2000	888	3.704	29.1%	

Source: KYTC Multimodal Programs 2002 Vehicle Classification Database; Statewide 2002 Avg. Truck % from Traffic Forecasting Report 2003, KYTC Division of Multimodal Programs, August 2003, Page 20.

Notes:

- The milepoint and general location of Count Stations A45, 321, 313, and 257 was modified in this table to reflect the count station locations as identified on the Traffic Count Station map for Grayson County. Refer to note for Figure 5 for additional information regarding this modification.
- The 2002 Statewide Average Truck % is given for similar highways classifications in Kentucky.

The most recent data for KY 259 (south of town) indicates a truck percentage of 7.4 percent. On US 62, only one of the count stations was located west of town. It showed

a truck percentage of 8.4 percent in 1998. The other stations were all located east of town and had slightly lower truck percentages ranging from 3.5 to 6.8 percent. All of these numbers are below the statewide average of 12.4 percent. On KY 54 and KY 187, truck percentages are around 7 percent, though the data is somewhat dated, especially for KY 187.

Truck percentages on the Western Kentucky Parkway are clearly the highest of any of the study area highways with the most recent count showing 31 percent trucks east of Leitchfield. The WKP ramps also have relatively high truck percentages of 13.3 percent and 29.1 percent. The mainline count percentages have fluctuated over time, but appear to have increased since the early 1990s.

Overall, most of the truck percentages on the study area roadways are below the statewide average, except for the Western Kentucky Parkway which has truck percentages much higher than the statewide average of 17.8 percent. Based on the vehicle classification data presented above, the other highways in the study area (excluding the WKP) have a fairly even distribution of truck traffic with an average truck percentage of seven percent. While it is difficult to detect an overall trend for truck percentages in the study area, it is clear from the data that trucks make up a substantial portion of the traffic stream, especially on the Western Kentucky Parkway. The socioeconomic analysis and community input also indicated the importance of truck traffic to the local economy.

3.3 Traffic Analysis Methodology

Study Intersections and Highway Segments

The Leitchfield Northwest Bypass Study in Grayson County focused on critical intersections and highway segments in the study area. Specifically, traffic operations were examined at the following locations:

Intersections

- KY 259 / Western Kentucky Parkway Eastbound Ramps
- KY 259 / Western Kentucky Parkway Westbound Ramps
- KY 259 / East Lake Drive
- US 62 (West White Oak Street) / KY 259 (South)
- US 62 / KY 54 (West Main Street)
- US 62 (Mill Street) / KY 259 (North)
- KY 259 / KY 737 (Lilac Road)

Highway Segments

- KY 259 – Bloomington Road to Kiper Road
- US 62 – Fountain View Drive to western primary study area boundary
- KY 54 – US 62 to western primary study area boundary
- KY 187 – US 62 to KY 1133
- KY 737 – KY 259 to western primary study area boundary
- Western Kentucky Parkway from MP 102.3 to MP 109.0

Intersection Analysis

For this analysis the Highway Capacity Software package (HCS 2000) was used to assess the peak period traffic operating conditions respectively. This software package implements the Highway Capacity Manual (HCM) intersection analysis method. For each study intersection, average vehicle delays were calculated as well as the resulting levels of service (LOS).

Level of service (LOS) is a qualitative measure of expected traffic conflicts, delay, driver discomfort, and congestion. Levels of service are described according to a letter rating system ranging from LOS A (free flow, minimal or no delays – best conditions) to LOS F (stop and go conditions, very long delays – worst conditions). For intersections the Highway Capacity Manual (2000) defines levels of service based on the average delay due to signal or STOP control as shown in Table 3.

Table 3: LOS Criteria for Intersections

LOS	Signalized Intersections Control Delay (seconds vehicle)	Unsignalized Intersections Control Delay (seconds/vehicle)
A	≤ 10	≤ 10
B	>10 – 20	>10 – 15
C	>20 – 35	>15 – 25
D	>35 – 55	>25 – 35
E	>55 – 80	>35 – 50
F	>80	>50

Source: Highway Capacity Manual (2000)

In general terms, a facility is considered to have reached its physical capacity at LOS E. However, for rural conditions, LOS B or C is usually considered the threshold for desirable traffic conditions. In this study, LOS C is used as the threshold. Operations below this threshold are noted as undesirable and warrant improvement. LOS C corresponds to ≤ 35 seconds of delay per vehicle at a signalized intersection and ≤ 25 seconds of delay at an unsignalized intersection. (Refer to the HCM published by the Transportation Research Board for more specific information.)

Rural Two-Lane Highway Analysis

A peak hour traffic operations analysis was prepared for major study area roadway segments using the HCS 2000 two-lane road analysis package. This is based on the 2000 HCM. For this method, there are two classes of roadways: Class I highways include higher speed arterials and daily commuter routes, while Class II highways include lower speed collector roadways and roads primary designed to provide access. Driver expectations regarding speed and flow are important in determining a highway's class. KY 259 and US 62, as the major through routes in the study area, were considered Class I highways. KY 54, KY 737, and KY 187 were considered Class II highways because they are classified as collectors and typically provide access in the study area.

Levels of service for Class I highways are based on the estimated average travel speeds and percent time vehicles spend following other vehicles as shown in Table 4. Levels of service for Class II highways are defined only in terms of the percent time vehicles spend following other vehicles. Average travel speed is not considered since drivers typically will tolerate lower speeds on a Class II facility because of its function as an access roadway (serving shorter trips and fewer through trips). Refer to the HCM for more details.

Table 4: LOS Criteria for Two-Lane Highways

LOS	Class I Highways		Class II Highways
	Percent Time Spent Following	Average Travel Speed	Percent Time Spent Following
A	≤ 35	>55	≤ 40
B	>35 - 50	>50 – 55	>40 – 55
C	>50 - 65	>45 – 50	>55 – 70
D	>65 – 80	>40 - 45	>70 – 85
E	>80	≤40	>85
F	LOS F applies whenever the flow rate exceeds the capacity		

Source: Highway Capacity Manual (2000)

Again, LOS C is the threshold for desirable traffic operations in this study. Operations below this threshold are noted as undesirable and warrant improvement. For Class I highways, the LOS C threshold corresponds to an average travel speed of >45 miles per hour with ≤65 percent time spent following another vehicle. For Class II highways, the LOS C threshold corresponds to ≤ 70 percent time spent following another vehicle. (Refer to the HCM for more specific information.)

Freeway Analysis

To analyze peak hour traffic operations on the Western Kentucky Parkway, the Highway Capacity Software freeway analysis package was used. This is based on the 2000 Highway Capacity Manual (HCM Chapter 23) methodology. For each section, the estimated travel speed and the resulting levels of service (LOS) were calculated.

Levels of service for freeway sections are based on density in terms of passenger cars per mile per lane as shown in Table 5. Density is used to define levels of service because it is an indicator of freedom to maneuver within the traffic stream and the proximity to other vehicles. Speed in terms of mean passenger-car speed and volume-to-capacity (v/c) ratios are interrelated with density and can be used to characterize a freeway segment.

Table 5: LOS Criteria for Freeways

LOS	Density Range (pc/mi/ln)
A	0 – 11
B	> 11 – 18
C	> 18 – 26
D	>26 – 35
E	> 35 – 45
F	> 45

Source: Highway Capacity Manual (2000)

Similar to intersection and rural two-lane highway analysis, LOS C is the threshold for desirable traffic operations used in this study. For freeways, a LOS C corresponds to a density between 18 and 26 passenger cars per mile per lane. (Refer to the Highway Capacity Manual for more specific information.)

3.4 Existing Traffic Operating Conditions

Intersection Level of Service and Delay

In order to determine the turning movements at the key intersections, peak period traffic counts were performed at the seven study intersections on May 14 and 15, 2003. Hourly traffic data for nearby count stations were examined to determine the peak traffic periods to be counted. The peak periods were 12:00 to 2:00 PM CT (MIDDAY peak) and 4:00 PM to 6:00 PM CT (PM peak) for most of the study intersections. Turning movement counts were conducted during both of these periods and the highest peak hour for each was selected for use in the analysis. Intersection geometry, signal timings, and other necessary traffic operations data was also collected and used to evaluate the intersection operations.

Typical weekday traffic operating conditions were determined for both the MIDDAY and PM peak hours. Table 6 in Appendix A lists the level of service and delay for each approach. For the unsignalized intersections, the Highway Capacity Software does not calculate whole intersection levels of service. As a result, only intersections 2, 3, 4, and 6 have an overall intersection delay and level of service. Figure 6 (Appendix B) shows the lowest overall intersection level of service for the signalized intersections and the lowest approach level of service for each of the unsignalized intersections.

Most of the intersections operate above or at the desirable LOS C threshold. US 62 (Mill Street) / KY 259 (North) operates at a LOS D in the PM peak period, which is just below the desirable threshold level. The analysis also showed that some of the intersections that currently operate at LOS C are on the border of operating at a LOS D based on the average delay value. These intersections include KY 259 / East Lake Drive and US 62 (W. White Oak Street) / KY 259 (South). These intersections will most likely experience traffic operational problems in the future.

Two-Lane Highway Level of Service and Delay

The current traffic volumes and roadway characteristics were used to evaluate operating conditions on all of the major study area roadways. Peak hour traffic volumes for highway segments were estimated based on the average daily traffic volumes for those segments. Based on the available data, between 11.1 and 11.6 percent of the daily traffic volume occurs during the peak hour of the day. The current lane widths, shoulder widths, percent passing, and other design factors were also used.

With the exception of KY 259 and US 62, all roadway segments operate at an acceptable level of service. All segments of KY 259 and US 62 operate at a level of

service E or D, which is below the desirable LOS threshold of C. The poor levels of service are a result of low estimated travel speeds (<45 mph) which are attributable to a number of factors including narrow lanes and shoulders, truck traffic, grade, and high traffic volumes. The segment levels of service are listed in Table 7 (Appendix A) and illustrated on Figure 6.

Freeway Level of Service and Delay

Similar to the two-lane highway analysis, current traffic volumes and roadway characteristics were used to evaluate operating conditions on the Western Kentucky Parkway. For this analysis, it was estimated that 10.6 percent of the daily traffic volume occurs during the peak hour of the day. Peak hour traffic volumes for the Western Kentucky Parkway were calculated based on this estimate.

The analysis showed both roadway segments operate at level of service A or B. Estimated travel speeds are approximately 65 mph, indicating low levels of delay are experienced on this roadway. Segment levels of service are listed in Table 7 and illustrated on Figure 6.

3.5 Future No-Build Traffic Operating Conditions

Traffic forecasts were developed for the no-build scenario with and without the eastern bypass for the future year 2030. The future projections without the eastern bypass provided a baseline for completing the future year reassignment of traffic to the eastern bypass. Two other projects impacting the traffic forecasts included in both scenarios are: 1) improvements to the Clarkson interchange and 2) reconfiguration of the KY 259 / WKP interchange (Refer to Sections 4.0 and 5.0). Improvements to the Clarkson interchange are expected to reduce traffic volumes on US 62 and increase them on the WKP. The reconfiguration of the KY 259 / WKP interchange alters turning movements at the ramp intersections due to the new geometrics.

The methodology and findings for the future no-build traffic forecasts are summarized below. The complete traffic forecast report is included for reference in Appendix C, including all figures and tables detailing the forecasted traffic volumes.

Traffic Forecast Methodology

In order to determine future baseline no-build traffic volumes without the eastern bypass, a growth factor was applied to current year traffic volumes. Historic traffic data, historic and projected population data, data from other studies, and statewide averages were all considered in determining the appropriate traffic growth rate for the study area. Typically, growth rates used to calculate future traffic volumes are annual growth rates compounded over time. A thorough review of historic traffic data determined that traffic was growing at slightly different rates in different parts of the study area. Figures 7 – 10 in Appendix B show the traffic growth patterns and average growth rates over approximately the last twenty years for the major highways in the study area. Overall, average rates for the different parts of the study area ranged from 1.8 percent per year

in the center of town to 3.0 percent per year east of town, but were closer to 2.8 percent per year north and west of town. The system wide average was determined to be approximately 2.5 percent per year. This system wide average matched the rate used in the Clarkson Interchange Study which was performed by Jordan, Jones, and Goulding in 2002. The 2.5 percent per year growth rate was therefore used throughout the study area.

To develop future traffic forecasts for the no-build scenario with the eastern bypass, the Manual Gravity Technique was employed. First, a simple network of major highways was selected for the analysis. The future traffic volumes for the no-build scenario without the eastern bypass were used as the baseline traffic volumes for this forecast. Next, origin-destination flows were estimated between points on the system. Based on calculated travel times and distances, traffic was reallocated to the bypass and redistributed through the system using the California diversion curve equation. The results of these forecasts are discussed below.

No-Build Traffic Volumes without the Eastern Bypass

Attachments 1 through 3 in Section 1 of Appendix C show the projected 2003 and 2030 average daily traffic volumes for this scenario. Current average daily traffic volumes are around 16,000 to 18,000 in town. US 62 east and west of town also carries substantial traffic. Much smaller volumes are present on the outlying highways in the rural areas such as KY 737, KY 187, and KY 54. By 2030, without completion of the eastern bypass, daily traffic volumes in town could exceed 30,000. Traffic volumes on US 62 east of town also could exceed 30,000.

No-Build Traffic Volumes with the Eastern Bypass

Attachments 4 through 6 in Section 1 of Appendix C show the projected 2003 and 2030 average daily traffic volumes for the no-build scenario with construction of the eastern bypass. Construction of the eastern bypass will decrease 2003 volumes on US 62 and KY 259 in town by about 2,000 to 5,000 vehicles per day depending on the location. 2003 traffic volumes on the eastern bypass itself range from 8,800 at KY 259 (South) to 1,900 near KY 259 in the north. The volume drops off as it progresses north with decreases at each of the major intersections. Two reasons for the larger volumes in the south are that the southern portion of the eastern bypass connects two large activity centers (the Wal-Mart retail area in the east and the WKP interchange retail area in the south) and two highways with considerable traffic volumes (US 62 East and KY 259 South).

The 2030 volumes show an increase in traffic on the eastern bypass as well as a larger reduction in traffic going trough town. In 2030 the decrease is as much as 8,500 vehicles per day, keeping the total through volume below 30,000. However, traffic on the eastern bypass does not grow as much as it would without completion of the

Clarkson interchange. The completion of this interchange removes approximately 1,700 vehicles from the US 62 East / KY 259 south corridor. Overall traffic on the eastern bypass in 2030 will be approximately 16,500 to 6,800 ADT in the south and 4,500 to 3,700 ADT in the north.

