



IMPROVED ACCESS ROAD STUDY

Bluegrass Crossings Regional Business Centre Ohio County, Kentucky February 2015

Submitted To: Kentucky Transportation Cabinet, Division of Planning Prepared By: CDM Smith

Final Report

Bluegrass Crossings Regional Business Centre Improved Access Road Study

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Section 1 Introduction

The Bluegrass Crossings Regional Business Centre Improved Access Road Study looks at ways to improve accessibility, safety, and mobility for the Bluegrass Crossings Regional Business Centre traffic in Ohio County, Kentucky. The objective of this study is to gather critical information necessary to develop and evaluate alternatives that improve the existing access to the business center. Through this study, the Kentucky Transportation Cabinet (KYTC) intends to identify a potential solution for the transportation needs of the Bluegrass Crossings Regional Business Centre and its neighbors.

1.1 Project Location

The Bluegrass Crossings Regional Business Centre is a regional industrial park jointly developed by the Kentucky counties of Daviess, Hancock, McLean, Muhlenberg, and Ohio and managed by the Green River Regional Industrial Development Authority. Bluegrass Crossings is an industrial park development containing approximately 1,200 acres. The project study area is shown in **Figure 1.1**. Study area roads include:

- Old Liberty Church Road (CR 1193),
- US 231 between milepoints 6.0 and 7.0, and
- Interchange Ramps at Western Kentucky Parkway Exit 75.

The existing business center entrance (Old Liberty Church Road) has residential homes along it, which creates a safety concern due to the high number of trucks that use the entrance.

1.2 Study Objectives and Tasks

The intent of this study is to:

- Identify known issues, concerns, and constraints; including safety, traffic, social, environmental, and geotechnical considerations;
- Develop preliminary purpose, needs, and goals for the proposed project;
- Listen to and share information with local officials and other interested stakeholders;
- Develop and evaluate improvement concepts for the corridor based on the project purpose and need; and
- Make project recommendations.





1.3 Programming and Schedule

All phases of this project are funded in the *Kentucky's FY 2014 – FY 2020 Highway Plan* with state priority project (SPP) funds. The project budget has \$400,000 for design, \$700,000 for right-of-way, \$300,000 for utilities, and \$3.0 million for construction.



Section 2 Existing Conditions

Characteristics of the major roadways in the study area (i.e., Old Liberty Church Road, US 231, and Western Kentucky Parkway ramps) are identified in the following sections. Included are data and/or information on roadway characteristics, geometric characteristics, bridge structures, traffic conditions, and roadway safety. These features are summarized from the KYTC Highway Information System (HIS) database and other sources as noted throughout the text.

2.1 Roadway Characteristics

Old Liberty Church Road is classified as a Rural Local Road with a 35 mph posted speed limit. It is a two lane facility with 11-foot wide lanes and 6-foot wide shoulders. There are approximately 30 residential homes along Old Liberty Church Road, which is the only entrance to the Bluegrass Crossings Regional Business Centre. There are also two school bus routes that use Old Liberty Church Road. Advisory signs are located along Old Liberty Church Road to remind drivers to be cautious while driving along this road.



Representative views along Old Liberty Church Road

US 231 is classified as a rural major collector with a 55 mph posted speed limit. It is a two lane facility with 10-foot wide lanes and 4-foot wide shoulders. US 231 connects Old Liberty Church Road to the Western Kentucky Parkway; the nearest ramps are located approximately 1,100 feet north of the US 231/Old Liberty Church Road intersection. These key roadway characteristics are shown in **Figure 2.1**.

2.2 Geometric Characteristics

As part of the study effort, designers conducted a review of existing geometrics along US 231 and Old Liberty Church Road. These were compared to the common geometric practices for rural collector roads listed in Exhibit 700-02 and rural local roads listed in Exhibit 700-01 of the *2006 KYTC Highway Design Manual*. Analysis found the 10-foot wide lanes and 4-foot wide shoulders along US 231 to be deficient between milepoint 2.900 and milepoint 6.648. The *2006 KYTC Highway Design Manual* recommends a minimum of 12-foot wide lanes and 8-foot wide graded shoulders for rural collector roads with an Average Daily Traffic (ADT) greater than 2,000 vehicles. The 11-foot wide lanes and 6-foot wide shoulders along Old Liberty Church Road meet the minimum standards for rural local roads with an ADT between 1,500 and 2,000 vehicles.









Bluegrass Crossings Regional Business Centre Roadway Characteristics & Geometric Deficiencies 1/16/2015 A review of as-built plans for US 231 between the Western Kentucky Parkway and Old Liberty Church Road found one crest vertical curve that does not meet current standards for stopping sight distance. This deficient crest vertical curve is located at the US 231/Old Liberty Church Road intersection. Based on the *2006 KYTC Highway Design Manual* for 55 mph rural collector roads, 495 feet of stopping distance is recommended but only 368 feet is available at this vertical curve. There are no horizontal curve deficiencies along this portion of US 231.

There are no as-built plans available for Old Liberty Church Road. Because of this, the existing vertical alignment could not be checked for deficiencies. The horizontal alignment was checked using aerial photography. No horizontal curve deficiencies were found along Old Liberty Church Road.

The results of the geometric analysis are shown in more detail in Figure 2.1.

