



# Phase II: ICE Worksheet

## Project and Analyst Information:

Project ID: 0656-01-00  
Project Type: Traffic Impact Analysis (TIA)  
Location: 4<sup>th</sup> Street and Liberty Avenue  
City of Beloit  
Rock County

Analyst: Lee Gibbs  
Agency: SRF Consulting Group  
Date: April 19, 2019

## Background Information:

**Project Need:** This intersection is the primary gateway to the Beloit Memorial High School campus. With 4<sup>th</sup> Street recently closed one block north of Liberty Avenue, traffic patterns at this intersection have shifted to accommodate this condition. Furthermore, high school land use plans show continued growth to the campus and the de-emphasis of the 4<sup>th</sup> Street and Liberty Avenue intersection as the gateway to the high school campus.

**Project Objectives:** Project objectives include the evaluation of intersection alternatives to accommodate both vehicular and non-vehicular traffic at 4<sup>th</sup> Street and Liberty Avenue for future-year conditions.

**Additional Information:** 4th Street, the north-south roadway, provides two travel lanes north of Liberty Avenue and four travel lanes south of Liberty Avenue. Liberty Avenue, the east-west roadway, provides two travel lanes on both approaches. Wisconsin State Trunk Highways 81 and 213 (WIS 81/213) run concurrent to 4th Street and Liberty Avenue and are designated as such on the south and west approaches of this intersection. A northbound left-turn lane and an eastbound right-turn lane are the only exclusive turn lanes provided at this intersection. All roadway approaches have a posted speed limit of 25 miles per hour and on-street parking is prohibited near the intersection. The intersection is located on the south end of the Beloit Memorial high school campus and experiences a high amount of high school pedestrians and student pick-up and drop-off operations. Other land uses in the area consist of a CVS drug store (southeast quadrant), Taco Johns fast-food restaurant (northwest quadrant), and a Speedway gas station (southwest quadrant).

**Existing Crash Information:**

Please include the crash diagram as an attachment.

Crash Trends: Crash data for Years 2013 through 2017 were obtained from the WisDOT database via UW TOPSLab. 24 crashes were documented at the intersection of 4th Street and Liberty Avenue. Attached with this document is a crash diagram illustrating and summarizing the crashes. The following summarizes key findings from the obtained crashes:

- Of the 24 crashes, 8 crashes were rear-end crashes ; 7 crashes were angle crashes ; 5 crashes were sideswipe crashes ; 2 crashes were fixed object crashes ; and 1 crash was a head-on crash
- 1 crash resulted in a B-injury crash, 1 crash resulted in a C-injury crash, and 22 crashes resulted in property damage only

10 of 24 crashes occurred during inclement weather and/or roadway conditions (i.e. rain, snow, wet pavement, snow-covered pavement, icy pavement)

Crash History:	Crashes	K	A	B	C	PD	Crash Type				
							Angle	Head-On	Other	Rear-end	Sideswipe
2013	6	0	0	1	0	5	3	0	1	1	1
2014	5	0	0	0	0	5	0	0	0	3	2
2015	2	0	0	0	0	2	1	0	0	1	0
2016	5	0	0	0	0	5	2	0	0	2	1
2017	6	0	0	0	1	5	1	1	1	1	2
Total	24	0	0	1	1	22	7	1	2	8	6

**Additional Modes of Transportation:**

Please fill out the following table, adding rows as needed for each additional mode of transportation.

Mode	Need? Yes/No	Nearby Generators and Existing Facilities	Volume	
			#	Unit
PED/BIKE	Yes	Beloit Memorial High School	130	peds during school release
OSOW	Yes	4 <sup>th</sup> Street and Liberty Avenue identified as long range truck route		

Other Information: Identify any concerns or limitations the additional modes of transportation have.

**Summary Table:**

Please fill out the following table (delete any unused alternative rows and corresponding pages).

