

Planning Study

Bowling Green Outer Beltline

(Item # 03-103.00)



Prepared for
Kentucky Transportation Cabinet

By



 **BERNARDIN • LOCHMUELLER & ASSOCIATES, INC.**
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EXECUTIVE SUMMARY

INTRODUCTION

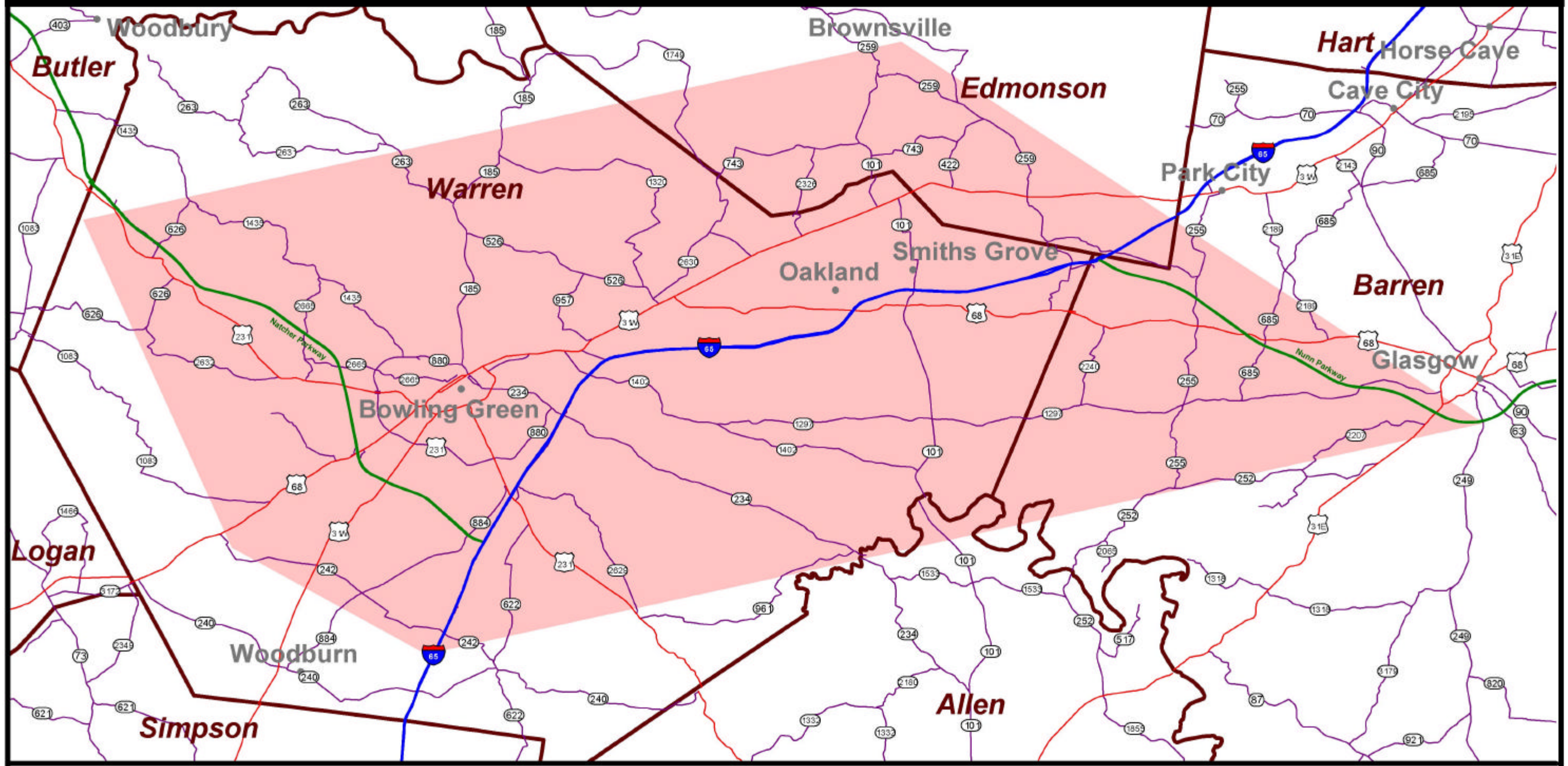
The concept of an Outer Beltline for Bowling Green was first proposed in the *1972 Urban Transportation Plan*. The concept was continued and expanded in the *1983 Transportation Plan*, the *1990 Warren County Comprehensive Plan*, and the *2000 Bowling Green Transportation Plan*.

The Study Area is located in south-central Kentucky in the Mississippi Plateau Physiographic region. The Study Area is approximately 520 square miles in size as shown in Figure ES-1. The project area is centered around the city of Bowling Green. The Study Area for the project coincides with the I-66 Corridor Study Area between the William H. Natcher and Louie B. Nunn (Cumberland) Parkways, and includes portions of Warren County, Edmonson County, and Barren County. The Study Area is bisected by I-65, which connects the cities of Louisville (KY) and Nashville (TN). The Study Area is approximately 65 miles north of Nashville and 110 miles south of Louisville. Major east to west routes include KY 1297, KY 1402, and US 68/KY 80. Important north to south routes include US 31W and US 231. Many other state and county roads also crisscross the Study Area. The Study Area encompasses a population of approximately 100,000 people, including the communities of Smiths Grove, Oakland, Brownsville, and Glasgow.

The purpose of this Planning Study is to identify and evaluate alternative freeway corridors, including a “no build” corridor for the Bowling Green Outer Beltline. The objective of this study is to find the corridors that best fulfill the established project goals. These goals are to:

- Accommodate the transportation needs of the Bowling Green urban area by completing an Outer Beltline, an access controlled freeway with interchanges that is consistent with the *2000 Bowling Green Urban Transportation Study*.
- Reduce current and future traffic congestion on the highways and streets in Warren County by diverting traffic to a new freeway facility.
- Strengthen the regional highway system by improving the connections between major highways and streets in the region.
- Provide better access to major employment centers, regional commercial centers, major education and health facilities, and regional recreation facilities in Warren County.

I-66/BOWLING GREEN OUTER BELTLINE PLANNING STUDIES STUDY AREA



- Interstate Highway
- Parkway
- US Highway
- State Highway
- County Boundary
- Study Area

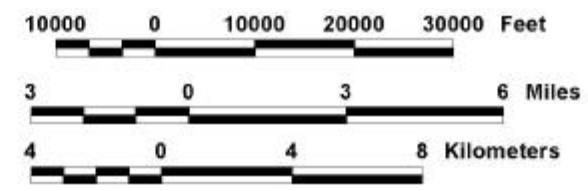


Figure ES-1

SCREENING PROCESS

The screening of corridors to evaluate performance relative to the established project goals included a review of traffic, engineering and environmental considerations. In addition, public input received as the result of an extensive public involvement effort was considered throughout the screening process. The screening process for this study was divided into two levels, including a more qualitative Level 1 Screening of preliminary corridors and a more quantitative Level 2 Screening of final corridors that were carried through from the Level 1 Screening. In addition to the “build” corridors considered, a “no build” corridor has also been considered throughout the evaluation process.

Traffic considerations consisted of the evaluation of existing traffic conditions and the development of a traffic model to assess future traffic conditions and needs. The engineering considerations included evaluation of terrain, obstructions, potential interchange locations and configuration, and potential bridge crossing locations based on USGS data and supplemental aerial photography. Environmental considerations consisted of literature searches and database review, including the development of a geographic information system (GIS) of previously recorded data for use in the development of corridors. Windshield surveys of the corridors were also conducted to identify additional areas of concern.

CORRIDORS CONSIDERED

The proposed project begins at the William H. Natcher Parkway extension/US 231 (Scottsville Road) intersection south of Bowling Green. The corridor continues along the east side of the urban area to I-65 northeast of the city, skirts the north side of the urban area, and ends at the William H. Natcher Parkway north of the city. Eight (8) Outer Beltline corridors, as well as the “no build” option, were reviewed in the Level 1 Screening. The length of the Level 1 Corridors varied from a low of 11.0 miles for Corridor G to a high of 33.7 miles for Corridor F. The eight (8) corridors were narrowed down to four (4) corridors, which were studied for further evaluation in the Level 2 Screening. The final corridor lengths range from a low of 23.9 miles for Corridor A to a high of 31.0 miles for Corridor E. The average distance of the four (4) “build” corridors is 27.4 miles.

The corridors consisted of options that required all new terrain routes. The four (4) final corridors included two (2) routes that end closest to the north side of Bowling Green and two (2) other routes that take a more distant path on the north side of the city. Corridors A and D take routes closest to the existing development on the north side of Bowling Green while B and E take the more distant loop on the north side. Corridors A and B are in close proximity to existing development on the southeast side of Bowling Green, while Corridors D and E extend further out on the southeast side.

SCREENING OF CORRIDORS

Engineering

Corridors D and E extended the furthest east into the sinkhole plain and would be more difficult to construct regarding karst features. Corridor B and E take the most northerly route across the north side of Bowling Green, crossing more rugged terrain, which increases construction difficulty and results in higher costs. Corridor A takes the route closest to Bowling Green on both the north and southeast sides, making it the shortest and least costly corridor.

Geology

The Outer Beltline corridors are predominantly located within the sinkhole plain. All of the corridors will have potential impacts upon karst features along the sinkhole plain. Corridor A has the least amount of anticipated impacts associated with sinkholes and other geologic issues in comparison to the other Beltline corridors, primarily due to its shorter length. Corridor B also takes the shorter route on the southeast side of Bowling Green and is estimated to have a moderate probability for geologic issues in comparison to the other Outer Beltline corridors. All of the Outer Beltline corridors cross a portion of the Rinker Materials limestone quarry northeast of Bowling Green.

Corridors D and E take a longer route through the sinkhole plain on the southeast side of Bowling Green increasing the potential for encountering karst features and karst related construction issues.

Traffic

For the purposes of this study, the minimum acceptable level-of-service (LOS) is LOS C for rural areas and LOS D for urban areas. In the year 2030, Corridor A had the highest estimated average daily traffic volume at 16,000 vehicles per day (vpd) with the segment between the KY 526 and KY 185 interchanges having the highest estimated volume at 19,200 vpd. In addition, Corridor A also diverts the greatest traffic volume from I-65, leaving an estimated 86,200 vpd on I-65 between KY 234 and KY 446 (LOS E for the recently widened six-lane facility) versus an estimated 97,300 vpd (LOS F) under the “no build” condition. Corridors A and D provide the greatest congestion relief to the northeast side of Bowling Green by improving the level-of-service (LOS) on US 31W from Riverside Drive to US 68 and on KY 446 between US 31W and on I-65 to an acceptable urban level of LOS D. Because of their proximity to the north side of Bowling Green, Corridors A and D draw additional traffic onto KY 185, which would push the LOS to F on the two-lane segment of KY 185. Corridors B and E are too far north to be as effective as Corridors A and D in relieving congestion on the northeast side of Bowling Green. Corridor E also attracts and diverts the least amount of traffic from I-65.

In the year 2030, Corridors A and B decrease traffic on Old Scottsville Road (just east of Cumberland Trace) from an estimated 13,000 vpd (under the “no build” corridor) to 7,500 vpd; and Cemetery Road (KY 234 just east of Cumberland Trace) from an estimated 20,500 vpd (under the “no build” corridor) to 15,500 vpd. Corridors D and E result in more modest reductions on Old Scottsville Road and Cemetery Road.

BOWLING GREEN OUTER BELTLINE CORRIDOR PLANNING STUDY

Warren and Edmonson County, Kentucky

For Warren County, Corridor A results in the greatest decrease in total VMT and truck VMT, and is the best in diverting VMT from non-freeway facilities. Corridor E is the least effective in these categories for Warren County. In the case of Edmonson County, Corridor B results in the greatest decrease in total VMT and truck VMT, and is the best in diverting VMT from non-freeway facilities.

With year 2030 traffic volumes ranging from 86,200 vpd to 92,600 vpd between the Natcher Parkway and the I-65/northern Beltline interchange, none of the Outer Beltline corridors diverts sufficient traffic from this portion of I-65 to achieve an acceptable LOS of D as a six-lane urban freeway. [A LOS D is a maximum of 80,700 vpd for a six-lane freeway with rolling terrain (9% K-factor, 55% D-factor and 25% trucks).]

When I-65 was recently widened to six lanes from the Natcher Parkway to the Nunn Parkway, the reconstruction was designed so that I-65 could be widened to eight lanes within existing right-of-way and without reconstructing overpasses. [A LOS C is 95,680 vpd for an eight-lane freeway with rolling terrain (9% K-factor, 55% D-factor and 25% trucks).] Thus, all Outer Beltline corridors can achieve level-of-service C for the urban portion of I-65 if I-65 were widened to eight (8) lanes within existing right-of-way.

Environmental Considerations

All of the corridors will have a potential impact upon karst features along the sinkhole plain. All of the Outer Beltline corridors are completely within the Barren River groundwater basin.

Corridor A is the shortest corridor, and has the fewest overall impacts of the corridors considered. This corridor has low potential to impact forest and farmland, and it also has the least amount of anticipated impacts associated with sinkholes and other karst features compared to the other corridors. This also leads to the least concern for water quality issues. However, Corridor A does cross a potential historic district, which could become a Section 106 issue. Corridor B also has a lower potential for karst related complications and includes the fewest relocations; however, this corridor has a higher potential for impacts to archaeological resources and forestland. Corridor B does not cross the potential historic district.

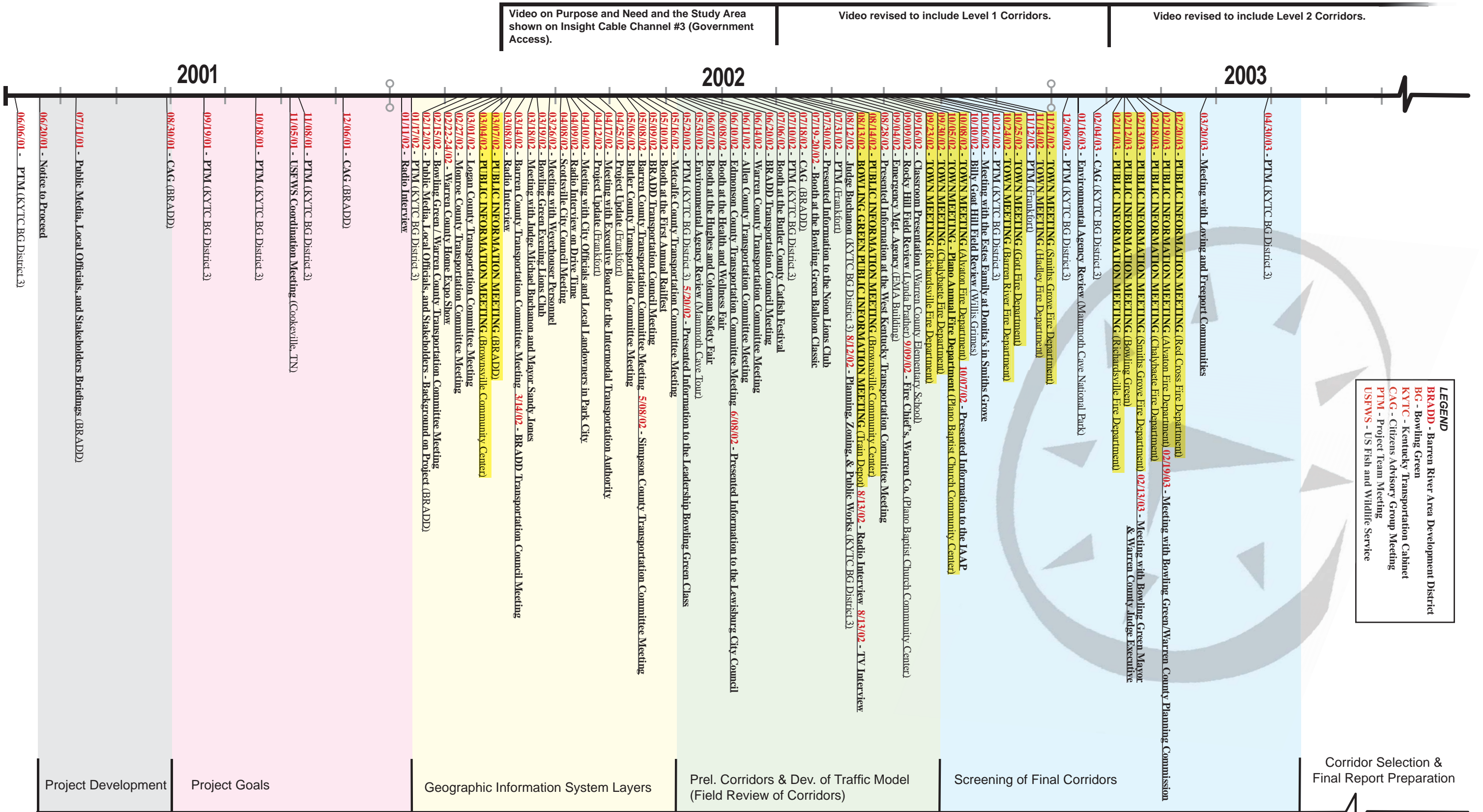
Corridors D and E have the highest potential for farmland impacts and the highest number of potential relocations. In addition, these corridors also have higher potential to impact caves, sinkholes and other karst features, increasing the potential for water quality concerns.

Public Involvement

The public involvement process for this study was extensive including community outreach in many forms. Three sets of public information meetings were held with multiple meetings each time to cover the entire study area. A Citizens Advisory Group (CAG) was also created including representatives from a cross-section of the community. The CAG provided additional public input to the project team. In addition to this involvement by the general public, multiple meetings were also held with state and local officials, emergency services officials, as well as state and federal review agencies. The extensive public involvement process provided valuable insight into issues and concerns of the public as well as cost and benefits of various corridors. A timeline showing project meetings and milestones is shown on Figure ES-2.

I-66 and Bowling Green Outer Beltline Timeline

Figure ES-2



RECOMMENDATIONS

Corridors A and B received recommendations for further consideration after the Level 2 Screening (see Figure ES-3). These corridors best satisfied the project goals and at the same time, posed the least amount of environmental impacts and engineering difficulty. These corridors had good traffic performance and low potential for relocations.

Corridors A and B take the closer route to Bowling Green on the southeast side, then diverge and take different routes across the north side of the city. Corridor A takes a closer route across the north side, creating the shortest total length of the corridors considered, while Corridor B takes a more northerly route across the north side, utilizing a different Barren River crossing location.

Based on the evaluation, it was concluded that Corridors D and E did not merit further evaluation. These corridors had poor traffic performance and higher potential environmental impacts than Corridors A and B. These corridors had higher potential impacts to the sinkhole plain and karst features and higher potential for residential relocations. Corridor E also had the least public support and the highest potential impacts to floodplains, farmland, and forestland, including large block forest.

This study has identified traffic concerns under the “no build” scenario in the future year. Segments of roadways failing to meet a minimum LOS C for rural areas and LOS D for urban areas in the year 2030 (Kentucky State Data Center growth scenario) include:

- US 31W from the Simpson County Line to KY 240, from KY 242 to Memphis Junction Road, from US 231 to Business US 231 (University), from US 68 (Riverside Drive) to KY 446, and from Jackson Grove Church Road (Bristow Road) to US 68.
- US 68/KY 80 from the Logan County Line to KY 1083, from KY 432 to Natcher Parkway, and from KY 880 to US 31W.
- US 231 from KY 662 to KY 880 (Lover’s Lane) and from US 68 to KY 880.
- Business US 231 from US 68 (Russellville Road) to KY 880.
- KY 185 from Double Springs Road to the Butler County Line.
- KY 234 from KY 961 to US 68 (Kentucky Street).
- KY 446 from I-65 to US 31W.
- KY 880 from KY 1435 to US 231 (Morgantown Road).

Bowling Green Outer Beltlines Recommended Corridors

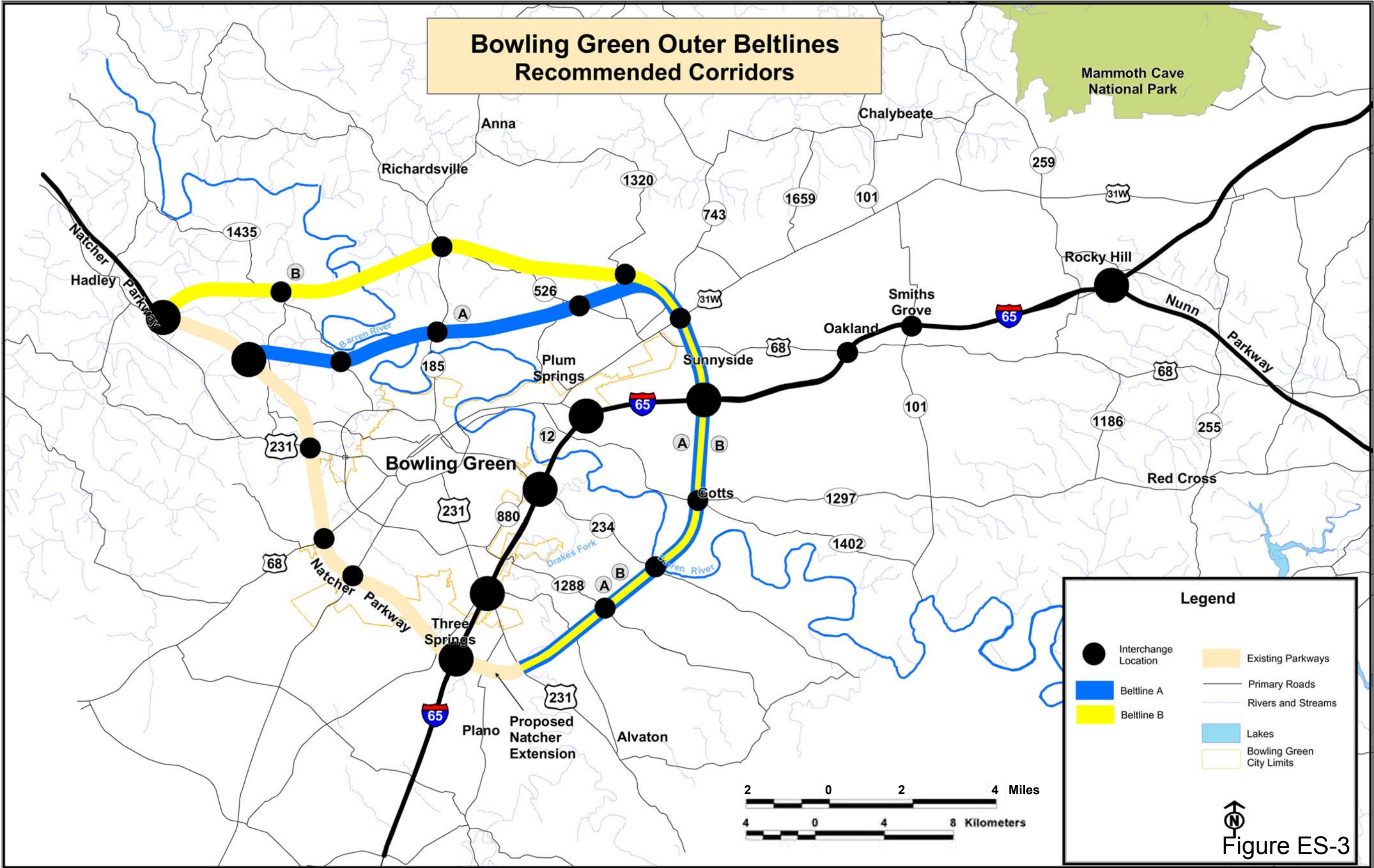


Figure ES-3

I. INTRODUCTION

A. Preface

The concept of an Outer Beltline for Bowling Green was first proposed in the *1972 Urban Transportation Plan*. The concept was continued and expanded in the *1983 Transportation Plan*, the *1990 Warren County Comprehensive Plan* and the *2000 Bowling Green Transportation Plan*.

B. Study Purpose

The purpose of this Planning Study is to identify and evaluate freeway corridors, including the “no build” option, for the Bowling Green Outer Beltline. This study identified and evaluated potential corridors to determine technical feasibility; social and environmental impacts; and ensured that the public was involved in the planning process. The objective of this study is to find the corridors that best fulfill the established project goals. It is likely that one or more corridors will need to be examined in more detail in future engineering and environmental studies. The established project goals are to:

- Accommodate the transportation needs of the Bowling Green urban area by completing an Outer Beltline, an access controlled freeway with interchanges that is consistent with the *2000 Bowling Green Transportation Plan*.
- Reduce current and future traffic congestion on the highways and streets in Warren County by diverting traffic to a new freeway facility.
- Strengthen the regional highway system by improving the connections between major highways and streets in the region.
- Provide better access to major employment centers, regional commercial centers, major education and health facilities, and regional recreation facilities in Warren County.

C. Compatibility with I-66 Corridor Planning Study

The Bowling Green Outer Beltline Study was jointly conducted with the I-66 Corridor Planning Study. The main reasons for this were because the Study Area for the Outer Beltline lies entirely within the Study Area for the I-66 Corridor and the corridor concepts considered for I-66, in some cases, are coincident with Outer Beltline corridors. A more thorough explanation of the compatibility of the two projects is included in Appendix A.

II. EXISTING CONDITIONS

A. Study Area

1. Geographic Location

The Study Area is located in south-central Kentucky in the Mississippi Plateau Physiographic region. The project area lies between the William H. Natcher Parkway, northwest of Bowling Green and the Louie B. Nunn (Cumberland) Parkway near Glasgow. This area coincides with the I-66 Corridor Study Area, and includes portions of Warren, Edmonson, and Barren Counties. The Study Area encompasses a population of approximately 100,000, and is 520 square miles in size as shown in Figure 1. The Study Area is bisected by I-65, which connects the cities of Louisville (KY) and Nashville (TN). The Study Area is approximately 65 miles north of Nashville and 110 miles south of Louisville. Major east to west routes include KY 1297, KY 1402, and US 68/KY 80. Important north to south routes include US 31W and US 231. Many other state and county roads also crisscross the Study Area leading to and from Bowling Green. The study is centered around the city of Bowling Green.