2.3 Structures

There are no bridges along US 231 or Old Liberty Church Road in the study area. However, there are two culverts that pass under Old Liberty Church Road and one culvert that passes under US 231, just south of Old Liberty Church Road. The culverts were located during a field visit. None of the structures are listed in the KYTC Bridge Data Miner. Thus, there is no readily available information on the sufficiency rating, type, or size of the culverts.



Culvert along Old Liberty Church Road

2.4 Existing and Future Traffic Analysis

As part of this study, 48-hour traffic counts were conducted by KYTC in 2014 at special count stations along US 231 north and south of Old Liberty Church Road and along Old Liberty Church Road. Based on these counts, daily traffic volumes range from 5,400 to 6,100 vehicles along US 231 with 6.5% to 10.2% of that being truck traffic. Old Liberty Church Road has an ADT of 1,800 vehicles. Of the 1,800 vehicles, 180 are trucks (10.0%).

Traffic volumes were forecast along US 231 and Old Liberty Church Road for two scenarios: (1) 2040 No-Build and (2) 2040 Build. The 2040 No-Build scenario assumes Old Liberty Church Road would remain the only entrance to the Bluegrass Crossings Regional Business Centre. The 2040 Build scenario assumes a new entrance will be built for the business center and no access to the center will be provided via Old Liberty Church Road. Both scenarios assume new industrial tenants will come to the industrial park over time.

The growth rates for each scenario were developed to capture a range of possible outcomes. Rates vary significantly due to the fact that in the 2040 No-Build scenario, trucks have to enter/exit the business center through a residential zone. The mix of large trucks and residential traffic is perceived as an impediment to attracting additional industrial tenants; therefore, the latter scenario was forecast to have a higher growth rate.

The Bluegrass Crossings Regional Business Centre has 1,134 acres of land available for industrial development. The first industrial building opened in 2004 and as of 2014 there are three industrial



buildings with a total employment of 700 people. The *ITE Trip Generation Manual (8th edition)* was used to calculate trip generation rates based on several factors such as employment, area available for industrial development, and likely development based on the presence of the residential zone. Population and historical traffic growth rates were also considered.

The traffic forecast report prepared by KYTC provides additional information about the existing and future year volume forecasts and is included as **Appendix A**.

2.4.1 Segment Operational Analysis

Traffic volumes were forecast along US 231, Old Liberty Church Road, and (where applicable) the proposed new entrance. These values were used to understand how the roadway segments operate.

The 2014 and 2040 design hour volumes (DHV) were compared to the road's theoretical capacity. A volume-to-capacity ratio (V/C) represents the number of vehicles using the road in a specific time period (i.e. design hour volume) compared to the number of vehicles the road could theoretically handle during that period. The target V/C is 0.90 for rural areas and 1.00 for urban areas. A V/C greater than this indicates the road is congested, i.e. operating above its theoretical capacity. This is the preferred KYTC methodology for analyzing the adequacy of roadway segments.

Along US 231, Old Liberty Church Road and the proposed new entrance, the 2014 and 2040 V/C varies between 0.06 and 0.56. This indicates each roadway segment operates well below its design capacity, meaning a two lane roadway is adequate for US 231, Old Liberty Church Road and the proposed new entrance. **Table 2.1** presents the 2014 and 2040 ADT, Percent Trucks, DHV, and V/C.

Road	2014			2040 No-Build			2040 Build					
	ADT	Percent Trucks	DHV	V/C	ADT	Percent Trucks	DHV	V/C	ADT	Percent Trucks	DHV	V/C
US 231	6,100	10.2	690	0.34	9,000	10.2	1050	0.42	11,300	10.2	1,350	0.56
Old Liberty Church Road	1,800	10.0	240	0.19	2,800	10.0	400	0.24	400	10.0	60	0.06
Proposed Entrance	N/A							5,900	10.0	750	0.35	

Table 2.1: 2014 and 2040 Segment Operational Analysis

2.4.2 Intersection Operational Analysis

Four hours of turning movement counts were conducted at the intersection of US 231 and Old Liberty Church Road. The counts were then factored to determine current year DHV turn movements. The current year turning movements were grown using the same growth rates in the segment analysis to determine future year turn movements.

Level of Service (LOS) is a qualitative measure of highway traffic conditions, as identified in the *2010 Highway Capacity Manual (HCM)*. Individual levels of service characterize these conditions in terms of speed, travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six levels of service are defined and given letter designations from A to F, with LOS A



representing free flow conditions and LOS F representing severe congestion and/or time delays. Typically, a minimum LOS D is considered acceptable in urban areas and LOS C is considered acceptable in rural areas. This is the preferred KYTC methodology for analyzing the adequacy of an intersection.

Currently Old Liberty Church Road and US 231 are operating at acceptable levels of service. Looking to the future, a southbound left turn lane may be needed along US 231 based on projected business center traffic volumes. It is assumed if a new entrance were built and the business center developed most of its open land, a traffic signal would likely be warranted in the future to accommodate the vehicles turning left out of the entrance. Results of the LOS analysis are presented in **Table 2.2**. Note the 2040 Build scenario assumes a left turn lane will be constructed along US 231 at the new industrial park entrance.

