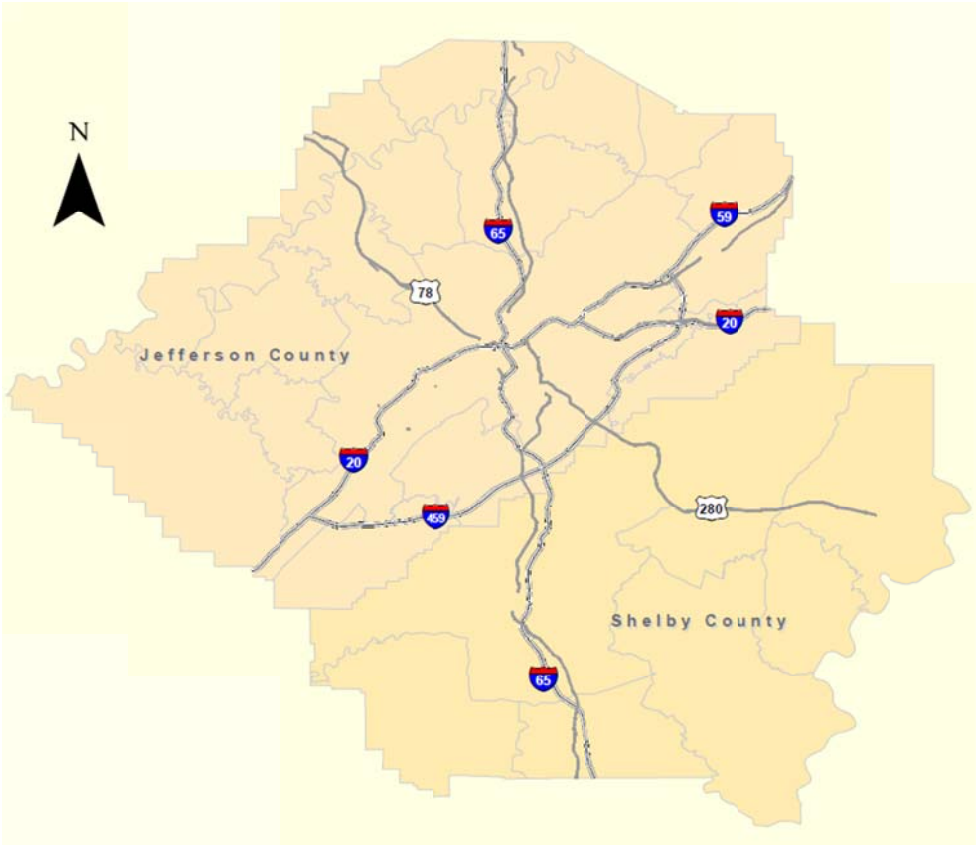
2012 BIRMINGHAM REGIONAL CONGESTION MONITORING REPORT



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and

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1. Overview

The Birmingham Region devotes significant resources to maintaining and improving its transportation system. The Regional Planning Commission of Greater Birmingham (RPCGB) has developed a comprehensive process for planning, allocating, and monitoring transportation resources to ensure continued mobility for the region. One component of that is the Congestion Management Process (CMP), which monitors transportation system performance, serves as a planning tool to help manage traffic congestion, and offers a set of multi-modal solutions for addressing the growing problem of traffic congestion in our region. Primarily, the CMP is a way to:

- Monitor, measure and diagnose the causes of congestion on the region's transportation system;
- Evaluate and recommend alternative strategies to manage or improve regional congestion; and
- Evaluate the performance of strategies put in practice to manage or improve congestion.

Every two years, the RPCGB, in conjunction with the Birmingham Regional Transportation Data Center, collects regional performance data and develops measures to assess the state of the transportation system. This report is the second of the series. It is intended to identify areas of significant congestion and monitor changes in congestion over time.

