U.S. Department of Transportation
Federal Highway Administration

Brent Spence Bridge
Replacement/Rehabilitation Project

Kentucky

Purpose and Need Statement

PID No. 75119
HAM-71/75-0.00/0.22
KYTC Project Item Number 6-17

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1.0 INTRODUCTION

Interstate 75 (I-75) is a major north-south transportation corridor through the Midwestern United States linking Ohio and Kentucky with Toledo, Ohio and Detroit, Michigan to the north, and Atlanta, Georgia and Miami, Florida to the south. I-75 is among the longest and busiest continuous interstate trade corridors on the continent, creating a 2,200-mile major trade corridor from Canada to the Port of Miami. According to the Federal Highway Administration (FHWA) estimates, I-75 is among the busiest trucking routes in North America, with truck traffic approaching six billion miles annually.

I-75 is one of Ohio's oldest interstate highways. Since its original construction in the 1950s, traffic has increased beyond what was originally envisioned. Safety, congestion and geometric problems exist on the Brent Spence Bridge and its approaches. The Brent Spence Bridge, which opened to traffic in 1963, was designed to carry 80,000 vehicles per day. Currently, 150,000 vehicles per day use the Brent Spence Bridge, with truck traffic accounting for 20 percent of the traffic volume. Traffic volumes are projected to increase to 200,000 vehicles per day by 2025.

The I-75 corridor within the Greater Cincinnati/Northern Kentucky region is a major thoroughfare for local and regional mobility (Exhibit 1). The Brent Spence Bridge facilitates local travel by providing access to downtown Cincinnati, Ohio and Covington, Kentucky. As shown in Exhibit 1, this corridor contains two interstates, I-71 and I-75, which connect to I-471 and US Route 50 (US 50). I-71 and I-75 merge in Boone County, Kentucky and follow the same alignment through northern Kentucky and across the Brent Spence Bridge into Ohio. At the north end of the Brent Spence Bridge, I-71 and I-75 divide. I-71 continues to the northeast across Fort Washington Way and I-75 continues to the north. The I-75 corridor is designated differently in Kentucky and Ohio. The Kentucky Transportation Cabinet KYTC identifies the merged section of interstate in northern Kentucky as I-75/I-71. The Ohio Department of Transportation (ODOT) identifies the merged interstate section on the Brent Spence Bridge and its approaches as I-71/I-75.

The I-75 corridor within the Greater Cincinnati/Northern Kentucky region is experiencing problems, which threaten the overall efficiency and flexibility of this vital trade corridor. Areas of concern include, but are not limited to, growing demand and congestion, land use pressures, environmental concerns, adequate safety margins, and maintaining linkage in key mobility, trade, and national defense highways.

The I-75 corridor has been the subject of numerous planning and engineering studies over the years as it is a strategic link in the region's and the nation's highway network. As such, ODOT and KYTC, in cooperation with the FHWA, are proposing to improve the operational characteristics of I-75 and the Brent Spence Bridge in the Greater Cincinnati/Northern Kentucky region through a major transportation project. The purpose of this project is to:

- improve traffic flow and level of service,
- improve safety,
- correct geometric deficiencies, and
- maintain links in key mobility, trade, and national defense transportation corridors.

2.0 PROJECT HISTORY

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) identified High Priority Corridors on the National Highway System (NHS). Among these corridors are I-75 from Toledo to Cincinnati and I-71 between Columbus and Cincinnati. More recent federal surface transportation legislation (the 1998 Transportation Equity Act for the 21st Century [TEA-21] and the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users [SAFETEA-LU]), continued funding for the High Priority Corridors.

In response to ISTEA, ODOT completed a statewide transportation study and strategic plan, *Access Ohio* in 1993, which was updated in 2004. This long-range transportation plan identified “Transportation Efficiency and Economic Advancement Corridors” also known as “macro corridors” throughout the state of Ohio. These corridors are defined as “highways with statewide significance that provide connectivity to population and employment centers in Ohio and the nation by accommodating desired movements of persons and goods”. The I-75 corridor is included in the list of macro corridors.

The Brent Spence Bridge Replacement/Rehabilitation project is included in ODOT’s four-year State Transportation Improvement Program (STIP) for Fiscal Years (FY) 2006-2009. The FY 2006-2009 STIP was approved by the US Department of Transportation effective July 1, 2005 and remains in effect through June 30, 2007. This project is listed in the first three years of the STIP, which indicates that it is eligible for federal funding.

In 1999, the KYTC completed its current long-range multimodal transportation plan (Kentucky Transportation Cabinet, *Statewide Transportation Plan FY 1999–2018*, December 1999). The transportation plan is a 20-year plan for all modes of transportation. The plan consists of two phases – the short range element, which is the Six-Year Transportation Plan, and the long-range element, which is a 14-year plan beyond the six year plan. The long-range element is the principal source for new projects added to the Six-Year Transportation Plan.

Kentucky’s Recommended Six-Year Transportation Plan FY 2005-2010 lists six “Mega-Projects” (projects that will cost or are in excess of $1 billion). The I-71/I-75 Brent Spence Bridge Project is one of the six “Mega-Projects”. The plan notes that I-71/I-75 Brent Spence Bridge “is the focal point for some of the heaviest traffic volumes in Kentucky”, which not only provide a link between two major urban centers (Covington, Kentucky and Cincinnati, Ohio) but also connects the region to one of the nation’s busiest airports, the Cincinnati/Northern Kentucky International Airport located in Boone County, Kentucky.

Kentucky’s STIP covers a three year period, FY 2005-2007. The STIP includes only federally funded projects for non-MPO area counties and only regionally significant state-funded projects. In Kentucky, projects listed on a Metropolitan Planning Organization’s Transportation Improvement Programs (TIP) are incorporated into the STIP through the amendment process by reference. The Ohio-Kentucky-Indiana Regional Council of Governments (OKI), *2030 Regional Transportation Plan 2004 Update*, includes improvements to I-71/75 and the Brent Spence Bridge in Kenton

County in the TIP for FY 2006-2009. Funding is committed for providing additional capacity for I-75 only for a 2.5 mile section south of the Brent Spence Bridge as well as for replacement of the bridge itself.

OKI and the Miami Valley Regional Planning Commission (MVRPC), the Metropolitan Planning Organizations serving the I-75 corridor, formed a partnership in 2000 to undertake a transportation investment analysis of the section of the I-75 corridor from northern Kentucky to Piqua, Ohio to address the current and future transportation issues in the corridor. This analysis, known as the *North-South Transportation Initiative* (2004) was a traditional Major Investment Study (MIS) conducted as part of the merged National Environmental Policy Act (NEPA) process. One goal of this study was to identify strategies to ensure that the I-75 corridor remains effective and efficient at moving people and goods through the region. The study addressed major improvements to all existing modes of transportation and identified appropriate transportation alternatives that need to be incorporated into the regional transportation plans. A preferred program of projects was defined based upon a thorough assessment of transportation needs and consensus of where the region wants to be.

The *North-South Transportation Initiative* recommended a number of capacity and safety improvements for the I-71 and I-75 corridor in Kentucky and I-75 in Ohio. The southern limit of the study area for this project was the I-71/I-75 Interchange in Kentucky. The northern limit on I-75 was north of Piqua, Ohio. A number of major replacement and rehabilitation projects were recommended for advancement into the NEPA Process as a part of the *North-South Transportation Initiative*. One key recommendation was the replacement or rehabilitation of the Brent Spence Bridge in order to provide for improved capacity, access, and safety in this portion of the corridor.

KYTC initiated an engineering feasibility study to investigate replacement options for the Brent Spence Bridge in 2003. The results of this study are documented in the *Brent Spence Bridge Feasibility and Constructability Study* (2005). The study area for this analysis began south of Kyles Lane in Kentucky and extended to the Western Hills Viaduct in Ohio. Concurrently, ODOT began evaluating a number of alternatives for improving segments of I-75 in Ohio, from the area north of the Western Hills Viaduct, to a point north of I-275.

Two projects north of the Brent Spence Bridge were also recommended by the *North-South Transportation Initiative,* the Thru-the-Valley project (PID 76256) and the Mill Creek Expressway project (PID 76257). These projects are being conducted as related studies as part of a program to improve I-75. This is in anticipation of preserving right-of-way and assuring that short term improvements made to the corridor build on each other and provide improved capacity. It is also to assure that responsible transitions between these projects occur.

3.0 PROJECT DESCRIPTION

3.1 Study Area Description

The project study area is located along a 6.5-mile segment of I-75 within the Commonwealth of Kentucky and the State of Ohio. The study area is shown on Exhibit 2 and is 2.82 square miles in size. The southern limit of the project is 2,800 feet south of the midpoint of the Kyles Lane Interchange on I-71/I-75 in Covington, Kentucky. The northern limit of the project is 1,500 feet north of the midpoint of the Western Hills Viaduct Interchange on I-75 in Cincinnati, Ohio.

The eastern and western limits of the study area generally follow the existing alignment of I-75. The study area is a 1,500-foot wide corridor centered on I-75 from the southern limit, near the Kyles Lane Interchange, north to the city of Covington. At Covington, the eastern and western study area boundaries widen and follow city streets as described below:

- Western project limits (from south to north):
  - At KY 5th Street in the city of Covington, the western boundary extends in the northwesterly direction across the Ohio River to US 50, approximately 1,000 feet west of the Freeman Avenue Interchange.
  - The western limit extends northerly parallel to Dalton Avenue to Hopkins Street.
  - The western limit extends westerly along Hopkins Street to the western limits of Union Terminal, where it then extends northerly along the western limits of Union Terminal to Kenner Street.
  - The western limit follows easterly along Kenner Street to the intersection with Dalton Avenue.
  - The western limit parallels Dalton Avenue to north of Findlay Street, where it follows in the northerly direction with a consistent 750-foot offset from the I-75 centerline.

- Eastern project limits (from south to north):
  - In the city of Covington, the eastern boundary follows Philadelphia Street to its intersection with KY 5th Street.
  - The eastern boundary follows KY 5th Street to its intersection with Main Street and then follows Main Street to the Ohio River.
  - The eastern boundary parallels the Clay Wade Bailey Bridge across the Ohio River to Pete Rose Way in the city of Cincinnati.
  - Through downtown Cincinnati, the eastern boundary follows Second Street and US 50 eastbound to approximately the I-71/US 50 interchange, then westerly along Third Street, Pike Street and Fourth Street to Elm Street, then northward until it reaches West Court Street.
  - From West Court Street, the eastern boundary extends west to Linn Street, where it follows Linn Street to Central Parkway.

- The eastern boundary extends north paralleling Central Parkway to Linn Street.
- From Linn Street, the eastern boundary extends westerly to Bank Street.
- From Bank Street, the eastern limits extend in the northerly direction with a consistent 750-foot offset from the I-75 centerline.

3.2 Logical Termini

Federal requirements for logical termini require project limits that have independent transportation utility. It must be of sufficient size to consider all environmental impacts that will result from the proposed improvement. This requires the termini of the study to have logical end points in the roadway and highway network and that the project limits are of sufficient length and width that common environmental and social concerns can be addressed in a meaningful way. The logical termini for this project are rational end points for the transportation improvement and rational limits for the review of the environmental impacts resulting from implementation of the improvement.

There are four logical termini for the project:

- The southern terminus is the I-75/Kyles Lane Interchange in Kentucky.
- The eastern terminus is Fort Washington Way at the interchange with I-71 and US 50 in Ohio.
- The western terminus is the US 50/Freeman Avenue Interchange in Ohio.
- The northern terminus is the I-75/Western Hills Viaduct Interchange in Ohio.

These interchanges were selected as the logical termini for the project because they are existing interchanges that serve as points of access to the regional and interstate highway system in the area. In addition, these termini were selected based upon the need to achieve a seamless connection with the existing regional transportation system without creating new access points.

KYTC has made a number of improvements to the interstate from the area south of the south abutment of the Brent Spence Bridge to Dixie Highway. This included the removal of the major "S" curve between KY 5th Street and Kyles Lane. This improvement, referred to as "The Cut in the Hill," eliminated poor roadway geometry, and decreased the likelihood of crashes in the area. South of the Kyles Lane interchange, KYTC made improvements to I-75 that eliminated another sharp curve at Dixie Highway. KYTC recommended that the southern terminus of the improvement of the Brent Spence Bridge project should be at the northern terminus of these completed improvements. The KY 12th Street exit in Covington may be the construction limits of improvements required to replace or rehabilitate the Brent Spence Bridge. Therefore, the study area was extended south to the next major interchange at Kyles Lane.

From the south abutment of the Brent Spence Bridge, I-71 and I-75 cross the Ohio River and split as I-71 turns to the northeast across Fort Washington Way and I-75 continues north. Fort Washington Way was reconstructed in 2000 to improve the capacity, congestion, and substandard geometry of this southernmost portion of I-71 in Ohio. The logical terminus of the study on I-71 is beyond the interchange between I-75 and I-71 in southwestern Cincinnati. The eastern terminus is Fort Washington Way at the interchange with I-71 and US 50 in Ohio.

Just north of the I-71/I-75 interchange, US 50 intersects with I-75 near OH 6th Street in southwestern Cincinnati. US 50 provides access from I-75 into the Queensgate area, western Hamilton County, and Indiana. The western terminus of the study area is west of the interchange with Gest Street. It is the first interchange west of I-75 on US 50. The old street grid that existed in the Queensgate area continues over the interstate by bridges which connect the streets. Ramps provide on and off access to the interstate.

I-75 continues north through a dense urban area to the Western Hills Viaduct, which is the northern terminus. This area is a combination of industrial and residential development located close to the mainline of the interstate. According to 2000 US Census data, this area of Cincinnati possesses a much higher population density than areas to the north, has more persons below poverty level, and more households with no vehicle available. Western Hills Viaduct is the first interchange north of the downtown area where connectivity is provided to a primary arterial both east and west of the freeway. South of this interchange, all of the connections are provided to local streets or to arterials that connect into the downtown area. North of the Western Hills Viaduct is the Mill Creek Expressway project southern terminus, which is currently in the preliminary engineering phase.

3.3 Independent Utility

FHWA regulations 23 CFR part 777.111(f) state, "In order to ensure meaningful evaluation of alternatives and to avoid commitments to transportation improvements before the are fully evaluated, the action evaluated in each environmental impact statement (EIS) or finding of no significant impact (FONSI) shall:

1. Connect logical termini and be of sufficient length to address environmental matters on a broad scope;
2. Have independent utility or independent significance, i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made; and
3. Not restrict consideration of alternatives for other reasonably foreseeable transportation improvements."

This regulation anticipates that an agency's National Environmental Policy Act (NEPA) review of a highway project may be separated into smaller segments if circumstances and facts so warrant.

The *North-South Transportation Initiative* recommended a number of capacity and safety improvements for the I-71/I-75 corridor in Kentucky and the I-75 corridor in Ohio. The southern limit of the study area for this project was the I-71/I-75 interchange in Kentucky. The northern limit was on I-75 north of Piqua, Ohio. The *North-South Transportation Initiative* recommended the following major projects within the Greater Cincinnati/ Northern Kentucky region for advancement into the NEPA Process:

- Thru-the-Valley project (PID 76256)
- Mill Creek Expressway project (PID 76257)
- Brent Spence Bridge project (PID 75119; KYTC Project No. 6-17)

ODOT's decision to pursue three separate projects for the I-75 corridor is consistent with FHWA regulations. The three studies along this corridor have logical termini which are rational transportation and environmental end points, and are geographically continuous.

