

BRENT SPENCE

BRIDGE CORRIDOR



BRENT SPENCE BRIDGE CORRIDOR PROJECT

INTERCHANGE MODIFICATION STUDY (IMS) ADDENDUM

DECEMBER 8, 2023



HNTB

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1. INTRODUCTION

The purpose of this *Interchange Modification Study (IMS) Addendum* is to update the original *Access Point Request (August 2011)*¹ for the Brent Spence Bridge (BSB) Corridor project. The original document presented various design and performance criteria for Alternative I to substantiate that the proposed changes in access to the interstate system would not degrade the operation or safety compared to the existing conditions and was approved by the Federal Highway Administration (FHWA) on November 3, 2011. This approved design is Selected Alternative I (from the 2012 EA/FONSI). This IMS Addendum provides information relative to design and traffic analysis performed since 2012, referencing project documents leading to the identification of several value engineering refinements to Selected Alternative I. Throughout this IMS Addendum, these collective refinements incorporated into Selected Alternative I are referred to as Refined Alternative I (Concept I-W). The addendum will assist the Kentucky Transportation Cabinet (KYTC), the Ohio Department of Transportation (ODOT), and FHWA in assessing the differences in impacts to safety and mobility between the Selected Alternative I and the refinements incorporated into Refined Alternative I (Concept I-W) and provide the justification and documentation necessary to substantiate that the refinements incorporated into Refined Alternative I (Concept I-W) will not result in adverse impacts to operations or safety.

2. PROJECT AREA AND STUDY AREA

Figure 1 illustrates the BSB project area and interstate I-71 and I-75 corridor, including geospatial data for the bridge crossing. The southern limit of the project is approximately 5,000 feet south of the US 25/Dixie Highway interchange on I-71/I-75 in Fort Mitchell at Kentucky milepost 188.0. The northern boundary of the project is about 1,500 feet north of the Western Hills Viaduct (WHV) interchange on I-75 in Cincinnati at Ohio milepost 2.5. The eastern and western limits of the project corridor generally follow the existing alignment of I-75, a major thoroughway for local and regional mobility within the Greater Cincinnati/Northern Kentucky region. Locally, I-75 connects to I-71, I-74, I-275, and US Route 50. The BSB provides an interstate connection carrying I-71 and I-75 over the Ohio River, providing a critical link along the national I-75 corridor stretching from Florida to Michigan.

¹ [AccessPointRequest-Aug.2011.pdf \(brentspencebridgecorridor.com\)](#)



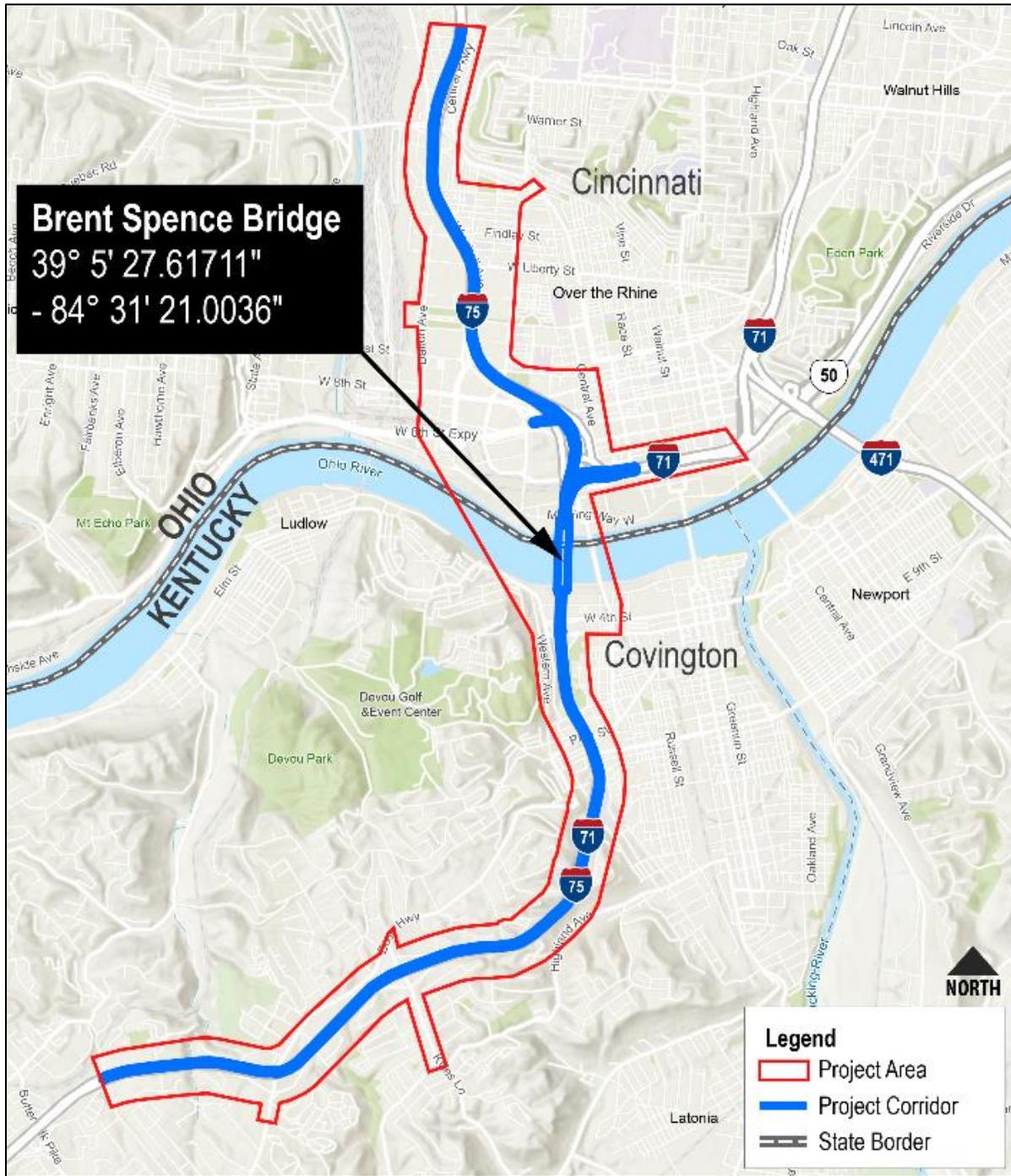


Figure 1: BSB Project Area



The BSB Study Area for this IMS Addendum extends to the first adjacent interchange beyond the project area, including Buttermilk Pike south of the US 25/Dixie Highway Interchange and Hopple Street north of the WHV Interchange. **Figure 2** shows the TransModeler operations limits, which extend along the I-71/75 corridor to include the I-275 Interchange on the south and the I-74/I-75 Interchange on the north. The model consists of mainline, ramps, and ramp terminal intersections.



Figure 2: TransModeler Project Limits

3. PROJECT HISTORY

3.1 Project Background

On October 14, 2004, KYTC and ODOT recognized the need to improve the Brent Spence Bridge (BSB) corridor. They formally agreed to jointly develop and deliver a project to replace the existing BSB over the Ohio River. Key characteristics of the BSB corridor include:

- The corridor comprises 7.8 miles of I-71 and I-75, located within portions of Ohio and Kentucky.
- The BSB carries both I-71 and I-75 over the Ohio River.
- The BSB opened in 1963 and was designed to carry 80,000 vehicles per day (VPD). The current traffic volumes are 160,000 VPD.

3.2 Existing Conditions

The I-71 and I-75 facilities do not meet current design standards for numerous features, including lane widths, shoulder widths, horizontal and vertical clearances, left-hand entrances and exits, and horizontal and vertical geometry. The BSB, with its reduced travel lane and shoulder widths, is the most frequently noted substandard feature. The BSB 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, increased traffic volumes warranted an additional travel lane in each direction to add capacity. To accomplish this, the original safety curb on the bridge was retrofitted to the New Jersey Barrier style barrier, and the existing travel lanes were reduced in width to accommodate four 11-foot lanes with one-foot shoulders.

In addition to the design deficiencies on the bridge, the approaches on either side are also characterized by design deficiencies, such as narrow travel lanes and reduced shoulder widths. The substandard lane widths and lack of shoulders result in unacceptable operational deficiencies and create safety hazards for motorists.

3.3 Purpose and Need

The purpose of the BSB Corridor Project is unchanged from what was presented in the approved 2012 EA/FONSI:

- Improve traffic flow and level of service;
- Improve safety;
- Correct geometric deficiencies; and
- Maintain connections to critical regional and national transportation corridors.

3.4 Project Development Before 2012

To satisfy the requirements of the National Environmental Policy Act (NEPA), KYTC and ODOT completed numerous resource-specific technical studies to determine potential impacts on the human and natural environment. These efforts were documented in resource-specific technical reports. The results of the



resource-specific studies were incorporated into the evaluation of alternatives throughout the project's development. A summary of the decision-making documents that culminated in identifying the preferred alternative is provided in the *Project Summary Report*². Several documents are summarized below that documented the selection of Alternative I:

- *Environmental Assessment (EA) (March 2012)* – Compared the two feasible Build Alternatives E and I, and the No Build Alternative. Alternative I was recommended as the preferred alternative based on design, local access, traffic operations, estimated costs, environmental impacts, and stakeholder coordination.
- *Access Point Request (August 2011, approved on November 3, 2011)* – Documented various design and performance criteria for Alternative I to substantiate that the proposed changes in access to the interstate system would not degrade the operation or safety compared to the existing conditions.
- *Finding of No Significant Impact (FONSI) (August 9, 2012)* – FHWA determined that Alternative I would not significantly impact the human or natural environment.

4. DEVELOPMENT OF REFINEMENT CONCEPTS

Since the approval of the FONSI, the Selected Alternative I was further evaluated by KYTC and ODOT to apply practical design principles, which included an update to design standards, traffic counts, and traffic operations to determine potential cost savings. As a result of this effort, two value engineering concepts were developed with different lane configurations at the Ohio River crossing. These concepts did not change the access points provided in the preferred alternative, nor did they change the concept of creating a collector-distributor system that separates the interstate through traffic from the local connections. Evaluation of both concepts showed that they remained within the footprint of the original NEPA document. These efforts included:

- In October 2012, a Value Engineering Workshop was held to generate technical ideas to improve the design and constructability of Selected Alternative I.
- In 2015, as part of the continuing value engineering process, KYTC and ODOT developed the Whiz Bang Concept to evaluate further one of the high-value ideas generated during the Practical Design/Value Engineering Workshop: separating through (interstate) traffic from local ramp connections.
- In 2019, a Performance-Based Design Workshop was held to review the project using practical design principles, updated design standards, updated traffic counts, and traffic analysis to determine potential cost savings. Value engineering concepts were developed to reduce the cost of Alternative I. Each concept utilized different lane configurations for the existing and companion bridges – Concept W (Whiz Bang), Concept S, and Concept M.

² [2021-11-4-Brent Spence Summary-Report.pdf \(brentspencebridgecorridor.com\)](https://www.brentspencebridgecorridor.com/2021-11-4-Brent_Spence_Summary-Report.pdf)



The development of these concepts was documented in the *Analysis of Design Concepts (May 2020)* report³, with recommendations for moving forward based on operation, design, and cost. Concept W and Concept M were both considered viable options for the BSB corridor and recommended for further study. After completing the *Analysis of Design Concepts* report, the concept names were updated to Concept I-W and Concept I-M to convey more clearly that the concepts are value engineering refinements to Selected Alternative I.

Selected Alternative I and value engineering Concepts I-W and I-M were further evaluated as described in the following reports.

- In August 2022, a *Traffic Operations Report*⁴ was prepared to review available traffic counts, OKI travel demand modeling, existing (2019) TransModeler calibration, development of refined alternative traffic forecasts, and TransModeler scenario analysis of 2050 build concepts. The primary focus of the traffic modeling was freeway operational analysis of the value engineering Concepts I-W and I-M.

Traffic operations analysis using TransModeler and refined traffic forecasts developed from the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) travel demand model were completed for the BSB corridor. The existing TransModeler files were calibrated to 2019 AM and PM peak periods, and the forecast origin-destination (O-D) matrices represented a 2050 condition. The two value engineering concepts were evaluated and compared to Selected Alternative I. The operations analysis indicated that Concept I-W has acceptable traffic operations while Concept I-M experiences excessive traffic queues for NB I-71/I-75 in the AM peak period.

- In August 2022, a *Design Summary Report*⁵ was prepared to compare Selected Alternative I, Concept I-W, and Concept I-M regarding operations, local connectivity, design exceptions, work limits, and cost estimates. The operations analysis indicated Concept I-W has acceptable traffic operations with similar deficiencies to Selected Alternative I. At the same time, Concept I-M experiences excessive traffic queues for NB I-71/I-75 in the AM peak period. Based on a comparison of the design factors and traffic operations, it was recommended that Concept I-W be carried forward as a value engineering refinement to Selected Alternative I and that Concept I-M be excluded from further consideration. For the remainder of this IMS Addendum, the collective refinements incorporated into the Selected Alternative I since the 2012 EA/FONSI are referred to as Refined Alternative I (Concept I-W).

4.1 Refined Alternative I (Concept I-W) Conceptual Signing Plan

The 2012 Selected Alternative I conceptual signing plan was reviewed for compatibility with Refined Alternative I (Concept I-W). No fatal flaws were found for the signing of Refined Alternative I (Concept I-W) from the southern project limits in Kentucky to Linn Street in Ohio. However, while considering the signing, it was recognized that potential revisions could be made to the original Selected Alternative I signing plan to improve

³ [Analysis-of-Design-Concepts.pdf \(brentspencebridgecorridor.com\)](#)

⁴ [BSB Traffic Operations Report Final.pdf \(brentspencebridgecorridor.com\)](#),

⁵ [2022-8-23-Final-Design-Summary-Report-wAppendix-note.pdf \(brentspencebridgecorridor.com\)](#)



driver understanding and operations for southbound I-75 drivers north of Linn Street in Ohio. Comments received from both states are addressed on the plan sheets included in **Appendix A**.

Coordination with the two BSB Corridor ODOT design projects north of Linn Street (Linn Street to Findlay Street and Findlay Street to north of the WHV) will be necessary to verify lane assignments for the interstate and determine appropriate pavement marking and signing needs for Refined Alternative I (Concept I-W). This will also include coordination with the freeway management/ITS design and destination signing in the BSB corridor.

5. LOCAL COORDINATION AND PROJECT PHASING

5.1 Local Coordination and Refined Alternative I (Concept I-W)

Since the 2012 FONSI, KYTC and ODOT have coordinated with local cities and counties to develop the refinements in Refined Alternative I (Concept I-W) and identify mitigation activities and additional measures that integrate the BSB Corridor Project into the surrounding communities. As part of these efforts, KYTC and ODOT coordinated with the City of Cincinnati and Covington to refine the project design in their communities. These refinements include:

- The local connections at the I-75 and WHV Interchange were changed based on the final bridge alignment of the WHV Replacement Project (a City of Cincinnati and Hamilton County joint project).
- The northbound entrance ramp to I-75 from Freeman Avenue from south of Ezzard Charles Drive was relocated to the north of Ezzard Charles Drive.
- The northbound entrance ramp in Ohio to I-75 from 4th Street was relocated to 3rd Street.
- The Ohio southbound I-75 to 5th Street exit ramp was removed to provide improved geometrics and open land for potential redevelopment.
- A new intersection with the northbound C-D ramp was created at 5th Street in Ohio; the number of lanes was reduced on the 5th Street approach to Central Avenue; the connection from 6th Street was changed from Winchell to the northbound C-D directly to I-75; and the exit ramp from SB I-75 to 7th Street was widened to two lanes.
- The number of lanes on Simon Kenton Way and Bullock Street between 12th Street and 9th Street in Kentucky was reduced to minimize right-of-way impacts.
- Simon Kenton Way was extended to the 5th Street ramp.

KYTC and ODOT will continue coordinating with appropriate local agencies throughout the procurement, final design, and construction phases of the BSB Corridor Project.



5.2 Design Criteria

The Refined Alternative I (Concept I-W) design follows the most current versions of the KYTC *Highway Design Guidance Manual* and the ODOT *Location and Design Manual*. Notable changes to the project design criteria since the 2012 EA/FONSI include:

- The original design followed the preferred criteria for design speed at that time. Per accepted practice for KYTC and ODOT, Refined Alternative I (Concept I-W) utilizes performance-based design guidelines that allow the design speed to match the posted speed for the I-71/I-75 mainline. As such, the design speed for the I-71/I-75 mainline is reduced from 60 mph to 55 mph. The design speed for the C-D roads matches the mainline design speed of 55 mph. Selected Alternative I used a design speed of 50 mph for the C-D roads.
- The original design utilized shoulder widths to accommodate pier foundations, light towers, and sign foundations. Current KYTC and ODOT design standards do not require the extra widening of shoulders in these situations. In addition, the requirement for 12-foot shoulders on roadways in Ohio with three or more lanes and high truck traffic was removed. As such, the design standard for inside and outside shoulder widths for I-71/I-75 and the C-D roads for Refined Alternative I (Concept I-W) is revised to 10 feet.