2030 Intersection Level of Service and Delay

No-build scenario levels of service were evaluated for the key intersections using the projected traffic volumes. The key intersections are the same as the ones evaluated in the 2003 analysis with the exception of US 62 (KY 259) / KY 54 and KY 259 / KY 737. The intersection of US 62 / KY 54 was not analyzed since the irregular geometry of the intersection does not allow for a traditional analysis using the HCS software. The KY 737 intersection was not included in the analysis since it is currently unsignalized and was considered to not be critical to the analysis. To accurately reflect the future highway system, it seemed appropriate to perform future traffic analysis with the eastern bypass. Portions of the bypass are complete now, and the whole bypass should be completed by the future analysis year of 2030. Therefore, the projected volumes used for the 2030 future year LOS analysis take into account the eastern bypass,

Table 8 below shows the 2030 no-build intersection levels of service and delay. The 2003 levels of service and delay are shown for reference.

Table 8: No-Build Intersection Levels of Service

Int. No.	Intersection	Type	Design Hour	2003		2030	
				Ave. Delay	LOS	Ave. Delay	LOS
1	KY 259 / Western Kentucky Parkway Eastbound Ramps	STOP Controlled on Ramp	Midday	**11.0**	**B**	**31**	**C**
			PM	**12.1**	**B**	**22**	**C**
2	KY 259 / Western Kentucky Parkway Westbound Ramps	Signal	Midday	**17.9**	**B**	**24**	**C**
			PM	**19.1**	**B**	**30**	**C**
3	KY 259 / West Lake Drive / East Bypass (South)	Signal	Midday	**33.2**	**C**	*	**F**
			PM	**33.2**	**C**	*	**F**
4	US 62 (W. White Oak Street) / KY 259 (South)	Signal	Midday	**34.0**	**C**	*	**F**
			PM	**34.1**	**C**	*	**F**
6	US 62 (Mill Street) / KY 259 (North)	Signal	Midday	**34.2**	**C**	*	**F**
			PM	**40.1**	**D**	*	**F**

Note: Only the 2030 analysis includes the eastern bypass. LOS for the unsignalized intersections is the lowest LOS for the controlled movements.

The two KY 259 / WKP interchange intersections remain at acceptable levels of service in 2030. The intersections through town, however, fall below the desirable LOS C threshold, even with the eastern bypass in place. Construction of a western bypass

may remove enough traffic to improve the levels of service from LOS F. However, intersection capacity enhancements (such as turn lanes and even through lanes) may be required to improve traffic operations to an acceptable level of service through town.

2030 Highway Level of Service

No-build scenario levels of service were also calculated for all the major highways. The highway sections are the same as those used in the 2003 analysis. The traffic volumes used in the 2030 analysis are the projected volumes for the no-build scenario with the eastern bypass, similar to those used for the 2030 intersection analysis. Table 9 in Appendix A shows the levels of service for each of the highway sections.

The KY 259 and US 62 sections remained below LOS C even with the construction of the eastern bypass. Most other highways remained at the same LOS, with a few sections falling one letter grade. Two sections of KY 54 degraded from a LOS C to a LOS D. Levels of service for the WKP drop from LOS A/B to LOS C.

2030 Eastern Bypass Analysis

With traffic volumes increasing throughout the study area, the construction of the eastern bypass overall lessens the decline of traffic operations at the intersections and highway sections analyzed. Most of the eastern bypass will operate at LOS B/C in 2030, which is above or at the desirable LOS threshold. However, two sections between US 62 and Wallace Avenue are predicted to operate at LOS D. It is possible that this could be raised to LOS C depending on the percent passing and other design criteria used in constructing these sections. Overall, the eastern bypass should operate acceptably in the future analysis year of 2030.

3.6 Crash Analysis

Crash Analysis Methodology

The Kentucky Transportation Cabinet provided crash data for a three-year period from January 1, 2000 through December 31, 2002. Crash rates were computed for specific segments of each major roadway in the study area using the methodology provided in the crash analysis report periodically published by the Kentucky Transportation Center (KTC)[3]. The section crash rates are based on the number of crashes on a specified section, the average daily traffic on the roadway, the time frame of analysis, and the length of the section. They are expressed in terms of crashes per 100 million vehicle-miles. A section's crash rate was then compared to a statewide critical crash rate[4] derived from critical crash rate tables for highway sections in the KTC crash report (Appendix D of KTC crash report). This comparison is expressed as a ratio of the

[3] Analysis of Traffic Crash Data in Kentucky (1997 – 2001), Kentucky Transportation Center Research Report KTC-02-22/KSP2-01-1F. A more recent version is available for 1999 – 2004.

[4] The critical crash rate is the threshold above which an analyst can be statistically certain (at a 99.5% confidence level) that the section crash rate exceeds the average crash rate for a similar roadway and is not mistakenly shown as higher than the average due to randomly occurring crashes.

section crash rate to the critical crash rate and is referred to as the critical crash rate factor. Sections with a critical crash rate factor greater than one are considered high crash locations and are potential candidates for safety improvements.

The section crash rate is also compared directly to the statewide average crash rate presented in the KTC crash report. The statewide averages consider all crashes for a specified period that are listed in the Collision Report Analysis for Safer Highways (CRASH) database maintained by the Kentucky State Police and stratified by functional classification (Table A-1 in KTC crash report). Section rates that exceed the statewide average crash rate but not the critical crash rate may be problem areas, but they are not statistically proven to be higher crash areas. Therefore, this second comparison is used to identify a second tier of highway sections that may have crash problems and could be considered for safety improvements if warranted based on further analysis.

Section Crash Analysis

For the major roadways within the study area, several of the observed section crash rates exceed the critical crash rate for that roadway type. The critical crash rate factors ranged from 0.09 to 2.58. All of US 62 and portions of KY 259, KY 54 and the Western Kentucky Parkway have crash rates that exceed the critical crash rate. Other sections are not confirmed high crash rate sections (i.e. they do not exceed the critical crash rate), but their current crash rates exceed the statewide average crash rate. This includes two sections of KY 259 and one section of KY 187. Table 10 (Appendix A) shows the crash statistics for the segments analyzed and Figure 11 (Appendix B) shows the segments on a map.

Spot Crash Analysis

In addition to high crash sections, there have been other sections identified as having crash clusters. Figure 12 (Appendix B) shows the locations of crashes by severity for January 1, 2000 through December 31, 2002. To determine if any of these crash clusters exceeded critical crash rates, a spot crash analysis was conducted for all segments. A spot location is defined as a section of highway 0.3 miles in length. The methodology used to calculate the spot crash rates is similar to that used for calculating the section crash rates. The crash rates at these “spots” were compared to the critical crash rates for similar facilities derived from critical spot crash rate tables in the KTC crash report (Appendix E in KTC crash report). The initial analysis looked at the sections that were not identified as high crash sections. Table 11 (Appendix A) lists the spots exceeding the critical crash rate for these sections and Figure 11 shows the locations for these high spot crash locations.

To isolate the critical spot locations within the high crash segments, a spot analysis was then conducted for all segments with a crash rate exceeding the critical crash rate. Table 12 (Appendix A) shows the crash statistics for these spot locations and Figure 11 illustrates these locations on a map.

As shown in Tables 11 and 12 and Figure 11, all roadways with the exception of KY 737 have at least one spot location with a high crash rate. Some roadways, particularly KY 259 and US 62, have multiple high spot crash locations. For the Western Kentucky Parkway, most crashes tended to occur around the interchange at KY 259. This is illustrated by the high spot crash rate at this location.

Crash Report Analysis

Because of the number of crashes within the primary study area, an additional crash analysis was conducted to look at crash type, severity, and other factors. This analysis was conducted in three steps, each evaluating one of the following three groups:

1. High crash sections in the primary study area;
2. Sections with rates above the statewide average, but below the critical rate; and
3. Other high crash spot locations in the primary study area.

Table 13 (Appendix A) presents a summary of crash type and directional analysis data for the four high crash rate sections in the primary study area. The section of KY 259 located just north of the interchange had a high number of crashes related to vehicles entering and leaving the roadway, rear-end crashes (one vehicle stopped), and same direction sideswipes. These types of crashes could be expected given the many driveways and the signals located in this four to five-lane section of KY 259. On the two sections of US 62, rear end crashes were by far the most common crash type. This may be related to the typical two-lane cross section with no turn lanes in this area. Approximately 35 percent of the crashes on US 62 Section 1 were injury crashes. The only fatal crash in the primary study area also occurred in this section and was listed as a single vehicle collision on shoulder. Future roadway planning could consider turn lanes and wider shoulders on this highway. On the WKP section there were very few crashes

Table 14 (Appendix A) presents a summary of the crash type and directional analysis data for sections in the primary study area with a crash rate exceeding the statewide average (but below the critical rate). For KY 259 Section 3 (north of town), there were only six crashes, three of which were rear end crashes. With so few crashes it is difficult to form a conclusion regarding crash cause. On KY 187, over half of the 15 crashes were rear end crashes. This may be related to the fact that KY 187 is a two lane road without turn lanes.

Finally, Table 15 (Appendix A) is a summary of the crash types for the remaining high spot crash locations in the primary study area. (A separate table was not created for the high spot crash locations in the high or above average crash segments since that data is already contained in Tables 13 and 14.) There does not appear to be a strong pattern related to crashes on KY 54, while all of the WKP crashes at this spot location are single vehicle crashes.

3.7 Highway Ratings

The KYTC Highway Information System (HIS) database provides a series of highway ratings that are useful for assessing a facility's current physical and operating conditions. The available indices include:

- Condition Index – This includes pavement condition.
- Safety Index – This includes accident critical rate factors, lane, shoulder, and median widths (as well as alignment adequacy for rural segments).
- Service Index – This includes volume / service flow ratio and access control.
- Composite Index – This is the total of the other three indices and has a maximum of 100 points.
- Percentile of Composite Index – This is calculated as the percentage of the section mileage (for the same functional class) that has a Composite rating lower than or equal to the current section.

Other related information that is available to support the rating assessments includes:

- Maximum Road Capacity (Capacity is hourly, includes both directions for two-lane and one direction on multilane facilities, and is the maximum service flow at Level of Service E.)
- V/SF Ratio (V/SF Ratio or Volume/Service Flow Ratio is the peak hour traffic flow compared to the calculated capacity.)
- Design Speed
- Horizontal Alignment Adequacy
- Vertical Alignment Adequacy

Ratings are only available for arterial routes, rural major collectors, and urban collectors. As such, ratings are only available for KY 259, US 62, KY 54, and the Western Kentucky Parkway. The ratings and related assessment data for these highways are shown in Table 16 (Appendix A).

Overall, the ratings confirm what the previous analysis has shown. KY 259 has relatively low ratings for safety in town and south of town. It also has low service ratings in town. Some locations also showed horizontal geometry issues and many had vertical geometry issues (i.e. frequent grades without sight distance).

US 62 also had low safety and service index ratings in town. It has low condition index ratings in town as well. Horizontal geometry issues are present in town, while there are relatively few vertical geometry issues. KY 54 only had a low safety index rating as it approaches town, the other ratings as well as the horizontal and vertical alignment adequacy notes did not show significant issues. None of the WKP ratings appeared to highlight problems.

3.8 Pedestrian and Bicycle Facilities

Within the study area, pedestrian facilities are generally in good condition and appear to have adequate connectivity in the major developed areas. Sidewalks can be found in town and in some of the subdivisions in the area. There are however, sections of sidewalk that are in disrepair and there are areas where curbs are missing or inadequate.

Sidewalks in Good Condition but Close to Roadway

There are two marked bicycle routes in the county. These routes are intended to provide bicyclists the opportunity to view Kentucky's landscape and tourism attractions. They follow existing local highways, and should have adequate shoulders to provide for bicyclists. The routes include the Mammoth Cave Tour and the Ramblin' River Tour. The Mammoth Cave Tour follows sections of US 62 and KY 54 in the far western portion of Grayson County, outside the limits of the study area for this project. The Ramblin' River Tour also follows a portion of KY 54 in the far western part of Grayson County and is outside the limits of the study area for this project.

3.9 Existing and Future No-Build Traffic and Highway Conditions Summary

Based on the existing transportation conditions analysis, there appear to be a number of key transportation issues in the primary study area. Some of these could potentially be addressed through the construction of a new western bypass. They include the following:

Traffic Conditions – There are currently poor traffic conditions (levels of service) on KY 259 and US 62 in both the primary and auxiliary study areas. Some of these deficiencies will be addressed by projects that are currently under construction (such as the eastern bypass and upgrades to US 62 east), while others could be addressed by projects currently on the unscheduled needs list (such as upgrades to KY 259 north and US 62 west). However, a western bypass may also alleviate traffic demand on some of these facilities by providing a new route (with possible new connections to either KY 259 or the WKP) that will divert traffic from other study area highways.

Safety – The safety analysis highlighted a number of high crash sections and spots in the study area. This included sections on US 62, KY 259, KY 54, and KY 187 in the primary study area. Projects currently under consideration in the area will address

many of these concerns. However, the proposed western bypass may also be useful in improving safe travel conditions in the area. It may also divert traffic from other highways with safety concerns.

Connectivity and Access – The current highway system west of Leitchfield is mainly a radial system with east-west highways running west from Leitchfield. There are few good north-south connections in the primary study area. The proposed western bypass would directly address this lack of system connectivity. It may also benefit the primary study area (and nearby areas of Grayson and Breckinridge Counties) through improved local and regional access. This would include local access to industry, schools, and developable land; and regional access to and from the WKP and the rest of the state.

Other Issues – Other issues identified in this report include truck traffic, highway geometrics, and bicycle and pedestrian facilities. There are a number of truck traffic generators north and west of Leitchfield. This truck traffic currently passes through downtown Leitchfield. Even with the eastern bypass, the truck traffic from the west will have to pass through town. The proposal for a western bypass may help address this issue. The current highway facilities in the primary study area are primarily rural type roads with narrow lanes and shoulders. As the community develops and traffic volumes increase, these highways may become an issue. Again, a new highway west of town may help this situation. It may also offer the opportunity for better bicycle and even pedestrian connections on the west side of Leitchfield.