2. Termini and Project Length

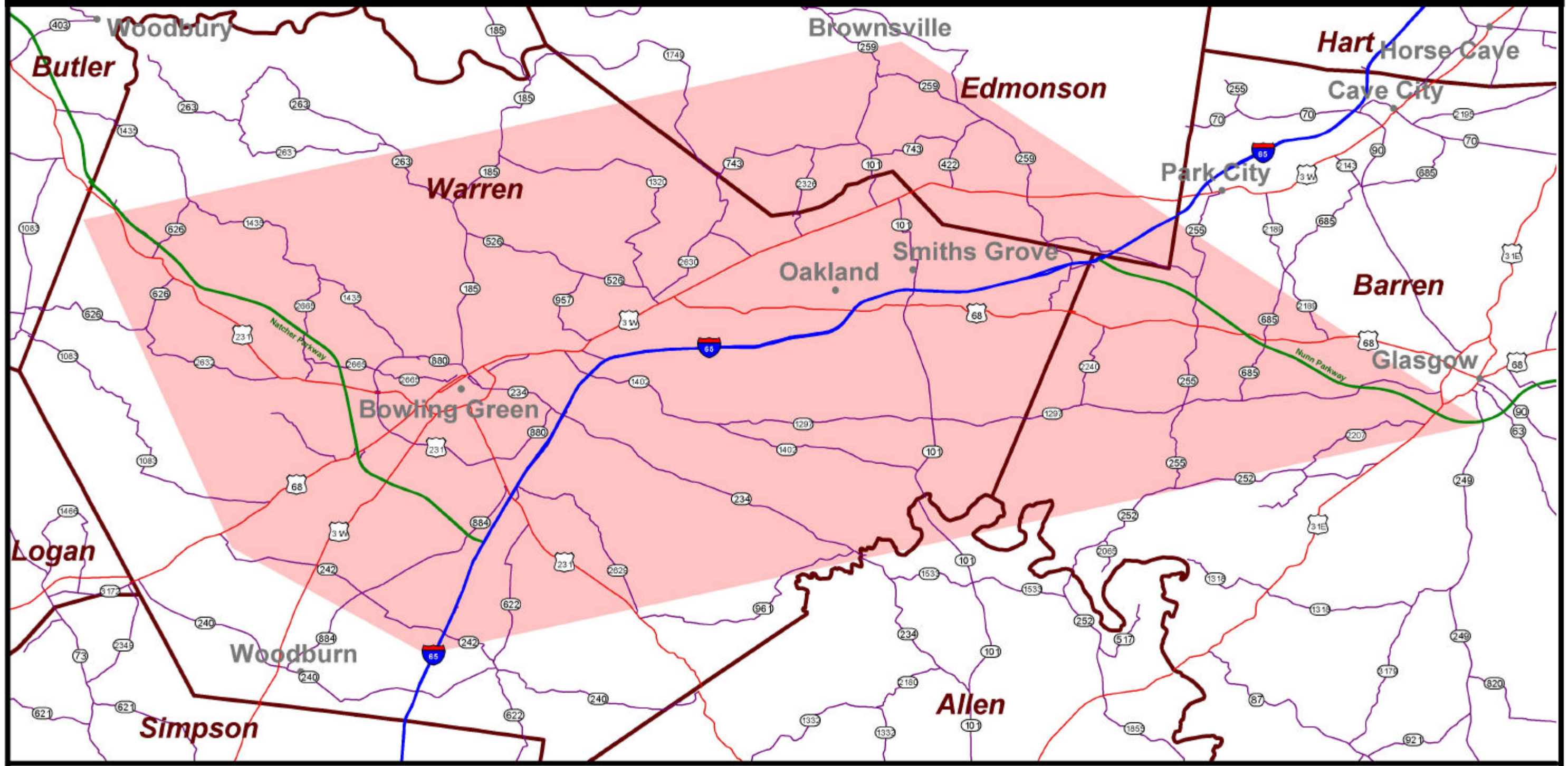
The Bowling Green Outer Beltline is proposed to begin at the William H. Natcher Parkway extension/US 231 (Scottsville Road) intersection south of Bowling Green, continue along the east side of the urban area to I-65 northeast of the city, skirt the north side of the urban area, and end at the William H. Natcher Parkway north of the city.

B. Existing Facilities and System Characteristics

The Study Area is currently served by I-65, the William H. Natcher Parkway, the Louie B. Nunn (Cumberland) Parkway, US 31W, US 68, US 231, and numerous state highways. Table 1 summarizes the major characteristics of these facilities.

I-65. Interstate 65 is the only existing interstate facility in the Study Area. Running from Chicago (IL) to Mobile (AL), I-65 links Bowling Green to Louisville (KY) on the north where east-west interstate connections exist and Nashville (TN) on the south where east-west interstate connections exist. The interstate enters the northeast corner of the Study Area near its interchange with the Louie B. Nunn (Cumberland) Parkway, passes through the east side of the Bowling Green urban area and exits at the southwest corner of the Study Area. From the William H. Natcher Parkway to the Louie B. Nunn (Cumberland) Parkway, I-65 is presently being widened from a four-lane to a six-lane facility with bridge structures to accommodate an eight-lane facility.

I-66/BOWLING GREEN OUTER BELTLINE PLANNING STUDIES STUDY AREA



- Interstate Highway
- Parkway
- US Highway
- State Highway
- County Boundary
- Study Area

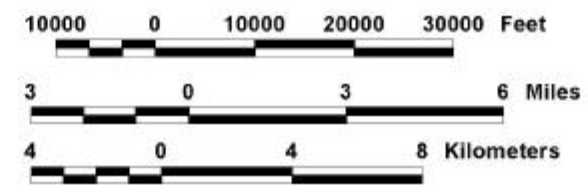


Figure 1 - Study Area

BOWLING GREEN OUTER BELTLINE CORRIDOR PLANNING STUDY

Warren and Edmonson County, Kentucky

Table 1: Existing Roadway Characteristics

Route	Begin Mile Point	End Mile Point	Segment	Functional Class	Number of Lanes	Lane Width (ft.)	Shoulder Width (ft.)
I-65	0.000	20.539	Simpson Co. Line to Natcher Pkwy	Rural Interstate	4	12	10
	20.539	28.006	Natcher Parkway to KY 446	Urban Interstate	4*	12	10
	28.006	53.956	KY 446 to Hart Co. Line	Rural Interstate	4*	12	10
Natcher Parkway	0.000	7.422	I-65 to US 231	Urban Other Freeway	4	12	6
	7.422	26.419	US 231 to KY 79	Rural Principal Arterial	4	12	6
Nunn Parkway	0.000	11.445	I-65 to US 31E	Urban Other Freeway	4	12	10
	11.445	13.990	US 31E to KY 90	Rural Principal Arterial	4	12	4
US 31W	0.000	8.788	Simpson Co. Line to Memphis Jct. Rd.	Rural Major Collector	2	10	2
	8.788	18.866	Memphis Jct. Rd to Jackson Grove Church Rd	Urban Minor Arterial	2-4	9-13	0-4
	18.866	20.905	Jackson Church Grove Rd. to US 68	Rural Major Collector	4	11	2
	20.905	29.114	US 68 to Edmonson Co. Line	Rural Major Collector	2	10	2-4
	0.000	7.996	Warren Co. Line to Barren Co. Line	Rural Major Collector	2	10	2-4
US 68/ KY 80	0.000	5.021	Logan Co. Line to KY 1083	Rural Principal Arterial	2	12	2-4
	5.021	7.514	KY 1083 to KY 432	Rural Principal Arterial	4	12	10
	7.514	9.407	KY 432 to KY 880	Urban Principal Arterial	4	12	2
	9.407	10.623	KY 880 to Business US 231	Urban Principal Arterial	2-3	11	2
	10.623	13.060	Business US 231 to US 31W (then over US 31W)	Urban Principal Arterial	4	10-12	0
	13.060	25.027	US 31W to Barren Co. Line	Rural Major Collector	2	9	2-3
US 231	0.000	7.988	Allen Co. Line to KY 622	Rural Principal Arterial	2	10	2
	7.988	14.028	KY 622 to KY 880 via Campbell Lane to US 68	Urban Principal Arterial	4	11-12	0-10
	14.028	16.445	US 68 to KY 880 to Natcher Parkway	Urban Minor Arterial	2	10-11	2-10
	16.445	27.581	Natcher Parkway to Butler Co. Line	Rural Major Collector	2	9	3
KY 101	0.000	7.865	Allen Co. Line to I-65	Rural Major Collector	2	9	3
	7.865	12.850	I-65 to Edmonson Co. Line	Rural Minor Arterial	2	10	0-10
	0.000	4.131	Warren Co. Line to KY 259	Rural Minor Arterial	2	10	0-10
KY 185	0.000	0.309	US 68 to Garvin Lane	Urban Minor Arterial	2-4	10-11	0-4
	0.309	12.222	Garvin Lane to Butler Co. Line	Rural Major Collector	2	9-12	4-10
KY 234	0.365	10.333	KY 961 to I-65	Rural Major Collector	2	10	4
	10.333	13.552	I-65 to US 68	Urban Minor Arterial	2-4	10-12	1-2
KY 259	0.000	3.087	US 68 to Edmonson Co. Line	Rural Minor Collector	2	7-8	3-4
	0.000	9.242	Warren Co. Line to KY 101	Rural Minor Collector	2	7-8	3-4
	9.242	12.096	KY 101 to KY 70	Rural Minor Arterial	2	8	4
KY 446	0.000	0.970	I-65 to US 31W	Urban Principal Arterial	4	12	10
KY 880	0.000	1.866	KY 185 to KY 1435	Urban Minor Arterial	4	12	10
	1.866	3.292	KY 1435 to Jennings Creek Bridge	Rural Minor Arterial	2	12	10
	3.292	3.646	Jennings Creek Bridge to US 231 (Morgantown Rd)	Urban Minor Arterial	2	12	10
	3.646	6.426	US 231 (Scottsville Road) to KY 234 (Cemetery Rd)	Urban Collector	2	10	3

Source: Kentucky Transportation Cabinet Highway Information System (HIS)

Note: * These segments of I-65 were being widened to six lanes during the course of this planning study.

BOWLING GREEN OUTER BELTLINE CORRIDOR PLANNING STUDY
Warren and Edmonson County, Kentucky

Louie B. Nunn and William H. Natcher Parkways. These parkways are four-lane divided highways with full access control, and are classified as Urban Other Freeways within the Bowling Green and Glasgow areas and as Rural Principal Arterials elsewhere. They belong to both the National Highway System (consisting of about 155,000 miles of Interstate and Other Principal Arterials throughout the Nation) and the National Truck Network.

The William H. Natcher Parkway begins at the US 60 Bypass in Owensboro, runs southeast parallel to US 231 and intersects with the Wendell H. Ford (Western Kentucky) Parkway (about 25 miles north of the Study Area). South of the Wendell H. Ford (Western Kentucky) Parkway, it runs along the west side of the Bowling Green urban area and terminates south of Bowling Green at I-65. The William H. Natcher Parkway has been proposed as the route for I-66 from north of the Study Area to the Wendell H. Ford (Western Kentucky) Parkway where I-66 is routed westward along the Wendell H. Ford (Western Kentucky) Parkway to I-24. The Louie B. Nunn (Cumberland) Parkway begins at I-65 near the Warren-Edmonson-Barren County Line, passes around the south side of Glasgow as it exists the Study Area, and terminates at US 27 in Somerset. The Louie B. Nunn (Cumberland) Parkway from Glasgow to Somerset is designated as I-66.

US 31W, US 68/KY 80 and US 231. These United States (US) numbered routes vary in number of lanes (from two to four lanes) and functional class (from Rural Major Collector to Urban Principal Arterial) as they traverse the Study Area. When the routes do not parallel higher functional class roadways such as I-65 and the William H. Natcher Parkway, they are generally classified as arterials. These routes carry significant traffic volumes and serve as important through routes across the Study Area.

Having been superceded nationally as a Principal Arterial by I-65, US 31W generally parallels I-65 through the Study Area. It enters the northeast edge of the Study Area near Park City and continues south generally parallel to I-65. US 31W passes through the center of the Bowling Green urban area and exits the region at the southwest edge of the Study Area traveling towards Franklin (KY) and Nashville (TN). US 31W is on the National Truck Network.

US 68/KY 80 also parallels I-65 through the eastern portion of the Study Area. It enters the western edge of the Study Area from Russellville (KY), joins US 31W northeast of downtown Bowling Green, continues on a common alignment with US 31W for about seven (7) miles, and breaks away from US 31W to follow a more direct route eastward toward Glasgow where it exits the Study Area. From the William H. Natcher Parkway in Bowling Green to the Edward T. Breathitt (Pennyrile) Parkway in Hopkinsville (KY), US 68/KY 80 is a four-lane divided Principal Arterial on the National Highway System and the National Truck Network.

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US 231 enters the Study Area from the north (traveling parallel to the William H. Natcher Parkway from Owensboro, KY), runs southeast through the Bowling Green urban area, and ends at US 31E in Scottsville (KY), southeast of the Study Area. US 231 is presently being widened to four lanes in the Study Area from the current four-lane section southeast of I-65 to the Allen County Line. This segment of US 231 is on the National Highway System.

KY 446, KY 234 and KY 880. In addition to the US numbered routes passing through the Bowling Green urban area, these state highways are part of the arterial network of the City of Bowling Green, and carry high daily traffic volumes. On the National Truck Network, KY 446 connects US 31W/US 68 to I-65 entering the north side of Bowling Green. With the new I-65/KY 234 (Cemetery Road) interchange open to traffic, KY 234 is becoming an even more important entry point to the Bowling Green urban area. KY 234 is also a Rural Major Collector from I-65 to the northern portion of Allen County. KY 880 serves as the Inner Beltline for the Bowling Green urban area.

KY 101, KY 185 and KY 259. KY 101 is the major north-south route in eastern Warren County and southern Edmonson County. KY 101 is classified as a Rural Major Collector from I-65 to northern Allen County and as a Rural Minor Arterial from KY 259 in southern Edmonson County to I-65. An Intermediate Planning Study for the reconstruction of KY 101 from I-65 south of Smiths Grove to US 31W was completed in 2001. KY 259 is the primary north-south artery from the Wendell H. Ford (Western Kentucky) Parkway through Edmonson County to its intersection with KY 101. KY 259 is functionally classified as a Rural Minor Collector from KY 101 near Rhoda in Edmonson County to US 68 in Warren County. A Design Study Report was completed for this segment of KY 259, which examined reconstruction with a connection to the existing I-65/Louie B. Nunn (Cumberland) Parkway interchange. KY 185 is the major north-south route in north central Warren County. It enters the Study Area from the north near the intersection of the Warren-Butler-Edmonson County Line and travels to KY 880 in Bowling Green. KY 185 is classified as a two-lane Rural Major Collector except for a short four-lane segment classified as an Urban Minor Arterial inside the City of Bowling Green.

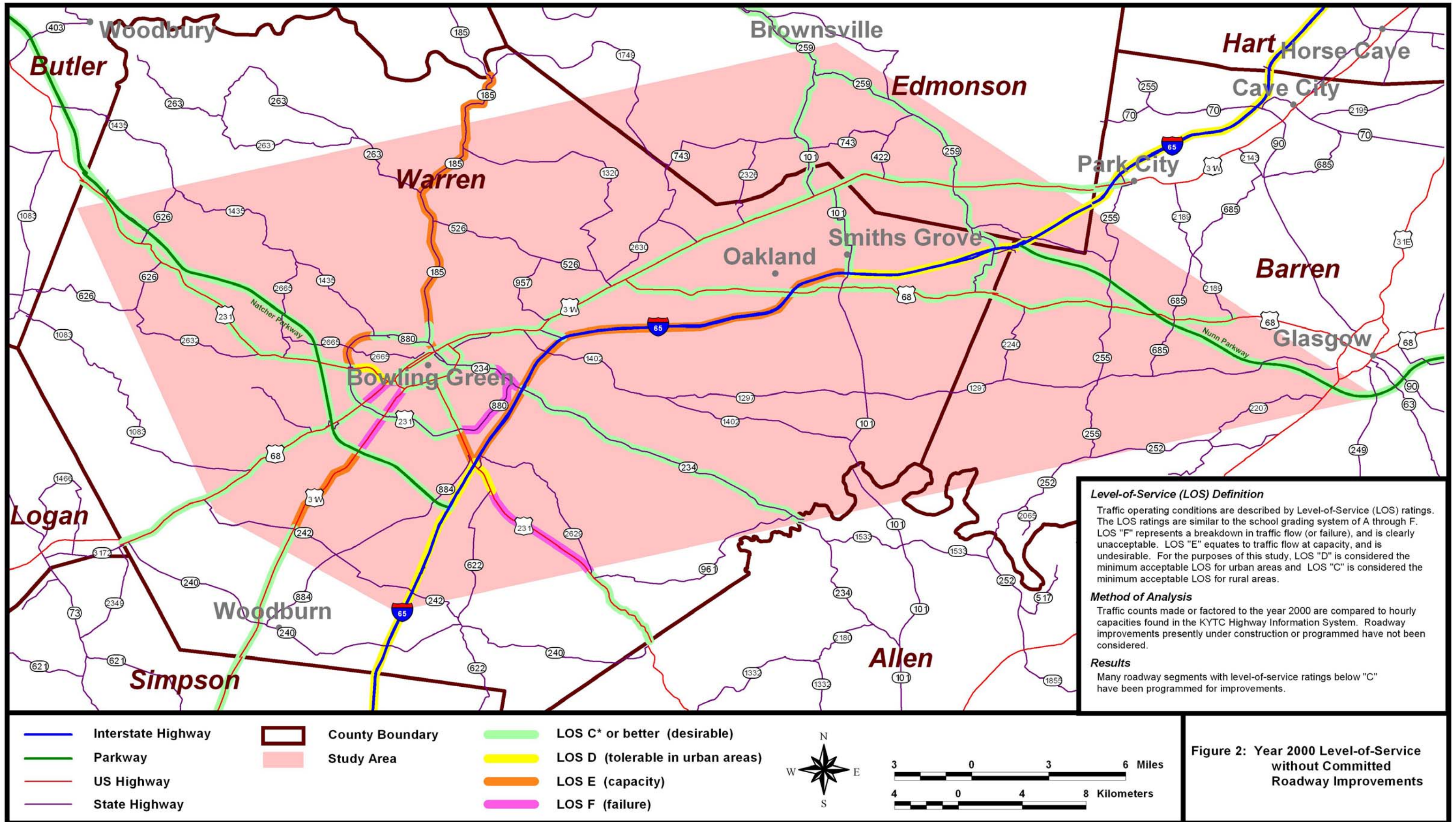
C. Existing Traffic Volumes and Level-of-Service

Traffic operating conditions are described by level-of-service (LOS) ratings similar to the school grading system of A through F (LOS A being the best, representing relatively free-flow conditions with little interference from other traffic and LOS F being the worst, representing a breakdown or even a failure in traffic flow). LOS A is the most desirable and LOS F is unacceptable. For the purposes of this study, the minimum acceptable LOS is LOS C for rural areas and LOS D for urban areas.

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The LOS for roadway segments is determined by dividing the average daily traffic (ADT) by the existing capacity (equivalent to the volume-to-capacity or V/C ratio) for the type of facility (i. e., the functional classification and number of lanes) during peak periods. A volume-to-capacity (V/C) ratio of 1.00 correlates to LOS E. Figure 2 shows the LOS for major facilities in the Study Area in the year 2000 without “committed” improvements (described in Section E in this chapter). Table 2 reports the LOS in the year 2000 based on the Kentucky Transportation Cabinet (KYTC) Highway Information System (HIS). Facility segments operating at an unacceptable LOS are highlighted in yellow. Facility segments with “committed” lane additions are highlighted in green. It can be readily observed that improvements have been programmed for most facility segments with capacity deficiencies in the year 2000. However, “committed” improvements do not fully address future deficiencies as described later in Section G of this chapter.

The KYTC Highway Information System establishes LOS E capacities by functional class and number of lanes for level terrain using average statewide factors. In the case of I-65 from the Natcher Parkway to KY 446, a LOS E capacity for rolling terrain has been substituted to better reflect the operational characteristics of this facility. For a more detailed discussion the peak-hour percent of daily traffic (K-factor), directional distribution of traffic (D-factor) and percent of trucks assumptions used the evaluation of the performance of I-65, please refer to the page 59 of the Traffic Analysis Technical Memorandum included as Appendix B.



Sources: Kentucky Transportation Cabinet Highway Information System (HIS) for average daily traffic counts and historical annual growth rates by facility classification. Bernardin-Lochmueller & Associates, Inc. for LOS analysis based on the "Highway Capacity Manual" (1994).

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Route	Begin MP	End MP	Segment	Functional Class (b)	Existing Lanes	Existing Hourly Capacity (c)	2000 ADT	V/C Ratio (d)	Existing LOS (f)
I-65	0.000	20.539	Simpson Co. Line to Natcher Pkwy	1	4	2,985	36,800	0.758	D
	20.539	25.664	Natcher Pkwy to US 231	11	4	2,940 (e)	44,800	0.919	E
	25.664	28.006	US 231 to KY 446	11	4	2,940 (e)	44,500	0.913	E
	28.006	35.562	KY 446 to US 68	1	4	2,943	42,400	0.886	E
	35.562	37.551	US 68 to KY 101	1	4	2,943	44,500	0.930	E
	37.551	43.135	KY 101 to Nunn Pkwy	1	4	2,943	36,500	0.762	D
	43.135	47.696	Nunn Pkwy to KY 255	1	4	2,550	29,800	0.718	D
	47.696	52.523	KY 255 to KY 70	1	4	2,550	30,700	0.740	D
52.523	53.956	KY 70 to Hart Co. Line	1	4	2,550	32,200	0.776	D	
Natcher Parkway	0.000	3.576	I-65 to US 31W	12	4	3,991	13,600	0.215	A
	3.576	4.969	US 31W to US 68	12	4	3,991	13,800	0.218	A
	4.969	7.422	US 68 to US 231	12	4	3,991	7,820	0.124	A
	7.422	26.419	US 231 to KY 79	2	4	3,603	8,490	0.148	A
Nunn Parkway	0.000	11.445	I-65 to US 31E	12	4	3,603	6,920	0.121	A
	11.445	13.990	US 31E to KY 90	2	4	3,265	8,670	0.166	A
US 31W	0.000	1.464	Simpson Co. Line to KY 242	7	2	1,837	5,420	0.339	A
	1.464	5.283	KY 240 to KY 242	7	2	1,837	8,230	0.515	B
	5.283	8.788	KY 242 to Memphis Junction Road	7	2	1,349	10,700	0.912	E
	8.788	8.986	Memphis Junction Rd. to Natcher Pkwy	16	2	1,349	11,600	0.989	E
	8.986	10.567	Natcher Pkwy to US 231 (Campbell Lane)	16	2	1,010	17,300	1.747	F
	10.567	11.805	US 231 to Business US 231 (University)	16	2	1,446	17,300	1.220	F
	11.805	12.812	Bus. US 231 (University) to Bus. US 231	16	4	2,828	19,400	0.399	B
	12.812	13.699	Bus. US 231 (Scottsville Rd.) to KY 234	16	4	2,828	20,600	0.307	B
	13.699	14.670	KY 234 to US 68 (Louisville Rd.)	16	4	2,828	22,000	0.328	B
	14.670	17.371	US 68 (Riverview Dr.) to KY 446	14	4	2,828	30,800	0.668	C
	17.371	18.866	KY 446 to Jackson Grove Church Rd.	16	4	2,461	22,500	0.532	C
	18.866	20.905	Jackson Church Grove Rd. to US 68	7	4	2,649	12,200	0.318	A
	20.905	23.538	US 68 to KY 743	7	2	1,361	7,140	0.603	C
	23.538	29.114	KY 743 to Edmonson Co. Line	7	2	1,346	3,240	0.277	A
	0.000	3.565	Warren Co. Line to KY 259	7	2	1,361	1,790	0.151	A
3.565	7.996	KY 259 to Barren Co. Line	7	2	1,332	1,950	0.168	A	
0.000	0.894	Edmonson Co. Line to KY 255	7	2	1,797	2,100	0.134	A	
0.894	6.823	KY 255 to KY 90	7	2	1,817	3,130	0.198	A	
US 68/ KY 80	0.000	0.319	Logan Co. Line to KY 240	2	2	1,509	8,580	0.625	C
	0.319	3.201	KY 240 to KY 242	2	2	1,608	4,560	0.312	B
	3.201	5.021	KY 242 to KY 1083	2	2	1,608	9,870	0.675	C
	5.021	7.514	KY 1083 to KY 432	2	4	2,526	14,400	0.357	B
	7.514	8.196	KY 432 to Natcher Pkwy	14	4	2,526	20,600	0.500	B
	8.196	9.407	Natcher Pkwy to KY 880/US 231	14	4	2,534	26,400	0.540	C
	9.407	10.550	KY 880 W to Business US 231	14	2	1,305	19,000	1.514	F
	10.550	13.060	Business US 231 to US 31W	14	4	1,538	17,000	0.678	C
	13.060	18.452	US 31W to I-65	7	2	1,754	2,820	0.185	A
	18.452	20.059	I-65 to KY 101	7	2	1,461	3,090	0.243	A
20.059	25.027	KY 101 to Barren Co. Line	7	2	1,445	2,810	0.224	A	

Note: (a) The highest average daily traffic (ADT) volume and worst LOS are shown for a segment when multiple values are available from the KYTC HIS. Yellow shaded values fail to meet minimum acceptable LOS C for rural areas and LOS D for urban areas. Green shaded lanes are programmed for widening.