Intersection	LOS							
2014								
		NB US 231	N/A					
LIS 231 at Old Liberty Church Road		SB US 231	A (A)					
	N/A	WBR Old Liberty Church Rd	В (В)					
		WBL Old Liberty Church Rd	C (C)					
2040 No-Build								
		NB US 231	N/A					
LIS 221 at Old Liberty Church Road		SB US 231	A (A)					
	N/A	WBR Old Liberty Church Rd	В (В)					
		WBL Old Liberty Church Rd	D (C)					
2040 Build								
	N/A	NB US 231	N/A					
LIS 231 at New Entrance (Lin-Signalized)		SB US 231 ¹	B (A)					
		WBR New Entrance	В (С)					
		WBL New Entrance	F (E)					
		NB US 231	В (В)					
US 231 at New Entrance (Signalized ²)	B (B)	SB US 231 ¹	A (A)					
		WB New Entrance	D (C)					
		NB US 231	N/A					
US 231 at Old Liberty Church Road	N/A	SB US 231	A (A)					
	,,,	WBR Old Liberty Church Road	В (В)					
		WBL Old Liberty Church Road	C (C)					

Table 2.2: 2014 and 2040 Inte	rsection Operational Analysis
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AM (PM)

¹ Assumes a southbound left turn lane on US 231 will be constructed at the entrance.

² HCM 2010 Signalized Analysis

The 2014, 2040 No-Build, and 2040 Build daily traffic volumes along with V/C, peak hour turning movement volumes and LOS are shown in **Figure 2.2**, **Figure 2.3**, and **Figure 2.4**, respectively.









It should be noted that additional counts were performed at the US 231 intersection with the southern Western Kentucky Parkway ramp terminals although this intersection is not evaluated in the discussion above. This data was collected in case future traffic volumes associated with the build-out of the business center or proposed alternative improvement scenarios led to unexpected queuing along US 231. Neither 2040 scenario resulted in queues that would begin to approach the ramp terminals; therefore, no description of this intersection is presented herein.

2.5 Roadway Safety

To quantify safety concerns, a crash analysis was performed for segments of US 231 and Old Liberty Church Road adjacent to the project area. Crash records were collected from KYTC and the Kentucky State Police for a 48-month period (February 1, 2010 to January 31, 2014) as shown in **Appendix B**. Crashes were geospatially referenced and compared to statewide data to identify locations experiencing above-average crash rates. The methodology used is defined in the *Analysis of Traffic Crash Data in Kentucky (2008-2012)* (Kentucky Transportation Center, 2013).

Over the analysis period, there were 85 crashes on US 231 and 6 on Old Liberty Church Road. Of these, zero resulted in fatalities. In total, 29 crashes on US 231 resulted in injury. **Figure 2.6** presents the locations of crashes along the corridor, highlighting other statistics as well. The majority of crashes (54 percent) were single vehicle crashes. **Figure 2.5** demonstrates the distribution of crashes by collision type.



Figure 2.5: Distribution of Crashes by Type





2.5.1 Segment Analysis

As defined in the methodology report, segments vary in length and are divided along roadways where geometry or traffic volumes change. For each section, analysts evaluated the number of crashes to determine the critical rate factor (CRF). The CRF is one measure of the safety of a road, expressed as a ratio of the crash rate at the location compared to the average crash rate for roadways of the same roadway type throughout the state. CRF also takes into account traffic volume, area type (rural/urban), and the number of lanes. If the CRF is 1.00 or greater, it indicates that crashes may be occurring due to circumstances that cannot be attributed to random occurrence.

Analysis of segments along US 231 on either side of Old Liberty Church Road and Old Liberty Church Road itself did not yield any locations with a CRF over the threshold. CRF values ranged from 0.49-0.85.

2.5.2 Spot Analysis

Analysts also conducted a spot crash analysis along US 231 and Old Liberty Church Road. Spots were defined by observing crash data to identify 0.10-mile sections where crashes were concentrated. Crashes were again geospatially referenced and compared to statewide data to identify spot locations experiencing above average crash rates. The methodology is defined in the *Analysis of Traffic Crash Data in Kentucky (2008-2012)*.

One spot was found to have a CRF greater than 1.00, as shown in **Figure 2.6**. This spot is located at the intersection of Old Liberty Church Road and US 231; it has a CRF of 1.68. Nine total crashes occurred at this spot, three of which resulted in injury. Of the nine total crashes, six were single-vehicle crashes. An in-depth review of crash records shows two of the six single vehicle collisions involved deer, two involved drivers hitting the retaining wall/Bluegrass Crossings sign, and two involved drivers swerving to avoid oncoming vehicles. It should be noted that the retaining wall on the east side of the US 231/Old Liberty Church Road intersection lies in the prescribed clear zone. Further, the substandard vertical curve along US 231 at this location limits stopping sight distance.



Section 3

Environmental Overview

The following sections provide an overview of the existing human and natural environment, based on information from readily available sources. Alternatives should be developed to minimize impacts to the environment, particularly resources such as schools, parks, and homes in the vicinity of the study area.

3.1 Socioeconomic and Community Resources

The following sections summarize the community resources and socioeconomic characteristics of the study area.

3.1.1 Schools and Parks

There are no publicly-owned parks or recreation areas within the project study area. One school is located in the vicinity of the project area: Southern Elementary School is located 1.4 miles south of the project area on US 231. Other community resources with the study area can be seen on **Figure 3.1**.