4.0 REVIEW OF RELATED STUDIES

A review of previous transportation studies and reports for the study area is necessary to better understand the problems and possible solutions that have already been identified or studied. In this case, there are several previous reports relevant to the current planning study. They include the following:

- Leitchfield Bypass Advanced Planning Report (KYTC, 1987)
- Eastern Leitchfield Bypass Traffic Forecast Memos (KYTC, 1993 and 1996)
- KY 101/259/79 – US 60 Corridor Feasibility Study (Wilbur Smith Associates, 1999)
- Western Kentucky Parkway / KY 224 Interchange Expansion Traffic Forecast Report (Jordan, Jones, and Goulding, 2002)

Leitchfield Bypass Advanced Planning Report (KYTC, 1987) – The Leitchfield Bypass Advanced Planning Report was prepared by the Kentucky Transportation Cabinet, Department of Highways, Division of Transportation Planning in January 1987. The purpose of the study was to assess the need for and determine the most desirable location of a bypass around Leitchfield. The project was intended to relieve congested areas on Main Street and Mill Street and to decrease the traffic volume going through Leitchfield.

The study examined the existing physical infrastructure and highway operations of the major area highways (KY 259, KY 54, US 62) at the time of the study (1986). No geometric deficiencies were identified for any of the major study area roadways. A crash analysis was performed for the major study area highways from January 1, 1983 to December 31, 1985. Crash problems were identified on KY 259 south of the courthouse, KY 54 within the city limits, US 62 (East), and a portion of US 62 (West).

Traffic volumes at the time of the study (1986) were high on some highway sections, particularly on Main Street and Mill Street. Forecasted traffic volumes for the design year of 2010 showed an increase of traffic ranging from 0% to 118%. KY 259 south of the courthouse was projected to have little to no growth, but traffic volumes on KY 54 were projected to more than double.

Multiple alternatives were initially considered for a bypass, but the number of feasible alternatives was ultimately reduced to five. These included the No-Build Alternative, two eastern bypass alternatives, a western bypass alternative, and an alternative for constructing a full bypass around Leitchfield.

The No-Build Alternative would likely result in traffic volumes remaining high in town and traffic conditions worsening by the design year of 2010. Analysis of the two eastern bypass alternatives showed both would operate at a level of service ranging from C to D, would decrease traffic on KY 259, KY 54, and US 62 East, would slightly increase

traffic volumes on US 62 West, and would improve access to the industrial park, hospital, and the elementary and middle schools.

The analysis of a western bypass indicated that the bypass would operate at an average level of service C in the design year of 2010. Predicted traffic volumes on a western bypass ranged from 4,500 to 8,500 vehicles per day, slightly lower than those predicted for either of the eastern bypasses. Traffic volumes on US 62 and KY 259 were expected to decrease with the construction of this bypass, but the volume on US 62 east of KY 259 was not expected to be decline significantly.

A complete bypass of Leitchfield was expected to reduce traffic volumes on all portions of US 62 and KY 259 in the study area by 46 percent or more. Traffic volumes on the bypass forecasted for 2010 ranged from 4,100 to 10,800 vehicles per day in the east, and 3,900 to 9,600 vehicles per day in the west.

Cost estimates based on 1984 average unit bid prices were developed for each of the four bypass alternatives. The cost estimates included estimates for design, utilities, right-of-way and construction. The two eastern bypasses were similar in cost with an estimated cost of $5,142,000 for one alternate and $5,252,000 for the other eastern bypass alternate. The western bypass had a slightly higher cost estimate at $5,575,000. The most expensive bypass alternative was the full bypass at an estimated cost of $10,745,000.

An environmental overview was performed. While there were anticipated impacts, the analysis did not reveal any prohibitive conditions that would prevent any of the alternates from advancing. The overview did, however, identify a potential problem area that directly impacted the western bypass alternate. To the west of KY 259, between US 62 and the Western Kentucky Parkway is a solid waste dump. At the time of the study, it was no longer receiving waste, but was not closed since certain regulations had not been met. The removal of the waste was determined to be necessary to construct a bypass in this area.

Ultimately, the study concluded that the eastern bypass extending from KY 259 in the north to KY 259 at East Lake Drive in the south should be constructed. This alternate was selected over the other proposed alternates because:

- It had the best access to the local hospital;
- It traversed less extreme terrain than the other eastern bypass alternate;
- It provided greater opportunity for westward expansion than the second eastern bypass alternate;
- It provided good traffic relief to KY 259 in the downtown area; and
- It cost the least (by only a small amount) than the other alternates.

The recommendation was also made that if the availability of highway funds prevented the full construction of the recommended eastern bypass, then the eastern bypass could be built in phases. The first phase would consist of constructing the portion of the

bypass from East Lake Drive to US 62 East, immediately followed by the remaining portion of the bypass from US 62 to KY 259 North.

Eastern Leitchfield Bypass Traffic Forecast Memos (KYTC, 1993 and 1996) – The Eastern Leitchfield Bypass Traffic Forecast Memorandums were prepared by the Kentucky Transportation Cabinet, Department of Highways, Division of Transportation Planning in September 1993 and February 1996. The purpose of these memos was to provide a traffic forecast in Grayson County for the Eastern Leitchfield Bypass. These forecasts were intended to aid in the analysis and design of an Eastern Leitchfield Bypass and were referred to during the course of the current analysis for a potential western bypass.

KY 101/259/79 – US 60 Corridor Feasibility Study (WSA, 1999) – The KY 101/259/79 – US 60 Corridor Feasibility Study was prepared by Wilbur Smith Associates for the Kentucky Transportation Cabinet, Division of Transportation Planning in December 1999. The purpose of the study was to determine the feasibility of a north–south highway corridor through west–central Kentucky. The study corridor begins just north of Scottsville at US 31 East and terminates at two separate locations on the Ohio River (Hawesville and Brandenburg). The study corridor goes through multiple counties including 21.46 miles along KY 259 / 79 in Grayson County. Included in the study report is documentation of the existing transportation and socioeconomic conditions, an analysis of future traffic demand, an evaluation of the feasibility of transportation improvement options, and a recommendation for future developments in the corridor.

A review of existing highway conditions throughout the study area revealed that traffic volumes ranged from 1,000 to 5,000 vehicles per day in the rural areas, with truck percentages between 5 and 12 percent. Most highway sections along the corridor were level of service (LOS) D or better. There were some sections with an undesirable level of service of E or F, and these typically occurred near urban areas or areas with narrow roadway cross-sections. The level of service for KY 259 just south of the Western Kentucky Parkway (WKP) was determined to be LOS D; the section of KY 259 between the WKP and US 62 was a LOS F; north of US 62 the LOS was E. A review of crash data from July 1, 1993 to June 30, 1996 did not identify any crash problems in Grayson County.

Socioeconomic data compiled for the study that is relevant to this study includes population and unemployment information. Of the seven counties within the study corridor, Grayson County is expected to have the greatest population increase from 1996 to 2020 of all of the counties. Also, in comparison to the six other counties, Grayson County had the second highest unemployment rate (7.6%) in 1995.

The feasibility study also identified several environmental issues located in Grayson County including a concentration of underground storage tanks in Leitchfield and eleven major geological faults near Rough River Lake and Leitchfield. Within Grayson County are several major trucking / industrial facilities. One is located north of Leitchfield in the vicinity of KY 259, and two are located west of Leitchfield along US 62.

A set of traffic forecasting models was constructed using the Kentucky Statewide Traffic Model (KySTM). Forecasts indicated that traffic volumes would increase by almost 81% between 1995 and 2025. To provide a basis of comparison for build alternatives, a traffic analysis was conducted for an existing plus committed projects scenario in the design year of 2025 using the forecasted traffic volumes. This scenario included existing highway conditions plus future highway improvements that were likely to be implemented in the next three to five years (projects programmed for construction within the current version of the KYTC Six-Year Plan). The analysis revealed no decline in level of service either north or south of Leitchfield in Grayson County.

To address safety issues, roadway deficiencies, capacity and transportation demands, system linkages, and economic development needs for the corridor and surrounding region, several alternatives were developed. These included a no-build scenario, spot improvements, improved 2-lane facility along existing corridor with and without new bridge structures, a 4-lane divided facility along portions of the corridor, and a 4-lane divided facility the entire length of the corridor. Intermodal and multimodal enhancements also were considered for the corridor.

Initial review and analysis of the existing conditions data and traffic forecasts indicated that there was a need for increased capacity and safety along portions of the KY 101/259/79 – US 60 corridor. Therefore, implementation of the no-build and spot improvement alternatives were not considered to be viable alternatives for most sections through the corridor and were not included in the detailed alternatives evaluation. Multimodal and intermodal enhancements were evaluated in a generalized manner in the study, and recommended to be included with the preferred build alternative.

For the remaining build alternatives, the evaluation criteria used for selecting the preferred alternative considered a range of issues. Each criterion is listed below along with the alternative that ranked best in that category.

- Engineering and Costs – All of the build alternative cost estimates exceeded the available funding. Therefore, the highest ranked alternative for this criterion was the one with the lowest cost - improvements to the existing 2-lane facility with minimal new bridge structures.

- Environmental Impacts – The 2-lane improvement alternative with minimal new bridge structures mostly follows the existing corridor and was determined to have the least environmental impact of the build alternatives. Therefore it was rated the highest for this criterion.

- Traffic Serviceability – The analysis concluded that the complete 4-lane alternative and the one with portions of 4-lane had the lowest volume / capacity ratios. Therefore, these two alternatives rated the highest for this criterion.

- Travel Efficiency Feasibility – Based on a comparison of travel efficiencies versus alternative costs, none of the alternatives were economically feasible. The alternative that consisted of improvements to the existing 2-lane facility with new bridge structures had the highest B/C ratio of all the alternatives even though it was below 1. Since none of the alternatives were considered economically feasible, prioritization of segments was recommended. The benefit / cost analysis was applied to individual segments and subsegments. Based on this analysis, three segments were found to be economically feasible. The first segment includes the portion of the KY 101/259/79 – US 60 corridor between I-65 and Brownsville. The second segment consists of the eastern bypass around Leitchfield. The third segment is a portion of the corridor on the Breckinridge / Meade County line.

- Economic Development Impacts – Overall, the construction of a 4-lane divided highway the length of the corridor was expected to have the highest degree of value added with implementation, and therefore was assigned the highest rating for this criterion.

Taking into account all of these evaluation criterion, a composite rating was assigned to each alternative. This combination of evaluation criteria indicated that improving the two lane highway within the existing corridor and construction of new structures (bridges) was the preferred alternative for recommendation. Also, variations such as bypass facilities, two-lane sections on four-lane right-of-way, and four lane sections would be included. At the time this study was completed, there was a shortage of funding. Therefore, prioritization of segments was included in the recommendation. Phase 1 was recommended as improvements from I-65 to Brownsville. Phase 2 consisted of improvements from Brownsville to Leitchfield and from the vicinity of Hardinsburg to Brandenburg. The final phase, Phase 3 was recommended as improvements from Scottsville to I-65 and from Leitchfield north to Hardinsburg.

Western Kentucky Parkway / KY 224 Interchange Expansion Traffic Forecast Report (Jordan, Jones, and Goulding, 2002) – This report contains traffic forecasts for the completion of the interchange at Clarkson assuming the construction of a westbound on-ramp and an eastbound off-ramp. Both no-build and build alternates were examined for the current year (2002) and the future year of 2027. The assumptions used to develop the traffic forecasts as well as the traffic volumes themselves were employed during the course of the traffic analysis for this current western bypass study.

5.0 PAST AND FUTURE TRANSPORTATION PROJECTS

An understanding of the regions past transportation projects and future transportation plans is important for study context as well as for making future recommendations. Transportation Plans analyzed for this study include:

- KYTC Recommended Six-Year Highway Plan FY 2005 – FY 2010 (February 2004)
- KYTC Statewide Transportation Plan FY 1999 – FY 2018 (December 1999)
- Unscheduled State Highway Projects for Grayson County (May 2002)

Recent Transportation Projects in the Study Area – Construction of an eastern bypass around Leitchfield has been a major project in the study area for the past several years. A potential corridor for an eastern bypass was recommended in the Advanced Planning Project Report in 1987. Authorization to proceed with the project was given on April 23, 1992 with authorization to proceed with design on July, 12, 1993. Design of the eastern bypass was completed in September 1996. Ultimately, construction was divided into three phases. The first phase consisted of construction of a portion of the bypass from KY 259 South to the Grayson County Hospital. Construction for this section began on August 29, 2000 and was completed on December 19, 2001 at a cost of $3.5 million. The second phase consisted of construction of the portion of the bypass between KY 920 and KY 259 North. This portion of the project was awarded on August 7, 2002 and is to be completed on April 1, 2005 at a cost of $2.7 million. It was opened to traffic on November 20, 2004, with some final work remaining before the completion date. The third, and final section, connects the first two sections of the bypass between the Grayson County Hospital and KY 920. This section of the bypass was awarded for construction on November 14, 2003, but the contractor chose not to begin work until the summer of 2004. The completion date set for this project is September 1, 2005 and is estimated to have a construction cost of $8.2 million.

Another major project is the reconstruction of the Western Kentucky Parkway interchange at Leitchfield (KY 259). This project involved the reconfiguration of the interchange to a typical diamond interchange, meeting all current design standards. The construction cost was estimated at $6 million with a total project cost (including utilities and construction) of approximately $6.3 million. The interchange was opened to traffic on October 30, 2004 with some final work still remaining before its completion date of April 1, 2005.

Future Transportation Projects – A review of relevant planning and programming documents indicates that there are several projects that are programmed in the current KYTC Six-Year Highway Plan in Grayson County. These projects, along with their descriptions and funding schedules from the Six-Year Plan, are listed in Table 17 in Appendix A.

A review of the KYTC Statewide Transportation Plan showed no major transportation projects planned for Grayson County other than reconstruction of the Leitchfield interchange, which is already in the construction phase.

There are also several projects that have been proposed in the study area, but are not included in either the KYTC Six-Year Highway Plan or the Statewide Transportation Plan. They are on what is termed the Unscheduled State Highway Projects List. These projects are listed in Table 18 in Appendix A.

The projects affecting the Leitchfield Northwest Bypass project study area are shaded on Table 18. Of special note are the following projects: 1) proposed reconstruction of KY 259 from the East Bypass north to Hanging Rock Road; 2) proposed reconstruction of US 62 from Leitchfield to KY 187; and 3) proposed new interchanges at KY 187 and KY 1214.

6.0 HUMAN ENVIRONMENT OVERVIEW

An overview was conducted to determine the general characteristics of the human environment in the study area. The analysis addresses: general socioeconomic characteristics, environmental justice, land use, agricultural activity, hazardous materials sites, historic resources, and archeological resources. The following sections summarize the overview findings. For more detailed information, refer to the Environmental Overview report.

