

ACCESS JUSTIFICATION REPORT

I-57 / IL 14 Interchange Modifications

Franklin County, Illinois



Prepared for:

City of Benton



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1 INTRODUCTION

This Access Justification Report (AJR) seeks approval from the Federal Highway Administration (FHWA) on the engineering and operational acceptability for modifications to the Interstate 57 (I-57) and Illinois Route 14 (IL-14) interchange at West City and the City of Benton in southern Illinois. I-57 runs between I-55 at Sikeston, Missouri and I-94 at Chicago, Illinois. IL-14 is an east-west highway in southern Illinois running from US 51 south of Du Quoin to the Indiana state border west of New Harmony just short of the Wabash River. Within the study area, I-57 has an average annual daily traffic (AADT) of 32,000 vehicles per day (vpd), of which 35.2% is heavy commercial traffic. In the Benton/West City area IL-14 is an Arterial Highway with AADT of 14,700 vpd east of I-57 and 13,800 vpd west of I-57.

The proposed modifications would not add access points to the interstate but rather seeks to improve the transportation system by more efficiently distributing traffic utilizing the same number access points. The interchange was constructed in 1963 and has served the area well for most of the past 50 years. However, recent and anticipated development is resulting in a need to modify access to I-57. Responding to that need, the Benton-West City Economic Development Corporation (EDC) initiated planning studies in 2009 to identify opportunities to address the mobility, system linkage, and economic development needs of the local communities connected to I-57 at IL-14. A summary of the roadway improvement recommendations identified in this plan are shown in **Figure A-1 (Proposed Transportation Plan) in Appendix A**. The key recommendation from those efforts is improved I-57 access at Petroff Road by reconfiguring the IL-14 interchange to a Split Diamond configuration between IL-14 and Petroff Road.

The proposed Split Diamond configuration would preserve access to residential, institutional, and commercial destinations in Benton and West City while at the same time improving access to regional industrial centers. Specifically, the proposed Split Diamond configuration would maintain the existing "local" connection to IL-14 and also provide a new "industrial" connection at Petroff Road. This configuration would allow heavy truck and industrial traffic to access industrial areas north and east of the existing interchange without traveling through downtown Benton and West City and through the Benton Town Square. As described in **Section 20** the Benton Town Square is congested with traffic and the land uses within and adjacent to the Benton Town Square are generally not compatible with heavy truck traffic. Routing heavy industrial traffic through this area is becoming problematic for both local and industrial uses. These problems are only expected to worsen as development continues into the future. Moreover, the proposed interchange modifications would improve access to the US Army Corps of Engineer's recreational facilities at Rend Lake. The connection between I-57 and Rend Lake currently requires 3 miles of meandering travel on local roadways. The proposed improvements would reduce this distance by about 1 mile and simplify movements for those traveling to the site.

There is a clear need to provide more direct access to the region's industrial centers while at the same time maintaining access to the commercial and institutional activities in downtown Benton and West City. The proposed split diamond configuration accomplishes both goals. These modifications will facilitate a more efficient distribution of traffic and enhance the economic potential of the surrounding areas by relieving congestion and improving safety. More detailed information is provided in the following sections.

1-1 Description of Study Area

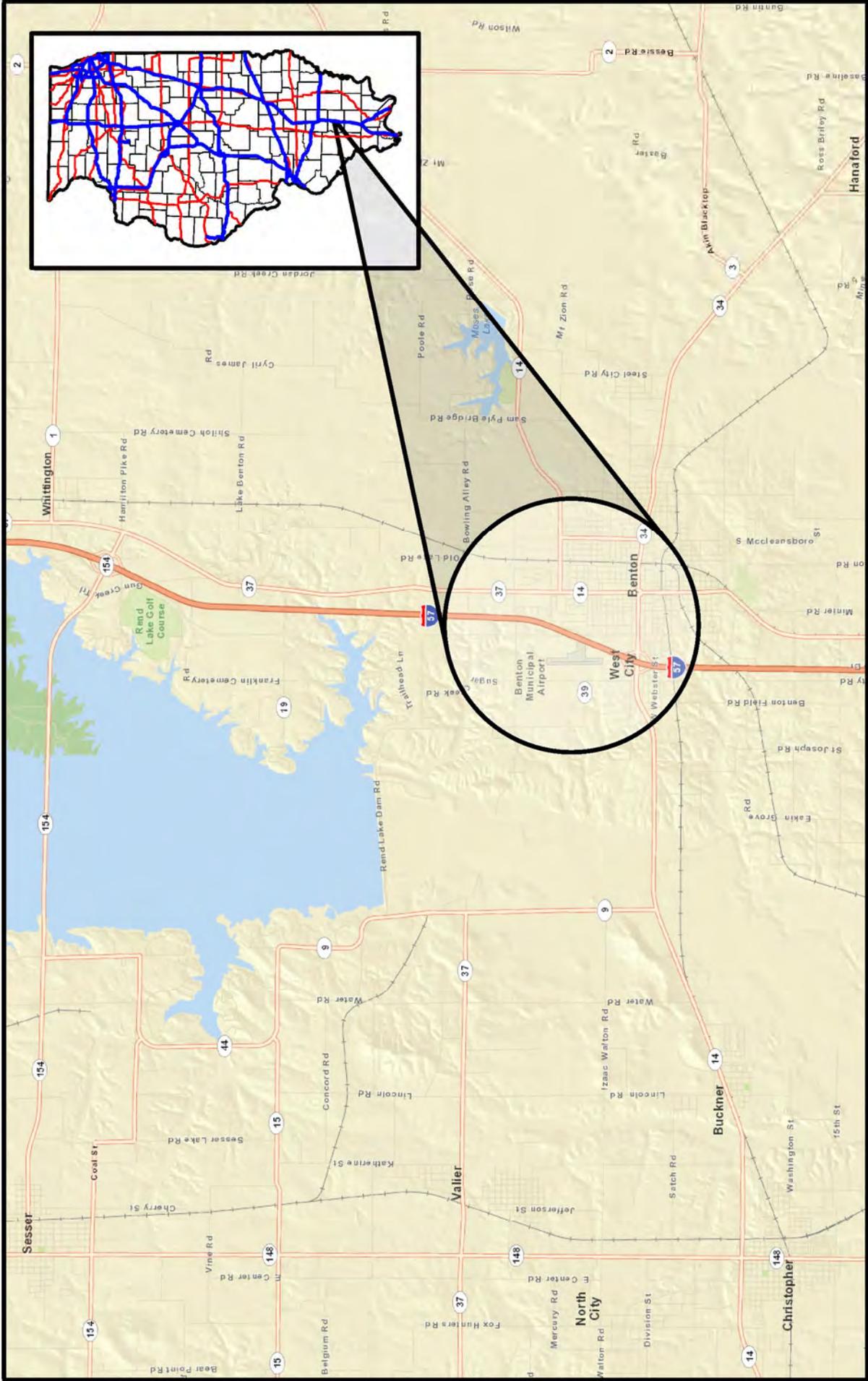
The study area is located in Franklin County in central southern Illinois southeast of Rend Lake as shown in **Figure 1-1**, the Project Vicinity Map. The primary focus for the study area was a 5 miles by 5 miles square area centered just east of I-57 between the Benton Municipal Airport and Franklin Hospital. This area is shown within **Figure 1-2**, the Project Location Map which illustrates key locations of the study area upon aerial imagery. An illustration of the existing roadway network is provided in **Figure 1-3**.

The limits of this study along I-57 are from north of the existing Petroff Road overpass (including the northbound off-ramp to the Rest Area approximately 0.75 miles north of the Petroff Road overpass) to south of the existing Canadian National (CN) railroad overpass. The Petroff Road overpass is 1.4 miles north of the I-57/IL 14 interchange and the CN railroad overpass is 0.4 miles south of IL 14.

The study area includes West City and the City of Benton which is located at the cross roads of three major state highways: Illinois Routes 14, 34, and 37. These highways intersect at the Benton Town Square in the heart of the city. IL-37 parallels I-57 and frequently functions as a detour route for I-57 during emergency events or when required by construction activities. IL-34 extends southeastward to Harrisburg and the Shawnee National Forest, and IL-14 extends from US Route 51 eastward through Benton to McLeansboro and Carmi. These state routes are all classified as Other or Minor Arterials and collectively provide connectivity to the I-57 corridor for the existing mining, recreational, industrial and agricultural traffic generators in the area. However, as discussed in subsequent sections, the current configuration of these routes requires this regional traffic to flow through the Benton Town Square and residential areas.

1-2 Description of Report

This report is structured on the comparison between two alternatives; the "No-Build" and the "Split Diamond-Build", which compare the differences from doing nothing to modifying the existing diamond interchange into a Split Diamond interchange. The "No-Build" option, like it sounds, explores likely outcomes if nothing is done. The "Split Diamond-Build" option explores likely outcomes if the proposed interchange modifications and associated improvements are constructed. Recognizing the expense and time required for implementation, the "Split Diamond-Build" alternative is further divided into an Interim-Phase and a Full Build-Phase.

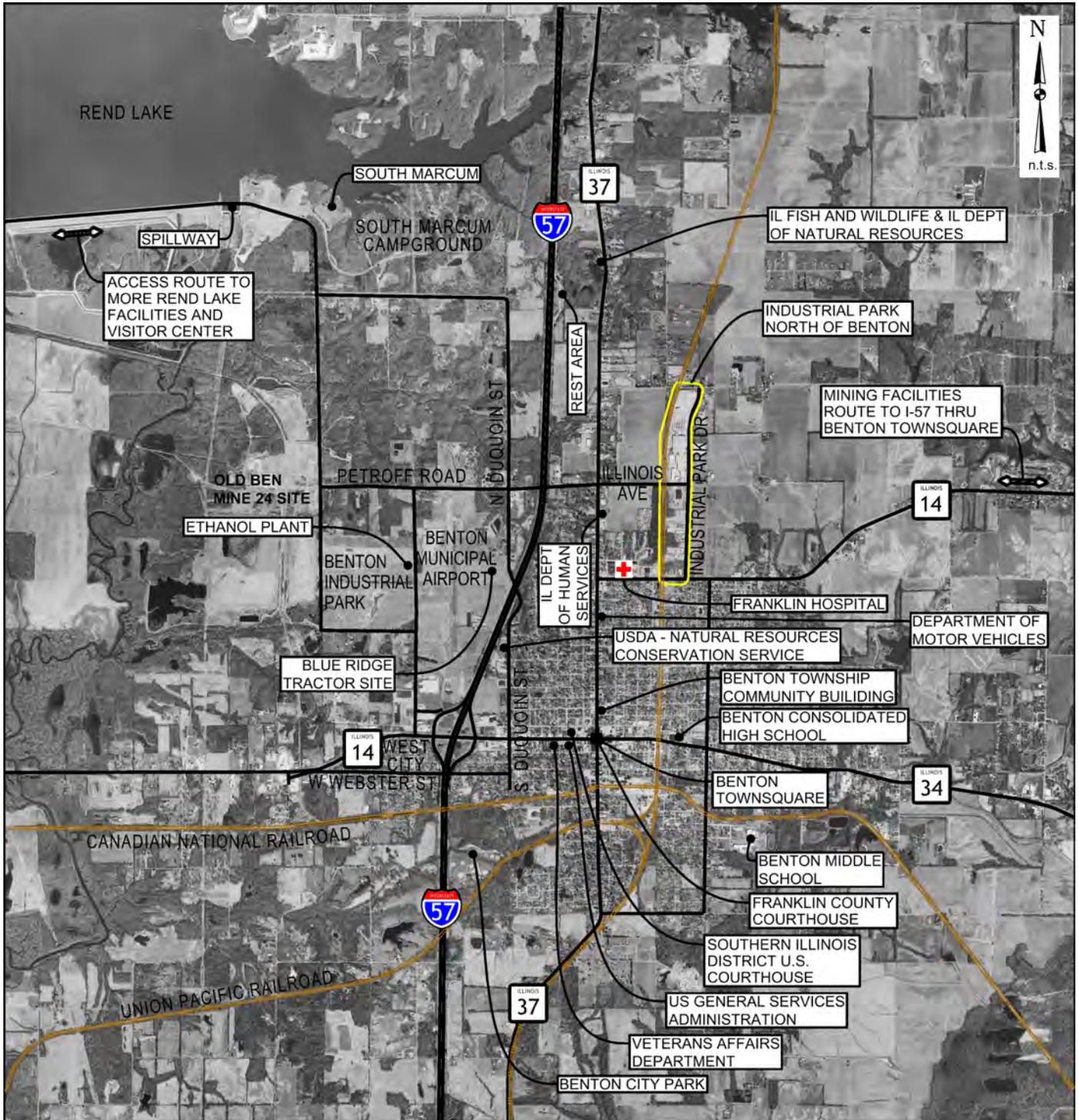


I-57 / IL 14 Interchange Modifications
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Figure 1-1
 Project Vicinity Map



Figure 1-2: Project Location Map





Legend

- — — EXISTING INTERSTATE
- — — EXISTING STATE ROUTES
- — — EXISTING LOCAL TRUCK ROUTES
- — — EXISTING LOCAL ROADS

I-57 / IL 14 Interchange Modifications

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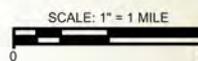


Figure 1-3

Existing Roadway Network

1-3 No-Build Option

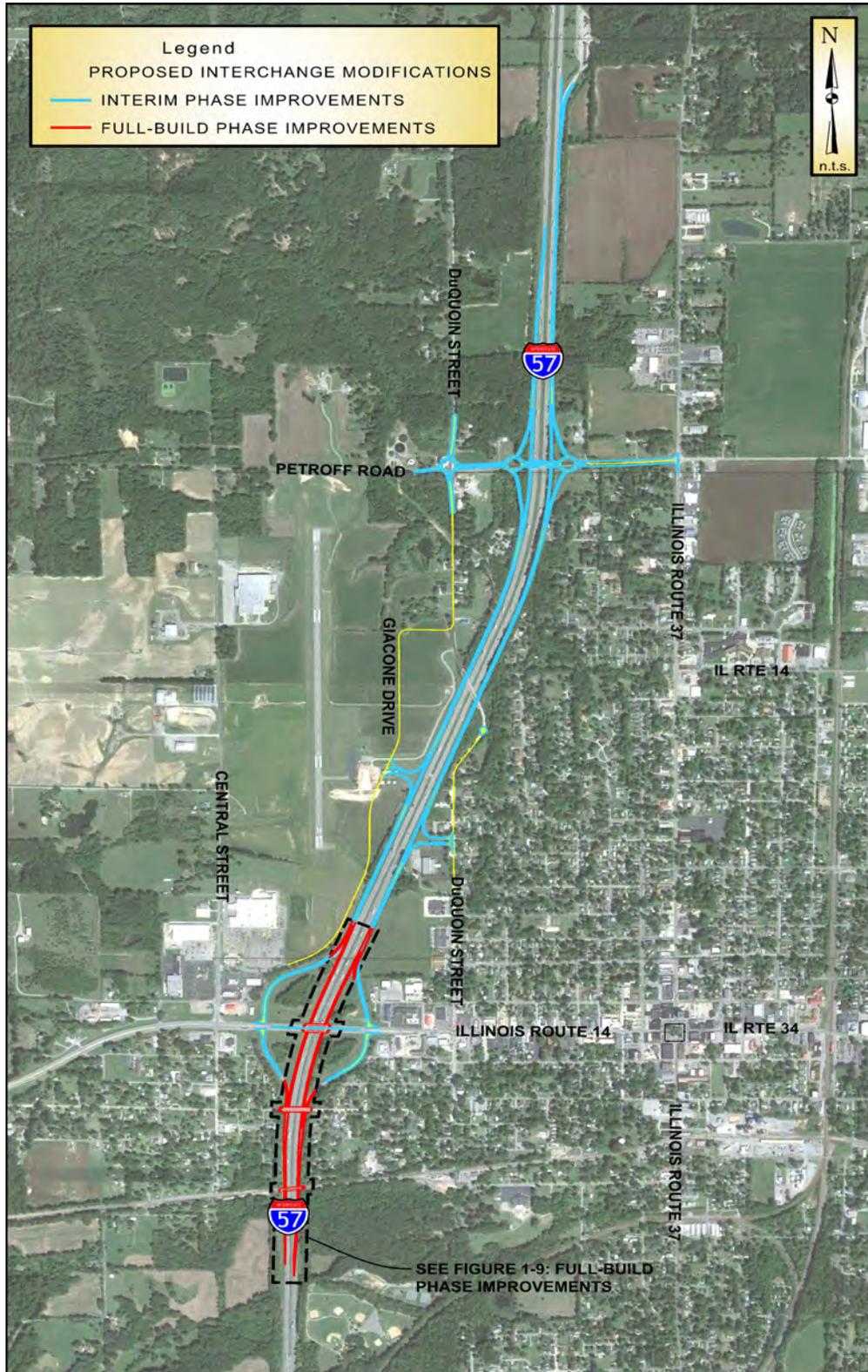
The No-Build Option was evaluated to determine future traffic operations absent any interchange modifications. The no-build option does not provide any new or improved access for the new industrial areas adjacent to I-57 nor does it improve access to the Rend Lake recreational facilities. Thus, this option evaluates the existing highway system with no geometric improvements. Under these conditions, analysis indicates that the local roadway network cannot support the forecasted traffic volumes and overall traffic flow in the study area remains disrupted. As described in **Section 20**, traffic flow around the Benton Town Square would break down and multiple movements at a number of intersections would degrade to Level of Service (LOS) F. Mixing local commercial/residential traffic with regional heavy industrial traffic at the existing IL-14 interchange creates operational issues that will worsen over time. The analysis shows that these issues have major impacts on IL-14 that spill back, impacting traffic at the IL-14/I-57 interchange, and eventually impacting traffic in I-57.

1-4 Split Diamond-Build Option

In order to better serve the needs of the local communities of Benton and West City and facilitate planned industrial and business growth, it is proposed that the existing IL-14 diamond interchange be modified to a Split-Diamond configuration with on/off ramps to and from the north provided at Petroff Road and on/off ramps to and from the south provided at IL-14. C-D roads would be constructed to provide connectivity between IL-14 and Petroff Road.

The interchange modifications (see **Figure 1-4**) are shown in two phases: 1) Interim Phase and 2) Full Build Phase. Under the Interim phase (see **Figure 1-5** through **Figure 1-8**), the C-D roads will include lanes under (by-passing) Petroff Road so that traffic accessing IL-14 to/from the north will not travel through the Petroff Road roundabouts, (see **Figure 1-7**). Also, under the Interim Phase the IL-14 Bridge over I-57 would remain in place and the C-D roads would not continue under the IL-14 overpass. I-57 traffic accessing Petroff Road to/from the south would pass through the signalized intersections on IL-14, (see **Figure 1-6**). The Full Build Phase extends the C-D roads to include lanes under (by-passing) IL-14 so that traffic accessing Petroff Road to/from the south will no longer travel through the traffic signals on IL-14, (see **Figure 1-9**).

Figure 1-4: Proposed Interchange Modifications



The Interim Phase will be in place for several years until the existing IL-14 Bridge reaches the end of its useful life. As described in **Section 8**, the two additional structures south of IL-14 will also remain until which time the Full Build Phase is constructed. When constructed, the Full Build Phase would provide more direct access to Petroff Road (to/from the south). These existing structures can accommodate the future 3rd lane expansion of I-57 if the interstate is widened prior to the completion of the Full Build Phase since the widening will occur within the existing median. However, this would require the I-57 widening project to include additional traffic safety measures such as guardrail and barrier walls to protect the traveling public and the structure supports within the median.

a. Interim Phase

The interim phase is the first stage of the proposed interchange modifications. The interim phase would complete a functional Split Diamond interchange between IL-14 and Petroff Road of which can be summarized in three major project components as listed below:

- Modify connections to I-57 and construct C-D roads
- Petroff Road Improvements and Overpass Reconstruction
- DuQuoin Street Reconfiguration and Overpass Removal

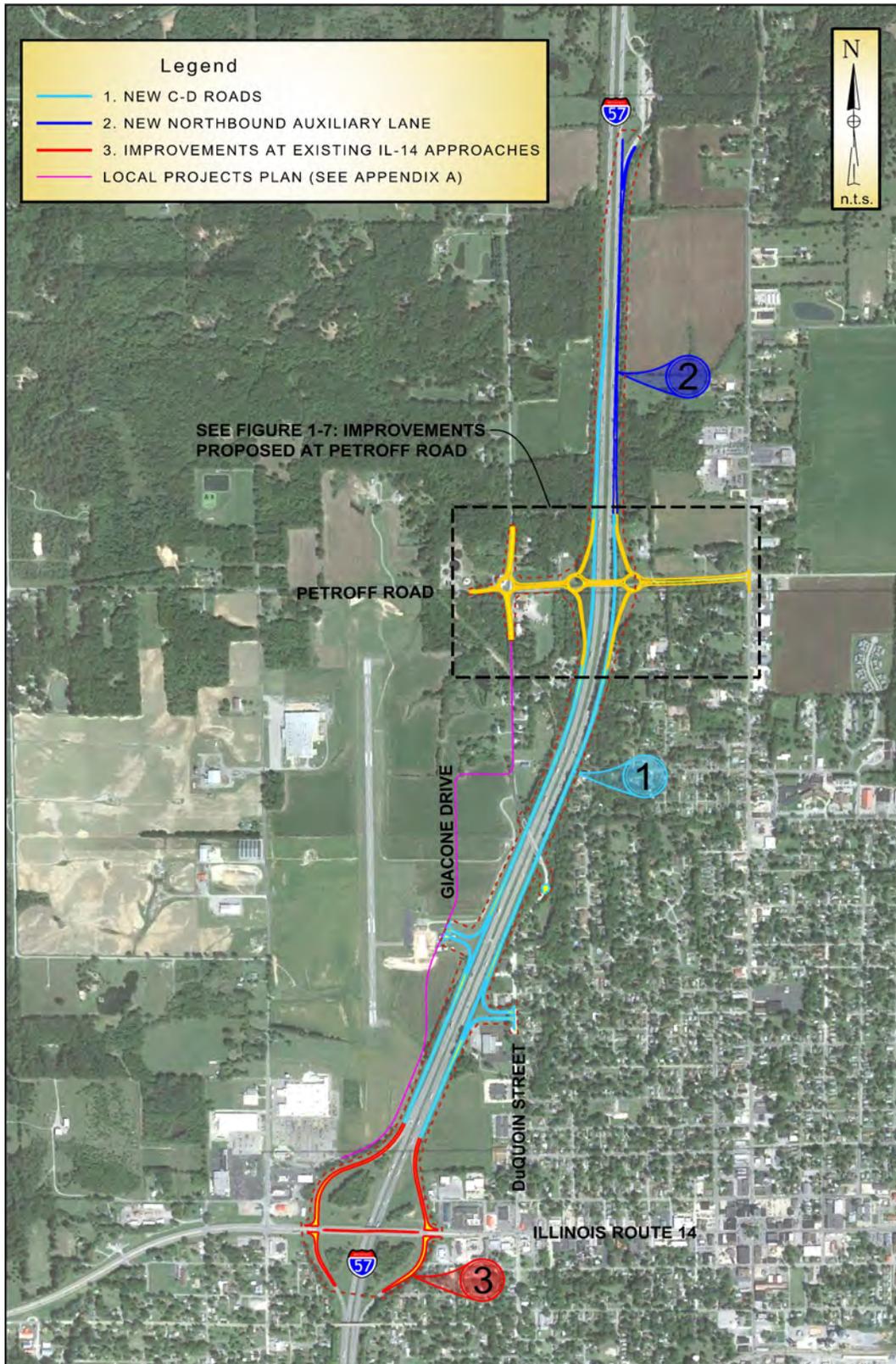
These major project components are described further within the following pages.

Modify connections to I-57 and construct C-D Roads

As shown in **Figure 1-5**, the interim phase includes several work items as discussed below.

1. Construct new C-D roads starting to the south at the existing IL-14 northbound on-ramp /southbound off-ramp and connecting to the north to I-57 north of the Petroff Road overpass. This improvement includes relocation of the northbound on-ramp and southbound off-ramp to north of the Petroff Road overpass. The C-D roads will provide lanes under (by-passing) Petroff Road so that traffic accessing IL-14 to/from the north will not travel through the Petroff Road roundabouts. The northbound C-D road will have a local connection to DuQuoin Street and the southbound C-D road will have a local connection to Giacone Drive between IL-14 and Petroff Road. The C-D roads will be 1-2 lanes with shoulders on each side.
2. Construct a new northbound auxiliary lane on I-57 between the new northbound on-ramp and the off-ramp to the rest area approximately 0.75 miles north of the Petroff Road overpass.
3. Improve the north/south approaches at the existing signalized IL-14 ramp terminal intersections to accommodate new north/south through traffic on the C-D roads, see **Figure 1-6**.

Figure 1-5: Interim Phase Improvements



The IL-14 Bridge over I-57 will remain in place until its useful life expectancy has elapsed. Under the interim improvements the C-D roads will not continue under the IL-14 overpass. Rather, traffic accessing Petroff Road to/from I-57 from the south will pass through the signalized intersections on IL-14. The north/south approaches of these intersections will be widened in order to accommodate new north/south through traffic. Only minor improvements are needed on the east/west approaches of these signalized intersections.

Figure 1-6: IL-14 Ramp Approaches



Additional detail is provided in **Section 13**.

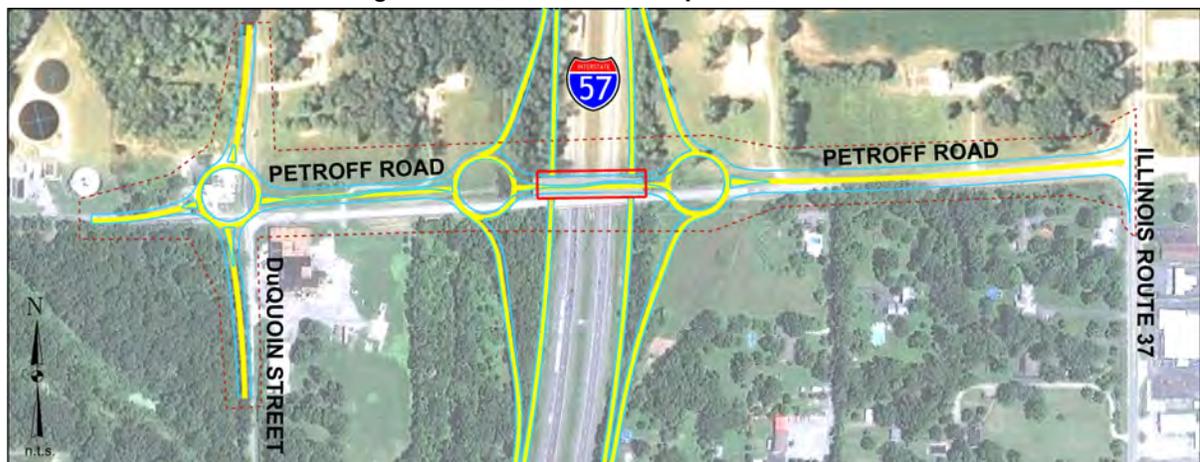
Petroff Road Improvements and Overpass Reconstruction

Improvements shown in **Figure 1-7** will be constructed on Petroff Road between North DuQuoin Street and North Main Street/IL-37 to facilitate efficient traffic flow at the new roundabout interchange with the C-D roads; this includes a new roundabout at North DuQuoin Street and two new roundabouts connecting to the C-D road ramps. Improvements include several work items.

1. Reconstruct the Petroff Road overpass over I-57.
2. Construct a roundabout interchange on Petroff Road to connect to the C-D roads.
3. Improve Petroff Road intersection between DuQuoin Street (located around 700 feet to the west of the proposed southbound roundabout) and North Main Street/IL-37 (located around one quarter mile to the east of the proposed northbound roundabout).

The roadway segment between the roundabout intersections will consist of 3 lanes with median and shoulder. The Petroff Road segment between I-57 and North Main Street/IL-37 will consist of 4 through lanes (2 lanes in each direction) with combination of a median and center lane and outside shoulders. The Petroff Road segment between I-57 and North DuQuoin Street will consist of 3 lanes (1 through lane in each direction with left turn lanes) with shoulders. This work will also include the removal and replacement of the Petroff Road Bridge. Additional detail is provided in **Section 13**.

Figure 1-7: Petroff Road Improvements



DuQuoin Street Reconfiguration and Overpass Removal

Modifications illustrated in **Figure 1-8** will be made along North DuQuoin Street for the interim phase and include the following improvements.

1. Remove the DuQuoin Street overpass to create room for the new one-way C-D road system.
2. Improve connections between DuQuoin Street and the local roadway system on both sides of I-57.

This will include the removal of the North DuQuoin Street Bridge and removal of roadway segments no longer needed. The reconstruction of North DuQuoin Street will include the construction of a cul-de-sac on the east side of I-57 and necessary intersection work with the connector road for access to the CD roads. The replacement of the bridge is not warranted based on projected traffic. Additional detail is provided in **Section 13**.

Figure 1-8: Modifications at North DuQuoin Street



b. Full Build Phase

Along with the all of the interim phase improvements, the full build phase adds improvements primarily in the vicinity of IL-14 to complete the south end of the C-D road system. This work is shown in **Figure 1-9** and includes:

1. Extend the C-D roads under IL-14 so that traffic accessing Petroff Road to/from the south will not travel through the traffic signals on IL-14. These roadways will consist of 1 lane with shoulders on each side.
2. Replace the IL-14 overpass, Webster Street overpass, and Canadian National Railroad overpass including the construction of all bridge approaches as required, in order to provide policy acceleration and deceleration lanes.