During the development of final plans, all design standards will be the current approved KYTC Highway Design Guidance Manual and the ODOT Location and Design Manual and will be verified to meet current AASHTO Standards at a minimum.

5.3 Description of Alternatives

ODOT and KYTC identified Selected Alternative I as the preferred Alternative in the BSB 2012 EA/FONSI. Refined Alternative I (Concept I-W) was developed as a value engineering refinement to Selected Alternative I through a series of design and operational studies completed since 2012. The two alternative designs are described in the following sections as a general overview of the alignment and configuration of bridges. Specific differences related to the change in design speed for Refined Alternative I (Concept I-W) are not included.

5.3.1 Selected Alternative I

Selected Alternative I utilizes the existing I-71/I-75 alignment from the southern project limits at the Dixie Highway Interchange north to the Kyles Lane Interchange. The Dixie Highway and Kyles Lane Interchanges are modified to accommodate a C-D roadway, designed along both sides of I-71/I-75 between the two interchanges. The alignment shifts to the west to accommodate additional I-71/I-75 travel lanes north of the Kyles Lane Interchange. Six lanes are provided in each direction between Kyles Lane and KY 12th Street. Near KY 12th Street, the alignment separates into three routes for I-71, I-75, and a C-D roadway in the NB direction.

A companion bridge (with a width of 172 feet) is designed just west of the existing BSB to carry NB and SB I-75 traffic with three lanes in each direction. Two additional lanes for SB I-71 traffic and three other lanes will



carry SB local traffic as part of the C-D roadway system. The existing BSB, which currently has four lanes on each deck, is rehabilitated to maintain two lanes for NB I-71 traffic and three for NB local traffic as part of the C-D roadway system.

Selected Alternative I reconfigures I-75 through the I-71/I-75/US 50 Interchange and eliminates access to and from NB I-75 between KY 12th Street and the US 50/OH 6th Street overpass in the NB direction. Selected Alternative I also eliminates access to and from SB I-75 between the Freeman Avenue and KY 12th Street exits. A new C-D system accommodates these movements. See **Appendix B** for the Selected Alternative I plan.

5.3.2 Refined Alternative I (Concept I-W)

Refined Alternative I (Concept I-W) uses the Selected Alternative I alignment and design from the Dixie Highway Interchange to KY 12th Street and includes a C-D on both sides of I-75 north of US 50 in Ohio with access restrictions similar to those in Selected Alternative I.

In Refined Alternative I (Concept I-W), a companion bridge (with a width of 107 feet) is proposed just west of the existing BSB with all I-71 and I-75 traffic on the new bridge and all C-D traffic on the existing BSB. The new bridge will carry five lanes of SB I-71 and I-75 traffic on the lower deck and five lanes of NB I-71 and I-75 traffic on the upper deck. The existing BSB will be rehabilitated and restriped from four lanes to three lanes on each deck for NB C-D traffic on the lower deck and SB C-D traffic on the upper deck as part of the C-D roadway system. See **Appendix C** for the Refined Alternative I (Concept I-W) Plan. Also, **Appendix D** provides the number of lanes on the freeway segments and proposed turn movements at the intersections.

5.4 BSB Project Phasing

The BSB Corridor Project is divided into three phases, as shown in **Figure 3**.

5.4.1 Phase I (ODOT PID 114161)

ODOT has a contract for the design of the interstate and interchanges in this corridor segment from Findlay Street to the north of the WHV, which includes coordination with the design of the WHV. In 2012, it had yet to be determined that the WHV needed a complete replacement, so Selected Alternative I included an interchange designed to connect to the existing structure. The WHV will be replaced, and a new interchange will be designed to ensure local and interstate connections. The City of Cincinnati and Hamilton County lead the WHV project. This Phase I work will follow a Design-Bid-Build process with construction coordinated with the WHV.

5.4.2 Phase II (ODOT PID 113361)

ODOT has a contract to design the interstate and interchanges from Linn Street to Findlay Street in this corridor segment. Based on discussions with the City of Cincinnati, changes have been made to the Alternative I design of the Ezzard Charles Drive bridge over I-75 and the location of the northbound entrance ramp to I-75 from Freeman Avenue. This Phase II work will follow a Design-Bid-Build process.



5.4.3 Phase III (ODOT PID 116649/KYTC Project Item No. 6-17)

Phase III includes all work from Dixie Highway in Kentucky to Linn Street in Ohio, including constructing the new companion bridge and rehabilitating the existing BSB bridge. This phase will follow a Progressive Design-Build Process.

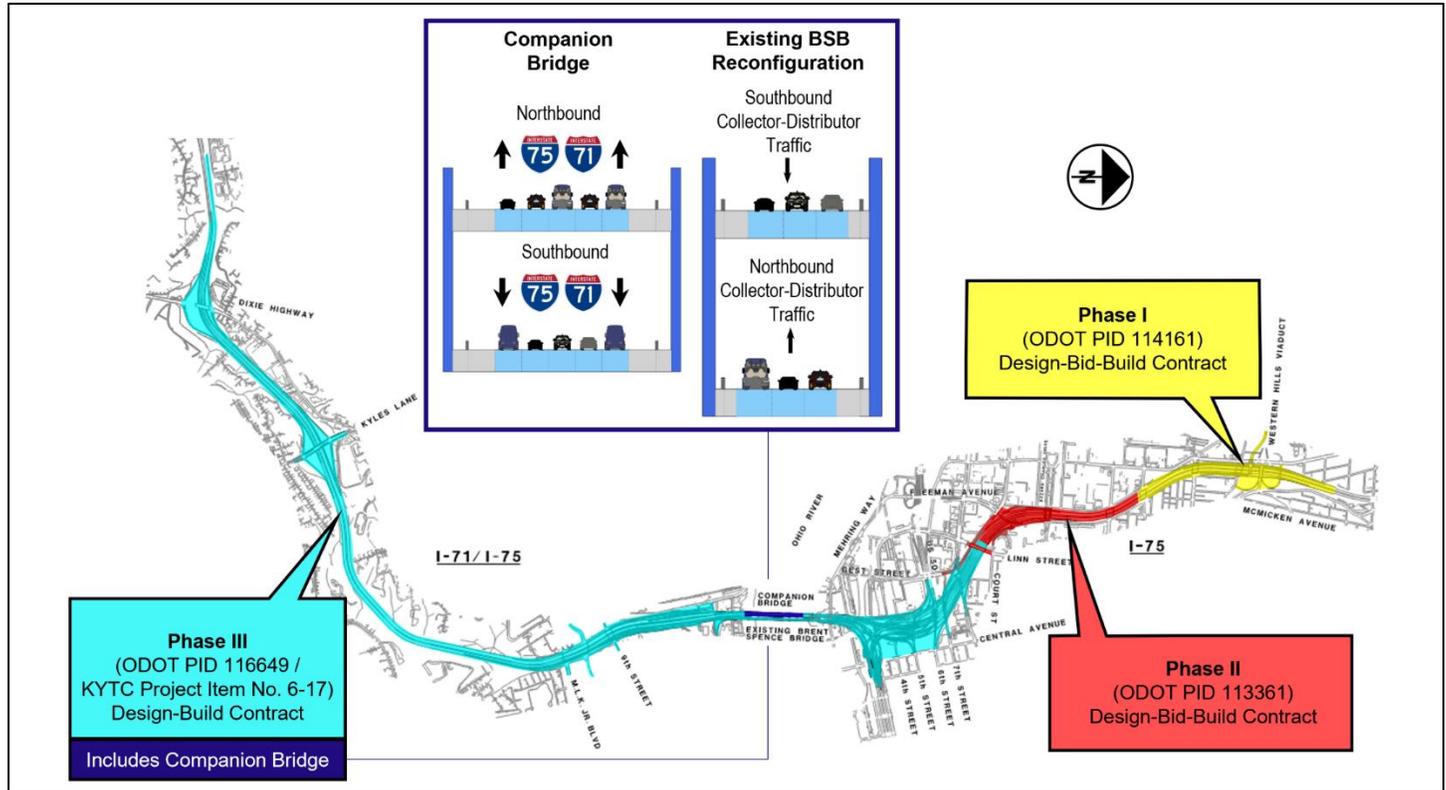


Figure 3: BSB Corridor Phasing

5.5 Adjacent Projects

Improvements to I-75 between Turfway Road and the southern limits of the BSB Corridor project, including the I-275 and Buttermilk Parkway Interchanges, are identified in the Metropolitan Transportation Plan and are currently in the NEPA development phase. These safety and capacity improvements are anticipated to be phased between 2027 and 2035, pending funding authorization by the KY General Assembly. The current layout and the potential construction phases are shown in **Figure 4**. The roadway improvements shown in Segment 3 are included in the 2049 operations analysis summarized in the BSB IMS addendum. A traffic operational sensitivity analysis was completed for BSB opening year 2029 and design year 2049 to evaluate I-71/I-75 operations for Refined Alternative I (Concept I-W) without the inclusion of this project. The sensitivity analysis indicated that the completion of this project is critical for efficient operations of I-71/I-75 between the BSB and I-275 Interchange.

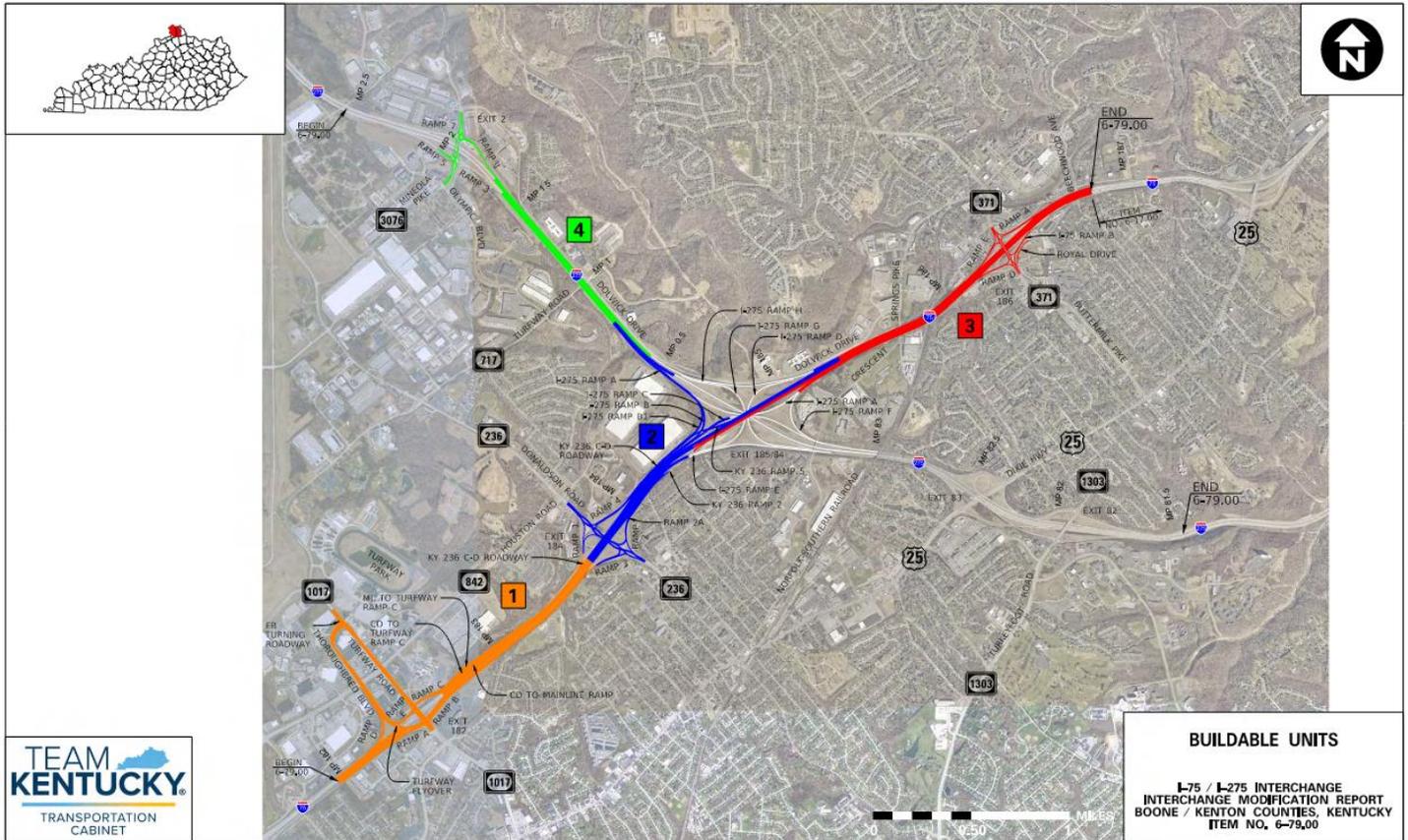


Figure 4: I-275 Project Layout and Project Phasing

6. LOCATIONS OF NOTABLE CHANGE

6.1 New Interchange Configuration at I-75 & WHV

During the development of Selected Alternative I, it was assumed that the WHV would remain in its existing location. Therefore, the design of the I-75 and WHV Interchange was shown with connections to the existing structure. The City of Cincinnati and Hamilton County have studied the bridge and determined that a total replacement is needed. The WHV Replacement Project has established the final bridge alignment and connectivity to local streets. As part of the BSB Corridor project, the interchange with I-75 was modified for Refined Alternative I (Concept I-W) to coordinate with the design and constructability of the WHV project. A comparison of the Existing 2012 EA/FONSI Selected Alternative I and the Refined Alternative I (Concept I-W) interchange designs for the WHV is shown in **Figure 5**.

6.2 Change in Location of Northbound Entrance Ramp from Freeman Avenue

In coordination with the City of Cincinnati, the northbound entrance ramp to I-75 from Freeman Avenue was relocated from south of Ezzard Charles Drive to north of Ezzard Charles Drive via Winchell Avenue. This configuration change is shown in **Figure 6**.

6.3 Cincinnati Ramp Modifications

In coordination with the City of Cincinnati, changes were made to various I-75 ramps between the Ohio River and Linn Street. These include relocating the northbound entrance ramp in Ohio to I-75 from 4th Street to 3rd Street and removing the southbound exit ramp in Ohio from I-75 to 5th Street to provide improved geometrics and create additional land for potential redevelopment. As part of these ramp changes, a new intersection with the northbound C-D ramp was created at 5th Street; the number of lanes were reduced on the 5th Street approach to Central Avenue; the connection from 6th Street was changed from Winchell Avenue to the northbound C-D directly to I-75; and the exit ramp from SB I-75 to 7th Street was widened to two lanes. A comparison of the ramp changes is shown in **Figure 7**.

6.4 Kentucky Collector-Distributor Modifications in Covington

The SB Exit from the collector-distributor (existing BSB) to 5th Street in Covington is a left-hand exit in Refined Alternative I (Concept I-W). This changes from the Selected Alternative I design that serves this movement with a right-hand exit from the companion bridge. The two configurations for this ramp are depicted in **Figure 8**. Revisions to the C-D roads are also shown, including the modification to the frontage roads between 12th Street and 9th Street to minimize right-of-way impacts and an extension of Simon Kenton Way (northbound frontage road) parallel to the I-71/I-75 northbound ramp to 5th Street in Covington.