6.1 Socioeconomic Profile

Population Growth – According to the 2000 Census, the population of Grayson County was 24,053 and the population of the City of Leitchfield was 6,139. These numbers are up from 1990 when the populations for Grayson County and the City of Leitchfield were 21,050 and 4,965 respectively. The population of Grayson County is projected to increase to 27,698 by 2010 (an increase of 15.2 percent).

Minority Populations – The largest minority population in the county is Black / African American, with less than three percent of the county population and approximately four percent of the city population falling into this category. Both of these percentages are below the statewide average percent of 10.7 percent. The highest concentration of minorities in the study area is 7.0 percent, near the intersection of West Lake Drive and KY 259. While the minority percentage at this location is not higher than the statewide average, public agency input has identified this section as a potential Environmental Justice community based on race.

Low – Income Populations – In 2000, approximately 18.1 percent of the Grayson County population was below the poverty line. In Leitchfield, approximately 21.3 percent was below the poverty line. These numbers exceed the statewide average of 15.8 percent. Similar to the minority population analysis, a low-income population was identified near the intersection of West Lake Drive and KY 259. The percentage of low-income residents in this area is 34.6 percent, which is more than double the statewide average. This area may be considered an Environmental Justice community.

Age of Population – The City of Leitchfield and Grayson County both have a higher percentage of residents age 62 and over (18.2 and 16.9 percent respectively) compared to the statewide average (14.9 percent). The highest percentage of residents age 62 and over is 20.8 percent, located along KY 259 north of KY 54 to Cave Mill Road. The area near the intersection of West Lake Drive and KY 259 has a percentage of elderly residents of 20.7 percent.

Local Economy – In 2002, Grayson County's unemployment rate was 8.7 percent. This is higher than the 2002 unemployment rates for Kentucky and the U.S., which were 5.6 and 5.8 percent, respectively. Of the 8,235 people working in the county (in 2000), the highest percentage (32 percent) work in manufacturing, followed by trade,

transportation, and utilities (22.1 percent), and services (19.4 percent). The remainder of the county workforce is employed in a range of other fields as shown in Table 19 (Appendix A). There are several major manufacturers in the Leitchfield area employing over 200 workers. They include Campbell Group (600 employees), Trim Masters Inc, (390 employees), Modern Transmission Development (350 employees), and Leggett & Platt Inc. (230 employees). Other manufacturers in the area are listed in Table 20 (Appendix A).

Commuting – Approximately 74 percent of employed Grayson County residents work in the county, with the remaining 26 percent commuting to other nearby counties such as Hardin and Jefferson counties as shown in Table 21 (Appendix A).

Community Facilities and Development Patterns – Typical community facilities are located within Leitchfield, e.g., courthouse, city hall, elementary school, high school, police department, churches, etc. Much of the community's commercial development is located on KY 259 through town, and on US 62 (East) between KY 259 and the new east bypass. Residential development is also centered on Leitchfield, with multiple new subdivisions scattered throughout the study area. Figure 13 in Appendix B shows these facilities and development on a map.

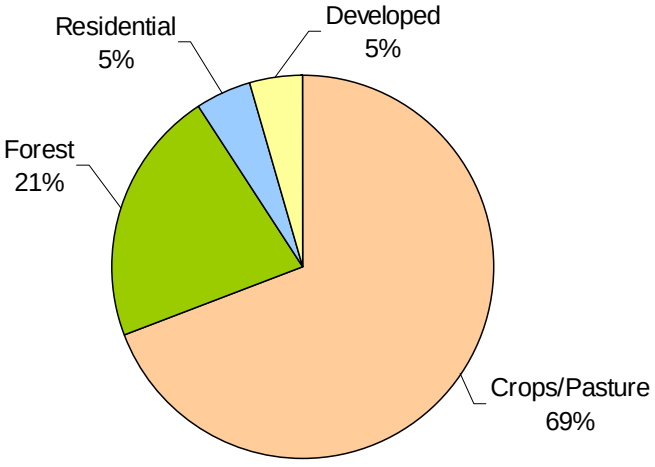
6.2 Environmental Justice

Based on data obtained from the U.S. Census Bureau and input from the community of Leitchfield, an Environmental Justice community may exist within the study area. The primary focus of the community is the southwest section of town around West Lake Drive. This is based on the low-income distribution, minority distribution, and elderly population distribution. Additional information regarding Environmental Justice is included in Appendix D.

6.3 Land Use

The study area covers 11,200 acres. Seven types of land use are found within the study area: crops / pasture, forest, residential, developed (commercial / industrial), strip mines / quarries / gravels, and reservoirs. Crops / pasture cover 7,690 acres, representing the largest percentage. Forested land covers the next largest percentage at 2,380 acres. Residential areas and commercial areas occupy 530 acres and 510 acres, respectively. Figure 14 shows the percent coverage of the four main land use types within the study area. In addition to these land uses, strip mines / quarries occupy 70 acres or less than 1

Figure 14: Land Use



percent of the study area and reservoirs account for 20 acres (KNREPC).

The site visit verified these findings; the study area is comprised primarily of cropland and pastures. Many of the crops consisted of hay and tobacco with the pastures used for cattle. Residential land use is most concentrated inside the city limits. Outside the city limits, houses and new subdivisions were observed along major and minor roadways.

Developed land consisting of commercial and industrial facilities is scattered throughout the study area. The Judge Kenneth H. Goff Industrial Park is located in the study area north of Leitchfield and west of KY 259. Many other businesses were observed along the major and minor roadways in the study area. Two underground limestone quarries are present in the study area. Ragland Quarry Inc. is located north of KY 54 and the Grayson County Quarry (Scotty's) is located on the south side of KY 54.

Regarding the forested land, Rough River Lake State Wildlife Management Area (WMA), owned by the Army Corps of Engineers and maintained by the Kentucky Division of Fish and Wildlife Resources, is an open forested area covering a small section of land in the northwestern portion of the study area. This WMA which covers approximately 3,695 acres in Grayson and Breckinridge Counties, may require consideration under Section 4(f) of the Department of Transportation Act of 1966. Other forested land in the study area includes Baumberger Barrens, owned and maintained by The Nature Conservancy. Baumberger Barrens is located south of Leitchfield off McDonald Road. Ribbons of forest separate crops and line many of the streams.

6.4 Agricultural Activity and Prime and Unique Farmland

Farming is prevalent throughout Grayson County. According to the 1997 Census of Agriculture, nearly 209,000 acres are farmed, primarily family operations on 1,412 farms, with an average farm size of 148 acres. Beef is the primary livestock product, with a small number of farms specializing in dairy operations. In 2001, Grayson County ranked sixth out of Kentucky's 120 counties for its number of beef operations.

In an informal interview, Brent Miller, Grayson County District Conservationist, confirmed that no agricultural districts exist within the study area. Furthermore, none of the land in the study area would be considered prime or unique farmland. However, large portions of the study area are considered as locally important farmland from an economic perspective.

6.5 Underground Storage Tanks/Hazardous Materials

Potential hazardous materials sites are primarily located in and around the urban limits of Leitchfield. An environmental database search for the study area revealed nineteen potential UST / hazardous materials sites as shown on Figure 13 in Appendix B. Of key interest are a closed residential landfill located near West Lake Drive and a solid waste transfer station on South English Road. Also, there are two large underground quarries

located on KY 54. The underground mine works for these quarries extend south toward US 62 and north of KY 54. Additional information on these mines is presented in Section 8.0.

6.6 Previously Documented Cultural Historic and Archeological Sites

The cultural historic overview revealed one previously surveyed cultural historic site, site GY-38. This site is called the Richardson House and is located west of the junction of KY 737 and Little Clifty Church Road. It was built around 1900, and its status for listing on the National Register of Historic Places (NRHP) is currently undetermined. In addition, 125 structures were identified as potentially eligible cultural historic sites within the study area based on available data and the archeological overview. A subsequent field review showed few potentially NRHP eligible buildings in the primary study area west of Leitchfield. However, the potential exists for crossroads communities such as the area near the intersection of US 62 and Black Rock Road. Five potentially historic cemeteries were located within the project area. Based on the interment dates, these cemeteries may be eligible for inclusion on the National Register of Historic Places.

The archeological overview indicated a low density of archeological sites within the study area. One previously recorded site is the Day Cliffs located in the central portion of the study area, which consists of rock shelters. These rock shelters have not been assessed for NRHP eligibility, but should be considered as potentially eligible. Additional unrecorded rockshelters may be possible in the western part of the study area.

7.0 NATURAL ENVIRONMENT OVERVIEW

An overview was conducted to determine the characteristics of the natural environment in the study area. Resources addressed in this section include: aquatic ecosystems (surface waters, wetlands, ponds, and 100-year floodplains) and terrestrial ecosystems (nature preserves and wildlife management areas, threatened and endangered species, floral communities, and faunal communities). For more detailed information, refer to the Environmental Overview report.

7.1 Aquatic Ecosystems

Surface Water – The major watershed of Rough River covers the northern portion of the study area, and the major watershed of the Upper Green River covers the southern portion of the study area. Located within these major watersheds are seven smaller watersheds that also cover the study area. The largest of these is Big Run Branch which covers the northern and central parts of the study area as shown in Figure 15 (Appendix B). Tributaries of Big Run Branch northwest of Leitchfield drain most of the area. All streams in the study area flow into rivers that eventually flow into the Ohio River system. These streams flow in a radial pattern away from Leitchfield. Most of the streams and tributaries in the study area flow northwestward toward Rough River Lake.

Wetlands and Ponds – A total of 225 wetlands were indicated on National Wetland Inventory (NWI) mapping for the study area. Nineteen appear to be natural wetlands based on their type and have the most potential to be considered jurisdictional by the United States Army Corps of Engineers (USACE). Most of these natural wetlands run along a line from the central part of the study area to the southwest edge of the study area. (See Figure 15 in Appendix B) The remaining wetlands appear to be manmade in origin and represent impounded or diked areas (ponds) constructed as part of farming operations. Two of the larger ponds range in size from five acres to seven acres, and are found in the Big Run Branch watershed and the McClure Fork watershed. Two hydric soils and two potential hydric soils are also found within the study area suggesting the presence of other wetlands.

Floodplains – Two small 100-year floodplains exist in the study area. Big Run Branch floodplain covers 19.3 acres while Taylor Fork floodplain covers just over eight acres (Federal Emergency Management Agency [FEMA] 1998). (See Figure 15 in Appendix B) Larger floodplain areas are found directly northwest of the study area along Big Run Branch and Little Clifty Creek and southeast of the study area along Taylor Fork.

7.2 Terrestrial Ecosystems

Nature Preserves and Wildlife Management Areas – Located in the upper northwest portion of the study area at Big Run Branch of Rough River Lake is a portion of the Rough River Lake Wildlife Management area. This wildlife management area is owned by the USACE and is maintained by the Kentucky Department of Fish and Wildlife Resources. A nature preserve called the Baumberger Barrens is located in the study

area, south of US 62 on McDonald Road. Baumberger Barrens is owned and maintained by the Nature Conservancy. It is an 80-acre tract of land dominated by an oak-hickory canopy with a very open understory. Openings in the canopy are dominated by grassland species with groupings of prairie species including the federally and state threatened Eggert's sunflower and the state threatened hairy hawkweed.

Threatened and Endangered Species – Initial research indicated that a total of 13 threatened or endangered species may occur in or near the study area as listed in Table 22 in Appendix A.

All five of the plant species listed are likely to occur in the study area. Suitable habitat for these species is prairies or barrens, and remnants of these two habitats occur sporadically throughout the entire study area. Five of the six species of bivalves listed are not likely to find suitable habitat in the study area. Only the Kentucky creekshell may possibly find habitat in the headwater streams found in the study area.

The Indiana bat is a federally listed species for the study area. Areas with wooded slopes and intermittent streams flowing down them present potential foraging flyways for this species. Areas containing this type of potential habitat include Rocky Knob, Layman Knob, and Blue Knob in the northern part of the study area; McClure Fork, Taylor Fork, and their tributaries in the southern portion of the study area; and the wooded slopes of Big Run Branch and its tributaries on the northwest side of the project area.

Populations of the gray bat are typically found in Mammoth Cave National Park, approximately 18 miles from the study area. There are maternity records for this species in Grayson County; however, none of these records are in the study area. Big Run Branch and the lower portions of its large tributaries in the northwestern portion of the study area represent potential foraging habitats for the gray bat.

Floral and Faunal Communities – No major issues or concerns were identified relative to plant or animal communities in the study area, other than the potential for threatened or endangered species as discussed above.

8.0 GEOTECHNICAL OVERVIEW

A geotechnical overview was compiled from several reports prepared by the Geotechnical Branch of the Kentucky Transportation Cabinet, Division of Materials; the University of Kentucky, Kentucky Geological Survey (KGS); and Fuller Mossbarger Scott & May who was subcontracted to perform geotechnical related analysis.

The data supplied by the KYTC Geotechnical Branch and the Kentucky Geological Survey detailed the geologic formations in the study area, identifying which are not suitable for construction applications. In general most formations found in the study area should not lead to construction problems. Some conditions may exist in the northern portion of the study area that may require special consideration or avoidance. There is the potential for karst features such as sinkholes and caves as well as the presence of geologic fault lines. Correspondence with both agencies is included with the rest of the agency correspondence in Appendix E.

The geotechnical overview performed by Fuller Mossbarger Scott & May consisted of reviewing available geologic and topographic mapping of the study area as well as conducting a field visit. Located within the study area are a landfill, two limestone quarries, and several geologic fault lines that could potentially cause issues related to construction of a western bypass over or near these features.

Geotechnical issues related to constructing a roadway over a landfill would primarily relate to settlement of the roadway embankment. If the roadway was constructed as embankment over the landfill, settlements within the waste would result from the increases in stress caused by the roadway embankment as well as decomposition of the waste itself, and could continue for many years. Without knowing the exact composition, vertical thickness, and placement history of the waste, settlement estimates would only be guesses that could be in error by orders of magnitude. It can generally be stated that construction of a significant roadway over a landfill would likely result in long term maintenance issues for the pavements. Therefore, construction of a roadway over the landfill should be avoided, or consideration should be given to removal of the waste prior to construction.