The I-71/I-75 corridor improvements in Kentucky and the I-75 corridor improvements in Ohio function independently of each other and improvements in any one section of these transportation corridors provide direct transportation and safety benefits within that section, regardless of whether any of the other sections are improved.

4.0 TRANSPORTATION ISSUES

The project purpose is to provide a facility that meets the transportation demand for high-speed regional travel in the Greater Cincinnati/Northern Kentucky area that is now provided by I-71/I-75 and the Brent Spence Bridge. More specifically, several issues justify the need for improvements to this corridor; these are:

- Existing and future traffic demand,
- Safety,
- Highway and bridge design deficiencies, and
- System linkage.

4.1 Existing and Future Traffic Demand

The I-71/I-75 corridor within the Greater Cincinnati/Northern Kentucky region has experienced substantial traffic growth over the past several years. As a result, traffic congestion is a primary problem on I-71/I-75 within the study area. Several sections of the interstate system within the study area operate at capacity or beyond capacity during peak traffic hours. Today, the average daily traffic volume (ADT) along the I-71/I-75 corridor within the Greater Cincinnati/Northern Kentucky region totals approximately 150,000 vehicles per day of which approximately 30,000 are freight vehicles (heavy trucks). Future projections estimate that the average daily traffic volume will exceed 200,000 vehicles per day by 2025.

A comprehensive traffic analysis was conducted for the project in order to obtain a detailed understanding of traffic patterns within the study area. Mainline interstate segments, interchange ramp merge and diverge points, and local intersections were studied. The analysis determined AM and PM design hour volumes and levels of service (LOS) for existing (2005) and future conditions (2030). The traffic analysis is discussed in detail in the *Brent Spence Bridge Existing and Future Conditions Report* (2006).

4.1.1 I-71 and I-75 Mainline Analysis

Table 1 presents the results of the 2005 existing conditions analyses performed on the mainline segments of I-71 and I-75 within the study area. The AM peak traffic hour on I-71 and I-75 within the study area occurs between 7:30 and 8:30 AM. The northbound and southbound lanes of I-75 north of the Brent Spence Bridge accommodate the highest volumes of traffic during the AM peak period. The northbound and southbound lanes of I-71/I-75 south of the Brent Spence Bridge accommodate more traffic during the PM peak period, which occurs between 4:30 and 5:30 PM. East of I-75, I-71 northbound carries more traffic during the AM peak period, while I-71 southbound is more heavily traveled during the PM peak period. While no segments on I-71 currently operate at

LOS E or F, many segments on the combined section of I-71 and I-75, as well as I-75 operate at LOS E or F, and several segments operate at LOS D.

Table 1. 2005 I-71 and I-75 Mainline Segments

Segment			AM Peak Period			PM Peak Period		
	From	To	Volume	LOS	Density (pc/mi/ln)	Volume	LOS	Density (pc/mi/ln)
I-71/I-75 Northbound	Kyles Lane Merge	West KY 12th Street Diverge	5806	E	37.5	5092	D	29.7
	West KY 12th Street Diverge	West KY 5th Street Diverge	5576	D	34.6	4596	C	25.8
	West KY 5th Street Diverge	Pike Street Merge	4964	D	28.6	4098	C	22.6
	Pike Street Merge	West KY 4th Street Merge	5866	E	38.3	4464	C	24.9
	Brent Spence Bridge South	Brent Spence Bridge North	6964	D	30.9	5408	C	22.3
I-75 Northbound	I-71 Diverge	West OH 5th Street Diverge	3429	D	30.2	3616	D	32.9
	West OH 5th Street Diverge	US 50 Diverge	2845	C	23.6	3400	D	29.8
	US 50 Diverge	I-71 Merge	2182	B	17.9	2771	C	22.9
	I-71 Merge	West OH 9th Street Merge	3862	B	15.9	5750	C	23.9
	West OH 9th Street Merge	Freeman Avenue Merge	4046	B	16.6	6621	D	28.6
	Freeman Avenue Merge	Ezzard Charles Drive Merge	4599	C	18.9	7230	D	32.9
	Ezzard Charles Drive Merge	Western Hills Viaduct Diverge	4689	C	19.3	7550	E	35.6
	Western Hills Viaduct Diverge	Western Hills Viaduct/Bank Street Merge	4316	B	17.7	6783	D	29.7
	North of Western Hills Viaduct Merge		5273	C	21.7	7611	E	36.2
I-71 Northbound	South of OH West 2nd Street Diverge	West OH 2nd Street Diverge	3535	D	31.4	1792	B	14.6
	West OH 2nd Street Diverge	I-75 Southbound/US 50 Merge	2662	C	21.8	1498	B	12.2
	I-75 Southbound/US 50 Merge		5855	C	24.3	4254	B	17.4

Notes: LOS = Level of Service; pc/mi/ln = passenger car per mile per lane; * Capacity exceeds HCS calculations

Table 1. 2005 Operating Conditions, I-71 and I-75 Mainline Segments

Segment			AM Peak Period			PM Peak Period		
	From	To	Volume	LOS	Density (pc/mi/ln)	Volume	LOS	Density (pc/mi/ln)
I-75 Southbound	North of Western Hills Viaduct		8304	E	44.3	5846	C	24.4
	Western Hills Viaduct Merge	Findlay Street Diverge	9007	D	32.7	5642	C	18.5
	Findlay Street Diverge	Ezzard Charles Drive Diverge	8372	F	*	5033	C	20.7
	Ezzard Charles Drive Diverge	Freeman Avenue Diverge	7871	E	38.9	4842	C	19.9
	Ezzard Charles Drive Merge	West OH 7th Street Diverge	7314	D	33.6	4660	C	19.1
	I-71 Diverge	West OH 9th Street Merge	2959	C	24.7	2115	B	17.4
	West OH 9th Street Merge	US 50 Merge	3126	D	26.5	2569	C	21.1
	US 50 Merge	I-71 Merge	3673	D	33.8	3230	D	27.7
I-71/I-75 Southbound	Brent Spence Bridge North	Brent Spence Bridge South	5280	C	21.8	7156	D	32.3
	West KY 5th Street Diverge	Pike Street Diverge	4605	C	18.9	6429	D	27.5
	Pike Street Diverge	West KY 4th Street Merge	4324	B	17.8	5836	C	24.3
	West KY 12th Street Merge	Kyles Lane Diverge	5039	C	20.7	7277	D	33.3
	West KY 4th Street Merge	West KY 12th Street Merge	4718	C	19.4	6739	D	29.4
	West KY 12th Street Merge	Kyles Lane Diverge	5039	C	20.7	7277	D	33.3
I-71 Southbound	East of 1-75 Northbound Diverge		3746	B	15.3	5566	C	22.9

Notes: LOS = Level of Service; pc/mi/ln = passenger car per mile per lane; * Capacity exceeds HCS calculations

Table 2 presents the results of the 2030 future condition analyses of the mainline segments of I-71 and I-75 within the study area. In 2030, the combined section of I-71/I-75 will operate at a LOS F in the AM and poorly (LOS ranges from D to F) in the PM peak hours. Similarly, I-75 north of the Brent Spence Bridge will operate poorly in both the AM and PM peak periods in 2030. The northbound lanes of I-71 will operate at LOS

D and E during the AM peak hour. The I-71 southbound lanes during the AM and PM peak hours and the northbound lanes during the PM peak hours will operate at LOS B and C.

Table 2. 2030 Operating Conditions, I-71 and I-75 Mainline Segments

Segment			AM Peak Period			PM Peak Period		
	From	To	Volume	LOS	Density (pc/mi/ln)	Volume	LOS	Density (pc/mi/ln)
I-71/I-75 Northbound	Kyles Lane Merge	West KY 12th Street Diverge	7736	F	*	6434	F	*
	West KY 12th Street Diverge	West KY 5th Street Diverge	7594	F	*	6011	E	40.5
	West KY 5th Street Diverge	Pike Street Merge	7001	F	*	5610	D	35.0
	Pike Street Merge	West KY 4th Street Merge	8008	F	*	6028	E	40.8
	Brent Spence Bridge South	Brent Spence Bridge North	9253	F	*	6884	D	30.3
I-75 Northbound	I-71 Diverge	West OH 5th Street Diverge	5348	F	*	4628	F	*
	West OH 5th Street Diverge	US 50 Diverge	4460	F	*	4340	F	*
	US 50 Diverge	I-71 Merge	3626	D	33.1	3737	D	34.9
	I-71 Merge	West OH 9th Street Merge	5996	C	25.1	6971	D	30.9
	West OH 9th Street Merge	Freeman Avenue Merge	6204	D	26.2	7610	E	36.2
	Freeman Ave Merge	Ezzard Charles Drive Merge	6612	D	28.6	8156	E	42.3
	Ezzard Charles Drive Merge	Western Hills Viaduct Diverge	6699	D	29.1	8766	F	*
	Western Hills Viaduct Diverge	Western Hills Viaduct/Bank Street Merge	6236	D	26.4	8134	E	42.0
	North of Western Hills Viaduct Merge		7104	D	31.9	8850	F	*
I-71 Northbound	South of West OH 2nd Street	West OH 2nd Street Diverge	3905	E	37.8	2256	C	18.4
	West OH 2nd Street Diverge	I-75 Southbound/US 50 Merge	3097	D	26.0	1866	B	15.3
	East of I-75 Southbound/US 50 Merge		6290	D	26.5	4621	C	18.9

Notes: LOS = Level of Service; pc/mi/ln = passenger car per mile per lane; * Capacity exceeds HCS calculations

Table 2. 2030 Operating Conditions, I-71 and I-75 Mainline Segments

Segment			AM Peak Period			PM Peak Period		
	From	To	Volume	LOS	Density (pc/mi/ln)	Volume	LOS	Density (pc/mi/ln)
I-75 Southbound	North of Western Hills Viaduct		9333	F	*	7688	E	36.9
I-75 Southbound	Western Hills Viaduct Merge	Findlay Street Diverge	9985	E	40.2	7662	C	25.8
I-75 Southbound	Findlay Street Diverge	Ezzard Charles Diverge	9345	F	*	7023	D	31.3
I-75 Southbound	Ezzard Charles Drive Diverge	Freeman Avenue Diverge	8934	F	*	6763	D	29.5
I-75 Southbound	Ezzard Charles Drive Merge	West OH 7th Street Diverge	8516	F	*	6750	D	29.5
I-75 Southbound	I-71 Diverge	West OH 9th Street Merge	3951	E	39.2	3526	D	31.5
I-75 Southbound	West OH 9th Street Merge	US 50 Merge	4228	F	*	4124	E	43.5
I-75 Southbound	US 50 Merge	I-71 Merge	4781	F	*	4904	F	*
I-71/I-75 Southbound	Brent Spence Bridge North	Brent Spence Bridge South	6636	D	28.7	9114	F	*
I-71/I-75 Southbound	West KY 5th Street Diverge	Pike Street Diverge	6158	C	26.0	8641	F	*
I-71/I-75 Southbound	Pike Street Diverge	West KY 4th Street Merge	5821	C	24.3	8034	E	40.8
I-71/I-75 Southbound	West KY 4th Street Merge	West KY 12th Street Merge	6199	D	26.2	9125	F	*
I-71/I-75 Southbound	West KY 12th Street Merge	Kyles Lane Diverge	6505	D	27.9	9671	F	*
I-71 Southbound	East of I-75 Northbound Diverge		4327	B	17.7	6086	C	25.4

Notes: LOS = Level of Service; pc/mi/ln = passenger car per mile per lane; * Capacity exceeds HCS calculations

4.1.2 I-71 and I-75 Ramp-Freeway Junctions

Traffic congestion throughout the highway network is also attributable to the many merge and diverge locations at interchanges along I-71 and I-75. Tables 3 and 4 present the results for the 2005 existing conditions and 2030 future conditions analyses performed on interchange ramps within the study area. The traffic analyses determined that numerous interchanges currently operate at LOS D, E, and F during both the AM and the PM peak hours and service will continue to degrade through 2030 without any improvements.

Table 3. 2005 Operating Conditions, I-71 and I-75 Ramps

	Ramp	Junction	AM Peak Period		PM Peak Period	
			LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-71/I-75 Northbound	Kyles Lane Entrance Ramp	Merge	E	36.0	D	30.3
	West KY 12th Street Exit Ramp	Diverge	E	36.5	D	33.7
	West KY 5th Street Exit Ramp	Diverge	E	35.8	D	31.2
	Pike Street Entrance Ramp	Merge	E	35.1	C	26.0
	West 4th Street Entrance Ramp**	Add Lane	E	38.3 [U]	C	24.9 [U]
	I-71 Northbound Exit Ramp**	Drop Lane	D	33.5 [R]	D	32.9 [D]
I-75 Northbound	West OH 5th Street Exit Ramp	Diverge	E	35.4	E	37.2
	US 50 Exit Ramp	Diverge	E	35.6	E	35.4
	I-71 Entrance Ramp**	Add Lane	B	17.9 [U]	C	24.4 [R]
	West OH 9th Street Entrance Ramp	Merge	B	14.4	C	20.4
	Freeman Avenue Entrance Ramp	Merge	B	16.0	C	21.3
	Ezzard Charles Drive Entrance Ramp	Merge	B	16.0	C	23.0
	Western Hills Viaduct Exit Ramp	Diverge	C	20.8	E	35.3
	Bank Street Entrance Ramp	Merge	B	18.9	C	24.4
I-71 Northbound	West OH 2nd Street Exit Ramp	Diverge	E	35.2	B	18.1
	I-75 Southbound Entrance Ramp**	Add Lane	D	26.7 [R]	C	22.4 [R]

Table 3. 2005 Operating Conditions, I-71 and I-75 Ramps

	Ramp	Junction	AM Peak Period		PM Peak Period	
			LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-75 Southbound	Western Hills Viaduct Exit Ramp	Diverge	F*	37.3	D	28.6
I-75 Southbound	Western Hills Entrance/Findlay Street Exit	Weave	F*	44.4	C	25.3
I-75 Southbound	Ezzard Charles Drive Exit Ramp	Diverge	F*	38.1	C	22.0
I-75 Southbound	Freeman Avenue Exit Ramp	Diverge	F*	36.9	C	22.6
I-75 Southbound	West 7th Street Exit	Weave	E	35.5	B	19.3
I-75 Southbound	Ezzard Charles Drive Entrance/					
I-75 Southbound	I-71/West OH 5th Street Exit Ramp**	Drop Lane	C	25.8 [R]	C	19.2 [R]
I-75 Southbound	West OH 9th Street Entrance Ramp	Merge	D	30.4	C	25.2
I-75 Southbound	US 50 Entrance Ramp	Merge	F*	35.9	D	31.8
I-71/I-75 Southbound	I-71 Entrance Ramp**	Add Lane	D	33.8 [U]	E	39.1 [R]
I-71/I-75 Southbound	West OH 5th Street Exit Ramp	Diverge	D	29.5	E	37.8
I-71/I-75 Southbound	Pike Street Exit Ramp	Diverge	C	22.9	D	32.4
I-71/I-75 Southbound	West KY 4th Street Entrance Ramp	Merge	B	15.8	B	19.5
I-71/I-75 Southbound	West KY 12th Street Entrance Ramp	Merge	B	19.8	C	26.4
I-71/I-75 Southbound	Kyles Lane Exit Ramp	Diverge	C	26.6	E	38.3
I-71 Southbound	West OH 3rd Street Entrance Ramp	Merge	B	16.1	E	36.4
I-71 Southbound	I-75 Northbound/US 50 Exit Ramp**	Drop Lane	C	18.6 [R]	D	26.9 [D]