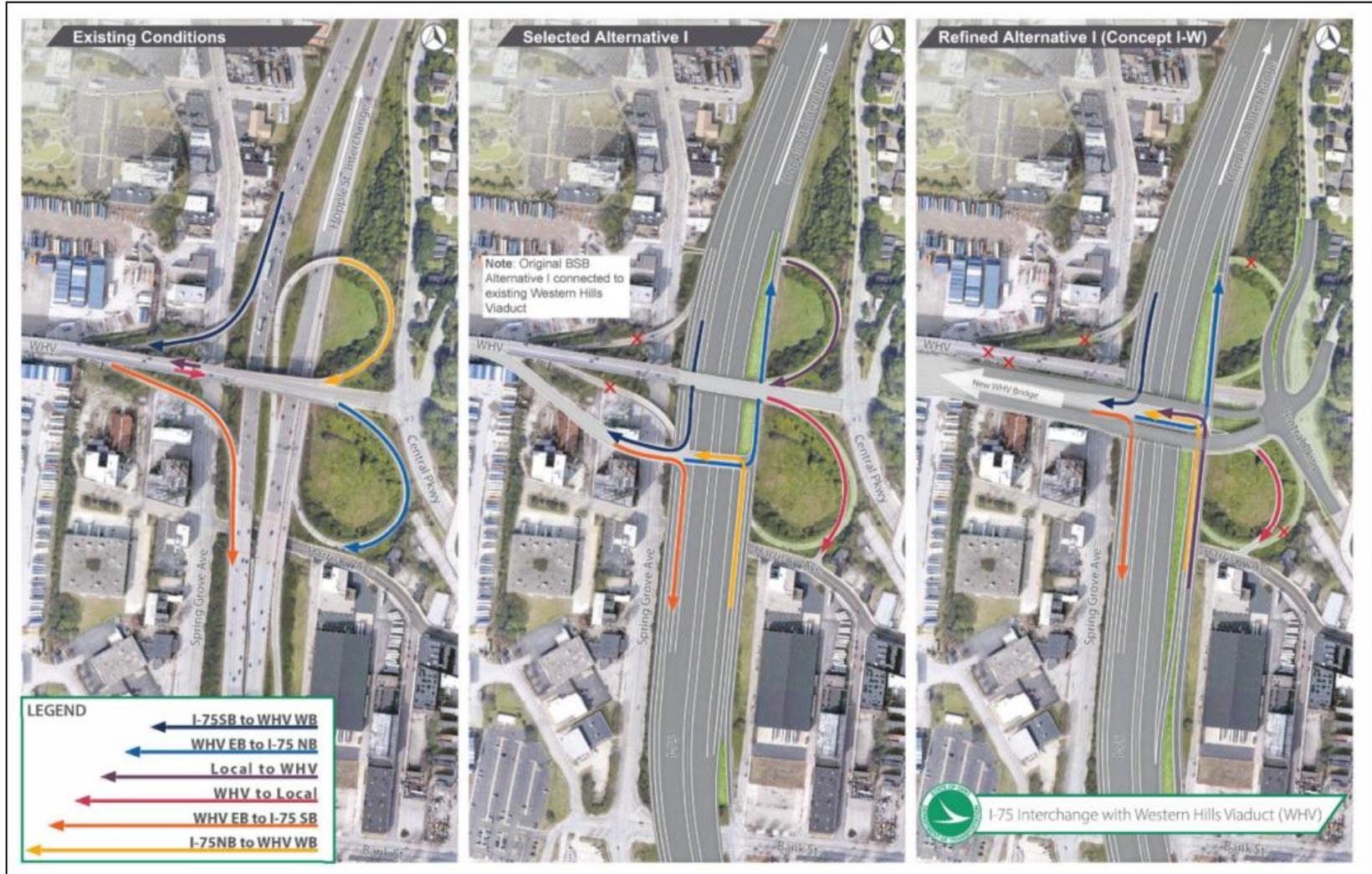


Figure 5: I-75 Interchange with WHV



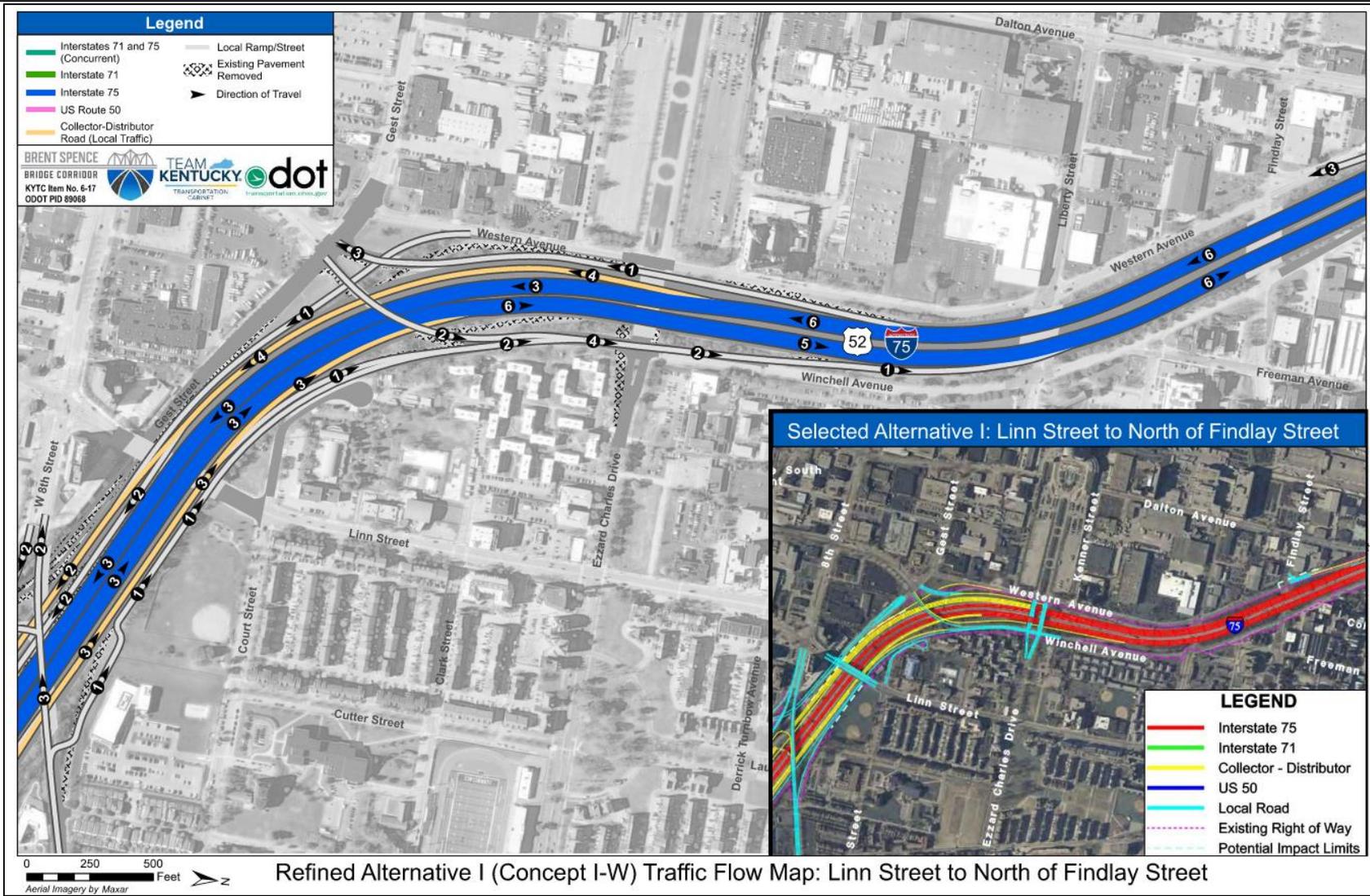


Figure 6: I-75 NB Entrance Ramp Modification at Freeman Avenue



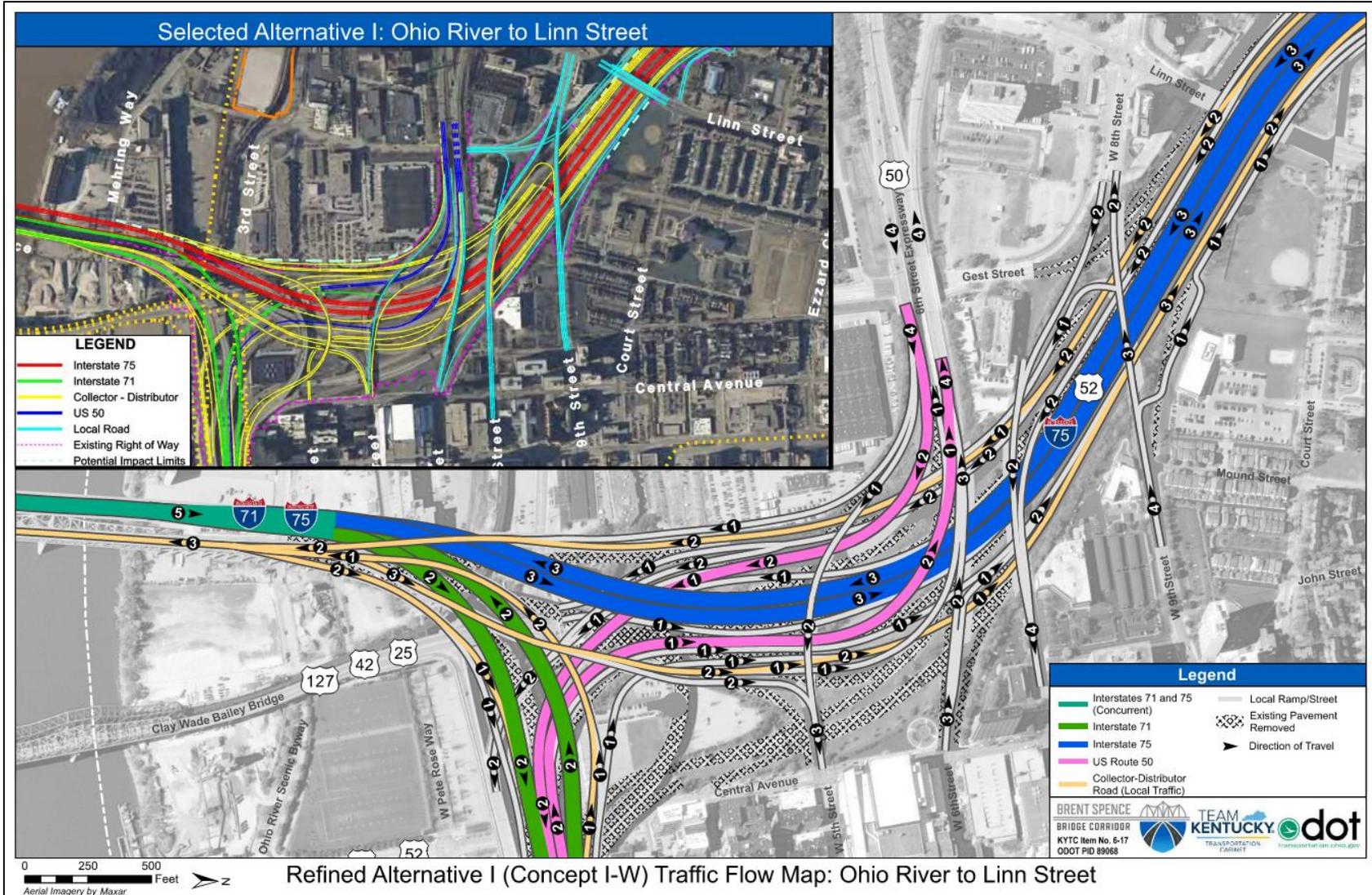


Figure 7: Cincinnati Ramp Modifications



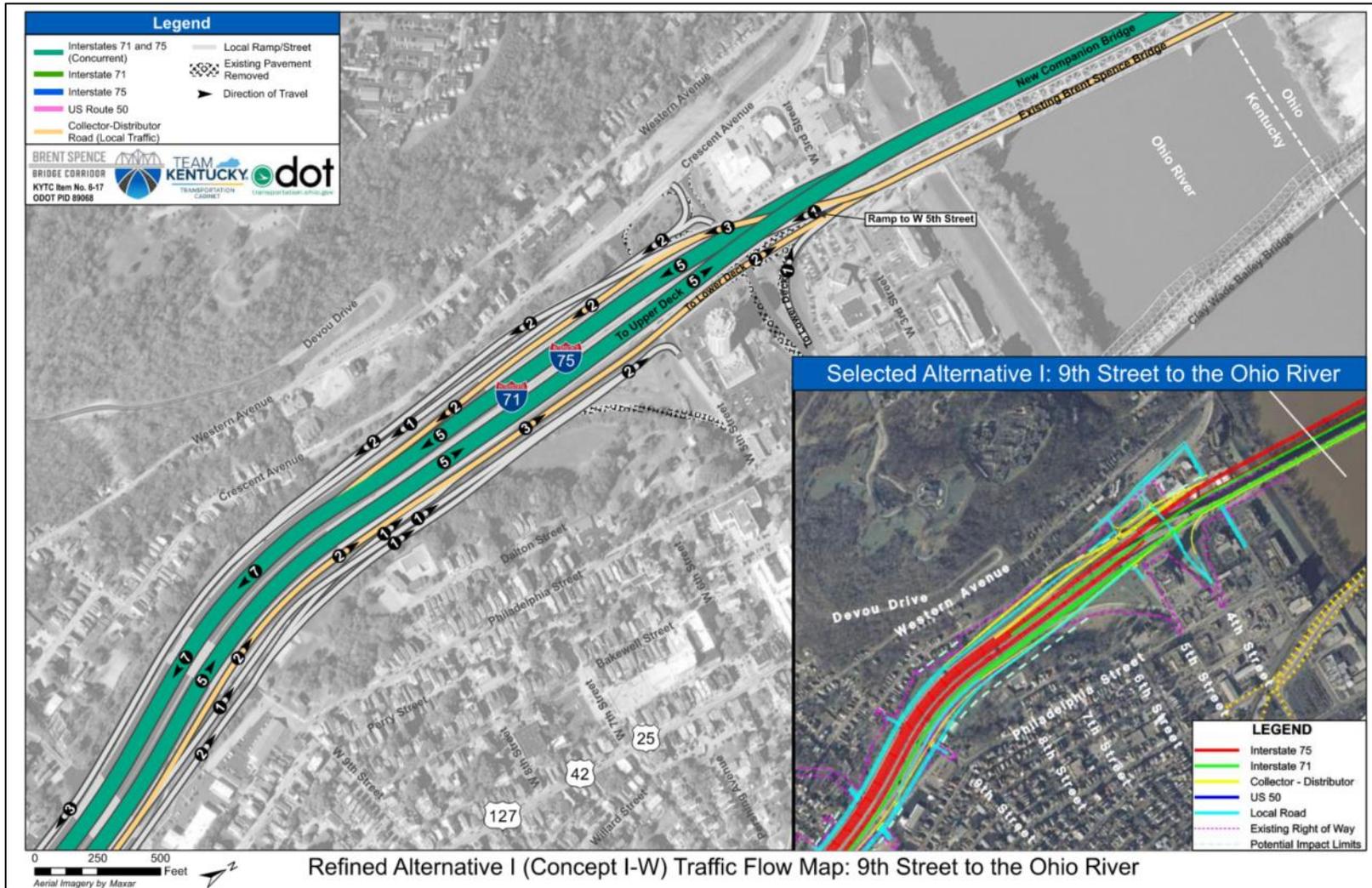


Figure 8: Kentucky Collector-Distributor Modifications in Covington



6.5 Brent Spence Bridge: Existing and Companion Bridge

The BSB, including the existing span and the companion bridge, has 16 travel lanes for both Selected Alternative I and Refined Alternative I (Concept I-W). This includes six lanes for local traffic, six for limited access I-75, and four for I-71. The companion bridge and lane widths are 12 feet for both alternatives. The shoulder width is 14 feet for Selected Alternative I and 10 feet for Refined Alternative I (Concept I-W). On the existing span, the NB local traffic is served on the lower deck for both alternatives with the same cross sections; the upper deck serves the northbound I-71 direct traffic for Selected Alternative I and the SB local traffic for Refined Alternative I (Concept I-W) (see **Figure 9** and **Figure 10**). There are cross-section differences for the upper deck of the existing span due to differences in the functionality of the road. Still, both alternatives meet design standards for the Companion Bridge. The existing BSB is improved from the existing conditions but requires design exceptions for both alternatives, including lane and shoulder widths.