Figure 1-9: Full-Build Phase Improvements



2 PURPOSE

The proposed project would update a 50 year old interchange and serve the significant regional need to improve system linkage, mobility, and economic development: Specifically the project would:

- Improve access between I-57 and regional industrial centers; facilitating continued economic growth in Benton, West City, and the greater Franklin County community.
- Route 25 - 30% of heavy truck traffic away from downtown Benton and the Benton Town Square; reducing congestion, improving the walkable context of the square, and improving the level-of-service.
- Improve access to the U.S. Corps of Engineers Facilities at Rend Lake.

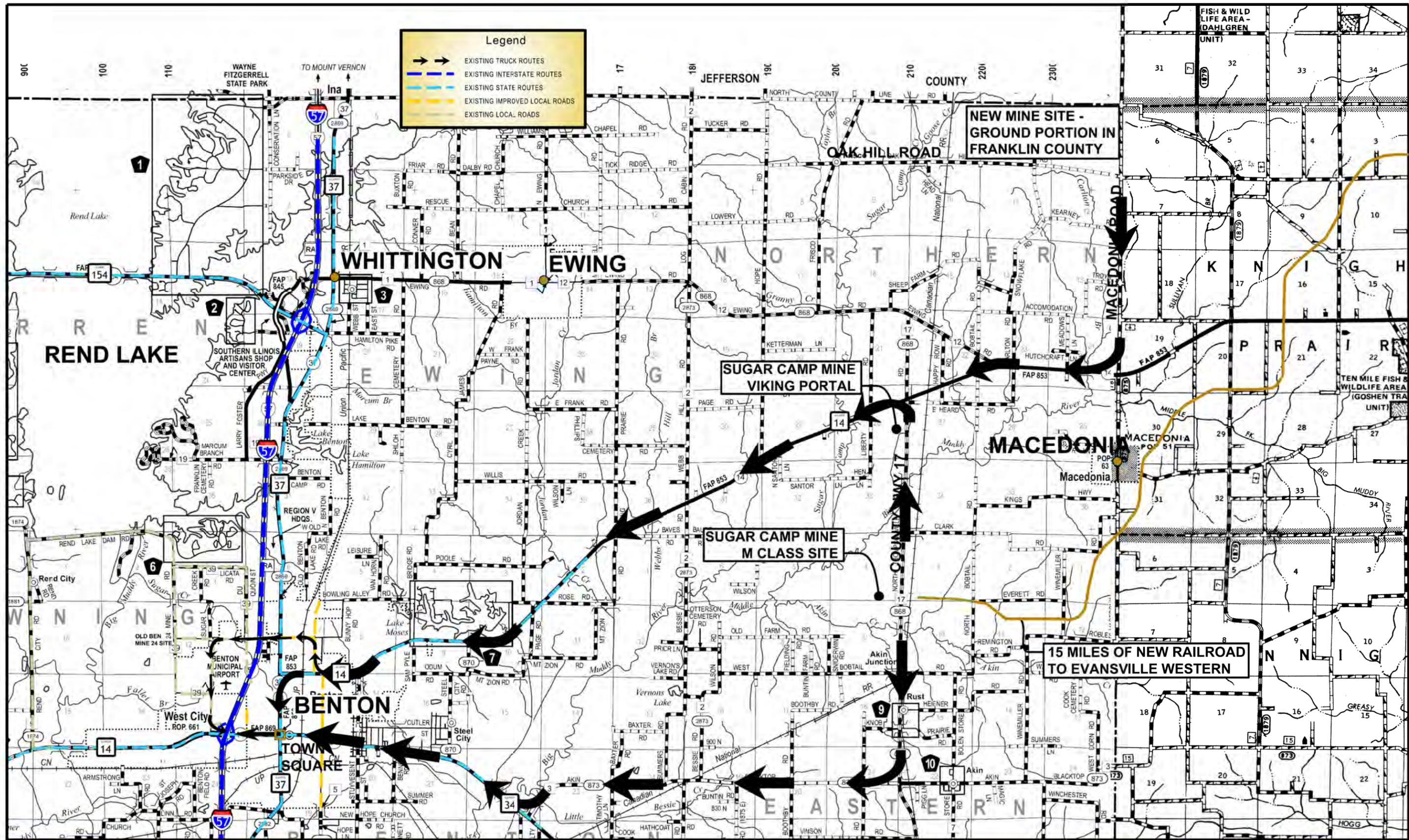
While the proposed access modifications will not remove all heavy truck traffic from the downtown Benton Square, it will reduce the heavy truck traffic in the Square by a significant amount. Specifically, trucks traveling to and from IL 14 east of IL 57, as well as heavy truck traffic accessing Benton's new industrial areas in the vicinity of Petroff Road, will use the new access instead of accessing I-57 through the Square. However, truck traffic on IL 34 and IL 37 east of I-57 would still travel through the Square without other local system improvements, such as those shown in Figure A-1 (Proposed Transportation Plan) in Appendix A. Beyond the proposed interchange modifications, note that the local system improvements illustrated per Legend on Figure A-1 of Appendix A are illustrative and also unfunded at this time.

The proposed modifications do not add access points to the interstate but seek to improve the existing transportation system by more efficiently distributing traffic utilizing the same number of access points. The proposed Split Diamond configuration would preserve access to residential, institutional, and commercial destinations in downtown Benton and West City (via access to I-57 from existing IL 14) while at the same time improving access to regional recreational and industrial centers (via access to I-57 from Petroff Road). In short, the proposed project improves system linkages, reduces congestion, and improves the level-of-service of the regional and interstate system, as is described in Section 18 (Operational Analysis). Moreover, the project enhances safety. The ISATe analysis of the interim improvements predicts a reduction of 135.4 crashes over the 19 year design period of 2011 to 2029, with a reduction of 29.2 fatal/injury crashes (see Operational Analysis in Section 18). More specific information is provided in the following sections.

2-1 Freight Movement

Efficient freight movement is a vital part of economic development. Freight traffic along I-57 at IL-14 can include up to 35.2% of all traffic volume, according to the Illinois Department of Transportation Map Viewer. A portion of the I-57 freight traffic uses IL-14 for east-west traffic movements. Existing truck routes using the IL-14 interchange are shown in **Figure 2-1**. Industrial access to I-57 from east of the Benton-West City area is limited to three primary routes:

- Through residential neighborhoods,
- Approaching I-57 from the west by traveling across I-57 at Petroff Road and “doubling back” to I-57 (thus incurring adverse travel), or
- Traveling through the Benton Town square.



As discussed in **Section 20**, the Benton Town Square currently operates near capacity during peak periods and traffic disruptions in the square often spill back onto IL-14, IL-37, and IL-34. While regional freight movements operate efficiently on I-57, freight mobility is often impaired by traffic congestion when bottlenecks occur at the square and along IL-14. This problem is expected to worsen in the future due to continued industrial investment throughout the area. Examples of recent industrial development are shown in **Figure 2-2** and include:

- M Class #1 Mine by Sugar Camp Energy located east of Benton contains 1.3 billion tons of clean, recoverable coal reserves and began coal production in 2011 reaching 900,000 tons the first year. The site has a production capacity of 8 million tons per year and continues to grow towards its potential.
- Viking Mine Portal by Sugar Camp Energy located northeast of Benton and directly north of its neighboring M Class #1 Mine is another mining site that is expected to begin operation soon and is currently in early stages of development.
- New mine site by Klein Energy is planned in the northeast corner of Franklin County. More information on this development is still forthcoming.
- New Ethanol Plant, called Man Metate Grain & Energy Commodities Plant is making use of the former Ag Energy ethanol plant facilities located on North Central Street west of the Benton Municipal Airport. This new ethanol plant will produce 7 million gallons of ethanol per year.

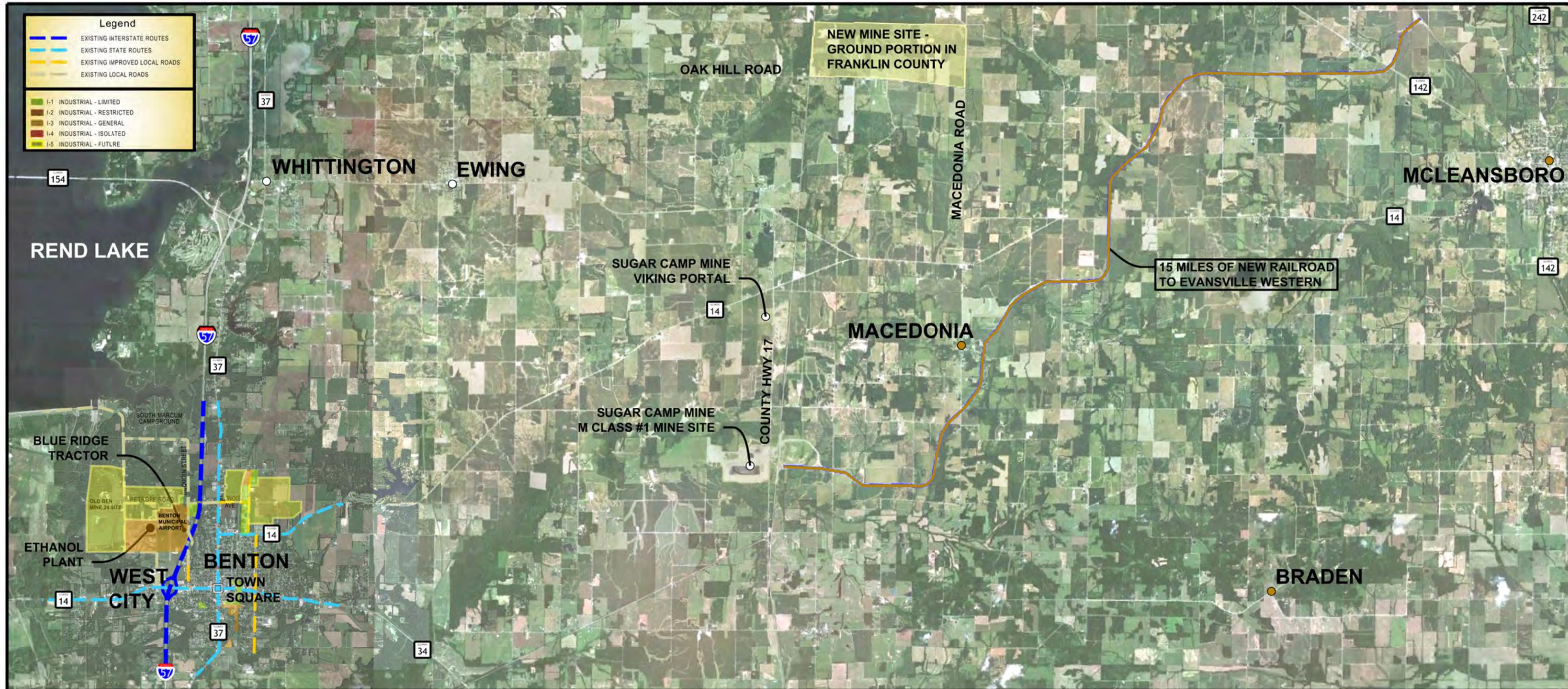
The analysis provided in **Section 20** shows that freight mobility is expected to further degrade in the future as continued industrial investment strains the existing roadways with additional truck traffic.

As previously discussed, the proposed access modifications will not remove all heavy truck traffic from the downtown Benton Square. However, it will reduce traffic (including the number of heavy trucks) in the Square by 25 – 30%. Specifically, traffic traveling to and from IL 14 east of IL 57, as well as heavy truck traffic accessing Benton's new industrial areas in the vicinity of Petroff Road, will use the new access instead of accessing I-57 through the Square. Truck traffic on IL 34 and IL 37 east of I-57 would still travel through the Square without other local road improvements, such as shown in Figure A-1 (Proposed Transportation Plan) in Appendix A.

While the proposed improvements will not remove all heavy truck traffic from the Square, significant benefits are achieved from the traffic (including heavy trucks) that is removed from the Square with the proposed improvements. The Highway Capacity Analysis described in Section 20 (**Figures 20-5 and 20-6**) illustrates the significant queue reductions that would result from the proposed project. For example, under the 2035 No-Build conditions a 0.8 mile queue is anticipated to extend west along IL 14 from the Square, through Du Quoin Street, and onto northbound mainline I-57. Under the 2035 Build condition, 25 – 30% of traffic (including heavy trucks) is removed from the Square as access is now provided to IL-57 from Petroff Road. The "Build" queues on IL 14 are expected to be contained within about 500' of each intersection and not extend onto mainline I-57. As another example, under the 2035 No-Build conditions queues are anticipated to extend north from the Square along IL 37 to about E.

Bond Street, a distance of about 0.8 miles. Under the 2035 Build condition this queue is reduced to about W 5th Street (a distance of a little less than 0.3 miles). Thus, even though the proposed improvements alone do not remove all heavy trucks from the Square, they can be expected to reduce the queues along IL 14 and IL 37 by as much as 60-70%.

The system linkage provided by the existing IL-14 interchange is not adequate. Industrial traffic generators are required to work their way through non-industrial business and residential zones in order to access I-57. The proposed Split Diamond interchange aims to improve system linkages by creating a connection between I-57 and the region's industrial zones north of West city and Benton (see **Figure 2-2**) and also accommodate industrial freight movements using IL-14 northeast of Benton. **Figure 2-3** shows the new truck route that will be created with the implementation of the proposed interchange modifications.



I-57 / IL 14 Interchange Modifications

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Figure 2-2

Recent and Anticipated Regional Industrial Development Sites

Figure 2-3: New Truck Route Created with Split Diamond Interchange



The proposed Split Diamond interchange is the most critical improvement identified in the previously mentioned Benton/EDC Transportation Planning Study. This becomes apparent when comparing existing truck routes and the new truck route created with the implementation of the Split Diamond Interchange. Even with other local transportation improvements completed (e.g., IL-14 relocation east of IL-37 as shown in **Figure A-5 in Appendix A**) without the Split Diamond interchange traffic that is destined to I-57 is still heavily reliant on travel along IL-14 and through the Benton Town Square. Significant transportation benefits are only realized when the Split Diamond interchange is implemented and industrial traffic can be routed directly to Petroff Road. The local improvements identified in the Benton/EDC Transportation Planning Study and outlined within Appendix A work with and support the proposed Split Diamond interchange. However, the Split Diamond interchange is the central component necessary to make the system work as a whole.

2-2 Local Roadways and the Local Community

The existing access to industrial areas north and east of Benton to I-57 at IL-14 is also creating significant problems for the local communities. While the area surrounding the proposed interchange is a regional magnet for new industrial development (bringing needed jobs and enhancing the economic base of the Benton and West City communities and the surrounding region), these industrial activities are also bringing heavy truck traffic into the heart of Benton and West City because of the current access to I-57. This is a continuing problem for the area which is expected to only get worse as freight traffic increases in the future.

People, from throughout the region, travel to Benton and West City for a variety of government services, shopping, and employment. Benton is the Franklin County seat, home to the U.S. District Court (Southern District of Illinois) and several other federal and state offices. Many antique and collectable shops are located in Benton's Downtown Antique Shopping District on the square and West City contains a growing retail area anchored by a Wal-Mart Super Center.

The existing interchange at IL-14 poorly serves both the industries and the local communities. The local land uses along IL-14 are not compatible with high volumes of heavy truck traffic. As illustrated in **Figure 2-4**, heavy trucks disrupt the walkable nature of the communities, add unwanted congestion to sensitive points in the transportation system, and distract from their historic charm. In short, heavy truck traffic is not appropriate for the local context. As previously discussed, while the proposed access modifications alone do not remove all heavy truck traffic from West Main Street and the Square, the proposed improvements do remove 25 – 30% of this traffic; significantly improve conditions.

Figure 2-4 Photograph of Truck Navigating the Benton Town Square



Traffic operations in the town square are expected to continue to degrade in the future. The 2035 “No-Build” analysis (described in **Section 20**) forecasts breakdown in flows both in the morning and evening hours. Traffic flow is anticipated to break down at a number of intersections, degrading to Level of Service (LOS) F. This mixing of local residential traffic and heavy industrial traffic creates operational issues on the local system. In accounting for the projected levels of industrial development, traffic analysis (provided in **Section 20**) shows that queues are anticipated to extend west along IL 14 from the Square, through Du Quoin Street, and onto northbound mainline I-57, impacting interstate traffic operations.

A solution is required that both supports movement of freight for regional industry while at the same time balancing the needs of the local communities as to not stagnate commercial growth or degrade quality of life for local commerce and residents. There is a clear need to provide more direct access to the region’s industrial centers while at the same time maintaining access to the commercial and institutional activities in downtown Benton and West City. Solutions to these issues also need to avoid and minimize impacts to human and natural environmental features.

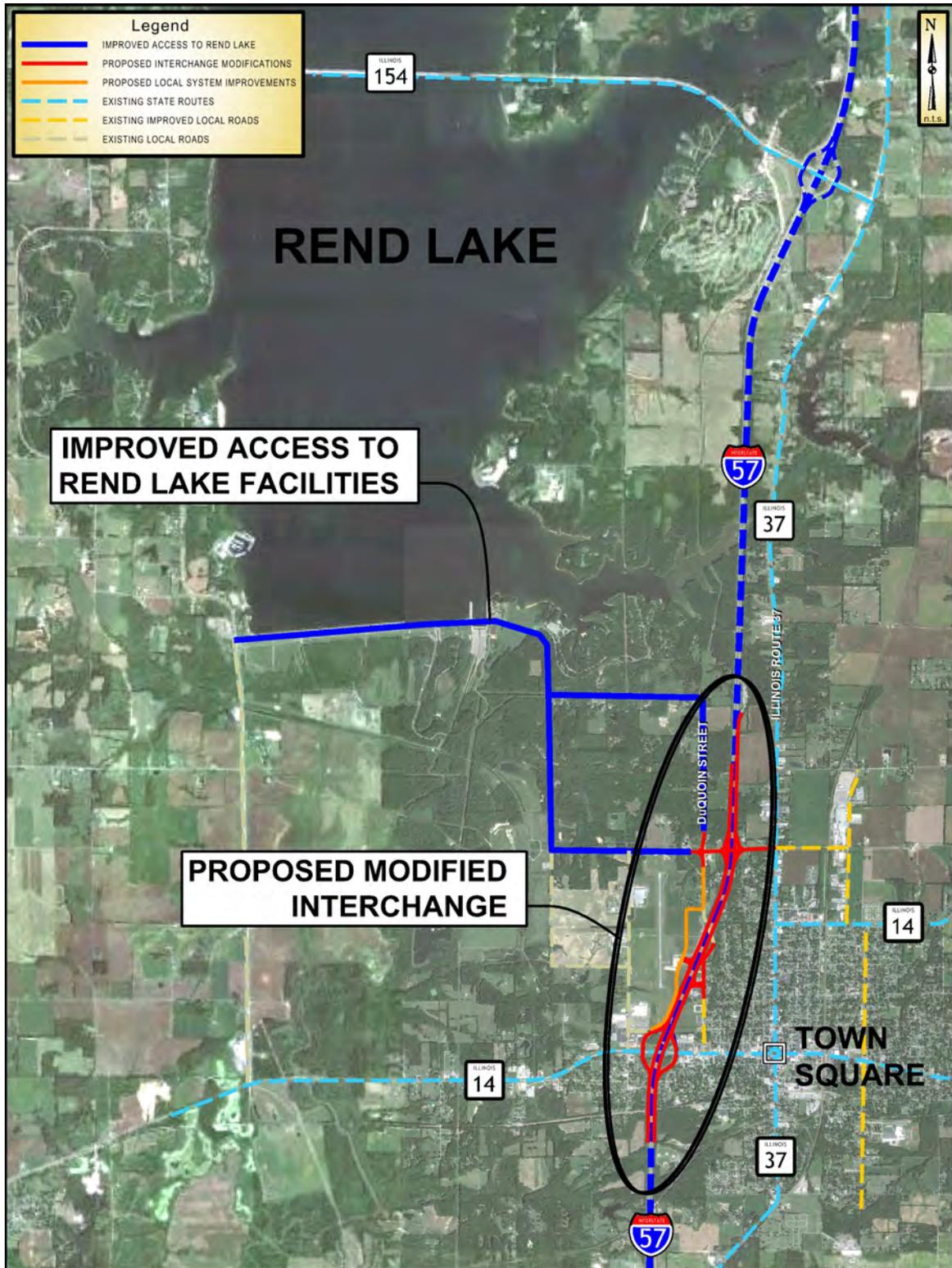
The proposed modifications would allow heavy truck traffic to access industrial areas north of the existing interchange without traveling through downtown Benton and West City and the Benton Downtown Square. Thus, the proposed split diamond configuration accomplishes both goals of providing a more direct route to regional industrial centers while also preserving capacity to meet the demands of local residents, businesses, and government offices located in downtown Benton/West City and in the Benton Town Square.

2-3 U.S. Corps of Engineers Facilities at Rend Lake

The U.S. Army Corps of Engineers maintains recreational facilities at Rend Lake located west of I-57 and north of the IL-14 exit. Rend Lake saw over 3.6 million visitors in 2012. Since 2010, the visitation to Rend Lake facilities has grown on average by 390,000 visitors each year. Rend Lake is currently ranked #12 among US Corp of Engineer Lakes in generating revenue. The US Federal Government has made a \$26 million investment in their facilities at Rend Lake in recent years (through the American Recovery and Reinvestment Act) including \$8 million for a Rend Lake Project Office and Visitor Center which has drawn an average of 20,000 visitors a year since it opened in 2011.

Currently, visitors access Rend Lake via the IL-14 exit and meander through 3 miles of local roads. The proposed improvements would reduce this distance by about 1 mile and simplify movements for those traveling to the site. **Figure 2-5** shows how access would be improved to the Rend Lake facilities as a part of this project.

Figure 2-5: Access to the U.S. Army Corps of Engineers Facilities at Rend Lake



3 COST

This section provides a conceptual cost estimate summary for both the Interim and Full Build phases of the recommended interchange modifications. Additional detail of these cost estimates are provided in **Table 3-1** of the following spreadsheets.

Interim Phase of the project including the new half interchange at Petroff Road with ramps to the rest area, collector-distributor roads (from Petroff Road to IL-14), removal and replacement of Petroff Bridge, connections from local roads to CD Roads, removal of North DuQuoin Street Bridge and reconstruction of the adjacent North DuQuoin Street segments indicate an anticipated combined construction cost of **\$19.2 M** and a land acquisition cost of **\$1.2 M**.

Full Build Phase of the project including extension of the CD Roads from the north side of IL-14 to Exit 71 with ramp connections, and removal and replacement of the IL-14 Bridge, Webster Street Bridge, and Railroad Bridge indicate an anticipated combined construction cost of **\$17.0 M**.

Table 3-1: Cost Spreadsheets

INTERIM PHASE									
DESCRIPTION	TERMINI	TYPICAL SECTION	LENGTH (MILE)	AREA (SF)	COST / MILE	COST / SF	COST	COST USED IN ESTIMATE	
PETROFF ROAD RECONSTRUCTION	RDWY SEGMENT WEST OF ROUNDABOUT AT PETROFF ROAD AND NORTH DUQUOIN STREET	2 LANE (26') WITH SHOULDERS (4')	0.06		\$1,800,000		\$108,000	\$150,000	
	ROUNDABOUT AT NORTH DUQUOIN STREET AND PETROFF ROAD	18' TO 26' PAVT WIDTH AND SHOULDER (6')	0.10		\$1,800,000		\$180,000	\$200,000	
	RDWY SEGMENT BETWEEN NORTH DUQUOIN STREET AND DOGBONE	3 LN (42') UNDIVIDED WITH MEDIAN (6') & OUTSIDE SHLD (8')	0.10		\$3,500,000		\$350,000	\$350,000	
	ROUNDABOUTS OF DOGBONE	18' TO 26' PAVT WIDTH AND SHOULDER (8')	0.20		\$1,900,000		\$380,000	\$400,000	
	TANGENT SEGMENT OF DOGBONE	3 LN (42') UNDIVIDED WITH MEDIAN (6') & OUTSIDE SHLD (8')	0.06		\$3,500,000		\$210,000	\$250,000	
	RDWY SEGMENT BETWEEN DOGBONE AND IL-37	4 LN UNDIVIDED (62') WITH CENTERLANE & OUTSIDE SHLD (8')	0.21		\$4,000,000		\$840,000	\$850,000	
	PETROFF BRIDGE REMOVAL	220' SPAN x 32' WIDTH		7,050		\$35	\$246,750	\$250,000	
	NEW PETROFF BRIDGE OVER I-57	306' SPAN x 77' WIDTH		23,450		\$140*	\$3,283,000	\$3,300,000	
I-57 RECONSTRUCTION	RAMPS TO DOGBONE	16' TO 24' PAVT WIDTH & OUTSIDE SHLD (6'), INSIDE SHLD (4')	0.91		\$1,800,000		\$1,638,000	\$1,650,000	
	RAMP TO REST AREA	1 LN (16') AND OUTSIDE SHLD (6') AND INSIDE SHLD (4')	0.19		\$1,500,000		\$285,000	\$300,000	
	CD ROADS FROM PETROFF TO IL-14	16' - 24' WIDE PAVT & INSIDE SHLD (4') AND OUTSIDE SHLD (8')	3.88		\$1,900,000		\$7,372,000	\$7,400,000	
	CONNECTIONS FROM LOCAL ROADS TO CD ROADS	16' TO 24' WIDE PAVT & INSIDE SHLD (4'), OUTSIDE SHLD (6')	0.65		\$1,800,000		\$1,170,000	\$1,200,000	
	MODIFICATIONS TO IL-14 RAMPS	24' TO 36' WIDE PAVT & INSIDE SHLD (4'), OUTSIDE SHLD (8')	0.76		\$2,500,000		\$1,900,000	\$1,900,000	
	RECONSTRUCTION OF IL-14 AT INTERCHANGE	NEW MEDIAN AND LAYOUT	0.28		\$1,100,000		\$308,000	\$350,000	
NORTH DUQUOIN STREET EAST OF I-57	NORTH DUQUOIN STREET BRIDGE REMOVAL	300' SPAN x 30' WIDTH		9,000		\$35	\$315,000	\$350,000	
	NORTH DUQUOIN STREET RECONSTRUCTION	2 LANE URBAN ROADWAY AND APPURTENANCES	0.20		\$1,300,000		\$260,000	\$300,000	
							SUB-TOTAL	\$18,845,750	\$19,200,000

* UNIT COST DOES NOT INCLUDE CONCRETE DECKING FOR ROADWAY OR APPROACH PAVEMENT

FULL BUILD PHASE									
DESCRIPTION	TERMINI	TYPICAL SECTION	LENGTH (MILE)	AREA (SF)	COST / MILE	COST / SF	COST	COST USED IN ESTIMATE	
I-57 RECONSTRUCTION	EXTENSION OF CD ROADS FROM NORTH SIDE OF IL-14 TO EXIT 71	16' PAVT, INSIDE SHLD (4'), OUTSIDE SHLD (8') & INTERSECTIONS	1.00		\$2,000,000		\$2,000,000	\$2,000,000	
	IL-14 BRIDGE REMOVAL	216' SPAN x 80' WIDTH		18,000		\$35	\$630,000	\$650,000	
	NEW IL-14 BRIDGE OVER I-57	286' SPAN x 92' WIDTH		25,110		\$300	\$7,533,000	\$7,550,000	
	WEBSTER STREET BRIDGE REMOVAL	282' SPAN x 36' WIDTH		10,000		\$35	\$350,000	\$350,000	
	NEW WEBSTER STREET BRIDGE OVER I-57	350' SPAN x 45' WIDTH		15,700		\$300	\$4,710,000	\$4,750,000	
	RAILROAD BRIDGE REMOVAL	214' SPAN x 18' WIDTH		4,050		\$35	\$141,750	\$150,000	
	NEW RAILROAD BRIDGE OVER I-57	290' SPAN x 18' WIDTH		5,050		\$300	\$1,515,000	\$1,550,000	
							SUB-TOTAL	\$16,879,750	\$17,000,000

LAND ACQUISITION									
DESCRIPTION	TERMINI	TYPICAL SECTION	LENGTH (MILE)	AREA (SF)	COST / MILE	COST / SF	COST	COST USED IN ESTIMATE	
INTERCHANGE								\$1,200,000	
							SUB-TOTAL	\$1,200,000	

4 BACKGROUND INFORMATION

4-1 General Background Information

The desire for improved industrial interstate access to the Benton / West City area to help grow the economy and alleviate heavy truck traffic through downtown areas has been discussed for many years. Recently the City of Benton has engaged the help of the EDC to partner with them in working towards obtaining approval for this long-awaited transportation improvement. After consulting with IDOT, the City of Benton and EDC initiated planning studies to help identify opportunities to address the regional transportation challenges.

After further consultation with IDOT and FHWA, which included preliminary analysis of various alternatives, the project stakeholders developed a list of desired transportation improvements. These improvements are summarized in **Figure A-1 (Proposed Transportation Plan) in Appendix A**. The most critical project in this plan is the modification of the IL-14 interchange to a Split Diamond configuration with C-D roads between IL-14 and Petroff Road.