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Table 2: Existing Traffic Volumes and Level-of-Service ^(a)

Route	Begin MP	End MP	Segment	Functional Class (b)	Existing Lanes	Existing Hourly Capacity (c)	2000 ADT	V/C Ratio (d)	Existing LOS (f)
US 231	0.000	3.236	Allen Co. Line to KY 961	2	2	1,546	4,710	0.335	B
	3.236	3.500	KY 961 to KY 2629	2	2	1,546	7,880	0.561	C
	3.500	7.988	KY 2629 to KY 622	2	2	1,310	24,400	2.049	F
	7.988	9.106	KY 622 to I-65	14	4	2,220	26,400	0.730	D
	9.106	10.601	I-65 to KY 880 (Lovers Lane)	14	4	2,732	39,600	0.889	E
	10.601	13.188	KY 880 over Campbell to US 31W	14	4	2,636	27,700	0.645	C
	13.188	14.028	US 31W over Campbell to US 68	14	4	2,636	20,200	0.470	B
	14.028	15.510	US 68 to KY 880	16	2	1,618	10,400	0.656	C
	15.510	16.445	KY 880 to Natcher Pkwy	16	2	1,618	10,100	0.175	A
	16.445	18.406	Natcher Pkwy to KY 2632	7	2	1,445	5,920	0.471	B
18.406	27.851	KY 2632 to Butler Co. Line	7	2	1,445	2,350	0.187	A	
Business US 231	0.000	2.066	KY 880 (Lovers Ln.) to US 31W	16	4	3,115	34,600	0.646	C
	2.066	2.507	US 31W to US 68 (University Dr.)	16	4	3,018	19,600	0.378	B
	2.507	3.899	US 68 (Russellville Rd.) to KY 880	16	2	1,554	10,900	0.715	D
KY 101	0.000	3.082	Allen Co. Line to KY 1297	2	2	1,531	1,240	0.093	A
	3.082	7.277	KY 1297 to US 68	2	2	1,421	1,810	0.146	A
	7.277	7.865	US 68 to I-65	2	2	1,503	3,160	0.242	A
	7.865	11.641	I-65 to US 31W	2	2	1,412	5,010	0.408	B
	11.641	12.850	US 31W to Edmonson Co. Line	2	2	1,616	3,290	0.234	A
	0.000	4.131	Edmonson Co. Line to KY 259	2	2	1,381	5,340	0.445	B
KY 185	0.000	0.309	US 68 to KY 880/Gordon Ave.	16	2	1,569	14,800	0.910	E
	0.309	0.737	KY 880 to Double Springs Road	16	4	2,995	10,300	0.200	A
	0.737	1.569	Double Springs Rd. to Garvin Lane	16	2	1,569	10,100	0.657	C
	1.569	12.222	Garvin Lane to Butler Co. Line	7	2	1,344	10,600	0.924	E
KY 234	0.365	10.333	KY 961 to I-65	7	2	1,333	5,920	0.511	B
	10.333	12.081	I-65 to Hayes Lane	16	2	1,569	18,300	1.190	F
	12.081	12.222	Hayes Lane to US 68 (Kentucky St.)	16	4	1,955	21,700	0.645	C
KY 259	0.000	3.087	US 68 to Edmonson Co. Line	2	2	1,381	204	0.017	A
	0.000	2.083	Warren Co. Line to US 31W	2	2	1,381	1,090	0.091	A
	2.083	9.242	US 31W to KY 101	2	2	1,381	1,480	0.123	A
	9.242	12.096	KY 101 to KY 70	2	2	1,381	4,710	0.392	B
KY 446	0.000	0.970	I-65 to US 31W	14	4	3,180	13,900	0.268	A
KY 880	0.000	1.866	KY 185 (Gordon Ave.) to KY 1435	16	4	3,108	13,100	0.245	A
	1.866	3.646	KY 1435 to US 231 (Morgantown Rd.)	6	2	1,569	11,800	0.853	E
	3.646	6.426	US 231 (Scottsville Rd.) to KY 234	17	2	1,569	12,800	1.036	F

Source: Kentucky Transportation Cabinet Highway Information System (HIS) and Bernardin-Lochmueller & Associates, Inc.

Notes: (a) The highest average daily traffic (ADT) volume and worst LOS are shown for a segment when multiple values are available from the KYTC HIS. Yellow shaded values fail to meet minimum acceptable LOS C for rural areas and LOS D for urban areas. Green shaded lanes are programmed for widening.

(b) Functional Class: 1 = rural interstate, 2 = rural principal arterial, 6 = rural minor arterial, 7 = rural major collector, 8 = rural minor collector, 11 = urban interstate, 12 = urban other freeway, 14 = urban principal arterial, 16 = urban minor arterial, 17 = urban collector

(c) Existing hourly capacity at service flow for LOS E as reported in the KYTC Highway Information System. For two-lane facilities, the cited capacity is for both directions. For four or more lane facilities, the cited capacity is for one direction only.

(d) V/C ratio is volume to service flow for LOS E as reported in the KYTC Highway Information System.

(e) KYTC Highway Information System hourly capacity for level terrain (3,880 vph) replaced by hourly capacity for rolling terrain (2,940 vph).

(f) Level-of-Service versus V/C ratio comparison: See Appendix B: Traffic Analysis Technical Memorandum, Table 2.

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According to the KYTC Highway Information System for the year 2000, Interstate 65 is a four-lane facility with a LOS E in urban areas and LOS D or E in rural areas resulting in unacceptable daily operating conditions in both urban and rural areas throughout the Study Area. In fact, segments of I-65 from the Natcher Parkway to KY 101 operated at capacity (LOS E) in the year 2000. (As discussed later, I-65 is being widened from the Natcher Parkway to the Nunn Parkway and farther north to address traffic flow concerns.)

Existing traffic flow conditions on the Natcher Parkway and Nunn Parkway exhibit the highest level-of-service (i.e., LOS A).

In the year 2000, the two-lane sections of US 31W were operating at capacity (LOS E) from KY 242 to the Natcher Parkway (southwest of Bowling Green) and at failure (LOS F) from the Natcher Parkway to University Drive. [As discussed later, under committed projects, US 31W is programmed for widening to four-lanes from north of KY 242 to US 231(Campbell Lane)]. The remainder of US 31W has an acceptable level-of-service in the Study Area.

US 68/KY 80 operates at an unacceptable level-of-service for the two-lane segment between KY 880 (Campbell Lane) and Business US 231 (Morgantown Road), but other segments operate at an acceptable level-of-service.

US 231 (Scottsville Road) operates at an unacceptable level-of-service for the two-lane segment from KY 2629 (Old Scottsville Road) to KY 622 (Plano Road). (As discussed later, US 231 is currently being widened to four lanes from KY 622 southeast into Allen County.) The four-lane segments of US 231 (Scottsville Road) from KY 622 (Plano Road) through the I-65 interchange to KY 880 (Campbell Lane/Lovers Lane) are presently operating at LOS D and E. Other segments of US 231 operate at an acceptable level-of-service.

The two-lane segment of KY 185 (Veterans Memorial Lane) from US 68/KY 80 (Kentucky Street) to KY 880 (Gordon Avenue) is operating at LOS E. (A widening is programmed for this segment as described later.) The rural portion of KY 185 from Garvin Lane (Old Richardsville Road) to the Butler County Line is also operating at LOS E.

The two-lane segment of KY 234 (Cemetery Road/Fairview Avenue) from I-65 to Hayes Lane operates at an unacceptable level-of-service, was being widened to four lanes during this study, and is now four lanes.

Finally, the two-lane segment of KY 880 (Veterans Memorial Lane) from KY 1435 (Barren River Road) to US 231 (Morgantown Road) is operating at LOS E; and the two-lane segment of KY 880 (Lovers Lane) from US 231 (Scottsville Road) to KY 234 (Cemetery Road) operates at an unacceptable level-of-service. (The last segment of KY 880 from US 231 to KY 234 is programmed for

widening.) Only the four-lane segment of KY 880 (Veterans Memorial Lane) from KY 185 (Gordon Avenue) to KY 1435 (Barren River Road) shows acceptable operating conditions.

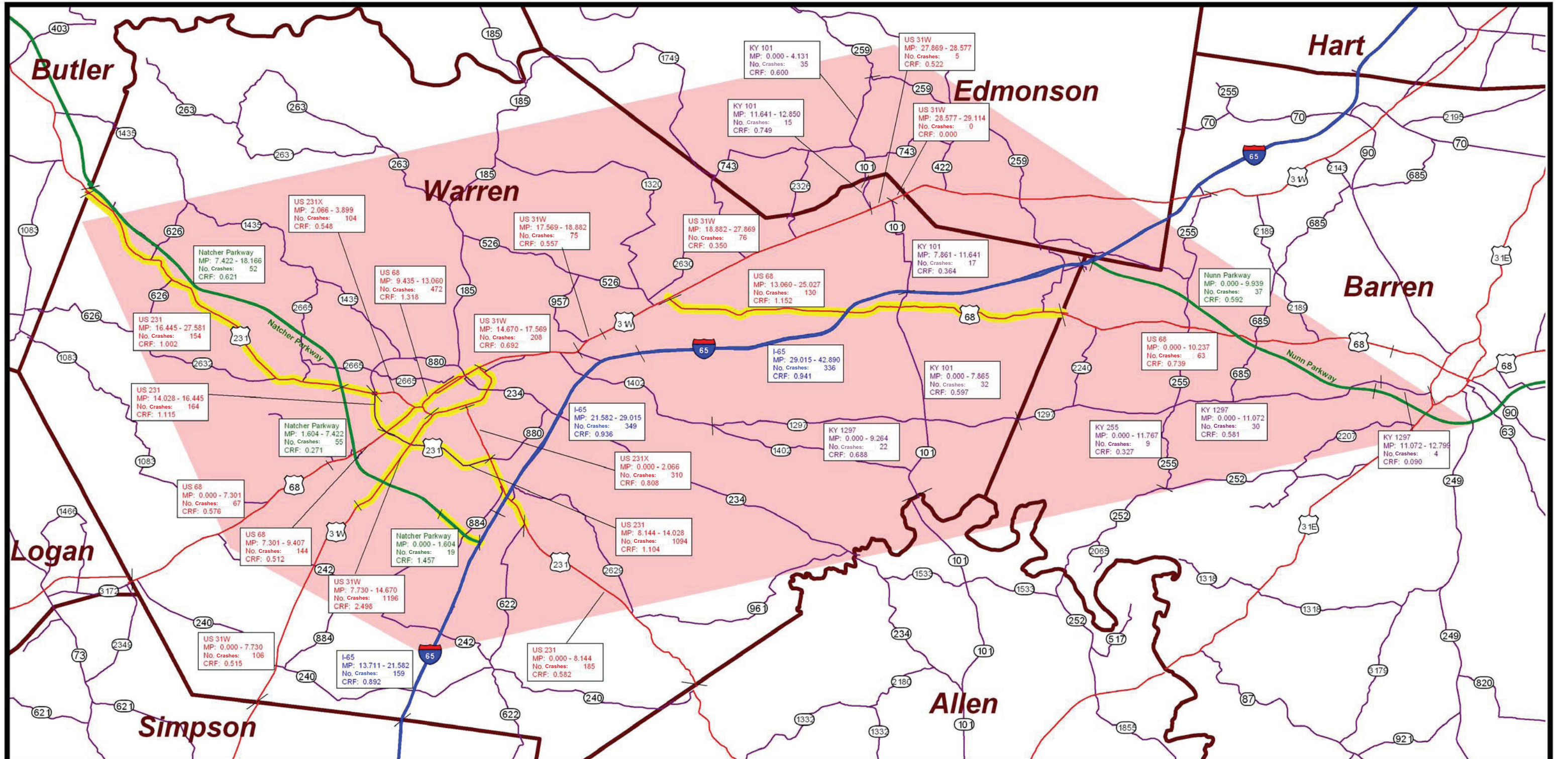
A more detailed discussion of operational conditions of the existing transportation facilities in the Study Area as well as additional traffic information is included in the Traffic Analysis Technical Memorandum included as Appendix B.

D. Crashes

Between 1997 and 1999, 5,736 traffic crashes were reported by the Kentucky Transportation Cabinet Highway Information System within the Study Area on I-65, the Natcher Parkway, the Louie B. Nunn (Cumberland) Parkway, KY 101, KY 255, KY 1297, US 31W, US 68, US 231, and Business US 231. These crashes included 1,853 non-fatal injury crashes and 17 crashes involving fatalities. Referring to Figure 3, analysis of the Highway Information System crash data revealed that there were at least seven roadway segments along these routes with a Critical Rate Factor greater than 1.00. (A Critical Rate Factor greater than 1.00 means that the crashes are not occurring at random and that other factors may be involved.)

There is evidence that heavy congestion contributed to the elevated crash rates on at least one (1) of these seven (7) critical segments. Forty-two percent of the crashes on the critical section of US 68/KY 80 between Milepost 9.435 and 13.060 (Campbell Lane to 1st Avenue) were classified as rear-end type collisions, which are associated with high levels of congestion.

Because the calculation of accident rates and Critical Rate Factors depends heavily on the length of the segment, it is possible that shorter segments may have a Critical Rate Factor greater than 1.00. In light of the high number of crashes on I-65 and Business US 231, shorter segments of these roadways may have Critical Rate Factors in excess of 1.00. An analysis of more detailed crash data included in the *2000 Bowling Green Transportation Plan* identified many tenth-of-a-mile roadway segments in the Bowling Green area (including segments of I-65, US 31W, US 68, and US 231 among others) with Critical Rate Factors above 1.00.



Interstate Highway	County Boundary	Critical Rate Factors MP: Begin Milepoint - End Milepoint No. Crashes: Number of Total Crashes CRF: Critical Rate Factor		
Parkway	Study Area			
US Highway	CRF >= 1.0			
State Highway				

Figure 3:
Critical Rate Factors for Crashes

E. Committed Projects

The I-66 Corridor was originally defined and designated as a “high priority corridor” in the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA). The I-66 Corridor was added to the National Highway System (about 155,000 miles of interstates and principal arterials through the nation) within the State of Kentucky in the 1995 National Highway System (NHS) Act. After being found economically justified and financially feasible in the 1997 Southern Kentucky Corridor (I-66) Study, I-66 was incorporated in the *Statewide Transportation Plan* (FY 1999-2018).

Aspects of the Bowling Green Outer Beltline first appeared in the *1972 Bowling Green Transportation Plan*, and were carried forward into the *1983 Bowling Green Transportation Plan*. The beltline was further defined in the *1990 Comprehensive Plan for Warren County* and again in the *2000 Bowling Green Transportation Plan*.

In addition to these two proposed projects, there are a number of other planned “major capital” improvements that may affect traffic operations in the Study Area. For analysis purposes, “committed” or “programmed” projects were added to the existing roadways to constitute the “no build” option, and had to satisfy two criteria in the KYTC 2000 Six Year Highway Plan. First, “major capital” improvements with the potential to expand the traffic flow capacity of the existing roadway network were included. Such “capacity expansion” projects include major roadway widenings, new or relocated roadways, and new or expanded interchanges. [While the highway and transportation plans include many other improvements for “capacity preservation” (such as bridge and pavement replacement/reconstruction, intersection and signal improvements, etc.), these projects are not listed because they do not increase through traffic carrying capabilities.] Second, “capacity expansion” projects must be programmed for a phase subsequent to planning in the Six Year Highway Plan, be recently completed, or under construction.

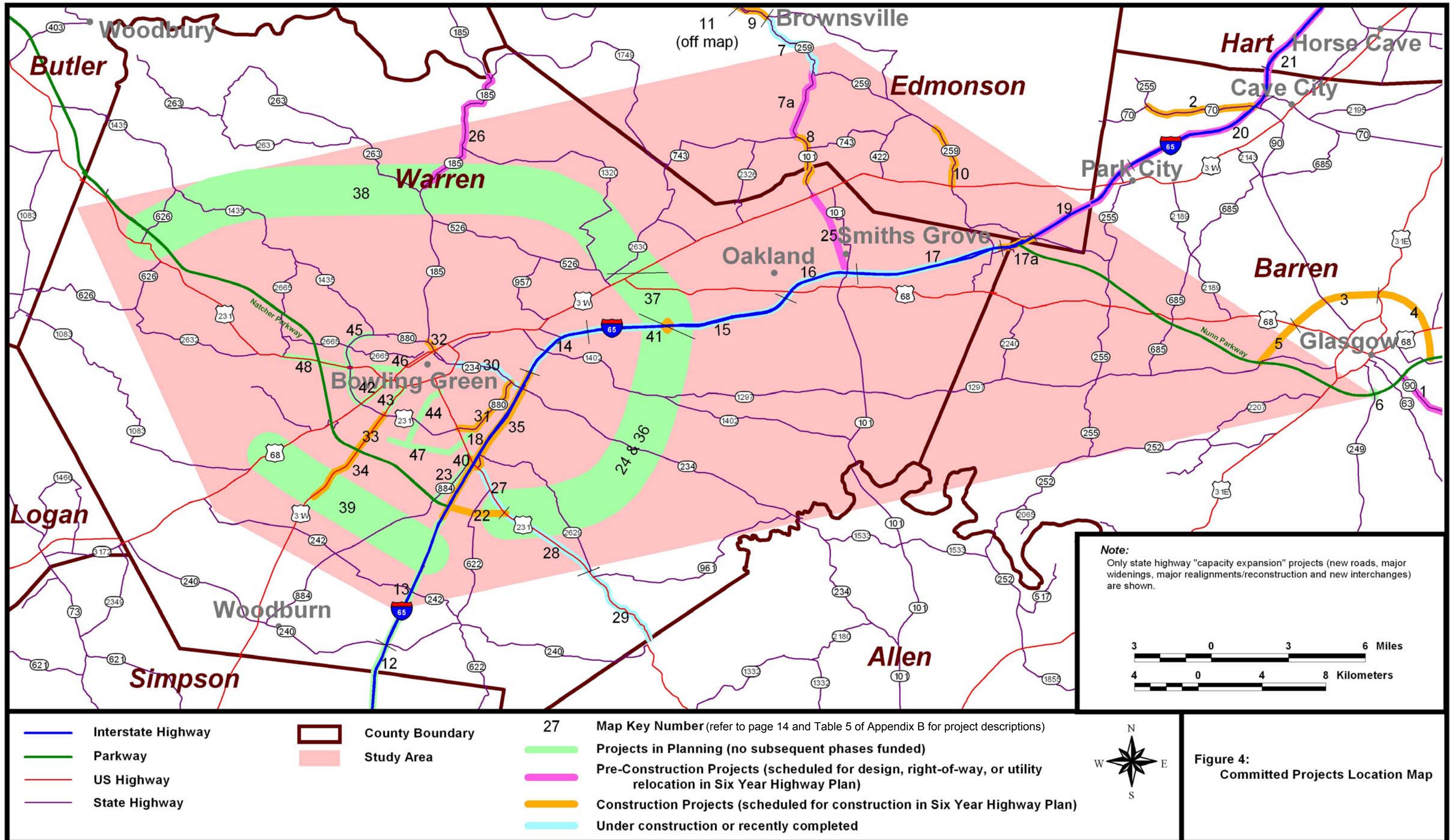
Based on the KYTC 2000 Six Year Highway Plan, the committed “capacity expansion” projects (i.e., projects with a phase funded beyond planning) included in the “no build” option within the Study Area are (refer to Figure 4):

- Map Key #1 -- KY 90 from the Nunn (Cumberland) Parkway to the Metcalfe County Line (realignment and minor widening)
- Map Key #2 -- KY 70 from I-65 to the Mammoth Cave National Park entrance (realignment and minor widening)
- Map Key #3/4/5 -- Glasgow Outer Loop from the Nunn (Cumberland) Parkway east of Glasgow to the Nunn (Cumberland) Parkway west of Glasgow near KY 1297 (new construction of a four-lane divided facility)

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- Map Key #7a/8/25 -- KY 101 from I-65 to KY 259 near Rhoda (realignment and minor widening)
- Map Key #7/9/11 -- KY 259 from Rhoda to Brownsville (realignment and minor widening)
- Map Key #10 -- KY 259 through the Knobs area north of US 31W (realignment and minor widening)
- Map Key #14-21 -- I-65 from Natcher Parkway to north of KY 224 in Hart County (widen to six lanes)
- Map Key #22 -- Natcher Parkway Extension from I-65 to US 231 (Scottsville Road)
- Map Key #26 -- KY 185 from KY 263 to the Butler County Line (realignment and minor widening)
- Map Key #27-29 -- US 231 from southeast of Cumberland Trace to US 31E in Allen County (widen to four lanes)
- Map Key #30 -- KY 234 (Cemetery Road) from Collett Lane to east of I-65 with a new interchange at I-65 (widen to five lanes)
- Map Key #31 -- KY 880 (Lovers Lane) from US 231 (Scottsville Road) to KY 234 (Cemetery Road) (widen to five lanes)
- Map Key #32 -- KY 185 (Veterans Memorial Lane) from KY 880 to the 7th and College Street intersection (new route completing a one-way pair)
- Map Key #33/34 -- US 31W from Dillard Road to US 231 (Campbell Lane) (widen to five lanes)
- Map Key #35 -- KY 2158 (Cumberland Trace) from US 231 (Scottsville Road) to KY 234 (Cemetery Road) (widen to three lanes)

Refer to Table 5 of Appendix B “Technical Memorandum: Traffic Analysis” for a complete listing of projects displayed in Figure 4.



Sources: Kentucky Transportation Cabinet 2000 Six Year Highway Plan.
 Kentucky Transportation Cabinet 2002 Six Year Highway Plan.
 Kentucky Transportation Cabinet 1999 Statewide Transportation Plan (FY 1999-2018).
 Bowling Green Transportation Plan (2001).

F. Regional Travel Model Development

A regional travel demand model was developed for roughly a 13-county area encompassing the I-66/Bowling Green Outer Beltline Study Area and surrounding counties. (See Figure 5.) The Bowling Green Regional Travel Model is a composite of the Kentucky Statewide Traffic Model (KySTM)¹ and the Bowling Green Transportation Plan Travel Model.² The Traffic Analysis Technical Memorandum is included in Appendix B.

Thus, the Bowling Green Transportation Plan Travel Model roadway network and travel analysis zone (TAZ) system were incorporated into a clipped portion of the KySTM covering portions of 13 counties. The Warren County TAZ system from the Bowling Green Transportation Plan was reviewed for consistency with 2000 Census Tract boundaries and major geographic barriers such as rivers and freeways. A few TAZs required minor boundary adjustments and splits. Appropriate adjustments were made to centroid connectors in Warren County including the elimination of a few inappropriate centroid connections to freeways between interchanges. A few adjustments were made to the Warren County roadway network to ensure all freeway interchanges were modeled. For the balance of the Regional Travel Model outside Warren County, roadway network was added to ensure the representation of all state roadways, TAZs were split, and appropriate changes were made to centroid connectors.

To ensure consistent trip generation throughout the region, the KySTM trip generation equations were used in the regional model; however, Western Kentucky University remains a special generator consistent with the Bowling Green Transportation Plan Travel Model. To ensure consistency with other KYTC traffic studies, the KySTM protocols for roadway link attributes and roadway capacities were used throughout the region. A unique speed-functional class table was created for the Regional Travel Model. On the other hand, the gravity model aspect of the Bowling Green Transportation Plan Travel Model was expanded to the entire region for internal trip distribution. Congestion is also recognized in the choice of travel paths through application of capacity constraint in the Regional Travel Model (similar to the Bowling Green Transportation Plan Travel Model).

In conclusion, the Regional Travel Model reflects 2000 Census and year 2000 employment data, provides greater network and travel analysis zone (TAZ) detail than either of the source travel models, incorporates new year 2030 socioeconomic forecasts for TAZs (as later described), and better replicates actual traffic volumes than either of the source travel models.

¹ *Kentucky Statewide Traffic Model: Final Calibration Report*, prepared for Kentucky Transportation Cabinet by Wilbur Smith Associates; April, 1997. *Kentucky Statewide Traffic Model Update*; prepared for Kentucky Transportation Cabinet by Wilbur Smith Associates; January, 2001. *Traffic Model Coordination for the I-66 (Southern Kentucky) Corridor*, prepared for Kentucky Transportation Cabinet by Wilbur Smith Associates; October 5, 2001.

² *Bowling Green Transportation Plan*; prepared for Kentucky Transportation Cabinet by HNTB; August, 2000. *Bowling Green/Warren County, Kentucky Travel Demand Forecasting Model: Documentation of Model Extension and Validation*; prepared for Kentucky Transportation Cabinet by HNTB; June, 2000.

G. Future Traffic Volumes and Level-of-Service (No Build Traffic Conditions)

Future travel in the year 2030 was assigned to the No Build (Existing-Plus-Committed) Roadway Network based on the Kentucky Statewide Traffic Model (KySTM) and the Kentucky State Data Center (SDC) growth scenarios. While both assignments included the through traffic associated with assumed completion of I-66 throughout the Commonwealth, the Kentucky State Data Center population forecasts result in slightly higher traffic assignments. The resulting traffic conditions for two growth scenarios appear in Table 3 for major facilities in Warren County. Figure 6 shows the level-of-service for the Study Area for the SDC growth scenarios. (Refer to Appendix B Figures 14 through 17 of the Traffic Analysis Technical Memorandum for additional LOS displays on the two growth scenarios based on the Regional Travel Model.)

Referring to Table 3, I-65 as a six-lane facility fails to achieve minimum acceptable level-of-service standards in rural and urban areas in the year 2030 for both the Kentucky Statewide Traffic Model (KySTM) and State Data Center growth forecasts in Warren County. In fact, only two segments in Barren County achieve LOS C under the lower KySTM forecast.