3.1.2 Land Use

The Bluegrass Crossings Regional Business Centre is a 1,000+ acre industrial park in Ohio County. Although there is no formal zoning, protective covenants apply. Today, the site is primarily wooded; three industrial tenants occupy the northwestern portion of the site.

Surrounding land uses are residential to the west of the business center with scattered single family residences along Old Liberty Church Road. Commercial establishments are present north of the Western Kentucky Parkway at the US 231 interchange and in the parkway median north of the business center. The remaining area is a combination of rural residential, agricultural, and wooded land uses.

Several streams and scattered wetlands are located within the project area. Two unnamed streams drain northward through the site, one of which includes designated FEMA 100-year floodplains. An overview of water resources can be found in **Figure 3.2**.







3.1.3 Demographics

The Green River Area Development District (GRADD) assembled an overview of select socioeconomic characteristics to determine the potential for the project to impact environmental justice populations, such as minorities and low-income individuals. The Environmental Justice Review is presented as **Appendix C** and summarized in this section. Census data was assembled within two Census block groups containing the project, along with average statistics for Ohio County, the state of Kentucky, and the US for comparison. The demographic data collected for the two block groups is summarized in **Table 3.1** and as follows:

- Block Group 1 of Census Tract 9205 shows an elevated percentage of persons 60 and over relative to the state threshold. The percentage is below the county threshold level. Concentrations of minority, low income, and disabled populations are lower than statewide or county averages.
- Block Group 2 of Census Tract 9205 shows elevated percentages of persons 60 and over and disabled persons. Both are higher than the averages for the county, state, and nation. The percentage of minorities and population below poverty level are below the county, state, and nation.

Geography	Minority Population ¹	Population over Age 60 ²	Population Below Poverty Level ³	Disabled Population ⁴
United States	25.8%	13.2%	15.0%	10.1%
Kentucky	11.9%	13.4%	18.4%	15.4%
Ohio Co.	2.1%	21.6%	20.8%	15.5%
Tract 9205, Block Group 1	1.0%	19.5%	7.6%	11.2%
Tract 9205, Block Group 2	0.6%	37.2%	9.1%	22.3%

Table 3.1: Demographic Summary Data for Selected Geographies

1 Table DO02 from 2008-2012 ACS estimates.

2 Table DP03 from 2008-2012 ACS estimates.

3 Table DP05 from 2008-2012 ACS estimates.

4 US Census Bureau for Age data, 2008-2012.

3.2 Aquatic and Terrestrial Resources

The study area is in a rural setting with suitable wildlife habitats and above-ground streams present.

US Fish & Wildlife Service and Kentucky Department of Fish & Wildlife Resources identified a list of federally endangered or threatened species that could occur in the vicinity of the project area. These species are presented in **Table 3.2**.



Group	Species	Common Name	Legal Status	Action Area Presence *
Mammals	Myotis sodalist	Indiana bat	Endangered	Potential
Mammals	Myotis septentrionalis	Northern long-eared bat	Proposed Threatened	Potential
Mussels	Epioblasma o. obliquata	purple catspaw pearlymussel	Endangered	Potential
Mussels	Cyprogenia stegaria	fanshell	Endangered	Known
Mussels	Plethobasus cooperianus	orangefoot pimpleback	Endangered	Known
Mussels	Lampsilis abrupta	pink mucket	Endangered	Potential
Mussels	Obovaria retusa	ring pink	Endangered	Potential
Mussels	Plethobasus cyphyus	sheepnose	Endangered	Potential
Mussels	Pleurobema clava	clubshell	Endangered	Potential
Mussels	Pleurobema plenum	rough pigtoe	Endangered	Potential
Mussels	Potamilus capax	fat pocketbook	Endangered	Potential
Mussels	Quadrula cylindrica	rabbitsfoot	Threatened	Potential

Table 3.2: Federally Listed Species in Vicinity

* These species are known to occur or have the potential to occur in the action area

3.3 Air Quality

The study area is identified in US Environmental Protection Agency (EPA) records as in attainment for all criteria pollutants.

3.4 Noise

This project is not a Type I project that would require a noise abatement study as designated in FHWA Regulation 23 CFR Part 772, as it does not require FHWA approval and is not using federal-aid highway funds.

3.5 Mining, Drilling, Monitored Sites, and Farmland

GIS data from the US EPA include a few permitted facilities/monitor sites within the study area. These are shown in **Figure 3.3** and summarized below:

- Mining/Drilling One coal outcrop lies near a permitted mine boundary outside the limits of the business center. Other areas within the limits have previously been mined out. A dry and abandoned gas well is located on the property.
- Monitored Sites These include facilities that discharge into the water system, hazardous
 waste sites identified under the Resource Conservation and Recovery Act (RCRA) of 1976,
 and other miscellaneous EPA monitored sites.

There do not appear to be any indications of hazardous materials on the surface.

Prime farmland and farmland of statewide importance was identified and presented in **Figure 3.4**. Both are present within the study area.







3.6 Cultural & Historic Resources

Kentucky Heritage Council records show no listed or eligible historic sites on the National Register of Historic Places (NRHP) identified within the planning area. Based on the Kentucky Office of State Archaeology, seven archaeology sites were identified within the planning area. If federal funds are used or federal permits are anticipated, additional field surveys should be conducted during any future project development phases to determine if previously unidentified NRHP resources could be present. If a cave is discovered within the project limits during the construction phase, it must be investigated by a professional archaeologist.