The two active limestone quarries within the study area are located on both sides of KY 54, west of Leitchfield. Underground mining of the limestone has occurred to both the north and south of KY 54 with numerous rooms of the mines extending under the roadway. The quarry to the south of KY 54 is operated by Scotty's Contracting & Stone, LLC. The above ground operations of this mine are south of KY 54, and the underground mining is to the south, under, and to the north of KY 54. The typical underground configuration of this mine is: rooms which are 40 feet wide by 21 feet tall by 40 feet in horizontal depth, crosscuts which are 30 feet in width, and pillars which are 40 feet by 40 feet in plan dimension. At the entrance to the underground portion of the mine the bedrock between the mine and the groundsurface was noted during the field visit to consist of friable sandstones and shales. The entrance was also noted to

immediately dip down to go below a limestone seam which had been mined in the past. Reportedly, this upper seam was 'worked' in the early days of the mine, but eventually was abandoned as the seam pinched out. The current mining occurs in a lower seam which reportedly has approximately 80 feet of rock and soil overburden cover. In 1991 there was a collapse of the roof rock into a portion of this upper mine, but no damage occurred in the lower (present) mine. The caved-in area is located to the south of KY 54. This area, as well as the entire footprint of the upper mined seam should be avoided by roadway design and construction.

The quarry to the north of KY 54 is operated by Ragland Quarry, Inc. The room and pillar sizes within the underground portion of this quarry are approximately 40 feet wide by 21 feet tall by 60 feet in horizontal depth, and 25 feet wide by 21 feet tall by 60 feet in horizontal depth, with crosscuts which are approximately 30 feet in width. Near KY 54 the amount of bedrock and soil overburden above the mine is approximately 80 feet. As the seam progresses northward, it reportedly rises on an incline of approximately five percent, subsequently decreasing the amount of bedrock and soil cover between it and the groundsurface. Also, near the northern boundary of the Ragland Quarry, Inc. property, geologic mapping indicates a geologic fault is present. For these two reasons, it is recommended that roadway design and construction avoid the northern extent of the underground mining where it comes in close proximity to the geologic fault.

Hazards associated with roadways crossing over underground mines are primarily associated with collapse of the mine roof and the subsequent subsidence of the overlying bedrock and soil overburden. When translated to a roadway section, subsidence can destroy pavements, and in the event of severe subsidence, create sudden vertical drop-offs which can endanger the public. The bedrock above the limestone formation is comprised of shale, sandstone, siltstone, limestone, and limestone conglomerate. These strata are often thin-bedded and interbedded. Past experience in this type of rock indicates these strata are not massive, nor durable. If this roof rock was to give way and allow the mine to collapse, preliminary estimates indicate as much of 17 feet of subsidence could occur. To reduce the potential of subsidence affecting the roadway, a method used by the KYTC in areas of mining is to backstow that portion of the mine within the influence of the roadway with rock fill. Typically, backstowing consists of filling up the mined out rooms under the roadway (and for a distance encompassed within a 15 degree projection downward and outward from the roadway ditchline) with durable rock. Backstowing would likely prove very expensive because of the quantities of durable stone backfill required. In general, it is recommended that a roadway not be designed or constructed over the underground mining operations described above.

Throughout the study area are numerous geologic fault lines. Crossing the faults at nearly perpendicular angles should reduce the potential for any construction related problems. A fault parallel to the roadway centerline could create differing subsurface conditions in either cut or fill situations, and lead to slope stability problems. Also, if a bridge is required, the situation of bridge foundations straddling a geologic fault should be avoided. The bridge should be located on one side of the fault or the other.

9.0 PUBLIC INVOLVEMENT AND AGENCY COORDINATION

9.1 Public Involvement Program Summary

Specific elements of the Public Involvement Program for the Leitchfield Northwest Bypass Study included a Project Advisory Committee, elected officials briefings, stakeholder interviews, public workshops/meetings, and a project website. The process and methods for public involvement are outlined in this chapter. The results and feedback from implementation of the Public Involvement Program are provided throughout the entire report. For example, public input on the corridors development is included in that section of the report and feedback on the corridors is integrated into the corridor evaluation sections. Copies of meeting minutes are included in Appendix F for reference.

Project Advisory Committee Meetings – A Project Advisory Committee (PAC) was created for this study. The role of the PAC was to provide advisory input and feedback at key points during the study. Meetings were scheduled to occur at the three following project milestones:

1. Refinement of Project Issues and Goals and Development of Initial Study Corridors
2. Presentation of Level 1 and 2 Corridor Evaluations
3. Presentation of Level 3 Corridor Evaluation (Recommended Corridor)

The PAC consisted of a group of approximately 25 individuals selected to represent the interests of all stakeholders and facility users. The makeup of the committee was not finalized until after the first public meeting was held. This was done to better familiarize the project team with the groups that needed to be represented. It also allowed the public the opportunity to provide input on the committee makeup. Letters were then mailed to all potential PAC members inviting them to participate on the committee and informing them of the first PAC meeting date.

The first PAC meeting was held on September 23, 2003. The purpose of the meeting was to familiarize committee members with their role, discuss key project issues and goals, and present the initial set of proposed bypass corridors. Feedback on the preliminary corridors was requested as well as input on other corridors that could be considered.

The second PAC meeting was held on March 30, 2004. This meeting was held to present the Level 1 and 2 corridor evaluations. The full range of alternative corridors was presented along with the first level of evaluation. For corridors advanced to the second level of analysis, traffic forecasts and the initial benefits/drawbacks for each corridor were presented. Feedback regarding the initial evaluation as well and input regarding the corridors to be considered for further study in Level 3 was requested.

The final PAC meeting was held on July 13, 2004 to present to the PAC the Level 3 corridor evaluation and the preliminary recommended corridor. Traffic forecasts, costs, and benefits/drawbacks of the corridors were discussed. Feedback regarding the preliminary findings and recommendations was requested.

Elected Officials Briefings – Prior to the first public meeting and announcements regarding the study, the project team held briefings for local elected officials including the County Judge Executive (Gary Logsdon), the Mayor of Leitchfield (William Thomason), the county magistrates, and city council members. Briefings were also held with the then current Kentucky State Representative (C.B. Embry, Jr.) and Kentucky State Senator (Virgil Moore). The purpose of the briefings was to inform them of the study and gain their input regarding issues and special concerns at the outset of the study. The briefing for the Kentucky State Representative and Senator was held on June 26, 2003 at the Centre on Main. The briefing for the local elected officials was held at the Leitchfield City Hall later that same day.

Stakeholder Meetings – A number of stakeholder meetings were held during the course of the study. A meeting was held with one interested community group representing the local businesses. The meeting was held with the Leitchfield Chamber of Commerce on October 21, 2003. This luncheon meeting offered the project team the opportunity to present the study to a broad range of business and government stakeholders, many of whom were not in attendance at any of the previous project events. Another meeting was held with the City of Leitchfield Director of Public Works to discuss issues related to the landfill. A meeting was also held with a local developer to discuss issues related to proposed development just south of US 62 near KY 259

Public Meetings (Open House Workshops) – Two public meetings were held. Key goals for these meetings were to gather input on the issues and corridors to be considered and then to obtain feedback on the preliminary recommendation before a final recommendation was made. Each of these meetings is described below.

- Public Meeting #1 – This meeting was held on July 8, 2003. The purpose of the first public information meeting was to inform the public of the study, present the existing conditions documentation, gather input on the project issues and goals, and begin the process of corridor development. At this meeting, the public was specifically encouraged to highlight what they would like to have the study examine. Input on potential PAC members was also requested.

- Public Meeting #2 – This meeting was held on August 26, 2004. The purpose of the meeting was to present to the public all of the analysis work completed up to that time, and to present and request feedback on the preliminary recommendation prior to KYTC making a final decision on the project.

These meetings were designed as open house style meetings and were held at The Centre on Main. At the first pubic meeting, a brief presentation was given to familiarize the public with the study. The second public meeting featured display stations staffed

with project team members to answer questions. All attendees were encouraged to provide their thoughts and opinions on the comment forms provided at each meeting.

Project Website – A project website was used to provide information regarding the Leitchfield Northwest Bypass Study. The site is part of the KYTC planning projects website. The site is operated by the KYTC Division of Planning, which posts project information, including maps, upcoming event information, document summaries, contact information, and other project related information. The Leitchfield Northwest Bypass Study website is located at the following address:

http://transportation.ky.gov/planning/projects/projects/dist4/nw_leitch_byp/nw_leitch_byp.shtm

9.2 Agency Coordination

An agency mailing was prepared at the outset of the study and sent by the Kentucky Transportation Cabinet to various local, state and federal agencies to obtain input early in the study process. A copy of the mailing and the list of recipients are both included in Appendix E for reference. A supplemental letter was sent by Third Rock Consultants to the Kentucky State Nature Preserves Commission to gather data for the environmental overview. Copies of both the letter and response are included in Appendix E. The contents of the response are included in the Natural Environmental Overview section.

From the KYTC mailing, responses were received from a variety of agencies. Several of the responses indicated that their agency did not anticipate any significant project related issues in the study area. Others outlined standard requirements and guidance related to project planning, design, and construction. A third set of agencies did have specific concerns or issues that they wanted to have considered in the study. The agencies with specific concerns or issues included:

- Department of Military Affairs
- Kentucky Workforce Development Cabinet
- United States Department of Agriculture, Natural Resources Conservation Service
- United States Department of the Interior, Fish and Wildlife Service
- Kentucky Division of Waste Management
- Kentucky Economic Development Cabinet
- Kentucky Transportation Cabinet, Division of Multimodal Programs
- Kentucky Transportation Cabinet, Division of Environmental Analysis

A brief summary of concerns and comments related to the project from these agencies is provided below. Copies of all responses to the agency mailing are included in Appendix E.

The Department of Military Affairs expressed interest in the study. In their response they noted that they did not foresee any problems associated with the project. Instead, they thought that it would be beneficial by providing better access for troops and citizens

wanting to use the National Guard Armory located on KY 187 in the southwestern part of the study area.

The Kentucky Workforce Development Cabinet's response indicated that a new bypass west of Leitchfield would minimally benefit or possibly not benefit the agency's services. In general, they thought that a new bypass would provide no added benefit for the area, particularly for the cost of constructing the facility. Based on their response, they think that the area west of Leitchfield is not heavily congested, and a bypass located in this area would only detract from the downtown business community and roadside fast-food industry. Furthermore, they think that the current economic conditions do not support the project.

The response received from the United States Department of Agriculture, Natural Resources Conservation Service (NRCS) indicated concerns regarding impacts to prime farmland soils and additional farmlands of statewide importance. The response stated that if federal money is used to convert farmlands from agricultural use to non-agricultural use for the project, a form specific to this request must be completed and submitted to the local NRCS office.

The United States Department of Interior, Fish and Wildlife Service response expressed general concern about highway construction impacts / effects to the aquatic and terrestrial environments. The letter listed three federally threatened or endangered species that are known to occur in the project area. These species are Eggert's sunflower, the Indiana bat, and the gray bat. A survey by a trained biologist is recommended, and the US Fish and Wildlife Service should be given a copy of the data collection plan and the survey results to review. However, a survey is not necessary if it could be proven that there is no potentially suitable habitat or the species would not be present in the study area due to site-specific factors.

A comment provided by the Kentucky Division of Waste Management relates to the design phase of the project. They requested that Pulverized Glass Aggregate (PGA) be used in roadbed construction for this project to the greatest extent possible.

The response from the Kentucky Economic Development Cabinet related to providing access to area industrial facilities. The Goff Industrial Park located near the northern city limits of Leitchfield on KY 259 was specifically mentioned, and consideration was requested to include the industrial park in the new bypass corridor.

Several requests were provided in the response from the Kentucky Transportation Cabinet, Division of Multimodal Programs. They requested that the guidelines set forth in KYTC's 2002 Pedestrian and Bicycle Travel Policy be followed to ensure bicycle and pedestrian issues are considered and accommodated throughout the study. 10-ft to 12-ft paved shoulders are recommended for a shoulder bikeway corridor enhancing bicycle travel to Rough River Dam State Resort Park and Mammoth Cave National Park. A connection to the new shared use path currently in the planning stages in the Mammoth

Cave area eventually could be considered. For pedestrians, urban sections should include sidewalks for pedestrian connectivity.

The response from the Kentucky Transportation Cabinet, Division of Environmental Analysis indicated a high possibility of archeological sites in the study area, particularly the northwest portion. The rock shelters found within the study area should be avoided, as there is a strong possibility that some will be eligible for listing in the National Register of Historic Places. Some may also contain human remains.

10.0 CORRIDOR DEVELOPMENT

Overall, the corridor development process was designed to be inclusive, with input from the following sources contributing to the initial set of corridors developed for the study:

- General Public
- Project Advisory Committee Members
- Specific Stakeholders and Elected Officials
- Project Team (KYTC District and Central Office staff and the consultant team)
- Initial Technical Review (traffic, highway, environmental, etc.)
- Previous Studies

Public involvement activities conducted by the project team to solicit input during the corridor development process included:

- A public meeting held in a workshop format, where the public was encouraged to offer potential corridors for a western bypass.

- A Project Advisory Committee meeting where input was requested on potential bypass locations and connections. Those in attendance were also encouraged to offer any additional suggestions regarding other potential corridors.

- Other meetings including public officials' briefings and a presentation to the Leitchfield Chamber of Commerce where attendees were free to discuss various options and present their views both on issues and corridors.

Based on comment form responses obtained from the first public meeting, sixteen initial corridors were proposed by the public. These initial corridors are presented in Figures 16 through 18 in Appendix B. Figure 16 shows the proposed corridors with both northern and southern end points at the eastern bypass. Figure 17 shows the proposed corridors that have a northern end point at the eastern bypass and southern end points at various locations along the Western Kentucky Parkway (WKP). Figure 18 illustrates proposed corridors beginning at locations other than the eastern bypass in the north and various tie-in locations to the WKP in the south.

Also included in the list of corridors is Alternative 1, the No-Build alternative. The No-Build alternative reflects the current conditions in the study area and assumes no new construction other than projects planned in the current Six-Year Highway Plan (FY 2005 – FY 2010), including completion of the eastern bypass. The No-Build alternative will provide the baseline for comparison among the different western bypass corridors in addition to being a potential alternative.