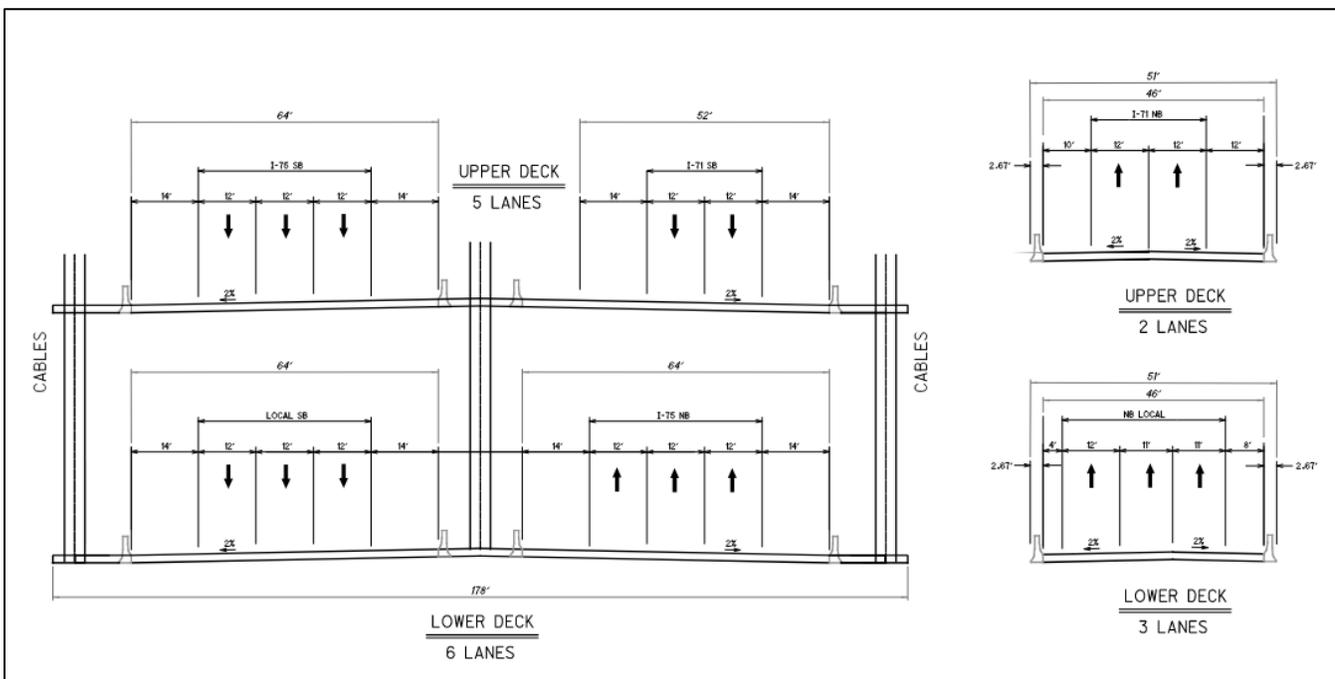


Figure 9: Selected Alternative I BSB Cross Sections

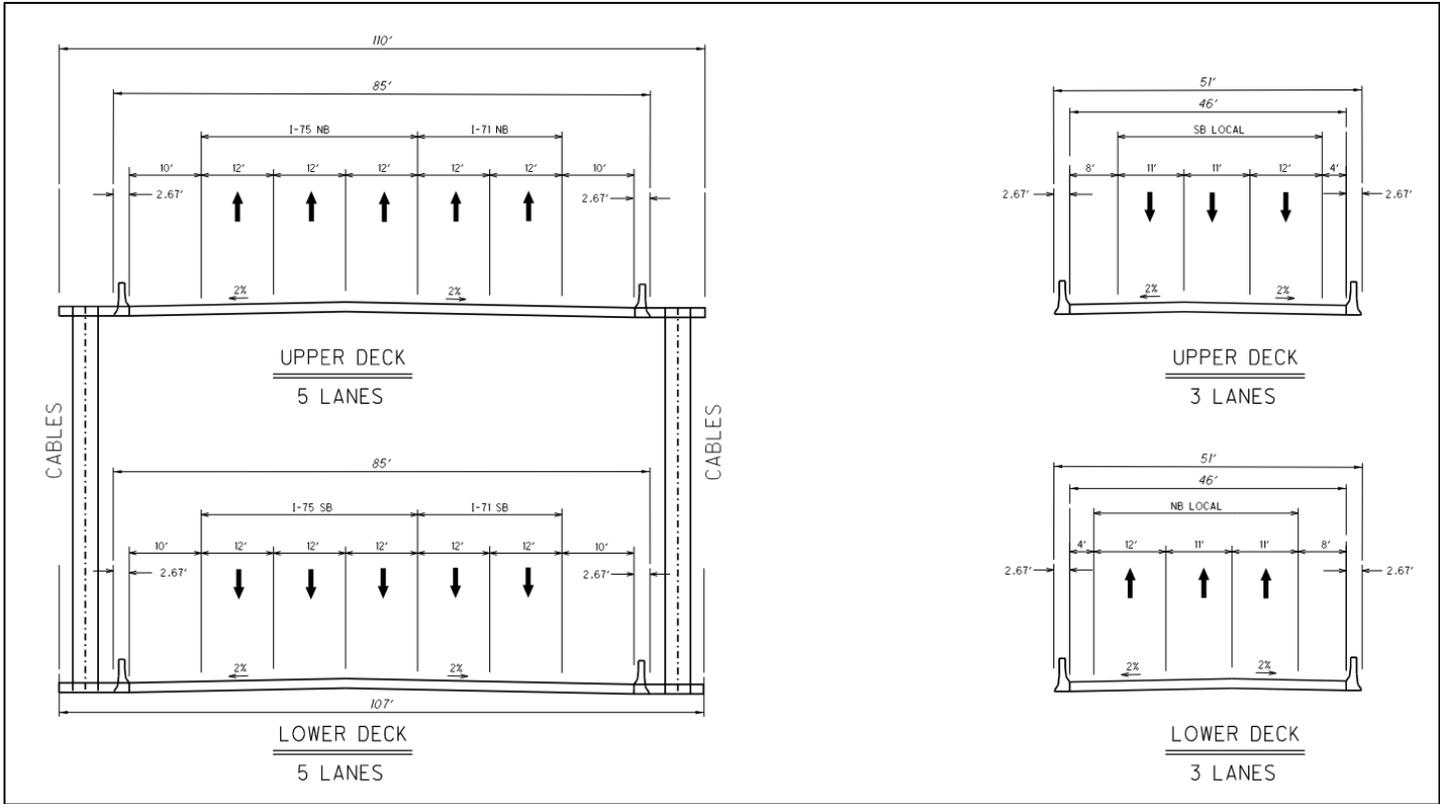


Figure 10: Refined Alternative I (Concept I-W) BSB Cross Sections

7. CERTIFIED TRAFFIC

Certified traffic forecasts, including design hours and Annual Average Daily Traffic (AADT), were developed for years 2029 and 2049 for the BSB project study limits. The forecasts include the No Build, Selected Alternative I, and Refined Alternative I (Concept I-W). The study limits include the I-71 and I-75 interstate between the Buttermilk Pike Interchange in the south and the Hopple Street Interchange in the north and I-71 between the BSB and the US 50/I-471 Interchange. The ramp terminal and adjacent arterial intersections are included in the forecast area. The 2011 Access Revision Request traffic forecasts were forecasted for the design year 2035. The forecasting parameters, methodology, and certified traffic forecasts are in **Appendix E: BSB Certified Traffic Report**.

The design year 2035 traffic forecast developed as part of the 2012 BSB IMS for No Build and Selected Alternative I is compared to the 2049 traffic forecast for No Build, Selected Alternative I, and Refined Alternative I (Concept I-W). A screenline comparison of the BSB and CWB Bridge is shown in **Table 1 (Daily)**,

Table 2 (AM DHV), and **Table 3** (PM DHV). In summary, the 2049 No Build forecasts are similar to the 2035 No Build forecasts, with some differences between the BSB and CWB distributions due to geometric changes at the NB I-75 entrance ramp from 4th Street in Covington. The 2049 Selected Alternative I forecasts are about 15% lower than the 2035 Selected Alternative I forecasts developed for the 2012 IMS. The forecasts are developed with base year traffic counts, base year model assignments, and future year model assignments. Therefore, the differences in the traffic forecasts indicate that the current OKI model of record (MOR) is forecasting fewer new trips to the corridor with the implementation of the BSB project compared to the model results from the 2010 OKI MOR.

Table 1: Daily Traffic Forecast Comparison – Ohio River Screenline

Facility			Daily				
Route	Bridge	Direction	2035 No Build ('12 IMS)	2035 Alt I ('12 IMS)	2049 No Build	2049 Selected Alt I	2049 Refined Alt I (I-W)
I-75/ I-71	Brent Spence	NB I-71	98,530	38,490	86,900	26,650	57,550
		NB I-75		40,900		34,700	
		NB I-71/75 CD		40,420		38,850	38,750
		SB I-71	98,530	35,500	96,050	27,600	60,250
		SB I-75		38,600		34,100	
		SB I-71/75 CD		39,000		38,900	40,500
US-42	Clay Wade	NB	6,420	11,100	17,900	8,200	10,700
		SB	9,140	10,420	8,650	7,550	7,600
Screenline		NB	<i>104,950</i>	<i>130,910</i>	<i>104,800</i>	<i>108,400</i>	<i>107,000</i>
		SB	<i>107,670</i>	<i>123,520</i>	<i>104,700</i>	<i>108,150</i>	<i>108,350</i>
		Total	212,620	254,430	209,500	216,550	215,350



Table 2: AM Peak Hour Traffic Forecast Comparison – Ohio River Screenline

Facility			AM Peak Hour				
Route	Bridge	Direction	2035 No Build ('12 IMS)	2035 Alt I ('12 IMS)	2049 No Build	2049 Selected Alt I	2049 Refined Alt I (I-W)
I-75/ I-71	Brent Spence	NB I-71	8,650	3,690	8,000	2,390	5,120
		NB I-75		2,450		2,950	
		NB I-71/75 CD		4,220		3,980	3,840
		SB I-71	6,520	2,310	6,460	1,840	4,230
		SB I-75		3,920		2,570	
		SB I-71/75 CD		1,410		2,340	2,530
US-42	Clay Wade	NB	800	1,140	2,320	1,160	1,300
		SB	390	420	410	350	350
Screenline		NB	9,450	11,500	10,320	10,480	10,260
		SB	6,910	8,060	6,870	7,100	7,110
		Total	16,360	19,560	17,190	17,580	17,370

Table 3: PM Peak Hour Traffic Forecast Comparison – Ohio River Screenline

Facility			PM Peak Hour				
Route	Bridge	Direction	2035 No Build ('12 IMS)	2035 Alt I ('12 IMS)	2049 No Build	2049 Selected Alt I	2049 Refined Alt I (I-W)
I-75/ I-71	Brent Spence	NB I-71	6,690	2,380	6,630	2,190	4,530
		NB I-75		4,000		2,580	
		NB I-71/75 CD		2,290		2,970	2,910
		SB I-71	8,870	3,170	8,450	2,300	4,710
		SB I-75		2,730		2,340	
		SB I-71/75 CD		4,660		4,180	4,130
US-42	Clay Wade	NB	470	770	1,320	660	910
		SB	1,410	1,320	1,350	1,100	1,080
Screenline		NB	7,160	9,440	7,950	8,400	8,350
		SB	10,280	11,880	9,800	9,920	9,920
		Total	17,440	21,320	17,750	18,320	18,270



8. TRAFFIC OPERATIONS ANALYSIS

The traffic operational comparison for No Build, Selected Alternative I, and Refined Alternative I (Concept I-W) is based on traffic simulation analyses performed using Caliper's TransModeler platform. Travel time and level of service (LOS) metrics are reported for intersections and the freeway mainline segments. The analysis focuses on AM and PM period operations for the 2049 design year. **Appendix F: IMS Addendum Traffic Operations Analysis** describes the complete modeling methodology and results. The corridor-wide operational summary is covered in this section, with detailed segment-by-segment results reserved for review in **Appendix F**. The operations analysis described in this section assumes the completion of the I-275 project, which borders the southern project limits. Without the I-275 project, there is anticipated to be an operations concern associated with the existing roadway lanes between Dixie Hwy and I-275; the operations analysis report describes this condition in greater detail. The LOS summaries in the report are based on the peak hours of 7:00-8:00 AM and 4:30-5:30 PM.

8.1 Freeway Operations

The existing I-71/I-75 corridor has reoccurring travel delays for NB I-71/I-75 in the AM peak, with traffic queues stemming from the BSB and often reaching the I-275 Interchange. The PM peak has reoccurring traffic delays for SB I-71/I-75 upstream of the BSB, with queues forming on I-75 in Ohio, often reaching the WHV Interchange. The traffic analysis for the 2049 No Build indicates these traffic delays are compounded and impact the local arterials, with queues forming at the ramp terminal intersections. Selected Alternative I and Refined Alternative I (Concept I-W) address these operational deficiencies with the increase in freeway travel lanes and the addition of the C-D system. The I-71/I-75 travel time comparison from the I-275 Interchange to the I-74 Interchange (10.4 miles) is summarized in **Table 4**. Selected Alternative I and Refined Alternative I (Concept I-W) operate through the freeway system at free-flow speeds.

Table 4: Maximum Peak Travel Time (minutes) for I-71/I-75

Facility	Peak Period	2019 Existing	2049 No Build	2049 Selected Alternative I	2049 Refined Alternative I (Concept I-W)
NB I-71/I-75	AM	25	43	12	12
	PM	12	29	12	12
SB I-71/I-75	AM	12	38	12	12
	PM	26	65	12	12

The freeway segments were also measured in terms of LOS. **Table 5** summarizes the number of freeway segments defined by HCS as diverge, merge, weave, or basic within each LOS grade.



Table 5: Freeway Segments by LOS Grade

Peak Period	LOS	2049 No Build	2049 Selected Alternative I	2049 Refined Alternative I (Concept I-W)
AM	C or better	35	61	62
	D	11	22	27
	E	2	4	1
	F	31	3	1
PM	C or better	19	62	57
	D	10	18	25
	E	4	7	6
	F	46	3	3

The LOS results are similar to the travel time comparison with many segments in the No Build registering a LOS F, while Selected Alternative I and Refined Alternative I (Concept I-W) have only a few segments in the LOS F and LOS E categories. The one AM and three PM LOS F segments for Refined Alternative I (Concept I-W) occur at external points of the project area, including US 50 to the west of I-71/I-75, and I-71 on the eastern project limits. All Refined Alternative I (Concept I-W) segments within the project area have LOS E or better.

8.2 Intersection Operations

The operations analysis for the IMS addendum includes 62 intersections. The operational goal is to have the intersections operate at LOS D or better. The results for each intersection are summarized in **Table 6** (Kentucky) and **Table 7** (Ohio). As shown in the tables, Refined Alternative I (Concept I-W) achieves the intersection LOS target for all intersections, except Philadelphia Street & 9th Street (LOS F), Bullock Street & 12th Street (LOS E), and Bullock Street & 12th Street (LOS E). These intersections are constrained to existing geometry due to right-of-way constraints. Philadelphia Street and 9th Street is a stop-controlled intersection adjacent to the ramp terminal intersection at 9th Street and Simon Kenton Street. This intersection is currently an all-way stop controlled. The TransModeler analysis assumed a one-way stop controlled on Philadelphia Street to prevent queueing between Philadelphia Street and Simon Kenton Street. The 12th and Bullock Street intersection is an all-way stop-controlled intersection in the existing conditions and is analyzed as a signalized intersection for the build alternatives. The 12th Street and Bullock Street intersection has a traffic signal for the existing and future year conditions.

The No Build intersections experience poor operations, primarily due to the impact of freeway mainline congestion, which backs up into the ramp terminal intersections. However, some intersections in the No Build have better operations than the Build, resulting from traffic metering. Selected Alternative I has three intersections with LOS F, including the 4th Street intersections in Kentucky and the Freeman Avenue & Gest Street intersection.