Notes: LOS = Level of Service; pc/mi/ln = passenger car per mile per lane.
* Failed capacity check for ramp or freeway (implies that the density exceeds the capacity of the facility).
** Values represent the result for the worst operating component of the ramp junction.
[R] = Ramp operates the worst; [U] = Upstream freeway operates the worst; [D] = Downstream freeway operates the worst

Table 4. 2030 Operating Conditions, I-71 and I-75 Ramps

	Ramp	Junction	AM Peak Period		PM Peak Period	
			LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln
I-71/I-75 Northbound	Kyles Lane Entrance Ramp	Merge	F*	45.9	F*	37.4
	West KY 12th Street Exit Ramp	Diverge	F*	43.4	F*	49.2
	West KY 5th Street Exit Ramp	Diverge	F*	43.1	F*	37.3
	Pike Street Entrance Ramp	Merge	F*	46.9	F*	34.5
	West OH 4th Street Entrance Ramp**	Add Lane	F*	[U]	E	40.8 [U]
	I-71 Northbound Exit Ramp**	Drop Lane	F*	[U]	F*	[D]
I-75 Northbound	West OH 5th Street Exit Ramp	Diverge	F*	54.3	F*	47.2
	US 50 Exit Ramp	Diverge	F*	45.8	F*	44.6
	I-71 Entrance Ramp**	Add Lane	D	33.1 [U]	D	34.9 [U]
	West OH 9th Street Entrance Ramp	Merge	C	20.4	C	22.9
	Freeman Avenue Entrance Ramp	Merge	C	20.4	F*	23.3
	Ezzard Charles Drive Entrance Ramp	Merge	C	21.5	F*	24.7
	Western Hills Viaduct Exit Ramp	Diverge	D	30.0	F*	39.8
	Bank Street Entrance Ramp	Merge	C	23.1	F*	27.9
1-71 Northbound	West OH 2nd Street Exit Ramp	Diverge	F*	38.9	C	22.6
	I-75 Southbound Entrance Ramp	Add Lane	D	26.7 [R]	C	22.4 [R]
I-75 Southbound	Western Hills Viaduct Exit Ramp	Diverge	F*	41.5	E	35.8
	Western Hills Entrance/Findlay Street Exit	Weave	F*	51.2	E	36.1
	Ezzard Charles Drive Exit Ramp	Diverge	F*	41.8	D	31.0
	Freeman Avenue Exit Ramp	Diverge	F*	40.8	D	30.4
	Ezzard Charles Drive Entrance/West OH 7th Street Exit	Weave	E	42.3	D	29.7
	I-71/ West OH 5th Street Exit Ramp**	Drop Lane	E	39.2 [D]	D	31.5 [D]

Table 4. 2030 Operating Conditions, I-71 and I-75 Ramps

	Ramp	Junction	AM Peak Period		PM Peak Period	
			LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
I-71/I-75 Southbound	West OH 9th Street Entrance Ramp	Merge	F*	40.2	F*	39.0
	US 50 Entrance Ramp	Merge	F*	45.8	F*	46.8
	I-71 Entrance Ramp**	Add Lane	F*	[D]	F*	[R]
	West OH 5th Street Exit Ramp	Diverge	D	34.2	F*	44.9
	Pike Street Exit Ramp	Diverge	D	29.9	F*	42.1
	West KY 4th Street Entrance Ramp	Merge	B	19.0	F*	22.4
	West KY 12th Street Entrance Ramp	Merge	C	24.7	F*	33.6
I-71 Southbound	West OH 3rd Street Entrance Ramp	Merge	B	18.3	F*	39
	I-75 Northbound/US 50 Exit Ramp	Drop Lane	C	21.3[R}	D	32.5[D]

Notes: LOS = Level of Service
pc/mi/ln = passenger car per mile per lane
* Failed capacity check for ramp or freeway (implies that the density exceeds the capacity of the facility)
** Values represent the result for the worst operating component of the ramp junction
[R] = Ramp operates the worst; [U] = Upstream freeway operates the worst; [D] = Downstream freeway operates the worst

4.1.3 Local Street At-Grade Intersections

The traffic analysis also examined 47 signalized and eight unsignalized local street intersections within the study area. Detailed data for each intersection analyzed are presented in the *Brent Spence Bridge Existing and Future Conditions Report* (2006).

In general, most of the study area local street intersections currently operate at a LOS B and C. However, the intersections adjacent to the Kyles Lane Interchange at the southern end of the study area operate at a LOS F during both the AM and PM peak periods. In addition, several local street intersections in Kentucky operate at a LOS D during one or both peak traffic periods. These include:

- West 4th Street at Philadelphia Street,
- Pike Street at Jillians Way, and
- West 12th Street at Jillians Way.

The West 3rd Street and Central Avenue intersection in Cincinnati operates at a LOS D during both AM and PM peak periods. The West 3rd Street and Clay Wade Bailey Bridge intersection in Cincinnati currently operates at LOS E during the PM peak hour.

The analysis of future conditions shows that five local street intersections in Kentucky will operate at a LOS F in 2030, which include:

- West 4th Street at Main Street (AM and PM peak period)
- West 12th Street at Bullock Street (AM peak period)
- West 12th Street at Jillians Way (AM and PM peak period)
- Kyles Lane at Dixie Highway (AM and PM peak period)
- Kyles Lane at Highland Pike (AM and PM peak period)

One intersection in Ohio will operate at a LOS E during the PM peak traffic period in 2030, which is at West 3rd Street and Central Avenue.

4.2 Safety

A second major concern associated with the Brent Spence Bridge Project is motorist safety. Crash rates for I-71 and I-75 corridor within the study area are higher than statewide averages for both Kentucky and Ohio. The majority of crashes are rear-end collisions and sideswipes, which are typical accidents on congested highways.

Two separate safety studies were completed for the study area which focused on three distinct sections of the interstate system, as listed below:

- I-71/I-75 in Kenton County, Kentucky between SLM 187.70 near the Dixie Highway (US 25 interchange) and SLM 191.77 at the Kentucky/Ohio border
- I-75 in Hamilton County, Ohio between SLM 0.00 at the Kentucky/Ohio border to SLM 2.90 north of the Western Hills Viaduct Interchange; and I-71 in Hamilton County, Ohio between SLM 0.22 (I-75) at the junction with I-75 and SLM 0.90 at Walnut Street

Crash data for Kentucky was provided by the KYTC Division of Traffic Operations, Traffic Safety Data Service. The crash data for Ohio was provided by ODOT's Office of Roadway Safety and Mobility and the Ohio Department of Public Safety. This document presents the results of two separate studies, one for each State. To be consistent with each States' reporting guidelines and system, crash data is being compared with each States' statistical record.

The methodology used and the results of these analyses are further discussed in detail in the *Brent Spence Bridge Existing and Future Conditions Report* (2006).

4.2.1 Safety Study - I-75 Kenton County, Kentucky (US 25 – Kentucky/Ohio State Line)

An analysis of safety data obtained from the KYTC for the period between 2001 and 2003 was conducted for the section of I-71/I-75 from a point just north of the US 25 (Dixie Highway) Interchange and the Kentucky/Ohio border. The analysis of this section of I-71/I-75 showed the following:

- The crash severity rate ([fatality accidents + injury accidents] / total accidents) is 0.1953.
- Of the 676 total crashes, 349 of the accidents (51.6 percent) were rear-end type crashes, while another 219 (32.4 percent) were categorized as sideswipe accidents.
- Approximately 67.3 percent of the crashes occurred during daylight, and about 74.3 percent occurred on dry pavement, suggesting that road and light conditions

may not be major factors in influencing accidents since most took place during favorable situations.

- The overall crash rate (accidents per 100 million vehicle miles traveled) for the Kentucky section of I-71/I-75 equaled 130.363, which is 1.33 times greater than the statewide (Kentucky) average crash rate for an interstate facility (93 accidents per 100 million vehicle miles traveled for years 2000 through 2003).
- The Critical Rate Factor calculated for this section of I-75 was 1.304, nearly 7.67 times higher than the average of 0.17 for similar roadway types in Kentucky.

After reviewing the crash reports obtained from the KYTC and plotting the accidents in a Geographic Information System (GIS), the following observations were made about the I-71/I-75 corridor in Kentucky. This information is shown on Exhibits 5 and 6.

- Approximately 56.4 percent of the accidents on I-71/I-75 in Kentucky occurred in the northbound lanes.
- There is a high concentration of single vehicle crashes on I-71/I-75 northbound on a curve located near SLM 189.7 north of the Kyles Lane Interchange.
- There are three locations with high concentrations of rear-end accidents on I-71/I-75 northbound - just north of the Kyle's Lane exit near SLM 188.8, just north of the Kyle's Lane exit near SLM188.9; and nearing the vicinity of SLM191.0 near the KY 12th Street/Pike Street exit.
- Locations along the southbound lanes of I-71/I-75 with high concentrations of rear-end accidents include the mainline near SLM 191.0 at southbound KY 12th Street/Pike Street exit ramp and the mainline near SLM 191.2 at KY 5th Street exit ramp.
- There is a high concentration of sideswipe accidents on the southbound mainline near SLM 191.2 at the KY 5th Street exit ramp.

Along this section of I-71/I-75, more than half of the crashes are rear-end type accidents, which are common to slow moving and congested peak hour traffic conditions like those found along this section of highway. The traffic analysis indicates that specific section of the northbound travel lanes operate at a poor level of service during the AM period between Kyles Lane and the Brent Spence Bridge. Additionally, the majority of entrance and exit ramps along the northbound lanes operate at a LOS E in the AM peak and a LOS D during the PM peak. While the southbound lanes operate at a slightly improved rate, the Pike Street and Kyles Lane exit ramps now operate at a LOS E in the PM peak period. The poor operating conditions of the entrance and exit ramps result in bottleneck and stop-and-go traffic conditions, which could result in more accidents. Also, traffic incidents such as traffic accidents and vehicle breakdowns can cause increased traffic congestion by temporarily reducing the physical capacity of the highway. The high incidences of crashes within the study area likely leads to increasing congestion along the corridor, as the congestion continues to increase, the likelihood of additional accidents also increases.

4.2.2 Safety Study - I-75 Hamilton County, Ohio (SLM 0.00 to SLM 2.90) and I-71 Hamilton County, Ohio (SLM 0.30 to SLM 0.90)

An analysis of safety data obtained from ODOT's Office of Roadway Safety and Mobility and the Ohio Department of Public Safety (ODPS) for the period between 2001 and 2003 was conducted for a 2.9-mile section of I-75 between the Kentucky/Ohio State Line and a point located just north of the Western Hills Viaduct Interchange (SLM 0.00 to SLM 2.90) and a 0.9-mile section of I-71 between SLM 0.00 at the junction with I-75 and SLM 0.90 near Walnut Street.

Based on the review of safety management databases maintained by ODOT, these sections of I-71 and I-75 have been designated as a corridor with safety concerns. As shown in Table 5, two locations on I-71 and four locations on I-75 within the study area are listed in ODOT's High Crash Location Identification System (HCLIS). This system is used to identify high hazard locations throughout the state. One section on I-71 (SLM 0.50 to 1.00) ranks fourth of all projects on the HCLIS listing, while the section from SLM 0.00 to 0.29 ranks 96th on the HCLIS list. The three locations on I-75 in the study area rank in the top 100 locations on the HCLIS list.

Table 5. ODOT High Crash Location Identification System Listings on I-71 and I-75 within the Study Area

Location	Begin Point	End Point	Location Type	HCLIS Rank
I-75 Corridor Segments and Interchanges	Kentucky/Ohio State Line (SLM 0.00)	North of the I-71/I-75 Interchange (SLM 0.49)	Section	22
	North of the I-71/I-75 interchange (SLM 0.50)	South of Linn Street (SLM 0.99)	Section	28
	Linn Street (SLM 1.00)	North of Western Hill Viaduct (SLM 2.90)	Section	36
I-71 Corridor Segments and Interchanges	Junction at I-75 (SLM 0.00)	Clay Wade Bailey Bridge Crossing (SLM 0.29)	Section	96
	Central Parkway Crossing (SLM 0.50)	Main Street Crossing (SLM 1.00)	Section	4

Source: Ohio Department of Transportation, Office of Roadway Safety and Mobility, High Crash Location Identification System, 2005.

ODOT's Office of Roadway Safety and Mobility lists I-71 between SLM 0.00 and SLM 2.00 as well as I-75 between SLM 0.22 and SLM 4.22 as a Safety Hot Spot (Table 6). Safety Hot Spot locations are based on the total number of accidents over a three-year period in an area regardless of traffic volume and other factors. Ohio roadways are divided into two-mile segments, and the number of crashes for each two-mile segment is compared to a given rate to establish if a Hot Spot exists.

Table 6. ODOT Safety Hot Spot List Listings
I-71 and I-75 within the Study Area (Two Mile Segments)

Location	Begin Point	End Point	Number of Crashes	Number of Fatalities	Number of Injuries
I-75 Corridor Segments	I-71/I-75 Interchange (SLM 0.22)	Liberty Street Crossing (SLM 2.22)	1,005	4	239
	Liberty Street Crossing (SLM 2.22)	North of Project Terminus (SLM 4.22)	802*	2	205
I-71 Corridor Segments	Kentucky / Ohio State Line (SLM 0.00)	East of Project Terminus (SLM 2.00)	721**	2	162

Source: Ohio Department of Transportation, Office of Roadway Safety and Mobility Safety Hot Spot List, 2001-2003.
* Number of crashes between SLM 2.20 and SLM 2.90 was 225.
** Number of crashes between SLM 0.00 and SLM O.90 was 291.

Related to the safety issue is highway congestion. Two sections of I-75 within the study area are among the most congested in Ohio. Congested areas are determined by calculating a roadway's volume to capacity ratio; roadways with a ratio greater than one are considered congested. The section of I-71 between SLM 0.48 and SLM 0.50 is ranked as the third most congested highway in the state. The section of I-75 between the OH 5th-6th Street Connector Crossing and the Liberty Street Crossing is ranked second in Ohio, while the section beginning just south the Ezzard Charles Crossing and extending beyond the northern limit of the study area is ranked 31st most congested highway in Ohio (Table 7).

Table 7. Congested Sections
Brent Spence Bridge Project Study Area

Location	Begin Point	End Point	Roadway Safety and Mobility Congestion List Rank
I-75 Corridor Segments	OH 5th Street-6th Street Connector Crossing (SLM 0.71)	North of OH 8th Street Crossing (SLM 0.90)	2
	South of Ezzard Charles Crossing (SLM 1.35)	North of Western Hills Viaduct (SLM 17.47)	31
I-71 Corridor Segments	Kentucky/Ohio State Line (SLM 0.00)	I-71/I-75 interchange (SLM 0.22)	62
	Fort Washington Way Exit Ramp (SLM 0.48)	I-75 Southbound Entrance Ramp (SLM 0.50)	3
	East of Main Street Crossing (SLM 1.15)	East of Project Terminus (SLM 1.34)	4

Source: Ohio Department of Transportation Office of Roadway Safety and Mobility Congestion List, 2005.