4-2 Regional Employment Information

The Benton / West City area has a wide range of employers including federal, state, and local government offices:

- US Department of Agriculture
- US Army Corps of Engineers
- US General Services Administration
- US District Court
- Illinois Secretary of State
- Illinois Department of Human Services
- Illinois Fish and Wildlife
- Illinois Department of Natural Resources
- Illinois Department of Veterans Affairs
- City of Benton
- Franklin County Circuit Clerk
- Department of Motor Vehicles
- Farm Service Agency

Other employers include local industries, retail businesses, and the Franklin Hospital. However, the region is in need of additional employment opportunities. The unemployment rate for Franklin County, as of April 2014 was 9.4%, the 3rd highest rate in Illinois, while the state average was 7.2%. Bringing jobs to this area is essential to the overall economy of the region. There are signs of economic growth beginning to take place in Franklin County; new development by Blue Ridge Tractor is expected to create up to 20 new jobs, the new ethanol plant anticipates 15 to 25 new jobs initially with an eventual creation of 40 jobs, and surrounding mine sites are continuing to develop creating more job opportunities in the area. The proposed interchange modifications will improve interstate access for the region's industrial centers, making the region more competitive to attract additional industrial investment and jobs.

4-3 Project Stakeholders

Throughout the project development process, the project team has engaged local decision makers from various fields; as evidenced by the more than 30 letters of support from government agencies, planning organizations, industries, the Franklin Hospital, and others (see **Appendix B**). Efforts to involve and engage the community will continue and will be expanded in future project stages. Future efforts will follow FHWA and IDOT guidelines for proactive and formal public involvement activities.

4-4 Project Schedule and Funding

It is anticipated that construction for the Interim Phase of this project could occur in 5 to 11 years. Construction could begin for the Full-Build Phase in 12 to 20 years. Potential funding sources will be explored among federal and state resources, but no project components have been programmed yet.

5 CONCERNS

5-1 Environmental

No significant environmental issues were identified at the level of analysis performed for this report. Please refer to **Section “17 Status of Planning and NEPA”** of this report.

5-2 Safety

Safety was a significant factor in this study. Please refer to the safety analysis sections, **18-1 through 18-3**, for more detailed information. There are three sections of I-57 in relatively close proximity to the study area that are reported on the Illinois FIVE PERCENT segment list from 2007-2011 indicating a higher than average occurrence of serious injury crashes. Freeway and ramp improvements will improve safety within the study area. Specifically, the freeway improvements will provide speed change lanes that provide additional time and space to merge onto and off of the ramps providing a safer influence area between the freeway and the ramps. In addition, the improvements at the ramp terminals will provide additional capacity, which is expected to reduce the congestion and minimize conflicts to promote safer intersections. In total, the proposed changes are expected to decrease the PDO and fatal/injury crashes. In fact, the proposed modifications are expected to reduce the overall number of crashes by approximately 14% as compared to the No Build condition.

6 COMMUNITIES

According to the 2010 census, the combined population of the Benton / West City area is around 8,000 and approximately 280,000 live within a 35 mile radius of the area. These numbers remained relatively steady from the year 2000 census numbers with a growth of approximately 0.5% over the entire ten

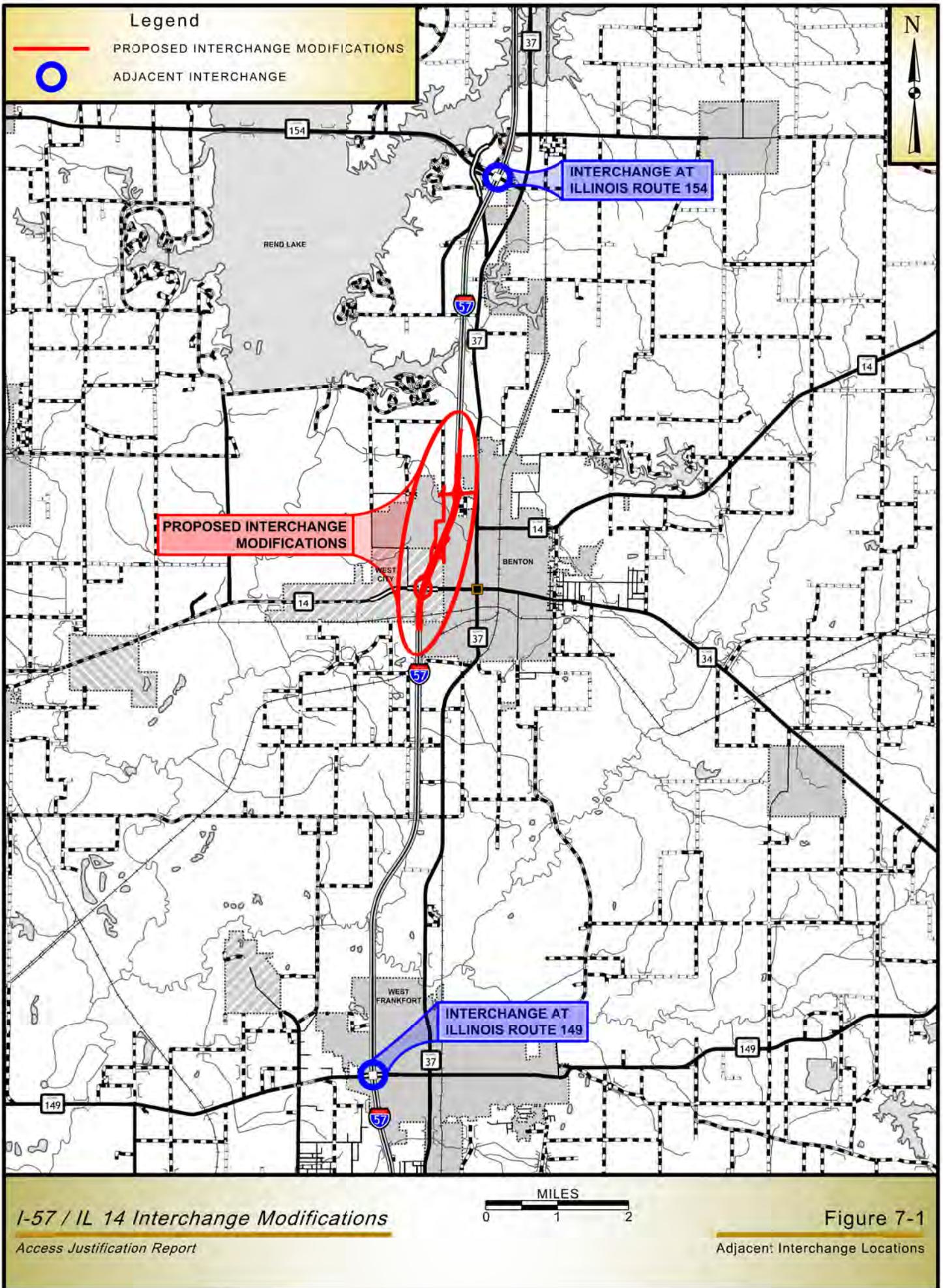
year period. Population numbers are projected to be stable for the near future, but could increase should new development occur in the region.

7 CONNECTIONS

The existing IL-14 interchange lies between the Illinois Route 154 (5.9 miles to the north) and Illinois Route 149 (7 miles to the south) interchanges on I-57. The proposed interchange modifications extend approximately 3 miles along I-57 from three-quarter miles south of the existing IL-14 interchange to the rest area exit on northbound I-57. As shown in **Figure 7-1**, the interchange is located far enough from adjacent interchanges to ensure adequacy of acceleration, deceleration and weaving lengths, and the ability to provide adequate signing.

8 DESIGN EXCEPTIONS

No design exceptions were identified at the level of analysis performed for this report. As-built plans were not available at this stage of review, but based on aerial imagery; the ramp lengths, ramp terminal taper lengths, and curve radii all appear to be constructed per IDOT policy. Any design deficiencies on the two structures above I-57 south of IL-14, the Webster Street overpass and the Canadian National Railroad overpass, would remain until the existing IL-14 Bridge reaches the end of its useful life. Short of reconstruction, all other possible improvements such as signing, striping, and safety enhancements will be considered in the interim design.



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9 TRAFFIC SIGNALS / SIGNING

The existing signage along I-57 (see **Figure 9-1**) will need adjustments to accommodate the new modified split-diamond configuration. Southbound Exit #71 signs will need to be removed and replaced with new exit signs north of Petroff Road and displayed as Exit #73. Specific service signs for this exit will also need to be adjusted northerly to make room for these sign adjustments. The number of service signs along I-57 will not increase beyond what has already been installed along the interstate. All proposed signage north of Petroff Road should be relatively the same for both full and interim build options (see **Figure 9-2 and 9-3**). The existing signs for northbound Exit #71 will need to be shifted south somewhat to accommodate the extra ramp length for the inclusion of C-D roads with the full build option.

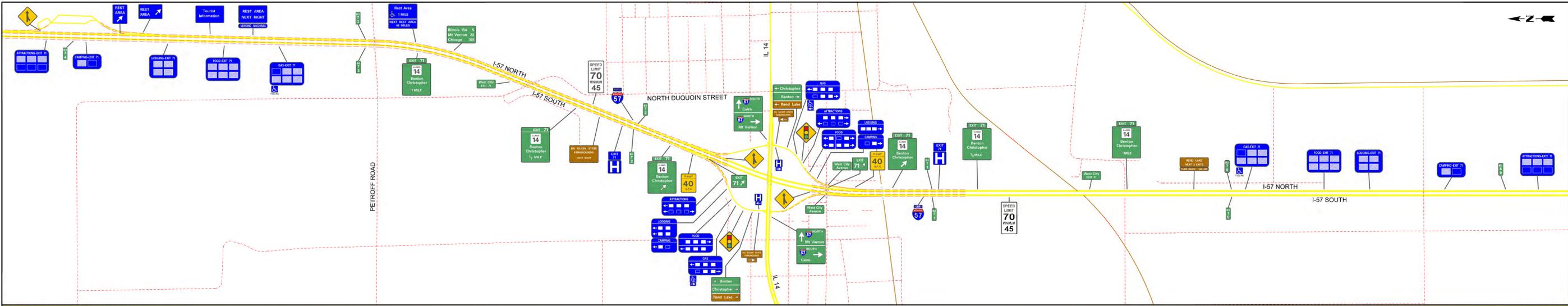
No additional traffic signals are anticipated. The roundabout concepts provided along Petroff Road at the north exit of the proposed split-diamond interchange do not require new signals (see **Figure 9-4**).

Existing speed limit sign locations for I-57 North should be shifted north of Petroff Road and possibly even north of the Rest Area allowing visibility for vehicles merging onto I-57 North from Exit #73. Additional speed limit signs should be installed for the proposed C-D roads both northbound and southbound. A posted speed limit equivalent to the existing ramp speeds at the IL-14 interchange should suffice.

Adequate signage should be installed to prevent vehicles from driving the wrong way on one-way C-D roads. Selective Exclusion Signs, such as “Wrong Way” and “Do Not Enter” signs, should be placed at the mid entry point locations of the C-D roads. These two entry points are the only locations where the alignments do not naturally inhibit a wrong-way entry. The roundabout geometry and directional guide signs anticipated at the two C-D road intersections of Petroff Road should be sufficient to stop wrong-way entries (see **Figures 9-2 thru 9-4**).

Interstate trailblazing signs will also be added on Giacone Drive and North DuQuoin Street at the entry points of the C-D Roads as shown in **Figures 9-3 and 9-4**. Additional truck route signing and interstate trailblazing signs will be added to the local system as required as part of the local transportation improvements described within **Appendix A** or as applicable with the interim interchange improvement.

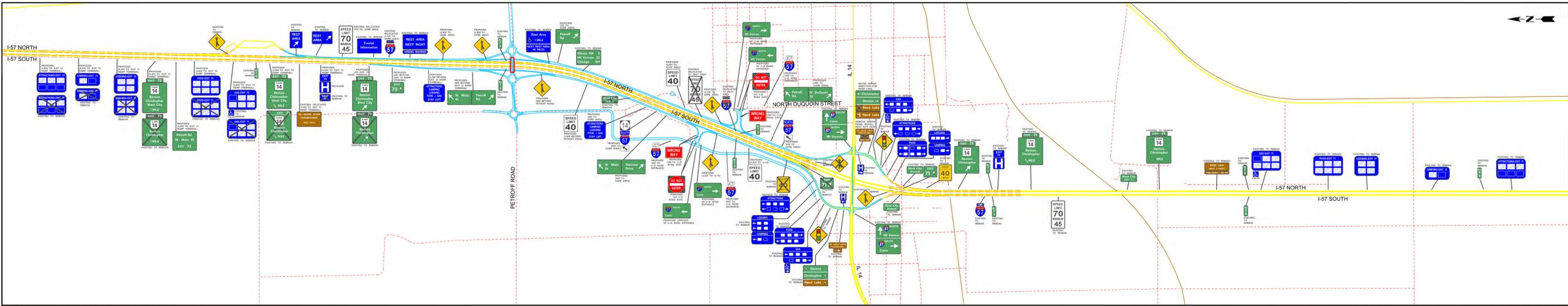
Additional merge signs should be added at all newly constructed on-ramp locations.



I-57 / IL 14 Interchange Modifications
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SCALE: 1" = 600 FEET
0 600 1200

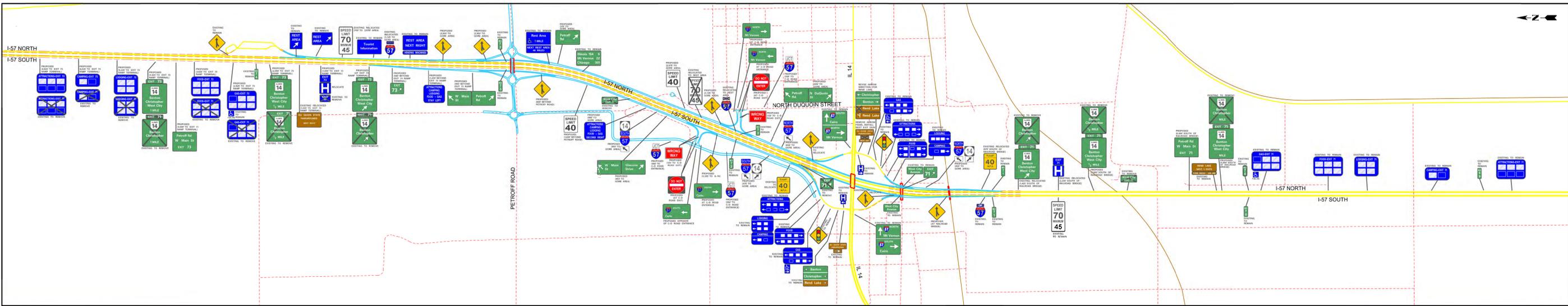
Figure 9-1
I-57 Existing Signage



I-57 / IL 14 Interchange Modifications
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SCALE: 1" = 700 FEET
0 700 1400

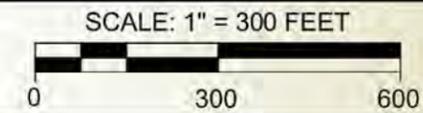
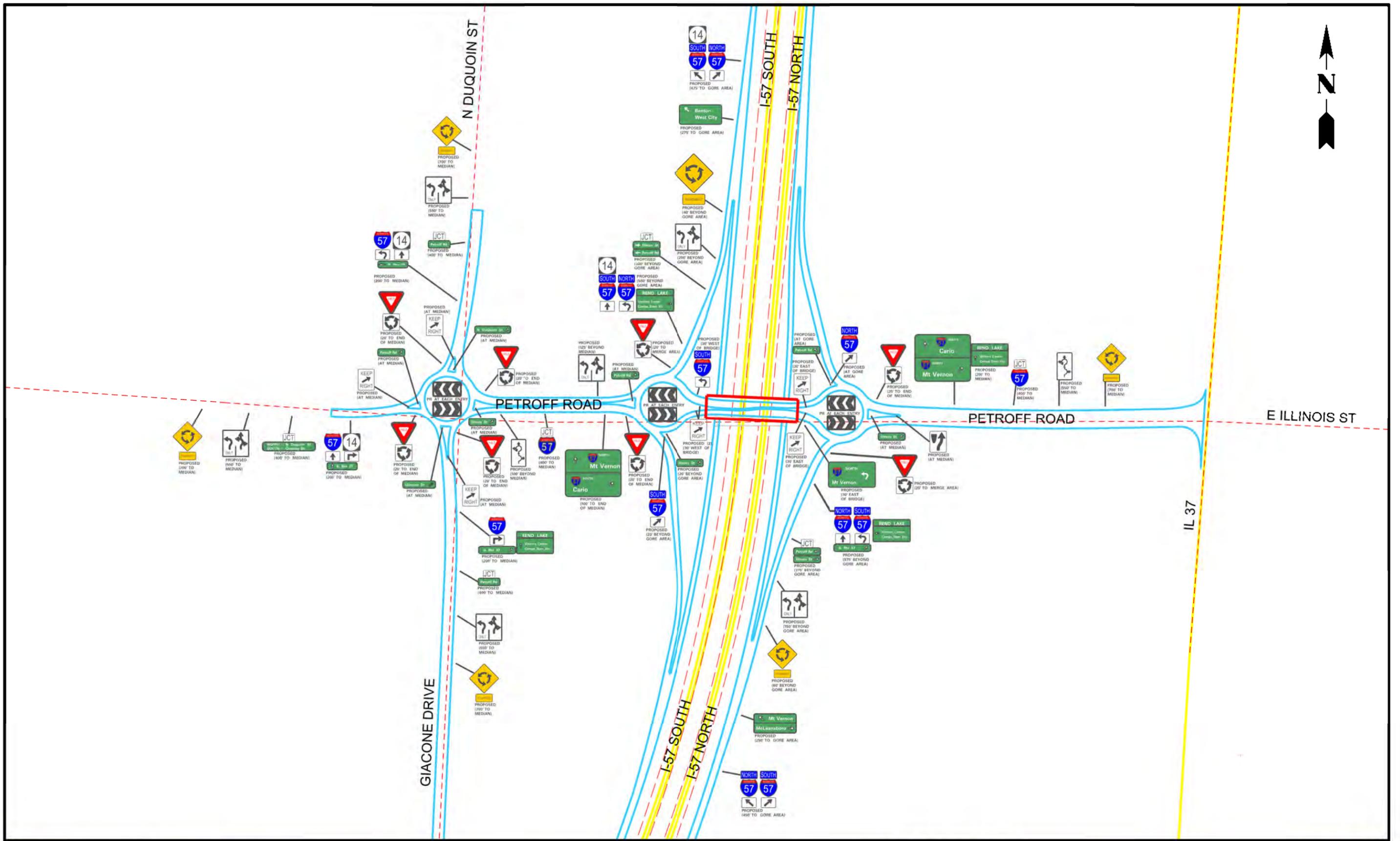
Figure 9-2
I-57 Interim Signage



I-57 / IL 14 Interchange Modifications
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SCALE: 1" = 700 FEET
0 700 1400

Figure 9-3
I-57 Full Build Signage



10 LANE BALANCE

The existing IL-14 interchange and proposed modifications meet AASHTO's requirements for lane balance.

Interchanges that are closely spaced may be influenced by adjacent interchanges to the extent that additional traffic lanes may be needed to satisfy capacity, weaving and lane balance. I-57 is a four lane, fully access controlled, facility that serves regional and interstate traffic. Long range plans call for the addition of a third lane in each direction to be added in the median that will likely extend from and beyond the bounding interchanges at IL-149 and IL-154. The number of approach lanes on the highway will continue to be equal to the number of lanes beyond the exit surrounding the modified split diamond interchange.

The modified split diamond interchange does not increase the number of choices made by drivers on I-57 in either direction; north or south.. Interchange spacing along I-57 from IL-149 to IL-154 ranges from 6 to 7 miles in length. This amount of spacing will limit the amount of lane changing and traffic shifting between interchanges.

11 EXISTING FACILITIES (FHWA POLICY POINT #1)

FHWA policy states: "The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands."

As discussed in **Section 20**, the Benton Town Square is the regional roadway system's primary capacity constraint. The square is a critical roadway junction, controlling traffic movements on all State Routes to the IL-14 interchange from east of I-57. Improving access management/upgrading traffic control along IL-14 and/or modifying the ramp terminal intersections at the interchange would have no impact on this fundamental issue. The square needs to be improved or by-passed to solve the region's fundamental transportation problem.

It is unreasonable to add lanes to or otherwise increase the traffic carrying capacity of the square because of how it has been developed and its historical nature. Further, it is undesirable from a land-use/contextual standpoint to encourage additional industrial traffic through the square. Simply put, there are no viable solutions to improve traffic flow through the square to the extent required. The ultimate solution needs to route industrial traffic away from the square.

As it is unreasonable to "improve" the traffic carrying capacity of the square, Benton's development patterns make it unreasonable to by-pass the square and still use the IL-14 interchange in its existing

configuration. Any by-pass route connecting to the existing interchange would significantly impact local neighborhoods and likely displace a large number of residents and/or local businesses. Modification of interstate access is essential to solving the identified transportation needs.

Modification of the existing interchange to a Split Diamond configuration allows traffic to distribute directly to Petroff Road increasing efficiency and creates an opportunity to “by-pass” not only the square but Benton and West City’s residential neighborhoods as well. Note that this by-pass is accomplished without adding access points to the interstate. The design of the proposed Split Diamond interchange would not result in the interstate becoming a part of the local circulation system. Local trips between Petroff Road and IL-14 would occur on the CD road system as these trips would not be allowed to enter the interstate between Petroff Road and IL-14.

In recent years the City of Benton has reconstructed Illinois Avenue and a portion of North DuQuoin Street, and soon will begin reconstruction of another section of North DuQuoin and a portion of Petroff Road. Further down the road is a possible realignment of IL-14 to tie into the Petroff Road access and development of an alternate truck route for IL-37 to bypass the downtown square (see **Figure A-1 (Proposed Transportation Plan) in Appendix A**). These local road improvements work with and support the proposed interchange modifications. . While the proposed local road improvements will have a positive impact on the local road system as a whole, the location and nature of these improvements will not lead to a significant impact on the operations of IL-14 and the downtown square without the inclusion of the proposed interchange modifications. If only the local road improvements are constructed as discussed above, traffic accessing I-57 will still need to travel through the square as it does today. By themselves, local road improvements are of marginal benefit.

On their own and as previously discussed, the proposed interchange improvements eliminate 25 – 30% of truck traffic from IL 14 and from the Square. Specifically, the interchange improvements will reroute trucks and other traffic traveling to and from IL 14 east of IL 57, as well as heavy truck traffic accessing Benton’s new industrial areas in the vicinity of Petroff Road to the new access at Petroff Road. The result is a reduction of queues on IL 14 and IL 37 by as much as 60-70%.

Once interchange improvements are constructed (and without the local road improvements discussed above) truck traffic on IL 34 and IL 37 east of I-57 would still travel through the Square. A next step could be the construction of improvements such as a realignment of IL-14 to tie into the Petroff Road access or the development of an alternate truck route for IL-37 to bypass the downtown square. These subsequent improvements to the local road system would expand upon the benefits achieved from the proposed interchange modifications.

12 TRANSPORTATION SYSTEM MANAGEMENT (FHWA POLICY POINT #2)

FHWA policy states: "The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management type improvements (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access."

12-1 TSM Considerations

The purpose of this criterion is to assure that all reasonable alternatives to new or revised access to the interstate have been considered in the form of system improvements and design options. As part of this report a number of different possible solutions were considered.

Transportation Systems Management (TSM) options were considered, but would generally not be effective in this case. HOV, ITS, and Ramp Metering are all methods used to improve freeway operations. In this instance, it is an access problem that is being addressed, not an operational one. Therefore, none of these methods would have any impact. Additionally, transit options were considered. A local mass transit system does not exist in the Benton/West City area. There is a call-a-ride service, but this is limited and does not have the capacity to provide significant drop in vehicular demand.

No TSM strategies are planned for this area in the immediate future. However, nothing is included the proposed interchange modifications that would preclude TSM treatments from being implemented in the future.

12-2 Local System Considerations

Local system improvements have also been considered and some are proposed in **Appendix A**. As stated previously, the issue being addressed is one of access to I-57, and not operations of the interchange or freeway. The layout of the local system requires all traffic wishing to access the IL-14 interchange from east of I-57 to travel through the downtown square. Development of bypass routes around the square is the obvious solution to this problem. However, due to existing development of urban density throughout Benton, options are limited. A potential north-south bypass could utilize McLeansboro Street, which is a few blocks east of IL-37, but options are limited for an east west route without major impacts to residential areas. The best east-west option is Petroff Road, but its distance from IL-14 makes accessing the IL-14 interchange in its current configuration impractical. However, reconfiguring the interchange to a Split Diamond configuration opens up the opportunity to use Petroff Road for the needed east-west access.

12-3 Pedestrian Considerations

As discussed previously, this project would enhance the walking and biking environment in Benton and West City. The selected split-diamond interchange with roundabouts at the intersections of Petroff Road will provide for both bicycle and pedestrian accommodations. Moreover, the existing sidewalks in Benton from the Square ending at about Du Quoin Street will be continued westward along IL-14 across I-57 with a terminus at North Central Street. This would make a connection from the many residential neighborhoods east of I-57 with the retail destinations in West City such as Walmart, Rural King and Dollar Tree that are located along North Central Street west of the existing I-57 / IL-14 Interchange. Bicycles and pedestrians would also have access to the local improvement project; Giacone Drive, to travel north and south between IL-14 and Petroff Road.

Pedestrian accommodations will be added during the interim phase of the project to the existing IL-14 Bridge in conjunction with the improvements to the adjacent signalized intersections. The existing structure provides 30' of bridge roadway width on each side of the center median, with two 12' travel lanes in each direction, with a 1 ft buffer between the lane widths and adjoining sidewalk and median, this only provides a width of 4 ft for the raised sidewalk which is not adequate. Options will be explored during the phase I engineering studies to include bicycles and pedestrians access across the IL-14 structure over Interstate 57.

Thus, as a result of this project, both IL-14 and Petroff Road interchanges will be compliant with the Complete Streets law which requires all new and reconstructed roadways to provide accommodations for pedestrians.

13 ACCESS CONNECTIONS AND DESIGN (FHWA POLICY POINT #4)

FHWA policy states: "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 for managed lanes (e.g., transit, HOVs, HOT 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))."

13-1 Full Interchange

The proposed Split Diamond interchange concept provides for full access to public roadways at both IL-14 and Petroff Road and will provide for all traffic movements. Additional access will be provided via the C-D roads to DuQuoin Street and the extension of Giacone Drive to limit adverse travel and improve the operations of the other intersections during peak hours.

13-2 Proposed Design

The proposed design involves converting the existing diamond interchange at IL-14 to a Split-Diamond configuration between IL-14 and Petroff Road. This would be accomplished by moving the northbound on-ramp and southbound off-ramp to Petroff Road with C-D roads connecting the two cross-roads. The C-D roads include additional access points to North DuQuoin Street for northbound and Giacone Drive for southbound (see **Section 1** for additional information as well as **Figures 13-1, 13-2, 13-3, and 13-4**).

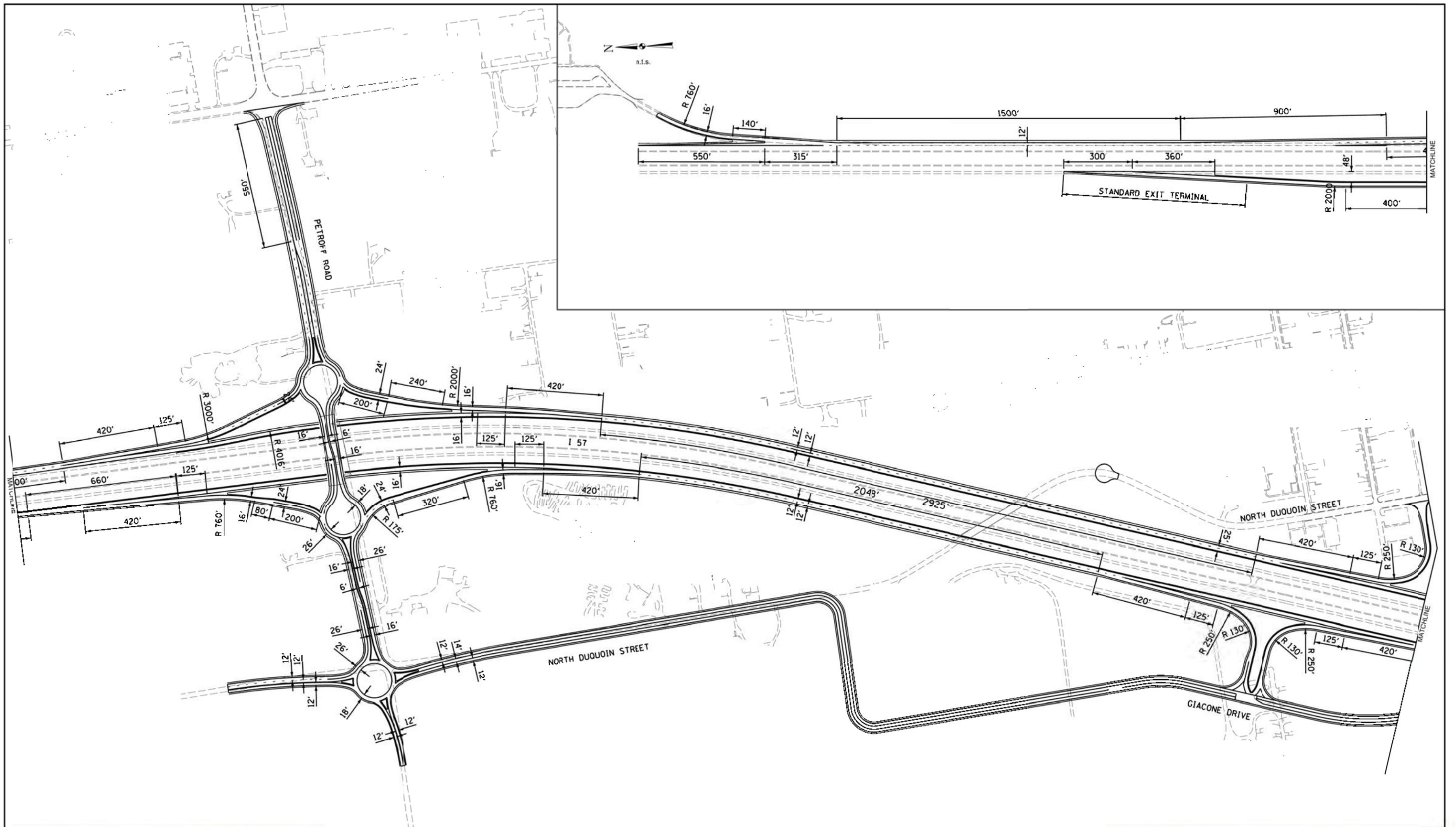
Two through lanes exist on each direction of I-57 to the north and south of the interchange. These lanes will remain as they currently exist. An auxiliary lane will be added between the northbound on-ramp and the exit ramp to the rest area located north of Petroff Road. Long range plans call for the addition of a third lane in each direction to be added in the median that will likely extend from and beyond the bounding interchanges at IL-149 and IL-154. The proposed design is compatible with plans to widen I-57 to 6-lanes through the study area.