Table 6: Kentucky Intersection Level of Service

<i>Intersection</i>	<i>No Build</i>	<i>Selected Alt I</i>	<i>Refined Alt I (I-W)</i>	<i>No Build</i>	<i>Selected Alt I</i>	<i>Refined Alt I (I-W)</i>
	<i>AM Period</i>			<i>PM Period</i>		
NB I-71/I-75 & Dixie Hwy	A	B	C	A	B	A
NB I-71/I-75 & Kyles Lane	C	C	C	B	B	B
SB I-71/I-75 & Dixie Hwy	A	A	C	B	B	C
SB I-71/I-75 & Kyles Lane	C	B	B	C	C	C
Dixie Hwy & Kyles Lane	C	B	C	C	C	C
Main St & Pike St	A	B	C	A	B	B
5th St & Main St	D	C	C	C	C	B
4th St & Main St	C	F	B	C	F	B
Simon Kenton & 12th St	F	D	C	A	C	C
Philadelphia St & 9th St	A	A	F	A	A	A
Simon Kenton & 12th St	E	D	D	C	C	C
Simon Kenton & 9th St	N/A	A	D	N/A	B	B
Philadelphia & 5th St	B	C	D	B	F	C
Philadelphia & 4th St	C	F	C	C	E	C
Bullock & 12th St	F	C	D	A	B	E
Bullock & Pike St	F	C	E	C	C	B
Bullock & 9th St	N/A	A	A	N/A	A	A
Crescent & 5th St	A	A	A	A	B	A
Crescent & 4th St	A	A	A	B	A	A



Table 7: Ohio Intersection Level of Service

Intersection	No Build	Selected Alt I	Refined Alt I (I-W)	No Build	Selected Alt I	Refined Alt I (I-W)
	AM Period			PM Period		
Central Ave & 3rd St	D	C	D	F	E	D
Central Ave & 4th St	B	C	B	D	D	B
Central Ave & 5th St	B	C	C	D	E	B
Central Ave & 6th St	B	C	A	D	D	C
Central Ave & 7th St	B	B	B	F	B	B
Central Ave & 9th St	B	B	B	F	B	C
Mound St & 9th St	A	A	A	A	A	A
US-42 & 3rd St	B	C	C	C	D	C
Gest St & 6th St	C	A	A	B	A	A
Elm St & 2nd St	B	B	B	A	A	B
Race St & 3rd St	A	A	B	D	B	C
Elm St & 3rd St	B	A	B	C	B	B
Elm St & 4th St	B	B	B	C	C	B
Plum St & 3rd St	F	A	A	F	D	B
Plum St & 4th St	B	A	A	E	C	A
Linn St & 6th St	C	B	B	D	B	B
Linn St & 8th St	B	B	B	B	B	B
Linn St & Court St	A	A	A	A	D	A
Linn St & Ezzard Charles Dr	D	C	C	C	C	C
Winchell Ave & Ezzard Charles	B	A	B	A	A	B
Freeman Ave & Gest St	C	D	C	B	F	B
Western Ave & Gest St	D	D	A	B	D	A
Western Ave & Ezzard Charles	A	A	A	A	A	A
Winchell Ave & Liberty St	B	A	A	B	B	B
Winchell Ave & Findlay St	B	B	B	B	B	B
Western Ave & Liberty St	B	B	B	B	B	B
Western Ave & Findlay St	B	B	B	B	B	B
Dalton Ave & Findlay St	B	C	B	C	C	C
Linn St & Bank St	A	A	A	A	A	A
Linn St & Central Pkwy	B	B	C	B	B	C
Brighton Pl & Central Ave	A	A	A	A	A	A
Brighton Pl & Central Pkwy	D	B	D	D	B	C
McMillian Ave & Central Pkwy	B	B	D	B	B	C
Colerain Ave & Harrison St	C	A	A	B	A	A
Patterson St & Harrison St	E	A	A	A	A	A
Winchell Ave & Bank St	C	C	C	C	C	C
Winchell Ave & Harrison St	E	A	A	C	A	A
NB I-75 & WHV	N/A	B	B	N/A	B	B
Spring Grove Ave & Bank St	B	A	A	B	B	A
Spring Grove Ave & Harrison	B	A	B	B	A	B
SB I-75 & WHV	N/A	A	B	N/A	A	B
WHV Ramp & Harrison Street	N/A	A	A	N/A	A	A
NB I-75 & 5 th Street	N/A	N/A	B	N/A	N/A	B



8.3 Turn Lane Storage Lengths

Turn lane length was calculated following ODOT and KYTC guidelines for all signalized intersections in the study area. The turn length accounts for deceleration, turning vehicles storage, and bay taper at the intersection. The calculation's design speed is 30 to 35 MPH, and the turn lane taper is 50 ft. The minimum turn lane length was 125 ft to meet the design guidelines for deceleration at this design speed. Vehicle storage lengths were calculated for each turning movement according to the 2049 certified traffic turning volume, number of turn lanes, and signal cycle length used in the TransModeler analysis.

The turn storage lanes were designed to accommodate through queue blockage. Thru blockage length is the storage length of through vehicles plus a 50 ft taper. The through storage length is calculated from through volume, number of through lanes, and cycle length. The turn length is the maximum between turn storage length plus taper, deceleration length, and thru blockage length. The turn lane storage calculations are conducted for the AM and PM peak hours, and the higher value is considered the recommended turn lane length. The calculation of the turn storage lengths is provided in the project files. A summary of the recommended storage lengths and provided storage lengths are outlined in **Table 8** and **Table 9**. If the turn lane is part of a shared through movements, "shared" is identified for storage lane length. In most cases, the storage lengths are constrained to available right-of-way. The design-build team will review the recommended storage lengths and incorporate design improvements where feasible.

Table 8: Recommended Turn Lane Storage – Kentucky

Intersection	Approach	Turn Movement	Critical period	Recommended Turn Lane Lengths (ft)	Provided Length (ft)
NB I-75 & Dixie	WB	Right	AM	925	515
	EB	Left	PM	850	350
SB I-75 & Dixie	WB	Left	AM	875	330
	EB	Right	PM	600	220
NB I-75 & Kyle	WB	Right	AM	1235	290
	EB	Left	PM	825	440
SB I-75 & Kyle	WB	Left	PM	450	650
	EB	Right	PM	450	280
Dixie & Kyle	NB	Right	AM	425	160
	SB	Left	PM	550	285
	WB	Right	PM	300	Shared
	WB	Left	PM	225	Shared
Simon Kenton & 12th	NB	Right	PM	425	470
	NB	Left	PM	225	Shared
	WB	Right	Both	550	575
	EB	Left	AM	525	Shared
Bullock & 12th	WB	Left	PM	525	Shared
	EB	Right	AM	325	Shared
	SB	Right	PM	375	Shared
	SB	Left	Both	400	460
Main & Pike	WB	Right	PM	300	Shared
	EB	Left	AM	425	165
Simon Kenton & Pike	WB	Right	PM	400	Shared
	EB	Left	AM	800	245
	NB	Right	Both	325	Shared



Intersection	Approach	Turn Movement	Critical period	Recommended Turn Lane Lengths (ft)	Provided Length (ft)
Bullock & Pike	NB	Left	PM	325	430
	WB	Left	PM	575	215
	EB	Right	AM	675	Shared
	SB	Right	PM	575	Shared
	SB	Left	PM	300	Shared
Simon Kenton & 9th	WB	Right	AM	550	Shared
	EB	Left	PM	300	Shared
	NB	Right	AM	600	Shared
	NB	Left	AM	600	Shared
Bullock & 9th	WB	Left	PM	150	Shared
	EB	Right	Both	125	Shared
	SB	Left	PM	450	Shared
	SB	Right	PM	450	Shared
Main & 5th	NB	Right	AM	425	Shared
	SB	Left	PM	575	110
	EB	Right	AM	600	Shared
	EB	Left	AM	600	Shared
Philadelphia & 5th	NB	Right	Both	225	Shared
	SB	Left	AM	225	170
	EB	Right	AM	600	Shared
	EB	Left	AM	600	Shared
Main & 4th	NB	Left	AM	575	340
	SB	Right	PM	725	695
	WB	Right	AM	1000	300
	WB	Left	PM	575	380
Philadelphia & 4th	NB	Left	AM	400	150
	SB	Right	AM	725	310
	WB	Right	PM	550	Shared
	WB	Left	PM	550	Shared

Table 9: Recommended Turn Lane Storage – Ohio

Intersection	Approach	Turn Movement	Critical period	Recommended Turn Lane Storage	Provided Length
CW Bailey & 3rd	NB	Right	AM	325	150
	NB	Left	AM	325	240
	SB	Right	Both	150	Shared
	SB	Left	AM	225	Shared
	EB	Right	PM	825	150
	EB	Left	PM	150	Shared
	WB	Right	PM	250	Shared
	WB	Left	PM	450	150
Central Ave & 3rd	NB	Left	AM	225	160
	SB	Right	PM	300	Shared
	EB	Right	AM	300	165
	WB	Right	PM	425	Shared
	WB	Left	AM	450	350
	EB	Left	Both	225	210
Central Ave & 5th	NB	Right	PM	300	Shared
	SB	Left	Both	200	230
	EB	Right	AM	450	Shared
	EB	Left	AM	450	Shared
Central Ave & 6th	NB	Left	Both	250	240
	SB	Right	Both	150	Shared



Intersection	Approach	Turn Movement	Critical period	Recommended Turn Lane Storage	Provided Length
Central Ave & 7th	WB	Right	PM	575	Shared
	WB	Left	PM	575	Shared
	NB	Right	Both	250	75
	EB	Right	AM	500	175
Central Ave & 9th	EB	Left	AM	500	Shared
	NB	Left	AM	225	180
Elm & 2nd	WB	Right	PM	425	Shared
	NB	Right	PM	300	Shared
	EB	Right	AM	450	Shared
Race & 3rd	EB	Left	AM	450	400
	SB	Right	PM	575	235
Elm & 3rd	WB	Left	PM	650	410
	NB	Left	Both	300	150
Elm & 4th	WB	Right	PM	150	340
	NB	Left	AM	425	160
Plum & 4th	SB	Right	PM	150	Shared
	WB	Left	Both	150	50
Linn & Dalton	NB	Left	PM	200	125
	SB	Right	PM	225	530
	WB	Left	Both	150	400
	WB	Right	AM	250	Shared
Linn & 8th	NB	Left	AM	225	300
	NB	Right	Both	150	150
	SB	Left	Both	150	210
	SB	Right	PM	325	Shared
	EB	Left	PM	250	270
	EB	Right	Both	225	120
	WB	Left	PM	200	470
	WB	Right	PM	200	Shared
Freeman & Gest	NB	Left	AM	300	300
	NB	Right	AM	300	180
	SB	Left	AM	300	170
	SB	Right	AM	300	Shared
	EB	Left	AM	200	60
	EB	Right	Both	200	160
	WB	Left	AM	200	240
	WB	Right	Both	225	110
Linn & Ezzard Charles	NB	Left	PM	225	200
	NB	Right	Both	200	50
	SB	Left	PM	300	200
	SB	Right	PM	300	50
	EB	Left	AM	250	180
	EB	Right	Both	250	Shared
	WB	Left	PM	225	175
	WB	Right	PM	225	Shared
Winchell & Liberty	NB	Left	Both	150	Shared
	NB	Right	PM	225	Shared
	EB	Left	PM	225	Shared
	WB	Right	PM	300	Shared
Western & Liberty	SB	Left	PM	250	155
	SB	Right	PM	250	Shared
	EB	Right	AM	200	Shared
	WB	Left	PM	250	170



Intersection	Approach	Turn Movement	Critical period	Recommended Turn Lane Storage	Provided Length
Winchell & Findlay	NB	Left	PM	250	Shared
	NB	Right	PM	250	Shared
	EB	Left	PM	200	Shared
	WB	Right	PM	150	Shared
Western & Findlay	SB	Left	PM	300	300
	SB	Right	PM	250	Shared
	EB	Right	PM	200	130
	WB	Left	PM	150	Shared
Dalton & Findlay	NB	Left	PM	200	135
	NB	Right	PM	200	Shared
	SB	Left	PM	250	260
	SB	Right	Both	225	Shared
	EB	Left	PM	150	50
	EB	Right	PM	150	Shared
	WB	Left	Both	150	145
	WB	Right	Both	150	Shared
Spring Grove & Bank	NB	Left	PM	200	310
	NB	Right	PM	200	Shared
	SB	Left	PM	300	250
	SB	Right	PM	300	Shared
	EB	Left	PM	200	70
	EB	Right	PM	200	130
	WB	Left	PM	150	190
	WB	Right	PM	250	Shared
Winchell & Bank	NB	Left	PM	225	125
	NB	Right	PM	225	Shared
	EB	Left	PM	250	250
	WB	Right	PM	300	180
Spring Grove & Harrison	NB	Left	PM	225	Shared
	NB	Right	PM	225	Shared
	SB	Left	PM	250	175
	SB	Right	PM	250	Shared
	EB	Left	Both	125	Shared
	EB	Right	Both	125	Shared
	WB	Left	AM	150	Shared
	WB	Right	PM	250	Shared
Brighton Pl & Central Pkwy	EB	Right	AM	375	Shared
	WB	Left	PM	325	110
Winchell ramp & WHV	NB	Left	PM	525	300
	EB	Left	AM	375	200
Central Pkwy & McMillian	NB	Left	PM	250	200
	NB	Right	PM	250	Shared
	SB	Right	Both	225	Shared
	EB	Left	AM	250	250
	EB	Right	AM	250	120
	WB	Right	PM	225	Shared
Winchell & Ezzard	EB	Left	AM	200	200
	WB	Right	PM	250	150
	NB	Right	AM	450	Shared
	NB	Left	PM	375	Shared
Western & Ezzard	WB	Left	Both	150	100
	EB	Right	Both	125	Shared
	SB	Right	PM	375	Shared
	SB	Left	PM	375	180



Intersection	Approach	Turn Movement	Critical period	Recommended Turn Lane Storage	Provided Length
Central Pkwy & Linn (Mohawk)	SB	Right	PM	250	75
	SB	Left	PM	250	Shared
	NWB	Right	PM	300	Shared
	NWB	Left	PM	300	Shared
	NEB	Right	Both	150	180
	NEB	Left	PM	250	190
	SEB	Left	AM	300	Shared
	SEB	Right	AM	300	Shared

9. SAFETY ANALYSIS

Safety analysis of the BSB corridor is documented in **Appendix G: IMS Addendum Safety Analysis**. The purpose of the safety analysis is to highlight existing crash trends; identify safety priority locations in Kentucky and Ohio; provide a comparison of predictive safety for No Build, Selected Alternative I, and Refined Alternative I (Concept I-W); and identify crash countermeasures that should be considered as the BSB project moves into detailed design. A summary of the findings is provided in this section.

9.1 Existing Crash Trends

ODOT and KYTC identify safety-priority roadway segments using existing crash data. Most of the I-71 and I-75 freeway segments are identified as priority locations for the project corridor. This means there is an elevated frequency of crashes compared to similar facilities. The project team reviewed crash data from 2017-2021 and found a significant pattern of rear-end and sideswipe crashes, typical in congested urban freeway systems with high ramp density. The specific crash distribution by state is listed below:

- Kentucky
 - 1,788 Rear-End crashes (53%)
 - 1,020 Side-Swipe crashes (30.2%)
 - 434 Single Vehicle Crashes (12.9%)
- Ohio
 - 886 Side-Swipe crashes (39.2%)
 - 734 Rear-End Crashes (32.4%)
 - Single Vehicle Crashes (17.8%)

A crash density map showing the locations in the corridor with the highest crash frequencies is shown in **Figure 11**. The higher crash density locations include the Brent Spence Bridge, I-71/I-75 in Kentucky at Kyles Lane and near 12th Street, I-71 segments near the I-75 Interchange, and I-75 between 9th Street and the WHV.