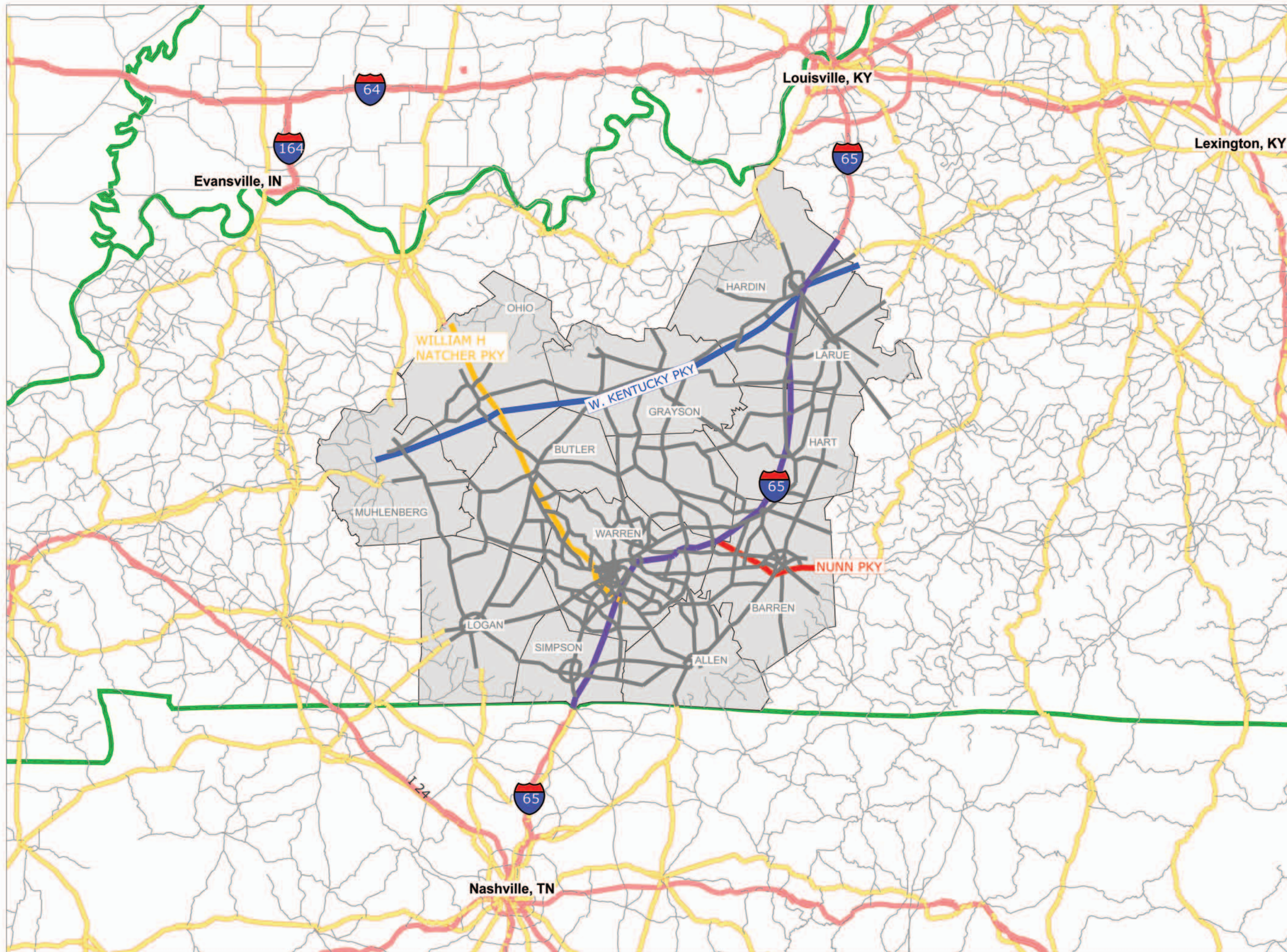
I-65. This means that I-65 would have to be widened to at least eight lanes to achieve LOS C (less than 95,680 vehicles per day) in rural areas and LOS D (less than 113,390 vehicles per day) in urban areas, provided trucks are only 25 percent of the total daily traffic volume. At present, trucks represent 40 percent of the total daily traffic volume. If this high percent of trucks continues into the future, even eight lanes will not be sufficient to achieve a LOS D (less than 86,000 vehicles per day) on the urban stretch of I-65 between US 231 and KY 446.

US 31W. While the programmed four-laning of US 31W from Memphis Junction Road to US 231 (Campbell Lane) addresses year 2000 LOS E and F problems on this segment, year 2000 LOS E and F problems from KY 242 to Memphis Junction Road and from US 231 (Campbell Lane) to Business US 231 (University Drive) grow worse by the year 2030. Further, under the SDC Growth Scenario, US 31W drops to LOS E from the Simpson County Line to KY 240 and US 68 (Riverside Drive) to KY 446. From Jackson Grove Church Road to US 68, US 31W drops to LOS D in the year 2030 under both growth scenarios.

US 68/KY 80. Without programmed improvements, the two-lane segment of US 68/KY 80 from KY 880 (Campbell Lane) to Business US 231 (Morgantown Road) continues to experience LOS F into the future. In the future, University Drive and the one-way pair of Adams Street/Kentucky Street (US 68/KY 80) from Old Morgantown Road to KY 234 (6th Avenue) also begin to experience LOS E and F operational problems.

Figure 5

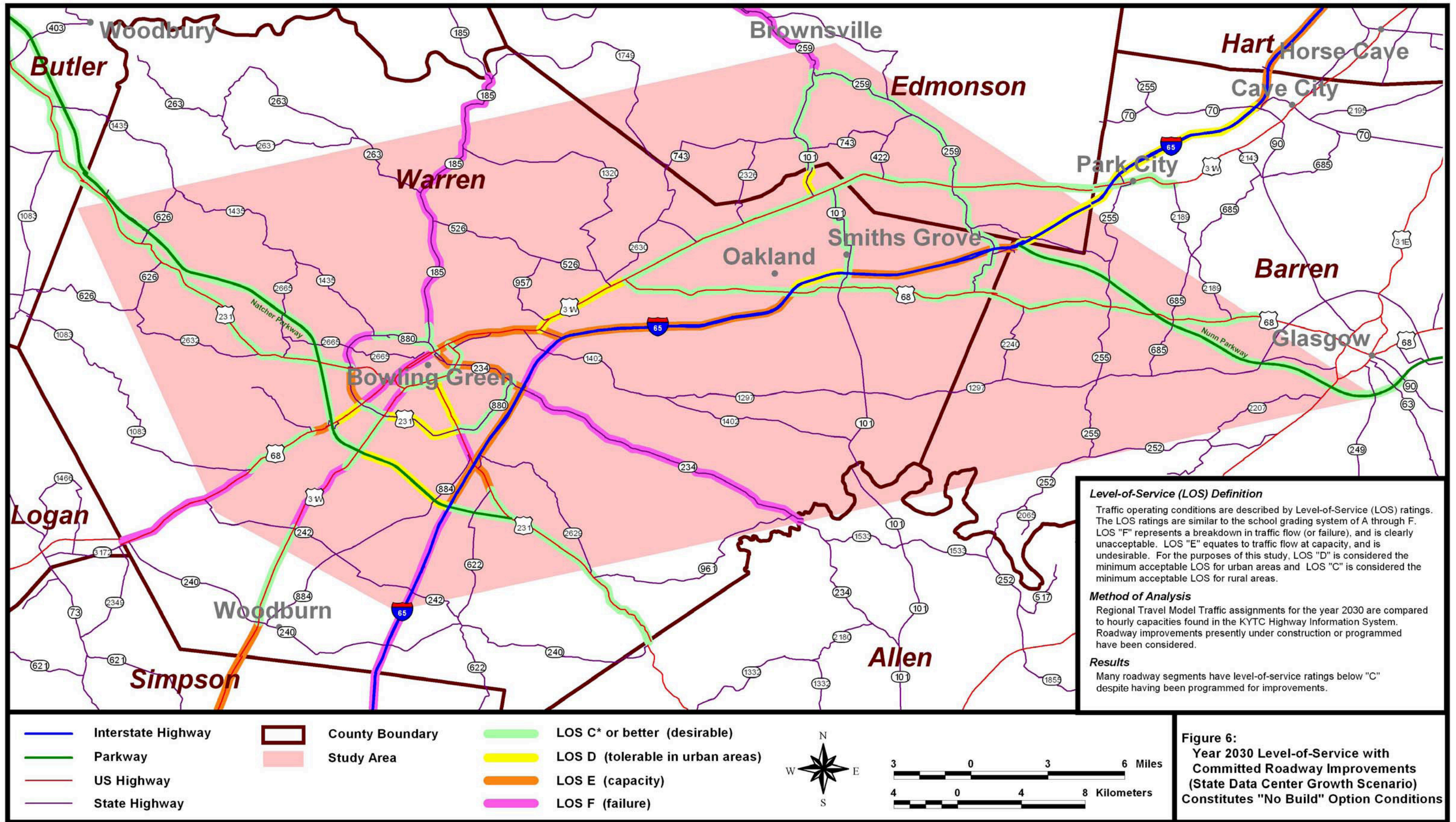
Regional Travel Model Geographic Area and Network Coverage



Map Legend

- Map Layers**
 - State (High)
 - Model Area Counties
 - Model Network
 - Key Corridors**
 - Western Kentucky Parkway
 - Natcher Parkway
 - I-65
 - Nunn Parkway
 - Street Type**
 - Highway
 - Highway (Divided)
 - Primary
 - Secondary
 - Local
 - Vehicle Trail
 - Other
- 0 8 16 24 Miles





Sources: Kentucky Transportation Cabinet Highway Information System (HIS) for average daily traffic counts and historical annual growth rates by facility classification. Bernardin-Lochmueller & Associates, Inc. for LOS analysis based on the "Highway Capacity Manual" (1994).

BOWLING GREEN OUTER BELTLINE CORRIDOR PLANNING STUDY
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Table 3: Future Traffic Volumes and Level-of-Service for No Build Corridor ^(a)

Route	Segment	Functional Class (b)	Existing Year 2000				No Build Alternative (E+C Network)					
			Lanes	Hourly Capacity (c)	2000 ADT	LOS (e)	Lanes	Hourly Capacity (c)	Statewide Traffic Model		State Data Center	
									2030 ADT	Future LOS	2030 ADT	Future LOS
I-65	Simpson Co. Line to Natcher Pkwy	1	4	2,985	36,800	D	4	2,985	49,300	F	51,900	F
	Natcher Pkwy to US 231	11	4	2,940 (d)	44,800	E	6	4,305	69,000	E	76,700	E
	US 231 to KY 234	11	4	2,940 (d)	44,500	E	6	4,305	78,600	E	86,700	E
	KY 234 to KY 446	11	4	2,940 (d)	44,500	E	6	4,305	84,000	E	97,300	F
	KY 446 to US 68	1	4	2,943	42,400	E	6	4,305	69,400	E	81,300	E
	US 68 to KY 101	1	4	2,943	44,500	E	6	4,305	61,100	D	63,700	D
	KY 101 to Louie B. Nunn Pkwy	1	4	2,943	36,500	D	6	4,305	61,700	D	69,300	E
	Nunn Pkwy to KY 255	1	4	2,550	29,800	D	6	4,305	49,100	C	54,100	D
	KY 255 to KY 70	1	4	2,550	30,700	D	6	4,305	49,100	C	54,100	D
KY 70 to Hart Co. Line	1	4	2,550	32,200	D	6	4,305	60,800	D	67,800	E	
Natcher Parkway	I-65 to US 31W	12	4	3,991	13,600	A	4	3,265	41,000	C	47,800	D
	US 31W to US 68	12	4	3,991	13,800	A	4	3,991	37,800	C	42,800	C
	US 68 to US 231	12	4	3,991	7,820	A	4	3,991	21,800	B	24,300	B
	US 231 to KY 79	2	4	3,603	8,490	A	4	3,603	17,200	A	19,200	B
Nunn Parkway	I-65 to US 31E	12	4	3,603	6,920	A	4	3,603	17,000	B	15,200	A
	US 31E to KY 90	2	4	3,265	8,670	A	4	3,265	18,200	B	19,800	B
US 31W	Simpson Co. Line to KY 240	7	2	1,837	5,420	A	2	1,837	13,600	D	13,900	E
	KY 240 to KY 242	7	2	1,837	8,230	B	2	1,837	11,000	C	9,500	C
	KY 242 to Memphis Junction Road	7	2	1,349	10,700	E	2	1,349	25,900	F	27,800	F
	Memphis Junction Rd. to Natcher Pkwy	16	2	1,349	11,600	E	4	3,352	31,200	C	37,200	C
	Natcher Pkwy to US 231 (Campbell Lane)	16	2	1,010	17,300	F	4	3,352	27,800	C	31,200	C
	US 231 to Business US 231 (University)	16	2	1,446	17,300	F	2	1,446	19,100	F	20,700	F
	Bus. US 231 (University) to Bus. US 231	16	4	2,828	19,400	B	4	2,828	24,900	C	26,600	C
	Bus. US 231 (Scottsville Rd.) to KY 234	16	4	2,828	20,600	B	4	2,828	27,800	C	31,000	C
	KY 234 to US 68 (Louisville Rd.)	16	4	2,828	22,000	B	4	2,828	24,000	C	25,700	C
	US 68 (Riverview Dr.) to KY 446	14	4	2,828	30,800	C	4	2,828	39,900	D	42,700	E
	KY 446 to Jackson Grove Church Rd.	16	4	2,461	22,500	C	4	2,461	30,800	D	32,400	D
	Jackson Grove Church Rd. to US 68	7	4	2,649	12,200	A	4	2,649	29,700	D	30,600	D
	US 68 to KY 743	7	2	1,361	7,140	C	2	1,361	5,300	B	6,900	C
	KY 743 to KY 101	7	2	1,346	3,240	A	2	1,346	6,600	C	8,300	C
	KY 101 to Edmonson Co. Line	7	2	1,376	3,240	A	2	1,376	4,200	A	6,000	B
Warren Co. Line to KY 259	7	2	1,361	1,790	A	2	1,361	1,400	A	2,000	A	
KY 259 to Barren Co. Line	7	2	1,332	1,950	A	2	1,332	2,500	A	3,300	A	
Edmonson Co. Line to KY 255	7	2	1,797	2,100	A	2	1,797	2,500	A	2,900	A	
KY 255 to KY 90	7	2	1,817	3,130	A	2	1,817	3,800	A	4,300	A	
US 68/ KY 80	Logan Co. Line to KY 240	2	2	1,509	8,580	C	2	1,509	14,500	F	15,300	F
	KY 240 to KY 242	2	2	1,608	4,560	B	2	1,608	13,000	E	17,100	F
	KY 242 to KY 1083	2	2	1,608	9,870	C	2	1,608	14,800	F	17,400	F
	KY 1083 to KY 432	2	4	2,526	14,400	B	4	2,526	26,000	C	26,800	C
	KY 432 to Natcher Pkwy	14	4	2,526	20,600	B	4	2,526	37,800	E	40,200	E
	Natcher Pkwy to KY 880/US 231	14	4	2,534	26,400	C	4	2,534	34,700	D	37,400	D
	KY 880 to Business US 231	14	2	1,305	19,000	F	2	1,305	30,200	F	30,400	F
	Business US 231 to US 31W	14	4	1,538	17,000	C	4	1,538	30,100	F	30,100	F
	US 31W to Sunnyside Road	7	2	1,754	2,820	A	2	1,754	6,300	B	10,100	C
	Sunnyside Rd. to I-65.	7	2	1,412	2,150	A	2	1,412	5,000	B	8,700	C
	I-65 to KY 101	7	2	1,461	3,090	A	2	1,461	6,900	C	8,900	C
	KY 101 to Barren Co. Line	7	2	1,445	2,810	A	2	1,445	3,700	A	3,600	A
Warren Co. Line to KY 685	7	2	1,397	2,980	A	2	1,397	4,500	A	4,900	B	

Note: (a) The highest average daily traffic (ADT) volume and worst LOS are shown for a segment when multiple values are available from the KYTC HIS. Shaded values fail to meet minimum acceptable LOS C for rural areas and LOS D for urban areas.

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Warren and Edmonson County, Kentucky

Table 3: Future Traffic Volumes and Level-of-Service for No Build Corridor ^(a)

Route	Segment	Functional Class (b)	Existing Year 2000				No Build Alternative (E+C Network)					
			Lanes	Hourly Capacity (c)	2000 ADT	LOS (e)	Lanes	Hourly Capacity (c)	Statewide Traffic Model		State Data Center	
									2030 ADT	Future LOS	2030 ADT	Future LOS
US 231	Allen Co. Line to KY 961	2	2	1,546	4,710	B	4	2,220	13,400	B	15,700	B
	Allen Co. Line to KY 961	2	2	1,546	4,710	B	4	2,220	13,400	B	15,700	B
	KY 961 to KY 2629	2	2	1,546	7,880	C	4	2,220	13,200	B	16,700	B
	KY 2629 to KY 622	2	2	1,310	24,400	F	4	2,220	20,700	C	24,800	C
	KY 622 to I-65	14	4	2,220	26,400	D	4	2,220	24,000	C	34,600	E
	I-65 to KY 880 (Lovers Lane)	14	4	2,732	39,600	E	4	2,732	45,100	F	47,900	F
	KY 880 over Campbell to US 31W	14	4	2,636	27,700	C	4	2,636	33,500	D	34,500	D
	US 31W over Campbell to US 68	14	4	2,636	20,200	B	4	2,636	21,500	C	22,500	C
	US 68 to KY 880	16	2	1,618	10,400	C	2	1,618	14,700	E	15,100	E
	KY 880 to Natcher Pkwy	16	2	1,618	10,100	A	4	3,352	18,200	B	18,600	B
	Natcher Pkwy to KY 2632	7	2	1,445	5,920	B	2	1,445	6,900	C	7,500	C
	KY 2632 to Butler Co. Line	7	2	1,445	2,350	A	2	1,445	3,000	A	3,500	A
Business US 231	KY 880 (Lovers Ln.) to US 31W	16	4	3,115	34,600	C	4	3,115	36,900	D	38,800	D
	US 31W to US 68 (University Dr.)	16	4	3,018	19,600	B	4	3,018	24,900	C	26,600	C
	US 68 (Russellville Rd.) to KY 880	16	2	1,554	10,900	D	2	1,554	15,400	F	15,900	F
KY 101	Allen Co. Line to KY 1297	7	2	1,531	1,240	A	2	1,531	3,200	A	4,400	A
	KY 1297 to US 68	7	2	1,421	1,810	A	2	1,421	3,400	A	5,300	B
	US 68 to I-65	7	2	1,503	3,160	A	2	1,503	5,600	B	6,000	B
	I-65 to US 31W	6	2	1,412	5,010	B	2	1,412	7,300	C	7,300	C
	US 31W to Edmonson Co. Line	6	2	1,616	3,290	A	2	1,616	7,200	C	10,800	D
	Edmonson Co. Line to KY 259	6	2	1,381	5,340	B	2	1,381	7,000	C	6,900	C
KY 185	US 68 to KY 880/Gordon Ave.	16	2	1,569	14,800	E	4	2,995	23,700	B	24,600	B
	KY 880 to Double Springs Road	16	4	2,995	10,300	A	4	2,995	14,200	A	14,600	A
	Double Springs Rd. to Garvin Lane	16	2	1,569	10,100	C	2	1,569	14,200	F	14,600	F
	Garvin Lane to Butler Co. Line	7	2	1,344	10,600	E	2	1,344	13,700	F	14,000	F
KY 234	KY 961 to I-65	7	2	1,333	5,920	B	2	1,333	26,700	F	30,900	F
	I-65 to Hayes Lane	16	2	1,569	18,300	F	4	2,636	38,500	E	42,600	E
	I-65 to US 68 (Kentucky St.)	16	4	1,955	21,700	C	4	1,955	27,900	D	28,000	E
KY 259	US 68 to Edmonson Co. Line	8	2	1,381	204	A	2	1,381	1,000	A	1,000	A
	Warren Co. Line to US 31W	8	2	1,381	1,090	A	2	1,381	800	A	800	A
	US 31W to KY 101	8	2	1,381	1,480	A	2	1,381	1,500	A	1,500	A
	KY 101 to KY 70	6	2	1,381	4,710	B	2	1,381	8,200	C	12,300	F
KY 446	I-65 to US 31W	14	4	3,180	13,900	A	4	3,180	38,300	D	43,100	E
KY 880	KY 185 (Gordon Ave.) to KY 1435	16	4	3,108	13,100	A	4	3,108	22,500	B	22,700	B
	KY 1435 to US 231 (Morgantown Rd.)	6	2	1,569	11,800	E	2	1,569	20,400	F	20,200	F
	US 231 (Scottsville Rd.) to KY 234	17	2	1,569	12,800	F	4	2,660	19,100	C	22,900	C

Source: Bernardin-Lochmueller & Associates, Inc.

- Notes: (a) The highest average daily traffic (ADT) volume and worst LOS are shown for a segment when multiple values are available from the KYTC HIS. Yellow shaded values fail to meet minimum acceptable LOS C for rural areas and LOS D for urban areas. Green shaded lanes are programmed for widening.
- (b) Functional Class: 1 = rural interstate, 2 = rural principal arterial, 6 = rural minor arterial, 7 = rural major collector, 8 = rural minor collector, 11 = urban interstate, 12 = urban other freeway, 14 = urban principal arterial, 16 = urban minor arterial, 17 = urban collector
- (c) Existing hourly capacity at service flow for LOS E as reported in the KYTC Highway Information System. For two-lane facilities, the cited capacity is for both directions. For four or more lane facilities, the cited capacity is for one direction only.
- (d) KYTC Highway Information System hourly capacity for level terrain (3,880 vph) replaced by hourly capacity for rolling terrain (2,940 vph).
- (e) Level-of-Service versus V/C ratio comparison: See Appendix B: Traffic Analysis Technical Memorandum, Table 2.

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US 231. While the programmed four-laning of US 231 (Scottsville Road) from KY 2629 (Old Scottsville Road to KY 622 (Plano Road) addresses existing operational problems for this segment, other segments of US 231 from KY 622 to KY 880 (Campbell Lane) experience greater congestion in the future. Further, the two-lane segment of Veterans Memorial Lane (US 231) from US 68 to Business US 231 (Morgantown Road) drops to LOS E in the future.

US 231 Business. The two-lane section of Morgantown Road (US 231) begins to experience future operational failure from US 68 (Russellville Road) to Veterans Memorial Lane (KY 880/US 231).

KY 185. While the four-laning of KY 185 (Veterans Memorial Lane) from US 68 (Kentucky Street) to Gordon Avenue improves operations over the year 2000, the remaining two-lane segments of KY 185 from Double Springs Road to the Butler County Line experience operational failure in the year 2030.

KY 234. Despite the programmed four-laning of KY 234 (Cemetery Road/Fairview Avenue) from I-65 to Haynes Lane (that has been recently completed), Cemetery Road/Fairview Avenue/6th-7th Avenue will experience LOS E and F conditions from east of I-65 to US 68 (Kentucky Street) in the future.

KY 446. Finally, KY 446 drops to LOS D under the KySTM growth scenario and to LOS E under the SDC growth scenario by the year 2030.

III. GENERAL ENVIRONMENTAL OVERVIEW

An environmental study was conducted on the Study Area to identify significant human and natural environmental areas of concern. These areas were considered in the development of corridors to avoid environmental “hot spots” where possible and to minimize potential impacts otherwise. The purpose of this overview is also to show the potential human and natural environmental impacts associated with the construction of each of the four (4) “build” corridors. The complete Environmental Overview report is located in Appendix C.

In the first phase of the study, information was extrapolated through Geographic Information System (GIS) data gathered from numerous sources including coordination with various local, state and federal agencies. From the information gathered, an environmental “footprint” map was prepared to illustrate the known areas of concern (e.g. streams, wetlands, karst features, churches, schools, etc.). In the second stage of the study, information was supplemented through additional coordination with local, state and federal agencies along with information obtained from windshield surveys of the local area. In addition, information was gathered through public and agency meetings regarding issues of concern within the Study Area.

A. General Overview

The Study Area is located primarily in Warren County, Kentucky. The Study Area for the project coincides with the I-66 Corridor Study Area between the William H. Natcher and Louie B. Nunn (Cumberland) Parkways. Because the I-66 Study Area encompassed the Bowling Green area, and the Bowling Green Outer Beltline Study could utilize the same date, the same study area was used for both projects. Warren County is located in south-central Kentucky in the Mississippian Plateau Physiographic region. The Bowling Green Outer Beltline Corridor Study Area is generally bisected by I-65 with the William H. Natcher Parkway at the western boundary and the Louie B. Nunn (Cumberland) Parkway at the eastern boundary. The waterway draining the majority of the Study Area is the Barren River, which flows through the western portion of the Study Area from southeast to northwest through Bowling Green. Main tributaries of the Barren River in the Study Area include the Gasper River, northwest of Bowling Green and the West Fork of Drakes Creek, southeast of Bowling Green. The Barren River drains into the Green River north of the Study Area. The Green River flows through Mammoth Cave National Park generally east to west and just outside of the Study Area to the north. The Green River also directly drains a smaller portion the Study Area to the north and east prior to its confluence with the Barren River.

A large portion of the Study Area is drained via underground flow largely associated with the karst plain that generally runs through the center of the Study Area from Park City to Bowling Green. The majority of this area also drains

southwest to the Barren River, while a smaller portion to the north and east flows through the Mammoth Cave Region to the Green River. This underground flow through the highly soluble limestone underlying the region has led to the formation of the extensive cave passages in the region. Although cave entry points and passageway locations are largely confidential, extensive cave passages exist under the Study Area. The climate of the Study Area is characterized by having cold winters and warm summers with four (4) distinct seasons. The average annual temperature is 57 degrees Fahrenheit with an average precipitation of 47 inches.

B. Specific Human Environmental Considerations

1. Land Use

The Study Area includes a mixture of residential, agricultural, and forestland, and floodplains and wetlands. Agriculture is the dominant land use within the Study Area due to large expanses of a sinkhole plain in the eastern portion of Warren County that extends into Barren County. Warren County ranks among the top 10 in the state for a variety of agricultural activities. Forestland is mainly restricted to northwestern Warren County and southern Edmonson County in the areas outside of the sinkhole plain. The Study Area is in the western mesophytic forest region, which is comprised of an Oak-Hickory forest along the Dripping Springs Escarpment. The majority of development of the city of Bowling Green is located between the William H. Natcher Parkway and I-65, south of the Barren River. Some primarily industrial development extends north of the Barren River and south of the William H. Natcher Parkway along US 31W. The largest concentration of commercial development exists along US 231 (Scottsville Road) from the center of Bowling Green southeast to I-65. Additional scattered residential development outside of Bowling Green also occurs extending from US 231 (Scottsville Road), KY 234 (Cemetery Road), and KY 1402 (Porter Pike), as well as north of Bowling Green along KY 185. The towns of Oakland and Smiths Grove are also located in close proximity to the northeast along I-65.