3.7 Geotechnical Overview

KYTC's Division of Geotechnical Engineering completed a preliminary geotechnical assessment of the study area, which is provided in **Appendix D** and summarized here. The study area is located in the Western Kentucky Coal Field Physiographic Region. Available mapping indicated that the bedrock in this area is of the Tradewater and Caseyville formations. No notable faults were mapped in the immediate vicinity of the project. Extensive coal mining has taken place in the region but nothing was found to indicate that any mining has taken place at this location. It appears that some grading may have taken place on the site and the area had likely been cultivated in the past.

Soil strata in this area tend to be relatively thin. Bedded material can be seen in outcrops for the Parkway ramps. The soils encountered in the area are generally suitable for embankment construction. Soil cuts along Old Liberty Church Road showed some signs of instability. Wet areas may be present and could require remediation.



Section 4

Initial Project Team and Stakeholder Input

Public officials and local business representatives were given the opportunity to provide input throughout the course of the Bluegrass Crossings Regional Business Centre Improved Access Road Study. This section describes the first round of project team and stakeholder involvement that occurred early in the study process and describes the comments and input received as a result of those efforts. Activities undertaken as part of the second round of project team and stakeholder involvement are summarized in **Section 6**, as they relate to the development and evaluation of the improvement alternatives.

4.1 Project Team Meeting #1

The first project team meeting was conducted on Wednesday, June 11, 2014 at the Ritatsu Manufacturing board room. The purpose of the meeting was to discuss the project history and purpose, scope of work, existing conditions, project issues, and stakeholder involvement needs. Participants in the meeting represented the KYTC District 2 and Central offices, the GRADD, and the consultant firm, CDM Smith. A copy of the meeting minutes is included in **Appendix E**. Key discussion items included:

- There are approximately 30 residential homes along Old Liberty Church Road, which is the only entrance to the Bluegrass Crossings Regional Business Centre. This creates a safety concern due to the high number of trucks that use the entrance.
- The primary purpose of the project is to improve safety, traffic operations and the existing accessibility to the Bluegrass Crossings Regional Business Centre.
- There is a high crash spot at the US 231 and Old Liberty Church Road intersection. Of the 8 total crash reports available at this spot, 5 involved passenger cars, 2 involved single unit trucks, and 1 involved an SUV/pickup truck.
- A new entrance should allow for a southbound left turn lane on US 231 and not impede movements at the Western Kentucky Parkway interchange or existing Old Liberty Church Road.
- The project team agreed that the alternatives considered should stay within the \$3 million construction budget in the *Kentucky's FY 2014 FY 2020 Highway Plan*. All phases of this project are funded in the current highway plan with state funds. It is a SPP project with \$400,000 for design, \$700,000 for right-of-way, \$300,000 for utilities, and \$3 million for construction.

Five Conceptual Alternatives were presented for discussion purposes only; additional alternative development and evaluation efforts are discussed in **Section 6**.



4.2 Local Officials and Stakeholders Meeting #1

As part of the public involvement portion of this study, a local officials meeting was held on Wednesday, June 11, 2014 at the Ritatsu Manufacturing board room. The purpose of the meeting was to discuss the project purpose and history, the scope of work, the existing conditions, relevant project issues, and conceptual alternatives. The 27 participants at the meeting included State Representative Tommy Thompson, County Judge Executives from Ohio, McLean and Daviess Counties, Mayor of Beaver Dam, Ohio and Daviess County Fiscal Court Representatives, Bluegrass Crossings Regional Business Centre Board Members, Green River Regional Industrial Development Authority Board Members, TVA Economic Development, RMI Manufacturing, MSE and staff from the GRADD, KYTC District 2, KYTC Central Office, and CDM Smith. A copy of the minutes from this meeting is included in **Appendix F**.

Some of the comments and local issues identified were as follows:

- This is the planning phase of the project, which is being conducted by CDM Smith, the consultant hired by KYTC to perform this work. The goal of planning phase is to develop alternatives within the \$3 million budget established in the *Kentucky's FY 2014 FY 2020 Highway Plan* that can then be designed in the next phase of the project.
- A 200-acre distribution center turned down this site because 200 to 300 trucks and 800 employees would need to access the center every day. They were not comfortable putting that much additional traffic onto Old Liberty Church Road.
- The proximity of the existing entrance to the Western Kentucky Parkway interchange provides a good regional connection for the business center. We want to maintain this when looking at different improvement alternatives.
- Attendees discussed whether a new interchange with the parkway would be a feasible alternative. The site is unlikely to satisfy FHWA warrants or design requirements. The industrial park does not have the roadway infrastructure to connect to a new interchange, making this a very expensive alternative.
- Daicel requires buffer zones due to the explosive nature of some of their materials.



Section 5

Project Purpose and Need

As a result of the existing conditions analysis, project team input and stakeholder input, a purpose and need statement for the proposed project was developed to guide future project development efforts, including design and environmental activities. The purpose and need statement explains why an expenditure of public funds is warranted and provides the foundation for the development and evaluation of reasonable improvement options.

The purpose of the proposed project is to improve safety, traffic operations, and the existing accessibility to the Bluegrass Crossings Regional Business Centre.