Alternative and Traffic Control Type <sup>1</sup>	Geometric Changes	Construction/O&M Costs	Real Estate			Environmental	
			Bldgs.	Acre	Cost	Type of Impact	Acre
Enter Future No-Build Conditions	-	-	-	-	-	-	-
Enter Alternative 1 Conditions	Single-lane roundabout	\$400,000		0.25	\$12,500	Choose an item.	
Enter Alternative 2 Conditions	Convert east leg to westbound-movement only	\$10,000				Choose an item.	
Enter Alternative 3 Conditions	Convert north leg to northbound-movement only	\$10,000				Choose an item.	
Enter Alternative 4 Conditions	Eliminate east leg and realign to the north, create horizontal curve for major street, and TWSC with north leg	\$500,000	1	1.0	\$300,000	Choose an item.	
Enter Alternative 5 Conditions	Eliminate east leg and realign to the north, create horizontal curve for major street, and AWSC with north leg	\$500,000	1	1.0	\$300,000	Choose an item.	

**Recommendation:**

Recommended Alternative: No-build

Concerns or Considerations: Based on peak-hour traffic operations analysis, the no-build condition will continue to work adequately with no anticipated operational deficiencies. Alternatives 1, 2, and 3 will also have adequate traffic operations, but will require right of way (Alternative 1) or limit access to the intersection (Alternative 2 and 3) which is not necessary for the no-build condition. Alternative 4 and 5 will have significant construction costs and are anticipated to have poor operations on the minor approach.

There is a possibility that southbound 4<sup>th</sup> Street approaching Liberty Avenue may be eliminated as part of improvements to the Beloit Memorial High School campus. If this occurs, it is likely that a traffic signal would not be needed at this intersection; however, other intersection improvements would be necessary to accommodate the predominant traffic movement (S-W legs) and the high number of pedestrians during school start and release times.

<sup>1</sup> If the project is an interchange, please list each intersection separately. Ex: Alt. 1, Int. 1: Traffic Signal & Alt. 1, Int. 2: RAB – Single Lane

**Enter Future No-Build Conditions and Enter Alternative 1 Conditions**

<b>Practical Feasibility</b>	<b>Enter Future No-Build Conditions</b>	<b>Enter Alternative 1 Conditions</b>
Public Opinion:	None	None
Business Impacts:	None	Minor – possible temporary limited easements necessary during construction
ROW Impacts:	None	Approximately 0.25 acres would be needed for construction
Utility Impacts:	None	Unknown at this time
Cost Estimate:	None	\$400,000 + right of way acquisition
Additional Info:		
<b>Operational Analysis</b>	<b>Enter Future No-Build Conditions</b>	<b>Enter Alternative 1 Conditions</b>
Warrant Analysis:	Yes; meets School Crossing warrant	N/A
Queue Impacts:	None	None
Additional Capacity:	Yes; adequate additional capacity anticipated	Yes; adequate additional capacity anticipated
Railroad/Lift Bridge Influence:	N/A	N/A
Additional Info:		



Year:	2040 Enter Future No-Build Conditions												2040 Enter Alternative 1 Conditions											
AM Peak	EB			WB			NB			SB			EB			WB			NB			SB		
	L/T	-	R	-	All	-	L	-	T/R	-	All	-	-	All	-	-	All	-	-	All	-	-	All	-
# Lanes	1		1		1		1		1		1			1			1			1			1	
LOS	B		B		B		B		A		B			B			A			A			B	
Delay (s)	15.8		12.6		15.6		9.4		7.7		18.6			10.2			6.3			8.1			11.3	
v/c	0.15		0.59		0.11		0.52		0.37		0.59			0.50			0.08			0.38			0.62	
Queue (ft.)	45		210		30		150		155		220			70			5			40			100	
Storage (ft.)			140				200																	
Int. LOS	B												B											
PM Peak	EB			WB			NB			SB			EB			WB			NB			SB		
	L/T	-	R	-	All	-	L	-	T/R	-	All	-	-	All	-	-	All	-	-	All	-	-	All	-
# Lanes	1		1		1		1		1		1			1			1			1			1	
LOS	B		B		B		B		A		C			A			A			A			B	
Delay (s)	18.7		10.9		19.7		11.9		7.2		22.9			9.5			7.9			9.3			14.5	
v/c	0.09		0.54		0.24		0.71		0.28		0.51			0.48			0.18			0.34			0.73	
Queue (ft.)	30		230		75		290		125		185			55			15			35			160	
Storage (ft.)			140				200																	
Int. LOS	B												B											
Add. Info.	NB approach has two travel lanes that convert to a left-turn and through/right lane configuration. Storage lane length listed for this approach																							