On northbound I-57 the off-ramp will depart the main line as a single lane tapered ramp before splitting to two lanes to accommodate one lane to the C-D road and one lane to the IL-14 ramp for the full build. For the interim, widening will occur within the existing IL-14 ramp to accommodate the number of lanes required for north/south through movements through the traffic signals. At the northbound I-57 on-ramp from Petroff Road, in both the interim and full build, the ramp lane will merge with the C-D road prior to the gore point onto I-57. The lane will continue as an auxiliary lane for approximately 0.75 miles until it exits at the rest area.

In both the interim and full build, on southbound I-57, the off-ramp will depart the main line as a single lane tapered ramp before splitting to two lanes to accommodate one lane to the C-D road and one lane

to the Petroff Road ramp. In the full build, at the I-57 on-ramp from IL-14, the ramp lane will merge with the C-D road prior to the gore point onto I-57. The lane will continue as an acceleration lane for the required distance before merging with the freeway. For the interim, the ramp lanes from IL-14 will basically remain the same and merge to one lane prior to the existing gore point onto I-57.

Interchange components proposed along Petroff Road in the northern portion of the split interchange are non-conventional for a rural area. Where the roundabout designs themselves are standard, rural interchanges typically encompass a larger footprint. A smaller than normal footprint is proposed at this location due to the close proximity of the North DuQuoin Street / Petroff Road Intersection to the I-57 Interchange. By policy, 950 feet is the closest (radius to radius) that a signalized intersection would be allowed to an interchange. If the interchange footprint were larger, the intersection of North DuQuoin Street and Petroff Road would likely require relocation farther west because of this policy. This would require additional expense with realignment of the north and south approaches along North DuQuoin Street.



I-57 / IL 14 Interchange Modifications

Access Justification Report

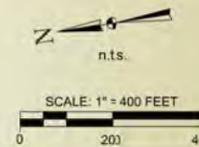


Figure 13-1
Full Build Design Concept (1 of 2)



I-57 / IL 14 Interchange Modifications

Access Justification Report

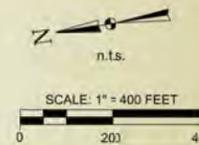


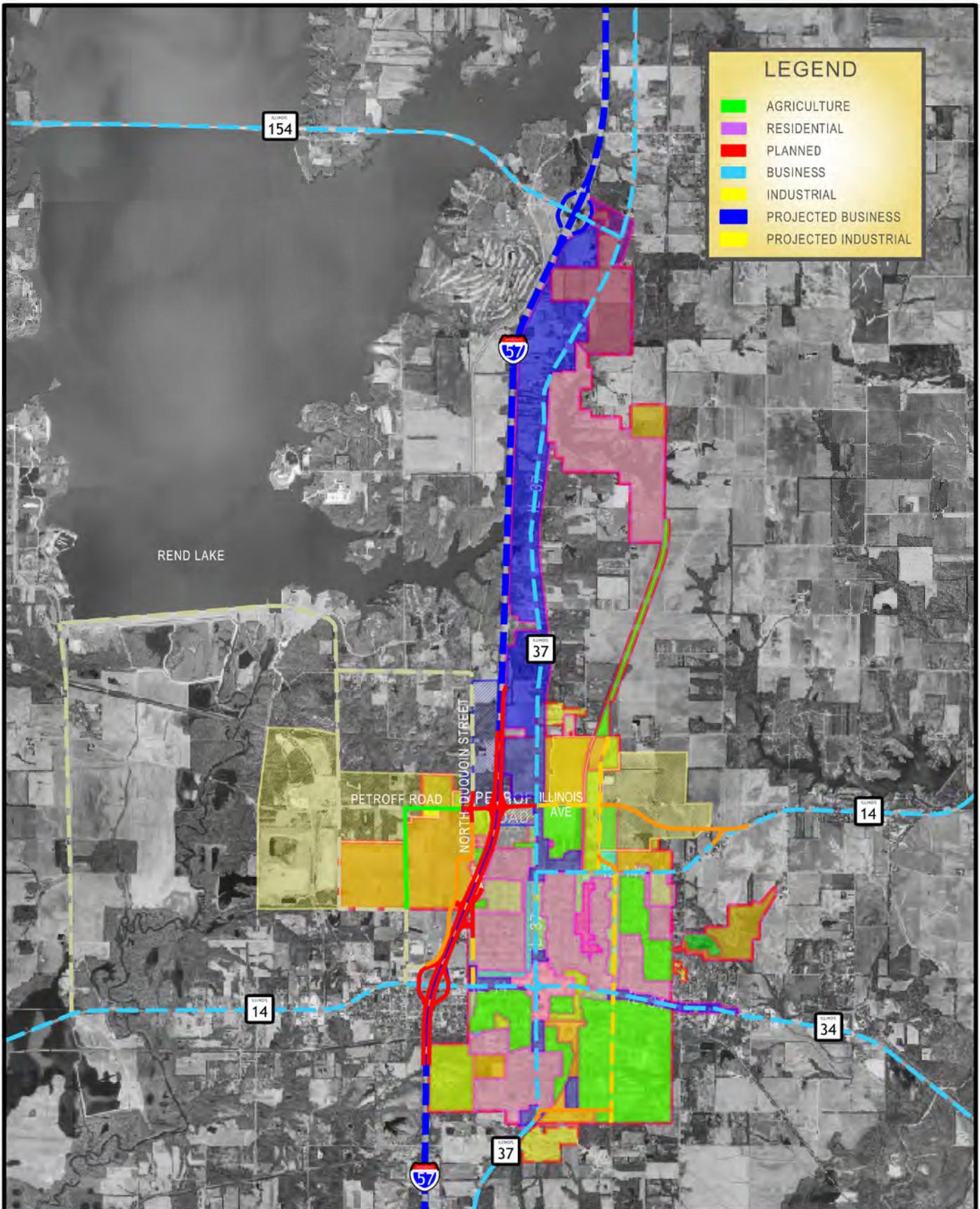
Figure 13-4
Interim Design Concept (2 of 2)

14 TRANSPORTATION LAND USE PLANS (FHWA POLICY POINT #5)

FHWA policy states: "The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all request for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Plan (STIP or TIP) and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and transportation conformity requirements of 40 CFR parts 51 and 93."

The proposed interchange modifications are consistent with the local and regional land use and transportation plans and makes use of existing interstate and roadway corridors. At the existing interchange, south between IL-14 and the railroad, the land use is mostly urban residential. Along IL-14 and north of the existing interchange within the immediate vicinity, the land use is mostly business retail. North, where the proposed interchange modifications connect to Petroff Road, the land use is primarily agricultural with rural residential sparsely spaced nearby. The City of Benton Zoning Map is provided in **Figure 14-1**.

The proposed location is not within a Transportation Management Area or a non-attainment area for air quality. *The project is not currently included in the Statewide Transportation Improvement Plan, but it is anticipated that it will be added if/when access approval is granted by FHWA.*



LEGEND	
■	AGRICULTURE
■	RESIDENTIAL
■	PLANNED
■	BUSINESS
■	INDUSTRIAL
■	PROJECTED BUSINESS
■	PROJECTED INDUSTRIAL

I-57 / IL 14 Interchange Modifications

Access Justification Report

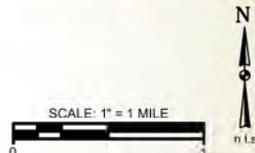


Figure 14-1
City of Benton Zoning Map
and City Limits

15 COMPREHENSIVE INTERSTATE NETWORK STUDY (FHWA POLICY POINT #6)

FHWA policy states: "In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d), 23 CFR 625.2(a), 655.603(d), and 771.111)."

A comprehensive network study is not required since no new access is proposed and no adjacent interchanges are being constructed or are planned to be improved.

No other projects are anticipated along I-57 near this location. The nearest interchanges to the existing Benton interchange are 5.9 miles to the north at IL-154 and 7 miles to the south at IL-149 in West Frankfort. To the north, an interchange approximately a mile north of the proposed Petroff Road location may be more appealing for access to Rend Lake; however, no cross roads exist in this area and the northbound rest area would likely be in conflict with the proposed location. To the south no major attractions, recreational area, or significant residential areas exist between the existing exits. It is anticipated that these circumstances will remain, and it is not at all likely that access would be required at any nearby location along I-57. As mentioned previously, the project will enhance the benefits of other local improvements which are planned as described within Appendix A.

16 COORDINATION WITH TRANSPORTATION SYSTEM IMPROVEMENTS (FHWA POLICY POINT #7)

FHWA policy states: "When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d))."

The development of the proposed Split Diamond interchange configuration was based on the needs of both existing land uses as well as anticipated future development. *The proposed modifications would connect to existing public roadways and is not contingent on any particular future land development.*

Currently, the areas along the state highways (Routes 14, 34, and 37) are generally designated business areas and the industrial areas are located along the railroad in the southern part of Benton and in the industrial parks adjacent to Petroff Road. West City is primarily residential except for the retail area surrounding the existing I-57 interchange. New industrial development will likely occur in the industrial parks along the Petroff Road corridor. Moreover, the reconfigured interchange could draw additional business development near Petroff Road and along the I-57 corridor (North DuQuoin Street and Giacone Drive). The location of the northern half of the split interchange at Petroff Road is

compatible with current and planned development. Improvements to the local road system may be required as development takes place; however, the interchange is designed to accommodate the traffic growth expected in the next 20 years. The Petroff Road interchange ramps have been designed to allow for restriping of added lanes as growth occurs, so as to not overdesign for existing conditions.

17 STATUS OF PLANNING AND NEPA (FHWA POLICY POINT #8)

FHWA policy states: "The request for new or revised access contains information relative to the planning requirements and the status of the environmental processing of the proposal."

Resources, such as aerial photographs, United States Geological Survey (USGS) topographic maps, National Wetlands Inventory (NWI) maps, the Franklin County Directory of Coal Mines, Flood Insurance Rate maps and the Illinois Archaeological Survey database have been reviewed in an effort to identify environmental resources that may be located within the project area. Preliminary reviews have identified the following:

17-1 Social/Economic/Environmental Justice

Based on our preliminary review of the project area, no low income or minority populations exist within the project area.

17-2 Farmland Impacts (Type and Area)

It is likely that prime farmland exists in the project area. The amount of prime farmland located within the project area will be identified in the preliminary design and environmental study phase of the project. However, it is unlikely that the type of farmland within the project area would alter the location of the proposed interchange due to the existing locations of I-57 and Petroff Road. Any prime farmland impacted should be minimal since the proposed work is located along an existing highway corridor.

17-3 Wetland and Waterbody Impacts

Wetlands and waterbodies are likely to exist within the general project area, based on the USGS topographic maps and NWI maps that were reviewed.

- Forested wetlands are associated with Sugar Creek to the west of I-57. It has not been determined if wetlands exist within the area of the proposed interchange. If wetlands are located within or near the proposed project area, wetland delineation would be required. If wetland impacts are proposed, an impact assessment will be conducted, and coordination with IDOT and resource agencies including the U.S. Army Corps of Engineers will be required. Mitigation may be necessary.

- Sugar Creek and other tributaries are located within the project area and drain under I-57. If the creek and any tributaries that may be considered waters of the United States are to be impacted, the limits of the waterbodies must be delineated and impacts must be assessed. Coordination with IDOT and resource agencies would be required, and Section 401 and 404 permits may need to be obtained. Mitigation may be necessary if impacts to waters of the United States are proposed. These efforts would be required during the final design phase of the project, prior to construction.

17-4 Geological Issues/Subsurface Mining Activity

Based on the Franklin County Directory of Coal Mines, *Rend Lake Dam Quadrangle*, dated February 2002 and revised April 2008, the site was partially undermined by the Old Ben Number 24 Mine. The mine was operated by the Old Ben Coal Corporation from 1965 to 1996. The Herrin Coal seam was the seam mined with long wall, room and pillar extraction, and high extraction retreat near the completion. The Herrin Coal seam is approximately 625 to 666 feet below the surface and is about 6.6 to 8.5 feet thick. Based on the above information, the risk of subsidence exists and further review is recommended during following design stages of the project. However, it is unlikely that the risk of subsidence within the project area would alter the location of the proposed interchange due to the existing locations of I-57 and Petroff Road.

17-5 Flood Plain Impacts

Flood Insurance Rate Maps were reviewed to determine whether any flood plains are located within the study area. No floodplains or floodways were identified.

17-6 Noise Impacts

Sensitive receptors, such as schools, hospital, churches or residential properties are located in and/or near the project area.

- Franklin Hospital is located southeast of I-57. According to USGS topographic maps and aerial photographs, residential properties are located within the general project area. Determination of whether or not a noise study would be completed during the NEPA process and, if required, a noise study would be completed according to IDOT and FHWA requirements. A cost-benefit analysis would be prepared to determine if noise barriers would be required, based on the outcome of the noise analysis.

17-7 Cultural Resources/Section 4(f)/6(f)

Available resource maps were reviewed to identify cemeteries, publicly-owned parks, recreation areas, wildlife and waterfowl refuges, or land from known historic or archaeological sites that exist within the study area.

- Two small archaeological sites were identified in and/or near the project area. It is possible, but not likely, that more sites have been identified in the area since 2005, the date of the resource maps consulted. If the proposed project appears to impact any archaeological sites, cultural resource surveys will be required. Mitigation would be required if the project were to impact any cultural resource sites. No other types of Section 4(f)/6(f) lands were identified in our preliminary review.

17-8 Threatened and Endangered Species

The Illinois Department of Natural Resources' (IDNR) website currently lists eight threatened and endangered species which may exist in Franklin County. It is unknown if these species exist within the project area. Coordination with the U.S. Fish and Wildlife Service and IDNR will occur to determine whether any threatened or endangered species or their critical habitats are known to be present within the proposed study area.

17-9 Special Waste

Various federal and state lists will be reviewed to determine whether the potential exists to encounter impacts from known Comprehensive Environmental Response and Compensation Liability Information System (CERCLIS) sites, Resource Conservation and Recovery Act (RCRA) corrective action sites, solid waste, special waste or hazardous waste (current or former) landfills, underground storage tanks sites, and leaking underground storage sites. Additionally, historic topographic maps and aerial photographs of the study area must be reviewed. The findings from this Special Waste Assessment may indicate the need for additional environmental activities (e.g., Preliminary Environmental Site Assessment). The majority of project area appears to be undeveloped, which may pose a lower risk of containing special waste sites. However, prior and adjacent land use has not been determined.

Based on our preliminary environmental review of the project area, it appears there are no significant environmental issues that would prevent the approval of a modified access point along the interstate in the general vicinity. However, more detailed environmental surveys are necessary, per NEPA, and mitigation for impacts to environmental resources may be required. The FHWA's approval of a modified access to interstate highways constitutes a federal action, and as such, requires that the NEPA procedures are followed. The NEPA procedures will be accomplished as part of the normal project development process and as a condition of the access approval. This means the final FHWA approval of access cannot precede the completion of the NEPA process. The NEPA procedure allows proposed

access point requests to be submitted for a determination of engineering and operational acceptability prior to the start of the NEPA process.

18 OPERATIONAL ANALYSIS (FHWA POLICY POINT #3)

FHWA policy states: "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, ramp intersections with crossroad) or on the local street network based both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on each side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and other roads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall 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 must 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 crossroad, and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must 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))."

18-1 Summary of Crash History

Crash data for the years 2008 to 2012 was acquired from the IDOT Division of Traffic Safety for I-57 between 0.5 miles south of IL-14 to the Rest Area on-ramp north of Petroff Road. Crash data was also obtained for the IL-14 on and off ramps as well as the ramp terminal intersections with IL-14.

Table 18-1 summarizes the number of crashes along each corridor as it relates to severity. As can be seen, the property damage only (PDO) crashes are most common overall at 75.2%. Two fatalities were found within the study area and further investigated.

The first fatality occurred on northbound I-57, at approximately 72.01 mile marker, in March of 2010 at 3:20 a.m. and involved a pedestrian. Witnesses report that a pedestrian was walking and drifted into the lanes of I-57 traffic when the pedestrian was struck. It was never verified if alcohol was involved. It was concluded that the highway design and roadway features were not a direct cause of this fatal crash.

The second fatality occurred on southbound I-57, at approximately 73.22 mile marker, in September of 2010 at 7:31 a.m. and involved a motorcycle hitting a deer. The motorcycle driver was then struck by

another southbound vehicle (truck). It was concluded that the highway design and roadway features were not a direct cause of this fatal crash.

Table 18-1: Crashes by Roadway Type Based on Severity

Roadway Type	Distance (mile)	Fatal		A-Injury		B-Injury		C-Injury		Total Fatal/Injury		PDO	
		# Crashes	% of Crashes	# Crashes	% of Crashes	# Crashes	% of Crashes						
I 57	3.37	2	1.4%	9	6.5%	12	8.6%	7	5.0%	30	21.5%	109	78.5%
IL 14 Ramps	1.32	0	0%	1	20%	2	40%	0	0%	3	60%	2	40%
IL 14 Ramp Terminals	0.30	0	0%	3	8.6%	7	20.0%	2	5.7%	12	34.3%	23	65.7%
Rest Area On/Off Ramps	0.53	0	0%	0	0%	0	0%	0	0%	0	0%	3	100%
Total	5.52	2	1.0%	13	7.3%	21	11.5%	9	5.0%	45	24.8%	137	75.2%

Tables 18-2 and 18-3 summarize the number and percentages of crashes along each corridor of the study area as it relates to the type of crash.

Table 18-2: Number of Crashes in Study Area by Roadway Type Based on Crash Type

Roadway Type	Angle	Animal	Fixed object	Other non-collision	Other object	Over turned	Parked motor vehicle	Pedestrian	Rear End	Side swipe same direction	Turning	Total
I 57	0	60	19	3	4	9	0	1	21	22	0	139
IL 14 Ramps	0	0	3	0	0	1	0	0	1	0	0	5
IL 14 Ramp Terminals	3	0	0	0	0	0	2	0	12	4	14	35
Rest Area On/Off Ramps	0	0	1	0	0	0	2	0	0	0	0	3
Total	3	60	23	3	4	10	4	1	34	26	14	182

Table 18-3: Percentage of Crashes in Study Area by Roadway Type Based on Crash Type

Roadway Type	Angle	Animal	Fixed object	Other non-collision	Other object	Over turned	Parked motor vehicle	Pedestrian	Rear End	Side swipe same direction	Turning	Total
I 57	0%	43.2%	13.7%	2.2%	2.9%	6.4%	0.0%	0.7%	15.1%	15.8%	0.0%	76.4%
IL 14 Ramps	0%	0%	60%	0%	0%	20%	0%	0%	20%	0%	0%	2.7%
IL 14 Ramp Terminals	8.6%	0%	0%	0%	0%	0.0%	5.7%	0%	34.3%	11.4%	40.0%	19.2%
Rest Area On/Off Ramps	0%	0%	33%	0%	0%	0%	67%	0%	0%	0%	0%	1.7%
Total	1.6%	33.0%	12.6%	1.6%	2.2%	5.5%	2.2%	0.6%	18.7%	14.3%	7.7%	100%

Tables 18-4, 18-5, and 18-6 summarize the percentages of crashes based on lighting condition, road surface condition, and weather. As can be seen, the freeway has the largest percentage of crashes in the study area with a large percentage attributable to animals (deer), including one fatality. Since there are few countermeasures to prevent these types of crashes, the animal crashes are excluded from these tables.

Appendix C shows graphical depictions of crash locations (straight line drawings) with the mile marker listed and types identified.

Table 18-4: Percentages of crashes based on lighting condition (No Animals)

Corridor	Darkness	Darkness/Lighted road	Dawn	Daylight	Dusk	Unknown
I 57	22%	1%	6%	71%	0%	0%
Ramps at IL 14	0%	20%	0%	80%	0%	0%
IL 14 Ramp Terminals	3%	11%	0%	80%	6%	0%
Rest Area On/Off Ramps	0%	33%	33%	34%	0%	0%

Table 18-5: Percentage of crashes based on surface condition (No Animals)

Corridor	Dry	Ice	Snow or slush	Unknown	Wet
I 57	79%	3%	11%	1%	6%
Ramps at IL 14	100%	0%	0%	0%	0%
IL 14 Ramp Terminals	77%	3%	0%	6%	14%
Rest Area On/Off Ramps	67%	0%	33%	0%	0%

Table 18-6: Percentage of crashes based on weather (No Animals)

Corridor	Clear	Rain	Sleet/hail	Snow	Unknown
I 57	82%	4%	3%	11%	0%
Ramps at IL 14	100%	0%	0%	0%	0%
IL 14 Ramp Terminals	85%	11%	0%	2%	2%
Rest Area On/Off Ramps	67%	0%	0%	33%	0%

Overall, the crashes without animals were generally distributed throughout the day with most occurring during the daylight and a high percentage occurring on a dry road surface and in favorable weather.

a. I-57 Corridor

The I-57 corridor included in this analysis is approximately 3.3 miles long from 0.5 miles south of IL-14 interchange to the Rest Area on ramp, north of Petroff Road. A total of 139 crashes occurred on this segment of I-57 during the five-year analysis period. The I-57 corridor had 109 property damage only (PDO) crashes, 29 injury crashes that resulted in 9 A-Injury crashes and 12 B-Injury crashes and 7 C-Injuries, and 2 fatal crashes. Animal (43%), side swipes same direction (15%), rear ends (15%), fixed objects (14%) and overturned (6%) were the major crash types. **Table 18-7** summarizes the number and percentages of crashes along the I-57 corridor as it relates to the type of crash. **Appendix C** shows the graphical locations of the crashes with the mile marker, year and type of crash identified.

Table 18-7: Freeway Crashes and Percentages by Type of Crash

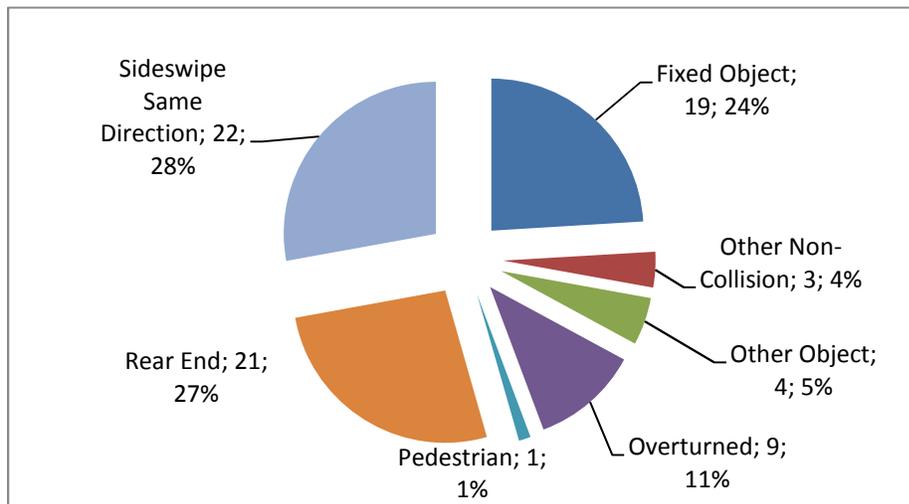
Animal	Fixed object	Other non collision	Other object	Over turned	Pedestrian	Rear End	Side swipe same direction	Total
60 (43.2%)	19 (13.7%)	3 (2.2%)	4 (2.9%)	9 (6.5%)	1 (0.7%)	21 (15.1%)	22 (15.8%)	139

Animal crashes were the most common type of freeway crash with 43% of the total freeway crashes. Animal crashes occurred more often than not away from the interchange area. All but two animal crashes resulted in PDO crashes. One crash was the motorcycle and deer fatality mentioned previously and another was a C-type injury at approximately 0.3 miles south of the Webster Street Bridge. Based on the rural character of this area, the animal crashes will be difficult to decrease or modify, especially due to any changes at the freeway. It is interesting to note that approximately 70% of the crashes involving animals occurred in darkness.

If the animal crashes are removed, a total of 79 crashes occurred on the study segment of I-57 during the five-year analysis period resulting in 15.8 crashes per year. The I-57 corridor had 51 property damage only (PDO) crashes (65%), 27 (34%) injury crashes that resulted in 9 A-Injury crashes and 12 B-Injury crashes and 6 C-Injuries, and 1 fatal crash (1%).

When the animal crashes are excluded, the major crash types changes to sideswipes same direction (22 crashes or 28%), rear ends (21 crashes or 27%), fixed objects (19 crashes or 24%), and overturned (9 crashes or 11%), see **Figure 18-1**.

Figure 18-1: Freeway Crash Types (Excluding Animals)



If the animal crashes are excluded the injury/fatal breakdown with respect to crash type is as follows:

- 8 fixed object (31% with 3 A-Injury; 4 B-Injury; and 1 C-Injury);
- 6 rear end (23% with 3 B-Injury and 3 C-Injury);
- 5 overturned (19% with 2 A-Injury; 2 B-Injury; and 1 C-Injury);
- 5 sideswipe same direction (19% with 2 A-Injury; 2 B-Injury; and 1 C-Injury);
- 1 other object (4% with 1 B-Injury) and;
- 1 pedestrian (4% with 1 fatal).

It is important to note that 12 of the 79 non-animal crashes (15%) were identified to occur in a Construction Zone from 2009 to 2012 (8 Rear ends, 3 sideswipes and 1 fixed object), four of which resulted in injuries (1 A-Injury, 1 B-Injury and 2 C-Injuries). An additional 4 crashes (5%) were noted to have “other warning signs” as the traffic control with two reporting injuries (1A and 1C).

- **22 sideswipe same direction crashes** (28% of total excluding animals), translates to less than five crashes per year.
 - Sideswipes were more concentrated at the entrance and exit ramps, see freeway crashes diagrams in **Appendix C**.
 - 3 of the 22 sideswipes (13% of sideswipe same direction crashes) were identified to occur in construction zones
 - One additional sideswipe had “other warning signs” as the traffic control.
 - 5 injury crashes occurred on 4 clear days and one with snow

- 2 A-Injury, 2 B-Injury and 1 C-Injury
 - 1 Injury crash occurred in construction zones (1-A Injury) where a passenger vehicle was passing and struck a guardrail;
 - The other A-injury was a sideswipe with a northbound semi-truck, which left the road to the right;
 - The B-Injury sideswipes traveled off the roadway one to the left (northbound) and one to the right (southbound);
 - The 1C-Injury was a sideswipe that remained in the roadway and occurred in the snow.
- 17 of the 22 sideswipes (77%) were PDO crashes.
- **21 rear end crashes** (29% of total excluding animals), translates to less than five crashes per year.
 - Rear ends were more concentrated at the entrance and exit ramps, see freeway crashes diagrams in **Appendix C**.
 - 8 of the 21 rear ends (38% of rear ends) were identified to occur in construction zones
 - An additional two rear ends having “other warning signs” as the traffic control.
 - 6 injury crashes occurred on clear days with dry pavement
 - 3 B-Injury and 3 C-Injury
 - 3 Injury crashes occurred in construction zones (1-B Injury and 2 C-Injury).
 - The 3 other injury crashes occurred in slow or stopped traffic.
 - 15 of the 21 rear ends (71%) were PDO crashes.
- **19 fixed object crashes** (24% of total excluding animals) translate to less than 4 crashes per year.
 - Generally not concentrated at any location.
 - 9 of the 19 fixed object crashes resulted in injuries (4 A-Injury, 4 B-Injury and 1 C-Injury)
 - 3 injury crashes were in wet weather (2A-Injury and 1 B-Injury)
 - One of the 19 fixed object crashes (PDO) was identified to occur in construction zones
 - 2 A-Injury crashes occurred northbound with vehicles off the road to the left with 1 ending up in the crash cushion for a bridge and 1 in the ditch.
 - 1 B-Injury crash occurred northbound with the vehicle off the road to the right and hitting a tree.
 - 3 injury crashes identified driver illness as a condition (1A 1B and 1C) with 2 occurring on a wet road and 1 with “other warning signs” as the traffic control. 2 northbound vehicles ran off the road to the right into a guardrail and other while the southbound motorist was off the road to the right into a ditch.
 - 2 B-Injuries identified northbound drivers fell asleep or faint and crash into crash cushion and ditch.
 - 1 A-Injury was a fatigued semi-truck driver traveling northbound veered off the road to the right and ended up in a ditch and overturning;
 - 10 of the 19 fixed object crashes (53%) were PDO crashes.