The following needs have been identified:

- Improve Safety
 - The US 231 and Old Liberty Church Road intersection is a high crash spot with a vertical curve on US 231 that does not meet recommended sight distance requirements.
 - Old Liberty Church Road passes through a residential area and is the only entrance to the business center.
 - Two school bus routes currently utilize Old Liberty Church Road.
- Improve Traffic Operations
 - Currently there are approximately 1,800 vehicles and 180 trucks using Old Liberty Church Road each day.
 - The industrial park has approximately 1,134 acres of land available for development. Based on a trip generation analysis, which looks at employment and area available for development, traffic volumes along a new entrance road could reach 5,900 vehicles per day by year 2040 if most of the land were developed within the business center. Based on these volumes, the existing intersection would operate at an unacceptable LOS without a signal (LOS F for the westbound left approach on Old Liberty Church Road).
 - If a new entrance is not built, traffic volumes along Old Liberty Church Road could reach 2,800 vehicles per day by year 2040 and the existing intersection would operate at an unacceptable LOS (LOS D for the westbound left approach on Old Liberty Church Road).
- Improve Accessibility
 - Business prospects are concerned about adding additional employee and truck traffic to Old Liberty Church Road because it passes through a residential area.



Section 6

Initial Alternative Screening Process

Following the existing conditions review and first round of consultation with local officials, three potential improvement alternatives were developed for the Bluegrass Crossings Regional Business Centre Improved Access Road Study. An evaluation process was undertaken to determine a preferred alternative. Findings were presented to the project team, local officials, and key stakeholders who were then given the opportunity to discuss the proposed improvement alternatives. The result of these meetings was the recommendation of a preferred build alternative.

6.1 Initial Alternatives

As presented in **Figure 6.1**, **Figure 6.2**, and **Figure 6.3**, three build alternatives were developed. The alternatives are described as follows:

- Alternative 1 includes a new entrance north of Old Liberty Church Road. A southbound left turn lane on US 231 is proposed to allow adequate storage length without impeding through traffic on US 231 or the Western Kentucky Parkway ramps. Proper intersection sight distance is provided between Old Liberty Church Road and the new entrance. An emergency access is provided at the eastern end of the new entrance. As part of this alternative, there are no improvements at the existing Old Liberty Church Road intersection. See Figure 6.1 for additional details.
- Alternative 2 includes a new entrance north of Old Liberty Church Road and a southbound left turn lane on US 231 similar to Alternative 1. As part of this alternative, there would also be improvements at the existing US 231/Old Liberty Church Road intersection. The deficient vertical alignment on US 231 and the skew along Old Liberty Church Road would be corrected. See Figure 6.2 for additional details.
- Alternative 3 includes a new route north of Old Liberty Church Road but still ties back to US 231 at the existing Old Liberty Church Road entrance. A southbound left turn lane on US 231 is proposed to allow adequate storage length without impeding through traffic on US 231. The deficient vertical alignment on US 231 and the skew along Old Liberty Church Road would also be corrected. A new connector road is proposed between the new business center entrance and Old Liberty Church Road which would require the residential traffic along Old Liberty Church Road to use the new business center entrance. See Figure 6.3 for additional details.

In addition to the three build alternatives, the No-Build Alternative was evaluated relative to the purpose and need. The No-Build Alternative would not improve safety, traffic operations, or improve the existing accessibility to the Bluegrass Crossings Regional Business Centre.









A series of potential connections further south along US 231 were discussed conceptually but rejected as they would result in substantially greater costs and impacts due to their larger footprints.

6.2 Initial Evaluation of Alternatives

Preliminary cost estimates were developed based on the conceptual layouts. The preliminary cost estimates are presented in **Table 6.1**.

Alternative	ternative Design ¹		ROW ² Utilities ²		Total Cost
1	\$0.3	\$0.4	\$0.3	\$2.5	\$3.5
2	2 \$0.3		\$0.3	\$3.1	\$4.1
3	\$0.3	\$0.4	\$0.3	\$3.3	\$4.3

Table 6.1: Preliminary Cost Estimates (Millions of 2014 Dollars)

¹ Design Cost = 10% of Construction Cost

² KYTC Provided ROW and Utility Cost Estimates

³ Widen 2 Lanes to 3 Lanes Construction Cost = \$2.0 million per mile New 2 Lane Road Construction Cost = \$3.0 million per mile New Driveway Connection = \$0.5 million per mile

As shown in **Table 6.1**, Alternative 1 is the least expensive and requires the least amount of new and/or improved roadway. Alternative 3 is the most expensive and requires the greatest distance of new and/or improved roadway.

In addition to the cost estimates, the No-Build and the three build alternatives were evaluated based on the project purpose and need, home impacts, community impacts, and environmental impacts. The evaluation matrix overview is presented in **Table 6.2**. All three build alternatives require two home relocations, have low impacts to farmlands, require one stream crossing, and have no known impacts to community resources, historic properties, archaeology sites, or wetlands. Overhead power lines and a water line run along the south side of Old Liberty Church Road and one water well is located near the western edge of the business center; coordination and special consideration for these resources may be required during future design phases.