The observations made through the analysis of the I-75 crash data are listed below:

- Between 2001 and 2003, 690 mainline accidents were reported between SLM 0.22 and SLM 2.22; 225 mainline accidents were reported between SLM 2.22 and SLM 2.90 (the northern terminus of the study area); 577 mainline accidents were reported between SLM 2.90 and SLM 4.22; and in addition, between SLM 0.22 and SLM 2.22, 315 accidents were reported on entrance/exit ramps.
- The crash severity rate ([fatality accidents + injury accidents] / total accidents) is 0.233.
- Of the 915 mainline crashes in the study area, 504 of the accidents (55.1 percent) were attributed to rear-end type crashes; while another 256 (28.0 percent) were attributed to sideswipes.
- Approximately 67.8 percent of the crashes occurred during daylight, and about 69.4 percent occurred on dry pavement, suggesting that road and light conditions may not be large factors in influencing accidents since the majority of them occurred during favorable situations.
- The overall crash rate for the I-75 corridor within the study area is 3.54, which is more than two times greater than the Ohio statewide average rate of 1.338 accidents per million vehicle miles traveled.
- Crash rates (accidents per million vehicle miles traveled) calculated for the section of I-75 in Hamilton County, Ohio show that the overall crash rates for most individual segments along I-75 are higher than the average crash rates for similar facilities in Ohio. The Ohio statewide average crash rate for similar facilities is 1.338 accidents per million vehicle miles traveled.
- The worst segment (OH 5^{th}-6^{th} Street Connector) has a crash rate more than six times greater than the Ohio statewide average.

The observations made through analysis of the I-71 crash data are listed below:

- Between 2001 and 2003, 141 mainline accidents were reported between SLM 0.00 and SLM 0.20; 150 mainline crashes were reported between SLM 0.20 to SLM 0.90 (the end of the study area); and 430 mainline accidents were reported between SLM 0.90 and SLM 2.00.
- The crash severity rate equaled 0.188.
- Of the accidents reported for this section in the study area, 37.3 percent were rear-end collisions, 16.7 percent were sideswipe collisions, and 14.7 percent were fixed object crashes.
- Approximately 58 percent of the 150 crashes occurred on dry pavement, and approximately 54.7 percent occurred during daylight hours, suggesting that road and light conditions may not be large factors in influencing accidents since the majority of them took place during favorable situations.
- The overall crash rate for I-71 section is 5.26 accidents per million vehicle miles traveled, which is nearly four times the statewide average rate of 1.338 accidents per million vehicle miles traveled.
- The crash rates calculated on all of the segments are greater than the Ohio statewide average rate of 1.338 accidents per million vehicle miles traveled (crash rates for I-71 are shown in Table 8).
- The worst segment (located between SLM 0.22 and SLM 0.27) has a crash rate more than 19 times the statewide average.

Crash reports were analyzed to determine crash rates and to provide support for observations made throughout the study area. Table 8 shows crash rates for each segment analyzed.

Table 8. Crash Rates Brent Spence Bridge Project Study Area
I-71 and I-75 in Hamilton County, Ohio

Location	Begin Point	End Point	Crash Rate
I-75 Corridor Segments	Kentucky/Ohio State Line (SLM 0.00)	I-71/I-75 interchange (SLM 0.22)	4.27
	I-71/I-75 interchange (SLM 0.22)	Midpoint between I-71/I-75 interchange and 5th-6th Street Connector (SLM 0.41)	5.90
	Midpoint between I-71/I-75 interchange and OH 5th-6th Street Connector (SLM 0.41)	OH 5th - 6th Street Connector (SLM 0.50)	7.95
	OH 5th - 6th Street Connector (SLM 0.50)	OH 6th Street Expressway (SLM 0.63)	8.30
	OH 6th Street Expressway (SLM 0.63)	OH 7th-8th Street Connector (SLM 0.71)	4.96
	OH 9th Street Connector (SLM 0.86)	OH 9th Street Connector (SLM 0.86)	2.42
	OH 9th Street Connector (SLM 0.86)	Gest Street (SLM 1.25)	3.51
	Gest Street (SLM 1.25)	Ezzard Charles (SLM 1.43)	3.10
	Ezzard Charles (SLM 1.43)	Findlay Street (SLM 1.91)	2.94
	Findlay Street (SLM 1.91)	Western Hills Viaduct (SLM 2.52)	2.55
	Western Hills Viaduct (SLM 2.52)	North of Project Terminus (SLM 2.90)	1.98
I-71 Corridor Segments	I-71/I-75 interchange (SLM 0.22)	Clay Wade Bailey Bridge Crossing (SLM 0.27)	25.66
	Clay Wade Bailey Bridge Crossing (SLM 0.27)	Fort Washington Way Entrance Ramp (SLM 0.48)	6.27
	Fort Washington Way Entrance Ramp (SLM 0.48)	I-75 Southbound Entrance Ramp (SLM 0.50)	11.95
	I-75 Southbound Entrance Ramp (SLM 0.50)	East of Project Terminus (SLM 0.90)	1.85

After reviewing the crash reports obtained from the ODPS and plotting the accidents in GIS, the following observations were made about this section of the I-75 corridor in the study area. This information is shown on Exhibits 5 and 6.

- There are high concentrations of rear-end accidents along I-75 northbound at SLM 0.10 just before the I-71/I-75 interchange and along I-75 northbound at SLM 1.90 near the Findlay Street bridge.
- There are high concentrations of sideswipe accidents along I-75 northbound at SLM 0.20 near the I-71/I-75 interchange, along I-75 northbound at SLM 1.00 near the OH 9th Street entrance ramp, and along I-75 northbound at SLM 1.20 near the Gest Street entrance ramp.
- There are high concentrations of wet road conditions and fixed object accidents along I-75 northbound at SLM 1.30 on a curve near the ramp bridges for Gest Street and along I-75 northbound at SLM 1.70 on a curve near the entrance ramp from Ezzard Charles.
- Approximately 56 percent of the accidents that occurred on I-75 happened in the southbound lanes.
- There are high concentrations of rear-end accidents along I-75 southbound at SLM 0.10 where I-75 and I-71 merge together, along I-75 southbound at SLM 1.00 near the OH 9th Street exit ramp and along I-75 southbound at SLM 1.80 near the Western Hills Viaduct exit.
- There is a high concentration of wet road conditions and rear-end accidents along I-75 southbound at SLM 1.40 near the Ezzard Charles exit.
- There is a high concentration of fixed object accidents along I-75 southbound at SLM 1.40 near the Ezzard Charles exit.
- There are high concentrations of sideswipe accidents on southbound I-75 at SLM 0.10 and 0.20 near the I-71/I-75 interchange and along I-75 southbound near SLM 2.70 near the Western Hills Viaduct exit ramps.

For the section of I-71, analysis of crash data showed:

- Approximately 57 percent of the 150 accidents reported on I-71 occurred along the northbound travel lanes.
- A high concentration of sideswipe crashes was observed along northbound I-71 near SLM 0.50; this location includes entrance traffic merging from US 50 southbound and the OH 2nd Street exit.
- A high concentration of rear-end and sideswipe accidents was observed near along I-71 northbound at SLM 0.80 between the Race Street and Vine Street bridges.
- A high concentration of fixed object crashes was observed along southbound I-71 near SLM 0.50.
- There are high concentrations of rear-end accidents along southbound I-71 between SLM 0.70 and 0.80 between Elm Street and Vine Street.

4.3 Geometric Design Standards

Several of the existing design features of the I-71/I-75 corridor located in the Greater Cincinnati/Northern Kentucky area do not meet currently acceptable design criteria for interstate highways as defined by the American Association of State Highway and Transportation Officials (AASHTO), KYTC, and ODOT. This can be attributed to the age of the facilities, which were early interstate construction projects completed in the 1950s.

Since that time, design standards for interstate highways have changed[1]. As a result, the design of the I-71 and I-75 facilities at many locations within the study area do not meet current design standards for numerous features including lane widths, shoulder widths, horizontal and vertical clearances, and horizontal and vertical geometry. The operational design of the Brent Spence Bridge, with its reduced travel lane and shoulder widths, is the most frequently noted substandard feature. However, as described in Table 9, other structures (ramps) as well as at-grade highways do not meet currently acceptable design standards for an interstate facility. The specific design standard deficiencies, at specific locations, are described in greater detail in the tables presented in Appendix A.

4.3.1 Brent Spence Bridge

The Brent Spence Bridge was opened in 1963, as a double-deck truss structure designed to carry three 12-foot travel lanes in both directions over the Ohio River. In 1985, the existing safety curb was retrofitted to New Jersey Barrier style and the travel lanes were narrowed to 11 feet in width to create one additional travel lane in each direction to increase roadway capacity. In addition, the approaches on either side are also characterized by design deficiencies, including narrow travel lanes and reduced shoulder widths. The substandard lane widths and lack of shoulders result in unacceptable operational deficiencies and create potential safety hazards for motorists.

4.3.1.2 I-71/I-75 Mainline

From the southern project terminus to KY 4th Street in Kentucky, I-71/I-75 northbound consists of three travel lanes. At KY 4th Street, another travel lane is added to the northbound lanes, so that the mainline consists of four lanes in each direction which are carried over the Brent Spence Bridge to the I-71/I-75 interchange in Cincinnati. There are four southbound travel lanes between the Brent Spence Bridge and the southern project terminus.

Between the I-71/I-75 interchange and the OH 8th Street crossing, the number of travel lanes varies from two to four with numerous entrance and exit ramps tying into the I-75 mainline. North of OH 8th street and extending to the northern project terminus, I-75 consists of four lanes in each direction.

I-71 is separated from the I-75-mainline via a series of connectors that generally consist of two travel lanes. As these connector ramps merge into each other (such as the two-lane facility connecting I-71/I-75 northbound with I-71 northbound and the two-lane facility connecting I-75 southbound with I-71 northbound), the interstate is expanded to a four-lane facility.

[1] Most of the highway design components were established in the late 1940s and the 1950s. Design components include vertical and horizontal alignments, and sight distances. These elements have been revised and refined over the years through evolving technology and research. The AASHTO publishes policies and guidelines, which are intended to provide operation efficiency, comfort, safety, and convenience for motorists. These publications are based on current research and technology.

Table 9. Design Deficiencies on I-71 and I-75 Brent Spence Bridge Project Study Area

Location	Design Issues
Kyles Lane Interchange	Vertical grades for southbound entrance/exit ramps exceed design criteria.
Kyles Lane Interchange to KY 12th Street Interchange	One curve is constructed with an undesirable combination of vertical and horizontal geometry.
KY 12th Street Interchange	Vertical clearances for several structures are less than the required clearances. Horizontal curve at the I-75 crossing over Pike Street does not meet current design criteria.
KY 9th Street	Shoulder widths in this area are less than the minimum required width. Vertical clearances of two structures are less than the required clearances.
KY 5th Street Interchange	Design inconsistencies in this area include design of vertical curves and associated limited stopping sight distances, horizontal curves with radii that do not meet current design criteria, vertical grade of the southbound exit ramp from I-75 to KY 5th Street, and the length of the deceleration zone along the same ramp.
KY 4th Street Interchange	The length of the acceleration ramp from KY 4th Street to northbound I-75 is substantially shorter than the length required to meet design criteria.
Brent Spence Bridge - Kentucky Approaches	Lane widths, shoulder widths, and bridge widths are not consistent with the current design criteria.
Brent Spence Bridge	Lane widths, shoulder widths, and bridge widths are not consistent with the current design criteria.
Brent Spence Bridge - Ohio Approaches	Lane widths, shoulder widths, and vertical curve lengths and associated stopping sight distances are not consistent with the current design criteria.
I-71 Connector	Design inconsistencies on connector ramps include design of vertical curves and associated limited stopping sight distances, horizontal curves with radii that do not meet current design standards and vertical clearance over the railroad.
Fort Washington Way Connector	Horizontal curves on directional ramps do not meet current design criteria.
I-75 (Brent Spence Bridge to OH 6th Street Expressway Interchange)	Deficiencies include vertical curves with limited sight distances, horizontal curves with reduced radii, vertical clearance (over railroad bridge), lane widths (bridges) and shoulder widths.
OH 4th Street Ramps	Deficiencies include horizontal curves with reduced radii, reduced vertical clearances, and limited shoulder widths.
US 50 Expressway Interchange	Design inconsistencies include vertical curves with limited sight distances, horizontal curves with reduced radii; lane widths, shoulder widths; vertical clearances; and length of acceleration zone (entrance ramp from OH 6th Street Expressway).
US 50 – OH 5th Street Connector	Design inconsistencies include a vertical curve with limited sight distance, a horizontal curve with reduced radii; shoulder widths; vertical clearances over roadways; and undesirable horizontal geometry (exit ramp on left side).

Table 9. Design Deficiencies on I-71 and I-75 Brent Spence Bridge Project Study Area

Location	Design Issues
US 50 Expressway Interchange	Design inconsistencies include vertical curves with limited sight distances, horizontal curves with reduced radii; lane widths, shoulder widths; vertical clearances; and length of acceleration zone (entrance ramp from OH 6th Street Expressway).
OH 7th Street Ramp	Ramp to eastbound OH 7th Street includes vertical curves with limited sight distance and reduced shoulder widths.
OH 7th-OH 8th Street Connector	Vertical clearances over I-75 do not meet required standard.
OH 9th Street Connector	Vertical and horizontal clearances and shoulder widths do not meet current design standards.
OH 9th Street Interchange	Vertical and horizontal alignments for ramps do not meet current design standards.
I-75 (OH 8th Street to Linn Street)	Vertical and horizontal clearances and shoulder widths do not meet current design standards.
Western Avenue Interchange	Ramps do not meet design criteria for vertical curves and stopping sight distances; and shoulder widths. Southbound I-75 on ramp also does not meet criteria for vertical clearance and lane width.
I-75 Mainline (Linn Street to Gest Street)	Vertical clearance under Gest Street ramp and pedestrian overpass do not meet minimum requirement. Horizontal clearance at Gest Street overpass is reduced because of bridge pier in median.
Gest Street Ramps	Vertical alignments and shoulder widths for ramps do not meet current design standards.
I-75 Mainline (Gest Street to Ezzard Charles)	Vertical grades are below minimum desired grade; median shoulder widths are less than design standard.
Ezzard Charles Overpass	Vertical clearance under overpass does not meet minimum requirement. Horizontal clearance at overpass is reduced because of bridge pier in median.
Winchell Avenue Ramps	Vertical alignments and shoulder widths for ramps do not meet current design standards
I-75 Mainline (Ezzard Charles to Western Hills Viaduct)	Vertical clearances over Liberty, Findley, and Bank streets and Harrison Avenue do not meet minimum required clearance. Shoulder widths do not meet design criteria. Just south of the Bank Street overpass, vertical curve length does not meet minimum required length.
Western Hills Viaduct Interchange	Design inconsistencies include vertical curves with limited sight distances, horizontal curves with reduced radii; shoulder widths; vertical clearances over local roadways and interstate; limited length of acceleration zone for the northbound onramp; and left side exit ramp for I-75 northbound to Western Hills Viaduct.
I-75 Mainline (North of Western Hills Viaduct Interchange)	Shoulder widths do not meet current design criteria.