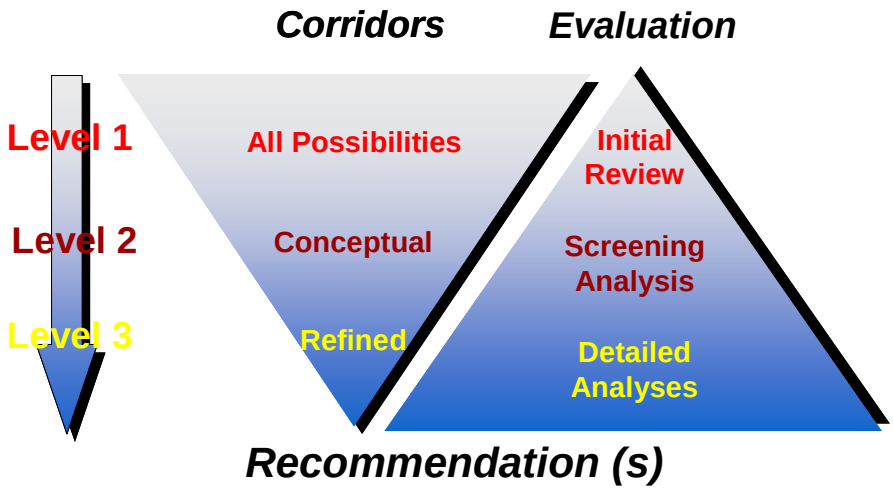
In addition to input from the public, previous studies were consulted and the study area was examined to make sure that the full range of potential corridors was considered. It was determined that the sixteen corridors put forth by the public provided a sufficiently broad range of possibilities, allowing for the examination of numerous options. However, some of the corridors developed by the public were noted as having significant impacts or construction issues. Therefore the first level of analysis was used to modify some the corridors to improve functionality and better fit the constraints of the area.

11.0 EVALUATION METHODOLOGY

The corridor evaluation procedure used in this study is a three-step process. The purpose of the three-step process is to refine the list of corridors from all possible corridors, to a short list of promising corridors, and then finally to a recommended corridor. The evaluation process uses increasingly detailed analysis methods to complete the screening and to refine the corridors remaining after each round of analysis. The goal is to study and further develop feasible corridors that best meet the project's goals, while not spending extensive effort on those that are unworkable or do not meet the project's goals.

Initially, a few pertinent and important details will be identified for a broad array of possible corridors. As the analysis progresses, the range and depth of information increases and the number of corridors being studied decreases as shown in Figure 19.

Figure 19: Three-Level Evaluation Procedure



During Level 1, much of the analysis is based on qualitative or comparative information. The principal goals at this level are to determine if a corridor is feasible (physically, financially, environmentally, and socio-politically) and generally how it compares to the other corridors. During the next two levels, the amount of quantitative data and analysis increases substantially (i.e. traffic forecasts, cost estimates, potential numbers of impacted wetlands, etc.) allowing for more detailed and definitive comparisons. The goal of the final Level 3 analysis is to select a recommended project(s).

The following three report sections present a summary of each of the three analysis levels.

12.0 LEVEL 1 EVALUATION – INITIAL SCREENING

The initial sixteen corridors plus the no-build alternative described in the corridor development section were evaluated qualitatively with regard to topography, environmental constraints, community constraints, previous studies, and feedback from the first public meeting, the first Project Advisory Committee meeting, and early project team meetings.

Some of the corridors proposed by the public impacted the quarry, the Baumberger Barrens, or the Rough River Wildlife Management Area. Others impacted heavily developed areas in town or the one documented archeological site in the study area. Impacts to these areas are not desirable and could lead to extensive mitigation, higher costs, and possible public and agency opposition. In some cases, Federal and State laws may not even permit state highway construction in these sensitive areas. Impacts to these five areas were considered flaws that required the corridors to be adjusted.

There were also corridors that crossed the tops of the knobs (north of town) or tied into the WKP in a ravine or at the existing interchange. While these corridors are feasible, they would result in high costs and impacts, which could be reduced through adjustments that would yield a similar functional concept, but a better corridor for implementation.

While these potential impacts and issues were not assessed in detail, there were many corridors with readily apparent concerns that could be addressed by adjusting the alignment. Therefore, the corridors with the issues discussed above were either modified to avoid the sensitive areas or new corridors were proposed that had relatively similar functional aspects (such as end points and distance from town). Several of the proposed corridors were also similar in concept to each other and were therefore combined to form one corridor.

Table 23 in Appendix A lists the initial sixteen corridors proposed by the public as well as the No-Build alternative. The table also lists the major impacts and the subsequent revisions to the corridors. These corridors correspond to those illustrated on Figures 16 through 18 in Appendix B.

The new corridors developed from the public corridors are listed in Table 24 in Appendix A and are illustrated on Figures 20 and 21 in Appendix B. Figure 20 illustrates the proposed new corridors that connect to the Eastern Bypass in the south (Group A corridors). The second figure, Figure 21, shows the corridors that have various connections with the WKP in the south (Group B and Group C corridors). These corridors are recommended for further analysis in Level 2.

While these are the corridors recommended for further study, it is possible that portions of different corridors could be combined to form a new alternative corridor. This option will be explored in the subsequent evaluation levels.

13.0 LEVEL 2 EVALUATION – PRELIMINARY ANALYSIS

13.1 Level 2 Evaluation Summary

Fourteen corridors remained after the Level 1 evaluation. For the second level of analysis, the corridors were arranged into three groups. Group A consisted of five corridors with connections at both ends to the eastern bypass. Group B consisted of six corridors that connect to the eastern bypass in the north and tie into the WKP at a new interchange at the southern end. Group C consisted of three corridors that connect to KY 259 north of the eastern bypass and utilize different portions of the Group B corridors to connect to the WKP.

Level 2 Analysis Methodology

The Level 2 evaluation procedure assigned qualitative ratings and/or numerical values for specific evaluation criteria in the categories of traffic, environment, community, and construction. The results of the Level 2 evaluation are presented in Tables 25 through 28 in Appendix A. Quantitative values presented in the matrices are approximations or estimates based on general alignments located within the proposed corridors. Figures 22 - 35 in Appendix B show each of the corridors and a summary of benefits, drawbacks, and other issues.

Traffic – For the traffic analysis at this level, traffic forecasts were developed for a specific corridor from each group. The most typical corridor(s) for each group was selected. Corridors A1 and A5 were selected from Group A to examine traffic flow both close to and far from town. Corridors B4 and C2 were selected from the B and C Groups. The results of the forecasts are summarized in the traffic evaluation matrix (Table 25). Refer to the Traffic Forecast Report in Appendix C, Section 1 for additional detail regarding the forecasts as well as traffic flow maps depicting the forecasted volumes for each scenario.

Environment – Specific quantitative elements of the Level 2 environmental analysis included an assessment of the number of streams, wetlands, ponds, fault lines, landfills, and potential hazardous material sites that may be impacted by each corridor. The analysis also included a general qualitative analysis of impacts to sensitive environmental features such as threatened and endangered species, habitat and natural areas, and impacts to quarries and mines. The potential for impacts to cultural historic sites and archeological impacts was also examined with respect to each corridor. Major environmental features including natural wetlands, landfills, natural areas (WMA and Baumberger Barrens), the quarries and mining area, and the knobs are all featured on the corridor figures. These figures graphically illustrate the major environmental constraints associated with each corridor.

Community and Construction – Other quantitative measures used to evaluate the corridors included an assessment of property impacts relative to the community, and the

development of initial conceptual construction cost estimates (excluding design, right-of-way, and utilities). A boundary for the approximate limits of dense development is shown on the corridor figures to illustrate the location of the bypass corridors relative to the existing development. Also, major impacts to residential areas are highlighted for each corridor on the figures.

Level 2 Corridor Analysis Summary

The following sections provide a summary of the Level 2 evaluation results, focusing on the key issues or reasons for advancing or removing a corridor. A comparative analysis was used to evaluate the corridors, thereby advancing corridors with the most desirable features compared to similar corridors and removing from further consideration corridors that were less desirable. For a full list of benefits, drawbacks, and other issues, please refer to the top portion of each of the corridor figures (Figures 22 – 35). For the detailed analysis and comparison of the corridors refer to the analysis matrices (Tables 25 – 28).

Group A Corridors (Refer to Figures 22 – 26)

- Corridor A1 – Corridor A1 has many desirable characteristics. It has the highest traffic volumes, removes the most traffic from KY 259 / US 62, appears to serve the existing and future community well (at least close to town), is the shortest in length, and has the least construction cost. It also has the fewest potential environment impacts. For these reasons, Corridor A1 was recommended for advancement to Level 3.
- Corridor A2 / A3 – These two corridors share the same northern and southern routes, but differ slightly in the middle where Corridor A3 is located closer to town and Corridor A2 borders the quarry and underground mine. These corridors have characteristics similar to Corridor A1, but are located slightly further from town. A general corridor through this area was recommended for study in Level 3. The corridor that did not cross the mine and was closer to town (Corridor A3) was selected as the better of the two; however the 2,000 foot A3 corridor captures the approximate centerline for both corridors.
- Corridor A4 – This corridor was not considered further because the analysis showed that the corridor crossed through the quarry area, passing over the underground mine. It also had a number of issues similar to Corridor A5 (see below). Corridor A3 was proposed as a better option.
- Corridor A5 – Corridor A5 is the furthest corridor from town that connects to the east bypass both north and south of town. It has relatively low traffic volumes, long length, and a fairly high cost. It is also far from town and could cause development to “jump” out to the new highway leaving undeveloped land in the vicinity of the current city limits. It does not have a new connection to the Western Kentucky Parkway and it increases traffic on US 62. The corridor follows US 62 and the railroad; thereby leading to potential construction and property impact issues (US 62 would be upgraded as part of this project). Comparatively, there are other corridors that appear to be better such as Corridor

A3 (for a close in option) and Corridor B5 (for a western option). Therefore, Corridor A5 was not recommended for further evaluation in the Level 3 analysis stage.

Group B Corridors (Refer to Figures 27 – 32)

- Corridor B1 – This corridor has a mix of benefits and impacts. It is possible that locating the bypass closer to town could be beneficial, with higher traffic volumes and lower construction costs. A western bypass closer to town could better serve the town and would keep new development near town. However, there is concern that the new interchange associated with this corridor would be constructed too close to the current KY 259 interchange (they are approximately one mile apart). Also, at this location there is no existing roadway south of the parkway and therefore no southern connectivity. Further analysis is necessary to fully evaluate the benefits and impacts of the corridor. Therefore it was retained for study in Level 3.
- Corridor B2 – This corridor consists of an interchange just east of KY 187 on the Western Kentucky Parkway. Similar to Corridor B1, there is no existing roadway south of the parkway at this location, and therefore no southern connectivity. From an accessibility and connectivity standpoint, an interchange is not desirable at this location. Other B corridors provide better access and functionality. Therefore this corridor was not recommended for further study.
- Corridor B3 – This corridor follows the existing alignment of KY 187 before connecting to the WKP at a new interchange. It is expected to operate similarly to Corridor B5 but has the potential for more impacts. Construction difficulties with building a bypass along an existing route, right-of-way issues, and property acquisition were factors in the decision to not recommend this corridor for further study.
- Corridor B4 – This corridor was also not recommended for further study at this time. It is expected to function in a manner similar to Corridor B5, but with greater property impacts. In particular, it has potential property impacts to a new subdivision just north of US 62.
- Corridor B5 – This corridor was recommended for advancement to Level 3 since it allows for the construction of a new interchange at KY 187 and the WKP, but goes far enough to the west to minimize property impacts to development in the vicinity of the high school. It also responds to the public's request for a far west corridor. Of the far west Group B Corridors (i.e. Corridors B2 – B6), Corridor B5 was determined to be the preferred option.
- Corridor B6 – This corridor is the furthest corridor west of Leitchfield, and it is also the longest. The high estimated construction cost was not justifiable as there are more cost-effective alternatives. In addition to these negative aspects, this corridor was found to have possible cultural historic and property impacts as

well as potential archeological issues. This corridor was not recommended for further study.

Group C Corridors (Refer to Figures 33 – 35)

- Corridor C1 – The C Corridors were developed to provide a possible northern connection option at the request of members of the public. The analysis showed that Corridor C1 was not an advantageous corridor, but it was initially kept as an option in case environmental or cultural / historic impacts were discovered that would prevent a new western bypass from connecting to the eastern bypass in the north. However, connecting to KY 259 north of the eastern bypass may be difficult due to cemeteries, churches, and other development, earthwork associated with crossing the knobs, and challenging vertical geometry on KY 259 that may make intersection placement difficult. Possibly even more significantly, the offset bypass intersections will force east-west through traffic on the bypass to turn twice. This will increase travel time and congestion, while decreasing bypass use. Corridor C1 would also likely cost more than a comparable B Group alternative. Upon further consideration at the second Project Advisory Committee meeting, it was determined that Corridor C1 did not merit further study for the reasons outlined above. Therefore, Corridor C1 was not advanced to the Level 3 analysis.
- Corridor C2 – This corridor was not considered further because of similar negative impacts as Corridor C1, including relatively low traffic volumes and a high estimated cost.
- Corridor C3 – This corridor was also not considered further since it was determined to have similar, or worse, impacts in most of the evaluation categories compared to Corridors C1 and C2.

13.2 Level 2 Analysis Summary

After the Level 1 initial screening evaluation, the original sixteen corridors were modified or combined to form fourteen corridors. The more detailed analysis performed in Level 2 further reduced the corridors to only four (4) corridors (Corridors A1, A3, B1, and B5). It was recommended that the other corridors, Corridors A2, A4, A5, B2, B3, B4, B6, C1, C2, and C3 be removed from further consideration. In general, it was determined that these corridors did not meet the project goals. Major reasons for discarding the corridors included community impacts, high construction costs compared to anticipated benefits, poor attributes compared to another similar corridor, environmental impacts, and low traffic volumes.

14.0 LEVEL 3 EVALUATION – DETAILED ANALYSIS

14.1 Level 3 Analysis Summary

Following the Level 2 analysis, the remaining corridors were refined for the Level 3 evaluation to provide the best possible corridor with the least impacts. Figure 36 in Appendix B shows these final four corridors as well as some of the key environmental and community features. After refining the four corridors advanced from Level 2, they were subjected to a detailed analysis to determine which corridor should be recommended for implementation. A summary evaluation matrix for each of the four primary categories (Traffic Operations, Environment, Community, and Implementation / Construction) was used as the primary analysis tool, and is included as Table 29 in Appendix A. This table highlights the key evaluation factors used to differentiate between the Corridors such as traffic volumes, cost estimates, developable land, and environmental resource data. Detailed traffic forecasts were developed for each corridor. The forecasted traffic volumes and levels of service are included in Section 3 of Appendix C. A brief discussion of the results of this analysis is included below for each corridor.