- **9 overturned crashes** (11% of total excluding animals) which translates to less than 2 crashes per year.
 - 6 injury crashes occurred on clear days with dry pavement
 - 3 A-Injury, 2 B-Injury and 1 C-Injury
 - 4 of the injury (2A, 1B and 1C) crashes occurred in the southbound direction
 - 3 of the 4 ran off the road to the left (1A, 1B, and 1C)
 - 1 A-Injury driver was alcohol impaired
 - 2 injury (1A, and 1B) crashes occurred in the northbound direction
 - 1 A-Injury involved a motorcycle that ran off the road on the right avoiding a blown tire and was ejected.
 - 1 B-Injury involved a pickup truck that was avoiding another vehicle or object.
 - 3 of the 9 overturned (33%) were PDO crashes.
 - 6 of the 9 overturned crashes occurred on Sunday
- **1 other object** (B-Injury) crash was a vehicle avoiding an object in the roadway.

The proposed Interim build condition will provide a southbound deceleration lane on I-57 at the Petroff Road exit as well as an auxiliary lane on northbound I-57 from the Petroff Road on-ramp to the Rest Area off-ramp. This will provide significantly more time and space for vehicles to accelerate/decelerate and merge between the freeway and the ramps, which is expected to reduce conflicts and increase safety within these merge areas between the freeway system and the ramps. These improvements are expected to reduce the rear end and sideswipe crash potential, which were the major crash types along the freeway.

b. Five Percent Freeway Sections

It is our understanding that there is one section of I-57 that is within the study area and two other sections in relatively close proximity to the study area that are reported on the Illinois FIVE PERCENT segment list from 2007-2011.

- The section within the study area is a 0.38 mile section of I-57 from the IL Route 14 overpass (MM 71.57) to near the southbound off ramps and northbound on ramps (71.19).
- Another 1.67 mile section is located at the next interchange to the north along I-57 at Highway 154 between mile marker 76.75 to 78.42.
- The last section is two sections (back-to-back) and 3.61 miles in length starting approximately 0.96 miles south of the IL 14 overpass. That section starts at mile marker 67.00 and ends at mile marker 70.61.

The Five Percent list is a system screening tool that enables IDOT the ability to investigate the areas where higher than average serious injury crashes are occurring and try to determine corrective

solutions. It is our understanding that no corrective solutions have been identified for these Five Percent sections.

During the 2007-2011 time period analyzed, the Five Percent section within the study area from the IL 14 bridge to the south had a total of 23 crashes with zero fatal crashes and seven injury crashes (three A-injury, two B-injury and two C-injury), resulting in a 30.4 percent fatal/injury rate. The 23 total crashes over the 5 years relates to 4.6 crashes per year on this section, 4.0 crashes per year if animal crashes are excluded.

- **Nine were fixed object** with 3 crashes on dry pavement and 6 during wet or snow conditions. The wet/snow crashes were all PDO and the three injury crashes (4 A-Injury and 1 B-injury) were on dry pavement.
 - One A-injury was a fatigued tractor trailer driver headed northbound on I-57 that veered off the road to the right and overturned in the ditch.
 - One A-injury was a passenger car changing lanes in the northbound lanes of I-57 near the IL 14 off-ramp and ran off the road to the left into the crash cushion.
 - The B-Injury crash was a passenger vehicle that fell asleep traveling southbound on I-57 and ran off the road to the right and struck the guardrail end.
 - All 6 PDO crashes were during wet/snow conditions.
 - Four PDO crashes were southbound with 3 off the road to the right into ditch, guardrail, or culvert and 1 off the road to the left into the concrete median.
 - Two PDO crashes were northbound with 1 off the road to the right into ditch, and one off the road to the left into a culvert.
- **Five were sideswipe same-direction** crashes with 2 crashes on dry pavement and 3 during wet or snow.
 - Four of the five crashes were PDO, occurred southbound near the merge area from the IL-14 on ramp and involved a semi tractor-trailer vehicle. Two PDOs were during snow/sleet conditions.
 - One C-injury was reported for northbound during a snow event near the exit ramp.
- **Three were animal** crashes resulting on all PDO crashes,
- **Two were rear end** crashes both southbound I-57 near the IL 14 entrance ramp on clear days and on dry pavement.
 - One C-Injury was a semi-truck that rear ended a passenger car
 - One was a PDO that was a truck that rear ended a semi-truck.
- **Two were overturned** crashes with both occurring on northbound and on dry surface conditions.
 - One was an A-Injury involving a motorcycle that ran into a truck tire that blew out ahead and was ejected.
 - One was a B-Injury that was headed north and ran off the road to the left in the dark and overturned.
- **One other object** crash that resulted in a PDO
- **One other non-collision** crash that resulted in a PDO

The proposed in full build condition will provide a deceleration lane on northbound I-57 and an acceleration lane on southbound I-57 at the ramp merge points which will provide additional time and space for vehicles to accelerate/decelerate near the on/off ramps and is expected to minimize conflicts and increase safety at these high conflict merge areas onto the freeway system within the 5% section. However, there are no geometric improvements planned in the interim phase to address these crashes.

As previously mentioned, the interim build condition (as well as the full build condition) is also expected to have a similar safety benefits at the Petroff Road ramps by providing acceleration/deceleration lanes and minimizing conflicts in that area. Providing these acceleration/deceleration lanes is expected to reduce the rear end and sideswipe crash potential, which were the major crash types along the freeway.

c. IL-14 Ramps

The 5 IL-14 ramp related crashes were sporadic, 3 involved injury (1A-Injury and 2 B-Injury). The A-Injury was an overturned vehicle that exited on the northbound off ramp of IL-14 and ran off the left side of the road while negotiating the curve, with a drug impaired driver. The remaining were southbound vehicles. The 2 B-Injury crashes were fixed object crashes off the right side of the road, one of which involved a motorcycle and the other was an ill driver. The PDO rear end was a result of a vehicle stopping to avoid debris on the roadway and was rear ended. The PDO fixed object was along the southbound on ramp (fixed object) near the merge with I-57. The types indicate that excessive speed is likely a contributing factor to most of these crashes.

The proposed changes will shift the existing northbound on ramp and southbound off ramp to north of Petroff Road and consist of less severe curves into the roundabout. New collector distributor roads will be constructed between the IL 14 ramps and the Petroff Road Ramps and are generally straight.

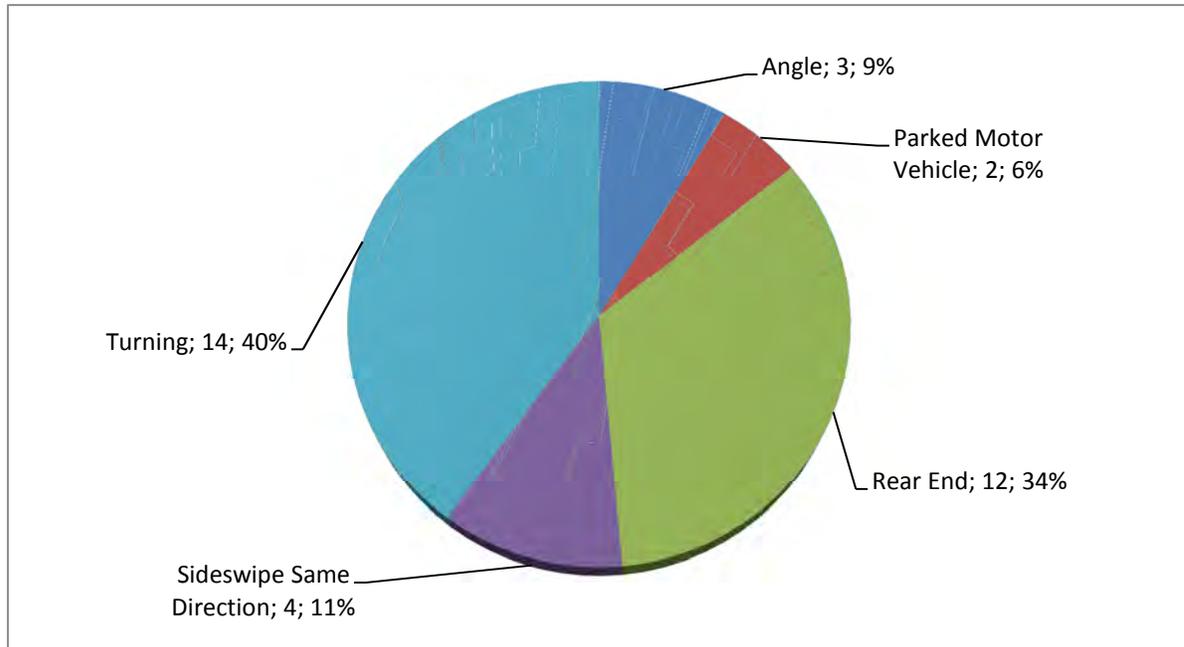
d. Rest Area Ramps

The rest area on-ramp had three PDO crashes over the five year study period, two parked vehicle and one fixed object and zero crashes for the Rest Area off-ramp. The fixed object crash was during a snow event. The rest area on-ramp to I-57 does not have significant crashes during the five year study period and will not be modified as part of this project.

e. IL Route 14 Ramp Terminals

The ramp terminal crashes are approximately 19 percent of the total study area crashes and consist of 35 total crashes over the five years. At the ramp terminals, rear end (12 total) and turning (14 total) crashes are the most common, which is typical for signalized intersections. **Figure 18-2** summarizes the crash types at the ramp terminals.

Figure 18-2: Ramp Terminal Crash Types



The terminal crashes resulted in 12 injury crashes (approximately 34% of all terminal crashes). The injury crashes consist of 4 turning (3B and 1C), 3 rear end injury (1A, 1B, 1C), 2 angle (1A and 1B), 2 parked motor vehicle (2B), and 1 sideswipe (1A). The angle, turning and rear ends are typical of intersection crashes, especially at high volume locations.

The proposed project will contain collector distributor roads which are expected to significantly reduce the overall volume traveling through and turning (reducing conflicting turns) at the ramp terminals. As a result, the number of crashes at the terminals will be reduced. Furthermore, the CD roads are one way and generally straight, which would further minimize conflicts and severity compared to the terminal locations that are high conflict. New crashes will occur on the C-D roads, but on roads with lower speeds and speed differentials.

18-2 Enhanced Interchange Safety Analysis Tool (ISATe) Analysis

The Enhanced Interchange Safety Analysis Tool (ISATe), developed by FHWA, provides the ability to assess safety effects of geometric design at existing interchanges and to predict the safety performance of design alternatives for new interchanges. ISATe was used to evaluate the 20-year No-Build and the Build assuming the Interim split diamond interchange configuration and the Full Build split diamond interchange configuration. The split diamond configuration sets the northbound on-ramp and the southbound off-ramps north of Petroff Road and connects the on and off-ramps at IL 14 via collector distributor roads between IL 14 and Petroff Road.

The ISATe interchange models used in this analysis were calibrated using available crash data from 2008 to 2012 provided by IDOT for all freeway segments, the ramp sections and the ramp terminals evaluated in the crash history section. It should be noted that the terminals part of the model was calibrated based on data at IL Route 14 interchange only. The calibration process consisted of allowing the ISATe calibration factors to correct the base data to more accurately reflect the total number of crashes and the ratio of crashes that were fatal or injury (FI) to property damage only (PDO) based on the crash data for each of the sections combined (data combined for freeway sections, ramp segments, and combined ramp segments). The distribution factors for the mainline, ramps, terminals, and crossroad segments were adjusted to portray the correct distribution of crashes that were single versus multiple vehicles.

ISAT, ISATe and any other predictive methods do not afford the ability to directly compare a standard diamond interchange (existing) to a split diamond interchange (proposed). However, ISATe was used as it is the best tool available to predict the crash conditions in the design year (2029) of the No-Build condition (existing standard diamond interchange) project area as a whole (cumulative of the mainline freeway, freeway ramps and the ramp terminals) and compare to a Build scenario.

As a result, design year ISATe analyses (2029) were generated to predict the crash conditions for the No-Build, Interim Build scenario (Split Diamond with no collector distributor and acceleration/deceleration lanes through the IL 14 interchange) and the Full Build geometric condition (Full collector distributor roads and acceleration/deceleration lanes) so that the design year can be compared with respect to safety.

ISATe has three main components to predict the safety of the study area: Freeway segments; Ramp/CD segments; and Ramp terminals.

The freeway segments of the ISATe takes into account Average Daily Traffic (ADT) Volumes, number of thru lanes, segment lengths, horizontal curve data, cross sectional data (lane widths, shoulder width, median width, presence of rumble strips), roadside data (clear zone width, presence of barriers) entrance ramp data, exit ramp data, and weave areas.

The ramps segment of the ISATe considers ADT, segment lengths, freeway speeds, control type of traffic control at crossroad terminals, horizontal curve data, cross sectional data (lane widths, shoulder widths, add/drop lane), roadside data presence of barriers, ramp entrance data, ramps exit data and weave sections. Collector distributor roads and connector roads are also considered within this ramp section.

The ramp terminal segment of the ISATe investigates ADT, ramp terminal configuration, traffic control, distance to adjacent ramps or intersections, skew angle, left and right-turn control, cross sectional data for crossroad and ramp, presence of turn bays, and number of access driveways.

Since traffic volume is a key component of the ultimate safety of each component and each individual segment within the ISATe, ADT volumes for each segment were generated from the No-Build traffic volumes (see **Figure 20-2**), Full Build Traffic Volumes (see **Figure 20-3**), and Interim Build Traffic volumes (see **Figure 20-4**). Further, the geographical extent of the freeway of both the build and no build scenarios are the same, which include one-half mile south of IL 14 to the north past the Rest Area on ramp. Please note that ISATe does not model weigh stations or rest area ramps. As mentioned previously, an auxiliary lane will be used to provide more time and space for vehicles to accelerate/decelerate and merge between the freeway and ramps to help reduce conflicts and increase safety within the merge areas. The proposed Interim Build and Full Build split diamond interchange configurations do not increase the number of gore points, only relocates gore points, includes additional speed change lanes, and adds collector distributor roads.

A comparison of the No-Build, Interim Build and Full Build conditions was made to predict changes in safety based on the proposed interchange modifications. The detailed outputs from ISATe analysis are shown in **Appendix D**. These analyses are not actually predicting number of crashes, but are just generating a baseline for comparison between existing and proposed traffic models.

Table 18-8 shows a summary of the ISATe output for the No-Build Condition. It should be noted that this summary represents the cumulative number of predicted crashes in the No-Build condition from 2011 to 2029 (design year) as well as the ratio of crashes that were Fatal/Injury (FI) or PDO for each facility type for the No-Build condition. Further, the average total crash rate in the table is the Total study period crashes divided by 19 years. The detailed output has year 2011 very close to the actual crash rate and gradually increases the crash rate (as traffic volumes increase) over the 19 year period. As can be seen over the 19 year analysis period, approximately 957 crashes are expected.

Table 18-8: No Build ISATe Results

Element Type	No Build Study Area		
	Total	FI	PDO
Mainline (crashes over 19 yrs)	601.3	140.1	461.2
Ramps (crashes over 19 yrs)	56.5	23.1	33.4
Crossroad Ramp Terminals/Intersections (crashes over 19 yrs)	299.4	98.1	201.3
Total Study Period (crashes over 19 yrs)	957.2	261.4	695.8
Total per year (on average)	50.4	13.8	36.6

Table 18-9 shows a summary of the ISATe output for the Interim Build Condition and the Full Build Study Scenario. Again, the crashes are the cumulative number of predicted crashes in the Interim and Full Build condition from 2011 to 2029 (design year) with FI and PDO's for each facility type. Similarly, the average total crash rate in the table is the Total study period crashes divided by 19 years. The detailed output has year 2011 very close to the actual crash rate and gradually increases the crash rate

(as traffic volumes increase) over the 19 year period. The build conditions have collector distributor roads combined with the ramps and not separated out independently.

As would be expected the number of crashes along the ramps and collector/distributor roads would increase in the Build condition since approximately 3.75 miles of new roads in the Interim Build and an additional 1.2 miles in the Full Build when compared to the No Build scenario. It should be noted that additional mileage of the collector distributor roads are the primary reason for the increase in crashes and the right-in/right-out access has minimal impact to the safety along the CD roads.

When comparing the total study period crashes for the two Build conditions, their results are similar. However, Interim Build condition does not have the CD road under IL 14 and more traffic has to travel through the signalized junction, predicting more crashes at the terminals compared to the build. Similarly, the Full Build scenario has more Ramp/CD road crashes since in this condition many vehicles avoid the terminal. Another difference between the two Build scenarios is the difference in severity. The Interim Build scenario is expected to have more severity crashes for each the freeway and the terminals, but lower severity for the ramp/CD roads since there is less CD roads.

Table 18-9: Proposed Split Diamond Interchange ISATe Results

Element Type	Interim Build Study Area			Full Build Study Area		
	Total	FI	PDO	Total	FI	PDO
Mainline (crashes over 19 yrs)	562.2	132.7	429.5	562.3	130.2	432.0
Ramps/CD Roads (crashes over 19 yrs)	95.1	35.3	59.8	109.3	41.1	68.2
Crossroad Ramp Terminals/ Intersections (crashes over 19 yrs)	165.4	64.2	101.2	149.4	54.7	94.7
Total Study Period (19-years)	822.7	232.2	590.5	821.0	226.1	595.0
Total per year (Average)	43.3	12.2	31.1	43.2	11.9	31.3

As can be seen over the 19 year analysis period, approximately 822.7 crashes are expected in the Interim Build and 821.0 crashes are expected for the Full Build Condition.

Comparing the total study period (19 year crashes) from **Table 18-8 and 18-9**, the Build scenario is predicted to reduce the number of crashes by 134.5 crashes for the Interim Build and 136.2 crashes for the Full Build Condition. The FI crashes are predicted to be lower by a total of 29.2 crashes if the Interim Condition were built and a total of 35.3 crashes if the Full Build Condition were built.

As can be seen from the tables, the proposed changes are expected to decrease the PDO as well as the fatal/injury crashes. In fact, the modifications are expected to have an overall improvement of approximately 14% compared to if the No Build condition were to occur.

18-3 Safety Analysis Summary

Based on ISATe analysis, it is reasonable to conclude that both the Interim Build and the Full build split diamond interchange will provide improved safety performance within the study area, including the freeway I-57, ramps and ramp terminals. When you compare the cumulative crashes, an approximate 14% reduction in crashes is predicted if either the Interim Build or the Full Build Condition is constructed in lieu of keeping the existing geometrics.

As shown in the ISATe data provided in Appendix D, the proposed Interim and Full Build modification to the interchange is expected to have the most impact to the multi-vehicle crashes. Specifically, the three largest reductions are expected to be the angle (34% reduction), rear end (25% reduction) and sideswipe crashes (25% reduction).

The detailed safety analysis described in this section shows that both the Interim Build and Full Build Alternatives will have a positive impact on the safety over the No-Build Condition. The Interim and Full Build Alternatives both reduce overall crashes by about 14% as compared to the No-Build (with 10-15% reduction in fatal/injury crashes and about 15% in property damage crashes). However, the Full Build Alternative reduces fatal/injury crashes by about 1.9 crashes per year as compared to the interim build condition which reduces fatal/injury crashes by about 1.5 crashes per year. The greater safety benefit of the Full Build Alternative as compared to the Interim Build Alternative is the reduced number of vehicles traveling through the IL 14 traffic signals under the Full Build Alternative.

18-4 Operations

a. Freeway Operations

HCS analysis shows all existing freeway segments within the project area operating at LOS A or B. Due to volume increases, the 2035 No-Build Alternative results in operations of LOS C or better. Ramp terminal delay in the 2035 No-Build VISSIM model results in poor operations at the I-57 northbound diverge to IL-14 which is expected to operate at LOS D in the AM peak hour. All other segments are at LOS C or better for both peak hours.

For the build conditions, the addition of ramp deceleration lanes results in improved density and, consequently, better LOS at diverge segments. However, because there are no changes to the number of gore points and the same amount of traffic enters and exits the freeway in both the Build and No-Build conditions, density and LOS along freeway segments is relatively constant between alternatives. Additionally, the northbound auxiliary lane between the northbound on-ramp and Rest Area off-ramp results in the Build conditions operating at an improved condition as compared to the No-Build condition. Both HCS and VISSIM show operations of LOS C or better for all freeway segments for both the Full Build conditions. HCS shows operations of LOS C or better for all freeway segments for both the Interim Build conditions.

b. Intersection Operations

As previously mentioned, the Build Alternative provides only minimal improvements to freeway operations; however, it would dramatically change local traffic patterns within and surrounding the city of Benton. In order to assess the impacts of the new interchange on the local network, a number of critical intersections were analyzed under each scenario using Synchro, Sidra, and VISSIM software packages. The VISSIM network provides the additional analysis of the critical operations in the Benton Town Square where heavy truck traffic and high peak hour volumes can lead to a near gridlocked network under existing conditions.

Existing analysis indicates that all intersections operate at LOS B or better in both peak hours according to both Synchro and VISSIM models. The VISSIM model does, however, indicate poor operations entering and within the downtown Square in both peak hours.

No-Build analysis clearly indicates that the existing network could not withstand the addition of the forecasted traffic volumes. It would lead to gridlock within the square and capacity issues and multiple movements at LOS E or F at a number of intersections in both peak periods. Additionally, VISSIM analysis predicts that queues spilling back from the Square could impact freeway operations on northbound I-57. Specifically, VISSIM modeling of 2035 No-Build conditions shows a 0.8 mile queue extending west along IL 14 from the Square, through Du Quoin Street, and onto northbound mainline I-57.

According to Synchro and SIDRA (for roundabouts) analysis of the Full Build scenario, all intersections would operate at LOS C or better in both peak hours, with the exception of the Petroff Road/East Illinois Street and N. Main Street (IL-37) intersection which is expected to operate at LOS D in the AM peak hour. Likewise, VISSIM analysis indicates that all intersections would operate at LOS C or better in both peak hours with the exception of the downtown square in the PM peak hour. Analysis indicates that vehicles entering the square from both West Main Street (IL-14) and North Main Street (IL-37) will experience significant delays and queues are likely to result but will not impact the freeway operations on I-57. Specifically, the "Build" queues on IL 14 are expected to be contained within about 500' of each intersection and not extend onto mainline I-57. Thus, even though the proposed improvements alone do not remove all heavy trucks from the Square, they can be expected to reduce the queues along IL 14 and IL 37 by as much as 60-70%."

The "Interim" analysis represents a condition which does not include the C-D road between the West Main Street/IL-14 Ramps. Only the IL-14 Ramp terminals are impacted by this modification, and all other intersection results are the same as those for the Full Build scenario. The Interim condition results in heavy through movements at the West Main Street (IL-14) signalized intersections with the C-D Roads/ramps. However, analysis indicates that the proposed improvements would provide adequate capacity at these intersections through the 2035 design year. The intersection of West Main Street (IL-14) and I-57 NB Ramps would operate at LOS D or better and the intersection of West Main Street (IL-

14) and I-57 SB Ramps is expected to operate at LOS B or better during the peak periods. These queues are not anticipated to impact mainline operations on I-57.

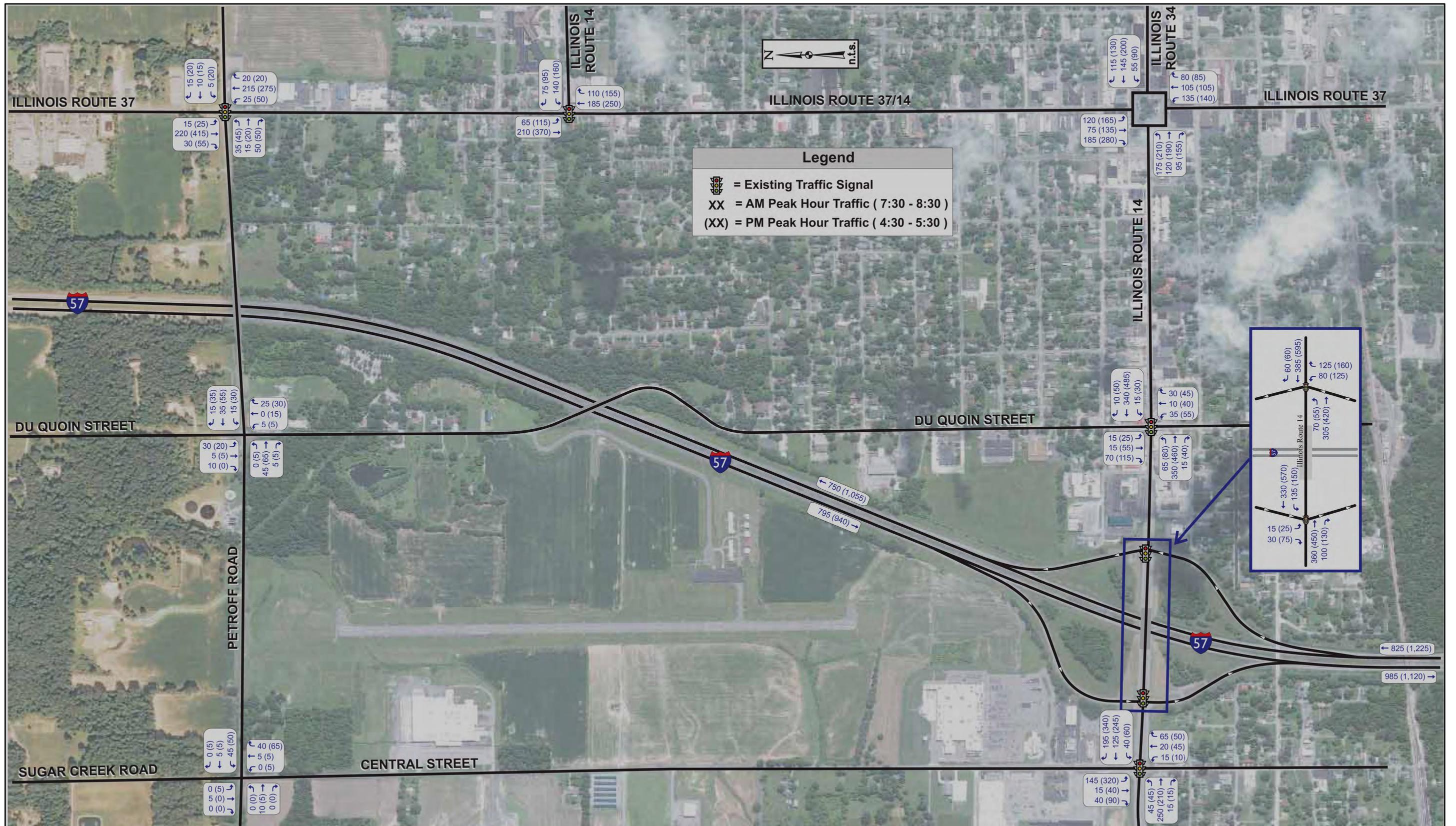
19 INTERCHANGE LOCATION MAP

Please refer to **13-1 through 13-4**.

20 HIGHWAY CAPACITY ANALYSIS

20-1 Existing Peak Hour Volumes

Existing weekday AM and PM peak hour traffic volumes were generated utilizing count data available from the Illinois Department of Transportation (IDOT) as well as intersection turning movement counts conducted by CBB at 5 intersections in 2010 and 2011 and at the downtown square in 2012 (see **Figure 20-1**).



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Figure 20-1

Existing Traffic Volumes

20-2 Design Year “No-Build” Peak Hour Volumes

Traffic forecasts were generated for 2035 (No-Build and Build) based on historical traffic growth trends, anticipated trip generation based on potential industrial and business development in the area, and our knowledge of travel patterns in the area. Based on the current City of Benton Zoning Map (see **Figure 14-1**), existing businesses in the area and engineering judgment as to the types and sizes of potential new businesses and industrial sites, potential developments were analyzed and daily peak hour trips were predicted for the entire projected area (see **Table 20-1**).