Safety Analysis	Enter Future No-Build Conditions	Enter Alternative 1 Conditions
Improvement of Crash Trend(s):		
CMF(s) for Treatment(s):		WisDOT CMF I-5.04.1.0.AS has a CMF of 0.86 for KABC crashes and 1.32 for PDO crashes
Additional Info:		

**Enter Alternative 2 Conditions and Enter Alternative 3 Conditions**

<b>Practical Feasibility</b>	<b>Enter Alternative 2 Conditions</b>	<b>Enter Alternative 3 Conditions</b>
Public Opinion:	None	None
Business Impacts:	Minor – Traffic to CVS could not enter the site via Liberty Avenue, but existing access remains on 4 <sup>th</sup> Street	Beloit Memorial High School traffic would need to be diverted to other routes for access from the high school traffic to 4 <sup>th</sup> Street
ROW Impacts:	None	None
Utility Impacts:	None	None
Cost Estimate:	\$10,000	\$10,000
Additional Info:		
<b>Operational Analysis</b>	<b>Enter Alternative 2 Conditions</b>	<b>Enter Alternative 3 Conditions</b>
Warrant Analysis:	Yes; meets School Crossing warrant	Yes; meets School Crossing warrant
Queue Impacts:	None	None
Additional Capacity:	Yes; adequate additional capacity anticipated	Yes; adequate additional capacity anticipated
Railroad/Lift Bridge Influence:	N/A	N/A
Additional Info:		

Year:	2040 Enter Alternative 2 Conditions												2040 Enter Alternative 3 Conditions												
AM Peak	EB			WB			NB			SB			EB			WB			NB			SB			
	L	-	R	-	All	-	L	T	-	-	-	T/R	L/T	-	R	-	All	-	L	-	T/R	-	-	-	
# Lanes	1		1		1		1	1				1	1		1		1		1		1				
LOS	B		B		B		B	A				B	A		A		A		B		B				
Delay (s)	15.5		12.6		15.4		11.6	7.5				18.8	8.2		0.0		8.1		10.3		10.5				
v/c	0.15		0.59		0.11		0.62	0.36				0.66	0.11		0.00		0.07		0.42		0.54				
Queue (ft.)	45		210		30		145	145				220	30		0		20		130		155				
Storage (ft.)			140				200								140				200						
Int. LOS	B												B												
PM Peak	EB			WB			NB			SB			EB			WB			NB			SB			
	L	-	R	-	All	-	L	T	-	-	-	T/R	L/T	-	R	-	All	-	L	-	T/R	-	-	-	
# Lanes	1		1		1		1	1				1	1		1		1		1		1				
LOS	B		B		B		B	A				C	A		A		A		B		A				
Delay (s)	18.5		11.1		19.7		14.6	7.0				24.3	9.6		0		9.9		12.5		9.6				
v/c	0.04		0.57		0.25		0.82	0.26				0.66	0.08		0.00		0.16		0.65		0.39				
Queue (ft.)	15		240		75		290	120				220	20		0		45		260		120				
Storage (ft.)			140				200								140				200						
Int. LOS	B												B												
Add. Info.																									

Safety Analysis	Enter Alternative 2 Conditions	Enter Alternative 3 Conditions
Improvement of Crash Trend(s):		
CMF(s) for Treatment(s):		
Additional Info:		

**Enter Alternative 4 Conditions and Enter Alternative 5 Conditions**

<b>Practical Feasibility</b>	<b>Enter Alternative 4 Conditions</b>	<b>Enter Alternative 5 Conditions</b>
Public Opinion:	None	None
Business Impacts:	Existing Speedway gas station would likely be acquired and removed to realign major roadway	Existing Speedway gas station would likely be acquired and removed to realign major roadway
ROW Impacts:	Approximately 1.0 acres of land + business acquisition	Approximately 1.0 acres of land + business acquisition
Utility Impacts:	Likely – unknown at this time	Likely – unknown at this time
Cost Estimate:	\$500,000 + right of way acquisition and/or relocation	\$500,000 + right of way acquisition and/or relocation
Additional Info:		
<b>Operational Analysis</b>	<b>Enter Alternative 4 Conditions</b>	<b>Enter Alternative 5 Conditions</b>
Warrant Analysis:	None	None
Queue Impacts:	The southbound queues will likely spill back to the intersection with the realigned east leg	The southbound queues will likely spill back to the intersection with the realigned east leg
Additional Capacity:	No	No
Railroad/Lift Bridge Influence:	N/A	N/A
Additional Info:		