2. Measuring Mobility

2.1 The Congestion Monitoring Network

The roadway network selected for this report consists of the primary access routes to the Birmingham region and is shown in Figure 1. It includes the following routes:

- I-65 from south Shelby County to north Jefferson County
- I-20/59 from west Jefferson County to the I-20/59 split
- I-20 from I-20/59 to the St. Clair County line
- I-59 from I-20/59 to the St. Clair County line
- U.S. 78 from the Walker County Line to I-20/59
- U.S. 280 from Shelby County the Red Mountain Expressway
- U.S. 31 from south Shelby County to north Jefferson County
- U.S. 11 from Bessemer to the St. Clair County Line

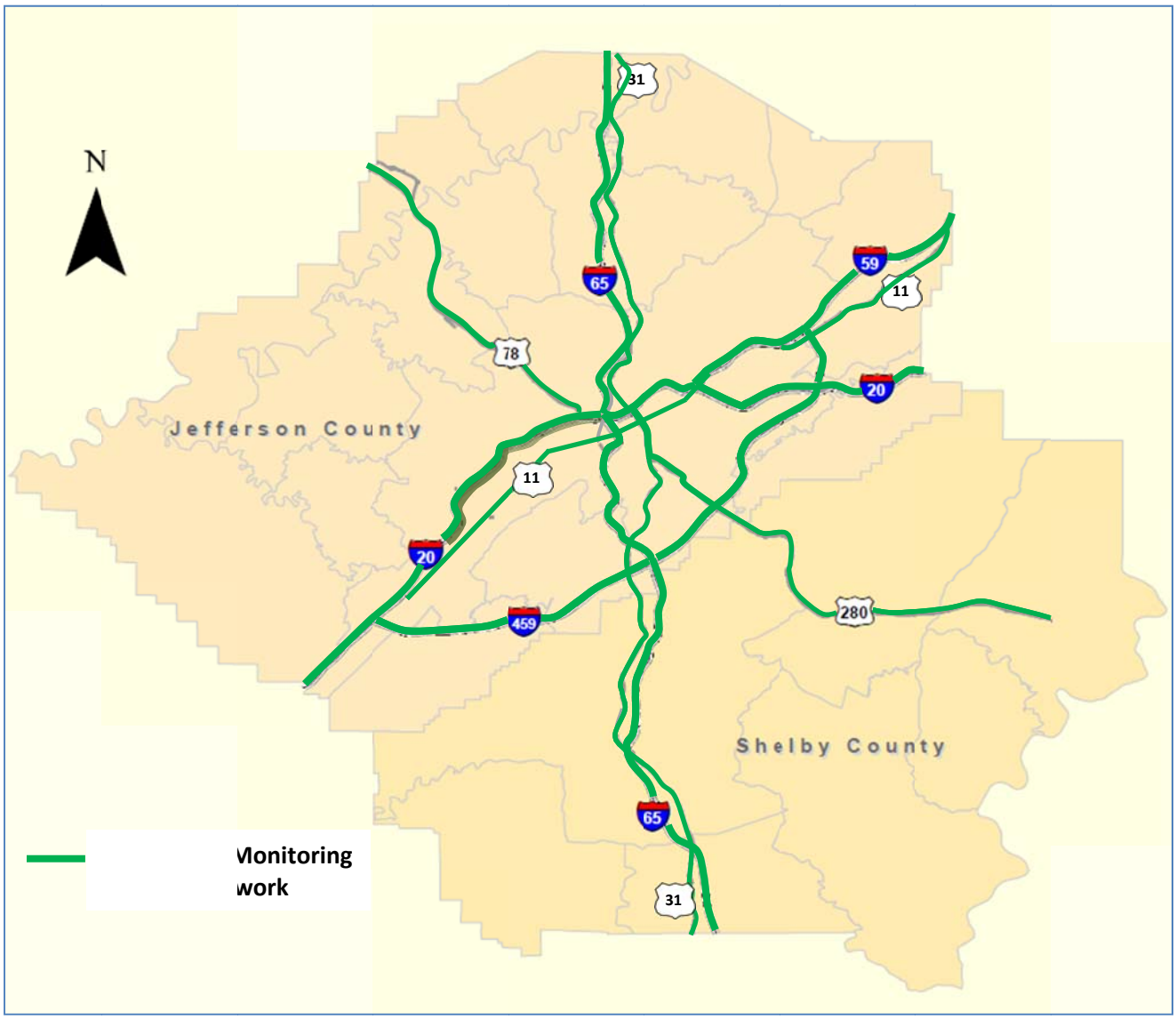


Figure 1. Congestion Monitoring Primary Network

2.2 Mobility Measures

This report uses three primary measures of mobility:

- Travel Time Index (TTI)
- Duration of congestion
- Spot speed profiles

The travel time index is used to identify roadway segments that currently experience congestion and will serve as a baseline against which to compare future congestion levels. The duration of congestion is a measure of how long the congestion persists on those segments. Spot speed profiles allow the RPC to monitor how traffic and congestion vary at key points in the network and track how they change over time.

Travel Time Index (TTI)

The Travel Time Index is a measure that allows RPC to identify and quantify congestion on major roadway segments. The TTI for a given roadway segment is defined as follows:

$$TTI = \frac{\text{travel time during peak period}}{\text{travel time under free flow conditions}}$$

The TTI is simply a comparison of the time it takes to travel a given segment during the peak period with the time it takes to travel that same segment under free flow conditions. For example, if a roadway segment has a travel time index of 2.0, it means that it takes twice as long to travel that segment during the peak period as it does during non-congested times. Simply put, the higher the TTI value the worse the congestion is. Threshold values were chosen to reflect when congestion was moderate, significant, or severe and are summarized below. These threshold values were chosen to reflect user perceptions of congestion and its impact on their travel times.

For freeway segments:

- TTI > 1.10 indicates moderate congestion
- TTI > 1.5 indicates significant congestion
- TTI > 2.0 indicates severe congestion
-

For US highways and arterials, travel times are typically slower due to traffic lights and the numerous driveway access points so the TTI thresholds are proportionally higher:

- TTI > 1.5 indicates moderate congestion
- TTI > 2.0 indicates significant congestion
- TTI > 2.5 indicates severe congestion

Peak period travel times were measured on the study routes using commercial fleet probe data. The INRIX Corporation collects travel information on all major Birmingham roadways using real-time position and speed data broadcast from commercial fleet vehicles. From these archived data, we can compute average travel times for all roadway segments in the network at 5 and 15 minute intervals. Four weeks of speed data collected in October 2012 were used to

compute average travel time values during the peak periods of 6:00 – 10:00 AM and 3:00 – 7:00 PM. TTI values are summarized for the study network in Tables 1 and 2.

Table 1. Travel Time Index – AM Peak Period – Peak 15 Minutes (October 2012 Data)

Route	Segment	Travel Time Index (TTI)			
		Direction 1	Significant Change from 2010?	Direction 2	Significant Change from 2010?
I-65	Shelby Co. to I-459	1.12 (NB)	-26%	1.04 (SB)	-
	I-459 to I-20/59	1.80 (NB)	+32%	1.05 (SB)	-5%
	I-20/59 to N. Jeff. Co.	1.02 (NB)	-	1.07 (SB)	-
I-20/59	W. Jefferson Co. to I-459	1.00 (EB)	-	1.00 (WB)	-
	I-459 to I-65	1.10 (EB)	-5%	1.02 (WB)	-
	I-65 to I-20/I-59 Split	1.11 (EB)	-	1.81 (WB)	+5%
I-20	I-59 to I-459	1.02 (EB)	-	1.02 (WB)	-13%
	I-459 to St. Clair Co. Line	1.00 (EB)	-	1.04 (WB)	-
I-59	I-20 to I-459	1.01 (EB)	-	1.14 (WB)	-17%
	I-459 to St. Clair Co. Line	1.00 (EB)	-	1.11 (WB)	-
I-459	I-20/59 to I-65	1.03 (EB)	-	1.03 (WB)	-
	I-65 to I-20	1.03 (EB)	-	1.03 (WB)	-
	I-20 to I-59	1.01 (EB)	-5%	1.01 (WB)	-
U.S. 280	Red Mt. Expwy. To I-459	1.19 (EB)	-	1.93 (WB)	-6%
	I-459 to Shelby County	1.06 (EB)	-	1.25 (WB)	-
U.S. 78	Walker Co. Line to I-20/59	1.18 (NB)	-	1.15 (SB)	-
U.S. 31	Shelby Co. to I-459	1.33 (NB)	-11%	1.19 (SB)	-9%
	I-459 to Red Mt. Expwy.	1.46 (NB)	-	1.28 (SB)	-10%
	I-20/59 to N. Jeff. Co.	1.09 (NB)	-11%	1.08 (SB)	-9%
U.S. 11	Academy Dr. to I-65	1.12 (EB)	-14%	1.17 (WB)	-8%
	I-65 to I-459	1.25 (EB)	-17%	1.28 (WB)	-16%
	I-459 to St. Clair Co. Line	1.16 (EB)	-16%	1.19 (WB)	-12%