Table 20-1: Trip Generation

Land Use	ITE Code	Unit	Size	AM PEAK HOUR ADJACENT STREET			PM PEAK HOUR ADJACENT STREET				
				Pass-By Trip Rate	IN	OUT	TOTAL	Pass-By Trip Rate	IN	OUT	TOTAL
					Trips	Trips	Trips		Trips	Trips	Trips
Hotel	310	1	50		20	10	30		15	15	30
Office Building	710	1	50		70	10	80		15	60	75
Shopping Center	820	1	50	0.50	30	20	50	0.50	90	95	185
Bank	912	1	3	0.45	20	15	35	0.47	40	40	80
Fast Food	934	16	1000	0.49	405	385	790	0.50	280	260	540
Gas Station	945	2	14	0.60	145	140	285	0.60	190	185	375
Industrial Park (east of I-57)	130	1	380		1,535	315	1,850		350	1,315	1,665
Industrial Park (west of I-57)	130	1	740		2,585	530	3,115		565	2,125	2,690
Subtotal					4,810	1,425	6,235		1,545	4,095	5,640
Less Common Trips					120	110	230		120	115	235
Net Total Trips					4,690	1,315	6,005		1,425	3,980	5,405
<i>Pass-By Trips</i>					240	240	480		250	250	500
<i>New Trips</i>					4,450	1,075	5,525		1,175	3,730	4,905

For year 2035, it is assumed that 50% of the forecasted business and industrial development will be in operation. Volumes to/from the development sites were distributed based on a survey taken in the spring of 2012 of existing businesses in the area. The survey asked for home zip codes of employees

as well as customers, what hour employees arrived and departed, typical customer volumes for each hour of the day, as well as information on truck arrivals and departures from the business.

Businesses responding did not have a high volume of truck traffic to and from their sites; therefore, existing truck percentages obtained during the turning movement counts was used for existing models. For future scenarios a maximum truck percentage of 10% was used at intersections where truck percentages were extremely high due to very low overall traffic volumes. Interstate truck volumes were assumed to remain constant during both peak periods.

Based on the survey results the following was determined to be the directional distribution of existing traffic during the peak hours.

- 12% to/from North
- 31% to/from South
- 9% to/from East
- 14% to/from West
- 34% local traffic from the Benton/West City area

20-3 Design Year “Full Build & Interim” Peak Hour Volumes

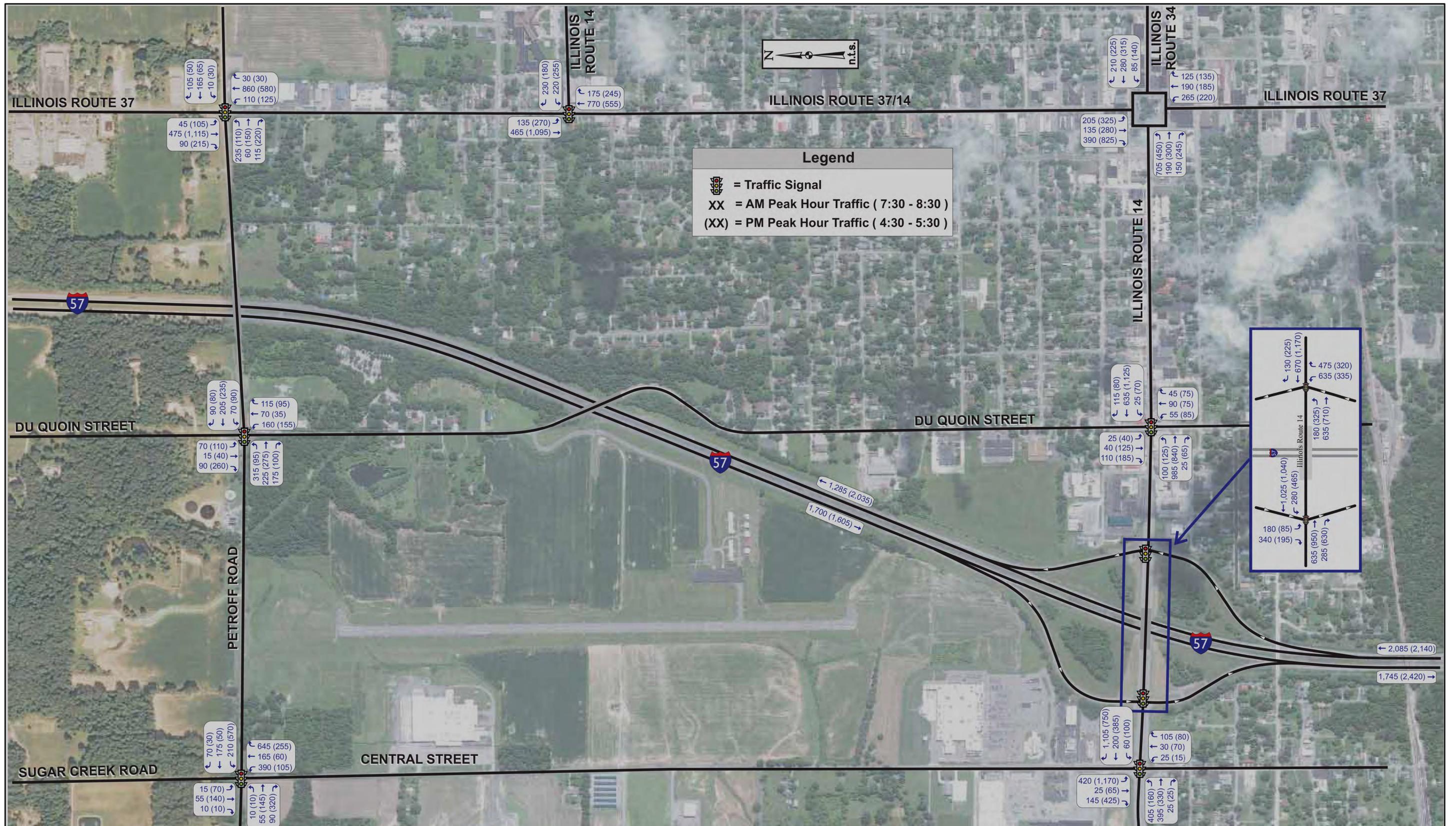
For the build scenarios the directional distribution percentages were modified in order to account for a greater percentage of traffic to/from I-57. Typically fast food restaurants and gas stations would likely attract a larger percentage of interstate traffic than local traffic. Additionally, the percentage of local traffic to industrial development, will likely level out to a lower percentage as unemployment is reduced and workers begin to come from greater distances. In order to account for these changes, and to provide a more accurate analysis of the interchange capacity and operations, the following directional distribution was used for the forecasted 2035 traffic.

- 20% to/from North
- 35% to/from South
- 10% to/from East
- 15% to/from West
- 20% local

Using the existing travel patterns, counts, and local knowledge of existing roadway, travel routes were determined to/from the development sites and volumes were distributed accordingly. In order to determine 2035 volumes, first a 2% annual growth rate was assumed for the entire area and added to the existing volumes throughout the network. This rate was based on historical interstate volumes. It is a very high growth rate for the local roadway network, however, adding vehicles due to growth, compensates for the margin of error in the trips determined through the ITE trip generation in **Table 20-**

1. By initially assuming a 2% overall growth rate, which is 49% growth over the 20 year period, we provide for a worst case scenario in the overall local network.

Figures 20-2, 20-3, and 20-4 provide traffic volumes for the 2035 No-Build, Full Build, and Interim scenarios used in the capacity analysis.

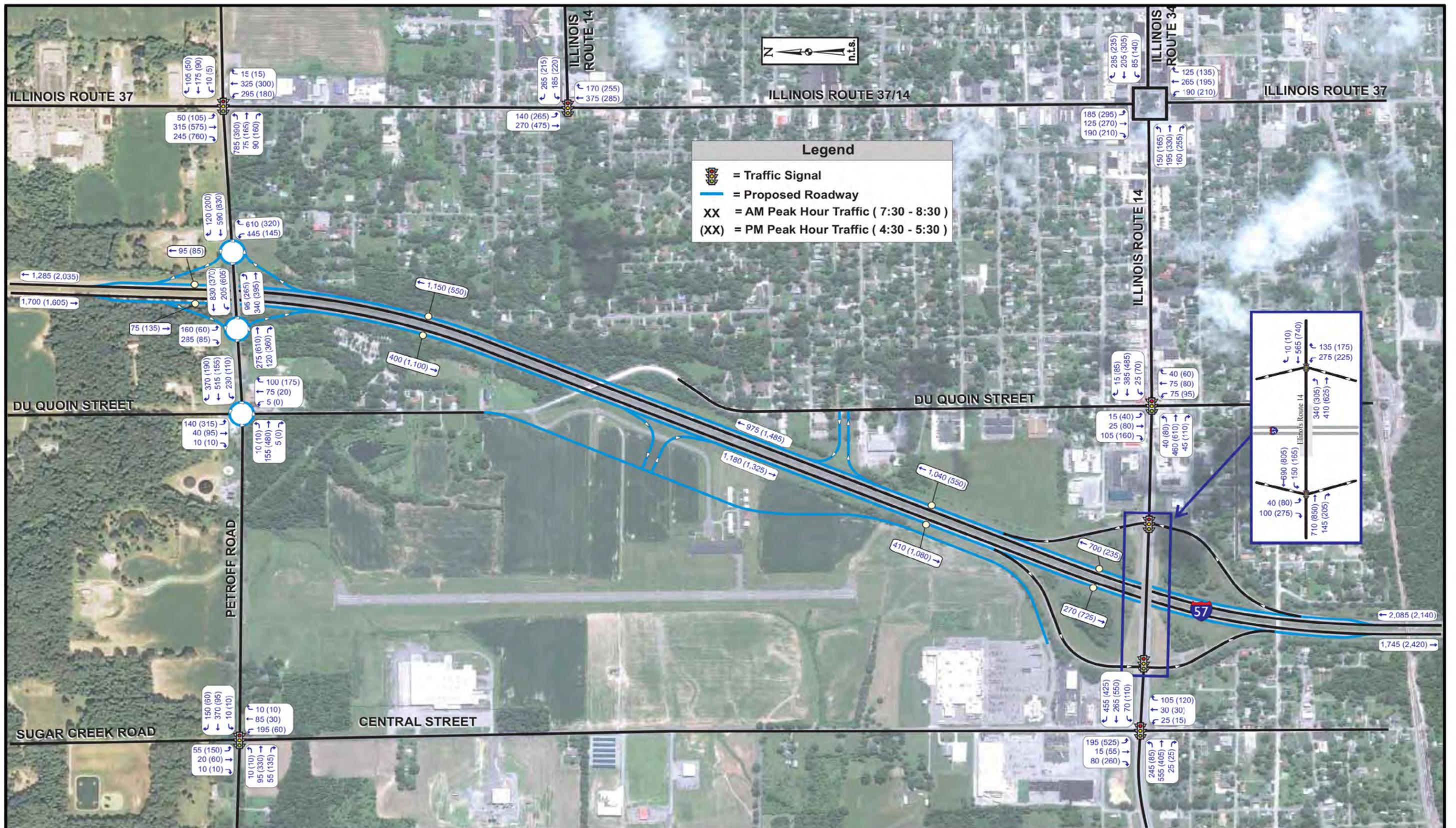


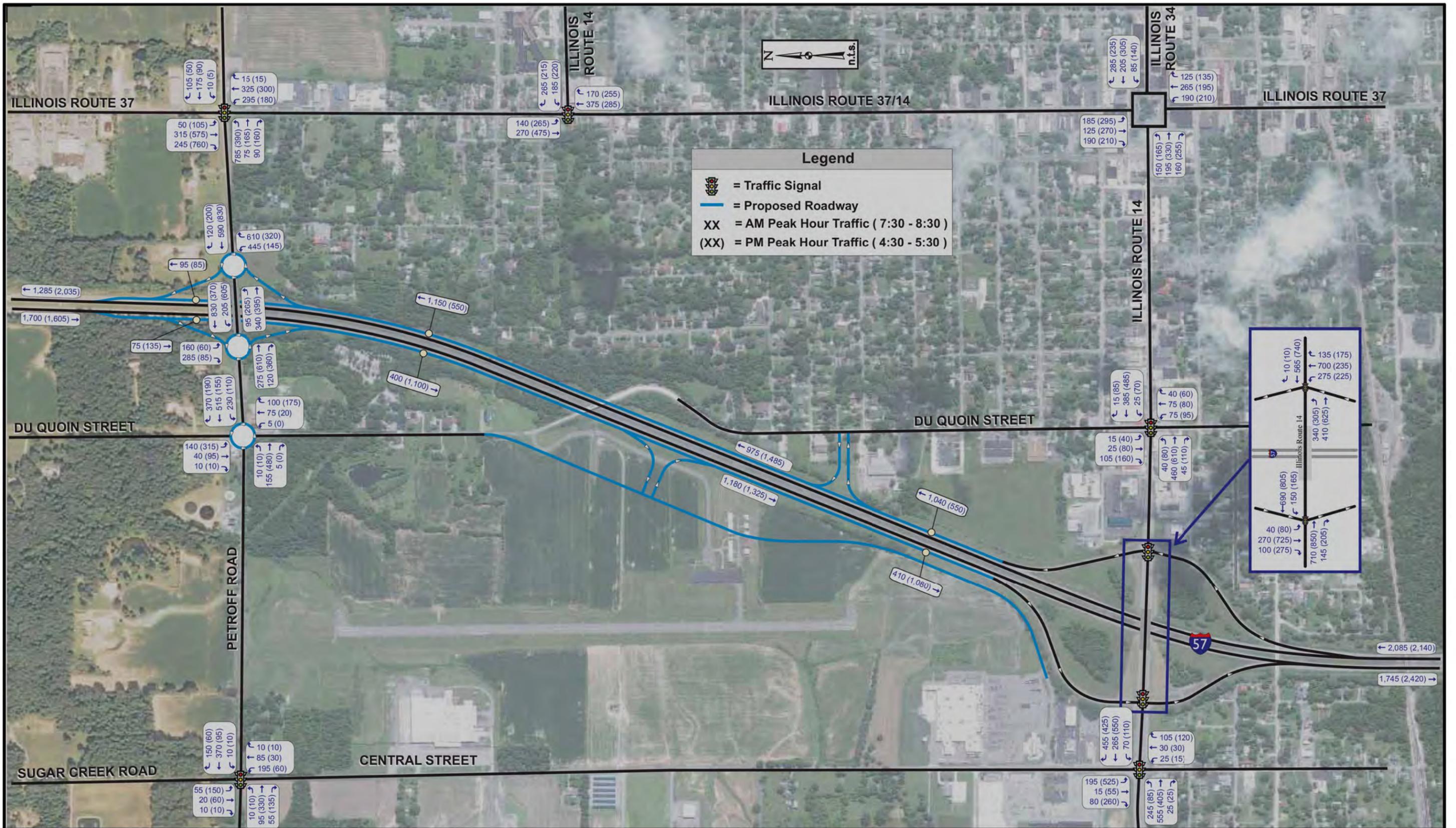
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Figure 20-2

No-Build Traffic Volumes





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Figure 20-4
 Interim Traffic Volumes

20-4 Summary of Operational Analysis

A detailed capacity analysis was undertaken to determine the anticipated operating conditions for the Existing, 2035 No-Build, and 2035 Full Build and 2035 Interim Build scenarios utilizing several modelling platforms.

Highway Capacity Software (HCS 2010) analysis procedures are based upon the methodologies outlined in the 2010 edition of the “Highway Capacity Manual” (HCM). The HCM, used universally by highway and traffic engineers to measure roadway capacity, establishes criteria for six Levels of Service (LOS): LOS A (“Free Flow”) through LOS F (“Breakdown Conditions”). HCS was utilized to evaluate the merge, diverge, weave, and basic freeway segments along mainline I-57.

SYNCHRO 7 is used to evaluate traffic operations at signalized intersections. In future scenarios signal phasing and timing may be modified from existing in order to improve signal operations.

SIDRA is used as an alternative to SYNCHRO 7 to evaluate roundabouts in the build scenarios. Roundabouts fall under the category of unsignalized intersection in terms of LOS determination, but SYNCHRO 7 software cannot provide the operational outputs available through SIDRA.

VISSIM is used to evaluate the network performance and test system wide MOE. VISSIM is a micro-simulation model used to analyze complex transportation systems. It allows the user to observe simulated traffic conditions. Output from VISSIM models was used to evaluate at-grade intersection and freeway operations. Travel time runs were used to calibrate the existing model to actual existing conditions.

The various results were compared to highlight any discrepancies between the modelling platforms. The various software platforms all calculate measures differently, so their results will differ compared to one-another. However, a comparison of their results can “flag” errors in the analysis if the differences cannot be resolved through an understanding of modelling assumptions or methods. A check of these measures concluded that all analysis platforms provided generally reasonable and consistent results. It should be noted that HCS, SYNCHRO, and SIDRA are deterministic models and results can be obtained directly from the software user interface. However, VISSIM is a stochastic model; therefore numerous model runs need to be performed and the output averaged to find the projected measures of effectiveness. The VISSIM results for each model are an average of ten model runs.

Several Measures of Effectiveness (MOE) were used in this evaluation including: LOS, vehicular delay, queue length, and density. The I-57 freeway operating conditions analysis was performed using HCS, which uses density as an MOE to determine LOS along a freeway, as well as VISSIM. Although drivers perceive speed to be a major indicator of service quality, freedom to maneuver within the traffic stream and proximity to other vehicles, as measured by the density of the traffic stream, is also a concern to drivers and an important measure of the facility’s operations. Density increases as flow

increases up to capacity, resulting in an MOE that is sensitive to a broad range of flows. For these reasons, density is the parameter used to define LOS for the freeway and ramp sections, as shown in **Table 20-2**.

Table 20-2: Freeway Level of Service Criteria

Level of Service	Freeway Weaving Segment Density (pc/mi/ln)*	Merging and Diverging Segment Density (pc/mi/ln)*	Basic Freeway Segment Density (pc/mi/ln)*
A	0 – 10	0 – 10	0 – 11
B	> 10 – 20	> 10 – 20	> 11 – 18
C	> 20 – 28	> 20 – 28	> 18 – 26
D	> 28 – 35	> 28 – 35	> 26 – 35
E	> 35 – 43	> 35	> 35 – 45
F	> 43	Demand exceeds capacity	> 45

* pc/mi/ln = passenger cars per mile per lane

At signalized intersections, LOS is directly related to control delay. The LOS criteria differ from that at unsignalized intersections primarily because different transportation facilities create different driver expectations. The expectation is that a signalized intersection is designed to carry higher traffic volumes and, consequently, may experience greater delay than an unsignalized intersection. **Table 20-3** summarizes the LOS thresholds used in the analysis for intersections. Typically LOS D is considered acceptable in urban areas for both freeways and arterial roadways.

Table 20-3: Intersection Level of Service Thresholds

Level of Service (LOS)	Control Delay per Vehicle (seconds/vehicle)	
	Signalized Intersections/Roundabouts	Unsignalized Intersections
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

a. Basic Freeway Segments Analyses of Existing Conditions

All freeway segments (including ramps) between and including the IL-14 interchange and the northbound off-ramp at the Rest Area (north of Petroff Road) are included in the freeway analysis. The nearest interchanges to the existing IL-14 interchange are 5.9 miles to the north at IL-154 and 7 miles to the south at IL-149 in West Frankfort. Because of the long distance to these interchanges they do not have a major influence in the study area and are not included in the traffic analysis models.

The existing freeway operations analysis results from HCS and VISSIM are summarized in **Tables 20-4 and 20-5**. All HCS outputs for Existing, 2035 No-Build, and 2035 Build conditions are included in **Appendix E**.

Table 20-4: Existing Conditions Freeway Operations Analysis (HCS)

SECTION	DIRECTION	Type	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln) *	Avg. Speed (mph)**	LOS	Density (pc/mi/ln) *	Avg. Speed (mph)**
Interstate 57	NB	Freeway	A	7.8	65.0	B	11.6	65.0
Off Ramp to IL-14	NB	Diverge	B	13.0	57.6	B	17.3	57.4
Interstate 57	NB	Freeway	A	5.9	65.0	A	8.9	65.0
On Ramp from IL-14	NB	Merge	B	10.5	58.1	B	13.4	58.0
Interstate 57	NB	Freeway	A	7.1	65.0	A	10.0	65.0
Off Ramp to Rest Area	NB	Diverge	B	12.2	57.9	B	15.5	57.7
Interstate 57	NB	Freeway	A	6.4	65.0	A	9.0	65.0
On Ramp from Rest Area	NB	Merge	B	9.3	58.5	B	12.2	58.4
Interstate 57	NB	Freeway	A	7.1	65.0	A	10.0	65.0
Interstate 57	SB	Freeway	A	7.6	65.0	A	8.9	65.0
Off Ramp to IL-14	SB	Diverge	B	12.7	58.0	B	14.2	57.9
Interstate 57	SB	Freeway	A	7.1	65.0	A	8.0	65.0
On Ramp from IL-14	SB	Merge	B	13.3	57.8	B	14.5	57.8
Interstate 57	SB	Freeway	A	9.4	65.0	A	10.6	65.0

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table 20-5: Existing Conditions Freeway Operations Analysis (VISSIM)

SECTION	DIRECTION	Type	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
Interstate 57	NB	Freeway	A	6.6	62.9	A	9.8	62.4
Off Ramp to IL-14	NB	Diverge	A	6.7	62.2	A	10.0	61.2
Interstate 57	NB	Freeway	A	4.9	63.1	A	7.3	62.7
On Ramp from IL-14	NB	Merge	A	5.2	61.4	A	7.8	61.2
Interstate 57	NB	Freeway	A	5.9	62.9	A	8.9	62.5
Off Ramp to Rest Area	NB	Diverge	A	5.9	62.9	A	8.9	61.9
Interstate 57	NB	Freeway	A	5.3	63.0	A	8.0	62.4
On Ramp from Rest Area	NB	Merge	A	5.4	61.7	A	8.1	61.1
Interstate 57	NB	Freeway	A	5.9	62.9	A	8.9	62.3
Interstate 57	SB	Freeway	A	6.3	63.1	A	7.5	62.6
Off Ramp to IL-14	SB	Diverge	A	6.3	62.6	A	7.4	62.4
Interstate 57	SB	Freeway	A	5.9	62.8	A	6.9	62.7
On Ramp from IL-14	SB	Merge	A	6.6	58.6	A	8.1	57.7
Interstate 57	SB	Freeway	A	7.8	62.5	A	9.6	62.2

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

All freeway segments operate at LOS B or better according to HCS, and at LOS A according to VISSIM in the existing conditions for both peak hours. There are no areas of concern at the current traffic volumes.

b. Basic Freeway Segments Analyses of the Design Year “No-Build” Conditions

2035 No-Build volumes (see **Figure 20-2**) were determined based on the growth rate and ITE trip generation previously discussed. The same volumes were used in both the no-build and build scenarios. Origins and destinations were held constant in all 2035 scenarios while routes were adjusted based on the modified access and roadway modifications.

The 2035 No-Build freeway operations analysis results from HCS (see **Appendix E** for HCS outputs) and VISSIM are summarized in **Tables 20-6 and 20-7**.

Table 20-6: 2035 No-Build Conditions Freeway Operations Analysis (HCS)

SECTION	DIRECTION	Type	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
Interstate 57	NB	Freeway	C	19.8	65.0	C	20.3	65.0
Off Ramp to IL-14	NB	Diverge	C	26.4	55.3	C	27.0	56.5
Interstate 57	NB	Freeway	A	9.3	65.0	B	14.1	65.0
On Ramp from IL-14	NB	Merge	B	15.5	57.9	C	22.6	57.2
Interstate 57	NB	Freeway	B	12.2	65.0	C	19.3	65.0
Off Ramp to Rest Area	NB	Diverge	B	17.9	57.7	C	25.6	57.4
Interstate 57	NB	Freeway	A	11.0	65.0	B	17.4	65.0
On Ramp from Rest Area	NB	Merge	B	14.4	58.3	C	21.6	57.6
Interstate 57	NB	Freeway	B	12.2	65.0	C	19.3	65.0
Interstate 57	SB	Freeway	B	16.2	65.0	B	15.2	65.0
Off Ramp to IL-14	SB	Diverge	C	22.3	56.8	C	21.3	57.4
Interstate 57	SB	Freeway	B	11.2	65.0	B	12.6	65.0
On Ramp from IL-14	SB	Merge	B	20.4	57.4	C	26.6	56.4
Interstate 57	SB	Freeway	B	16.6	65.0	C	23.0	64.9

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table 20-7: 2035 No-Build Conditions Freeway Operations Analysis (VISSIM)

SECTION	DIRECTION	Type	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
Interstate 57	NB	Freeway	B	17.2	60.5	B	17.6	60.7
Off Ramp to IL-14	NB	Diverge	D	28.6	41.0	C	25.1	50.8
Interstate 57	NB	Freeway	A	7.8	62.5	B	12.2	61.6
On Ramp from IL-14	NB	Merge	A	9.2	59.5	B	14.8	55.9
Interstate 57	NB	Freeway	A	10.4	62.3	B	17.0	60.6
Off Ramp to Rest Area	NB	Diverge	B	10.4	61.9	B	17.6	58.2
Interstate 57	NB	Freeway	A	9.3	62.4	B	14.4	60.9
On Ramp from Rest Area	NB	Merge	A	9.5	61.0	B	14.9	58.6
Interstate 57	NB	Freeway	A	10.4	62.1	B	17.0	60.4
Interstate 57	SB	Freeway	B	13.7	61.4	B	13.0	61.8
Off Ramp to IL-14	SB	Diverge	B	14.5	58.6	B	13.3	59.9
Interstate 57	SB	Freeway	A	9.6	61.7	A	10.8	61.4
On Ramp from IL-14	SB	Merge	B	12.5	54.2	B	17.6	50.9
Interstate 57	SB	Freeway	B	14.4	60.8	C	19.9	59.9

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

In both peak hours, and especially in the AM, the diverge to IL-14 from northbound I-57 is impacted by the heavy volumes utilizing the off ramp in the VISSIM model and its resulting queues from the signalized ramp terminal.

c. Basic Freeway Segments Analyses of the Design Year "Full-Build" Conditions

2035 Build volumes (see **Figure 20-3**) were determined based on the growth rate and ITE trip generation previously discussed. The same volumes were used in both the no-build and build scenarios. Origins and destinations were held constant in all 2035 scenarios while routes were adjusted based on the modified access and roadway modifications.

The 2035 Full-Build freeway operations analysis results from HCS (see **Appendix E** for HCS outputs) and VISSIM are summarized in **Tables 20-8 and 20-9**.

Table 20-8: 2035 Full-Build Conditions Freeway Operations Analysis (HCS)

SECTION	DIRECTION	Type	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
Interstate 57	NB	Freeway	C	19.8	65.0	C	20.3	65.0
Off Ramp to IL-14	NB	Diverge	C	22.8	55.3	C	23.4	56.5
Interstate 57	NB	Freeway	A	9.3	65.0	B	14.1	65.0
On Ramp from Petroff Rd to Off Ramp to Rest Area	NB	Weave	A	8.6	61.6	B	13.9	60.4
Interstate 57	NB	Freeway	A	11.0	65.0	B	17.4	65.0
On Ramp from Rest Area	NB	Merge	B	14.4	58.3	C	21.6	57.6
Interstate 57	NB	Freeway	B	12.2	65.0	C	19.3	65.0
Interstate 57	SB	Freeway	B	16.2	65.0	B	15.2	65.0
Off Ramp to Petroff Road	SB	Diverge	B	18.7	56.8	B	17.7	57.4
Interstate 57	SB	Freeway	B	11.2	65.0	B	12.6	65.0
On Ramp from IL-14	SB	Merge	C	20.1	57.5	C	26.3	56.5
Interstate 57	SB	Freeway	B	16.6	65.0	C	23.0	64.9

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table 20-9: 2035 Full-Build Conditions Freeway Operations Analysis (VISSIM)

SECTION	DIRECTION	Type	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
Interstate 57	NB	Freeway	B	17.2	60.6	B	17.7	60.5
Off Ramp to IL-14	NB	Diverge	B	13.6	50.3	B	16.2	59.5
Interstate 57	NB	Freeway	A	7.8	62.2	B	12.3	60.9
On Ramp from Petroff Rd to Off Ramp to Rest Area	NB	Weave	A	7.8	62.3	B	12.6	59.9
Interstate 57	NB	Freeway	A	8.9	62.4	B	14.5	60.6
On Ramp from Rest Area	NB	Merge	A	9.3	60.3	B	14.9	58.2
Interstate 57	NB	Freeway	A	10.4	62.1	B	17.0	60.3
Interstate 57	SB	Freeway	B	13.7	61.9	B	13.0	61.8
Off Ramp to Petroff Road	SB	Diverge	B	10.2	58.6	B	10.6	60.0
Interstate 57	SB	Freeway	A	9.6	62.2	A	10.7	61.7
On Ramp from IL-14	SB	Merge	B	12.7	54.5	B	19.5	46.9
Interstate 57	SB	Freeway	B	14.5	60.9	C	20.3	59.5

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Both HCS and VISSIM models of the Full-Build condition show improvements to the diverge sections due to the addition of deceleration lanes. Additionally, the weave area on northbound I-57 is expected to operate much more effectively than the existing on ramp from IL-14 and subsequent off ramp to the rest area. In the build scenario, VISSIM indicates that there may still be some issues with the IL-14 off ramp in the AM peak hour, leading to a reduced speed at the diverge area; however, the reduced speed is mostly attributed to those vehicles exiting and the speeds for through traffic remain consistent with the freeway segments.

d. Basic Freeway Segments Analyses of the Design Year "Interim-Build" Conditions

The 2035 Interim Build freeway operations analysis results from HCS (see **Appendix E** for HCS outputs) and VISSIM are summarized in **Tables 20-10 and 20-11**.

Note that only the northbound off-ramp diverge and southbound on-ramp merge segments are impacted so only those sections are shown in the tables. All other segments are the same as the Full-Build condition.