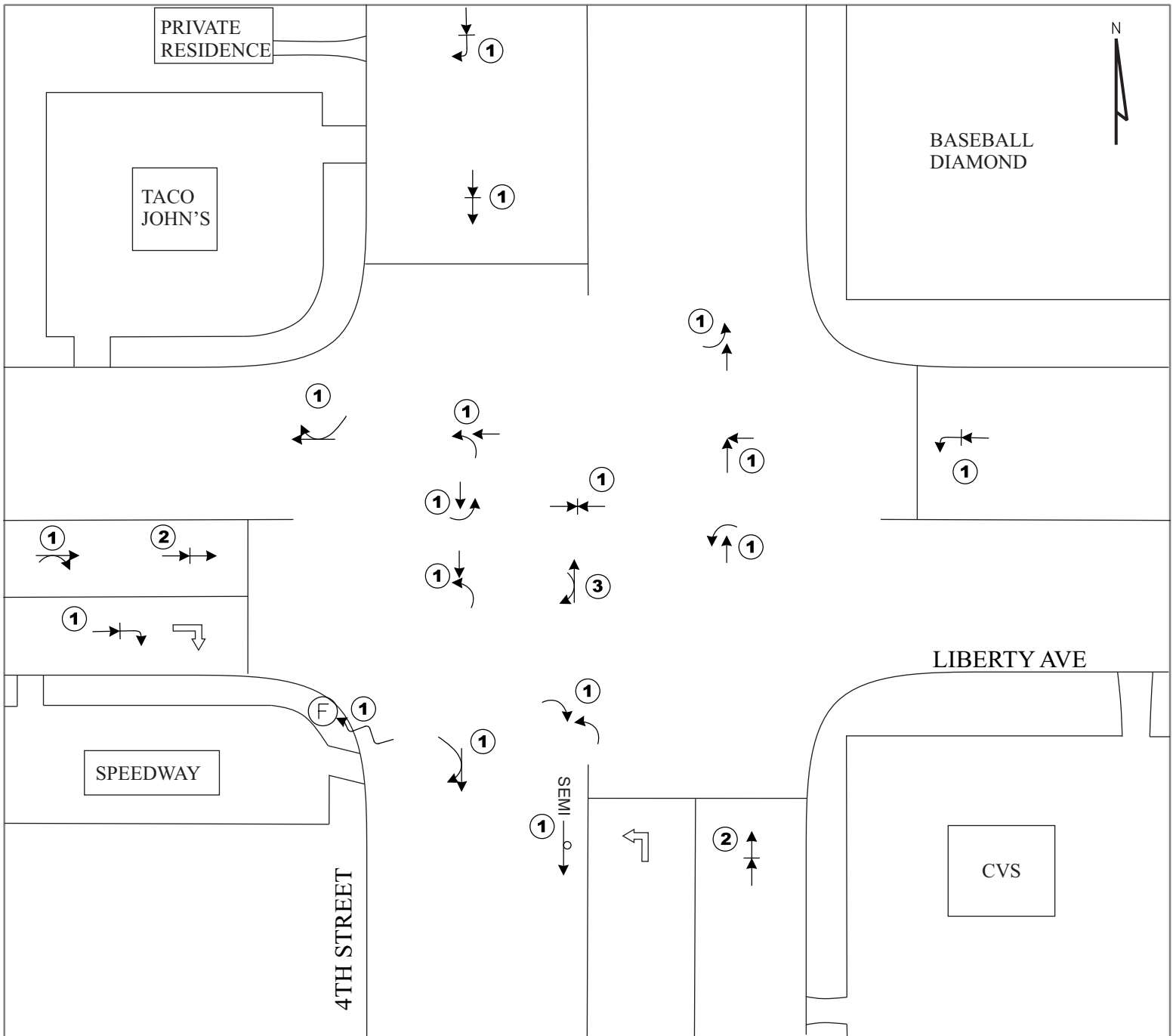
Year:	2040 Enter Alternative 4 Conditions												2040 Enter Alternative 5 Conditions											
AM Peak	EB			WB			NB			SB			EB			WB			NB			SB		
	L	T	-	-	T	R	-	-	-	L	-	R	L	T	-	-	T	R	-	-	-	L	-	R
# Lanes	1	1			1	1				1		1	1	1			1	1				1		1
LOS	A	A			A	A				F		B	B	D			C	C				C		B
Delay (s)	9.4	0.0			0.0	0.0				92.9		11.3	11.9	32.4			21.8	19.5				23.3		11.6
v/c	0.09	---			---	---				0.99		0.17	0.17	0.79			0.64	0.64				0.62		0.22
Queue (ft.)	10									255		30												
Storage (ft.)	100					100						100	100					100						100
Int. LOS	C												C											
PM Peak	EB			WB			NB			SB			EB			WB			NB			SB		
	L	T	-	-	T	R	-	-	-	L	-	R	L	T	-	-	T	R	-	-	-	L	-	R
# Lanes	1	1			1	1				1		1	1	1			1	1				1		1
LOS	B	A			A	A				F		C	B	E			F	C				C		B
Delay (s)	10.3	0.0			0.0	0.0				362		16.5	11.5	41.1			99.4	15.4				25.0		11.9
v/c	0.06	---			---	---				1.65		0.27	0.10	0.88			1.10	0.52				0.65		0.22
Queue (ft.)	10									485		30	10	220			460	75				110		20
Storage (ft.)	100					100						100	100					100						100
Int. LOS	F												F											
Add. Info.																								