Table 2. Travel Time Index – PM Peak Period – Peak 15 Minutes (October 2012 Data)

Route	Segment	Travel Time Index (TTI)			
		Direction 1	Significant Change from 2010?	Direction 2	Significant Change from 2010?
I-65	Shelby Co. to I-459	1.00 (NB)	-12%	1.10 (SB)	-14%
	I-459 to I-20/59	1.07 (NB)	-	1.68 (SB)	-
	I-20/59 to N. Jeff. Co.	1.01 (NB)	-	1.01 (SB)	-
I-20/59	W. Jefferson Co. to I-459	1.01 (EB)	-	1.01 (WB)	-
	I-459 to I-65	1.11 (EB)	+8%	1.03 (WB)	-
	I-65 to I-20/I-59 Split	1.13 (EB)	-11%	1.09 (WB)	-
I-20	I-59 to I-459	1.02 (EB)	-6%	1.02 (WB)	-
	I-459 to St. Clair Co. Line	1.00 (EB)	-	1.05 (WB)	-
I-59	I-20 to I-459	1.13 (EB)	-	1.00 (WB)	-
	I-459 to St. Clair Co. Line	1.08 (EB)	-	1.01 (WB)	-
I-459	I-20/59 to I-65	1.01 (EB)	-6%	1.03 (WB)	-
	I-65 to I-20	1.02 (EB)	-6%	1.02 (WB)	-6%
	I-20 to I-59	1.05 (EB)	-	1.00 (WB)	-
U.S. 280	Red Mt. Expwy. To I-459	1.74 (EB)	-32%	1.26 (WB)	-21%
	I-459 to Shelby County	1.24 (EB)	-	1.18 (WB)	+6%
U.S. 78	Walker Co. Line to I-20/59	1.15 (EB)	-	1.20 (WB)	-5%
U.S. 31	Shelby Co. to I-459	1.19 (NB)	-16%	1.24 (SB)	-17%
	I-459 to Red Mt. Expwy.	1.19 (NB)	-17%	1.39 (SB)	-19%
	I-20/59 to N. Jeff. Co.	1.07 (NB)	-9%	1.06 (SB)	-15%
U.S. 11	Academy Dr. to I-65	1.14 (EB)	-11%	1.20 (WB)	-10%
	I-65 to I-459	1.25 (EB)	+8%	1.27 (WB)	-18%
	I-459 to St. Clair Co. Line	1.22 (EB)	-14%	1.16 (WB)	-19%

2012 TTI values are shown graphically for the AM and PM peak periods in Figures 2 and 3. It should be noted that the values shown in the figures as well as Tables 1 and 2 reflect peak travel time indices for one 15 minute period between 6:00 – 10:00 AM and one 15 minute period between 3:00 – 7:00 PM. Individual roadway segments may have different peak periods within that time range.