Even though all three build alternatives meet the purpose of the project, Alternative 2 does the best job addressing safety, traffic operations and accessibility. Alternative 2 provides a new access point for the business center, fully separating residential and industrial traffic. Further, it improves safety by improving the vertical alignment deficiency and skew at the US 231/Old Liberty Church Road intersection. While Alternative 1 separates residential and industrial traffic, it does not improve the vertical alignment or skew at the existing intersection. Alternative 3 does not fully separate residential and industrial traffic, which is one of the primary needs driving the project. The No-Build option does not meet the purpose and need of the project.



Alternative	Total Length of New and	Addressing	Purpose and Need f Crossings	Home	Community	
	Roadway (Miles)	Improve Safety	Improve Traffic Operations	Improve Accessibility	Relocations	Resources
No-Build	0.00	No	No	No	0	0
1	0.89	Somewhat	Yes	Yes	2	0
2	1.07	Yes	Yes	Yes	2	0
3	1.14	Somewhat	Somewhat	Somewhat	2	0

Table 6.2: Evaluation Matrix Overview

Alternative	Environmental Impacts							Total Cost
	Prime Farmlands	Farmland of Statewide Importance	Historic Properties	Archaeology Sites	Wetlands	Stream Crossings	UST Sites	(millions)
No-Build	None	None	0	0	0	0	0	\$0.0
1	Low Impact	Low Impact	0	0	0	1	0	\$3.5
2	Low Impact	Low Impact	0	0	0	1	0	\$4.1
3	Low Impact	Low Impact	0	0	0	1	0	\$4.3

6.3 Final Local Officials and Stakeholders Meeting

As part of the alternative evaluation process, a second meeting was held with local officials and potential stakeholders on Monday, September 22, 2014 in Madisonville, Kentucky at the KYTC District 2 office. The purpose of the meeting was to review the project purpose, existing conditions, traffic forecast, and to solicit feedback on the initial alternatives. The meeting minutes are included in **Appendix F**.

Some of the comments and local issues identified were as follows:

- Alternatives 1 and 2:
 - The southbound left turn lane on US 231 at Old Liberty Church Road and the westbound left turn lane on Old Liberty Church Road, as shown in Alternative 2, are not warranted based on traffic volumes.
 - To limit access to the property around the proposed entrance, KYTC could either purchase the entire area or develop the proposed entrance roadway as partially controlled access to limit the number of access points. The possibility of reintroducing residential access in the future is a major concern.
 - Can the new entrance move closer to Old Liberty Church Road and allow the northern parcel access to US 231? Providing access on the new entrance rather than US 231



simplifies operations along US 231. Also, the new entrance cannot move any further south and maintain intersection sight distance requirements. The new entrance cannot move further north without increasing right-of-way costs or compromising traffic operations if the intersection is signalized.

- Alternative 1 could save money, which could be applied toward the potential rise in right-of-way costs. This will have to be considered in the design phase.
- The alternatives should add two permitted entrances and a center turn lane to Alternative 2 for a commercial entrance along the business center entrance road.
- The alternatives need a parallel driveway to the eastern private property next to Ritatsu extended from Old Liberty Church Road.
- Alternative 3 should be eliminated because it does not remove the residential traffic.

At the end of the meeting Local Officials and Stakeholders were asked: "Of the Initial Alternatives presented today, which do you prefer?" The results were as follows:

- No-Build = 0 votes (0%)
- Alternative 1 = 2 votes (22%)
- Alternative 2 = 7 votes (78%)
- Alternative 3 = 0 votes (0%)
- Other = 0 votes (0%)

6.4 Final Project Team Meeting

The project team held its second and final meeting for the Bluegrass Crossings Regional Business Centre Improved Access Road Study on Monday, September 22, 2014 in Madisonville, Kentucky at the KYTC District 2 office. The purpose of the meeting was to review the input received from stakeholders regarding the initial alternatives and discuss a project team preferred alternative. A copy of the minutes for this meeting is included in **Appendix E**.

The team reviewed the initial alternatives and the comments from the morning's stakeholder meeting. The group had an open discussion about the initial alternatives as follows:

- Alternative 2 (with minor changes) is the project team's preferred alternative. If cost becomes an issue during the design phase, Alternative 1 will also be considered.
- Additional right-of-way acquisition would be required to widen US 231.
- The feasibility of limiting access along US 231 between the interchange and the business center entrance should be examined during the design phase.
- The Bluegrass Crossings Regional Business Centre will need to remove the retaining wall and welcome signage at the US 231/Old Liberty Church Road intersection if a new entrance is built. The retaining wall in front of the welcome sign is in the US 231 clear zone and may need to be removed either way.



Section 7 Conclusions

This chapter provides conclusions and discusses alternatives for improvements for the Bluegrass Crossings Regional Business Centre Improved Access Road Study. The alternatives described in this chapter are the result of the initial alternative screening process discussed in **Section 6**.

7.1 Preferred Alternative

Alternative 2 was selected as the preferred alternative by the project team, local officials and stakeholders. The project team determined that Alternative 2 best met the project purpose and need; it will improve safety by separating the residential and truck traffic and correcting the existing geometric deficiencies at the US 231/Old Liberty Church Road intersection, will improve traffic operations by adding left turn lanes, and will improve accessibility by building a new business center entrance. By comparison, Alternative 1 separates residential and industrial traffic, it does not improve the vertical alignment or skew at the existing intersection. Alternative 3 least satisfies the project purpose as it does not fully separate residential and industrial traffic, which is the basis to the primary need driving the project.