Table 20-10: 2035 Interim Build Conditions Freeway Operations Analysis (HCS)

SECTION	DIRECTION	Type	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
Off Ramp to IL-14	NB	Diverge	D	28.6	41.0	C	25.1	50.8
On Ramp from IL-14	SB	Merge	B	12.5	54.2	B	17.6	50.9

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table 20-11: 2035 Interim Build Conditions Freeway Operations Analysis (VISSIM)

SECTION	DIRECTION	Type	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
Off Ramp to IL-14	NB	Diverge	C	22.1	46.7	C	20.2	52.9
On Ramp from IL-14	SB	Merge	B	11.0	50.7	B	18.5	43.9

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Both HCS and VISSIM models show the 2035 Interim Build condition at the IL-14 northbound off-ramp and southbound on-ramp similar to the No-Build condition. This is reasonable to expect since these ramp connections to I-57 remain unchanged from the no-build condition.

e. Intersection Analyses of the Existing Conditions

The following intersections are included in the intersection analysis:

- West Main Street (IL-14) and Central Street
- West Main Street (IL-14) and I-57 SB Ramps
- West Main Street (IL-14) and I-57 NB Ramps
- West Main Street (IL-14) and DuQuoin Street
- Petroff Road and DuQuoin Street
- Petroff Road and I-57 SB Ramps
- Petroff Road and I-57 NB Ramps
- Petroff Road/East Illinois Street and North Main Street (IL-37)

Although not required as a part of the interchange analysis, an operational evaluation of the Benton Town Square is also included as its operations are a large part of the need for the project.

The existing intersection operations analysis results of SYNCHRO 7 are summarized below in **Table 20-12**. From the SYNCHRO tables, all basic intersections within the study area operate at acceptable conditions with LOS B or better during both peak hours.

The existing intersection operations analysis results from VISSIM are summarized in **Table 20-13**. The highlighted areas of the tables signify intersections or roadway segments of concern. Specifically red highlighting denotes LOS F and yellow highlighting denotes LOS E.

Table 20-12: Existing Conditions Intersections Analysis (SYNCHRO 7)

Intersection / Approach	Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
	LOS (Delay, seconds)	Max 95th Queue, ft	LOS (Delay, seconds)	Max 95th Queue, ft
West Main Street (IL-14) and Central Street (Signalized)				
Eastbound West Main Street Approach	B (14.8)	85	B (19.3)	96
Westbound East Main Street Approach	A (5.6)	52	A (9.8)	127
Northbound Central Street Approach	C (21.1)	49	C (34.5)	87
Southbound Central Street Approach	C (27.9)	75	C (30.6)	151
Overall Intersection	B (14.7)		B (19.8)	
West Main Street (IL-14) and I-57 SB Ramps (Signalized)				
Eastbound West Main Street Approach	A (6.4)	103	A (3.9)	77
Westbound East Main Street Approach	A (1.6)	16	A (2.0)	34
Southbound I-57 SB Off Ramp Approach	C (22.8)	54	C (22.6)	52
Overall Intersection	A (5.3)		A (4.6)	
West Main Street (IL-14) and I-57 NB Ramps (Signalized)				
Eastbound West Main Street Approach	A (7.3)	77	B (14.9)	105
Westbound East Main Street Approach	A (7.3)	79	B (13.4)	165
Northbound I-57 NB Off Ramp Approach	C (28.2)	125	C (31.5)	240
Overall Intersection	B (11.1)		B (17.7)	
West Main Street (IL-14) and DuQuoin Street (Signalized)				
Eastbound West Main Street Approach	A (3.2)	82	A (5.5)	125
Westbound East Main Street Approach	A (3.6)	89	A (6.4)	206
Northbound DuQuoin Street Approach	C (23.3)	41	D (39.5)	63
Southbound DuQuoin Street Approach	B (18.4)	23	C (25.6)	84
Overall Intersection	A (6.7)		B (12.0)	
Petroff Road/East Illinois Street and North Main Street (IL-37) (Signalized)				
Eastbound Petroff Road Approach	A (8.5)	16	B (10.8)	29
Westbound East Illinois Street Approach	A (8.0)	7	B (10.7)	20
Northbound North Main Street (IL-37) Approach	A (6.6)	55	A (5.8)	69
Southbound North Main Street (IL-37) Approach	A (6.8)	57	A (7.3)	124
Overall Intersection	A (7.1)		A (7.5)	
Petroff Road and DuQuoin Street (4-way Stop)				
Eastbound Petroff Road Approach	A (7.5)		A (8.0)	
Westbound Petroff Road Approach	A (7.8)		A (8.1)	
Northbound DuQuoin Street Approach	A (7.1)		A (7.6)	
Southbound DuQuoin Street Approach	A (7.6)		A (8.0)	

Table 20-13: Existing Conditions Analysis (VISSIM)

Intersection/ Approach	AM Peak		PM Peak	
	LOS (Delay)	Max. Queue	LOS (Delay)	Max. Queue
West Main Street (IL-14) and Central Street (Signalized)				
Eastbound West Main Street Approach	A (4.5)	98	A (7.0)	106
Westbound West Main Street Approach	A (2.6)	65	A (3.2)	66
Northbound Central Street Approach	B (14.4)	87	C (14.8)	96
Southbound Central Street Approach	C (26.3)	111	C (25.3)	181
Overall	A (9.4)	-	B (12.9)	-
West Main Street (IL-14) and I-57 SB Ramps (Signalized)				
Eastbound West Main Street Approach	A (1.6)	95	A (1.8)	102
Westbound West Main Street Approach	A (2.0)	83	A (2.9)	106
Southbound I-57 SB Off Ramp Approach	B (11.7)	41	B (12.2)	55
Overall	A (2.3)	-	A (2.7)	-
West Main Street (IL-14) and I-57 NB Ramps (Signalized)				
Eastbound West Main Street Approach	A (6.1)	107	B (10.7)	166
Westbound West Main Street Approach	A (3.0)	110	A (3.8)	126
Northbound I-57 NB Off Ramp Approach	B (16.2)	224	B (18.9)	267
Overall	A (6.9)	-	A (9.7)	-
West Main Street (IL-14) and DuQuoin Street (Signalized)				
Eastbound West Main Street Approach	A (4.4)	119	A (6.6)	223
Westbound West Main Street Approach	B (16.9)	97	C (27.9)	173
Northbound DuQuoin Street Approach	A (4.1)	103	A (9.3)	314
Southbound DuQuoin Street Approach	C (23.8)	75	C (30.3)	118
Overall	A (7.1)	-	B (12.7)	-
Petroff Road/East Illinois Street and North Main Street (IL-37) (Signalized)				
Eastbound Petroff Road Approach	A (5.9)	57	A (6.9)	60
Westbound East Illinois Street Approach	A (5.5)	36	A (6.5)	42
Northbound North Main Street (IL-37) Approach	A (4.0)	98	A (4.9)	115
Southbound North Main Street (IL-37) Approach	A (3.1)	72	A (3.9)	124
Overall	A (4.0)	-	A (4.7)	-
Petroff Road and DuQuoin Street (4-way Stop)				
Eastbound Petroff Road Approach	A (8.9)	49	A (8.7)	53
Westbound Petroff Road Approach	A (9.2)	57	A (9.7)	67
Northbound DuQuoin Street Approach	A (6.2)	43	A (6.3)	46
Southbound DuQuoin Street Approach	A (7.0)	45	A (6.6)	40
Main Street Square				
Eastbound West Main Street Approach	E (39.3)	37	D (33.4)	658
Westbound East Main Street Approach	C (19.7)	0	C (20.6)	0
Northbound South Main Street Approach	C (17.6)	0	E (35.4)	0
Southbound North Main Street Approach	D (31.8)	0	D (31.8)	634

From the VISSIM table, the study intersections operate at acceptable conditions with LOS B or better during both peak hours. The Benton Town Square has two approaches operating at LOS E. This analysis matches field observations. Based on field observations queue lengths were minimal and were always able to be completely dissipated within a reasonable amount of time.

Modelling of the square is complicated due to the oddities of the existing conditions. When traveling through the square, vehicles inside yield to those entering. This creates delay inside the square, but minimizes queuing on the approaches. In order to duplicate this in the VISSIM models, a quick stop was placed prior to entry to the square, based on field observations stop signs do not exist at these locations. As vehicle move past the stop, a yield was included to allow for the incoming vehicles to have priority over those within the square. This created close to a one in, one thru movement as was observed in the field.

It should be noted that in VISSIM the queue lengths are a function of the number of vehicles arriving at the square at one time. Delay is likely a more accurate measure of existing conditions. Based on field observations, in the AM peak hour, queues are minimal on all approaches, and delay is a function of driver behavior of both the circling and entering vehicles. In the PM, queuing does occur, especially in the eastbound and southbound directions. It may reach 15 or 20 vehicles at times, with delays of a few minutes for those vehicles. However, the queues are not constant and delay will be much less for most vehicles, again delay is a function of driver behavior of both the circling and entering vehicles.

Additionally, in both peak hours, delay and queuing are greatly impacted by truck traffic. Heavy vehicles were more predominate in the AM, but had impacts in the PM as well. Large trucks have a more difficult time traversing the square due to parking on both sides of the roadway. This can lead to lower turning radii which is can be very difficult for some trucks to move through at all and leads to slower speeds for almost all large trucks as well as school busses. In order to replicate this in the VISSIM model truck speeds were 5-10 mph less than car speeds within the square. Pedestrians and parking also lead to slight increases in delays and queues in both peak hours based on field observations. Pedestrians cross at all points inside and outside of the square causing traffic to stop in multiple directions. Angled parking exists on both the inside and outside of the roadway within the square. Vehicles entering and exiting parking spaces cause delay to circling traffic. Because these delays were not found to be significant, the VISSIM model does not include pedestrians or parking within the downtown square. Their existence is likely accounted for in additional delay caused by the stop for vehicles entering the square.

f. Intersection Analyses of the 2035 Design Year “No-Build” Conditions

The 2035 No-Build intersection operations analysis results from SYNCHRO 7 are summarized in **Table 20-14**. This model represents no improvements to the existing local system with the exception of separate left turn lanes in all directions at the DuQuoin St and Petroff Road intersection, which would be reasonable to expect by 2035 if planned industrial development occurs.

Table 20-14: 2035 No-Build Conditions Intersections Analysis (SYNCHRO 7)

Intersection / Approach	Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
	LOS (Delay, seconds)	Max 95th Queue, ft	LOS (Delay, seconds)	Max 95th Queue, ft
West Main Street (IL-14) and Central Street (Signalized)				
Eastbound West Main Street Approach	B (19.9)	296	C (34.5)	135
Westbound East Main Street Approach	B (13.8)	694	B (11.8)	123
Northbound Central Street Approach	D (44.1)	140	F (100.1)	199
Southbound Central Street Approach	D (43.4)	251	C (31.9)	555
Overall Intersection	C (23.1)		C (28.4)	
West Main Street (IL-14) and I-57 SB Ramps (Signalized)				
Eastbound West Main Street Approach	B (19.8)	230	B (10.9)	194
Westbound East Main Street Approach	B (12.6)	172	A (3.7)	13
Southbound I-57 SB Off Ramp Approach	D (48.8)	535	D (42.8)	213
Overall Intersection	C (21.9)		B (10.4)	
West Main Street (IL-14) and I-57 NB Ramps (Signalized)				
Eastbound West Main Street Approach	E (58.8)	242	D (44.5)	288
Westbound East Main Street Approach	D (43.8)	355	D (48.1)	391
Northbound I-57 NB Off Ramp Approach	F (158.0)	1332	F (120.3)	620
Overall Intersection	F (94.8)		E (62.2)	
West Main Street (IL-14) and DuQuoin Street (Signalized)				
Eastbound West Main Street Approach	B (13.2)	513	D (37.0)	166
Westbound East Main Street Approach	A (6.3)	270	C (23.4)	894
Northbound DuQuoin Street Approach	E (62.4)	154	E (69.0)	139
Southbound DuQuoin Street Approach	C (29.4)	104	F (131.2)	333
Overall Intersection	B (16.3)		D (45.0)	
Petroff Road/East Illinois Street and North Main Street (IL-37) (Signalized)				
Eastbound Petroff Road Approach	D (47.9)	258	F (115.0)	342
Westbound East Illinois Street Approach	C (23.9)	175	C (24.9)	77
Northbound North Main Street (IL-37) Approach	D (39.5)	691	D (39.3)	174
Southbound North Main Street (IL-37) Approach	B (17.8)	287	F (81.3)	989
Overall Intersection	C (33.4)		E (73.1)	
Petroff Road and DuQuoin Street (4-way Stop)				
Eastbound Petroff Road Approach	D (33.7)		E (42.8)	
Westbound Petroff Road Approach	C (23.3)		D (29.3)	
Northbound DuQuoin Street Approach	C (15.9)		C (17.0)	
Southbound DuQuoin Street Approach	B (12.7)		C (24.1)	

From the SYNCHRO table, it is apparent that there are a number of movements with significant delay and queuing in both peak periods. In the AM peak hour the West Main Street and I-57 NB Ramp intersection operates at LOS F, while in the PM peak hour that same intersection operates at LOS E as does the intersection of Petroff Road/East Illinois Street and North Main Street (IL-37). These poorly operating intersections and movements cause additional issues when modeled in VISSIM as the queues have impacts on other intersections.

The operations of the downtown square were even more cumbersome in this VISSIM model than they were in the existing VISSIM model. Because the traffic volume in the square roughly doubles in both peak hours compared to existing volumes and because the square was already congested in existing conditions, it was apparent that the square would not function at these volumes. Allowing the square to operate under existing parameters created complete gridlock of the model within the 15 minute "loading" period. In order to complete some type of analysis on the square itself, the operations were modified so that it acted more as a normal roundabout with all vehicles yielding on entry and free flow within the circle. This prevented gridlock and allowed for the analysis of queues into the square. **Figures 20-5 and 20-6** illustrate the queue lengths resulting from VISSIM model runs under the Existing, 2035 No-Build and 2035 Build scenarios. Evident in both figures are the queues from the square continuing for miles in each direction with the exception of southbound in the AM peak hour for the No-Build condition. The continuous line from the square represents queuing which is a result of the square's operations. It is very apparent that it is not possible to put these high volumes through the square in the condition in which it exists today. For comparison, the queue lines for the existing and build scenarios were determined through VISSIM analysis and match the maximum queues included in the VISSIM tables.

In order to identify intersection delay and queue lengths at all intersections for comparison with the Build Scenarios, the square was modified to two lanes with free flow entry into an add lane from all directions and the unrealistic driving behavior of free overtaking, meaning that vehicles were free to change lanes without yielding by another vehicle. In the PM peak hour, this condition prevented grid lock in the square for more than half of the peak hour. Shortly after that mark, the queue along northbound N. Main Street from Bailey Lane reaches back into the square causing all movements to be impacted. In the AM peak hour, grid lock was prevented for the full peak hour, but the heavy volume of traffic into the low speed square caused excessive queuing on W. Main Street, extending west of N Central Street and on northbound I-57 extending back almost 2 miles from the ramp terminal at the end of the hour. In order to provide consistency and more measurable data, MOEs were collected for the first half of the peak hour in both cases.

The 2035 No-Build intersection operations analysis results from VISSIM are summarized in **Table 20-15**. The highlighted areas of the tables signify intersections or roadway segments of concern. Specifically red highlighting denotes LOS F and yellow highlighting denotes LOS E.

Table 20-15: 2035 No-Build Conditions Analysis (VISSIM)

Intersection/ Approach	AM Peak		PM Peak	
	LOS (Delay)	Max. Queue	LOS (Delay)	Max. Queue
West Main Street (IL-14) and Central Street (Signalized)				
Eastbound West Main Street Approach	B (17.1)	233	C (25.5)	172
Westbound West Main Street Approach	B (11.8)	363	B (10.4)	134
Northbound Central Street Approach	C (34.7)	165	C (24.5)	125
Southbound Central Street Approach	D (38.2)	443	C (23.3)	676
Overall	C (21.2)		B (19.4)	
West Main Street (IL-14) and I-57 SB Ramps (Signalized)				
Eastbound West Main Street Approach	D (35.9)	437	B (14.9)	311
Westbound West Main Street Approach	C (28.4)	602	A (6.4)	211
Southbound I-57 SB Off Ramp Approach	C (34.4)	418	B (19.0)	165
Overall	C (32.4)		B (11.8)	
West Main Street (IL-14) and I-57 NB Ramps (Signalized)				
Eastbound West Main Street Approach	F (166.9)	1169	D (49.2)	549
Westbound West Main Street Approach	D (36.1)	446	C (20.5)	284
Northbound I-57 NB Off Ramp Approach	F (154.7)	4074	E (59.9)	1057
Overall	F (129.8)		D (39.6)	
West Main Street (IL-14) and DuQuoin Street (Signalized)				
Eastbound West Main Street Approach	F (80.8)	1020	D (48.5)	880
Westbound West Main Street Approach	B (15.7)	574	B (11.4)	441
Northbound DuQuoin Street Approach	F (85.2)	364	F (85.4)	331
Southbound DuQuoin Street Approach	D (43.2)	204	F (392.3)	1472
Overall	E (56.2)		E (73.7)	
Petroff Road/East Illinois Street and North Main Street (IL-37) (Signalized)				
Eastbound Petroff Road Approach	C (26.0)	162	D (46.9)	172
Westbound East Illinois Street Approach	B (19.9)	198	C (21.7)	98
Northbound North Main Street (IL-37) Approach	C (29.7)	1097	C (24.9)	1159
Southbound North Main Street (IL-37) Approach	B (10.5)	225	F (205.7)	1670
Overall	C (22.9)		F (89.1)	-
Petroff Road and DuQuoin Street (Signalized)				
Eastbound Petroff Road Approach	B (13.4)	251	B (15.6)	184
Westbound Petroff Road Approach	B (16.6)	267	B (18.2)	287
Northbound DuQuoin Street Approach	B (11.6)	96	A (9.9)	96
Southbound DuQuoin Street Approach	B (11.2)	83	B (15.6)	145
Overall	B (14.1)		B (15.6)	
Main Street Square				
Eastbound West Main Street Approach	F (156.3)	2270	D (45.1)	708
Westbound East Main Street Approach	B (12.1)	0	C (30.1)	0
Northbound South Main Street Approach	B (17.4)	11	C (21.4)	0

Intersection/ Approach	AM Peak		PM Peak	
	LOS (Delay)	Max. Queue	LOS (Delay)	Max. Queue
Southbound North Main Street Approach	B (11.5)	0	F (136.6)	4360

From the VISSIM table, it is apparent that the existing network cannot withstand the impacts of the projected traffic growth.

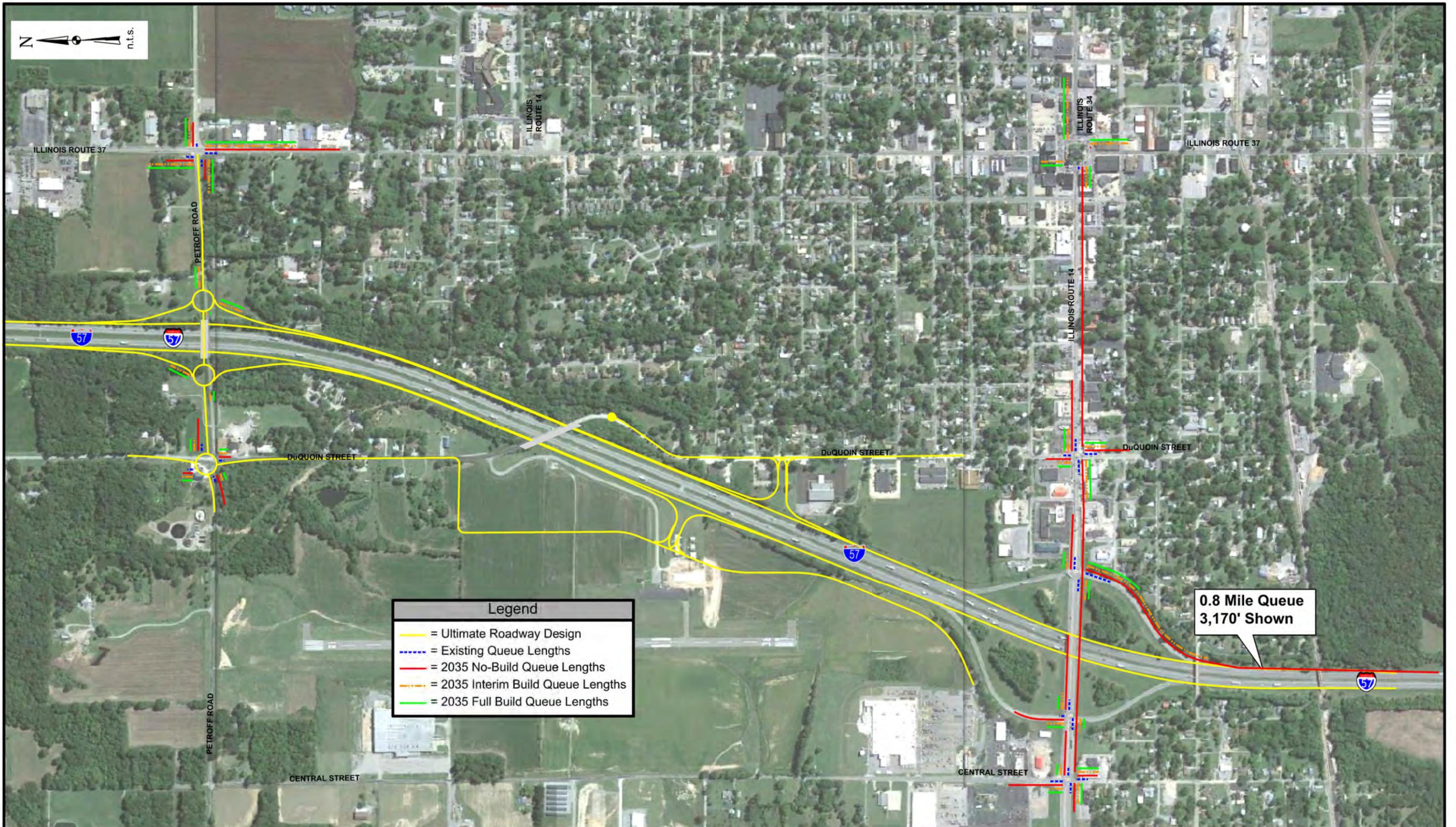
As noted above, in the AM peak hour, queues from the eastbound entrance to the Square extend along W. Main Street (IL-14) back to the I-57 southbound ramps and well past the diverge of the I-57 northbound off ramp after just the first 30 minutes of the peak hour. The intersection of W. Main Street and the I-57 northbound ramps operates at LOS F and the intersection of W. Main Street and DuQuoin Street operates at LOS E.

In the PM peak hour the intersections of N. Main Street and both Petroff Road and Bailey Street operate at LOS F. Additionally, the intersection of W. Main Street and DuQuoin Street operates at LOS E. A number of movements within each of these intersections also operate at a poor LOS along with the northbound I-57 off ramp. It is apparent in this analysis that the additional volume coming from N. Main Street north of Petroff Road cannot be handled by either the existing signalized intersection at N. Main and Petroff or the Square.

It should be reiterated that the poor results above are minimized by the addition of a two-lane Square with unattainable driving behaviors and analyzed through only half of the peak hour. Additional VISSIM analysis of the actual no-build network with the Square as it exists today was also completed for both peak hours (in their entirety) to determine the impacts of the Square itself. This analysis results in the queues shown in **Figures 20-5 and 20-6**. It is apparent that the Square, even more so than the rest of the network, cannot withstand the impacts of the projected traffic growth and results in miles of queuing throughout the network.

g. Intersection Analyses of the Design Year “Full Build” Conditions

The 2035 Build intersection operations analysis results from SYNCHRO 7 and SIDRA (for proposed roundabouts) are summarized in **Table 20-16**.



I-57 / IL 14 Interchange Modifications

Access Justification Report

Figure 20-5

AM Queue Lengths from VISSIM Models

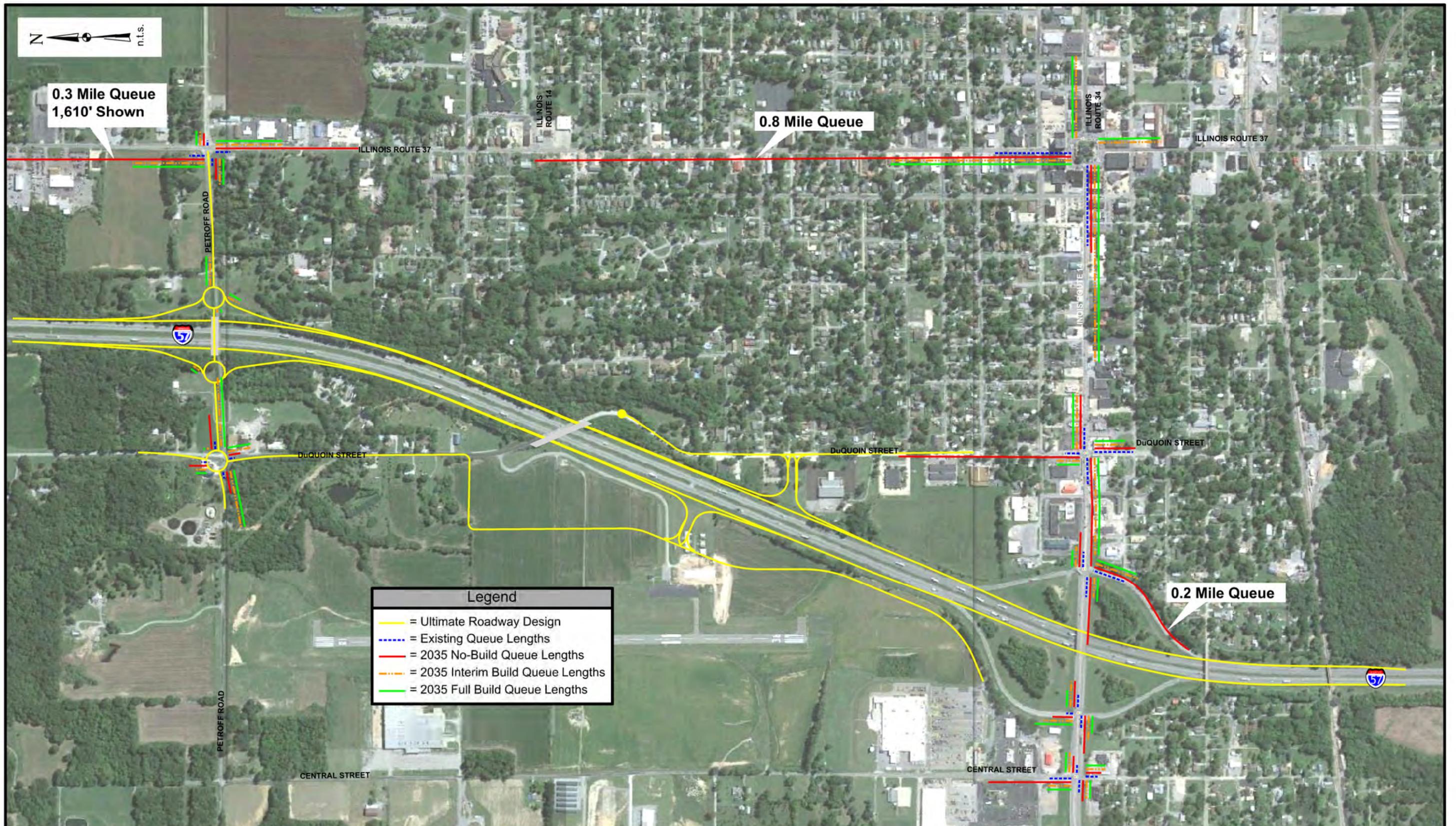


Table 20-16: 2035 Build Conditions Intersections Analysis (SYNCHRO7 and SIDRA)

Intersection / Approach	Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
	LOS (Delay, seconds)	Max 95th Queue, ft	LOS (Delay, seconds)	Max 95th Queue, ft
West Main Street (IL-14) and Central Street (Signalized)				
Eastbound West Main Street Approach	B (13.9)	135	B (18.8)	103
Westbound East Main Street Approach	B (12.8)	89	B (10.5)	113
Northbound Central Street Approach	C (20.3)	77	C (28.6)	103
Southbound Central Street Approach	C (28.3)	96	C (25.2)	213
Overall Intersection	B (16.1)		B (17.8)	
West Main Street (IL-14) and I-57 SB Ramps (Signalized)				
Eastbound West Main Street Approach	A (4.4)	41	A (6.1)	141
Westbound East Main Street Approach	A (3.4)	40	A (4.2)	46
Southbound I-57 SB Off Ramp Approach	C (24.1)	109	D (23.4)	124
Overall Intersection	A (6.2)		A (8.7)	
West Main Street (IL-14) and I-57 NB Ramps (Signalized)				
Eastbound West Main Street Approach	A (7.6)	110	A (6.1)	71
Westbound East Main Street Approach	B (14.3)	137	B (14.2)	189
Northbound I-57 NB Off Ramp Approach	D (38.8)	173	C (20.2)	121
Overall Intersection	B (14.6)		B (15.8)	
West Main Street (IL-14) and DuQuoin Street (Signalized)				
Eastbound West Main Street Approach	B (16.5)	258	B (13.0)	324
Westbound East Main Street Approach	A (8.1)	121	A (9.6)	193
Northbound DuQuoin Street Approach	C (26.3)	115	D (35.6)	124
Southbound DuQuoin Street Approach	A (8.9)	57	B (11.9)	71
Overall Intersection	B (14.0)		B (14.3)	
Petroff Road/East Illinois Street and North Main Street (IL-37) (Signalized)				
Eastbound Petroff Road Approach	D (40.6)	341	C (34.6)	162
Westbound East Illinois Street Approach	D (46.5)	223	D (41.4)	112
Northbound North Main Street (IL-37) Approach	C (34.5)	273	B (15.7)	154
Southbound North Main Street (IL-37) Approach	C (28.8)	306	B (15.7)	314
Overall Intersection	D (36.8)		C (21.6)	
Petroff Road At I-57 NB Ramps (Roundabout)				
Eastbound Petroff Road Approach	A (2.0)	0	A (3.5)	0
Westbound Petroff Road Approach	D (45.0)	718	D (39.5)	1069
Northbound I-57 NB Off Ramp Approach	B (18.8)	300	B (11.3)	69
Overall Intersection	C (23.5)		C (23.4)	
Petroff Road At I-57 SB Ramps (Roundabout)				
Eastbound Petroff Road Approach	A (3.3)	45	C (23.4)	484
Westbound Petroff Road Approach	A (1.6)	0	A (5.1)	0

Intersection / Approach	Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
	LOS (Delay, seconds)	Max 95th Queue, ft	LOS (Delay, seconds)	Max 95th Queue, ft
Southbound I-57 SB Off Ramp Approach	C (29.4)	196	B (13.5)	22
Overall Intersection	A (8.2)		B (14.0)	
Petroff Road and DuQuoin Street (Roundabout)				
Eastbound Petroff Road Approach	A (3.1)	37	C (31.8)	519
Westbound Petroff Road Approach	A (2.2)	160	A (3.5)	39
Northbound DuQuoin Street Approach	A (4.4)	29	B (15.6)	104
Southbound DuQuoin Street Approach	C (21.4)	99	A (9.3)	121
Overall Intersection	A (4.4)		B (15.7)	

From the SYNCHRO tables, all basic intersections within the study area operate at acceptable conditions with LOS C or better during both peak hours with the exception of Petroff Road/East Illinois Street and North Main Street (IL-37) which performs at LOS D during the AM peak hour. There are no movements operating below a LOS D. It should be noted that the intersection of Petroff Road/East Illinois Street and North Main Street (IL-37) was improved to include a second left turn lane for the eastbound movement. This improvement would be likely to occur as planned development occurs in the future.