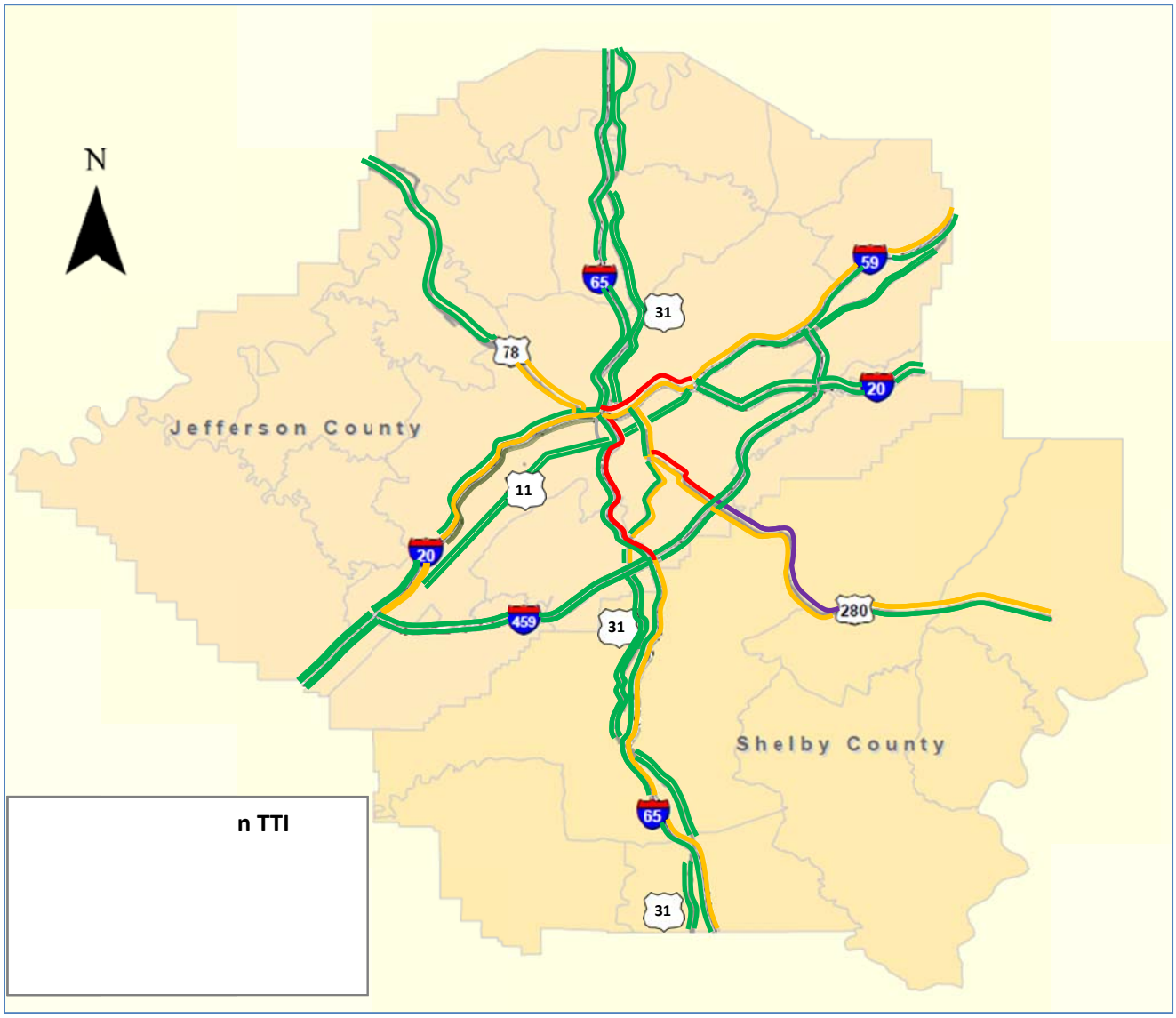


Figure 2. Travel Time Index – AM Peak