Safety Analysis	Enter Alternative 4 Conditions	Enter Alternative 5 Conditions
Improvement of Crash Trend(s):		
CMF(s) for Treatment(s):		
Additional Info:		



FIGURE 1  
INTERSECTION LOCATION  
4th STREET AND LIBERTY AVE  
BELOIT, WISCONSIN





**DOCUMENTATION CONVENTION**

Ⓝ = CRASH FREQUENCY (2013-2017)

**CRASH RATE**

**0.25 Crashes**  
Per One Million  
Entering Vehicles

Entering Vehicles: 10,350/day

**CRASH FREQUENCY/SEVERITY**

**24 Crashes**

- 0 Fatal Crash (K)
- 0 Incapacitating (A-level)
- 1 Non-Incapacitating (B-level)
- 1 Possible Injury (C-level)
- 22 Property Damage Only

**LEGEND**

- |                   |                     |                       |                  |
|-------------------|---------------------|-----------------------|------------------|
| → Moving Vehicle  | Ⓢ/Ⓨ Stop/Yield Sign | ↗ Angle (Right Angle) | ↔ Head-On        |
| ↔ Backing Vehicle | Ⓣ Tree              | ↖ Angle (Left Turn)   | ↔ Rear-End       |
| - - - Pedestrian  | Ⓤ Utility Pole      | ↘ Angle (Right Turn)  | ⤴ Out of Control |
| -B> Bicyclist     | ⓕ Fixed Object      | ↔ Sideswipe-Same      | ↗ Overtake       |
| ▭ Parked Vehicle  | Ⓝ Non-Fixed Object  | ↔ Sideswipe-Opposite  | ⦿ Overtake       |