14.1.1 Corridor A1

Traffic Operations - Of the four remaining corridors, Corridor A1 has the highest projected traffic volumes (3,300 – 11,600 ADT in 2030). This is partially a result of its proximity to the town of Leitchfield. Because of the higher traffic volumes, this corridor provides the greatest traffic reduction in town. For example, 2030 traffic volumes decrease by 2,200 vehicles per day just north of the KY 259 / KY 737 intersection and by 8,400 vehicles per day just south of the KY 259 / US 62 (West) intersection. Construction of this corridor is also expected to reduce traffic volumes on US 62 just west of town by approximately 7,900 vehicles per day in 2030. Removing traffic from these roadways helps reduce congestion in town. It also reduces traffic on high crash roadways in town. Most of the key intersections in town are expected to operate at LOS C in 2030 with the exception of two intersections: KY 259 / West Lake Drive / East Bypass and US 62 (Mill Street) / KY 259 (North), which will operate at LOS F. Of the four corridors, Corridor A1 provides the best overall traffic flow conditions (Corridor A3 is expected to have similar traffic operations). To improve operating conditions at the two intersections that fall below the desirable operating threshold, additional turn lanes and signal modifications would be necessary. Refer to Appendix C, Section 2 for further details regarding traffic volumes and traffic operations for Corridor A1.

Environment – Potential environmental and archeological impacts were determined to be minimal except for the possibility of landfill impacts near the southern connection point to KY 259.

Community - Corridor A1 is the closest western bypass to Leitchfield, and is therefore likely to impact the highest number of homes. Also, the corridor runs through primarily

developed areas, opening up the least amount of new land of any of the final corridors for potential development.

Implementation / Construction - A bypass constructed in the A1 corridor would likely be the shortest at approximately four miles. This leads to a lower construction cost, and the overall cost (including right-of-way, utilities, and design costs) for Corridor A1 is the least of the four corridors at $26.0 million compared to a high of $40.9 million for Corridor B5.

Corridor A1 Conclusion: Corridor A1 has many desirable features, including the highest traffic volumes on the bypass and the lowest cost (both construction and total cost). However, the analysis revealed that Corridor A1 is expected to impact the most residential homes of the four corridors and opens up the least amount of new land for economic development. Concern was expressed by the public and the Project Advisory Committee that a western bypass built that close to town would limit future development around Leitchfield. Overall, Corridor A1 is not recommended because of these reasons and because there is another corridor (Corridor A3) that is expected to better meet the project goals and therefore better serve the community.

14.1.2 Corridor A3

Traffic Operations – The projected Corridor A3 traffic volumes are high (3,200 – 10,200 ADT in 2030), but lower than those for Corridor A1 (3,300 – 11,600 ADT in 2030). As the bypass is located further west, the traffic volumes decrease, which leads to a lesser reduction of traffic in town. For example, 2030 traffic volumes decrease by approximately 2,000 vehicles per day just north of the KY 259 / KY 737 intersection and by 7,700 vehicles per day just south of the KY 259 / US 62 (West) intersection. On US 62, 2030 traffic volumes are decreased by a high of 7,900 vehicles per day just west of the KY 259 / US 62 intersection. Similar to Corridor A3, removing traffic from these roadways helps reduce congestion in town, and reduces traffic on high crash roadways in town. Levels of service for most of the key intersections in town in the year 2030 are similar to Corridor A1, with the same two intersections, KY 259 / West Lake Drive / East Bypass (South) and US 62 (Mill Street) / KY 259 (North), operating at a LOS F. Adding capacity such as turn lanes and signal modifications are necessary to improve the LOS. Refer to Appendix C, Section 2 for further details regarding traffic volumes and traffic operations for Corridor A3.

Environment – Similar to Corridor A1, potential environmental and archeological impacts were determined to be minimal except for the possibility of landfill impacts near the southern connection point to KY 259.

Community – Because this corridor is located slightly further from town and passes through less populated areas, the number of homes and buildings potentially impacted is lower than Corridor A1. Also, more land than Corridor A1 is opened up for potential new development. However, there is ongoing residential development in the vicinity of Sunbeam Road and there is development proposed for the area south of US 62. This

future development may cause additional property impacts, higher costs, and design complications for a western bypass constructed in the A3 corridor. An extra wide corridor was proposed for these areas to provide additional flexibility during the design phase.

Implementation / Construction – At a length of 5.5 miles, Corridor A3 is approximately 1.5 miles longer than Corridor A1. As a result, the estimated construction cost for this bypass is higher, with a total cost of $33.5 million (including right-of-way, utilities, and design). This is higher than the cost for Corridor A1, but lower than the cost for the two alternative corridors that include a new interchange on the WKP.

Corridor A3 Conclusion: Overall, Corridor A3 meets many of the project goals, offering significant benefits with modest impacts. Corridor A3 has relatively high traffic volumes on the bypass, with volumes just slightly lower than those for Corridor A1. Of the four corridors, Corridor A3 has the highest number of vehicle miles traveled. It benefits safety by removing traffic from high crash rate highway sections. It also offers an alternative connection between US 62 and the Eastern Bypass. It provides good access and circulation for truck traffic in the west. Impacts to the environment and community are limited. The estimated cost is higher than Corridor A1, but lower than Corridor B5. Furthermore, it does not constrain the town of Leitchfield from further development, but rather promotes the possibility of new development by increasing access, facilitating circulation, and opening new land to development. For these reasons, Corridor A3 was selected as the recommended corridor.

14.1.3 Corridor B1

Traffic Operations – Projected traffic volumes for this bypass are lower than for the previous two corridors (2,800 – 7,500 ADT in 2030). Consequently, the reduction in traffic volumes in town is also less. For example, 2030 traffic volumes decrease by approximately 1,900 vehicles per day just north of the KY 259 / KY 737 intersection and by 6,000 vehicles per day just south of the KY 259 / US 62 (West) intersection. Traffic on US 62 (West) would be reduced by a maximum of approximately 7,300 vehicles per day in 2030 east of McDonald Road. Constructing a new interchange with the WKP will impact traffic on this roadway. Forecasts show that traffic will increase on the WKP between the new interchange and the existing KY 259 / WKP interchange. This is likely the result of local traffic using the WKP to travel between KY 259 (south of town) and US 62 West (and other points west of Leitchfield). It is also due to regional traffic that would use the new interchange instead of the current interchange to access points on the west side of Leitchfield. Because of local traffic using the WKP, traffic would increase at the KY 259 / WKP interchange, potentially causing level of service problems in the Midday peak in 2030. All key intersections analyzed along KY 259 will also operate at undesirable levels of service in both the Midday and PM peak hour periods by the year 2030. The intersections of KY 259 / West Lake Drive / East Bypass (South) and US 62 (Mill Street) / KY 259 (North) will operate at level of service F without capacity and signal improvements. The intersection of US 62 (W. White Oak Street) / KY 259 (South) will operate at a level of service D without improvements. In general,

intersection operating conditions along KY 259 are worse with the construction of Corridor B1 compared to Corridors A1 and A3. Refer to Appendix C, Section 2 for further details regarding traffic volumes and traffic operations for Corridor B1.

Environment – This corridor has several environmental issues including possible conflicts with an underground mine and archeological impacts associated with potential disruption to the Day Cliffs. (The Project Advisory Committee requested that the study consider crossing the mine area.) Additional geotechnical analysis was performed to evaluate the impacts of constructing a roadway over portions of the underground mine. Two techniques could be used to allow for roadway construction including backstowing the cave with a durable rock fill or collapsing the mine. Because of the magnitude of this project and the amount of fill that would be necessary, utilizing either of these methods could lead to design complications and could greatly increase the cost of the project. It was recommended that construction over the mines be avoided if possible. It is also necessary to avoid the Day Cliffs area. Therefore, Corridor B1 would need to be widened to the east (similar to Corridor A3) to avoid these areas.

Community – Corridor B1 has fewer impacts to homes and businesses than Corridors A1 and A3, but has less available land for new development. This is a result of its proximity to the underground mining operations. A new interchange with the WKP would be beneficial to the community, providing access to the WKP for highways west of Leitchfield. However, it could negatively impact the community, if because of its proximity to the existing interchange, traffic begins to use the WKP as a shortcut to get from the west to the east thereby increasing congestion at the existing interchange. Adding traffic to the existing interchange is contrary to the project goal of improving traffic flow if it causes an increase in congestion and delay.

Implementation / Construction – This corridor is slightly shorter than Corridor A3 at a length of 5.3 miles. The total cost (including right-of-way, utilities, and design) for this corridor is higher than Corridors A1 and A3 at $39.7 million, but less than Corridor B5 ($40.9 million).

Corridor B1 Conclusion: Corridors A3 and B1 have many similarities since they share a portion of the same corridor. One of the primary issues with Corridor B1 is whether or not a new interchange is warranted, especially one close to the existing interchange with KY 259. The traffic forecasts indicate that the new interchange would be used by both local and regional traffic. However, the new interchange is close enough to the existing interchange that it could be viewed as serving a somewhat duplicative purpose. Conversely, an interchange further west could provide a new stronger link to the high school and other western development areas. In addition, without a southern connection, the interchange becomes a stub facility, serving only the area north of the WKP, which is not ideal for a regional access point. Another key issue is that the project does not include a new connection from US 62 to KY 259, a connection that was determined to be very beneficial during the course of the study. Projected traffic volumes are also slightly lower than for Corridors A1 and A3. In addition to traffic issues, Corridor B1 is more expensive than Corridor A3 (due to the interchange). It also

may impact a known archaeological resource area and crosses the edge of the underground mine, causing potential construction issues as well as possible increases to the cost. Based on the analysis described above, Corridor B1 is not recommended for implementation.

14.1.4 Corridor B5

Traffic Operations – This corridor is projected to have the lowest bypass traffic volumes ranging from 1,500 to 4,800 ADT in 2030. As a result, it removes the least amount of traffic from town as well as from the high crash sections of KY 259 and US 62 in town. In 2030, traffic on KY 259 declines by 1,300 vehicles per day just north of the KY 259 / KY 737 intersection and 3,600 vehicles per day just south of the KY 259 / US 62 (West) intersection. Traffic volumes on US 62 (West) are reduced by between 3,300 and 4,600 vehicles per day in 2030. (While, these are smaller reductions, traffic is removed from a much longer section of US 62 with this Corridor.) Similar to Corridor B1, traffic volumes increase on the Western Kentucky Parkway as a result of the construction of a new interchange in the vicinity of KY 187. Approximately 3,700 vehicles per day in 2030 are added to the WKP between the new interchange and the KY 259 / WKP interchange. This is less than the number of vehicles added as a result of constructing the interchange associated with Corridor B1. This is likely due to the fact that the distance between the two interchanges is greater than for Corridor B1; therefore travel times are greater, causing fewer drivers to choose the WKP path. It is also a result of the interchange being located further from the more densely developed areas close to town. Levels of service at key intersections in town are similar to Corridor B1, with the exception of the intersection of US 62 (W. White Oak Street) / KY 259 (South) which would operate at LOS F in 2030. Refer to Appendix C, Section 2 for further details regarding traffic volumes and traffic operations for Corridor B5.

Environment – The major environmental issues associated with this corridor include archeological impacts to potential rock shelter areas in the western portion of the corridor and impacts associated with the topography, which includes three substantial valleys or ravines. In these areas, deep cuts and/or extensive fills may be required. The corridor also runs along the edge of Layman Knob in the north. There are a number of stream crossings and a series of natural wetlands at the south end of the corridor.

Community – Compared to the other four western bypass corridors, Corridor B5 impacts the fewest homes and businesses. There is little existing development in the corridor, allowing for the greatest potential for economic development in terms of developable acres. However, because the bypass is so far from town, it would not serve as many users as a corridor closer to town (i.e. Corridors A1 and A3). Regarding the proposed interchange, the community could benefit from increased regional access at this location. This location would provide access both north and south of the WKP, and would improve access to the high school and other nearby development areas. Drivers would have the option of avoiding congestion on KY 259 to go to areas west of Leitchfield, improving overall traffic flow and circulation.

Implementation / Construction – Corridor B5 is the longest of the four corridors at approximately 7.4 miles. Correspondingly, the total cost estimate is also the highest of the four corridors at $40.9 million.

Corridor B5 Conclusion: Corridor B5 is a long western bypass that does not adequately address the first two project goals of improving traffic flow and safety. The traffic volumes are low; it minimally reduces traffic in town; and it has the worst levels of service in town of all four corridors. Furthermore, traffic is not substantially reduced on roadways identified as having a high crash rate. It also has a high construction cost and the greatest potential for archaeological impacts of the four Level 3 corridors. However, construction of a new interchange in the vicinity of KY 187 and the WKP could be beneficial as it could spur economic development, which is one of the project goals. It would also significantly improve regional access to the southwestern portion of the study area. Overall Corridor B5 appears to meet some of the project goals, but it conflicts with others. Therefore, this corridor is not recommended for implementation, but further consideration should be given to constructing a new interchange at KY 187 and the WKP.

15.0 RECOMMENDED PLAN

15.1 Study Recommendation

The proposed final recommendation for this study is Bypass Corridor A3 with two additional potential projects; a new WKP interchange at KY 187 and a new connector road between US 62 and KY 187. Figure 37 in Appendix B illustrates these three recommended projects. Table 30 in Appendix A summarizes the impacts and characteristics of these three projects in the matrix format used during the analysis phase. For reference, a final traffic forecast for these recommended projects is included as the last section of Appendix C.

Corridor A3 was selected as the recommended western bypass based on project team input, Project Advisory Committee input, public feedback, and the technical analysis. Overall, Corridor A3 was the most cost effective means of achieving the project goals, while minimizing impacts. A discussion of how this recommendation compares to the project goals is provided in the following section to further illustrate why it was the preferred corridor.

The construction of a new interchange and upgrades to KY 187 and US 62 between the interchange and the bypass is also proposed. This project was supported by the public and viewed as a good project to promote better local access and encourage development. The second independent project recommended by this study is construction of a new connector roadway between US 62 and KY 187 west of the high school. This would provide an optional route for traffic headed to the interchange from US 62 (west), thereby reducing through traffic on School House Road. Construction of this road is also recommended to limit congestion and safety issues in the vicinity of the high school that are likely to result if a new interchange is constructed at the WKP and KY 187.

15.2 Comparison of Recommendation to Project Goals

Below is a comparison of the project recommendation to the project goals. The comparison is used as a measure of how effectively the study recommendation achieves the goals set forth for the project.