Additionally, SIDRA software was used to analyze the performance of the proposed roundabouts at the new Petroff Road ramps and the intersection of Petroff Road and DuQuoin Street. Based on the projected 2035 volumes it was determined that modified two lane roundabouts would be required at both ramp terminals. The layouts for the ramp terminals may be modified to provide for more channelized flows through the roundabout lessening the stigma of a two-lane roundabout. Additionally based on assumptions of traffic growth over time, it was determined that one-lane roundabouts will likely work at all locations through at least 2025. It is recommended that the design of the one-lane roundabouts be compatible with revised striping to accommodate the layouts recommended for the design year.

The 2035 Build intersection operations analysis results from VISSIM are summarized in **Table 20-17**. The highlighted areas of the tables signify intersections or roadway segments of concern. Specifically red highlighting denotes LOS F and yellow highlighting denotes LOS E.

Table 20-17: 2035 Build Conditions Analysis (VISSIM)

Intersection/ Approach	AM Peak		PM Peak	
	LOS (Delay)	Max. Queue	LOS (Delay)	Max. Queue
West Main Street (IL-14) and Central Street (Signalized)				
Eastbound West Main Street Approach	A (7.9)	171	B (11.1)	149
Westbound East Main Street Approach	A (3.9)	91	A (7.4)	162
Northbound Central Street Approach	C (21.6)	175	B (18.8)	159
Southbound Central Street Approach	B (19.0)	121	B (15.4)	199
Overall	A (8.9)		B (11.3)	
West Main Street (IL-14) and I-57 SB Ramps (Signalized)				
Eastbound West Main Street Approach	A (1.2)	80	A (3.2)	143
Westbound East Main Street Approach	A (1.7)	110	A (4.6)	135
Southbound I-57 SB Off Ramp Approach	C (26.1)	138	C (21.0)	309
Overall	A (3.2)		A (6.4)	
West Main Street (IL-14) and I-57 NB Ramps (Signalized)				
Eastbound West Main Street Approach	A (8.9)	160	B (11.8)	197
Westbound East Main Street Approach	B (11.2)	139	A (8.6)	134
Northbound I-57 NB Off Ramp Approach	C (26.3)	442	C (23.0)	324
Overall	B (14.2)		B (13.0)	
West Main Street (IL-14) and DuQuoin Street (Signalized)				
Eastbound West Main Street Approach	A (9.9)	332	B (18.2)	791
Westbound East Main Street Approach	A (5.3)	183	B (13.5)	456
Northbound DuQuoin Street Approach	C (32.3)	176	D (37.0)	246
Southbound DuQuoin Street Approach	B (15.1)	108	C (20.3)	184
Overall	B (12.1)		B (19.1)	
Petroff Road/East Illinois Street and North Main Street (IL-37) (Signalized)				
Eastbound Petroff Road Approach	C (27.9)	270	C (22.7)	213
Westbound East Illinois Street Approach	C (28.8)	233	C (25.4)	119
Northbound North Main Street (IL-37) Approach	D (51.8)	743	D (39.6)	542
Southbound North Main Street (IL-37) Approach	C (26.1)	379	C (24.7)	583
Overall	C (33.7)		C (26.9)	
Petroff Road and I-57 NB Ramps (Roundabout)				
Eastbound Petroff Road Approach	A (2.2)	16	A (2.1)	27
Westbound Petroff Road Approach	B (13.0)	179	B (14.5)	244
Northbound I-57 NB Off Ramp Approach	B (11.5)	201	A (8.3)	109
Overall	B (10.1)		A (9.4)	
Petroff Road and I-57 SB Ramps (Roundabout)				
Eastbound Petroff Road Approach	A (2.7)	80	C (15.8)	571
Westbound Petroff Road Approach	A (1.8)	0	A (2.6)	2
Southbound I-57 SB Off Ramp Approach	C (18.4)	176	A (8.4)	65
Overall	A (6.0)		A (9.3)	
Petroff Road and DuQuoin Street (Roundabout)				
Eastbound Petroff Road Approach	A (4.1)	62	C (18.6)	467
Westbound Petroff Road Approach	A (2.9)	100	A (1.5)	19
Northbound DuQuoin Street Approach	A (2.6)	75	C (18.4)	194
Southbound DuQuoin Street Approach	A (9.0)	90	A (5.1)	90
Overall	A (3.7)		B (10.2)	
Main Street Square				
Eastbound West Main Street Approach	A (7.0)	178	F (72.9)	1598

Intersection/ Approach	AM Peak		PM Peak	
	LOS (Delay)	Max. Queue	LOS (Delay)	Max. Queue
Westbound East Main Street Approach	C (15.7)	506	C (19.2)	671
Northbound South Main Street Approach	A (9.5)	313	C (24.6)	504
Southbound North Main Street Approach	B (10.7)	181	F (71.4)	1475

From the VISSIM table, all study intersections within the study area operate at acceptable conditions with LOS C or better during both peak hours. This model also includes a two-lane eastbound left-turn lane at the intersection of Petroff Road/East Illinois Street and North Main Street (IL-37) as this improvement would be likely to occur as planned development occurs in the future.

Analysis of the downtown square shows that two movements operate at unacceptable levels of service in the PM peak period. Despite the addition of new ramps, trip generation estimates resulted in an approximately 50% growth in volumes entering the square. Due to this growth the square was modified to operate as a traditional roundabout in the build models. This would prevent gridlock and result in improved operations. As mentioned previously the projected volumes are a worst case and it is likely that the square will continue to function as it does presently for many years into the future. Based on the counts and information available it was difficult to determine how much traffic may reroute to new connections outside of the existing Benton business district, therefore very little traffic was moved and this worst case analysis was undertaken. The unacceptable LOS F for the eastbound movement results in a long queue down West Main Street/IL-14. The average queue length for this movement is approximately 650 feet, while the maximum queue is almost 1600 feet. Similarly, the unacceptable LOS F for the southbound movement results in a long queue down North Main Street/IL-37. The average queue length for this movement is approximately 375 feet, while the maximum queue is 1475 feet. While these are extreme queues, they do appear to clear throughout the peak period. The delay of approximately 70 seconds supports this statement and seems to be a reasonable delay at the projected volumes. Based on **Figures 20-5 and 20-6** it is evident that maximum queue lengths from the square are considerably longer in the 2035 Build scenario than in the existing. This is a result of both the 50% increase in volume and a change in the operations of the square itself. Should the square continue to operate under the existing driver parameters, it is likely that queue lengths would be shorter but delay within the square would increase considerably. However, it should be noted that the projected "Build" queues are considerably shorter than those shown in the 2035 No-Build scenario; and are not anticipated to impact operations on I-57.

h. Intersection Analyses of the Design Year "Interim Build" Conditions

The 2035 Interim condition does not include the C-D road between the West Main Street/IL-14 Ramps; resulting in heavy through movements at the signalized intersections of these ramps. The 2035 Interim intersection operations analysis results from SYNCHRO 7 are summarized in **Table 20-18**. Only the intersections at the ramp terminal of Interstate 57 and West Main Street/IL-14 were analyzed, as other intersections were not impacted.

Table 20-18: 2035 Interim Conditions Intersections Analysis (SYNCHRO 7)

Intersection / Approach	Weekday A.M. Peak Hour		Weekday P.M. Peak Hour	
	LOS (Delay, seconds)	Max 95th Queue, ft	LOS (Delay, seconds)	Max 95th Queue, ft
West Main Street (IL-14) and I-57 Southbound Ramps (Signalized)				
Eastbound West Main Street Approach	A (4.6)	41	B (12.5)	189
Westbound East Main Street Approach	B (13.4)	131	A (7.6)	72
Southbound I-57 SB Off Ramp Approach	C (20.9)	106	C (31.4)	301
Overall Intersection	B (11.5)		B (18.1)	
West Main Street (IL-14) and I-57 Northbound Ramps (Signalized)				
Eastbound West Main Street Approach	D (48.2)	252	A (5.6)	50
Westbound East Main Street Approach	B (17.0)	165	B (14.8)	189
Northbound I-57 NB Off Ramp Approach	D (37.4)	318	C (22.1)	136
Overall Intersection	D (35.0)		B (13.1)	

From the SYNCHRO table, both intersections operate at acceptable conditions with LOS D or better during both peak hours. There are no movements operating below a LOS D. In order to provide for the through movements and to obtain adequate levels of service, the following modifications were made to the ramps.

At the southbound Interstate 57 ramps

❖ Interim

- a 200 foot exclusive right turn lane was added,
- a 250 foot shared through/left turn lane was added, and

❖ Full Build

- a second lane was added to the I-57 on ramp to the length required by design to taper into a single lane before merging onto the interstate.

At the Interstate 57 northbound ramps

❖ Interim

- a 350 foot exclusive right turn lane was added,
- a 350 foot shared through/left turn lane was added, and

❖ Full Build

- a second lane was added to the C-D road on ramp to the length required by design to taper into a single lane.

No changes were necessary along West Main Street/IL-14.

The 2035 Interim intersection operations analysis results from VISSIM are summarized in **Table 20-19**. All intersections within the network were analyzed; however the result remained very similar to the Build scenario for all intersections other than the modified ramp terminals.

Table 20-19: 2035 Interim Conditions Analysis (VISSIM)

Intersection/ Approach	AM Peak		PM Peak	
	LOS (Delay)	Max. Queue	LOS (Delay)	Max. Queue
West Main Street (IL-14) and I-57 SB Ramps (Signalized)				
Eastbound West Main Street Approach	A (3.0)	119	A (8.2)	206
Westbound East Main Street Approach	A (7.9)	139	B (12.9)	210
Southbound I-57 SB Off Ramp Approach	C (22.7)	141	C (22.5)	253
Overall	A (8.8)		B (14.6)	
West Main Street (IL-14) and I-57 NB Ramps (Signalized)				
Eastbound West Main Street Approach	B (12.0)	171	B (10.5)	165
Westbound East Main Street Approach	B (10.3)	129	A (7.8)	167
Northbound I-57 NB Off Ramp Approach	D (38.9)	1281	D (45.3)	365
Overall	C (23.9)		B (19.2)	

From the VISSIM table, both intersections operate at acceptable conditions with LOS C or better during both peak hours. These operations were accomplished by making the same network modifications mentioned above for the SYNCHRO model. In general delays and level of service are very similar to those found in the SYNCHRO analysis, while queues are slightly longer. Specifically, a long queue occurs on the northbound ramp in the AM peak hour. While the maximum queue length modeled is very long, it is not expected to back up into the interstate through lanes, and the average queue length is a very reasonable 140 feet.

It should be noted that this alternative is designed to be a temporary solution until actual volumes merit and require the Full Build phase. At the projected 2035 volumes all modeled intersections operate effectively. As the volumes increase above this level and ramp queues begin to threaten the operation of the freeway, the full Build phase should be implemented.

i. Weave Area Analyses of the Existing Conditions

From the HCS **Table 20-4**, all basic freeway and merge/diverge segments along I-57 operate at acceptable conditions with LOS B or better during both peak hours. According to VISSIM **Table 20-5**, analysis all basic freeway and merge/diverge segments along I-57 operated at LOS A.

j. Weave Area Analyses of the Design Year “No-Build” Conditions

From the HCS **Table 20-6** all basic freeway and merge/diverge segments along I-57 operate at acceptable conditions with LOS C or better during both peak hours. The VISSIM **Table 20-7** also shows LOS C for all segments except for the northbound off-ramp to IL-14 during the AM peak period. Due to a considerable increase in traffic, according to HCS, moderate delay and reduced speeds are experienced at merge and diverge points throughout the analysis area. This also occurs in the VISSIM analysis with the northbound off ramp at IL-14 having the most delay in the AM peak hour and the southbound on ramp at IL-14 having the most delay in the PM peak hour.

k. Weave Area Analyses of the Design Year “Full Build” Conditions

Based on the analysis, freeway operations are minimally impacted by the modifications and addition of a split ramp at Petroff Road. Because no gore points are being added and No Build and Build volumes are projected to be the same, the only impact to the freeway is the weave section between the I-57 northbound on ramp and the rest area. The weave section operates at a level of service B or better according to both HCS and VISSIM, this is an operational improvement over both the existing merge point from the IL-14 on ramp and the existing diverge to the rest area under both analysis methods.

From both the HCS and VISSIM **Tables 20-8 and 20-9**, all basic freeway and merge/diverge segments along I-57 operate at acceptable conditions with LOS C or better during both peak hours. The HCS results for the Full-Build Condition show improved conditions at diverge and merge sections where improvements are made to deceleration/acceleration lanes, in addition to the improved operations with the addition of the northbound auxiliary lane north of Petroff Road. All freeway segments remain the same, as volumes are the same in both scenarios.

The VISSIM results also show improvements at both diverge sections and in the weave section. Again, this is due to the improvements made as a result of the project. The merge section at the IL-14 on ramp to I-57 SB, however, results in an increased density and decreased speed between the No-Build and Build scenarios. This is most likely due to the way that vehicles are getting to this merge point. While HCS accounts for all vehicles input into each section of freeway, VISSIM accounts for the operations of the full network. Therefore, it is likely that due to the C-D Road and improved overall network operations of the Build VISSIM model, more traffic is actually getting to this merge section (and the subsequent freeway section) in the Build model than is in the No-Build model. All other freeway sections, show very similar results between the No-Build and Build scenarios, any discrepancies are again due to the actual volumes getting to the segments.

l. Weave Area Analyses of the Design Year “Interim Build” Conditions

Only the northbound off-ramp diverge and southbound on-ramp merge segments are impacted between the Full-Build and Interim Build conditions. All other segments are the same as the Full-Build condition. The HCS model shows the 2035 Interim Build condition at the IL-14 northbound off-ramp

and southbound on-ramp similar to the No-Build condition. This is reasonable to expect since these ramp connections to I-57 remain unchanged from the no-build condition.

20-5 Conditions Analysis Summary

While freeway conditions are improved, these modifications are being undertaken in order to improve access to a developing area. The comparison of Build to No-Build alternatives provides an obvious improvement in overall network conditions at the same projected traffic volumes. This improvement is made without making significant changes throughout the network. The analysis shows that without the modified interchange, critical routes through the Benton and West City business districts would be detrimentally impacted by additional traffic resulting from growth and development in the northern parts of Benton. Major improvements would be required at multiple locations in order to provide adequate levels of service, and this would still not address the congestion issues of the downtown square.

At current volumes, the downtown square is impacted from heavy trucks and congestion. Currently these impacts do not normally result in extreme traffic delays, although, there are occasions where large trucks gridlock the entire square. As an area otherwise extremely conducive for pedestrians, the heavy truck traffic in the Square is an unfortunate circumstance of the current interchange configuration. Removing a significant amount of truck traffic from the Square will certainly provide a more walkable environment. Many of the existing pedestrian accommodations in the Square are outdated and many of the crosswalks are faded. As such, basic updates and/or modernization of the existing curb ramps and striping will be completed in advance or in addition to the proposed interchange improvements. Adding access at Petroff Road will allow for alternate routing of heavy vehicles, enhancing the walkable environment of the Square and surrounding neighborhoods.

The proposed interchange modifications will provide for a much improved quality of life in Benton and West City. Travel times will be improved and throughout the area as commuters and heavy trucks are able to utilize much more efficient routes to and from the freeway. This improved efficiency along with exceptional development opportunities in the northern parts of Benton is expected to result in a major boost for local industrial and business development.

A summary of the LOS results is provided in **Figures 20-7 through 20-10**.

Figure 20-7: Existing Peak Hour LOS Summary

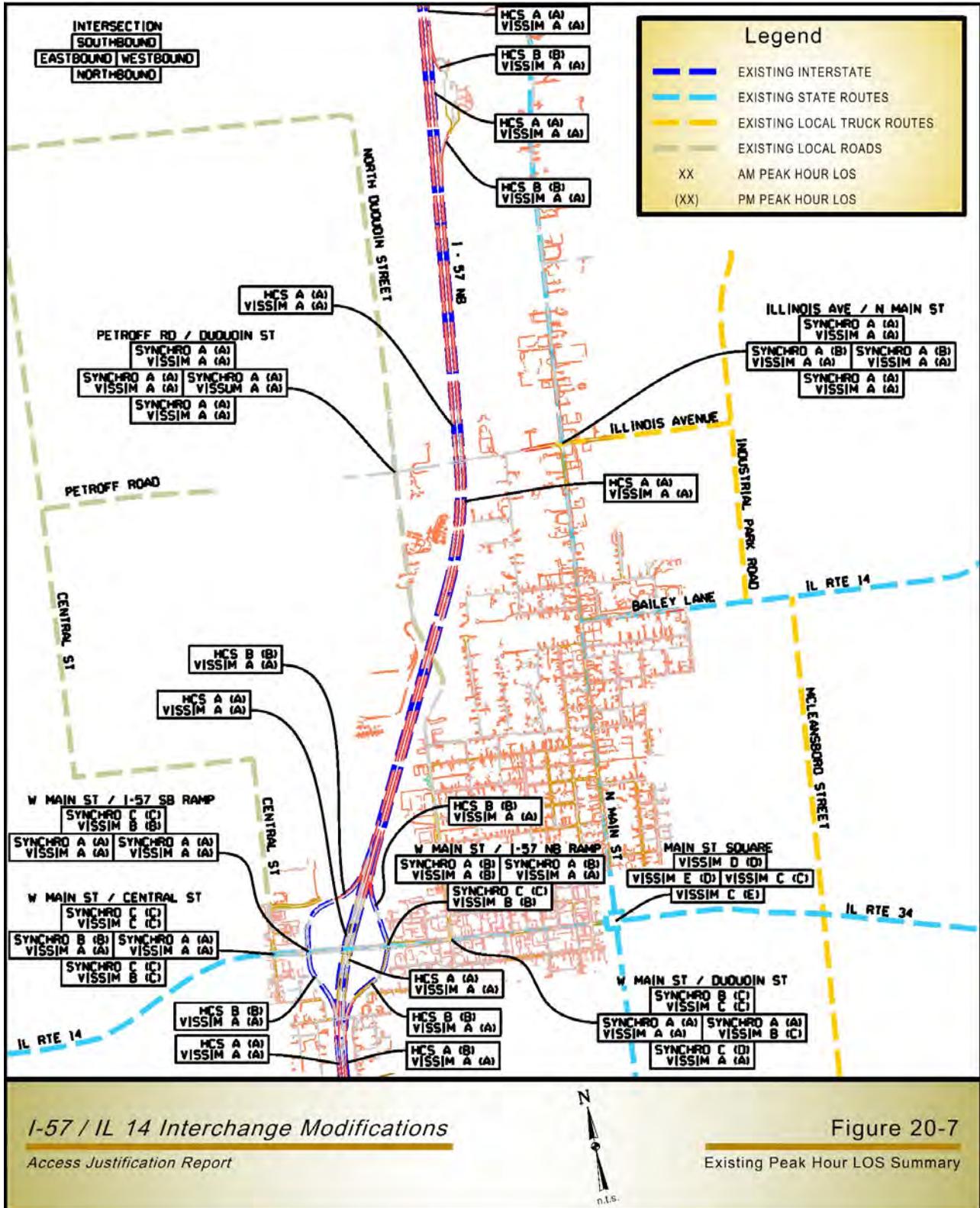


Figure 20-8: Design Year "No-Build" LOS Summary

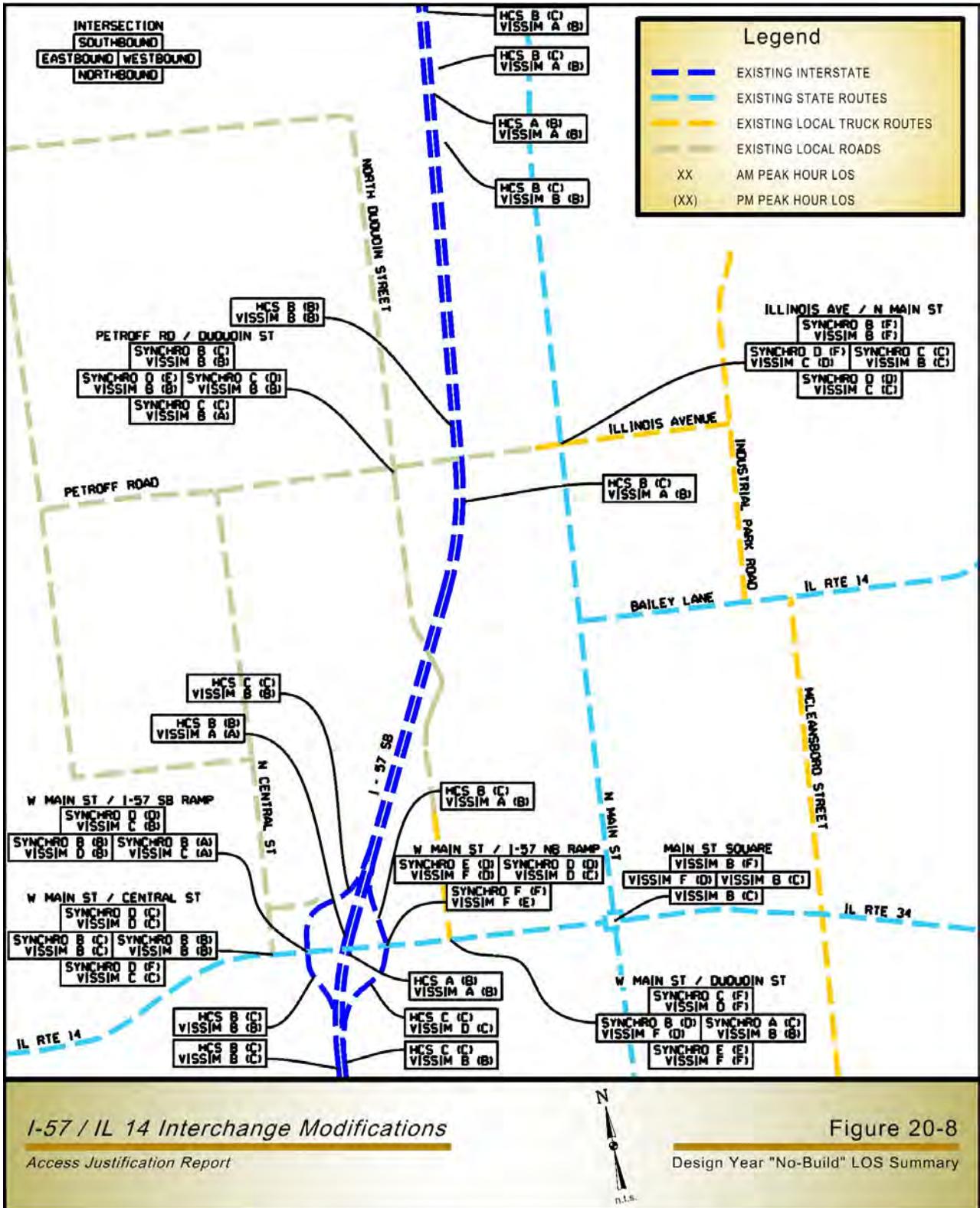


Figure 20-9: Design Year "Full Build" LOS Summary

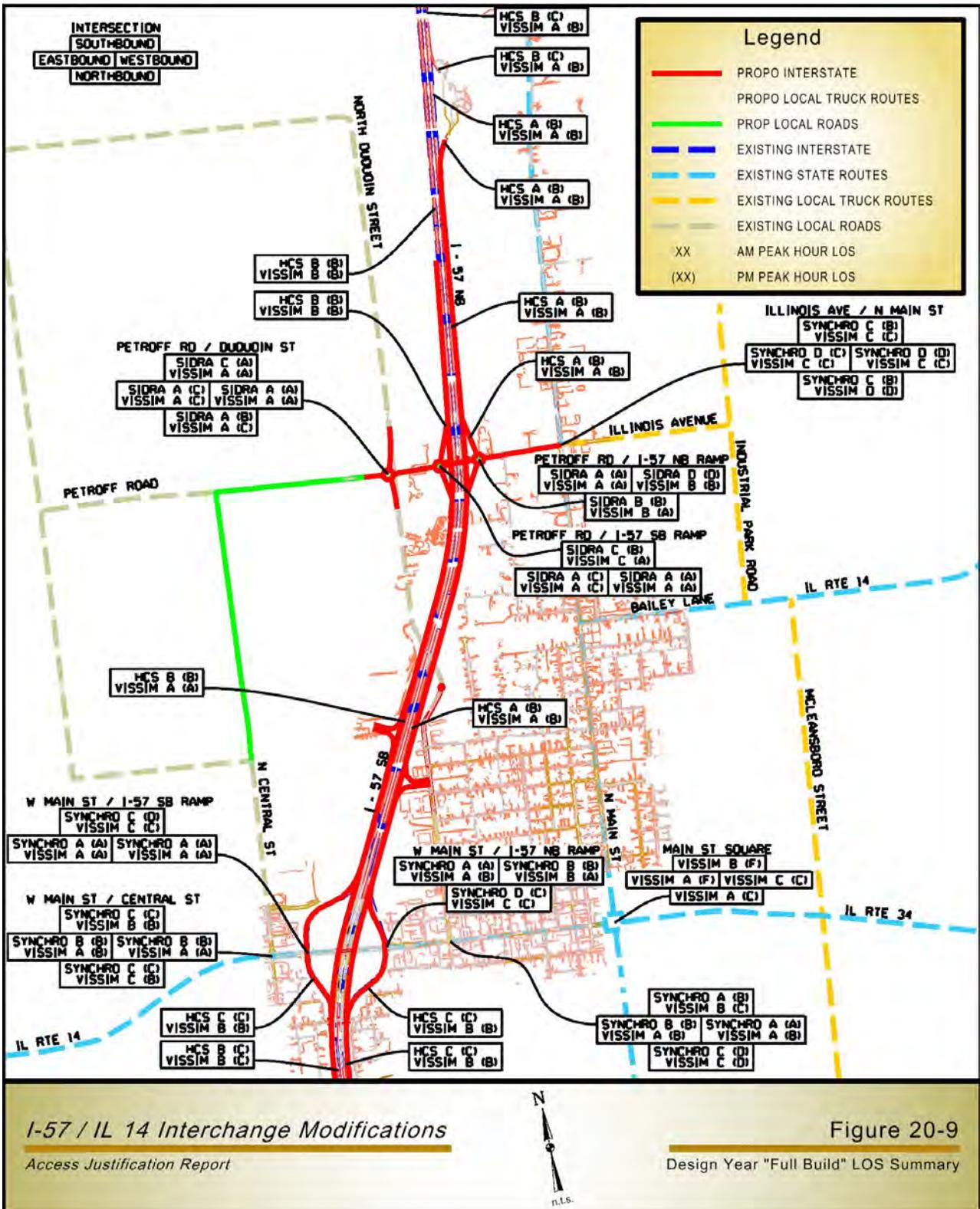


Figure 20-10: Design Year "Interim" LOS Summary