**FIGURE 2**  
**COLLISION DIAGRAM**  
**4th STREET AND LIBERTY AVE**  
**BELOIT, WISCONSIN**

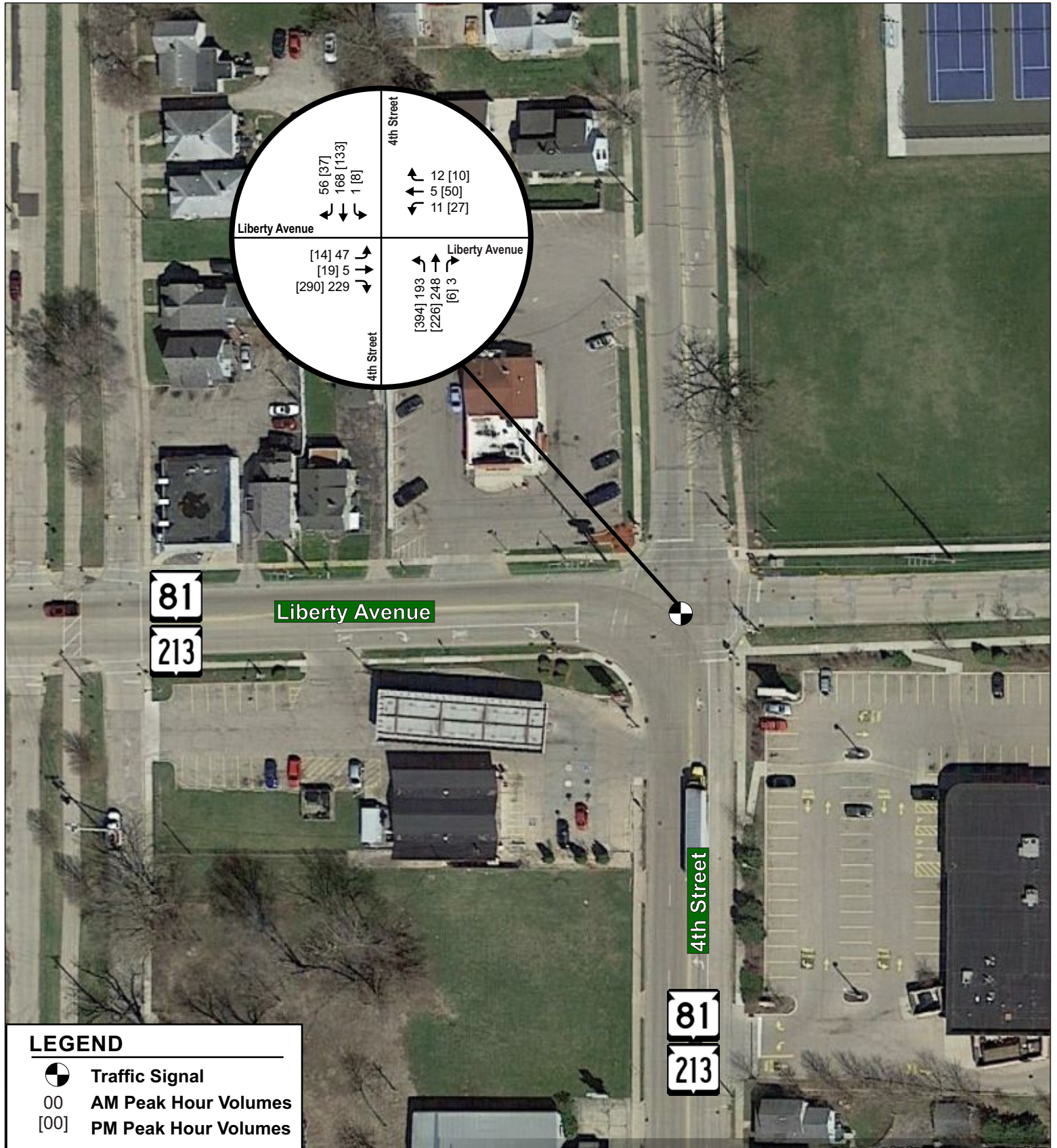


FIGURE 3  
 2018 INTERSECTION TURNING MOVEMENT COUNTS  
 4th STREET AND LIBERTY AVE  
 БЕЛОИТ, WISCONSIN



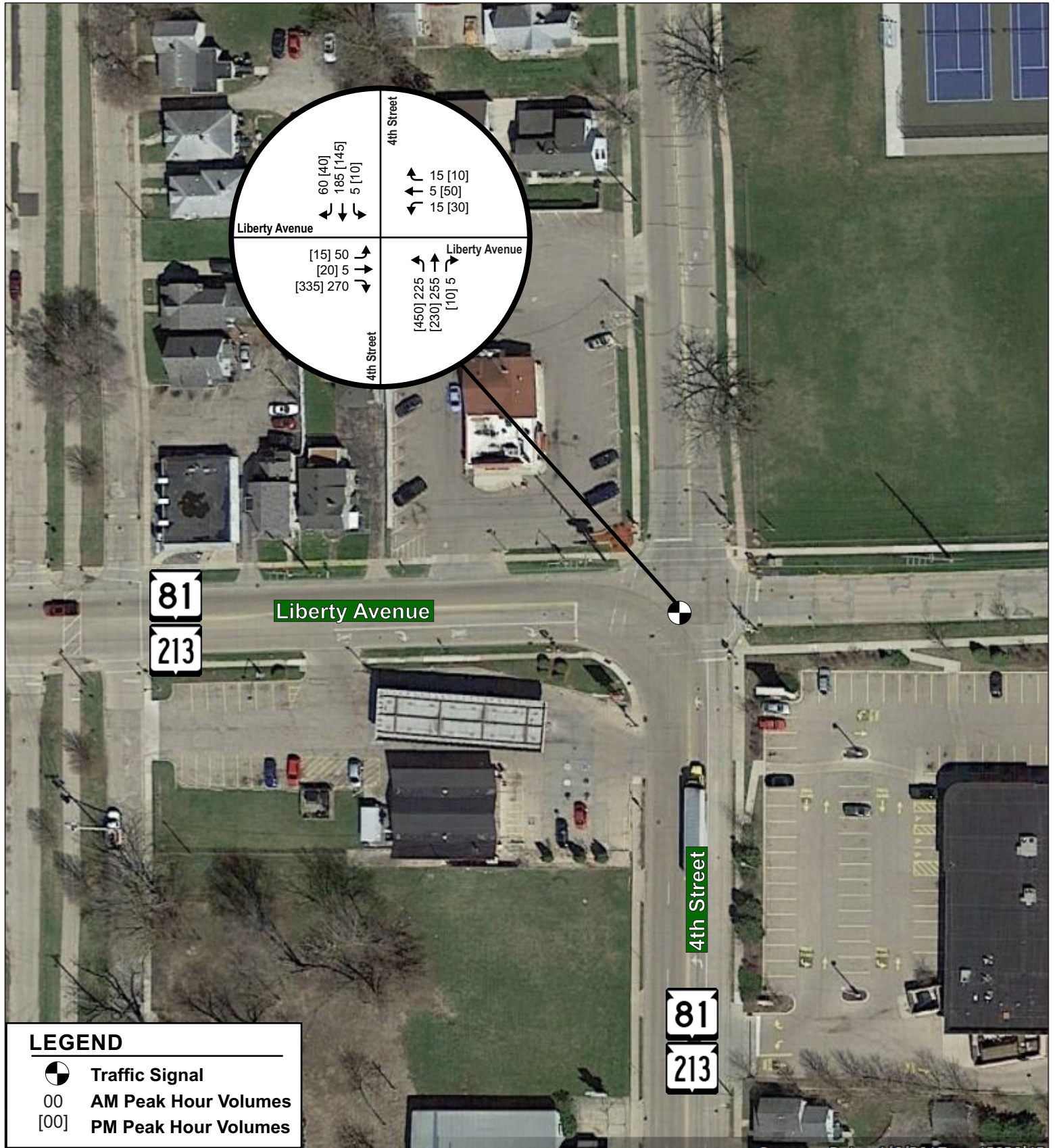
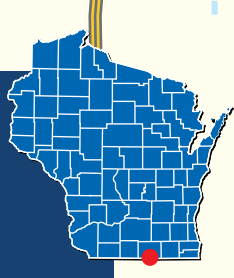


FIGURE 4  
 2040 INTERSECTION TURNING MOVEMENT COUNTS  
 4th STREET AND LIBERTY AVE  
 БЕЛОИТ, WISCONSIN



# City of Beloit and Surrounding Area

## Wisconsin Bicycle Map



Scale  
0 0.5 1 Miles

0 0.5 1 Kilometers



Urban areas	
	Bike Lane
	Bike Route
	Bike Path/Trail
	Low Volume
	Medium Volume
	High Volume

Rural areas	
	Best Condition
	Moderate Condition
	Higher Volume, Wider Paved Shoulders
	High Volume, Undesireable

[See Full Legend](#)