Preferred improvements include a new entrance for the Bluegrass Crossings Regional Business Centre and left turn lanes for movements to and from the new business center entrance. Additionally, the existing US 231/Old Liberty Church Road intersection would be reconstructed to correct the deficient vertical alignment on US 231 and the skew along Old Liberty Church Road.

Based on feedback from the project team, local officials, and stakeholders, changes to the initial Alternative 2 layout include: making the proposed industrial park entrance partially-controlled access with a fence along the road restricting all future access to one designated access point, adding a driveway connection off Old Liberty Church Road to the eastern private property next to Ritatsu, adding a cul-de-sac so school buses can turn around, and removing the left turn lanes at Old Liberty Church Road. **Figure 7.1** shows the preferred alternative layout in more detail.

Alternative 1 could also be considered if costs become an issue during the design phase. Right-ofway concerns in the northern parcel between the new business center entrance and the Western Kentucky Parkway could increase project costs above those shown in preliminary cost estimates in Chapter 6. Ultimately the design phase will determine whether or not Alternative 2 can be constructed within the *Kentucky's FY 2014 – FY 2020 Highway Plan* budget, which currently includes \$400,000 for design, \$700,000 for right-of-way, \$300,000 for utilities, and \$3 million for construction. If Alternative 2 cannot be constructed within budget, Alternative 1 is a viable alternative that also meets the project purpose and need. The improvements to Old Liberty Church Road described in the previous paragraph could be incorporated into Alternative 1.





7.2 Potential Design Criteria and Considerations

Potential design criteria and considerations for the Improved Access Road Study are noted here for planning purposes only. Typical section, access control considerations, environmental, right-ofway, and additional considerations are addressed. These criteria are general recommendations based upon the information gathered through this planning phase of study. Specific geometric parameters should be defined during future design phases of the project when more detailed information is available.

7.2.1 Typical Section

The proposed typical sections for US 231 and the new entrance for the Bluegrass Crossings Regional Business Centre are shown in **Figure 7.2**.

7.2.2 Access Control Recommendations

The new business center entrance roadway should have partially controlled access. One access point is shown 1,200 feet from US 231 with entrances on both sides of the road. Only one access point should be considered along the new business center entrance roadway. During the design phase, the 600-foot urban spacing requirement can also be considered before finalizing the location of the access points. A fence should be constructed along the road restricting all future access to the one designated access point.

If possible, KYTC should buy and/or limit access along both sides of US 231 between the proposed business center entrance and the Western Kentucky Parkway interchange. The feasibility of this will need to be studied further in the design phase.

7.2.3 Environmental Considerations

While a comprehensive environmental assessment has not been completed, a preliminary review revealed potential impacts to a stream, prime farmland, and farmland of statewide importance. This will need to be further investigated and potentially mitigated in future phases of this project.

7.2.4 Right-of-Way Considerations

The preferred alternative would require two home relocations. An additional concern is the undeveloped parcel between the new business center entrance and the Western Kentucky Parkway. The possibility of reintroducing residential access in the future is a major concern. One of the key project needs is to separate commercial traffic from residential traffic using Old Liberty Church Road today.

If the new business center entrance was fully controlled access, the entire parcel would likely have to be purchased because the owner would not have access to his property. It is recommended that the new entrance would be partially controlled access, which would limit access to one point along the new connection. Ohio County does not have any zoning ordinances; thus, KYTC would not be able to restrict what type of development ultimately occurs.



Figure 7.2: Proposed Typical Sections

NEW BUSINESS CENTRE ENTRANCE



US 231 (TWO LANE)









7.2.5 Additional Considerations

The Traffic Forecast Report (**Appendix A**) includes the recommendation that a sidewalk should be provided along the east side of the residential section of Old Liberty Church Road. This is not included in the preferred alternative but may be considered during subsequent design phases.

The existing Bluegrass Crossings Regional Business Centre will need to remove the retaining wall and welcome signage at the US 231/Old Liberty Church Road intersection when the new business center entrance is built. The existing retaining wall in front of the welcome sign is in the US 231 clear zone and could be a safety concern. This should be examined further during the design phase.

7.3 Phase Costs

The estimated total cost for the Preferred Alternative is \$4,400,000. Cost estimates for each project development phase are summarized below:

- Design \$300,000
- Right-of-Way \$700,000
- Utilities \$300,000
- Construction \$3,100,000

7.4 Next Steps

All phases of this project are funded in the *Kentucky's FY 2014 – FY 2020 Highway Plan* with SPP funds. The project budget has \$400,000 for design, \$700,000 for right-of-way, \$300,000 for utilities, and \$3.0 million for construction. The next phase would be phase 1 design (preliminary engineering and environmental).

Based on the preliminary project review, a Categorical Exclusion environmental report would, most likely, meet National Environmental Policy Act (NEPA) requirements if federal funding or permits are determined to be required as the alternative advances through design stages. Currently, no federal funding is associated with the project.

Following phase 1 design and environmental, phase 2 design would need to be completed, followed by the right-of-way, utilities, and construction phases. Overhead power lines and a water line run along the south side of Old Liberty Church Road; utility coordination may be required during future design phases.