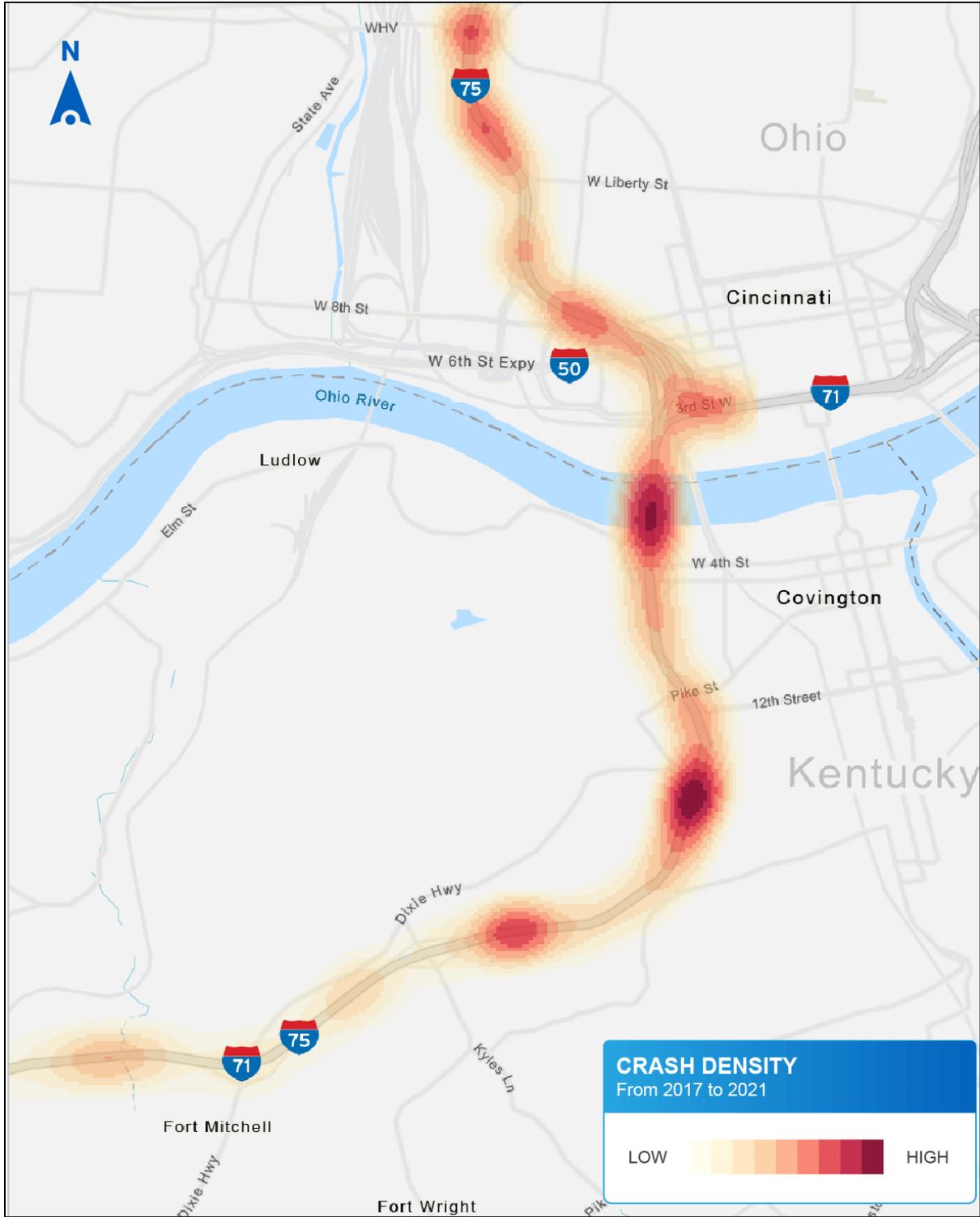


Figure 11: Existing Crash Density: 2017-2021



9.2 Alternative Safety Comparison

The existing I-71 and I-75 facilities do not meet current design standards for numerous features, including lane widths, shoulder widths, horizontal and vertical clearances, left-hand entrances and exits, and horizontal and vertical geometry. Selected Alternative I and Refined Alternative I (Concept I-W) provide freeway modernization that meets the operational needs of the corridor and improves upon all of the current design deficiencies. Refined Alternative I (Concept I-W) provides a 10 ft inside and outside shoulder width consistent with ODOT and KYTC freeway design standards. This implementation offers significant cross-sectional improvements compared to the existing configuration, especially on the Brent Spence Bridge. The predictive safety analysis for the project was split into three focus areas identified as safety priority segments for ODOT and KYTC. The segments include I-71/I-75 in Kentucky, the BSB, and I-75 in Ohio. A safety comparison of these sections is provided below.

9.2.1 Brent Spence Bridge

During the five years between 2017 and 2021, Brent Spence Bridge experienced 662 crashes. Most were sideswipes (47.6%), rear-end crashes (40.2%), and smaller proportions of single-vehicle and other crash types. As for crash injury severity, the bridge experienced no fatal crashes and nine serious injury crashes, representing less than 2% of total crash records. Minor injury crashes represented a considerable proportion (7.3%), while possible injury and PDO crashes represented the majority of crash counts (91.4%) on the bridge.

The AM peak period (6:00 to 10:00 AM) experienced 117 crashes in that 5-year duration. Sixty-seven of them were sideswipes, and 38 were rear-end crashes. Eight crashes were identified as minor or severe injury crashes. Two hundred forty crashes were recorded during the PM period (2:00 to 7:00 PM) in the same 5-year duration. One hundred twenty-five of which were rear-end, and 100 were sideswipe crashes. Fourteen minor and severe injury crashes were recorded during that period. It is noted that the PM peak duration experienced more crashes than the AM peak due to higher vehicle miles traveled, represented by higher traffic volumes and longer peak duration. The more congested traffic is the primary cause of a significant proportion of rear-end crashes during the PM peak.

Most crashes on the BSB bridge are rear-end, and sideswipe crashes due to traffic congestion and substandard lane and shoulder widths. The existing cross-section of the Brent Spence Bridge has four 11-foot lanes with 1-foot shoulders in each direction. Both the Selected Alternative I and Refined Alternative I (Concept I-W) expand the total number of lanes across the Ohio River from 8 to 16, providing improved lane and shoulder width on the existing bridge.

The predicted crash rate for the BSB spans is summarized in **Figure 12**. This figure shows that the Refined Alternative I (Concept I-W) has a lower crash rate on the companion bridge and existing bridge span than the No Build. The Companion bridge is designed to ODOT and KYTC design standards, and the existing span is retrofitted with wider shoulder widths compared to the No Build condition. Selected Alternative I has the lowest crash rate with 14 ft shoulder widths on the companion bridge. Since the design of Selected Alternative I, the current design standard of KYTC and ODOT for inside and outside shoulders is 10 ft and is applicable on the Brent Spence Bridge. The design decision for the shoulder widths balances the many project needs, including safety, right-of-way constraints, and project costs.



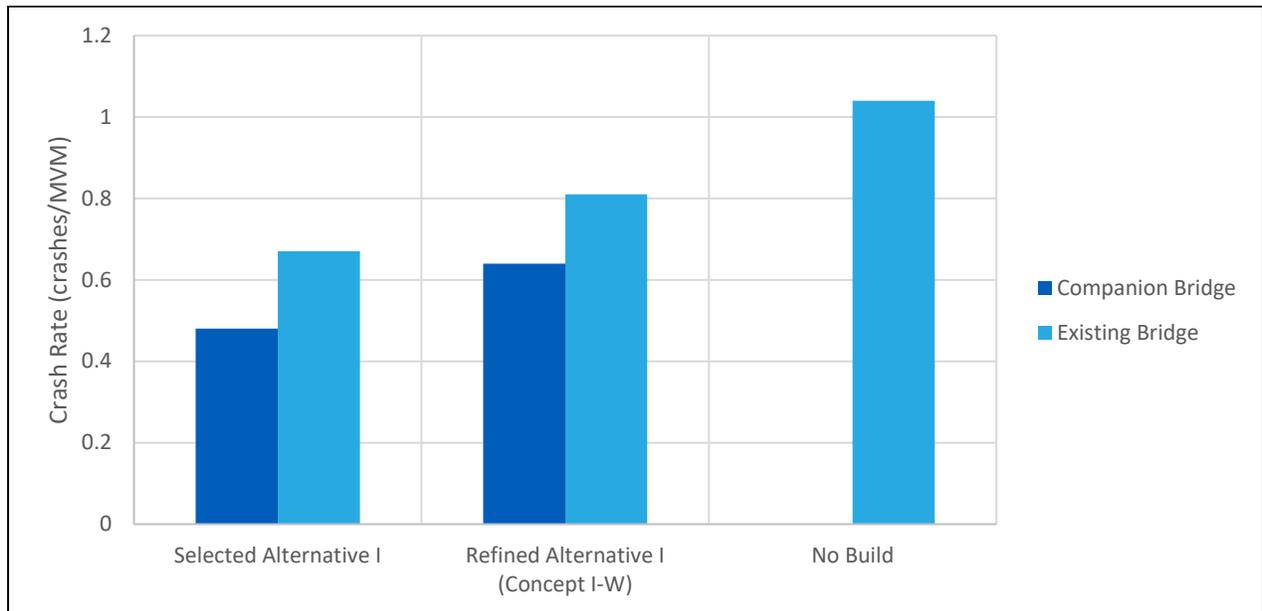


Figure 12: Predictive Crash Rate – Brent Spence Bridge and Companion Bridge

9.2.2 Kentucky I-71/I-75 Mainline

From 2017 to 2021, the Kentucky I-71/I-75 mainline experienced 2,828 crashes. Rear-end was the most recorded crash type, representing 55.1% of crashes, followed by sideswipe crashes (27.2%). As for crash injury severity, the mainline experienced five fatal crashes, while injury and PDO crashes represented 12.8% and 87% of total crash records, respectively.

Five hundred sixty-nine crashes occurred during the AM peak period (6:00 to 10:00 AM) in the 5-year duration. Three hundred forty-eight of which were rear-end, and 137 were sideswipe crashes. The AM peak experienced one fatal crash and 59 injury crashes. One thousand-seven crashes were recorded during the PM period (2:00 to 7:00 PM) in the 5-year duration. Six hundred seventy-one records were rear-end, and 251 were sideswipe crashes. The PM peak experienced two fatal and 111 injury crashes. Higher crash counts during the PM peak can be related to higher traffic volumes and the extended peak period.

KYTC has identified most of the I-71/I-75 mainline in the project limits to have a LOSS 3 or 4 ranking, indicating significant potential for safety mitigation. The I-71/I-75 corridor has reoccurring traffic congestion and tightly spaced ramps, influencing the high existing crash rates. The proposed improvements for Refined Alternative I (Concept I-W) address the current conditions by implementing a C-D road system between Dixie Hwy and Kyles Lane and between 12th Street and the BSB and companion bridge. These system improvements and basic cross-section enhancements are expected to reduce the crash rate for the Kentucky I-71/I-75 mainline.

The predicted crash rates for comparable segments on I-71/I-75 are summarized in **Figure 13**. Overall, a crash rate reduction for I-71/I-75 mainline segments in Kentucky for Refined Alternative I (Concept I-W) compared to



No Build and similar crash predictions to Selected Alternative I. Refined Alternative I (Concept I-W) uses a consistent 10 ft inside and outside shoulder width from the southern project terminus to the Companion Bridge. The No Build has a section of 12 ft inside shoulder in the roadway sections between Dixie Hwy and 12th Street. This cross-sectional element is decreased to 10 ft with Refined Alternative I (Concept I-W) to allow for other roadway improvements, including the C-D road system between Dixie Hwy and Kyles Lane. Widening the shoulders beyond the design standards would expand the roadway footprint and negatively impact adjacent properties. Refined Alternative I (Concept I-W) for the one comparative segment (Dixie Hwy to Kyles Ln) shows a slight increase in crashes compared to the No Build. However, this minor increase becomes insignificant when viewed next to the safety improvements at the other segment of I-71/I-75 at 5th Street. Furthermore, the safety improvements associated with the C-D road system are anticipated to alleviate the existing safety concerns caused by peak period traffic congestion that is not captured as part of the predictive safety analysis.

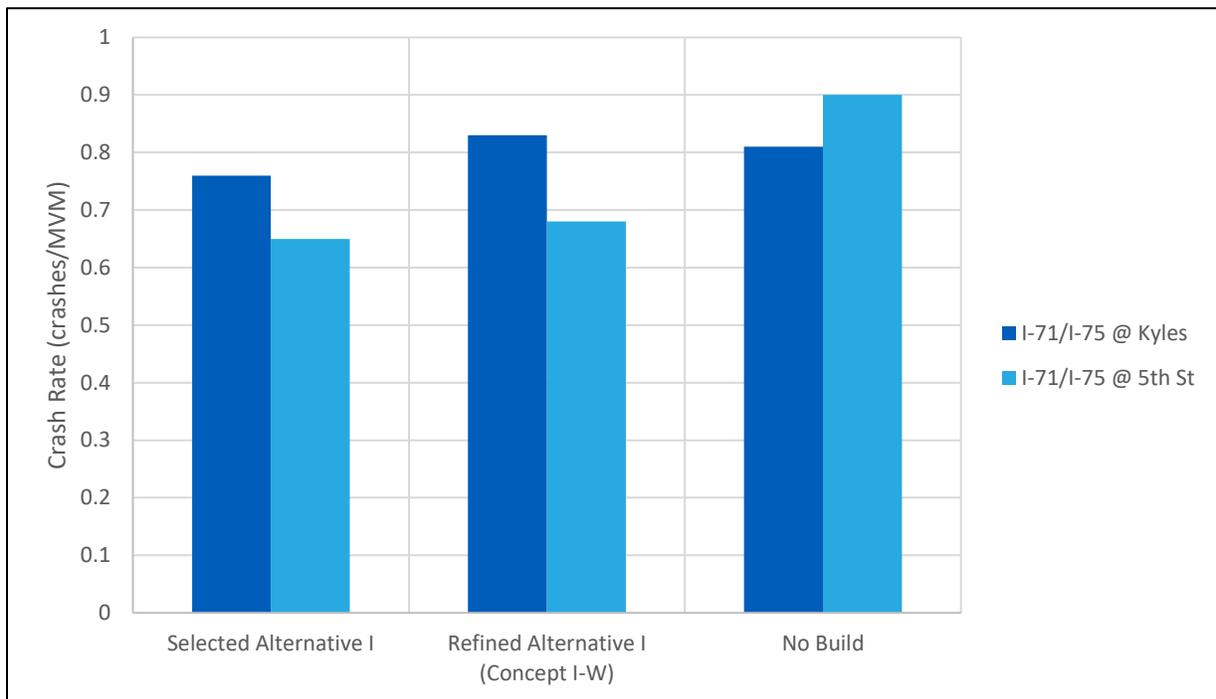


Figure 13: Predicted Crash Rate for Kentucky I-71/I-75 Mainline

9.2.3 Ohio I-75 Mainline

Ohio I-75 mainline (North of Linn Street) experienced 1,031 crashes between 2017 and 2021. Most recorded crashes were sideswipe (43.3%) and rear-end (33.3%). Three fatal crashes were recorded on the mainline, while injury crashes represented 11.6% of total crash counts. Property damage-only crashes accounted for 88% of crash records on the I-75 mainline.

One hundred seventy-five crashes were recorded during the AM peak period (6:00 to 10:00 AM) from 2017 to 2021. Seventy-two of these crashes were sideswipes, and 44 were rear-end crashes. Seventeen minor and severe injury crashes were recorded during that peak period. As for the PM period (2:00 to 7:00 PM), 406



crashes were recorded in the 5-year study duration. One hundred sixty-eight crashes were sideswipe, and 186 were rear-end collisions. Thirty-eight crashes during that peak period were minor or severe injury crashes. Increasing crashes were recorded in the PM peak duration compared to the AM peak due to higher traffic volumes and a more extended PM peak period. The more congested traffic during the PM peak is the primary cause of a more significant proportion of rear-end crashes.

ODOT identifies the I-75 mainline between WHV and I-71/I-75 Interchange as safety priority segments. This area experiences many crashes due to reoccurring congestion and interactions between the freeway mainline, service ramps, and system interchange ramps. This area is improved with Refined Alternative I (Concept I-W) with the consolidation of ramps and introduction of the C-D road through the I-71/I-75 interchange. These improvements are expected to improve traffic safety on the Ohio I-75 mainline.

As discussed in the previous sections, the Selected Alternative I proposed 12 ft inside and outside shoulders for I-75. The Refined Alternative I (Concept I-W) reduces the shoulder widths to 10 ft to match current KYTC and ODOT freeway design standards. The proposed 10 ft shoulder widths achieves design standards and balances the corridor's operational, safety, right-of-way, and project cost considerations. A comparison of the predicted analysis for comparable segments of I-75 in Ohio is summarized in Figure 14. The figure shows that Refined Alternative I (Concept I-W) has a lower predicted crash rate than the No Build condition.

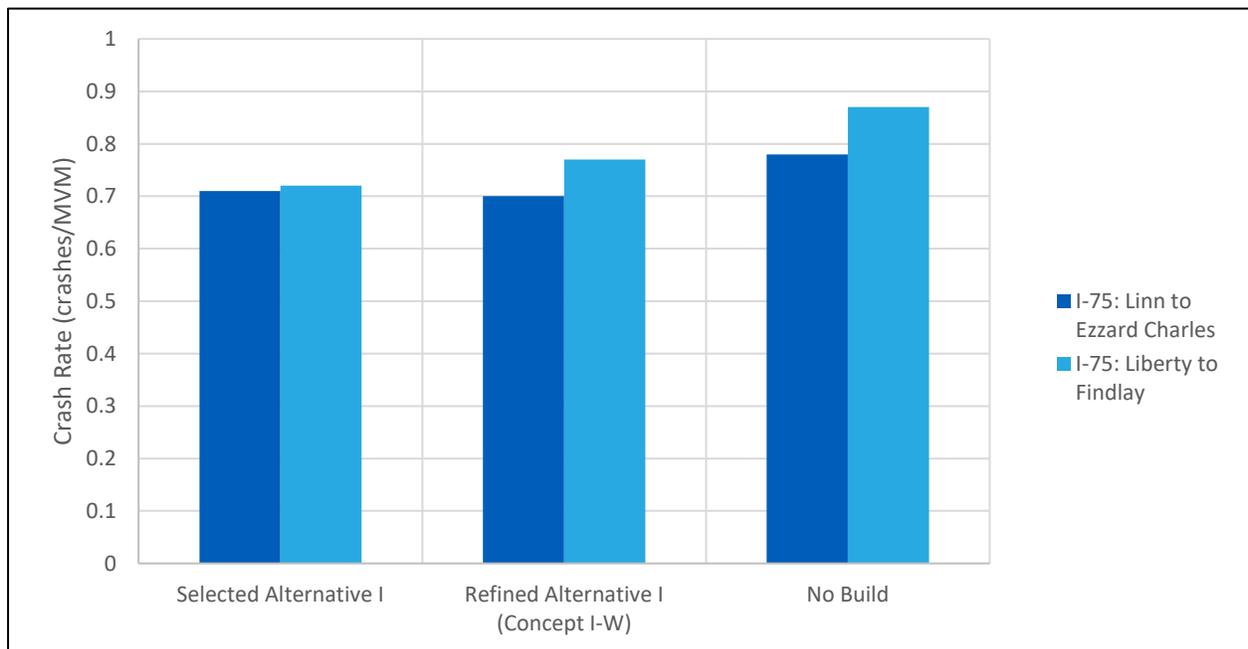


Figure 14: Predicted Crash Rates for Ohio I-75 Mainline

9.3 Safety Comparison for Locations with Notable Changes

Refined Alternative I (Concept I-W) incorporated design changes based on stakeholder feedback. These changes were not the result of a data-driven safety evaluation. However, the design updates meet design



standards and are not anticipated to result in unfavorable safety conditions. A brief qualitative safety review of these changes is provided in this section.