All areas on map	
	Local Road
	Freeway/Prohibited
	Bridges
	Interchanges



FIGURE 5

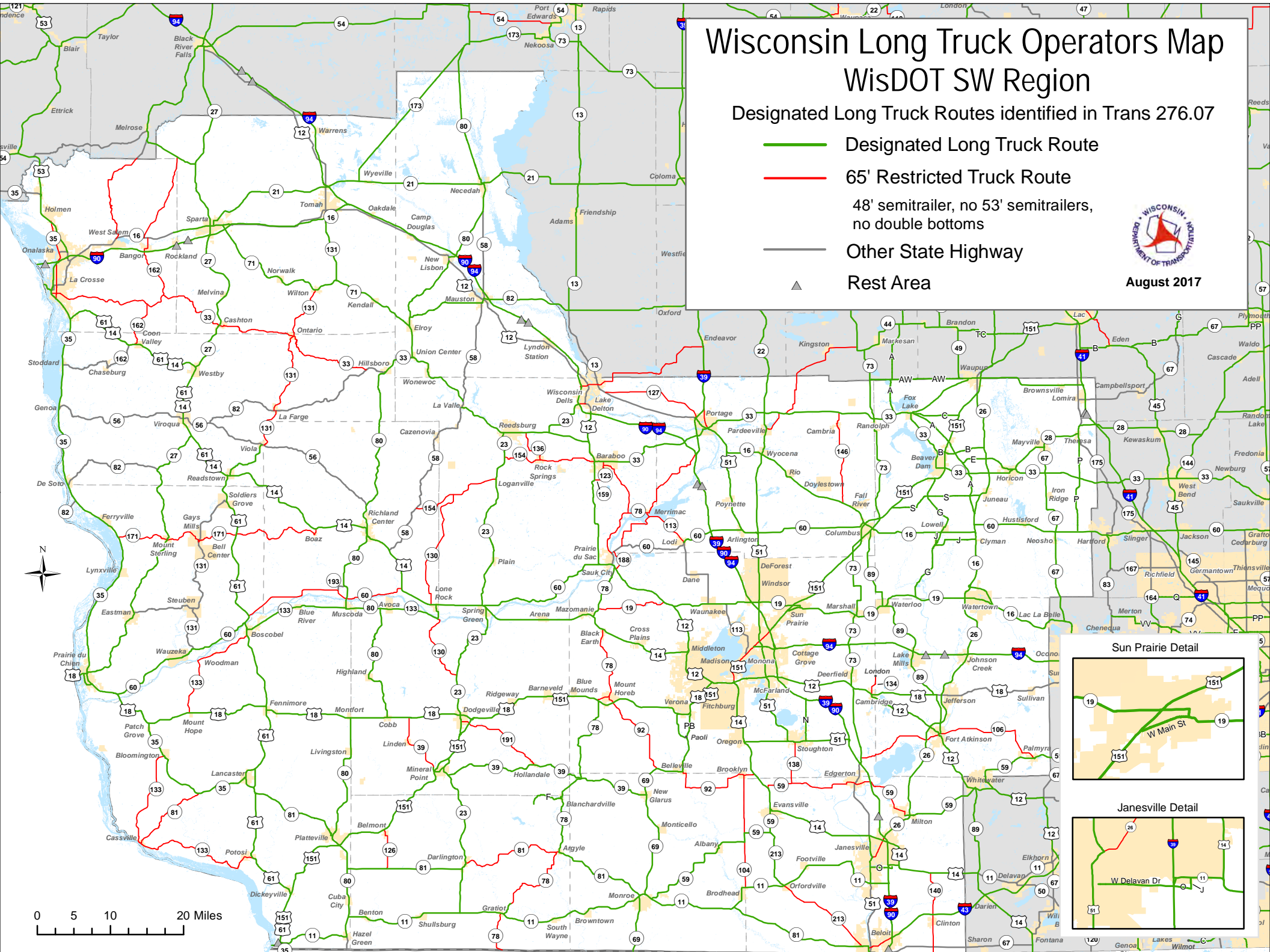
# Wisconsin Long Truck Operators Map WisDOT SW Region

Designated Long Truck Routes identified in Trans 276.07

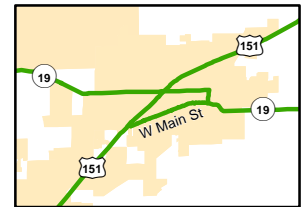
- Designated Long Truck Route
- 65' Restricted Truck Route  
48' semitrailer, no 53' semitrailers,  
no double bottoms
- Other State Highway
- ▲ Rest Area



August 2017



Sun Prairie Detail



Janesville Detail

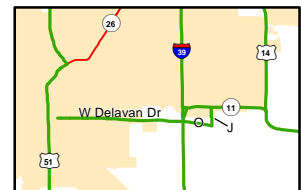


FIGURE 6