Deficiencies identified along the I-75 mainline include reduced shoulder widths, restricted vertical and horizontal clearances for overhead structures and substandard vertical and horizontal curvature. In addition, the vertical grade of the facility is problematic at two locations. Between Kyles Lane and KY 12th Street in Covington, the vertical grade is approximately five percent, which the maximum desirable grade for an interstate facility. The second problem area exists between Gest Street and the Winchell Avenue crossing. At this location, the grade does not meet the minimum desired grade for an interstate highway.

4.3.1.2 Interchanges

There are several interchanges and ramps providing access to I-71/I-75 within the study area. The entrance/exit ramps at the majority of these interchanges do not meet design criteria for several features including reduced vertical curve lengths with associated reduced stopping sight distances; narrow travel lane and shoulder widths, steep grades, reduced horizontal curvature, and substandard vertical clearances where the ramps are over other transportation facilities. There are two interchanges with left hand exit ramps (I-75 northbound to Western Hills Viaduct and I-75 southbound to the OH 5th- 6th Street Connector).

Design deficiencies such as substandard vertical alignments with limited stopping sight distances, and acceleration and deceleration lanes that are not of sufficient length for anticipated traffic volumes and movements, and narrow shoulders can present safety hazards, make maintenance of traffic difficult, and contribute to traffic delays when crashes, vehicle breakdowns, or scheduled roadwork result in lane restrictions. These problems will only become more noticeable as traffic volumes grow. With higher traffic volumes, the potential for crashes and breakdowns (which can cause lane blockages) increases. Higher volumes also increase the amount of delay experienced by drivers during any given period of lane blockage, particularly during rush hours. As previously discussed, traffic is expected to increase to 200,000 vehicles per day within the study area over the next 20 years.

4.3.2 Structural Conditions Analysis – Brent Spence Bridge

The Brent Spence Bridge, first opened in 1963, as a double-deck truss structure designed to carry three 12-foot travel lanes in both directions over the Ohio River. The main truss spans are approximately 1,736.5 feet in length; the longest span is approximately 831 feet in length; and the total bridge length is 2,951 feet. In 1985, the shoulders were eliminated and the travel lanes were narrowed to 11 feet in width to create one additional travel lane in each direction to increase roadway capacity.

The 1998 National Bridge Inventory inspection gave the bridge a Sufficiency Rating of 73 on a 100-point scale. Recent inspections conducted in October and December 2005 by KYTC and ODOT found the Brent Spence Bridge to have a Sufficiency Rating between 66 and 64. These ratings classify the bridge as functionally obsolete because its design features are not consistent with its operational characteristics; however, the bridge structure itself is considered in fair physical condition and is not necessarily of concern.

In November 2002, a Fracture Critical Inspection of the Brent Spence Bridge was completed for KYTC, which included inspection of the Kentucky approach spans as well as the main spans over the Ohio River. The inspection noted few changes in the condition of the bridge based on a comparison of the inspection ratings for November 2002 inspection with the previous April 2001 inspection. The two inspection ratings vary with respect to deck condition, which received higher ratings in the November 2002 inspection; and the condition of the superstructure, which received lower ratings for four characteristics evaluated (stringers, girders and beams; trusses – inspection walk; bearing devices; and deflection/vibration under load).

4.4 Transportation System Linkage

I-71 and I-75 are important links in several transportation systems including the National Highway System (NHS); several subsystems of the NHS including the Interstate Highway System, Strategic Highway Network (STRAHNET), and Intermodal Freight Connectors network; and are federally designated High Priority Corridors (HPC). At the state level, the I-71/I-75 Brent Spence Bridge project is one of six "Mega-Projects" (projects that will cost, or are in excess of $1 billion) included in Kentucky's Six-Year Transportation Plan. Ohio's Long Range Transportation, *Access Ohio 2004-2030 Statewide Transportation Plan* recognizes I-71 and I-75 as Macro Highway Corridors and as Trade and Travel Corridors, which are key statewide corridors for mobility and commerce.

4.4.1 National Transportation System

The NHS consists of approximately 160,000 miles of roadways that are important to the nation's economy, defense, and mobility. The Eisenhower Interstate Highway System is a subsystem of the NHS.

Within the study area, I-71 and I-75 are also designated as components of the STRAHNET, which is a 61,000-mile network of highways important to the nation's defense policy and provide defense access, continuity, and emergency capabilities for defense purposes. Within the states of Ohio and Kentucky, I-71 and I-75 provide access to Wright Patterson Air Force Base, Fort Campbell, and Fort Knox. Because the subject section of I-71/I-75 including the Brent Spence Bridge is a component of STRAHENT, it is considered to be an important corridor for Homeland Security.

Beginning with the Intermodal Surface Transportation and Efficiency Act (ISTEA) of 1991 and continuing with the passage of the Transportation Equity Act for the 21st Century (TEA-21) in 1998 and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005, High Priority Corridors (HPCs) are designated in federal legislation. High Priority Corridors are corridors of regional and/or national significance. Two of these corridors are I-71 (between Cincinnati and Cleveland, Ohio) and I-75 (between Cincinnati and Toledo, Ohio) within the state of Ohio, which are significant because of the national highway connections provided by interstate highway system and international ports of trade (Toledo and Cleveland) as well as the substantial volume of freight transported within and/or through these highway corridors.

I-71 and I-75 are recognized at the federal level as important Intermodal Connectors which are highways that provide access between major intermodal facilities and the four other subsystems making up the NHS. NHS freight connectors are the public roads that connect major intermodal terminals to the highway network. The connectors are critical components of our transportation system and important conduits for the timely and reliable delivery of goods and services. I-71 and I-75 in Kentucky and Ohio provide access to numerous intermodal centers located in the Greater Cinicinnati/Northern Kentucky region.

As shown in Exhibit 7, I-75 is one of the most heavily traveled trade corridors in the nation. The Commodity Flow Survey produced by the US Department of Transportation (USDOT) indicates that the value of commodities moved along any given segment of the I-75 corridor in Ohio exceeds $500 billion annually. The importance of this corridor to future freight movement is illustrated in Exhibit 8, which shows projected annual truck volumes in 2020.

4.4.2 State Transportation Systems

In 1999, the KYTC completed its current long-range multimodal transportation plan (Kentucky Transportation Cabinet, *Statewide Transportation Plan FY 1999 – 2018*, December 1999). The transportation plan consists of two basic components – the short range element, which is the Six-Year Highway Plan, and the long-range element, which is a 14-year Plan identifying highway corridor needs that have a relatively high priority.
Kentucky's Recommended Six-Year Highway Plan FY 2005-2010 lists six "Mega-Projects" (projects that will cost or are in excess of $1 billion), of which one is the I-71/I-75 Brent Spence Bridge project. The plan notes that I-71/I-75 Brent Spence Bridge "is the focal point for some of the heaviest traffic volumes in Kentucky", which not only provide a link between two major urban centers (Covington, Kentucky and Cincinnati, Ohio) but also connects the region to one of the nation's busiest airports, the Cincinnati/Northern Kentucky International Airport located in Boone County, Kentucky. FHWA's *Freight Facts and Figures 2004* reports that the Cincinnati/Northern Kentucky International Airport ranks 15th of the top 25 US airports based on landed weight of air cargo in 2002.

Relative to the Ohio statewide transportation system, I-71 and I-75 are designated as Macro Highway Corridors (Corridors 1 and 17, respectively) and as Trade and Travel Corridors in Ohio's Long Range Transportation Plan (*Access Ohio 2004-2030 Statewide Transportation Plan).* Macro corridors are considered to be the backbone of a macro-level system of transportation hubs, clusters and corridors, defined in the plan as "highways of statewide significance that provide connectivity to population and employment centers in Ohio and the nation by accommodating desired movement of persons and goods."

Access Ohio specifies the following design goals for Ohio's Macro Corridors:

- Safety: Adequacy is achieved when the crash rate (Accidents per Annual Million Vehicle Miles Traveled) and the crash density per mile are less than 2.5 and 75 respectively.
- Operational: Adequacy is achieved by a roadway traffic volume to capacity ratio (V/C) of 0.9 or less.
- Design: Adequacy is achieved by optimum lane widths shoulder widths, curves, grades, bridge approach widths, and bridge vertical clearances as defined in the ODOT Sufficiency Rating System.

As previously noted in the results of the I-71 and I-75 Safety Studies, the crash rate calculated for the section of I-71 located within the state of Ohio exceeds the Ohio statewide average rate of 1.338 accidents per million vehicle miles traveled (crash rates for I-71 are shown in Table 5). The overall crash rate for the corridor is 5.26 accidents per million vehicle miles traveled, which is nearly four times the statewide average rate.

Crash rates calculated for the subject section of I-75 in Ohio equal 3.54 accidents per million vehicle miles traveled, which is greater than the Ohio statewide average rate of 1.338. Crash rates for both highways also exceed the goal of 2.5 accidents per annual million vehicle miles traveled for Macro Highway Corridors as defined in *Access Ohio.*

As noted in the discussion on traffic operations conditions, v/c ratios calculated for sections of I-75 between the Brent Spence Bridge and the Western Hills Viaduct Interchange range from 1.18 to 1.30, which exceed Ohio's operational adequacy goal for Macro Corridors.

Relative to design, numerous design deficiencies have been inventoried along the section of I-75 between the Brent Spence Bridge and the Western Hills Viaduct interchange. These deficiencies include narrow travel lanes and shoulders, left-hand exits, short acceleration and deceleration lanes, substandard vertical and horizontal clearances, and vertical and horizontal alignments that do not meet current design criteria. Based on the inventory of existing features, it can be concluded that the I-75 corridor within the study area does not meet the design requirements specified in *Access Ohio* for Macro Corridors.

Access Ohio also identifies important Trade and Travel Corridors. This network of highways makes up an extensive and integrated multi-modal transportation network that provides "…accessibility and mobility to compete in the world economy". There are 26 Travel Corridors designated in the Ohio Statewide Transportation Plan, of which I-71 and I-75 are components of five corridors (Corridors 5, 7, 11, 16, and 17). Corridors 16 (I-75/SR-4; Cincinnati to Dayton) and 17 (I-71 Cincinnati to Columbus) are located within the study area.

Corridor 16 begins at the Kentucky/Ohio State Line and extends along I-75 to the I-70 crossing in Dayton, Ohio. The corridor's provisions, as noted in the plan, include both freight travel and commuting. *Access Ohio* includes numerous improvement projects within this corridor to address safety and congestion deficiencies including improvements to the Brent Spence Bridge.

Corridor 17 begins at the Ohio River and extends along I-71 to the I-70 crossing in Columbus, Ohio. *Access Ohio* includes several improvement projects within this corridor to address safety and capacity deficiencies including improvements to enhance accessibility and mobility for commerce and industry through improved access to rail and ports.

At the regional level, OKI is responsible for long transportation planning efforts in northeastern Kentucky and southwestern Ohio as the Metropolitan Planning Organization. In 2000, OKI and the MVRPC undertook a major planning study, known as the *North-South Transportation Initiative*, which assessed the multi-modal transportation systems serving northeastern Kentucky and much of western Ohio. This planning effort recognized the regional transportation systems, particularly roadways, carry a high volume of international trade and connect many high profile industries; and therefore the importance of the interstates to commerce cannot be overstated. I-75 is among the busiest in the nation connecting businesses and communities in six states. More recently, the OKI Board of Trustees adopted the *OKI 2030 Regional Transportation Plan 2004 Update* on June 10, 2004. This regional plan does not place an emphasis on construction of new transportation facilities, but rather on maintaining and improving the existing infrastructure first. The *OKI 2030 Regional Transportation Plan 2004* update indicates committed funding for providing additional capacity for I-75 only for a 2.5 mile section south of the Brent Spence Bridge as well as for replacement of the bridge itself.

The I-71 and I-75 corridors in the Greater Cincinnati/Northern Kentucky area are significant transportation corridors, not only for local access and mobility needs, but also for regional, statewide and national access and mobility needs. These corridors are recognized in county and regional transportation plans, as are the recommendations for needed improvements. In addition, I-71 and I-75 are key links in the national transportation system in terms of people movement (mobility and economic development), freight movement (commerce, economic development and international trade), and national defense. However, transportation plans and recommendations at all levels (local, state and national) recognize that these facilities now operate at or beyond capacity and therefore, need to be upgraded to modern standards to maintain these important transportation links.

5.0 CONCLUSION

The I-75 corridor is a major north-south transportation corridor through the Midwestern United States and one of the busiest freight movement (trucking) routes. Traffic volumes have increased far beyond what was originally envisioned when it was constructed in the 1950s. As a result, the I-75 corridor within the study area is characterized by poor levels of service which threaten the overall efficiency of people and goods movement within the region The design features of I-71 and I-75 within the study area do not meet current standards for an interstate highway facility. A recent inventory of I-71 and I-75 within the study area, including the Brent Spence Bridge, reports numerous design deficiencies associated with lane widths, shoulder widths, left-hand exits, horizontal and vertical alignments, and horizontal and vertical clearances. The substandard design features, compounded by increasing traffic volumes, result in deteriorated operations while negatively affecting motorists safety on the facility. Specific problems of I-71 and I-75 within the study area include, but are not limited to growing traffic demand and congestion, inadequate safety margins, and design deficiencies.

The current and future levels of service provided by the I-71/I-75 corridor range from LOS B to LOS F. With the anticipated growth in traffic, the level of service through the entire corridor is expected to continue to degrade and within the next 20 years, much of the corridor will operate at LOS D or worse. In addition, many interchange entrance ramps and exit ramps operate poorly today. In 2030, most interchanges will operate at LOS E or worse during one or both peak hours. The major cause of congestion is the inability of the interstate facility to handle current and future travel demand. If capacity improvements are not made to the I-71/I-75 corridor, the existing problems will only worsen resulting in increased travel time delays and transportation costs for motorists traveling the corridor.

Accident rates for the corridor exceed the Kentucky and Ohio statewide averages in part because of congested traffic conditions as well as deficient and substandard roadway geometry. As the safety analyses show, the crash rates for some sections of I-71/I-75 significantly exceed the statewide rates. Within Kentucky, the section of I-71/I-75 between Kyles Lane and the State Line has a Critical Rate Factor more than seven times greater than the statewide average. ODOT's safety management databases indicate that the I-71/I-75 corridor has been designated as a corridor with safety concerns with five specific locations are listed in ODOT's HCLIS. Both I-71 and I-75 in the study area are designated by ODOT as Safety Hot Spots.

The I-71/I-75 corridor within Kenton County, Kentucky has a crash rate higher than the Kentucky statewide average. The overall crash rate (accidents per 100 million vehicle miles traveled) for this section is 130.36, nearly 1.33 times higher than Kentucky's statewide average crash rate for interstate highways of 93 accidents per 100 million vehicle miles traveled. The overall crash rate for the Ohio section of I-71 in the study area is 5.26 accidents per million vehicle miles traveled, which is nearly four times the Ohio statewide average rate of 1.338 accidents per million vehicle miles traveled. The worst segment (located between SLM 0.22 and SLM 0.27) has a crash rate more than 19 times the statewide average. Overall, I-75 within the study area has a crash rate of 3.54, which is more than two times greater than the statewide average rate.