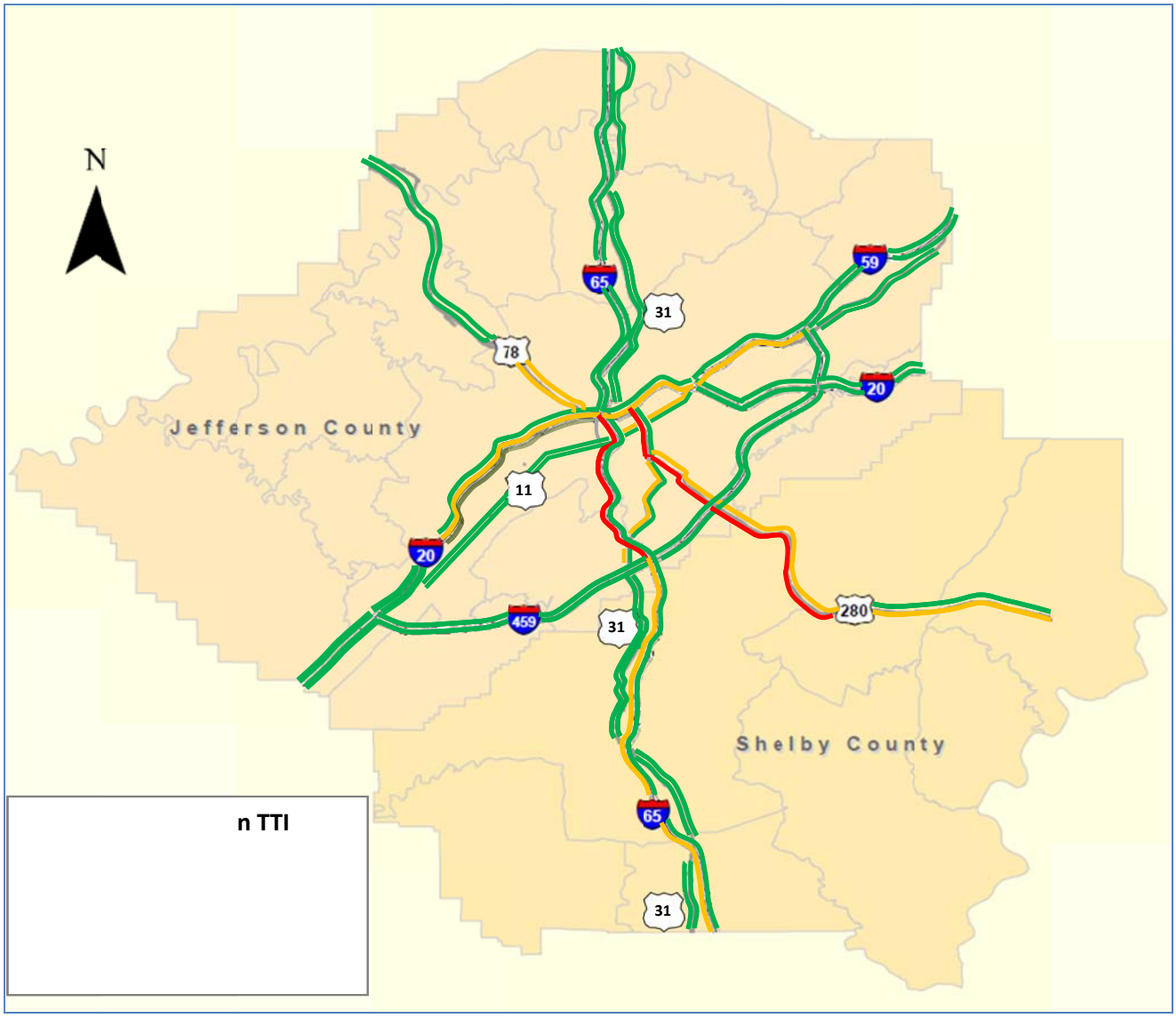
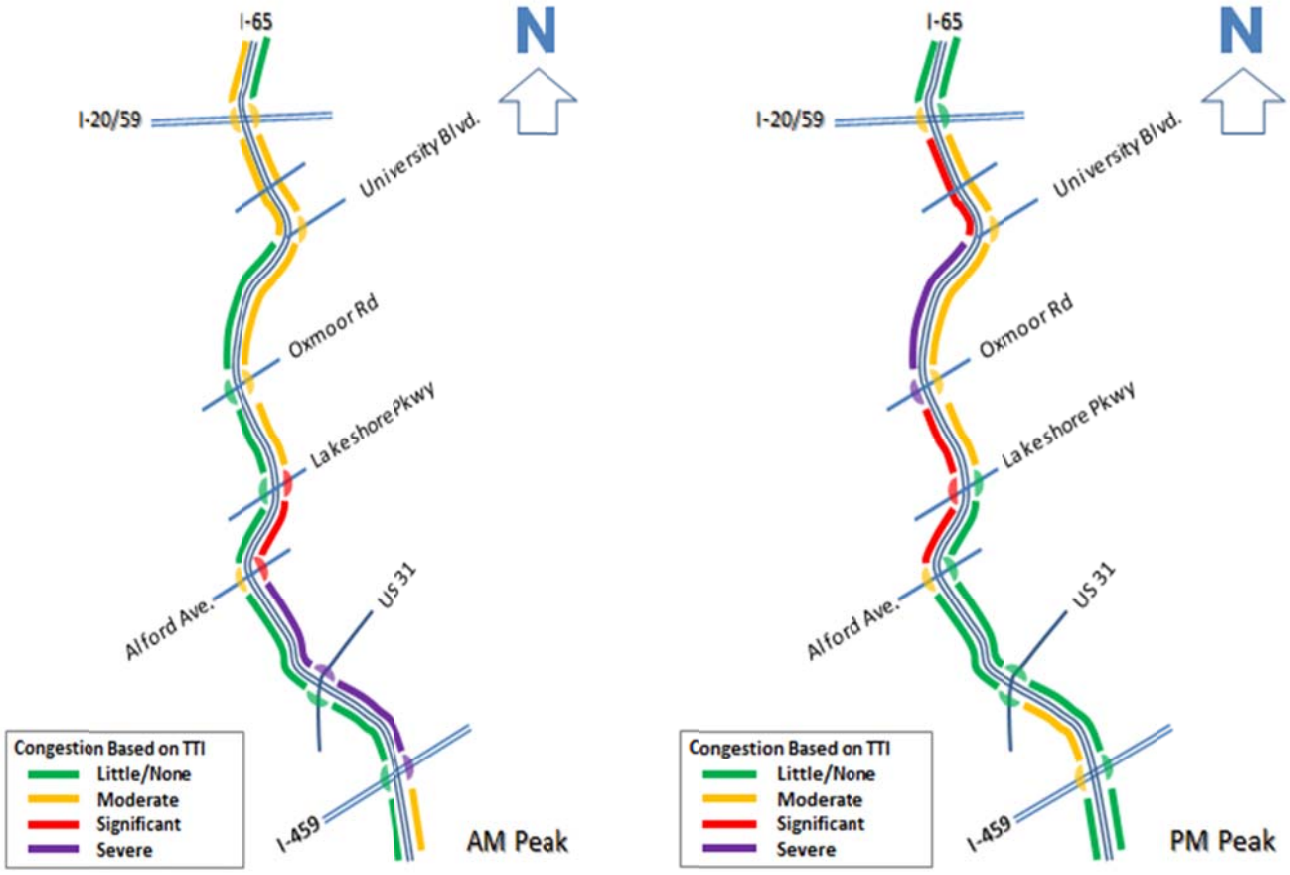