2. Historic

Early settlement in the area consisted of hunters and trappers. After the initial settlement of the area, farmers began to immigrate to this region for the vast fertile sinkhole plain. As the population grew, the village of Bowling Green became the center of culture and trade in the area. Most of the historical structures within the Study Area can be found on the major historical roadways surrounding the city of Bowling Green and the communities of Oakland and Smiths Grove. A full report on historical resources is located in Appendix C.

3. Archaeology

The majority of the Study Area has high potential impacts for archaeological resources. The major areas of these high potential impacts include dissected and undissected regions associated with ridge tops and karst features. Past archaeological studies have found a total of 233 known recorded sites within the Study Area. Of the sites found, 217 sites are prehistoric, eight (8) are historic, and eight (8) are a mix of the two. A complete report on archaeological resources can be found in Appendix C.

4. Hazardous Wastes and Underground Storage Tanks

Information regarding Comprehensive Environmental, Response, Compensation, and Liability Information System (CERCLIS) and the Resource Conservation and Recovery Information System (RCRIS) was used to identify any hazardous waste sites within the Study Area. Information from the Kentucky Department of Natural Resources Underground Storage Tank Division was used to identify UST sites within the Study Area as well. There was only one Resource Conservation and Recovery Act (RCRA) site identified within the final corridors; this site was Renfro's Grocery in Gott. Additional sites may be uncovered in future studies when more detailed information on right-of-way is available. This would be the case especially where existing right-of-way is utilized.

C. Specific Natural Environmental Considerations

1. Threatened and Endangered Species

A total of 13 federally listed "endangered" and "threatened" species were identified within the study area and vicinity. These species included: catspaw, clubshell, fanshell, gray bat, Indiana bat, Mammoth Cave shrimp, northern riffleshell, orangefoot pimpleback, pink mucket, red-cockaded woodpecker, ring pink, rough pigtoe and Eggert's sunflower. Many of these species are mussels, which are located in mussel beds in the Barren River and Drakes Creek in the western portion of the Study Area. Two species are bats, which are found in caves associated with the karst topography as well as in forested areas throughout the Study Area. The Mammoth Cave shrimp, or Kentucky Cave shrimp is limited to the Turnhole Spring Groundwater Basin in the northeastern portion of the Study Area. In addition, many state listed "endangered" and "threatened" species were identified within the project area.

2. Wetlands and Water Quality

Wetland impacts within the Study Area are anticipated to be minimal. Due to the karst topography, wetlands and surface water, for that matter, are infrequent occurrences. All of the larger wetlands within the Study Area are along the

Barren River and its larger tributaries. Numerous smaller isolated wetlands are scattered throughout the Study Area, the majority of these are anticipated to be sinkhole ponds.

Water quality issues for the Study Area are closely associated with the karst topography. There are three major underground drainage basins in the Study Area. These basins are Turnhole Spring, Lost River, and Graham Springs. The Turnhole Spring basin drains through Mammoth Cave National Park into the Green River, while the Lost River and the Graham Springs basins drain into the Barren River. Due to the susceptibility to runoff pollution, groundwater quality in karst areas is of greater concern than in non-karst areas because of the speed with which runoff reaches the groundwater in karst areas. Karst drainage concerns will be an issue with all potential corridors.

3. Geology and Soils

The Study Area resides upon four (4) geologic regions. These regions include the Caseyville Hills, Mammoth Cave Plateau, Western Pennyroyal, and Central Pennyroyal. Most of the Study Area sits on top of highly soluble limestone of the Mississippian Age, which is the reason for the vast expanses of sinkhole plains located in the region. A full report on geologic issues is located in Appendix D. A review of the Soil Survey for Warren County, Kentucky showed that main soil complexes within the project area are the Fredonia-Caneyville, Pembroke-Crider, Baxter-Nicholson, and Lawrence-Nicholson. Primary mineral resources in the Study Area are oil and gas as well as limestone. The largest concentration of oil and gas wells occurs in the area north of Bowling Green.

4. Air Quality

Warren and Barren Counties are currently listed as Attainment status for the National Ambient Air Quality Standards (NAAQS), while Edmonson County has been listed as Maintenance since January 3, 1995 for the 8-hour ozone standard. The Maintenance status for Edmonson County indicates that pollutant levels are approaching NAAQS limits. Both I-66 and the Bowling Green Outer Beltline are listed in the Kentucky Transportation Cabinet 2000 Six Year Highway Plan on page 272 and 273 respectively.

IV. INITIAL PUBLIC AND AGENCY PARTICIPATION

A. Early Coordination Meetings

The initial coordination meetings in the development of this Planning Study included meetings of the project team, state and local public officials and a Citizens Advisory Group (CAG) that was developed for the project. A project timeline showing major meetings with these groups is shown on Figure 7.

1. Project Team Meetings

Several project team meetings were held in the initial stages of project planning. The project team included KYTC District 3, KYTC Central Office Planning, Barren River Area Development District (BRADD), Federal Highway Administration (FHWA), Bernardin-Lochmueller & Associates (BLA), H.C. Nutting Company, and the Kentucky Geological Survey. These early meetings were held to develop the study approach and public involvement process, define the Study Area, begin development of project goals, and review related project studies. Minutes from these meetings are included in Appendix E.

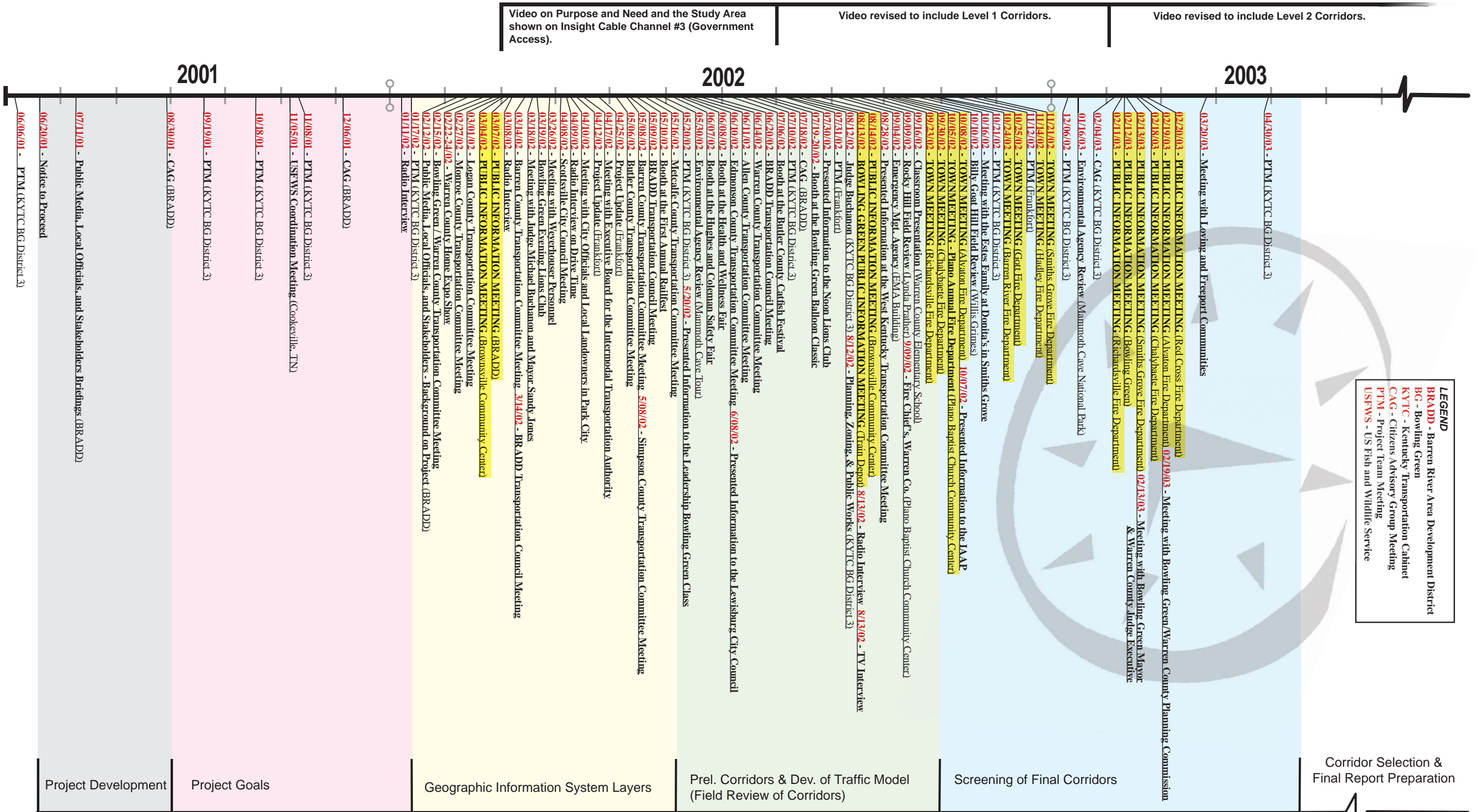
A project area was established in conjunction with the I-66 Corridor Study that would allow corridor options to coincide with the I-66 corridors around Bowling Green where possible. Meetings with local officials and the Citizens Advisory Group (CAG) initiated the public involvement process. Additional public involvement activities included local media press releases, resource agency coordination meetings and public information meetings.

2. Meetings with State and Local Officials

The initial stakeholders and local officials meetings were held on July 11, 2001 and February 12, 2002. These meetings were held to inform the attendees about the status of the project, obtain background information on the project, and gain input on goals to be established for the project. Several issues were raised at these meetings including: the potential to utilize the Bowling Green Outer Beltline for I-66; environmental concerns relative to the karst landscape and water quality; the ability to accommodate existing land use plans and minimize sprawl; the relationship of the Bowling Green Outer Beltline to the Kentucky Tri-modal Transpark development; and the feasibility of the Bowling Green Outer Beltline. Minutes from these meetings are included in Appendix E.

I-66 and Bowling Green Outer Beltline Timeline

Figure 7



3. Citizens Advisory Group

The Citizens Advisory Group (CAG) consisted of interested parties representing various communities and populations from the Study Area including towns, businesses, industry and interest groups. The group was created as a representative group that could provide input from their constituencies as well as inform their constituencies about progress on the project and issues being addressed. Early Citizens Advisory Group meetings were held on August 30, 2001 and December 6, 2001. These meetings were held to obtain background information on the project, inform the group about the current status of the project, and receive comments on project goals. In addition, draft materials for the public information meetings were presented for feedback from the group. Issues raised by the CAG included: environmental concerns (karst impacts, cultural resource impacts and pollution in general); access improvement as a result of the Bowling Green Outer Beltline; potential upgrades to existing facilities; traffic impacts on the Bowling Green Outer Beltline and I-65 including truck traffic; and the potential diversion of traffic from I-65. Minutes from the Citizens Advisory Group meetings are included in Appendix E.

B. Initial Public Information Meetings

An initial set of public information meetings were held on Monday, March 4, 2002 at the Brownsville Community Center in Brownsville in Edmonson County and on Thursday, March 7, 2002 at the Barren River Area Development District Regional Conference Center in Bowling Green in Warren County. A total of 109 citizens attended the March 4th meeting and a total of 120 citizens attended the March 7th meeting. The primary focus of the meetings was to introduce the public to the Bowling Green Outer Beltline and I-66 Corridor Planning Studies. The purpose of the Planning Studies was to identify and evaluate freeway corridor routes, including the “no build” option, for both I-66 and the Bowling Green Outer Beltline. The study would determine one or more corridors to be further examined in preliminary engineering and environmental studies. The meeting outlined the project overview, which explained the purpose, issues, schedule and project goals for the Planning Study.

The public was also presented with an environmental footprint map of the Study Area. Attendees learned about typical issues addressed during roadway planning, design and construction. These issues include environmental, economic and engineering considerations, along with road building steps and timeliness. The meeting focused on the importance of gaining public interest and involvement in development of the proposed corridors. A public comment survey was disseminated to the attendees so that the public could submit written ideas, opinions, and comments for consideration during the development of potential project corridors and for the identification of impacts for the proposed new freeway.

A total of 22 comment sheets were returned to the KYTC from both public information meetings. The following represents a general summary of citizen responses:

Bowling Green Eastern Outer Beltline Planning Study

1. Do you feel that a new road between Scottsville Road and I-65 on the east side of Bowling Green would provide benefits to the area?

Seventy-three percent (73%) of the respondents indicated an Outer Beltline would provide positive benefits by relieving traffic from I-65 and reducing traffic in Bowling Green and surrounding areas, thus resulting in fewer crashes. They also viewed new locations for businesses and development opportunities as good for the area. Twenty seven percent (27%) indicated that they see no benefits from promoting urban sprawl and increased traffic in predominantly low-density areas such as Scottsville Road.

2. Do you feel like this project would result in any problems for the area?

Forty percent (40%) of the respondents perceived problems including increased commercial development, urban sprawl, environmental encroachments, increased traffic and displacement issues. Sixty percent (60%) perceived no significant environmental, engineering or cultural problems. Respondents indicated economic development would be good for Bowling Green and surrounding counties.

3. If a new roadway is built, where should it be located?

Six (6) respondents submitted diagrams of various proposed routes. One (1) respondent felt the decision should be left to the KYTC with input from the people in the area.

4. What are the potential impacts of the project, both positive and negative? Are there problems, sensitive areas, special needs or other factors that should be considered in locating or designing the road?

Negative comments expressed by respondents included: the project is not needed, it is too costly, and there would be an increase in urban sprawl. There were also environmental concerns involving green space and sinkholes. Positive comments about the project included: relief from traffic congestion, increased access to public facilities, and better connections to existing roadways.

Copies of the March 2002 Public Meetings Summary, public comment surveys, summaries of citizen response sheets and additional Bowling Green Outer Beltline Planning Study information are contained within the official meeting documentation entitled "Public Information Meeting, I-66/Bowling Green Eastern

Outer Beltline, Warren/Edmonson Counties, Item Number 3-66, March 4 & 7, 2002.” A summary of these meetings is included in Appendix E.

C. Initial Resource Agency Coordination

The first Resource Agency Coordination meeting was held at the Mammoth Cave National Park “Rotunda” Conference Room on May 30, 2002. In addition to the meeting, a coordination mailing soliciting comments regarding the project was sent to allow an opportunity for comments to be provided by agencies and stakeholders. The purpose of this meeting as well as the mailing was to brief the agencies about the initiation of the I-66 Corridor and Bowling Green Outer Beltline Studies, including early public involvement and data gathering, and to receive input on project issues, needs and concerns to provide guidance for the study team in the development of corridors relative to major issues of concern.

The major issues identified by various agencies in regard to the development of the project included: karst geology (caves, sinkholes, underground drainage, etc.); water quality; threatened and endangered species; and future development and traffic demand. The minutes of the meeting and comments received are included in Appendix F.

D. Project Goals

The project goals were developed through coordination with local officials, review agencies and the public, taking into account the planning documents that originally identified the Bowling Green Outer Beltline. The goals are also directed toward addressing the transportation needs of the Bowling Green Region as currently evaluated.

Based on the input received, these goals are to:

- **Commitment:** Accommodate the transportation needs of the Bowling Green urban area by completing an Outer Beltline, an access controlled freeway with interchanges that is consistent with the *2000 Bowling Green Transportation Plan*.
- **Congestion:** Reduce current and future traffic congestion on the highways and streets in Warren County by diverting traffic to a new freeway facility.
- **Connectivity:** Strengthen the regional highway system by improving the connections between major highways and streets in the region.
- **Access:** Provide better access to major employment centers, regional commercial centers, major education and health facilities, and regional recreation facilities in Warren County.

V. DEVELOPMENT OF CORRIDORS

A. Corridor Development

The evaluation of corridors for the Bowling Green Outer Beltline corridors utilized a three-step process, including data collection and Geographic Information System (GIS) development, which was followed by a Level 1 Screening of preliminary corridors and concluded with a more detailed Level 2 Screening of final corridors.

The evaluation process was initiated at the onset of the Planning Study with the establishment of the project Study Area. This Study Area encompassed the geographic area to be investigated for the location of corridor routes and, in this case, consists of a generally trapezoidal shape stretching from the William H. Natcher Parkway, northwest of Bowling Green, to the Louie B. Nunn (Cumberland) Parkway, near Glasgow (see Figure 1). Once the Study Area was established, known and published data were gathered relating to the physical characteristics of the area, and the natural and man-made environments in and around the area. This information was then assimilated into a GIS that was used to establish the location of the 2,000-foot wide corridors.

Level 1 Screening involved a qualitative analysis focused on the achievement of project goals. It identified the preliminary corridors that merited further consideration in a more detailed evaluation in a Level 2 Screening. The Level 1 Screening criteria consisted of a hierarchy of considerations starting with the fatal flaws that have the potential to result in a non-permittable action; projects goals which were established at the onset of the study; major environmental issues which include most of the key natural and man-made resources; engineering and traffic issues such as length, constructability and connectivity; and public and review agency input. Each of the preliminary corridors was reviewed under each of the criteria and given a yes/no answer or a high/medium/low rating. The advantages and disadvantages of each corridor were identified and any corridor not satisfying each of the project goals was eliminated from further consideration.

Following the Level 1 Screening, the corridors that merited further consideration were reviewed, and refinements were made to improve their performance and to avoid or reduce adverse impacts on certain natural and man-made resources. Each corridor's characteristics and their corresponding impacts were determined and quantified. The Level 2 Screening of the final corridors consisted of a detailed quantitative evaluation based on their engineering characteristics and their relative impacts on traffic and mobility, natural and man-made environmental impacts, and public and agency input.

B. Definition of the Study Area

1. Establishment of the Study Area

The *2000 Bowling Green Transportation Plan* defined the termini for the Bowling Green Outer Beltline to begin at the William H. Natcher Parkway extension/US 231 (Scottsville Road) intersection south of Bowling Green, continue along the east side of the urban area to I-65 northeast of the city, skirt the north side of the urban area, and end at the William H. Natcher Parkway north of the city. Since the Bowling Green Outer Beltline project is being studied simultaneously with the I-66 project and because they have the potential to overlap or connect, the two projects share the same Study Area. The Study Area, as developed for I-66, encompasses approximately 462 square miles in a nearly trapezoidal shape as shown in Figure 1 and provides for a full range of potential alternate corridors around Bowling Green.

2. Future Conditions of the Study Area

The past growth trends within the project area have been and still are centered around the City of Bowling Green, with lesser amounts in Smiths Grove and Oakland. Residential development has been continuing to increase along the outer fringes of Bowling Green. Residential growth in Bowling Green has been predominantly in a southerly direction. Several subdivisions have been built in the areas along both sides of US 231 and east toward I-65. Business areas have developed in the vicinity of these homes to accommodate residents of these areas. Industrial developments have been expanding to the south along US 31W and to a greater extent, to the northeast of the US 31W corridor east of the Barren River.

Two scenarios were used to predict future population and employment growth in the Study Area for the year 2030. These data sources came from the Kentucky Statewide Traffic Model (KySTM) and the Kentucky State Data Center (SDC). The data from these two scenarios were derived from information acquired in the 2000 Census. The SDC year 2030 population forecast reflects the results of the 2000 Census, and is about 10% higher than the KySTM forecast. The SDC population forecast for Warren County is 142,200 with an increase of 49,700 from the 2000 Census. The KySTM population forecast for Warren County is 125,300 for the year 2030, an increase of 32,700 from the 2000 census count. With a predicted growth in population and workers come more housing developments, businesses, and industry. Future growth was allocated on the basis of adopted comprehensive plans, recent development activity, and the industrial commercial parks directory by local city and county planning officials. In the future, residential growth is expected to continue on the southeast side of Bowling Green.

A map illustrating population change for the SDC growth scenario (Figure 8) shows that growth trends will continue along the southern edge of Bowling Green with moderate growth occurring in the northeast along US 31W. This map also shows that the northwestern portion of Warren County and Bowling Green will have a population decrease. The characteristics of employment (Figure 9) change follow the same pattern. The majority of the growth will once again be centered around Bowling Green with the greatest amount of growth occurring to the south and northeast of the city, generally along the US 31W Corridor. The KySTM growth scenario shows similar population and employment changes (refer to Appendix B).

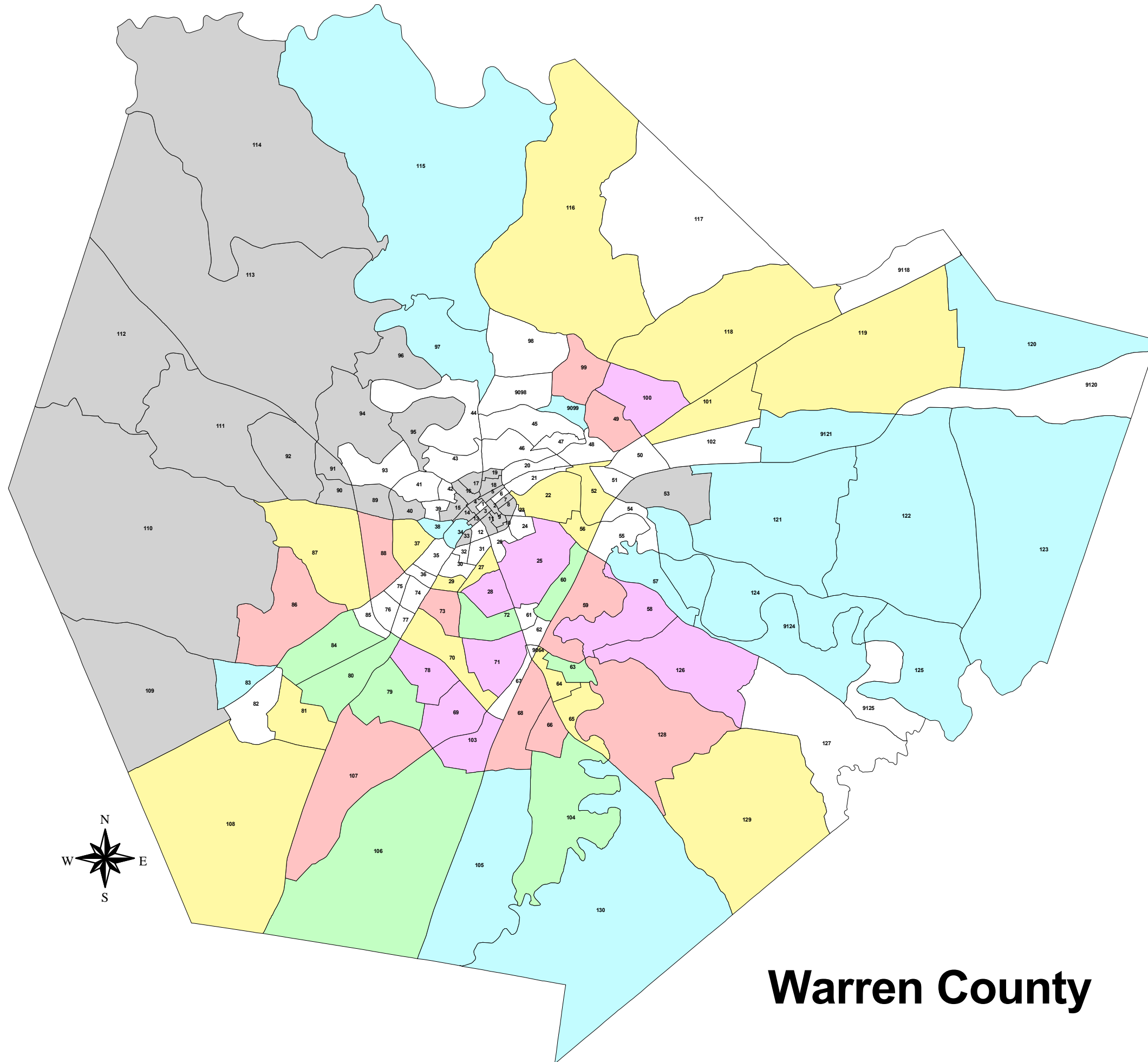
The main reasons for these growth patterns are associated with terrain. The rough terrain in northwest Warren County is a hindrance to construction (including roads, sanitary sewers and waterlines). At the same time, the areas in the south and northeast are within the sinkhole plain, an area that is relatively flat. This area is more appealing to development because it is along traditional highway and rail routes and because public utilities are easier to extend. The northeastern region of Bowling Green also has high potential for development because of the proposed Kentucky Tri-modal Transpark project. If this project is realized, there may be a new airport and many more opportunities for industrial and commercial growth within this area.

C. Development of Initial Corridors

The preliminary corridors were developed based on several factors. Input received from agency coordination and the public was taken into account and several corridors were developed with a concerted effort to avoid identified environmental concerns. Eight (8) preliminary corridors were developed which covered the entire Study Area. These corridors are described below and shown in Figure 10.