Design deficiencies such as substandard vertical alignments with limited stopping sight distances, and acceleration and deceleration lanes that are not of sufficient length for anticipated traffic volumes and movements, and narrow shoulders can present safety hazards, make maintenance of traffic difficult, and contribute to traffic delays when crashes, vehicle breakdowns, or scheduled roadwork result in lane restrictions. These problems will only become more noticeable as traffic volumes grow. With higher traffic volumes, the potential for crashes and breakdowns (which can cause lane blockages) increases. Higher volumes also increase the amount of delay experienced by drivers during any given period of lane blockage, particularly during rush hours. As previously discussed, traffic is expected to increase to 200,000 vehicles per day within the study area over the next 20 years.

The I-71/I-75 corridor in the Greater Cincinnati/Northern Kentucky area is a significant transportation corridor, not only for local access and mobility needs, but also for regional, statewide and national access and mobility needs. This corridor is recognized in county and regional transportation plans, as are the recommendations for needed improvements. In addition, I-71 and I-75 are key links in the national transportation system in terms of people movement (mobility and economic development), freight movement (commerce, economic development and international trade), and national defense. However, transportation plans and recommendations at all levels (local, state and national) recognize that these facilities now operate at or beyond capacity and therefore, need to be upgraded to modern standards to maintain these important transportation links.

The Brent Spence Bridge project is intended to improve the operational characteristics within the I-71/I-75 corridor for both local and through traffic. In the Greater Cincinnati/Northern Kentucky region, the I-71/I-75 corridor suffers from congestion and safety–related issues as a result of inadequate capacity to accommodate current traffic demand. The purpose of this project is to:

- improve traffic flow and level of service,
- improve safety,
- correct geometric deficiencies, and
- maintain links in key mobility, trade, and national defense transportation corridors.

6.0 REFERENCES

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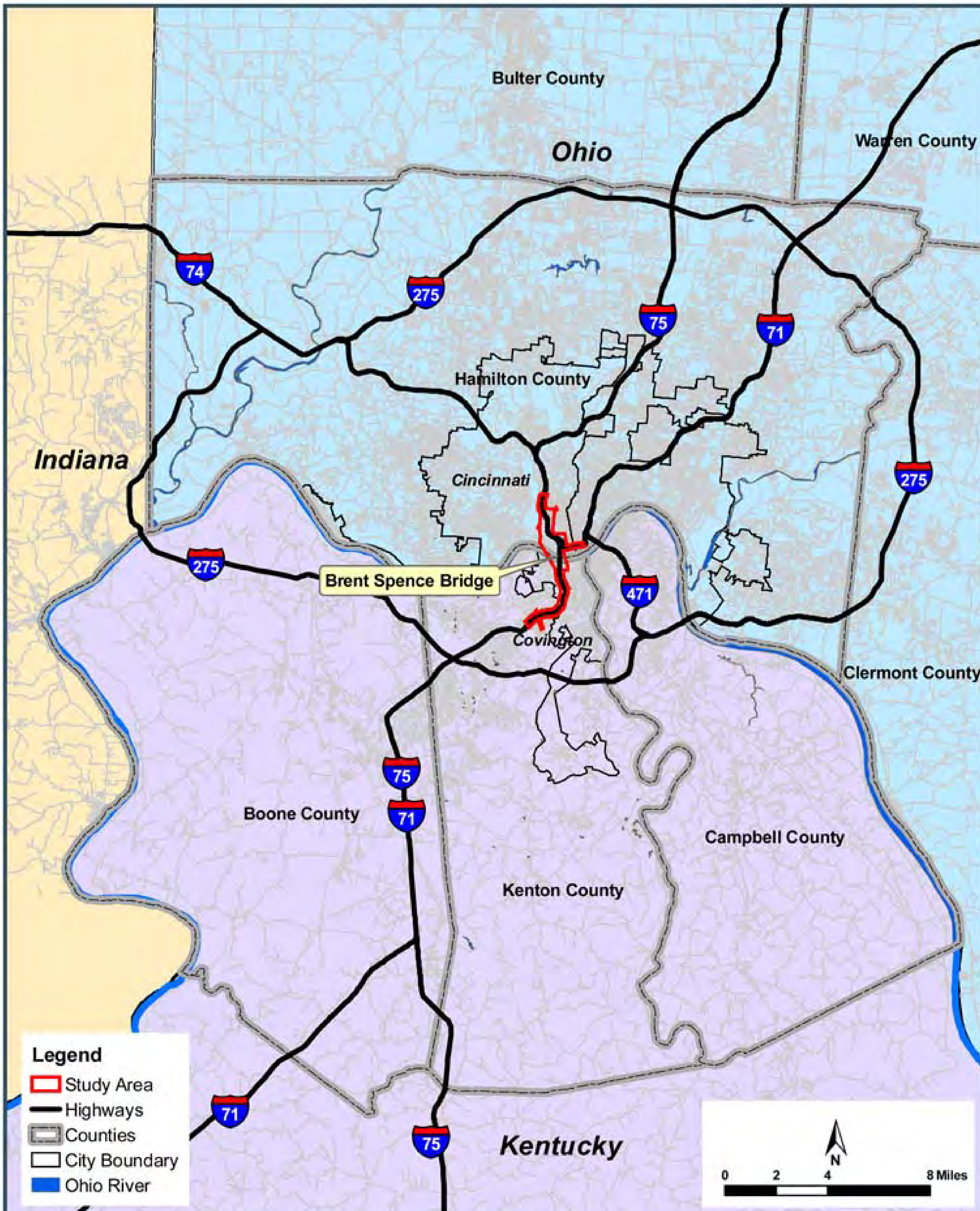
EXHIBITS



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REGIONAL MAP

EXHIBIT

1

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PROJECT STUDY AREA

EXHIBIT

2

Prepared by:
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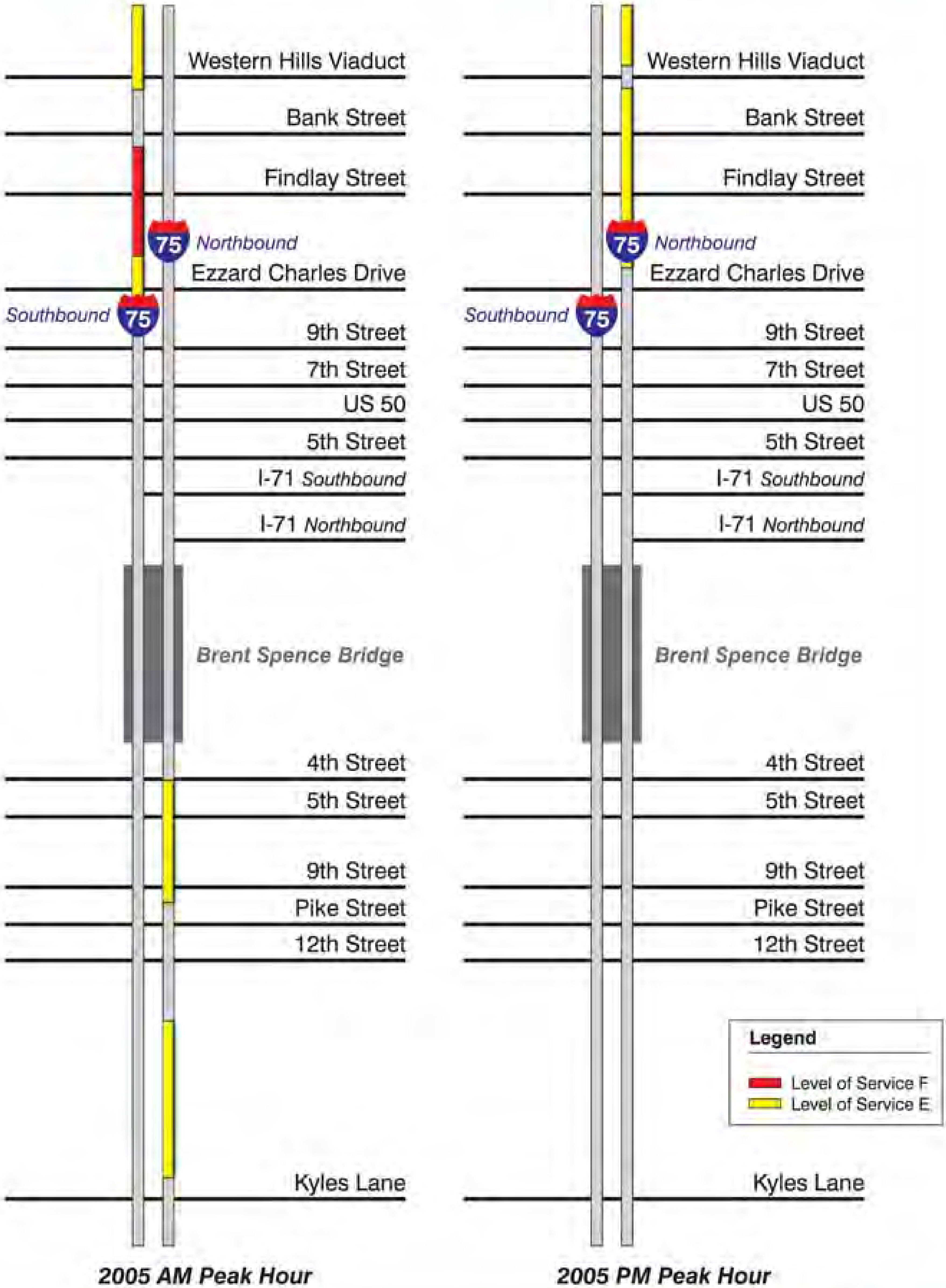
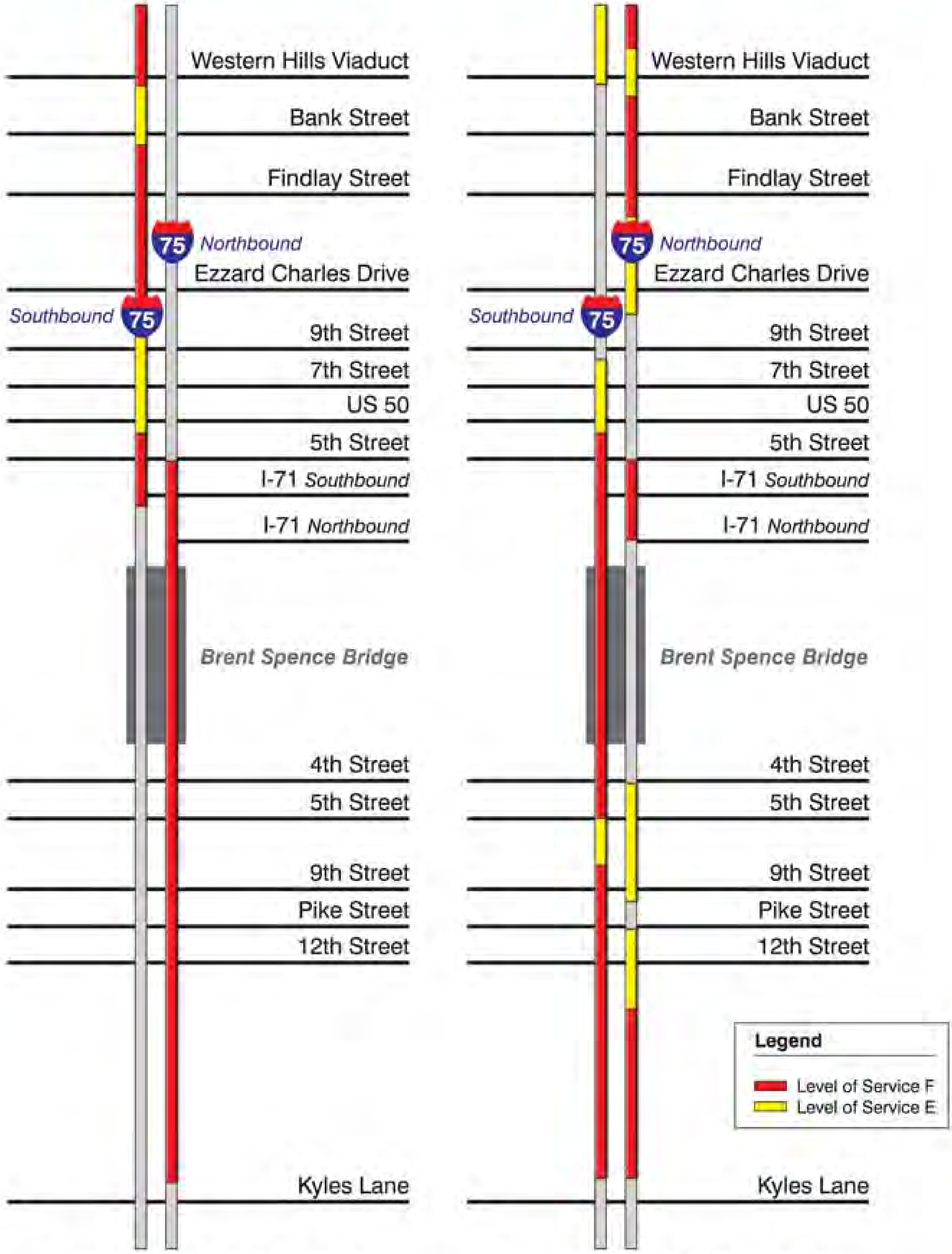


U.S. Department of Transportation
Federal Highway Administration

2005 AM & PM PEAK HOUR LEVEL OF SERVICE

EXHIBIT 3

Prepared by
PB PARSONS BRINCKERHOFF



2030 No Build AM Peak Hour ***2030 No Build PM Peak Hour***

U.S. Department of Transportation
Federal Highway Administration

2030 AM & PM PEAK HOUR LEVEL OF SERVICE

EXHIBIT

4

Prepared by
PARSONS BRINCKERHOFF

U.S. Department of Transportation
Federal Highway Administration

SAFETY STUDY ANALYSIS NORTHBOUND ACCIDENTS (BASED ON CRASH DATA FOR 2000-2003)

EXHIBIT

5

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Federal Highway Administration

SAFETY STUDY ANALYSIS SOUTHBOUND ACCIDENTS (BASED ON CRASH DATA FOR 2000-2003)