9.3.1 New Interchange Configuration at I-71 & WHV

The City of Cincinnati and Hamilton County have collaborated with ODOT to design the WHV replacement and integrate the new facility with the I-75 improvement project. This resulted in a new design for the I-75/WHV Interchange in the Refined Alternative I (Concept I-W) in 2023. The Selected Alternative I from 2012 provided a plan for a new interchange, including a connection to the existing WHV, since its design had yet to progress.

The I-75/WHV interchange experiences crashes related to its current design, mainly due to the northbound I-75 left exit and loop ramp to the upper deck of the WHV. Existing crash types in this area of I-75 include 36% sideswipe, 30% rear-end, and 11% fixed object. The new interchange will remove the left exit (with slow vehicles in the left lane of I-75) and associated weaving, reducing sideswipe and rear-end crashes. Removal of loop ramps will mitigate wet weather, fixed object crashes, and rear-end collisions due to poor sight distance. The Selected Alternative I and Refined Alternative I (Concept I-W) designs are similar to a tight diamond and share these crash-reduction features. The Refined Alternative I (Concept I-W) improves upon the Selected Alternative I design by better incorporating the local connectivity to Spring Grove Avenue (running parallel to I-75 on the west) by eliminating the local street loop connections, which required tunneling under I-75 and a steep grade to access the upper deck of the WHV.

In summary, the latest design of the interchange will significantly improve the safety for interstate and local drivers using current design standards and more intuitive right-side ramp placement.

9.3.2 Change in Location of Northbound Entrance Ramp from Freeman Avenue

The existing section of I-75 between Linn Street and Liberty Street includes partial interchanges with ramps to and from Freeman Avenue and ramps to and from Ezzard Charles to/from the north on I-75 within a relatively short distance. In the existing condition, northbound ramps from downtown streets and I-71 S converge with mainline I-75 just south of Ezzard Charles. Southbound in this area of I-75, drivers must select the appropriate lane to continue onto I-75 S or I-71 N/US 50E, use the right exit to Seventh Street, or use the left exit to Fifth Street or Second Street downtown. Given the left and right exit ramps and the associated need for driver decisions for lane selection, the highest crash types are sideswipe and rear-end due to weaving and stopped traffic.

The Selected Alternative I and Refined Alternative I (Concept I-W) are similar in using a C-D system for northbound and southbound I-75 to separate mainline traffic from traffic using the downtown and the design of right-side I-71/US-50 connections. These C-Ds diverge and merge with the mainline south of Ezzard Charles. In the Selected Alternative I, the ramps to and from Freeman remain similar to existing conditions, but the Ezzard Charles ramps are removed. In Refined Alternative I (Concept I-W), the southbound conditions are the same as in Selected Alternative I, with only the exit ramp to Freeman Avenue. However, in coordination with the City of Cincinnati, a change was made to the northbound entrance ramp to I-75 from Freeman Avenue from south of Ezzard Charles Drive to north of Ezzard Charles Drive at Winchell Avenue, similar to the existing condition. This change requires drivers from Freeman Avenue to use the arterial street to travel north through



the signalized intersection with Ezzard Charles before using the entrance ramp. This allows for better connectivity of the local roads to I-75 N while also adding more distance between the merge of the NB C-D and mainline I-75 N with this Ezzard Charles entrance ramp. However, this relocation moves the entrance ramp closer to the WHV exit ramp. It adds an auxiliary lane in Refined Alternative I (Concept I-W) between the Freeman Avenue entrance ramp and the exit ramp to WHV.

In summary, the relocation of the Freeman ramp is within design standards for ramp spacing. Creating NB and SB C-Ds will separate local access from mainline traffic, removing many closely spaced entrance and exit ramps and eliminating left exits from the No Build condition. This change will reduce weaving and associated sideswipe and rear-end crashes.

9.3.3 Cincinnati Ramp Modification

The existing ramps and local street connections for I-75, I-71, and US 50 just west of the downtown provide reasonable access today for all users and destinations. Existing crashes are generally sideswipe and rear-end due to the curves, weaving, and stopped traffic during peak hours. The Selected Alternative I separated mainline and local traffic with C-D roads while maintaining various access points for local connectivity. This design met current standards of roadway design while still reducing the facility footprint.

The notable difference between the Selected Alternative I and Refined Alternative I (Concept I-W) in this area comes from the separation of C-D and mainline uses on the BSB and companion bridge, respectively. This plan required modification to the travel location for ramps and local connections from Selected Alternative I. In addition, the City of Cincinnati requested additional changes for various I-75 ramps between the Ohio River and Linn Street, which are incorporated into Refined Alternative I (Concept I-W). These include relocating the northbound entrance ramp in Ohio to I-75 from Fourth Street to Third Street and removing the southbound exit ramp in Ohio from I-75 to Fifth Street to provide improved geometrics and free additional land for potential redevelopment. As part of these ramp changes, a new intersection with the northbound C-D ramp was created at Fifth Street; lanes were reduced on the Fifth Street approach to Central Avenue; and the connection from Sixth Street was changed from Winchell Avenue to the northbound C-D directly to I-75. These changes also impact traffic to adjacent ramps, resulting in design modifications to two-lane exit ramps from SB I-75 to Seventh Street and Second Street.

In summary, the design of the Cincinnati ramps will be significantly different from a No Build condition due to the reconfiguration of lane use on the BSB and integration with a companion bridge. Refined Alternative I (Concept I-W) will separate mainline traffic from the C-D and local connections and meet new standards for curves and shoulders, reducing weaving and potential for rear-end, sideswipe, and fixed object crashes.

9.3.4 Kentucky Collector-Distributor Modification in Covington

The existing local street connections from the BSB to the local street grid in Kentucky include ramps that do not meet current design standards, leading to a short southbound exit ramp to a T intersection at 5th Street. The parallel local arterials are designed as high-speed roadways near the BSB, meeting signalized arterials to the south towards 12th Street. Various crash types relative to interstate, local roads, signalized intersections,



and stop-control intersections occur due to the need for more consistency in the design along the routes, which are also not friendly to bikes and pedestrians.

Selected Alternative I separates mainline and local traffic with C-D roads while maintaining various access points for local connectivity. This design met current standards for the ramps. It provided a consistent design for the C-D system for southbound and northbound access and included a new connection under the interstate for 9th Street.

The notable difference between Selected Alternative I and Refined Alternative I (Concept I-W) in this area comes from the separation of C-D and mainline uses on the BSB and companion bridge, respectively. This plan required modification to the travel location for ramps and local connections from Selected Alternative I. Most notable is the southbound exit ramp from the C-D (existing BSB) to 5th Street in Covington, designed as a left-hand exit to meet vertical clearance and curve standards. This is a change from Selected Alternative I, which uses a right-side exit from the companion bridge. Revisions to the frontage road system south of 9th Street include the modification of Bullock Street (southbound frontage road) between 9th Street and 12th Street to minimize right-of-way impacts and an extension of Simon Kenton Way (northbound frontage road) parallel to the I-71/I-75 northbound ramp to 5th Street in Covington. There are also fewer lanes on both frontage roads from the Selected Alternative I design based on traffic modeling.

The new NB and SB C-D/frontage roads in Kentucky will provide an added connection to 9th Street, offering better connectivity for the Covington local street network. New intersection design with turn lanes and traffic signal timing will improve vehicular safety. Sidewalks, multiuse paths, crosswalks, and new signing will improve route options and safety for pedestrians and cyclists.

Reduced traffic on the existing BSB will allow the NB on-ramp from 4th Street in Kentucky to enter the bridge as an add-lane and not require a merge. This will reduce rear-end and sideswipe crashes.

In summary, the design of the Kentucky C-D/frontage road system will provide improved access to local destinations throughout Covington while addressing needed pedestrian and bicycle connectivity and safety. The left exit from SB C-D to 5th Street is less desirable than the right exit in Selected Alternative I. Still, it allows for a highly desired connection to 5th Street into the C-D and local street network and meets design standards.



9.4 Safety Countermeasures

The existing 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, left-hand entrances and exits, and horizontal and vertical geometry. The most frequently noted substandard feature of the corridor is the design of the BSB, with its narrow travel lanes and shoulder widths on the bridge and approaches. The existing BSB was also not designed to accommodate the current or future daily traffic volume. For these reasons, the BSB corridor experiences design deficiency and congestion-related crashes.

Selected Alternative I from the 2012 FONSI provides an improved corridor meeting current design standards. The new companion bridge will allow traffic distribution onto two bridges, and the proposed reconfiguration of the existing BSB will reestablish adequate shoulders and lane widths, reducing crash potential. Added capacity at the Ohio and Kentucky approaches and the bridges will further improve safety by lowering congestion-related crashes. In addition, separating interstate traffic from local traffic on the bridges and C-D system will enhance safety by reducing weaving and merging for all travelers.

Refined Alternative I (Concept I-W) shares many of the same design features for improved safety in the I-71/I-75 corridor as Selected Alternative I but provides additional design benefits by providing all interstate traffic on the companion bridge and all local or C-D traffic on the existing bridge. This eliminates the need for center barriers as on the Selected Alternative I companion bridge, which was used to separate opposing directions of traffic on the lower deck and the southbound I-71 and I-75 traffic on the upper deck. Other modifications in Refined Alternative I (Concept I-W) allow for better spacing of C-D connections to local streets and improved bike and pedestrian connectivity in the local arterial network.

The BSB project supports the [National Roadway Safety Strategy](#) (NRSS) [Safe System Approach](#) (SSA), a comprehensive approach to reducing serious injuries and deaths on the nation's roadways. Kentucky and Ohio will collaborate to design and operate a system that provides safe mobility for all users. The Project will incorporate the five SSA Safety System Elements:

- *Safer People* through real-time user information and messaging and improved driver expectation and decision-making features.
- *Safer Roads* through countermeasures on bridges, highway approaches, and adjacent frontage and C-D roadways, including pedestrian and bicycle improvements.
- *Safer Vehicles* and *Safer Speeds* through design speeds, speed limits, and intelligent transportation system (ITS) facilities that support connected/automated vehicle systems and speed management.
- *Post-Crash Care* through emergency vehicle access to the scene (using shoulders if needed), routing, and incident messaging.

The entire corridor will be rebuilt, and proven safety countermeasures identified by the FHWA will be proactively incorporated into the highway, C-D, and local street network. Examples of these countermeasures include:

Roadway/Highway

-
- Wider edge lines
 - Enhanced delineation for horizontal curves
 - Longitudinal rumble strips
 - Median barriers
 - Roadway lighting
 - Appropriate speed limits or variable speed limits

Local Streets

- Corridor access management for frontage roads
- Dedicated left and right turn lanes at intersections
- Appropriate yellow change and all-red intervals
- Backplates with reflective borders for traffic signals
- Walkways and pedestrian refuge areas
- Bike lanes and side paths

There are locations where design exceptions are proposed if current standards cannot be met, generally for shoulder and lane width, horizontal and vertical curve issues, and grades. The Refined Alternative I (Concept I-W) plan will improve upon existing conditions overall, and the areas of design exceptions could be made safer with enhanced warning signing, speed advisory plaques, and enhanced delineation. Redundancy in design elements, such as roadway lighting and guardrails, will also create layers of protection to reduce the likelihood of driver error, prevent crashes, and mitigate harm when they occur. As the design-build project progresses, the currently identified locations of design exceptions can be reviewed to determine any design changes or specific countermeasures to improve safety in those areas.

A new guide and destination signing will be installed, and ITS technology will be designed for the corridor, including changeable message signs, sensors, and cameras with fiber connectivity. This will allow real-time driver information, incident management, and event traffic management to reduce confusion and provide clear guidance. Future uses can be considered for connected and automated vehicle technologies.

During final design median access points will be identified to ensure emergency responder access. KYTC will coordinate with the Northern Kentucky cities along the corridor, including Fort Mitchell, Fort Wright, Park Hills, and Covington, and Kentucky first responders, including police, fire, and emergency services, to ensure the completed project accommodates emergency response access to the collector-distributor and mainline roadways.

In summary of the crash mitigation strategies, **Figure 15** identifies high crash locations within the project corridor and highlights safety-related improvements to be implemented to improve future safety conditions.



Safety Countermeasures

- 1 New interchange with Western Hills Viaduct (WHV) will remove NB left lane, reducing sideswipe and rear-end crashes. Removal of the loop ramps will reduce wet weather and fixed object crashes as well as rear-end crashes due to poor sight distance.
- 2 The construction of a NB and SB C-D system from Ezzard Charles in OH to 12th in KY will separate local access from mainline interstate traffic, removing closely spaced entrance and exit ramps and eliminating left exits. This change will reduce weaving and the presence of exiting vehicles in the left lane, reducing sideswipe and rear-end crashes.
- 3 Newly constructed ramps at I-71/I-75 interchange will meet updated seismic criteria and provide edge and median barriers meeting the current standards. This will reduce the severity of fixed object crashes.
- 4 The companion bridge will be built to add capacity to the Ohio River crossing with standard lane widths, shoulder widths, edge and median barrier designs to reduce sideswipe, rear-end and fixed object crashes. The shoulders will provide emergency vehicles access and storage for stalled vehicles, reducing secondary crashes.
- 5 Existing BSB decks will be reconfigured from four lanes with no shoulder to three lanes with inside and outside shoulders. This provides more space for stalled vehicles and maneuvering at emergencies, reducing rear-end, sideswipe and single vehicle crashes.
- 6 Reduced traffic on the existing BSB will allow for the NB I-71/75 4th St on-ramp to enter the bridge as an add-lane without merging. This will reduce rear-end and sideswipe crashes.
- 7 The new NB and SB C-D/frontage roads in KY will provide an added connection to 9th St, offering better connectivity for the Covington street network. New intersection design with turn lanes and traffic signal timing will improve vehicular safety. Sidewalks, multi use paths, crosswalks and new signing will improve mobility and safety for pedestrians and cyclists.
- 8 The new C-D road and increasing the number of lanes will provide safer maneuvering and reduce rear-end and sideswipe crash frequency. Maintaining sufficient friction levels will mitigate the effect of downhill grade (NB) and frequent wet road conditions.
- 9 Reconfiguration of the lanes will reduce the frequency of sideswipe and rear-end crashes due to merging and diverging on this section.
- 10 New C-D lanes in both directions between Dixie Highway and Kyles Lane will reduce rear-end and sideswipe crashes.