- **Improve Traffic Flow**
  Any of the western bypass corridors could have improved traffic flow by providing an alternate, higher speed facility for traffic traveling west of Leitchfield. However, by keeping the corridor just inside the mine and close to town, compared to constructing it further out, the traffic usage will be higher, thereby causing a reduction of traffic volumes through the congested parts of town. While the bypass traffic volumes for Corridor A3 were determined to be lower than for Corridor A1, the difference was relatively small and not worth the added impacts and limitations associated with the construction of Corridor A1. Corridor

A3 also provides a good north-south highway, which can collect and distribute traffic from the existing east-west routes, promoting better circulation. The southern connection between US 62 and KY 259 was shown to be the most important element of the plan, removing traffic from US 62 and providing an excellent east-west link on the southern side of the town. The construction of a new interchange and a new connector roadway is expected to improve traffic flow in the vicinity of the high school, which has been identified as a major traffic generator and a cause of congestion during peak hours.

- **Improve Safety**
  Construction of Corridor A3 will likely cause some traffic to divert from highways with safety concerns to the new bypass highway. It will provide a new facility built to current design standards, providing a safer option compared to some of the local roads that were identified as having poor lines of sight, narrow lanes, shoulders, and steep grades. The proposed upgrades to KY 187 and US 62 as well as the construction of a new connector road in the vicinity of the high school should also improve safety.

- **Economic Development**
  Of the four corridors evaluated in the Level 3 analysis, Corridor B5 had the most new land available for development in terms of acreage, with Corridor A3 ranked second. However, because of its proximity to town, development along Corridor A3 may be more likely than development far from town on Corridor B5. Corridor A3 will not limit the growth of Leitchfield, but facilitate development that has a strong relationship to the existing developed areas. Additionally, the construction of a new interchange at KY 187 will increase the opportunity for new development, particularly for interchange related businesses, but also for businesses on KY 187 and US 62 that may want convenient regional and national access via the WKP.

- **Improve Highway for Trucks**
  A major focus of Grayson County's economy is manufacturing. Several industrial plants are located in and north of town. There are also numerous other businesses including quarries and lumber yards located west of Leitchfield. Construction of Corridor A3 will provide an alternate, faster path for trucks traveling through Leitchfield to both industrial plants and businesses in the north and west. The bypass will also provide better circulation for trucks as well as better connections with the rest of the highway network in the west. Currently, trucks must travel through town to reach most of these businesses. The new bypass will allow truck traffic to avoid traveling through town on city streets, particularly the courthouse square, but also US 62 and KY 54 just west of town. According to the traffic forecast prepared for the recommended projects, a significant portion (likely in excess of 50 percent) of the 2030 truck traffic that is not already diverted by the Eastern Bypass would be removed from US 62 and KY 259 in town, and would shift to the new bypass.

If a new interchange is constructed, along with the connector and improvements to KY 187 and US 62, truck traffic, will have a more direct regional link via the WKP. This may be particularly useful for trucks coming from the west on the WKP, which could exit at the new interchange, travel along KY 187 to US 62, and then north on the bypass. It will also benefit businesses west of Leitchfield including businesses as far west as the town of Millwood such as W. M. Cramer Lumber Company and others. Overall, these projects will benefit local and regional truck traffic through better connections, more efficient paths, and greater access to destinations in and around Leitchfield as well as other regional locations.

- **Improve Access**
  Corridor A3 connects to both ends of the eastern bypass, thereby forming a continuous highway around Leitchfield. This results in a north-south route west of town, as well as an east-west route south of town connecting US 62 and KY 259. In addition, it better connects the existing highways west of Leitchfield, providing access between them. The construction of a new interchange at the WKP and KY 187 will improve access for both the high school and the National Guard Armory located along KY 187. All three projects combined best achieve this goal by providing a complete highway system west of Leitchfield and access / connectivity at key points.

- **Enhance System Efficiency and Connections**
  Part of the existing conditions analysis identified the lack of system connectivity as an issue. The current highway system west of Leitchfield is a radial system with mostly east-west highways running west from Leitchfield. There are few good north-south connections aside from KY 259 which runs through the center of town. A western bypass will link all of the east-west highways west of Leitchfield, providing a more efficient connection between the highways. Corridor A3 is preferred over the other bypasses since it is not too close to KY 259 where it would provide a duplicate route, and it is not too far from town where it would not serve a high number of users. Constructing a new interchange and a new connector roadway between KY 187 and US 62 will further enhance connectivity by providing an improved path for traffic south of the WKP to go north and vice versa. Overall, the three proposed projects will greatly increase highway connectivity west of Leitchfield, providing more direct and efficient travel options in the west.

16.0 PROPOSED DESIGN / MITIGATION AND NEXT STEPS

16.1 Design Elements

With higher traffic volumes predicted to use the southern segment of Corridor A3 from KY 259 to US 62, a typical four-lane urban section is proposed for initial planning and cost estimating purposes. (Refer to Figure 38 in Appendix B.) The proposed typical section is similar to the one used for the southern section of the eastern bypass, providing both an appropriate design and continuity between the two highways. From US 62 north to KY 54, an urban two-lane typical section is proposed due to lower predicted traffic volumes. (Right-of-way could be purchased for a four lane ultimate section.) This will then transition into a two-lane rural typical section from KY 54 to KY 259 north where it will terminate across from the eastern bypass. The two-lane rural typical section proposed for the northern segment of the western bypass is also similar to that used for the northern portion of the eastern bypass. The urban typical sections employed for this planning study included sidewalks and the rural sections included paved shoulders wide enough for use by class B/C bicyclists (basic bicyclists and children). To better accommodate bicyclists in the urban typical section, an additional six feet could be added in both directions of travel to provide marked six foot bike lanes as noted on Figure 38. All of the roads intersecting the western bypass that require reconstruction will be rebuilt with similar typical sections, including turn lanes as appropriate at each location.

16.2 Design Issues

There are a number of issues associated with the implementation of Corridor A3 that will likely need to be addressed during the design phase of the project. The first relates to the ownership of mineral rights in the area of Corridor A3 east of the existing mine. Ragland Quarry has acquired the mineral rights in the vicinity of Wallace Farm, with plans to expand its mine to the east and south over the next ten years. The section of Corridor A3 that would be impacted is in the vicinity of KY 54. (Refer to Figure 39 in Appendix B.) If the mine is expanded before the bypass reaches the right-of-way phase, it could limit the potential routes for the new highway. Alternately, if the bypass reaches the right-of-way phase before the mine is expanded substantially, the Cabinet may have to purchase a portion of the mineral rights. It may also be possible to try and preserve a corridor or route through the future mine area, however this could present legal and funding challenges. Regardless, this is an issue that will have to be addressed in the future design phase of the project.

The second issue relates to ongoing development in the corridor. Specific areas of new development that may be impacted by the construction of Corridor A3 include a new subdivision and other residential projects in the vicinity of Sunbeam Road and a new development south of US 62 and west of KY 259. (Refer to Figure 39 in Appendix B). The development along Sunbeam Road may increase the future property impacts and costs for the bypass section between KY 737 and KY 54. The development proposed

for the area south of US 62 could be impacted by the bypass section between US 62 and KY 259. The first phase of the US 62 development has already begun, and includes the construction of elderly housing units just south of US 62 outside of town. The future phases of this development consist of additional new homes. A new roadway from US 62 to near KY 259 is also planned as part of the development. The general location of the development and new road are shown in Figure 39 in Appendix B. Potential impacts related to these developments should be addressed in more detail during the design phase of the project.

Another issue is impacts to the old Leitchfield landfill located near the tie-in location for Corridor A3. While it would be beneficial to completely avoid the landfill, it may be difficult to do so. Efforts should be made to avoid or minimize impacts during the alignment selection. Estimates of environmental mitigation costs, including dealing with the old Leitchfield landfill, have been developed and are discussed in more detail in the next section (Section 16.3).

16.3 Cost Estimate

Planning Level Project Costs – Final planning level cost estimates have been developed for each of the three proposed projects. The estimated construction costs are listed in Table 31 for each project. Utility and design costs are also given for each project. Right-of-way costs are only presented for Corridor A3 as these were provided by District 4. Order of magnitude mitigation costs were also included in the right-of-way cost estimate since that is where they would likely be incurred. The total cost for each project includes all of the cost elements presented and is shown to the far right of the table. These cost estimates in 2004 dollars are for planning purposes only and are subject to further refinement during the design phase.

Mitigation Costs – Approximate costs of project mitigation for Corridor A3 have been developed and are included in the table above. Mitigation costs for the other two recommended projects were not determined since they are smaller scale projects and the analysis showed few if any impacts to the environment.

The three main mitigation costs appear to be for potential archeological resources, potential wetlands, and the crossing of the old municipal landfill at the south end of the corridor. It is important to note that at this point in the planning process, the mitigation estimates are merely order of magnitude costs based on past experience and professional judgment. No detailed estimates have been prepared, nor could they be prepared without substantial field investigation and highway design work. With that said, the archeological mitigation costs have been estimated to be between $250,000 and $1.5 million. A route that avoids the rock shelter/ Day Cliffs area in the west of the corridor could be closer to the low end of this range, while a route that affects these areas is more likely to be at the high end of this range. Regarding wetlands, it is difficult to predict the extent of wetland impacts without an alignment and wetland delineations. However, it is expected that the cost will be relatively modest (<$250,000) compared to the total cost of the bypass.

The landfill is likely to be the most expensive of the three. For Corridor A3, an additional $2 to $6 million may be necessary to cross the old Leitchfield landfill. This rough "ballpark" estimate is based on an assumed length and width of roadway crossing the landfill (1,200' by 200'), an assumed average depth of waste over that length (20'), and an assumed cost per cubic yard of waste removed ($25/CY). These values produce a cost estimate of $4.5 million. However, there is the potential for significant variation in these values. For example, the length and width could be increased or decreased depending on the final route across the landfill. The depth estimate was based on limited topographic information and knowledge of older closed landfills, but it could vary substantially. Field sampling will need to be completed to determine the true depth of the waste. The unit cost for removal is based on costs associated with the Russellville Landfill crossing six years ago, as well as a landfill designer cost estimate, but it also is likely to vary. Finally, this cost estimate does not account for any hazardous waste or leachate issues, nor does it account for removal of orphaned landfill areas. Field measurements and testing should be completed early in the Phase I Design process to facilitate an appropriate design and allow for more accurate cost estimates.

Table 31: Recommended Projects Cost Estimates

Project		Length (miles)	Construction	ROW & Project Mitigation	Utilities	Design	Total
Western Bypass A3		6.95	$21.4 million	$14.6 million ($6 million is mitigation cost)	$850,000	$2.6 million	**$39.5 million**
Western Bypass A3 (Phased Project Costs)	Phase 1: KY 259 S to KY 54	2.46	$11.3 million	$10.2 million ($4.5 million is mitigation cost)	$600,000	$1.4 million	$23.5 million*
	Phase 2: KY 259 N to KY 737	1.70	$4.4 million	$1.1 million	$130,000	$600,000	$6.2 million*
	Phase 3: KY 54 to KY 737	2.79	$9.1 million	$3.5 million	$120,000	$1.1 million	$13.8 million*
New Interchange/Upgrades to KY 187 from Interchange to Bypass		2.78	$14.0 million	-	$1.8 million	$1.7 million	**$17.5 million (w/o ROW)**
New Connector between KY 187 and US 62		0.67	$1.6 million	-	$80,000	$400,000	**$2.1 million (w/o ROW)**

Note: All costs are in 2004 dollars
*The sum of the phasing costs is higher than the total cost for Western Bypass A3 because of imbalance between cut and fill.

16.4 Project Phasing

The Corridor A3 bypass project could be divided into multiple phases if, as a result of funding or other limiting factors, it was determined that construction of the full western bypass was not feasible at one time. (For reference, costs for each phase are presented in Table 31.) If it were separated into phases, the most important section would be the southern end of the bypass between US 62 and KY 259 due to its high projected use. If possible, this section could be carried north to KY 54 with the initial construction. The reason for doing this is that there are construction cost savings to completing the railroad crossing with the initial project. If the crossing is not built initially, then the crossing will have to be retrofitted later by reconstructing the bypass and crossroad to raise, lower, or move the Bypass / US 62 intersection to bridge over (or under) the railroad.

The second phase of the bypass would likely be the section between KY 259 and KY 737 in the north, leaving the middle section from KY 737 south to KY 54 as the final section. This final section would face some of the most challenging obstacles due to existing and ongoing residential development in the area, mineral rights / mining issues, and the potential for archeological resource impacts. Lengths and costs for each of theses phases are shown in Table 31 with the overall project costs.

The WKP / KY 187 interchange project should be constructed separately from and after construction of at least the first phase of the bypass (western bypass from KY 259 north to US 62 and possibly KY 54). It would include improving KY 187 and US 62 between the interchange and the Corridor A3 bypass. The second project recommended by this study is construction of a new connector roadway between US 62 and KY 187 west of the high school. If sufficient funding is available, it is desirable to complete this project as part of the interchange project. However, it could be completed as a separate project at a later date.

16.5 Multimodal Facilities

There are no freight or transit facilities in the study area; therefore, these facilities would not be impacted by the study recommendation. The Paducah and Louisville Railway (P&L) will be crossed by the western bypass, and the railroad company should be consulted regarding the design of the crossing. Coordination with the railroad should be pursued to ensure minimal disruptions to its operations during construction.

Bicycle and pedestrian provisions have been incorporated in keeping with the KYTC Pedestrian and Bicycle Travel Policy (July 2002). Where applicable, the design for the western bypass should include wide curb lanes for bicycle use. They should also be considered in the design for reconstructing KY 187 and US 62 and the design of the new connector roadway. Care should be taken in the placement of shoulder rumble strips to avoid conflicts with the travel way for cyclists. For the urban typical sections, sidewalks should be included, particularly along the portion of the western bypass that connects to the eastern bypass in the south.

16.6 Intelligent Transportation Systems (ITS)

No intelligent transportation systems have been included in the proposed recommendations.

16.7 Commitment Action Plan

KYTC is committed to incorporating appropriate pedestrian and bicycle facilities into the proposed highway projects. KYTC is also committed to working with KTC/SHPO as the project progresses to avoid, to the greatest extent possible, impacts to any identified National Register eligible properties. KYTC will also coordinate with the U.S. Fish and Wildlife Service regarding the presence of, and possible impacts to, any Federally threatened or endangered species when the project reaches the appropriate stage.

16.8 Next Steps / Implementation

Following approval of this report by KYTC, the Project Advisory Committee and the general public will be notified of the final study recommendation. Next, funding could be allocated for the design and implementation of Corridor A3 (phased as necessary based on funding availability). The two additional projects recommended (new interchange at WKP/KY 187 and new connector road between KY 187 and US 62) should be included in the district's long range plan for future construction.