EXHIBIT

6

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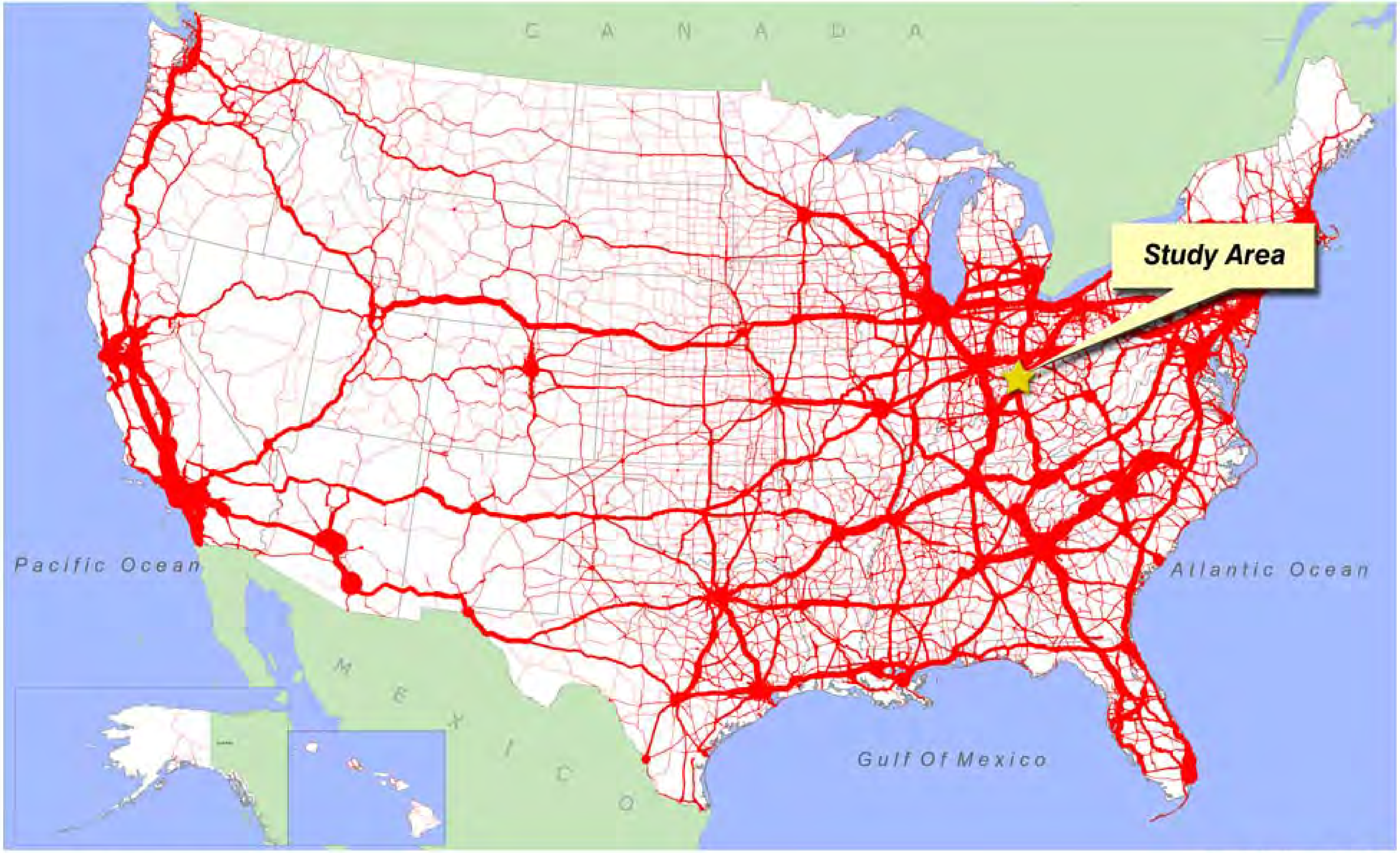

Source: FHWA Freight Facts and Figures (2004)

U.S. Department of Transportation
Federal Highway Administration

ESTIMATED AVERAGE ANNUAL DAILY TRUCK TRAFFIC (1998)

EXHIBIT
7

Prepared by:
PARSONS BRINCKERHOFF

Source: FHWA Freight Facts and Figures (2004)

Truck Volume Scale

50,000 25,000 12,500

U.S. Department of Transportation
Federal Highway Administration

ESTIMATED AVERAGE ANNUAL DAILY TRUCK TRAFFIC (2020)

EXHIBIT
8

Prepared by:
PARSONS BRINCKERHOFF

Appendix A

Review of Existing Geometrics for Mainline and Ramps Ohio and Kentucky

Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Functional Classification (Mainline) - Interstate
Design Speed (Mainline) - 60 Miles Per Hour (MPH)

Notes:
1. Based upon review of the Original Construction, Rehabilitation, and Reconstruction Plans.
2. When a deficient lane / shoulder width is identified, it is assumed that curve widening (when applicable) and bridge width (when applicable) are also deficient.
3. When a deficient horizontal curve is identified, it is assumed that superelevation (when applicable) is also deficient.
4. When a deficient shoulder width is identified, it is assumed that the graded shoulder width is also deficient.
5. Review is based upon design criteria established by the ODOT Location & Design Guidance Manuals.

Typical Section

State Line Mile	Item	Location	Existing	Required
0.3	Lane Width (Bridge Width)	I-75 NB Mill Creek Bridge Conn. (End of BSB to at Grade)	11 Feet	12 Feet
0.2	Lane Width (Bridge Width)	I-75 SB Mill Creek Bridge Conn. (End of BSB to at Grade)	11 Feet	12 Feet
0.2	Lane Width	Directional Ramp NB Mill Creek Expressway One Lane Portion	12 Feet	16 Feet
0.5	Lane Width	Directional Ramp SB Mill Creek Expressway One Lane Portion	12 Feet	16 Feet
0.5	Lane Width	Ramp H - Directional Ramp NB Mill Creek Expwy. To WB 6th St. Expwy.	14 Feet	16 Feet
1.3	Lane Width	Ramp J - SB Western Avenue to SB Mill Creek Expressway	14 Feet	16 Feet
0.3	Shoulder Width (Bridge Width)	I-75 NB Mill Creek Bridge Conn. (End of BSB to at Grade)	Varies <6 Feet Both Sides	10 Feet Both Sides
0.2	Shoulder Width (Bridge Width)	I-75 SB Mill Creek Bridge Conn. (End of BSB to at Grade)	Varies <6 Feet Both Sides	10 Feet Both Sides
0.5	Shoulder Width (Curbed)	Ramp G - 4th St. to NB Mill Creek Expwy.	3 Feet Both Sides	6 Feet Right 3 Feet Left

V=speed
R=radius
K=rate of verticle curvature
SSD=Stopping Sight Distance

NB=Northbound
SB=Southbound
EB=Eastbound
WB=Westbound

Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Typical Section (continued)				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
0.6	Shoulder Width (Curbed)	Ramp P - Sixth St. to NB Mill Creek Expressway	3 Feet Both Sides	10 Feet Right 4 Feet Left
0.6	Shoulder Width (Curbed)	Ramp R - EB 6th St. Expwy. To SB Mill Creek Bridge Conn.	6 Feet Right	10 Feet Right
0.9 - 1.3	Shoulder Width (Curbed)	Mill Creek Expressway	Median ~ 7 Feet	15 Feet
0.8	Shoulder Width (Curbed)	Ramp Q - 9th St. Conn. To SB Mill Creek Bridge Conn.	6 Feet Right 4 Feet Left	10 Feet Right 4 Feet Left
0.8	Shoulder Width (Curbed)	Ramp B - SB Mill Creek Expressway to EB 7th Street	3 Feet Right 3 Feet Left	10 Feet Right 4 Feet Left
1.3	Shoulder Width (Curbed)	Ramp F - Gest/Winchell to NB Mill Creek Expressway	3 Feet Both Sides	6 Feet Right 3 Feet Left
1.3	Shoulder Width (Curbed)	Ramp H - SB Mill Creek Expressway to Gest St.	4 Feet Right 4 Feet Left	6 Feet Right 3 Feet Left
1.3	Shoulder Width (Curbed)	Ramp J - SB Western Avenue to SB Mill Creek Expressway	3 Feet Both Sides	6 Feet Right 3 Feet Left
1.5	Shoulder Width (Curbed)	Ramp M - NB Winchell Ave. to NB Mill Creek Expressway	3-4 Feet Right 3 Feet Left	6 Feet Right 3 Feet Left
1.6	Shoulder Width (Curbed)	Ramp N - SB Mill Creek Expressway to SB Western Ave.	3 Feet Both Sides	6 Feet Right 3 Feet Left
1.6 - 2.3	Shoulder Width (Paved)	Mill Creek Expressway	Median ~ 7 Feet	15 Feet
2.7	Shoulder Width (Paved)	Mill Creek Expressway (Bifurcated Area)	Median ~ 7 Feet	15 Feet
2.1	Shoulder Width (Paved)	Ramp A - SB Mill Creek Expressway to Western Avenue	3 Feet Both Sides	6 Feet Right 3 Feet Left
2.5	Shoulder Width (Paved)	Ramp C - EB Western Hills Viaduct to NB Mill Creek Expressway	3 Feet Both Sides	6 Feet Right 3 Feet Left

V=speed
R=radius
K=rate of verticle curvature
SSD=Stopping Sight Distance

NB=Northbound
SB=Southbound
EB=Eastbound
WB=Westbound

Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Typical Section (continued)				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
2.5	Shoulder Width (Paved)	Ramp D - NB Mill Creek Expressway to WB Western Hills Viaduct	3 Feet Both Sides	6 Feet Right 3 Feet Left
2.5	Shoulder Width (Paved)	Ramp F - SB Mill Creek Expwy. To WB Western Hills Viaduct	3 Feet Both Sides	6 Feet Right 3 Feet Left

V=speed
R=radius
K=rate of verticle curvature
SSD=Stopping Sight Distance

NB=Northbound
SB=Southbound
EB=Eastbound
WB=Westbound

Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Horizontal Alignment				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
0.5	Horizontal Curves Radii	I-75 NB Mill Creek Bridge Conn. (First Curve on Grade)	R=1146 Feet	R=1349 Feet
0.4	Horizontal Curves Radii	Directional Ramp EB Distributor Bridge Conn. To I-71	R=654.81 Feet	Directional Ramp Min. V=40 mph - R=510 Feet Des. V=50 mph - R=850 Feet
0.5	Horizontal Curves Radii	Directional Ramp FWW / EB Dist. Bridge Conn.	R=754 Feet	Directional Ramp Min. V=40 mph - R=510 Feet Des. V=50 mph - R=850 Feet
0.4	Horizontal Curves Radii	Directional Ramp FWW / SB Dist. Bridge Conn.	R=466 Feet	Directional Ramp Min. V=40 mph - R=510 Feet Des. V=50 mph - R=850 Feet
0.5	Horizontal Curves Radii	Directional Ramp FWW / SB Dist. Bridge Conn.	R=476 Feet	Directional Ramp Min. V=40 mph - R=510 Feet Des. V=50 mph - R=850 Feet
0.5	Horizontal Curves Radii	Ramp J - Directional Ramp I-75 NB to 6th St. WB	R=435.16 Feet	Directional Ramp Min. V=40 mph - R=510 Feet Des. V=50 mph - R=850 Feet
0.5	Horizontal Curves Radii	Ramp L - SB Mill Creek Expwy. To 6th-5th St. Connector (at 6th-5th St. Connector)	R=100 Feet	V=30 mph R=232 Feet
0.6	Horizontal Curves Radii	Ramp Q - 9th St. Conn. To SB Mill Creek Bridge Conn.	R=90 Feet	V=30 mph R=232 Feet
2.5	Horizontal Curves Radii	Ramp E - EB Western Hills Viaduct to SB Mill Creek Expwy. (at Curve Nearest Expwy.)	R = ~ 229 Feet	Directional Ramp Min. V=40 mph - R = 488 Feet Pref. V=50 mph - R = 849 Feet
2.5	Horizontal Curves Radii	Ramp F - SB Mill Creek Expwy. To WB Western Hills Viaduct (at Curve Nearest Expwy.)	R = ~ 229 Feet	Directional Ramp Min. V=40 mph - R = 488 Feet Pref. V=50 mph - R = 849 Feet
0.5	Horizontal Alignment - Intersection Angle	Ramp G - 4th St. to NB Mill Creek Expwy. w/ Central Ave.	~ 15 Deg.	70 deg. Max.
2.5	Horizontal Alignment - General	Ramp D - NB Mill Creek Expressway to WB Western Hills Viaduct	Exit Ramp On Left Side	
0.6	Horizontal Alignment - General	Ramp L - SB Mill Creek Expwy. To 6th-5th St. Connector	Exit Ramp On Left Side	
0.4	Ramp Acceleration Length	Ramp R - EB 6th St. Expwy. To SB Mill Creek Bridge Conn.	~ 450 Feet	910 Feet Beg. 30 mph End 60 mph

V=speed
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SSD=Stopping Sight Distance

NB=Northbound
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WB=Westbound

Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Horizontal Alignment (continued)				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
2.5	Ramp Acceleration Length	Ramp C - EB Western Hills Viaduct to NB Mill Creek Expressway	~ 250 Feet	550 Feet Beg. - 25 mph End. - 50 mph
0.8	Horizontal Clearance	Mill Creek Expressway at 9th Street Connection (Median Pier)	5-6 Feet	10 Feet
1.0	Horizontal Clearance	Mill Creek Expressway at Linn St. (Median Pier)	5-6 Feet	10 Feet
1.2	Horizontal Clearance	Mill Creek Expressway under Ramp F (Gest St. to Winchell Ave.) (Median Pier)	5-6 Feet	10 Feet
1.4	Horizontal Clearance	Mill Creek Expressway under Ezzard Charles (Median Pier)	5-6 Feet	10 Feet

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Vertical Alignment				
State Line Mile	Item	Location	Existing	Required
0.0	Vertical Curve Length / SSD	I-75 NB Mill Creek Bridge Conn. (at End of BSB)	Length=350 Feet K=70 SSD=330 Feet V=42 mph	V=60 mph Length=680 Feet K=136 SSD=570 Feet
0.3	Vertical Curve Length / SSD	I-75 NB Mill Creek Bridge Conn. (Over R/R)	Length=600 Feet K=97 SSD=429 Feet V=52 mph	V=60 mph Length=936 Feet K=151 SSD=570 Feet
0.0	Vertical Curve Length / SSD	I-75 SB Mill Creek Bridge Conn. (at End of BSB)	Length=350 Feet K=70 SSD=330 Feet V=42 mph	V=60 mph Length=680 Feet K=136 SSD=570 Feet
0.3	Vertical Curve Length / SSD	I-75 SB Mill Creek Bridge Conn. (Over R/R)	Length=500 Feet K=81 SSD=370 Feet V=49 mph	V=60 mph Length=936 Feet K=151 SSD=570 Feet
0.6	Vertical Curve Length / SSD	I-75 NB Mill Creek Bridge Conn. (at 6th St. Connector)	Length=200 Feet K=133 SSD=562 Feet V=57 mph	V=60 mph Length=227 Feet K=151 SSD=570 Feet
0.3	Vertical Curve Length / SSD	Directional Ramp EB Distributor Bridge Conn. To I-71 (Over R/R)	Length=400 Feet K=65 SSD=375 Feet V=45 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.3	Vertical Curve Length/SSD	Directional Ramp SB Distributor Bridge Conn. To I-71 (Over 3rd St.)	Length=300 Feet K=60 SSD=292 Feet V=39 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.4	Vertical Curve Length / SSD	Directional Ramp FWW / SB Dist. Bridge Conn.	Length=787 Feet K=98 SSD=460 Feet V=52 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.5	Vertical Curve Length / SSD	Directional Ramp NB Mill Creek Expressway (Under 6th St. Connector)	Length=500 Feet K=82 SSD=374 Feet V=45 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Vertical Alignment (continued)				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
0.4	Vertical Curve Length / SSD	Directional Ramp SB Mill Creek Expressway Under SB Dist. Bridge Conn.	Length=450 Feet K=72 SSD=340 Feet V=42 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.5	Vertical Curve Length / SSD	Ramp H - Directional Ramp NB Mill Creek Expwy. To WB 6th St. Expwy. Under 6th-5th St. Connector	Length=300 Feet K=39 SSD=212 Feet V=31 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.7	Vertical Curve Length / SSD	Ramp L - SB Mill Creek Expwy. To 6th-5th St. Connector (at Diverge)	Length=150 Feet K=83 SSD=380 Feet V=46 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.8	Vertical Curve Length / SSD	Ramp P - Sixth St. to NB Mill Creek Expressway (at Merge w/ NB Mill Creek Expressway)	Length=200 Feet K=45 SSD=236 Feet V=33 mph	Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.5	Vertical Curve Length / SSD	Ramp R - EB 6th St. Expwy. To SB Mill Creek Bridge Conn. Under 6th-5th Street Connection	Length=200 Feet K=42 SSD=221 Feet V=32 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.9	Vertical Curve Length / SSD	Ramp A - 9th St. to NB Mill Creek Expressway (at Merge with Ramp P)	Length=150 Feet K=48 SSD=247 Feet V=34 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.9	Vertical Curve Length / SSD	Ramp A - 9th St. to NB Mill Creek Expressway (In Ramp P Merge Area)	Length=50 Feet K=55 SSD=275 Feet V=37 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.1	Vertical Curve Length / SSD	Ramp A - 9th St. to NB Mill Creek Expressway (At Ramp P Diverge Area)	Length=300 Feet K=38 SSD=207 Feet V=30 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.2	Vertical Curve Length / SSD	Ramp A - 9th St. to NB Mill Creek Expressway (Just Prior to Ramp G Merge Area)	Length=500 Feet K=54 SSD=341 Feet V=43 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Vertical Alignment (continued)