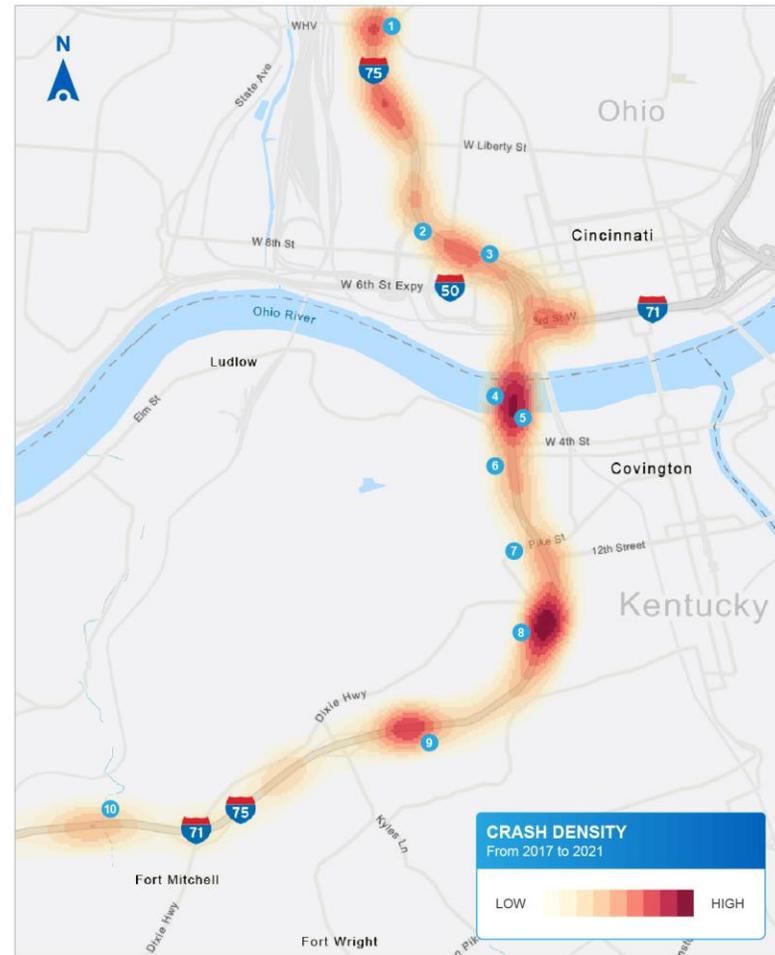


Figure 15: BSB Project Safety Improvements

10. COST ESTIMATES

The 2012 EA/FONSI cost estimates were updated to reflect current design contingencies, unit prices, inflation rates, and construction years for each project phase. The cost estimates were revised to include actual right-of-way, estimated costs for unacquired right-of-way, and utility relocation costs. Other updated costs included public relations, procurement, stipend, state labor, bridge painting, and design. Finally, previously expended preliminary development dollars were added to the estimated contract costs to estimate the total cost to implement the BSB Corridor Project.

A Cost, Schedule, and Risk Assessment workshop held by FHWA and the project team in October 2022 confirmed that the total project cost estimate is \$3.6 billion, which includes all costs required to deliver the project, including but not limited to planning, design, right-of-way acquisition, construction, construction management services, and agency labor.

The costs to deliver Selected Alternative I, defined in the 2012 EA/FONSI, were not updated to reflect current prices. However, based on the information presented in the *Design Summary Report* and the *2022 Project Summary with Associated Costs (June 2022)*, the total costs for Refined Alternative I (Concept I-W) are substantially less than the costs to construct Selected Alternative I.

11. ENVIRONMENTAL OVERVIEW

In accordance with the National Environmental Policy Act (NEPA), an [Environmental Assessment](#) (EA) was prepared for the Brent Spence Bridge (BSB) Corridor Project in the Commonwealth of Kentucky and the State of Ohio in March 2012. A [Finding of No Significant Impact](#) (FONSI) was approved by the Federal Highway Administration (FHWA) on August 9, 2012 (see Appendix B).

More than three years have passed since the 2012 FONSI and subsequent reevaluations of its validity. Project refinements have also occurred in response to public comments and further study, though they remain within the project footprint and impacts evaluated in the 2012 EA/FONSI. KYTC and ODOT are preparing a supplemental EA consistent with 23 CFR 771.129 and 771.130 to assess revised regulatory requirements, changed site conditions, design refinements, impact changes, further environmental commitments (enhancements and mitigation), and additional NEPA reevaluation and coordination efforts that have occurred since the 2012 EA/FONSI. The supplemental EA is anticipated to be available for public review, and public hearings are expected to occur in late 2023. FHWA's NEPA decision is expected in early 2024.



12. DESIGN EXCEPTIONS

Refined Alternative I (Concept I-W) currently has 19 design exceptions in Kentucky and 35 in Ohio. Most of the design exceptions are related to horizontal and vertical sight distances. There are also design exceptions for the existing Brent Spence Bridge, where the lane widths are 11 ft (12 ft is the design requirement), and the shoulder widths are 4 ft on the left shoulder and 8 ft on the right shoulder (10 ft is the design requirement). These design exceptions are similar or improved in all cases compared to No Build and Selected Alternative I. The design-build team will consider design enhancements and will not provide a design solution worse than currently proposed. Where removing the design exception is not possible, the states will retain decision-making authority and approvals, with an adequate justification provided in a design exception report. Mitigation strategies will be implemented for the remaining design exception to alert motorists and improve roadway safety. The current design exceptions for Refined Alternative I (Concept I-W) are listed in **Table 10** and **Table 11**.



Table 10: Refined Alternative I (Concept I-W) Design Exceptions – Kentucky

Route	Station	Design Met (Required)	Horizontal Dc (Maximum)	Horizontal SSD (Minimum)	Vertical SSD (Minimum)	Maximum Grade (Required)	Other	Design Speed Existing	Design Criteria
SB I-75 to Kyles Lane	445+00					8.1% (6%/8%)			KYTC - 904.4 / AASHTO 10.9.6.2.12
KY-SB-CD-75	566+50.00	51 mph (55)			439' (495')			N/A	
KY-SB-CD-75	572+05.41	46 mph (55)			373' (495')			N/A	
KY-SB-CD-75	575+27.31	45 mph (55)		360' (495')				N/A	
KY-SB-CD-75	577+47.53	45 mph (55)			360' (495')			N/A	
KY-SB-CD-75	580+45.54	45 mph (55)			360' (495')			N/A	
KY-SB-CD-75	583+15.88	47 mph (55)		385' (495')				N/A	
KY-SB-CD-75	Existing Bridge (Upper Deck)	4' left/8' right (10' both)					Shoulder Width		
KY-SB-CD-75	Existing Bridge (Upper Deck)	11' (12')					Lane Width		
KY-NB-CD-75	22+09.41	54 mph (55)			481' (495')			N/A	
KY-NB-CD-75	26+50.00	54 mph (55)			481' (495')			N/A	
KY-NB-CD-75	28+91.34	48 mph (55)		400' (495')				N/A	
KY-NB-CD-75	48+00.00	54 mph (55)			481' (495')			N/A	
KY-NB-CD-75	52+87.17	52 mph (55)		455' (495')				N/A	
KY-NB-CD-75	58+34.71	46 mph (55)			373' (495')			N/A	
KY-NB-CD-75	71+50.00	51 mph (55)			439' (495')			N/A	
KY-NB-CD-75	74+73.43	52 mph (55)		455' (495')				N/A	
KY-NB-CD-75	Existing Bridge (Lower Deck)	4' left/8' right (10' both)					Shoulder Width		
KY-NB-CD-75	Existing Bridge (Lower Deck)	11' (12')					Lane Width		



Table 11: Refined Alternative I (Concept I-W) Design Exceptions – Ohio

Route	Station	Design Met (Required)	Horizontal Dc (Maximum)	Horizontal SSD (Minimum)	Vertical SSD (Minimum)	Maximum Grade (Required)	Other	Design Speed Existing	Design Criteria
OH - I-71 NB	14+21.58	50 mph (55)	6°30'00" (5°30'00")					45 mph	Horizontal Curve Radius = 5°30'00" - ODOT 202.3
OH - I-71 NB	14+21.58	43 mph (55)		340' (495')				41 mph	HSSD = 495' - ODOT 201.2
OH - I-71 NB	28+10.00					6.51% (5.00%)			Max Grade = 5% - ODOT 203.2
OH - I-71 NB	28+97.11						Shoulder Width		Shoulder Width >= 10' - ODOT 301.2. & 303.1
I-75 CL	33+88.15	51 mph (55)		443' (495')				50 mph	HSSD = 495' - ODOT 201.2
OH - I-71 SB	17+41.26	50 mph (55)	5°37'00" (5°30'00")					35 mph	Horizontal Curve Radius = 5°30'00" - ODOT 202.3
OH - I-71 SB	17+42.26	45 mph (55)		360' (495')				35 mph	HSSD = 495' - ODOT 201.2
OH - I-71 SB	26+15.00					6.50% (5.00%)			Max Grade = 5% - ODOT 203.2
OH - I-71 SB	31+66.44						Shoulder Width		Shoulder Width >= 10' - ODOT 301.2. & 303.1
US 50 EB - OH	108+90.31	40 mph (50)	11°00'00" (6°45'00")					30 mph	Horizontal Curve Radius = 6°45'00" - ODOT 202.3
US 50 EB - OH	108+90.31	36 mph (50)		261' (425')				30 mph	HSSD = 425' - ODOT 201.2
US 50 EB - OH	109+50.00	45 mph (50)			360' (425')			30 mph	VSSD = 425' - ODOT 201.2
US 50 EB - OH	114+75.00	45 mph (50)			360' (425')			30 mph	VSSD = 425' - ODOT 201.2
US 50 WB - OH	112+25.00	45 mph (50)			360' (425')			35 mph	VSSD = 425' - ODOT 201.2
US 50 WB - OH	114+02.58	40 mph (50)	10°30'00" (6°45'00")					35 mph	Horizontal Curve Radius = 6°45'00" - ODOT 202.3
US 50 WB - OH	114+02.58	34 mph (50)		242' (425')				30 mph	HSSD = 425' - ODOT 201.2
US 50 WB - OH	128+38.49	34 mph (50)	10°30'00" (6°45'00")					30 mph	HSSD = 425' - ODOT 201.2
OH - I-75 SB to I- 71 NB	125+75.61	34 mph (45)		240' (360')					HSSD = 360' - ODOT 201.2
OH - NB CD to Local/I-75	4+80.00	40 mph (55)			305' (495')				VSSD = 495' - ODOT 201.2
OH - NB CD to Local/I-75	7+70.00					6.97% (5.00%)			Max Grade = 5% - ODOT 203.2



Route	Station	Design Met (Required)	Horizontal Dc (Maximum)	Horizontal SSD (Minimum)	Vertical SSD (Minimum)	Maximum Grade (Required)	Other	Design Speed Existing	Design Criteria
OH - NB CD to Local/I-75	8+88.92	45 mph(55)		360' (495')					HSSD = 495' - ODOT 201.2
OH - NB CD to Local/I-75	16+02.94	40 mph (55)			305' (495')				VSSD = 495' - ODOT 201.2
OH - NB CD to Local/I-75	17+24.96	42 mph (55)		325' (495')					HSSD = 495' - ODOT 201.2
OH - SB CD from I-75	3+20.00	46 mph (55)			360' (495')				VSSD = 495' - ODOT 201.2
OH - SB CD from I-75	6+40.00					6.02% (5.0%)			Max Grade = 5% - ODOT 203.2
OH - SB CD from I-75	16+00.00	50 mph (55)			425' (495')				VSSD = 495' - ODOT 201.2
OH - SB CD from I-75	20+31.37	52 mph (55)		455' (495')					HSSD = 495' - ODOT 201.2
OH - SB CD from I-75	21+30.00					6.5% (5.0%)			Max Grade = 5% - ODOT 203.2
OH - SB CD from I-75	28+40.37	52 mph (55)		455' (495')					HSSD = 495' - ODOT 201.2
OH - NB CD to I-75	36+51.70	48 mph (55)			400' (495')				VSSD = 495' - ODOT 201.2
OH - NB CD to I-75	40+36.53	48 mph (55)		400' (495')					HSSD = 495' - ODOT 201.2
OH - NB CD to I-75	42+41.09	45 mph (55)			360' (495')				VSSD = 495' - ODOT 201.2
OH - 3rd to NB CD to I-75	19+58.10	45 mph (55)			360' (495')				VSSD = 495' - ODOT 201.2
OH - 3rd to NB CD to I-75	20+90.14	47 mph (55)		385' (495')					HSSD = 495' - ODOT 201.2
OH - 3rd to NB CD to I-75	24+20.98	46 mph (55)			375' (495')				VSSD = 495' - ODOT 201.2



13. COMPLIANCE WITH FHWA POLICY REQUIREMENTS

FHWA provides guidance in the *Policy on Access to the Interstate System* dated May 22, 2017, which details two policy requirements the states must follow when seeking FHWA approval for a change in access to the interstate system. This section discusses each policy requirement as it relates to the BSB Corridor.

13.1 Policy Requirement #1

“An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, and ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis should, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (Title 23, Code of Federal Regulations (CFR), paragraph 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, should be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access should include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute, and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroads, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request should also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).”

Policy Requirement #1 - Traffic operational and safety analysis was completed to compare the No Build, Selected Alternative I, and Refined Alternative I (Concept I-W). The operational results indicate that Refined Alternative I (Concept I-W) will provide acceptable traffic operations. Section 8 demonstrates that operations are not degraded compared to No Build and Selected Alternative I. Likewise, the safety analysis confirms that the Refined Alternative I (Concept I-W) will improve the corridor’s safety compared to the No Build condition through design modernizations, increased cross-section widths, improved freeway capacity, and increased ramp spacing. The Safety analysis is summarized in **Section 9**.

The conceptual signing plan, as described in Section 4.1 and shown in **Appendix A**, illustrates that signing can be designed in accordance with Manual of Uniform Traffic Control Devices (MUTCD) guidelines without adverse impacts on other signing or drivers’ expectations.

13.2 Policy Requirement #2

“The proposed access connects to a public road only and will provide for all traffic movements. Less than “full interchanges” may be considered on a case-by-case basis for applications requiring special access, such as managed lanes (e.g., transit or high occupancy vehicle and high occupancy toll lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2), and 655.603(d)). In rare instances where all basic movements are not provided by the proposed design, the report should include a full-interchange option with a comparison of the operational and safety analyses to the partial interchange option. The report should also include the mitigation proposed to compensate for the missing movements, including wayfinding signage, impacts on local intersections, mitigation of driver expectations leading to wrong-way movements on ramps, etc. The report should describe whether the future provision of a full interchange is precluded by the proposed design.”



Policy Requirement #2 -. The proposed C-Ds and frontage roads allow for multiple points of access and connectivity in Ohio and Kentucky through local arterials. The ramp modifications in Cincinnati provide acceptable access in and out of the central business district. The operations analysis indicates these ramp modifications result in acceptable LOS for Refined Alternative I (Concept I-W).

The project will be developed to meet current design standards. Where current standards cannot be met, a design exception will be fully developed and vetted for that location and approved using state procedures.

14. CONCLUSION

The BSB IMS Addendum aims to confirm that the value engineering refinements incorporated into Refined Alternative I (Concept I-W) result in acceptable operations and safety compared to the previously approved IMS design, Selected Alternative I (from the 2012 EA/FONSI). The operations and safety analysis compares the No Build, Selected Alternative I, and Refined Alternative I (Concept I-W) and provides documentation to substantiate that Refined Alternative I (Concept I-W) does not adversely impact operations or safety.

The operations of the BSB corridor are improved significantly in both Selected Alternative I and Refined Alternative I (Concept I-W) due to the removal of the bridge capacity constraint over the Ohio River. This allows free flow traffic conditions on the freeway mainline throughout the project area, a significant operational improvement compared to the No Build. Additionally, the design modification for Refined Alternative I (Concept I-W) results in acceptable traffic operations for the C-D roadway, ramp terminal intersections, and adjacent arterial streets. Some traffic delays occur at external network points, including US 50, I-71, and I-71/I-75; however, these delays are similar to those in the Selected Alternative I and No Build conditions. Overall, the Refined Alternative I (Concept I-W) achieves the operational goals of the project's purpose and need.

The safety of the BSB Corridor is improved in both Selected Alternative I and Refined Alternative I (Concept I-W) from the No Build due to designs that alleviate capacity constraints and correct geometric deficiencies that contribute to existing crash conditions. These designs meet current standards for curves and shoulders, reduce weaving by separating mainline and local traffic, and eliminate left exits. The analysis shows that the improvements to safety over the No Build are similar between Selected Alternative I and Refined Alternative I (Concept I-W). Some isolated areas of Refined Alternative I (Concept I-W) show increased predicted crashes compared to Selected Alternative I, primarily from using 10 ft shoulders. The proposed 10 ft shoulder widths achieve the design standards and balance the corridor's operational, safety, right-of-way, and project cost considerations. Furthermore, the safety improvements associated with the C-D road system are anticipated to alleviate the existing safety concerns caused by peak-period traffic congestion.

The BSB Corridor Project is currently planned to be delivered in three phases. The two northern projects (PID 113361 and PID 114161) are being developed as Design-Bid-Build, and the remainder of the corridor (PID 116649/KYTC Project Item No. 6-17) is being developed according to a Progressive Design-Build process. The results of these recommendations do not preclude or eliminate consideration of additional concepts and ideas if developed by a design-build team as part of the Phase III project. Refined Alternative I (Concept I-W) is the base concept in the design-build Phase III of the BSB Corridor Project.