Figure 8

2000-2030 Population Change by TAZ SDC Growth Scenario



Map Legend
High Population Forecast
2000-2030 Population Change by TAZ

G	-49 to -1
F	0 to 100
E	101 to 200
D	201 to 400
C	401 to 800
B	801 to 1600
A	Greater than 1600

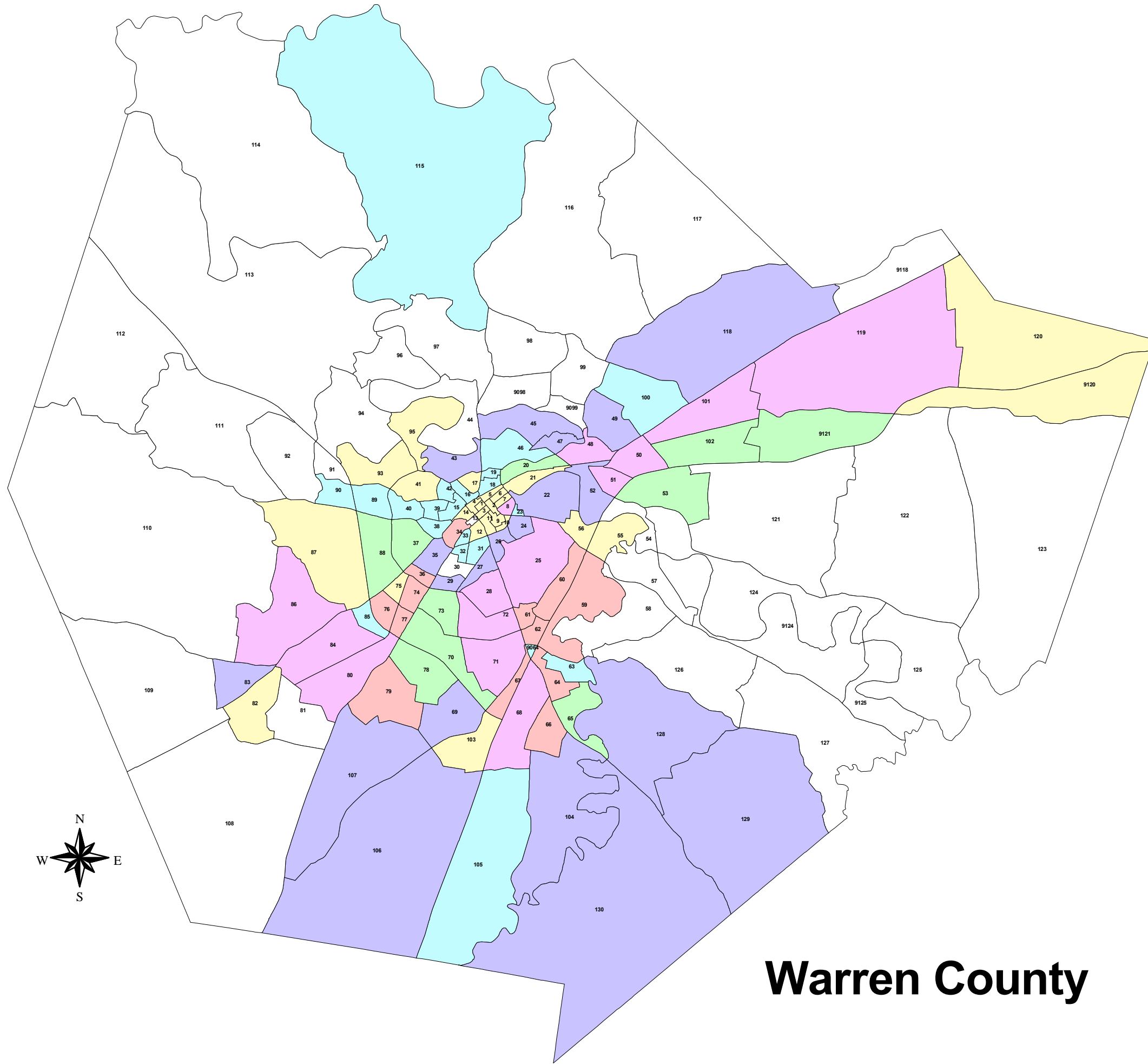
0 2 4 6 Miles

Warren County



Figure 9

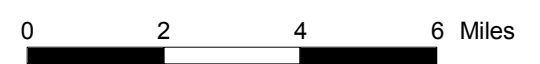
**2000-2030 Employment Change by TAZ
SDC Growth Scenario**



Map Legend

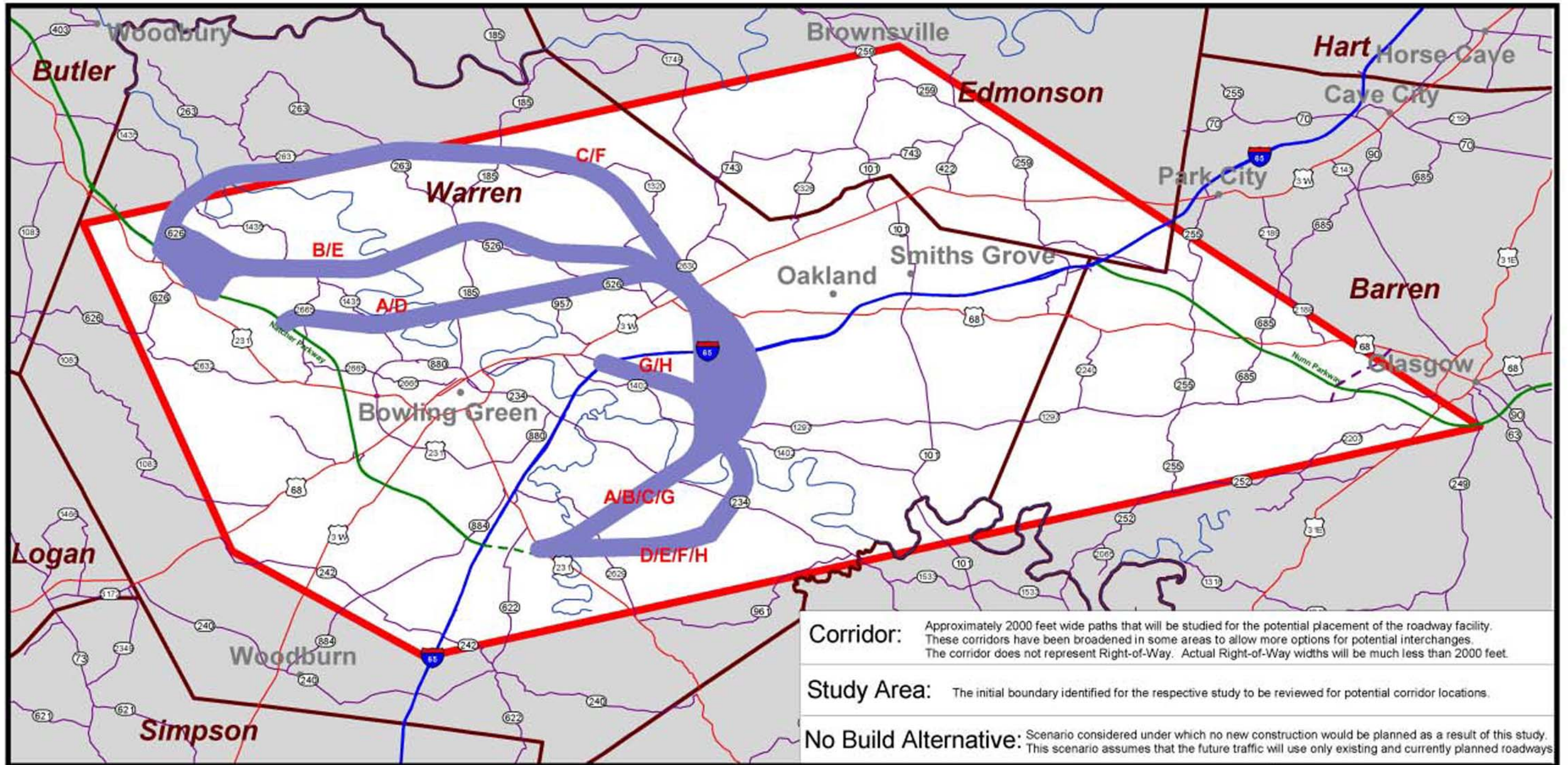
High Employment Forecast
2000-2030 Employment Change by TAZ

G	0 to 10
F	11 to 50
E	51 to 100
D	101 to 200
C	201 to 400
B	401 to 800
A	Greater than 800



Warren County





Corridor: Approximately 2000 feet wide paths that will be studied for the potential placement of the roadway facility. These corridors have been broadened in some areas to allow more options for potential interchanges. The corridor does not represent Right-of-Way. Actual Right-of-Way widths will be much less than 2000 feet.

Study Area: The initial boundary identified for the respective study to be reviewed for potential corridor locations.

No Build Alternative: Scenario considered under which no new construction would be planned as a result of this study. This scenario assumes that the future traffic will use only existing and currently planned roadways.

- Interstate Highway
- Parkway
- US Highway
- State Highway
- County Boundary
- Study Area
- A Corridor Letter
- Bowling Green Outer Beltline Corridors
- Natcher Parkway Extension
- Glasgow Outer Loop
- River



Figure 10
PRELIMINARY
BOWLING GREEN
OUTER BELTLINE
CORRIDORS

1. Description of Initial Corridors

- Corridor A - This corridor begins at the William H. Natcher Parkway Extension south of Bowling Green along US 231 and proceeds to the northeast on a new location, crossing Drake's Creek. It continues in a northeasterly direction to a crossing of the Barren River at mile marker 48. At this point, the corridor curves to the north near its intersection with KY 1297 in the vicinity of Gott and continues north toward the vicinity of Sunnyside-Gott Road bridge over I-65. This corridor would likely utilize the same interchange as a planned roadway to be constructed to connect I-65 with US 31W in the general vicinity of the Kentucky Tri-modal Transpark development. Continuing north, the corridor crosses US 68/KY 80 near Sunnyside and US 31W near Warren East High School, before curving southwest to intersect KY 526, near its intersection with KY 957. It then proceeds west southwesterly to cross KY 185 near its crossing of the Barren River and continues to its own crossing of the Barren River at mile marker 26. The corridor continues to the west to connect with the William H. Natcher Parkway south of Hadley near the KY 2665 bridge over the William H. Natcher Parkway. The total length of this corridor is 23.9 miles.
- Corridor B - This corridor begins at the William H. Natcher Parkway Extension south of Bowling Green along US 231 and proceeds to the northeast on a new location, crossing Drake's Creek. It continues in a northeasterly direction to a crossing of the Barren River at mile marker 48. At this point, the corridor curves to the north near its intersection with KY 1297 in the vicinity of Gott and continues north toward the vicinity of the Sunnyside-Gott Road bridge over I-65. This corridor would likely utilize the same interchange as a planned roadway to be constructed to connect I-65 with US 31W in the general vicinity of the Kentucky Tri-modal Transpark development. Continuing north, the corridor crosses US 68/KY 80 near Sunnyside and US 31W near Warren East High School, before curving in a westerly direction to parallel KY 526. It crosses KY 185 near its intersection with KY 526 and then proceeds west southwest to cross the Barren River at mile marker 19 and KY 1435 near the Barren River Fire Station #2, before connecting with the William H. Natcher Parkway near Hadley. The total length of this corridor is 28.3 miles.
- Corridor C - This corridor begins at the William H. Natcher Parkway Extension south of Bowling Green along US 231 and proceeds to the northeast on a new location, crossing Drake's Creek. It continues in a northeasterly direction to a crossing of the Barren River at mile marker 48. At this point, the corridor curves to the north near its intersection with KY 1297 in the vicinity of Gott and continues north toward the vicinity of the Sunnyside-Gott Road bridge over I-65. This corridor would likely utilize the same interchange as a planned roadway to be constructed to connect I-65 with US 31W in the general vicinity of the Kentucky Tri-modal Transpark development. Continuing north, the corridor crosses US 68/KY 80 near Sunnyside and US 31W near Warren East High School. The corridor then

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traverses in a northwesterly direction to parallel KY 1320, crossing KY 185 near Anna, and proceeding just north of Richardsville. It then generally parallels KY 2631 west of Richardsville, crossing the Barren River at mile marker 7, and connecting with the William H. Natcher Parkway near Hadley. The total length of this corridor is 31.1 miles.

- Corridor D - This corridor begins at the William H. Natcher Parkway Extension south of Bowling Green along US 231 and proceeds to the east on a new location, crossing Drake's Creek. Just before crossing KY 234 or Cemetery Road, it curves to the north and crosses the Barren River at mile marker 51. At this point, the corridor continues to the north intersecting with KY 1297 in the vicinity of Gott and proceeding toward the vicinity of Sunnyside-Gott Road bridge over I-65. This corridor would likely utilize the same interchange as a planned roadway to be constructed to connect I-65 with US 31W in the general vicinity of the Kentucky Tri-modal Transpark development. Continuing north, the corridor crosses US 68/KY 80 near Sunnyside and US 31W near Warren East High School, before curving southwest to intersect KY 526, near its intersection with KY 957. It then proceeds west southwesterly to cross KY 185 near its crossing of the Barren River and continues to its own crossing of the Barren River at mile marker 26. The corridor continues to the west to connect with the William H. Natcher Parkway south of Hadley near the KY 2665 bridge over the William H. Natcher Parkway. The total length of this corridor is 26.5 miles.
- Corridor E - This corridor begins at the William H. Natcher Parkway Extension south of Bowling Green along US 231 and proceeds to the east on a new location, crossing Drake's Creek. Just before crossing KY 234 or Cemetery Road, it curves to the north and crosses the Barren River at mile marker 56. At this point, the corridor continues to the north intersecting with KY 1297 in the vicinity of Gott and proceeding toward the vicinity of Sunnyside-Gott Road bridge over I-65. This corridor would likely utilize the same interchange as a planned roadway to be constructed to connect I-65 with US 31W in the general vicinity of the Kentucky Tri-modal Transpark development. Continuing north, the corridor crosses US 68/KY 80 near Sunnyside and US 31W near Warren East High School, before curving in a westerly direction to parallel KY 526. It crosses KY 185 near its intersection with KY 526 and then proceeds west southwest to cross the Barren River at mile marker 19 and KY 1435 near the Barren River Fire Station #2, before connecting with the William H. Natcher Parkway near Hadley. The total length of this corridor is 31.0 miles.
- Corridor F - This corridor begins at the William H. Natcher Parkway Extension south of Bowling Green along US 231 and proceeds to the east on a new location, crossing Drake's Creek. Just before crossing KY 234 or Cemetery Road, it curves to the north and crosses the Barren River at mile marker 51. At this point, the corridor continues to the north intersecting with KY 1297 in the vicinity of Gott and proceeding toward the vicinity of Sunnyside-Gott Road bridge over I-65. This

BOWLING GREEN OUTER BELTLINE CORRIDOR PLANNING STUDY
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corridor would likely utilize the same interchange as a planned roadway to be constructed to connect I-65 with US 31W in the general vicinity of the Kentucky Tri-modal Transpark development. Continuing north, the corridor crosses US 68/KY 80 near Sunnyside and US 31W near Warren East High School. The corridor then traverses in a northwesterly direction to parallel KY 1320, crossing KY 185 near Anna, and proceeding just north of Richardsville. It then generally parallels KY 2631 west of Richardsville, crossing the Barren River at mile marker 7, and connecting with the William H. Natcher Parkway near Hadley. The total length of this corridor is 33.7 miles.

- Corridor G - This corridor begins at the William H. Natcher Parkway Extension south of Bowling Green along US 231 and proceeds to the northeast on a new location, crossing Drake's Creek. It continues in a northeasterly direction to a crossing of the Barren River at mile marker 48. At this point, the corridor curves to the north near its intersection with KY 1297 in the vicinity of Gott and then curves again toward the northwest to connect with I-65 at the I-65/KY 446 Interchange (the "Corvette Interchange"). This corridor would then connect with the William H. Natcher Parkway through the use of existing city streets and state highways in Bowling Green. The total length of this corridor is 11.0 miles.
- Corridor H - This corridor begins at the William H. Natcher Parkway Extension south of Bowling Green along US 231 and proceeds to the east on a new location, crossing Drake's Creek. Just before crossing KY 234 or Cemetery Road, it curves to the north and crosses the Barren River at mile marker 51. At this point, the corridor continues to the north intersecting with KY 1297 in the vicinity of Gott and then curves again toward the northwest to connect with I-65 at the I-65/KY 446 Interchange (the "Corvette Interchange"). This corridor would then connect with the William H. Natcher Parkway through the use of existing city streets and state highways in Bowling Green. The total length of this corridor is 13.6 miles.
- No Build - In addition to the 8 "build" corridor options, the "no build" option was also considered. The "no build" would consist of no new construction and would rely on the existing transportation network to meet the future demands.

2. Meetings with State and Local Officials

Between the public information meetings in March of 2002 and August of 2002, meetings were held with stakeholders and local officials to discuss the initial corridors (see Figure 7). These meetings are documented in Appendices E and F.

3. Citizens Advisory Group

A third Citizens Advisory Group (CAG) meeting was held on July 18, 2002, to review the initial corridors. This meeting is documented in Appendix E.

4. Second Set of Public Information Meetings

A second round of public information meetings was held on Wednesday, August 14, 2002 at the Bowling Green Public Library-Depot Branch in Warren County and on Thursday, August 15, 2002 at the Brownsville Community Center in Edmonson County. A total of 195 citizens attended the August 14th meeting and a total of 128 citizens attended the August 15th meeting. The second round of meetings were designed to present the Bowling Green Outer Beltline preliminary corridor concepts and to illicit further comments from the public regarding environmental concerns. The information at the meeting consisted of the project overview (which outlined the purpose of the I-66/Bowling Green Outer Beltline Planning Study, issues, and project goals) and the preliminary I-66/Bowling Green Outer Beltline corridors that were identified on the basis of public and agency input and information gathered to date.

At the meetings, exhibits were also provided displaying environmental footprint maps of the Study Area (including eight preliminary corridor concepts for the Bowling Green Outer Beltline), aerial photograph maps of the Study Area including preliminary corridors for the Outer Beltline, and geological maps and diagrams explaining the karst geology in the Study Area. The handout packet included a survey form, and citizens were encouraged to complete the form and return it at the meeting or via a prepaid, preaddressed envelope included in the packet. In addition to the August 14th and 15th open format meetings, eight (8) “town hall” style meetings were held throughout the Study Area as an outreach effort to inform citizens of the corridor projects in outlying areas of the region. The town hall style meetings were held primarily in the unincorporated portions of the Study Area at local fire departments. The same information was provided as was provided at the large open format meetings including a short presentation about the projects. These meetings were targeted at the more rural portions of the Study Area to get feedback from a more diverse cross section of the potentially affected population.

A total of 36 citizen comment survey forms were received for the Bowling Green Outer Beltline project. The following represents a general summary of the responses received:

1. Are the goals for the Bowling Green Outer Beltline Planning Study clear and understandable? Please discuss any comments or concerns about the goals that you might have.

Seventy eight percent (78%) of the respondents answered yes to this question, eleven percent (11%) answered no, and eleven percent (11%) had no comment. Comments expressed ranged from supporting the “no build” option to high excitement for a “build” corridor. Concerns included the proposed direction of the Beltline and sensitivity to homes and neighborhoods.

2. **With the goals of the project in mind, what are the potential impacts of the proposed locations for the Bowling Green Outer Beltline, both positive and negative? Are there problems, sensitive areas, special needs or other factors that should be considered in locating the Bowling Green Outer Beltline?**

Respondents viewed the relief from congestion on I-65 and Scottsville Road and economic benefits as positive impacts. Proponents overwhelmingly favored a northern bypass. Opponents perceived environmental concerns, increased urban sprawl, false hope of economic returns, and encroachments to homes and businesses in smaller communities as negative impacts associated with the project.

3. **Besides the locations shown on the map, are there any other locations that should be considered for the Bowling Green Outer Beltline? Please let us know why you feel these locations should be considered. Please draw your locations on the map on the back of the survey.**

Twenty percent (20%) of the respondents submitted proposed corridors for the Beltline. Some respondents favored a northern Beltline, while others preferred a westward Beltline. Various concerns focused on the proposed Beltline being either too close or too far from Bowling Green.

4. **Please provide us with any other concerns, comments or issues that you think we should consider for the Bowling Green Outer Beltline.** Comments ranged from support of the “no build” option to swift completion of the William H. Natcher extension. Respondents also commented on project appearance, improved traffic flow, and a need for another bridge across the Barren River.

Copies of the August 2002 Public Meetings Summary, public comment surveys, summaries of citizen response sheets and additional Bowling Green Outer Beltline Planning Study information are contained within the official meeting documentation entitled “Public Information Meeting, I-66/Bowling Green Eastern Outer Beltline, Warren/Edmonson Counties, Item Number 3-66, August 14 & 15, 2002.” A summary of these meetings is included in Appendix E.

5. Refinement of Corridors

The corridors were refined based on public and agency input and additional information that was gathered. Based on the comments received, no major shifts were required. The refinements were primarily small shifts in short segments of the corridors to avoid cemeteries, developments and other potential issues as they were identified throughout the evaluation process.

VI. SCREENING OF CORRIDORS

A. Level 1 Screening of Corridors

The Level 1 Screening of preliminary corridors included a qualitative based evaluation of engineering, traffic and environmental considerations, taking into account public and agency input received from early coordination and public information meetings. The evaluations concentrated on consideration for “fatal flaws” that could result in a non-permittable action and performance relative to the project goals. The forms utilized for the Level 1 Screening of the preliminary Bowling Green Outer Beltline corridors are included in Appendix G.

1. Engineering Considerations

Engineering considerations evaluated for the Level 1 Screening included major factors that would affect the cost of the project. These factors included: total length of the corridor; bridge crossing locations; number of intersecting routes and constructability. The constructability rating accounted for the difficulty of the terrain crossed as well as maintenance of existing traffic concerns.

2. Traffic Considerations

Traffic considerations for the Level 1 Screening were based on the project goals. Potential performance of the corridors relative to the project goals was evaluated based on the total length of the corridors, improved connectivity added by the corridor and the proximity to major traffic generators. The total length of the corridors between designated termini was evaluated for potential travel time savings over the existing routes. The connectivity of the corridors and their proximity to major traffic generators were evaluated to determine relative efficiency with which the corridors would transport people and goods, reduce user costs, divert local traffic and improve access.

3. Environmental Considerations

Environmental considerations evaluated for the Level 1 Screening included major issues that could lead to significant concerns over potential impacts, including substantial mitigation requirements. In addition, avoidance and minimization potential in future development of the project were considered. The criteria included, among others, Section 4(f) resources, Section 106 considerations, waters of the U.S. (including wetlands), federally listed species, relocations, community impacts, karst features, and the potential to affect water quality. Potential impacts for all criteria were ranked as high, medium or low. Based on the rankings, an overall environmental impacts consideration was developed for each corridor.

4. Public and Agency Input

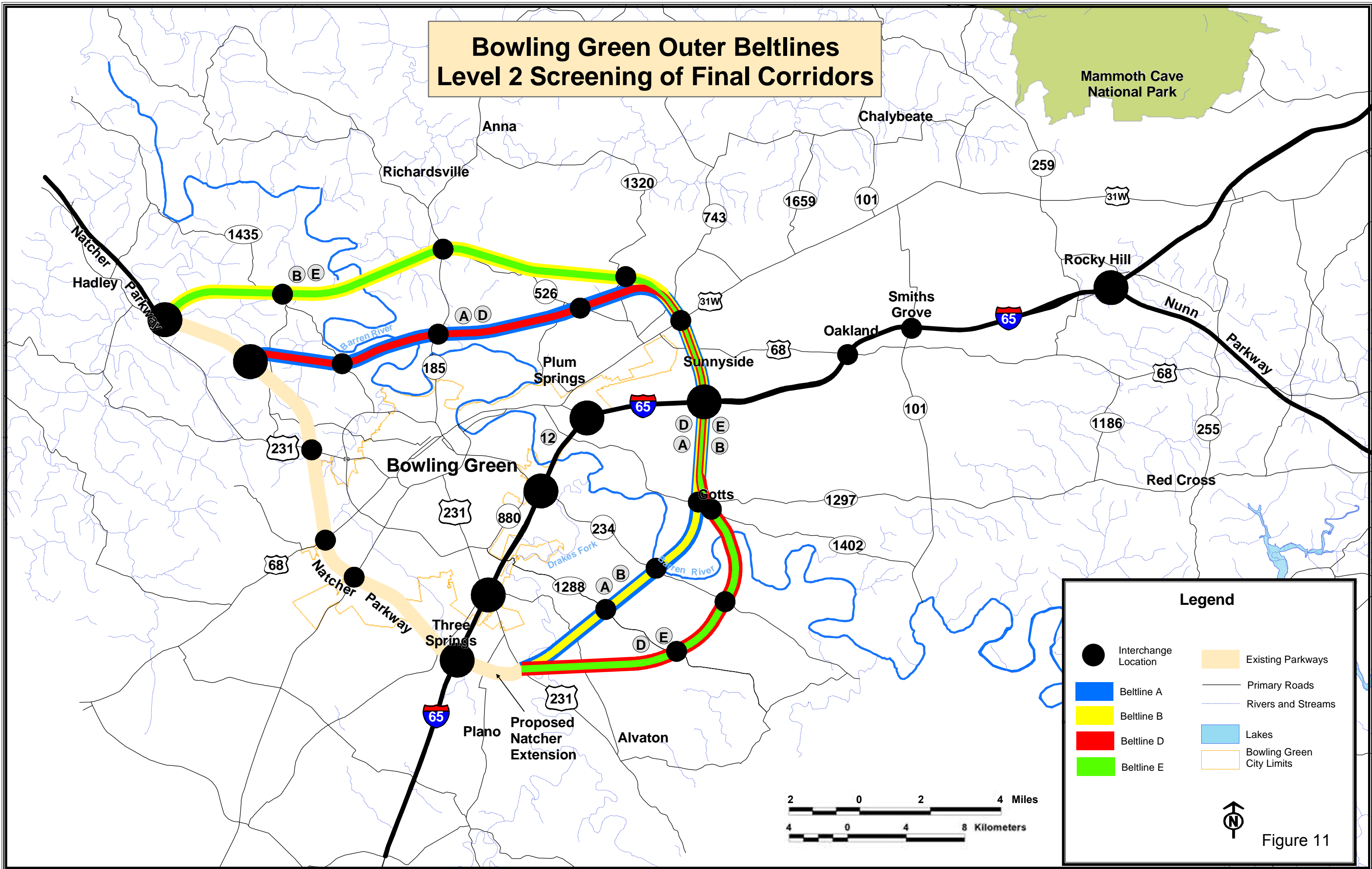
The public and agency input used for the Level 1 Screening was derived from the second round of public information meetings which presented the preliminary corridors for comment, and the first agency coordination meeting which presented route concepts and requested agency input on regulatory issues in the Study Area. In addition, various meetings with local officials were conducted to determine the level of support for the various corridors. The comments received from all activities were evaluated to determine if particular corridors had substantial support or opposition. Documentation of public/local officials meetings and agency meetings are included in Appendices E and F, respectively.

5. Corridors Not Carried Forward

The Level 1 Screening criteria consist of a hierarchy of considerations starting with “fatal flaws” that have the potential to result in a non-permittable action; projects goals which were established at the onset of the study; major environmental issues which include most of the key natural and man-made resources; major engineering and traffic issues which include length, constructibility, and connectivity; and public and review agency input. Each of the criteria was given a yes/no answer or a high/medium/low rating. Any corridor not satisfying each of the project goals was not carried forward for further consideration. Of the eight (8) original corridors, only four (4) met the desired criteria to be promoted for further evaluation. Corridors A, B, D, and E, as well as the “no build” option, were retained for further study. These corridors are shown in Figure 11.