State Line Mile	Item	Location	Existing	Required
1.3	Vertical Curve Length / SSD	Ramp A - 9th St. to NB Mill Creek Expressway (Just After Ramp G Merge Area)	Length=350 Feet K=44 SSD=232 Feet V=33 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.1	Vertical Curve Length / SSD	Ramp E - 9th St. WB to NB Mill Creek Expressway (Near Merge)	Length=100 Feet K=92 SSD=407 Feet V=48 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
0.9	Vertical Curve Length / SSD	Ramp B - SB Mill Creek Expressway to EB 7th Street (at Diverge)	Length=200 Feet K=50 SSD=258 Feet V=35 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.3	Vertical Curve Length / SSD	Ramp F - Gest/Winchell to NB Mill Creek Expressway (at Merge)	Length=300 Feet K=54 SSD=271 Feet V=36 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.3	Vertical Curve Length / SSD	Ramp H - SB Mill Creek Expressway to Gest St. (at Diverge)	Length=200 Feet K=58 SSD=287 Feet V=38 mph	Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.2	Vertical Curve Length / SSD	Ramp J - SB Western Avenue to SB Mill Creek Expressway (at Merge w/ SB Mill Creek Expwy.)	Length=200 Feet K=67 SSD=317 Feet V=41 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.3	Vertical Curve Length / SSD	Ramp J - SB Western Avenue to SB Mill Creek Expressway (Under Ramp H)	Length=400 Feet K=46 SSD=240 Feet V=33	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.3	Vertical Curve Length / SSD	Ramp J - SB Western Avenue to SB Mill Creek Expressway (at Western Avenue Diverge)	Length=200 Feet K=51 SSD=333 Feet V=42 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.5	Vertical Curve Length / SSD	Ramp M - NB Winchell Ave. to NB Mill Creek Expressway (at Diverge from Winchell Ave.)	Length=150 Feet K=46 SSD=316 Feet V=41 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Vertical Alignment (continued)				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
1.6	Vertical Curve Length / SSD	Ramp M - NB Winchell Ave. to NB Mill Creek Expressway (at Merge with NB Mill Creek Expwy.)	Length=200 Feet K=58 SSD=288 Feet V=38 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.6	Vertical Curve Length / SSD	Ramp N - SB Mill Creek Expressway to SB Western Ave. (at SB Mill Creek Expwy. Diverge)	Length=300 Feet K=50 SSD=254 Feet V=35 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
2.1	Vertical Curve Length / SSD	Mill Creek Expressway (Just South of Bank St. Overpass)	Length=400 Feet K=100 SSD=440 Feet V=51 mph	V=60 mph Length=680 Feet K=136 SSD=570 Feet
2.0	Vertical Curve Length / SSD	Ramp A - SB Mill Creek Expressway to Western Avenue (Near Merge w/ Western Avenue)	Length=200 Feet K=31 SSD=181 Feet V=27 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
2.1	Vertical Curve Length / SSD	Ramp A - SB Mill Creek Expressway to Western Avenue (Near Diverge w/ Expressway)	Length=200 Feet K=52 SSD=335 Feet V=42 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
2.5	Vertical Curve Length / SSD	Ramp C - EB Western Hills Viaduct to NB Mill Creek Expressway (at Merge w/ NB Mill Creek Expressway)	Length=150 Feet K=47 SSD=241 Feet V=34 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
2.5	Vertical Curve Length / SSD	Ramp D - NB Mill Creek Expwy. to WB Western Hills Viaduct (at Diverge from NB Mill Creek Expwy.)	Length=200 Feet K=38 SSD=208 Feet V=30 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
2.5	Vertical Curve Length / SSD	Ramp E - EB Western Hills Viaduct to SB Mill Creek Expwy. (at Diverge from Viaduct)	Length=200 Feet K=22 SSD=139 Feet V=23 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
2.5	Vertical Curve Length / SSD	Ramp E - EB Western Hills Viaduct to SB Mill Creek Expwy. (at Bridge Over Spring Grove)	Length=150 Feet K=42 SSD=304 Feet V=39 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Vertical Alignment (continued)				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
2.5	Vertical Curve Length / SSD	Ramp E - EB Western Hills Viaduct to SB Mill Creek Expwy. (at Diverge from Viaduct)	Length=150 Feet K=40 SSD=295 Feet V=39 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
2.6	Vertical Curve Length / SSD	Ramp F - SB Mill Creek Expwy. To WB Western Hills Viaduct (at Diverge from Expwy.)	Length=200 Feet K=22 SSD=139 Feet V=23 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
2.5	Vertical Curve Length / SSD	Ramp F - SB Mill Creek Expwy. To WB Western Hills Viaduct (at Bridge Over Spring Grove)	Length=200 Feet K=67 SSD=317 Feet V=41 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
2.6	Vertical Curve Length / SSD	Ramp F - SB Mill Creek Expwy. To WB Western Hills Viaduct (at Diverge From Expwy.)	Length=80 Feet K=57 SSD=351 Feet V=44 mph	Directional Ramp Min. Des. Spd.=40 mph Pref. V=50 mph
1.3	Vertical Grades	Mill Creek Expressway (~ Gest St. to Winchell Ave. Overpass to Just North of Ezzard Charles Overpass)	0.43% - Compounded by Superelevation Transition Near a Sag	0.50% Min.

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Vertical Clearance				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
0.3	Vertical Clearance	I-75 SB Mill Creek Bridge Conn. (R/R Bridge)	22.0 Feet	23 Feet Min.
0.4	Vertical Clearance	I-75 NB Mill Creek Bridge Conn. (SB Distributor Bridge Conn. Over)	15.0 Feet	16.5 Feet Min.
0.4	Vertical Clearance	I-75 NB Mill Creek Bridge Conn. (SB Mill Creek Expwy. Under)	15.0 Feet	16.5 Feet Min.
0.3	Vertical Clearance	Directional Ramp EB Distributor Bridge Conn. To I-71 Over R/R	22.0 Feet	23 Feet Min.
0.6	Vertical Clearance	EB 6th-5th St. Conn. Over NB Mill Creek Expwy.	15.0 Feet	16.5 Feet
0.5	Vertical Clearance	WB 6th St. Expwy. Over NB Mill Creek Expwy.	15.2 Feet	16.5 Feet
0.7	Vertical Clearance	8th-7th St. Conn. Over NB Mill Creek Expwy.	15.2 Feet	16.5 Feet
0.7	Vertical Clearance	8th-7th St. Conn. Over SB Mill Creek Expwy.	15.3 Feet	16.5 Feet
0.5	Vertical Clearance	Ramp H - Directional Ramp Under 6th-5th St. Connector	15 Feet	16.5 Feet
0.5	Vertical Clearance	Ramp G - 4th St. to NB Mill Creek Expwy. Under 6th-5th St. Connection	15 Feet	16.5 Feet
0.6	Vertical Clearance	Ramp L - SB Mill Creek Expwy. To 6th-5th St. Connector Under WB 6th St. Expwy.	15.0 Feet	16.5 Feet
0.6	Vertical Clearance	Ramp Q - EB 6th St. Expwy. To SB Mill Creek Bridge Conn. Over SB Mill Creek Bridge Conn.	15 Feet	16.5 Feet
0.8	Vertical Clearance	NB Mill Creek Expressway under 9th Street Connection	15.3 Feet	16.5 Feet
1.0	Vertical Clearance	SB Mill Creek Expressway under Linn St.	15.2 Feet	16.5 Feet

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Ohio

Vertical Clearance (continued)				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
1.2	Vertical Clearance	NB Mill Creek Expressway under Ramp F (Gest St. to Winchell Ave.)	15.0 Feet	16.5 Feet
1.4	Vertical Clearance	Mill Creek Expressway under Ezzard Charles	15.0 Feet	16.5 Feet
1.2	Vertical Clearance	Pedestrian Overpass over Ramp A	15.0 Feet	16.5 Feet
0.9	Vertical Clearance	Ramp B Under 9th St. Connection	16.1 Feet	16.5 Feet
1.3	Vertical Clearance	Ramp H over Ramp J	15.2 Feet	16.5 Feet
1.7	Vertical Clearance	Mill Creek Expressway Over Liberty Street	15.2 Feet	16.5 Feet
1.9	Vertical Clearance	Mill Creek Expressway Over Findlay Street	15.0 Feet	16.5 Feet
2.2	Vertical Clearance	Mill Creek Expressway Over Bank Street	15.0 Feet	16.5 Feet
2.4	Vertical Clearance	NB Mill Creek Expressway Over Harrison Avenue	15.1 Feet	16.5 Feet
2.5	Vertical Clearance	Ramp E - EB Western Hills Viaduct to SB Mill Creek Expwy. Over Spring Grove Avenue	15.0 Feet	16.5 Feet
2.5	Vertical Clearance	Ramp F - SB Mill Creek Expressway to WB Western Hills Viaduct Over Spring Grove Avenue	15.0 Feet	16.5 Feet
2.6	Vertical Clearance	Ramp D - NB Mill Creek Expwy. to WB Western Hills Viaduct Over NB Mill Creek Expwy.	15.0 Feet	16.5 Feet

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Kentucky

Functional Classification (Mainline) - Interstate
Design Speed (Mainline) - 60 Mile Per Hour (MPH)

Notes:
1. Based upon review of the Original Construction, Rehabilitation, and Reconstruction Plans.
2. When a deficient lane / shoulder width is identified, it is assumed that curve widening (when applicable) and bridge width (when applicable) are also deficient.
3. When a deficient horizontal curve is identified, it is assumed that superelevation (when applicable) is also deficient.
4. When a deficient shoulder width is identified, it is assumed that the clear zone width is also deficient.
5. Review is based upon design criteria established by the KYTC Highway Design Policy.

Typical Section				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
191.5	Lane Width	Brent Spence Bridge	11 Feet	12 Feet
191.4	Lane Width	Kentucky Approach Spans	11 Feet	12 Feet
191.5	Shoulder Width	Brent Spence Bridge	1 Feet on Both Sides	12 Feet
191.4	Shoulder Width	Kentucky Approach Spans	NB - 10 Feet Right, 4 Feet Left SB - 4 Feet Both Sides	12 Feet
191.0	Shoulder Width	I-75 - 9th St. to Approach Spans	10 Feet Outside ~8.5 Feet Inside	12 Feet
191.5	Bridge Width	Brent Spence Bridge	See Above	See Above
191.5	Bridge Width	Kentucky Approach Spans	Northbound - 50 Feet +/- Useable Southbound - 52 Feet +/- Useable	NB 3 Lanes = 60 Feet Useable SB 4 Lanes = 72 Feet Useable

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Kentucky

Horizontal Alignment				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
190.8	Horizontal Curves Lack of Spirals	I-75 Over 9th St.	Super=5.4% No spirals provided	
190.6	Horizontal Curves Radii	12th St. Under I-75	Hard PI w/ Delta ~ 15 degrees No Horizontal Curve	
191.4	Horizontal Curves Radii	Ramp H - 4th St. To I-75 NB (@ Merge Onto I-75 NB)	R=234 Feet	Directional Ramp Min. R = 510 Feet V = 40 mph
191.3	Horizontal Curves Radii	Ramp B1 - SB I-75 to EB 5th St.	R=90 Feet V=15 mph	Directional Ramp Min. R = 275 Feet V=30 mph
191.3	Horizontal Curves Radii	Ramp B2 - SB I-75 to WB 5th St.	R=65 Feet V=15 mph	Directional Ramp Min. R = 275 Feet V=30 mph
191.4	Ramp Acceleration Length	Ramp H - 4th St. To I-75 NB (@ Merge Onto I-75 NB)	~ 350 Feet	1020 Feet Beg. 25 mph End 60 mph
191.4	Ramp Deceleration Length	Ramp B - SB I-75 to 5th St.	~ 375 Feet	1550 Feet Beg. 60 mph End 15 mph
189.8	Horizontal Alignment - General	Undesirable Combination of Horizontal and Vertical Geometry Tight horizontal curvature with maximum superelevation combined with steep downgrade going into a sag		

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Brent Spence Bridge Project (BSB)
Review of Existing Geometrics
Mainline and Ramps, Kentucky

Vertical Alignment				
State Line Mile	**Item**	**Location**	**Existing**	**Required**
191.2	Vertical Curve Length / SSD	I-75 @ 5th St. Ramp Diverge	Length = 750 Feet K=127 SSD=539 Feet V=57 mph	V=60 mph Length=802 Feet K=136 SSD=570 Feet
191.4	Vertical Curve Length / SSD	I-75 @ Begin Approach Spans	Length = 600 Feet K=100 SSD=375 Feet V=52 mph	V=60 mph Length=906 Feet K=151 SSD=570 Feet
191.3	Vertical Curve Length / SSD	I-75 Over 4th St. Ramp	Length=350 Feet K=73 SSD=342 Feet V=43 mph	V=60 mph Length=653 Feet K=136 SSD=570 Feet
188.9	Vertical Grades	Ramp A - SB I-75 Exit Ramp to Kyle Feets Lane	~ 6.5%	5%
188.9	Vertical Grades	Ramp E - Kyle Feets Lane to NB I-75	~ 6.9%	5%
191.3	Vertical Grades	Ramp B - SB I-75 to 5th St.	~ 8.1%	5%
190.7	Vertical Clearance	I-75 Over Pike Street	14.5 Feet	16.5 Feet
190.8	Vertical Clearance	I-75 Over 9th St.	14.5 Feet	16.5 Feet
190.8	Vertical Clearance	Ramp Y (NB Pike St. to I-75 NB) Over 9th St.	14.5 Feet	16.5 Feet
190.7	Vertical Clearance	Ramp G (NB I-75 to 5th St.) Over Pike St.	15.0 Feet	16.5 Feet
190.6	Vertical Clearance	I-75 Over 12th St.	13.4 Feet	16.5 Feet

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