Corridors C, F, G, and H were discarded because of their inability to meet the set criteria. The four (4) discarded corridors did not meet all of the project goals for the proposed Outer Beltline project and all have high potential impacts. Corridors C and F also had extremely long corridor lengths and very low potential for traffic improvement.

Bowling Green Outer Beltlines Level 2 Screening of Final Corridors



Legend

- Interchange Location
- Existing Parkways
- Primary Roads
- Rivers and Streams
- Lakes
- Bowling Green City Limits
- Beltline A
- Beltline B
- Beltline D
- Beltline E

Figure 11

B. Level 2 Screening of Corridors

Following the Level 1 Screening, the surviving corridors were assessed in a quantitative manner. This more detailed screening included additional data collection, traffic modeling, engineering cost estimates and additional public and agency involvement. For comparison of the corridors, an evaluation matrix was developed for each corridor and criterion (see Table 4 at the end of this chapter).

1. Methodology and Assumptions

During the Level 2 Screening, each of the corridors were evaluated based on their engineering characteristics and their relative impacts on traffic and mobility, the natural and man-made environment and public and review agency input. Further study was conducted through literature searches, GIS, agency coordination, public meetings, and windshield surveys. Corridors were studied using 400-foot study bands to approximate the magnitude of impacts of the anticipated right-of-way needed. Some issues required larger study bands. Threatened and endangered species were evaluated within a two-mile band. Archeological and historical resources, and cave entrances were evaluated within a 2,000-foot band. All of the information obtained through this research was documented. Using this documentation, each corridor's strengths and weakness were measured. The corridors that best satisfied traffic and engineering objectives and posed the least impact upon environmental features were recommended for future engineering and environmental studies.

During the course of the screening several assumptions were made to ensure consistent comparison of the "no build" and "build" options. These include the following.

1. The new terrain typical section for the I-66 Corridor and the Bowling Green Outer Beltline is a four-lane, divided freeway with two 12-foot lanes in each direction and a depressed grass median.
2. The right-of-way for the I-66 Corridor and the Bowling Green Outer Beltline will vary; however, an average right-of-way width of 400 feet has been used for estimation purposes.
3. While the final corridors for both the I-66 Corridor and the Bowling Green Outer Beltline are 2,000 feet wide, a narrower 400-foot wide corridor was used to more accurately estimate the "true" impacts of the proposed projects. The center 400 feet of the 2,000-foot corridor was used to estimate impacts of the project, even though the actual location of the route could lie anywhere within the 2,000-foot corridor. This provides an estimate of the impacts that better reflects construction of this type of highway facility.
4. Interchanges or grade separations have been included at the intersections with all federal, state and local routes.

5. No improvements have been considered for the William H. Natcher Parkway, or the William H. Natcher Extension. At some point in the future, reconstruction of the parkway may be needed to meet interstate design standards, but no costs for reconstruction have been included with this project. KYTC will need to consider when upgrading the parkways to current interstate standards is needed if I-66 is coincident with the parkways.
6. For estimation purposes, the bridges crossing the Barren River and Drakes Fork have been considered completely spanning the entire 100-year floodplain as designated by FEMA in their National Flood Insurance Program.
7. The unit costs and preliminary cost estimates are in Year 2002 dollars and have not been adjusted for inflation to a midpoint of construction of the facilities. This is partially because no funding exists for these projects and neither are included in the latest KYTC Six-Year Highway Plan. Another reason is that construction costs have fluctuated in recent years instead of continuing an upward increase due to inflation.
8. Two growth scenarios were tested for this project. The first used population and employment data assembled by Bernardin, Lochmueller & Associates from information gathered from ForecastPro and compared to forecasts from Woods & Poole Economics, Inc. and the U.S. Bureau of Economic Analysis. The other used population and employment data from the Kentucky State Data Center. Based on review of the data, the second set of data forecasts a higher rate of growth for the Bowling Green and Warren County area. The traffic information shown in the corresponding evaluation table (see Table 1) for the various corridors was developed using the higher growth scenario to show the worst-case scenario.
9. The Existing-Plus-Committed (E+C) Network, shown in the first two columns of data in the evaluation table (see Table 1) and utilized within the traffic considerations section, represents the highway network for the existing system plus any currently committed projects in the Bowling Green area and represents the “no build” option for the Outer Beltline. The traffic measures for both growth scenarios are shown to demonstrate the difference between each.
10. It should be noted that existing traffic along I-65 ranges from an estimated 36,500 vehicles per day (vpd), between KY 101 and the Louie B. Nunn (Cumberland) Parkway, to 44,800 vpd, between the William H. Natcher Parkway and US 231. The estimated future traffic forecasts on I-65 with each of the proposed I-66 Corridors is greater than 89,000 vpd. In order to provide an unconstrained comparison of the corridors, I-65 was modeled as a 10-lane freeway, even though the traffic volume corresponding to level-of-service C for an eight-lane freeway is 95,700 vpd.

2. Engineering Considerations

The corridors considered in the Level 2 Screening were refined based on an alignment developed using USGS quadrangle maps supplemented with aerial photography. In addition, design plans for the current I-65 widening and the William H. Natcher Parkway extension were used. Estimates were developed based on costs for construction (including the roadway, bridges, drainage and mitigation), right-of-way acquisition, utility relocations and design. A Policy on Geometric Design of Highways and Streets (AASHTO 2001) was followed for the development of horizontal alignments. Based on the alignments developed, construction costs were developed for the 4-lane new terrain sections based on a “unit cost per mile” basis. Earthwork costs were figured with a factor included for various terrain types crossed. Costs for pavement and drainage structures were calculated on a per mile basis. In addition, costs were included for interchanges by type, overpass crossings for all state and local routes intersected, bridge crossings for all railroads and streams crossed, and the Barren River bridge crossing. Additional costs included were construction mobilization and maintenance of traffic.

Preconstruction costs were calculated for design activities for roadways and bridges as well as right-of-way acquisition and utility relocation. Design costs were based on a percentage of total construction cost. Right-of-way estimates included a per acre land cost for various land uses as classified by aerial photo inspection and landcover data. Right-of-way costs were estimated based on an estimated constant width right-of-way within the corridors identified. In addition, relocation costs were included for potential displacements. Utility relocation costs were estimated on a per mile basis along existing alignment or along new terrain alignment.

Other engineering considerations include overall length of the Barren River and Drakes Fork crossings; the number of roads crossed, along with the number of interchanges and overpasses; and the ratings of maintenance of traffic during construction and constructability.

Corridors D and E extend the furthest east into the sinkhole plain. Corridor E and B also take the more northerly route across the north side of Bowling Green, crossing more rugged terrain resulting in higher costs. In addition, Corridor E is the longest of the corridors. Corridor A takes the route closest to Bowling Green and is shorter than the other corridors, resulting in the lowest overall project cost.

3. Geotechnical Considerations

The Study Area contains four (4) geologic regions shown in Figure 12, including the Western Pennyroyal (sinkhole plain), Mammoth Cave Plateau, Central Pennyroyal, and Caseyville Hills. Most of the entire Study Area lies within the Western Pennyroyal. This heavily karsted area was created through the solubility

of the St. Louis and St. Genevieve limestone bedrock, which lays beneath this plain. The topography of this region is rolling to flat with low elevations. Outside of the sinkhole plain along the southern portion of the Study Area is the Central Pennyroyal (which consists of relatively high relief), which sits upon a less soluble layer of Warsaw limestone. This area has little karst development and is dissected by surface streams. The northern portion of the Study Area resides on top of soluble St. Louis and St. Genevieve limestone that is capped by a layer of sandstone. This area is the Mammoth Cave Plateau, which separated from the Western Pennyroyal by the Dripping Springs Escarpment. The Mammoth Cave Plateau is characterized by higher elevations and steeper terrain. This area has a high abundance of subsurface karst features. The Caseyville Hills region is found in the most northern regions of the Study Area. This area has only a small portion that extends into the project area. Caseyville Hills resides on top of Pennsylvanian Age limestone that contains deposits of coal, shale, and sandstone. Topography for this region consists of moderately high relief with steep ridges and narrow valleys.

The terrain in the Study Area varies from a steeper more dissected area in the northwest to a relatively flat to rolling landscape in the eastern portion. This landscape poses potential geological concerns such as loss of karst features, the Dripping Springs Escarpment, faults, expanding shales, oil and gas wells, and tar bearing sandstone. The karst features of the sinkhole plain are highly susceptible to runoff pollution as well as soil erosion. There may also be sinkhole collapses as a result of construction. Oil and gas deposits are located throughout the entire Study Area and need to be avoided wherever possible. The tar bearing sandstone is located in the Mammoth Cave Plateau area beyond the Dripping Springs Escarpment and can be used for construction purposes. The faults associated with this area are all located in the northern most portion of the project area. These faults could cause slight damage to structures in the event of an earthquake. A Geological Overview of the Bowling Green Area and a Geotechnical Report are located in Appendix D.

Topography and Geologic Regions of the I-66 Study Area

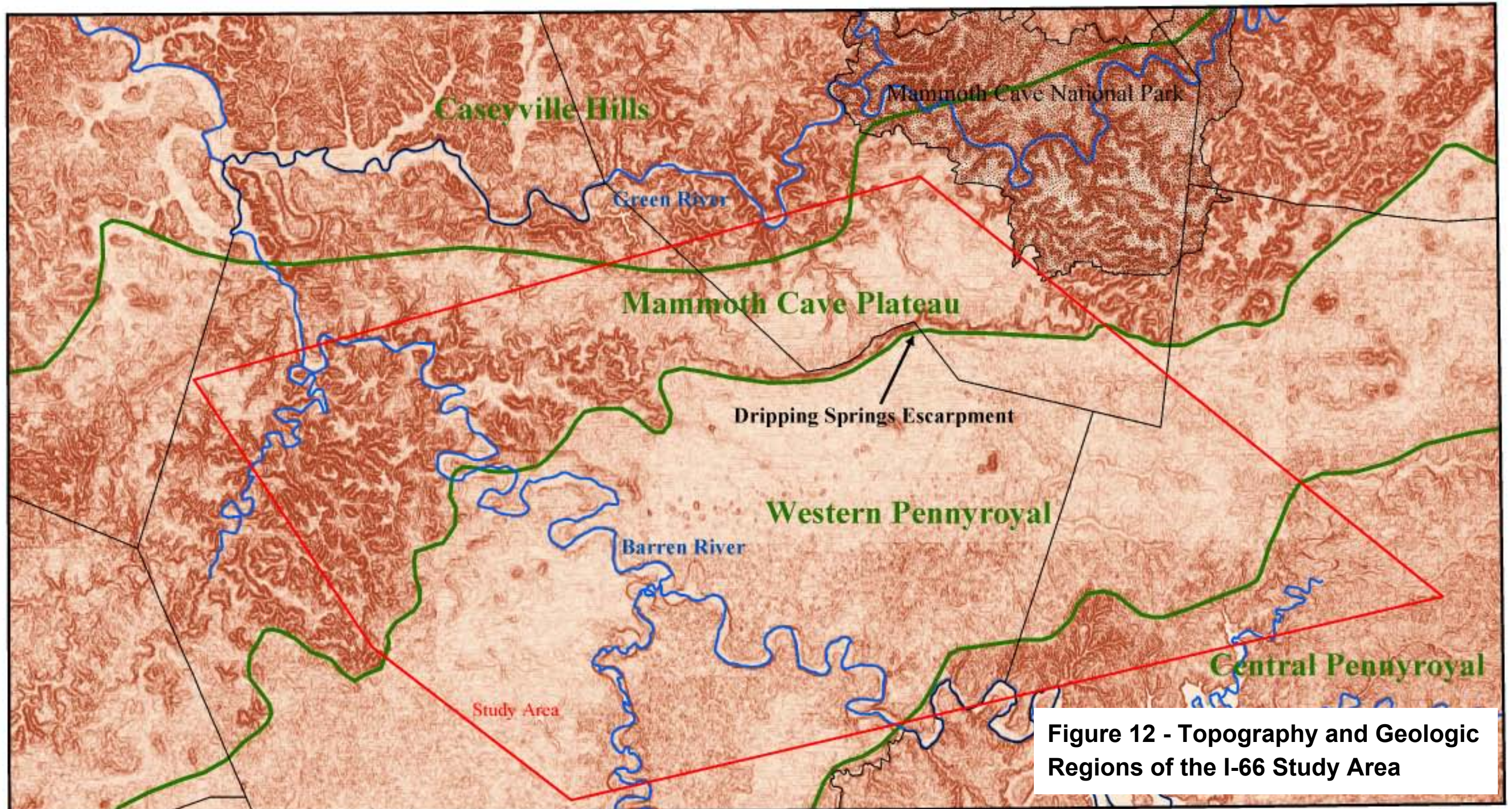


Figure 12 - Topography and Geologic Regions of the I-66 Study Area



The Outer Beltline corridors are predominantly located within the sinkhole plain. All of the corridors will have impacts upon karst features along the sinkhole plain. Portions of Corridors B and E extend into the more steeply dissected northwestern portion of the Study Area. This more rugged terrain will lead to more difficult construction in this area including increased excavation, rock excavation and blasting.

4. Traffic Considerations

Traffic considerations for the Level 2 Screening were evaluated based on modeling of the future roadway network for each of the “build” corridors. The future traffic volumes for each of the model scenarios were compared to the “no build” option, which consisted of only the existing roadway network plus committed projects (E+C) currently in development. The traffic modeling was based on the regional travel demand model that was developed for roughly a 13-county area encompassing the Bowling Green Outer Beltline Corridor Study Area and surrounding counties. The Bowling Green Regional Travel Model is a composite of the Kentucky Statewide Traffic Model (KySTM) and the Bowling Green Transportation Plan Travel Model. The Regional Travel Model reflects 2000 Census and year 2000 employment data, provides greater network and travel analysis zone (TAZ) detail than either of the source travel models, incorporates new year 2030 socioeconomic forecasts for TAZs, and better replicates actual traffic volumes than either of the source travel models. The new terrain “build” corridors are represented as four-lane freeways in the Regional Travel Model with interchanges as described. Based on the model output, various criteria were evaluated to determine the performance of each corridor relative to the project goals as described below.

Relative to the Bowling Green Outer Beltline goals, a reduction in vehicle-miles of travel (VMT) and congested vehicle-hours of travel (VHT) for all vehicle types in Warren County over the “no build” option measures the effectiveness of achieving Goal 1 (“Accommodate the transportation needs of the Bowling Green urban area by completing an Outer Beltline, an access controlled freeway with interchanges that is consistent with the *2000 Bowling Green Transportation Plan*”).

A reduction of vehicle-miles of travel (VMT) and congested vehicle-hours of travel (VHT) on arterial and collector streets in Warren County measures the effectiveness of achieving Goal 2 (“Reduce current and future traffic congestion on the highways and streets in Warren County by diverting traffic to a new freeway facility”). The average daily traffic on any new roadway and the highest ADT of any segment of the new roadway are indicators of the effectiveness of the new facility.

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A reduction of vehicle-miles of travel (VMT) and congested vehicle-hours of travel (VHT) for all vehicle types in Warren County and a reduction of congested vehicle-hours of travel on non-freeway arterial and collector streets in Warren County measures the effectiveness of achieving Goal 3 (“Strengthen the regional highway system by improving the connections between major highways and streets in the region”).

Finally, a reduction of vehicle-miles of travel (VMT) and congested vehicle-hours of travel (VHT) for trucks and autos in Warren County measures the effectiveness of achieving Goal 4 (“Provide better access to major employment centers, regional commercial centers, major education and health facilities, and regional recreation facilities in Warren County”).

Corridor A had the highest estimated average daily traffic (ADT) volume at 16,000 vpd with the segment between the KY 526 and KY 185 interchanges having the highest estimated volume at 19,200 vpd in the year 2030. In addition, Corridor A also diverts the greatest traffic from I-65, leaving an estimated 86,200 vpd on I-65 between KY 234 and KY 446. Corridors A and D provide the greatest congestion relief to the northeast side of Bowling Green by improving the LOS on US 31W from Riverside Drive to US 68 and on KY 446 between US 31W and I-65 to an acceptable urban level. Because of their proximity to the north side of Bowling Green, Corridors A and D draw additional traffic onto KY 185 which would push the LOS to F on the two-lane segment of KY 185. Corridors B and E are too far north to be as effective as Corridors A and D in relieving congestion on the northeast side of Bowling Green. Corridor E also attracts and diverts the least amount of traffic from I-65, leaving an estimated 92,600 vpd on I-65 in the future year.

Corridors A and B decrease traffic on Old Scottsville Road (just east of Cumberland Trace) from an estimated 13,000 vpd (under the “no build” option) to 7,500 vpd; and Cemetery Road (KY 234 just east of Cumberland Trace) from an estimated 20,500 vpd (under the “no build” option) to 15,500 vpd. Corridors D and E result in a more modest reduction on Old Scottsville Road and Cemetery Road.

For Warren County, Corridor A results in the greatest decrease in total VMT and truck VMT, and is the best in diverting VMT from non-freeway facilities. Corridor E is the least effective in these categories for Warren County. In the case of Edmonson County, Corridor B results in the greatest decrease in total VMT and truck VMT, and is the best in diverting VMT from non-freeway facilities.

None of the Outer Beltline corridors diverts sufficient traffic from I-65 to achieve an acceptable LOS if I-65 remains at six lanes between the William H. Natcher Parkway and the I-65/northern Beltline interchange. All Outer Beltline

corridors can achieve a LOS C for the urban portion of I-65 if I-65 is widened to eight lanes within existing right-of-way.

5. Environmental Considerations

Environmental considerations evaluated for the Level 2 Screening included an extensive list of both natural and human environmental issues. The following are categories of issues that were evaluated for potential impacts: aquatic and terrestrial ecosystems; federal and state listed species; cultural resources; socioeconomic data; geological data; managed lands; air quality; and noise. Several criteria were evaluated under these categories with potential impacts for each quantified based on the working alignment within the 2,000-foot corridor, or based on a specified buffer distance for selected criteria as defined in the methodology and assumptions. Table 4 shows the final evaluation matrix for all of the criteria identifying potential impacts.

The criteria evaluated were identified through literature searches, GIS database research, and gathering information from the public at public information meetings. Additionally, windshield surveys of the corridors were conducted to check the data compiled to the closest degree possible and to add supplemental data such as potential relocations.

The major natural environmental considerations for the Study Area include the karst geology and related issues. The unique subterranean ecosystem provided by the karst geology contains several rare species and is susceptible to disturbance. In addition, the nature of drainage in karst areas creates an increased potential for groundwater contamination. In many areas, surface water runoff moves underground almost immediately with little dilution and once underground, moves very quickly and can reach the groundwater table with little filtration. For these reasons, special consideration must be given to karst features and any potential construction in karst areas.

The major human environmental considerations in the Study Area include cultural resources, farmland and prime farmland, relocations and environmental justice. Bowling Green is an area with a rich history located along the Barren River and the historic route between Louisville and Nashville. Within Bowling Green, six National Register listed historic districts have been identified. The economy of the area outside of Bowling Green has historically been agricultural based and many farmsteads remain throughout the area. Additionally, karst features in the area also attracted prehistoric peoples to the area, and a high potential for archaeological sites is anticipated as well. Due to the largely agricultural nature of the area outside of Bowling Green, farmland impacts are also of concern. The primary area of prime farmland within the Study Area is north of I-65 in the northern portion of the sinkhole plain where the terrain is more level.

The four (4) remaining Outer Beltline corridors have similar impacts comparatively based on this level of evaluation, with Corridor A having the shortest overall length and generally lowest impacts. Corridors A and D have potential Section 106 concerns because of a possible historic district that is located north of Bowling Green near the Barren River where each of the corridors would cross. In addition, the Barren River crossing location for Corridors A and D is located in proximity to known mussel beds with federally endangered species records. Corridors B and E take the more northerly route across the north side of Bowling Green, encountering more difficult terrain and more potential forest impacts. Corridors D and E extend farther east into the sinkhole plain on the southeast side of Bowling Green, increasing the potential for karst related impacts for these corridors.

6. Additional Agency Coordination

A second agency coordination meeting was held January 16, 2003 at Mammoth Cave National Park. Coordination letters along with information packets were also mailed to the agencies and stakeholders with a request for comments on the proposed project. The meeting was held to present the Level 2 Screening of corridors that was provided in the information packet and to receive direct feedback from the agencies. Numerous comment letters were received in response. The minutes of the meeting, as well as all comments received, are included in Appendix F.

Specific agency comments relative to corridors or routes were included in some correspondence (copies of correspondence received from agencies is attached to the minutes in Appendix F). The United States Environmental Protection Agency noted that all of the Bowling Green Outer Beltline corridors under consideration would have a high potential for impacts on the sinkhole plain. The United States Fish and Wildlife Service recommended the selection of alignments as close to Bowling Green as possible. The City of Bowling Green as well as the Bowling Green/Warren County Planning Commission identified a preference for Corridors A, B, and D.

7. Third Set of Public Information Meetings

A third series of public information meetings was held throughout the month of February 2003. Six (6) public information meetings were held at the following locations: the Richardsville Fire Department; Warren East High School; Smiths Grove Fire Department; the Chalybeate Fire Department; the Alvaton Fire House #3; and at Red Cross Elementary School. A total of approximately 350 citizens attended the meetings with an average of approximately 50 citizens per meeting. The third round of public meetings was held by KYTC to present a narrowed down set of the preliminary corridors for additional review and comment. The corridors were reduced from eight (8) to four (4) for the

Bowling Green Outer Beltline, as a result of the Level 1 Screening and extensive input from the public.

In addition, a local outreach meeting was held at the Mount Zion Baptist Church in Oakland, Kentucky to present the information and address concerns regarding the potential I-65 interchange location identified. This meeting was attended by 12 citizens.

Citizens attending the meetings were asked to sign in and were given a handout packet of meeting information as they entered. Exhibits displayed included aerial photograph maps of the Study Area including Level 2 preliminary corridors for the Bowling Green Outer Beltline. Information contained in the packets included survey forms with maps on the back, a project overview form with a map on the back, an Evaluation Process "funnel" diagram, a public involvement process timeline, Level 1 Screening forms and a Level 2 Screening draft evaluation table.

The survey form contained in the handout packet requested citizens to rank the top two routes that they prefer for the location of the Bowling Green Outer Beltline Corridor, and return it at the meeting or via a prepaid, preaddressed envelope included in the packet. A total of 30 citizen comment survey forms were received by KYTC for the Bowling Green Outer Beltline project. All respondents were asked to submit their first and second corridor choices. However, some responses included combinations of one to two corridor selections and others only included identification of a non-preferred corridor.

According to the survey forms that were returned, most citizens favored the "no build" option (16 of 30 forms). Of the "build" corridor options, Corridor B had the most support with six (6) surveys in favor of this option. Corridor A was picked as the second choice for the Bowling Green Outer Beltline.

Copies of the February 2003 Public Meetings Summary, public comment surveys, summaries of citizen response sheets and additional Bowling Green Outer Beltline Planning Study information are contained within the official meeting documentation entitled "Public Information Meeting, I-66/Bowling Green Outer Beltline, Warren/Edmonson Counties, Item Number 3-66 and 3-103, February 11-13 & 18-20, 2003." A summary of these meetings is included in Appendix E.

C. Compatibility of I-66 Corridor and Bowling Green Outer Beltline

The compatibility of I-66 corridors with the Bowling Green Outer Beltline primarily focuses on the ability of the I-66 corridor to compliment the connectivity of the Bowling Green area and assist in the development of the Outer Beltline. Bowling Green is served by two freeways, the William H. Natcher Parkway and I-65. However, some areas around the city are lacking connectivity

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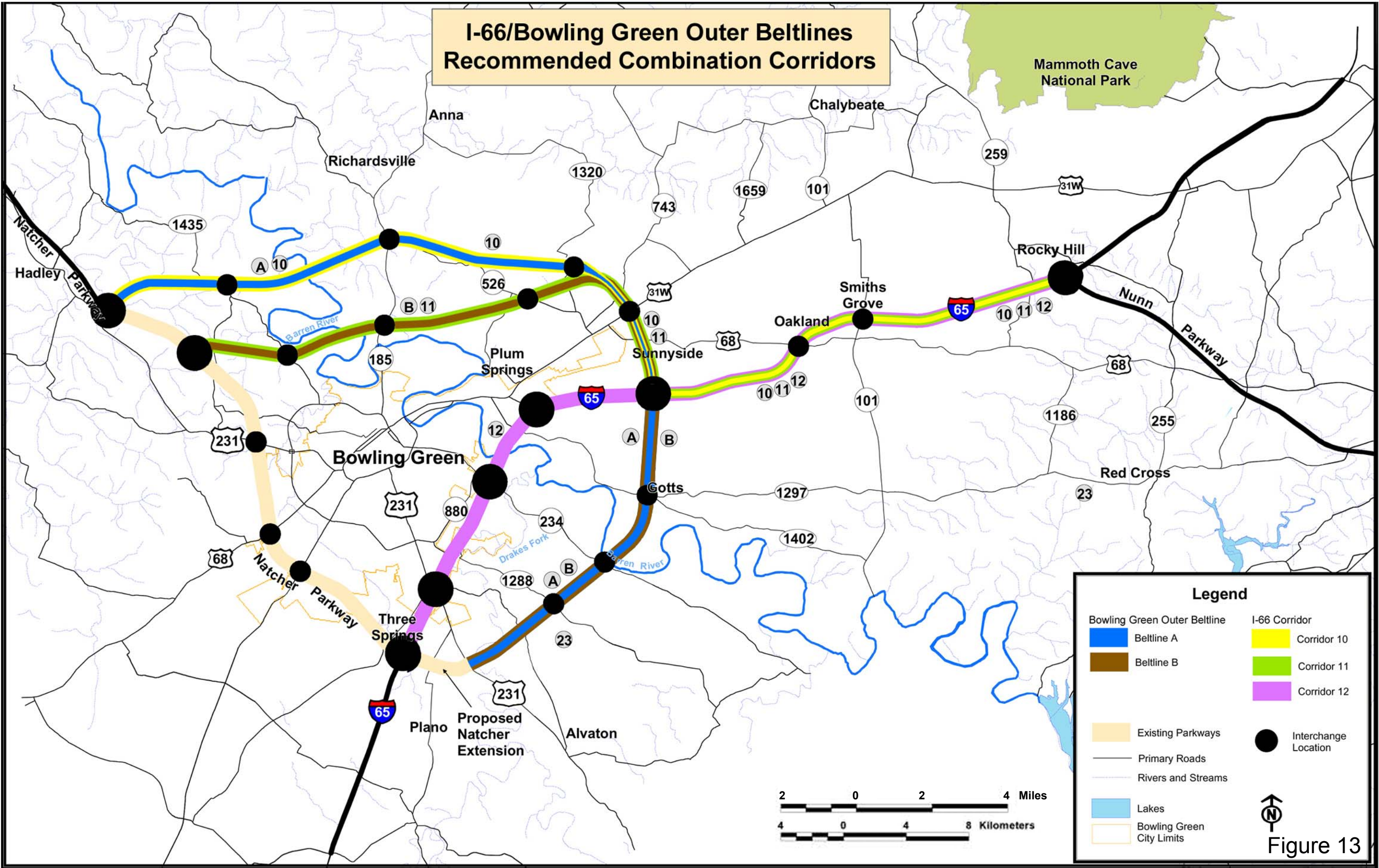
including primarily north of the city where a link between I-65 on the northeast side and the William H. Natcher Parkway on the northwest side would provide connectivity around the city and much needed access across the Barren River. In addition, a connector route between the William H. Natcher Parkway terminus south of Bowling Green around the developing area on Scottsville Road (US 231) to I-65 on the northeast side has also been identified.

The I-66 corridors that would provide the most utilization and provide portions of the connectivity links identified include Corridor 10, which merges with Outer Beltline Corridor B, and Corridor 11, which merges with Outer Beltline Corridor A. These corridors would complete the entire northern connection. Corridors 4 and 5 would also provide a large portion of the northern connection, but would still require a connection to I-65. Corridor 4 connects with Outer Beltline Corridor B and Corridor 5 connects with Outer Beltline Corridor A. Corridors 2 and 23 provide only small segments of the identified connectors with Outer Beltline corridors B and D, while Corridor 12, which only intersects Outer Beltline Corridor A, would provide no additional connections.

In addition to the potential utilization of the corridors for portions of the Outer Beltline, consideration must also be given to the performance of the corridor, relative to traffic considerations and impacts, in conjunction with the Outer Beltline. While the performance of the I-66 corridors north of I-65 are generally enhanced by the completion of the Outer Beltline, the performance of Corridor 23 south of I-65 decreases due to the completion of the Outer Beltline. Because Corridors 10 and 11 completely overlap with the Outer Beltline, these corridors in combination with the Outer Beltline produce the least impacts overall. Conversely, because Corridors 2 and 23 provide very little overlap, these corridors in combination produce the highest impacts overall. The recommended combinations of corridors are shown in Figure 13.

Given the above factors, Corridors 10 and 11 provide the greatest benefit to and are most compatible with the Bowling Green Outer Beltline. Additional discussion of the compatibility of these two projects is provided in Appendix A. The section of I-66 from the William H. Natcher Parkway to the Louie B. Nunn (Cumberland) Parkway is discussed thoroughly in a separate Planning Study Report.

I-66/Bowling Green Outer Beltlines Recommended Combination Corridors



Legend	
█ Bowling Green Outer Beltline	█ I-66 Corridor
█ Beltline A	█ Corridor 10
█ Beltline B	█ Corridor 11
█ Existing Parkways	█ Corridor 12
— Primary Roads	● Interchange Location
— Rivers and Streams	↑ North Arrow
█ Lakes	Figure 13
█ Bowling Green City Limits	

TABLE 4
Bowling Green Outer Beltline Level 2 Screening Evaluation

Red: least desirable, Green: most desirable

Criteria	Unit	E+C _{KySTM} [^]	E+C _{SDC} ^{^^}	Final BG Outer Beltline Corridors			
				A	B	D	E
Engineering Considerations							
Length: Total	Miles	n/a	n/a	23.9	28.3	26.5	31.0
New Location	Miles	n/a	n/a	23.9	28.3	26.5	31.0
I-65 Widening	Miles	n/a	n/a	0.0	0.0	0.0	0.0
Utilization of Parkways	Miles	n/a	n/a	0.0	0.0	0.0	0.0
Estimated Pre-Construction Cost (\$) (Design, Right-of-Way & Utilities)	Million \$	n/a	n/a	\$34.00	\$38.09	\$34.58	\$39.59
Estimated Construction Cost (\$) (Roadway, Drainage, Bridge & Mitigation)	Million \$	n/a	n/a	\$421.64	\$481.21	\$441.43	\$472.69
TOTAL PROJECT COST (\$)	Million \$	n/a	n/a	\$455.64	\$519.30	\$476.01	\$512.28
RIVER CROSSINGS							
Bridge Length over the Barren River (ft)	Lin. Ft.	n/a	n/a	3,150	2,900	3,550	3,300
Bridge Length over the Drakes Fork (ft)	Lin. Ft.	n/a	n/a	1,250	1,250	1,250	1,250
Proposed Number of Bridges/Drainage Crossings	Number	n/a	n/a	3	5	3	5
Roads Crossed: Interstates, US & Major State Routes	Number	n/a	n/a	8	7	8	7
Other State Routes & Local Roads	Number	n/a	n/a	24	30	27	32
Proposed Number of Interchanges (Existing/Proposed)	Number	n/a	n/a	10	10	10	10
Proposed Number of Overpasses	Number	n/a	n/a	14	17	17	20
Maintenance of Traffic during Construction **	Rating	n/a	n/a	L	L	L	L
Constructability Rating (Terrain, Obstructions, Conflicts, etc.) **	Rating	n/a	n/a	L	M	L	M
Traffic Considerations							
BG Outer Beltline Average Daily Traffic (ADT) Forecast -- Average	ADT	n/a	n/a	16,010	13,640	13,720	11,680
BG Outer Beltline ADT Forecast -- Highest Segment	ADT	n/a	n/a	19,220	20,710	19,630	20,650
I-65 (Natcher to Nunn) ADT -- Highest Segment	ADT	84,029	97,309	86,170	88,750	89,660	92,550
% Change from E+C (SDC)	%	---	---	-11.5%	-8.8%	-7.9%	-4.9%
BG Outer Beltline (Natcher to Nunn) Congested Speed	mph	61.7	59.6	65.0	65.0	65.0	65.0
% Change from E+C (SDC)	%	---	---	9.0%	9.0%	9.0%	9.0%
I-65 Natcher to Nunn Congested Vehicle Hours of Travel (VHT)	VHT	27,600	32,400	31,360	32,120	32,160	33,030
% Change from E+C (SDC)	%	---	---	-3.2%	-0.9%	-0.7%	1.9%

TABLE 4
Bowling Green Outer Beltline Level 2 Screening Evaluation

Red: least desirable, Green: most desirable

Criteria	Unit	E+C _{KySTM} [^]	E+C _{SDC} ^{^^}	Final BG Outer Beltline Corridors			
				A	B	D	E
Regional Congested Vehicle Hours of Travel (VHT)	VHT	583,920	667,240	665,940	667,250	666,990	668,490
% Change from E+C (SDC)	%	---	---	-0.2%	0.0%	0.0%	0.2%
Regional Congested VHT for Trucks	VHT	71,330	77,960	77,750	77,850	77,970	78,080
% Change from E+C (SDC)	%	---	---	-0.3%	-0.1%	0.0%	0.2%
Warren County Congested VHT	VHT	172,340	204,050	197,670	199,460	198,570	200,590
% Change from E+C (SDC)	%	---	---	-3.1%	-2.3%	-2.7%	-1.7%
Warren County Non-Freeway Congested VHT		130,670	155,810	143,580	145,560	144,250	146,380
% Change from E+C (SDC)	%	---	---	-7.9%	-6.6%	-7.4%	-6.1%
Warren County Congested VHT for Trucks	VHT	17,640	19,730	18,980	19,140	19,200	19,370
% Change from E+C (SDC)	%	---	---	-3.8%	-3.0%	-3.7%	-1.8%
Edmonson County Congested VHT	VHT	11,240	15,150	14,900	14,750	14,890	14,760
% Change from E+C (SDC)	%	---	---	-1.6%	-2.6%	-1.7%	-2.6%
Edmonson County Non-Freeway Congested VHT		9,090	12,760	12,490	12,330	12,470	12,350
% Change from E+C (SDC)	%	---	---	-2.2%	-3.4%	-2.3%	-3.3%
Edmonson County Congested VHT for Trucks	VHT	1,440	1,580	1,540	1,530	1,540	1,530
% Change from E+C (SDC)	%	---	---	-2.5%	-2.9%	-2.5%	-2.9%
BG Outer Beltline Vehicle Miles of Travel (VMT)	VMT	n/a	n/a	434,890	400,390	403,500	368,930
Regional VMT	VMT	23,075,370	25,823,750	26,374,530	26,363,370	26,379,450	26,372,925
% Change from E+C (SDC)	%	---	---	2.1%	2.1%	2.2%	2.1%
Regional VMT for Trucks	VMT	3,826,380	4,063,940	4,105,200	4,104,630	4,106,510	4,106,700
% Change from E+C (SDC)	%	---	---	1.0%	1.0%	1.0%	1.1%
Warren County VMT	VMT	5,973,780	6,765,850	6,998,280	7,002,360	6,999,640	7,006,290
% Change from E+C (SDC)	%	---	---	3.4%	3.5%	3.5%	3.6%
Warren County Non-Freeway VMT	VMT	3,409,330	3,877,440	3,700,660	3,732,940	3,702,370	3,735,380
% Change from E+C (SDC)	%	---	---	-4.6%	-3.7%	-4.5%	-3.7%
Warren County VMT for Trucks	VMT	870,960	925,890	937,810	939,110	939,070	940,990
% Change from E+C (SDC)	%	---	---	1.3%	1.4%	1.4%	1.6%
Edmonson County VMT	VMT	495,570	648,340	637,810	632,670	637,060	633,040
% Change from E+C (SDC)	%	---	---	-1.6%	-2.4%	-1.7%	-2.4%
Warren County Non-Freeway VMT	VMT	357,050	495,640	483,550	478,250	482,790	479,030
% Change from E+C (SDC)	%	---	---	-2.4%	-3.5%	-2.6%	-3.4%
Edmonson County VMT for Trucks	VMT	77,740	82,820	81,010	80,850	81,020	80,850
% Change from E+C (SDC)	%	---	---	-2.2%	-2.4%	-2.2%	-2.4%

TABLE 4
Bowling Green Outer Beltline Level 2 Screening Evaluation

Red: least desirable, Green: most desirable

Criteria	Unit	E+C _{KySTM} [^]	E+C _{SDC} ^{^^}	Final BG Outer Beltline Corridors			
				A	B	D	E
Environmental Considerations*							
Aquatic/Terrestrial Ecosystems							
Water Quality Issues**	Rating	n/a	n/a	H	H	H	H
Ground Water Basins: Green River	Length crossed(mi)	n/a	n/a	0	0	0	0
Barren River	Length crossed(mi)	n/a	n/a	12.7	14.3	15.8	17.4
Streams: 1st Order (Intermittent)	Number	n/a	n/a	5	8	5	8
2nd Order (Perennial)	Number	n/a	n/a	1	2	1	2
3rd Order (Perennial)	Number	n/a	n/a	0	0	0	0
4th Order (Perennial)	Number	n/a	n/a	0	0	0	0
5th Order (Perennial)	Number	n/a	n/a	0	0	0	0
6th Order (Perennial)	Number	n/a	n/a	1	1	1	1
7th Order (Perennial)	Number	n/a	n/a	2	2	2	2
Total	Number	n/a	n/a	9	13	9	13
Open Water Habitats (Ponds & Lakes)	Acres	n/a	n/a	7.1	10.1	7.2	9.5
Floodplains	Lin. Ft.	n/a	n/a	9,095	10,616	8,886	10,378
Wetlands: Forested	Acres	n/a	n/a	0.0	0.0	0.0	0.2
Scrub/Shrub	Acres	n/a	n/a	0.0	0.0	0.0	0.0
Emergent	Acres	n/a	n/a	0.2	0.0	0.4	0.4
Aquatic Bed	Acres	n/a	n/a	0.0	0.0	0.0	0.0
Total	Acres	n/a	n/a	0.2	0.0	0.4	0.6
Wild and Scenic Rivers***	Yes/No	n/a	n/a	No	No	No	No
Big Trees (e.g., State Champion)	Number	n/a	n/a	0	0	0	0
Federal and State Species****							
Federally Endangered	Number	n/a	n/a	3	0	3	0
Federally Threatened	Number	n/a	n/a	0	0	0	0
State Listed Species*****	Number	n/a	n/a	6	2	6	2
Total	Number	n/a	n/a	9	2	9	2
Historic/Archaeological Impacts*****							
Historic Structures (Listed)	Number	n/a	n/a	0	0	0	0
Historic Structures (Potentially Eligible)	Number	n/a	n/a	5	2	4	1
Historic Districts (Listed)	Number	n/a	n/a	0	0	0	0
Historic Districts (Potentially Eligible)	Number	n/a	n/a	1	0	1	0

TABLE 4
Bowling Green Outer Beltline Level 2 Screening Evaluation

Red: least desirable, Green: most desirable

Criteria	Unit	E+C _{KySTM} [^]	E+C _{SDC} ^{^^}	Final BG Outer Beltline Corridors			
				A	B	D	E
Archaeological Resource Potential	Rating	n/a	n/a	H	H	H	H
Archaeological Sites: National Register	Number	n/a	n/a	0	0	0	0
Historic	Number	n/a	n/a	3	3	3	3
Prehistoric	Number	n/a	n/a	8	8	8	8
Total	Number	n/a	n/a	11	11	11	11
Historic Cemeteries	Number	n/a	n/a	2	2	3	3
Socioeconomic Impacts							
Land Use: Farmland	Acres	n/a	n/a	997	996	1072	1073
Forest	Acres	n/a	n/a	173	301	212	340
Wetland	Acres	n/a	n/a	10	8	10	8
Residential/Business	Acres	n/a	n/a	0	0	0	0
Land Use: % Farmland	%	n/a	n/a	84	76	83	75
% Forest	%	n/a	n/a	15	23	16	24
% Wetland	%	n/a	n/a	<1	<1	<1	<1
% Residential/Business	%	n/a	n/a	0	0	0	0
Percent Prime Farmland (Estimate)*****	%	n/a	n/a	17	12	17	12
Large Forest Block (KSNPC)*****	Number	n/a	n/a	5	16	5	16
Large Forest Block (KSNPC)*****	Acres	n/a	n/a	10	182	10	182
Relocations: Homes	Number	n/a	n/a	36	31	54	48
Mobile Homes	Number	n/a	n/a	5	6	7	8
Businesses	Number	n/a	n/a	0	0	1	1
Schools	Number	n/a	n/a	0	0	0	0
Public Facilities	Number	n/a	n/a	1	2	0	1
Cemeteries	Number	n/a	n/a	0	1	0	1
Churches	Number	n/a	n/a	0	1	1	2
# of Railroad Tracks: Active	Number	n/a	n/a	1	1	1	1
Abandoned	Number	n/a	n/a	0	0	0	0
Utilities: Transmission Lines	Number	n/a	n/a	5	5	5	5
Pipelines	Number	n/a	n/a	4	1	4	1
Towers (Radio/Cellular)	Number	n/a	n/a	0	0	0	0
Water Towers	Number	n/a	n/a	0	0	0	0
Substations	Number	n/a	n/a	0	0	0	0
Fiber Optics	Number	n/a	n/a	1	1	1	1
Environmental Justice Issues**	Rating	n/a	n/a	M	L	L	L

TABLE 4
Bowling Green Outer Beltline Level 2 Screening Evaluation

Red: least desirable, Green: most desirable

Criteria	Unit	E+C _{KySTM} [^]	E+C _{SDC} ^{^^}	Final BG Outer Beltline Corridors			
				A	B	D	E
UST Facilities: Existing Abandoned	Number	n/a	n/a	0	0	0	0
	Number	n/a	n/a	0	0	0	0
Landfills (Old)	Number	n/a	n/a	0	0	0	0
CERCLA Sites	Number	n/a	n/a	0	0	0	0
RCRA Sites	Number	n/a	n/a	0	1	0	1
TRI Sites	Number	n/a	n/a	0	0	0	0
Geological Issues							
Number of Cave Entrances*****	Number	n/a	n/a	3	7	10	14
Sinkholes	Number	n/a	n/a	122	123	148	151
Sinkholes	Acres	n/a	n/a	153	161	172	175
Oil and Gas Wells	Number	n/a	n/a	7	19	15	27
Dry and Abandoned Wells	Number	n/a	n/a	6	8	8	9
Oil Batteries	Number	n/a	n/a	0	0	0	0
Quarries	Number	n/a	n/a	1	1	1	1
Coal Mines	Number	n/a	n/a	0	0	0	0
Managed Lands							
Federal Lands	Number	n/a	n/a	0	0	0	0
State Lands	Number	n/a	n/a	0	0	0	0
Nature Conservancy Lands	Number	n/a	n/a	0	0	0	0
City Parks	Number	n/a	n/a	0	0	0	0
Air Quality							
Project is in the 6-Year Plan***	Yes/No	n/a	n/a	Yes	Yes	Yes	Yes
Highway Noise							
Potential for Noise Impacts**	Rating	n/a	n/a	M	L	M	L

* Evaluation does not include any modifications to the existing Natcher Parkway or the Natcher Extension
 ** Denotes a probability, i.e., H – High, M – Moderate, L - Low
 *** Denotes a Yes or No response
 **** Denotes within 1 mile of the centerline
 ***** Does not include Federally Listed Species
 ***** Denotes within 1000 feet of the centerline
 ***** Denotes estimated percent of new terrain construction crossing prime farmland
 ***** Large Forest Blocks identified by Kentucky State Nature Preserves Commission
 ^ KySTM -- Forecasts based on similar data to that in the Kentucky Statewide Travel Model
 ^^ SDC -- Forecasts based on information received from State Data Center in 2002

VII. RECOMMENDATIONS AND PREFERRED CORRIDORS

A. Project Goals

The project goals for the proposed Bowling Green Outer Beltline are as follows:

1. **Commitment:** Accommodate the transportation needs of the Bowling Green urban area by completing an Outer Beltline, an access controlled freeway with interchanges that is consistent with the *2000 Bowling Green Transportation Plan*.
2. **Congestion:** Reduce current and future traffic congestion on the highways and streets in Warren County by diverting traffic to a new freeway facility.
3. **Connectivity:** Strengthen the regional highway system by improving the connections between major highways and streets in the region.
4. **Access:** Provide better access to major employment centers, regional commercial centers, major education and health facilities, and regional recreation facilities in Warren County.

B. Recommendations and Preferred Corridors

The Level 1 Screening of the eight (8) preliminary Outer Beltline corridors resulted in a set of four (4) corridors that were retained for further study. These corridors include A, B, D, and E. These corridors performed the best during the Level 1 Screening process. Each corridor was evaluated on certain criteria, including the ability to fulfill project goals, impacts upon major environmental features, public and agency support, and engineering and traffic issues. In the Level 2 Screening process, these corridors were analyzed in further detail to determine which corridors would best suit the project goals and traffic needs and at the same time, pose the least amount of engineering difficulty and environmental impacts. Corridors A and B received recommendation after the Level 2 analysis. In addition to the two “build” corridors, the “no build” option must also be fully evaluated throughout the NEPA process.

Corridors D and E did not receive further recommendation due to environmental impacts and lower traffic performance. These two (2) corridors extended the farthest east into the sinkhole plain, which was the main reason for greater environmental impacts related to these corridors.

Corridor A was recommended because it had the best performance in relation to traffic considerations (see Figure 14). This corridor was also associated with the lowest costs across the board and the second lowest number of relocations. The environmental impacts for this corridor were much less than Corridors D and E. This corridor had the lowest impact to sinkholes and mineral resources.

Bowling Green Outer Beltlines Recommended Corridors

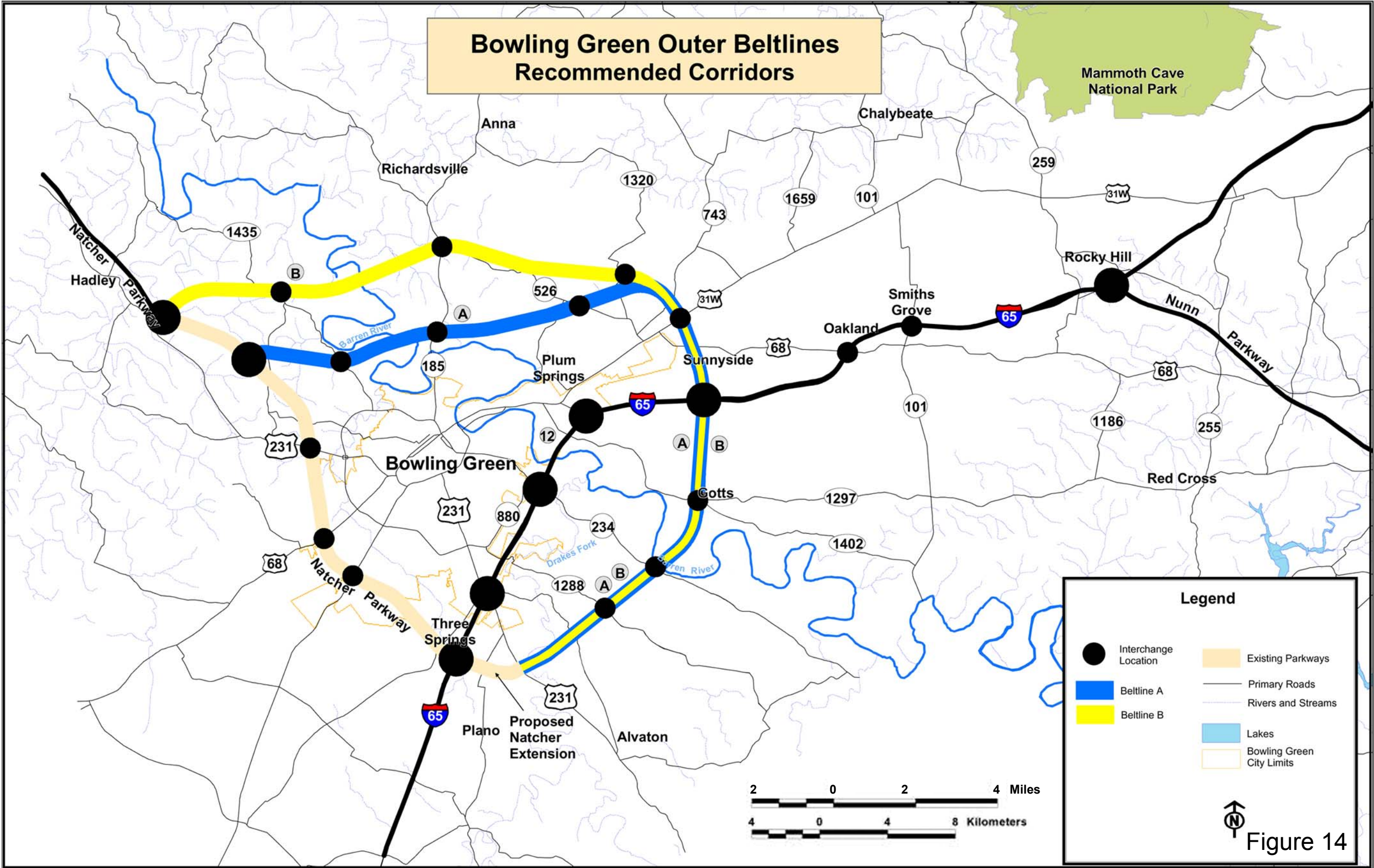


Figure 14

Corridor B was selected for recommendation because of low potential impacts upon historical resources and the environment. This corridor had the lowest potential impact upon wetlands, TES species, and residential relocations. In addition, Corridor B had the largest public support of “build” corridors from the third round of public information meetings.

In addition to the two corridors recommended for further evaluation, the “no build” option should also continue to be evaluated further. The “no build” option would provide no additional connectivity to the Bowling Green area, and would not improve the existing access of the area, relying on existing facilities to meet increased traffic demands. The “no build” option would not include any new construction to create environmental impacts.

Corridors A and B would provide the most benefit in combination with I-66 by completing the entire new terrain portion of I-66 depending on the preferred corridor identified for I-66. The “no build” option would provide little benefit in combination with the Beltline by including no coincidental sections with I-66 corridors. A complete discussion of the compatibility of the two projects is included in Appendix A.

C. Special Considerations and Commitments

All corridors recommended for further consideration cross areas of karst topography. Primary concerns of roadway construction through these areas include water quality associated with the vulnerability of groundwater resources. Due to the rapid infiltration of surface water runoff in karst regions, runoff can reach the groundwater with little filtration and is difficult to trace or contain once moving underground. In addition, subterranean ecosystems associated with caves and karst geology include rare species and are typically fragile and susceptible to disturbance. The potential for encountering unknown voids and conduits in the subsurface during construction and the potential for disturbance to known karst features dictate that special considerations be given to potential construction in these areas.

Further development of the recommended corridors identified should continue to avoid and minimize potential impacts to karst features as additional detailed information is gathered. Where potential impacts to karst features cannot be avoided, special design considerations should be implemented. These measures will include the utilization of grass-lined waterways to filter runoff prior to discharge to the subsurface, detention basins to contain potential contaminant spills as well as any other (BMPs) being used to mitigate potential karst impacts at the time of design and construction.

D. Future Activities to Consider

The recommendations provided in this section identify the corridors which best meet the goals specified for this project with the least potential environmental impacts. The evaluation of corridors to this point has been conducted with information gathered through agency coordination, literature reviews, GIS databases, the public and windshield surveys. Further evaluation of the recommended corridors to identify a single preferred corridor will require detailed surveys and analysis to identify specific impacts associated with each corridor. The results of this detailed analysis should be presented in a formal NEPA document for public presentation and agency review.