Figure 3. Travel Time Index – PM Peak

It can be seen in Figures 2 and 3 that congestion is most significant on the following route segments:

- I-65 from I-459 to I-20/59
- US 280 from the Red Mountain Expressway to CR 47
- I-20/59 from Arkadelphia to the I-20/I-59 split
- I-59 from the I-20/I-59 split to I-459
- US 78 from Cherry Ave. to I-20/59

Detailed illustrations of congestion on these segments are provided in Figures 4 through 15.



Figures 4 & 5. TTI indices for I-65 between I-459 and I-20/59 (AM and PM Peaks)

During the AM Peak, the most severe congestion occurs in the northbound direction along the segment of I-65 from I-459 to Lakeshore Parkway. This appears to be caused by a) heavy merging movements at US 31, b) the steep grade from US 31 to Alford Avenue, and c) capacity deficiencies at the Lakeshore Parkway interchange that cause vehicles to queue onto the interstate. During the PM peak, the most significant congestion on I-65 occurs in the southbound direction between I-20/59 and Alford Avenue. The causes here appear to be a) heavy merging volumes at University Boulevard, Greensprings Highway, Oxmoor Road, and Lakeshore Parkway, and b) the steep grade from Lakeshore Parkway to Alford Avenue.

Congestion indices for I-20/59 in the downtown area are illustrated in Figures 6 and 7.

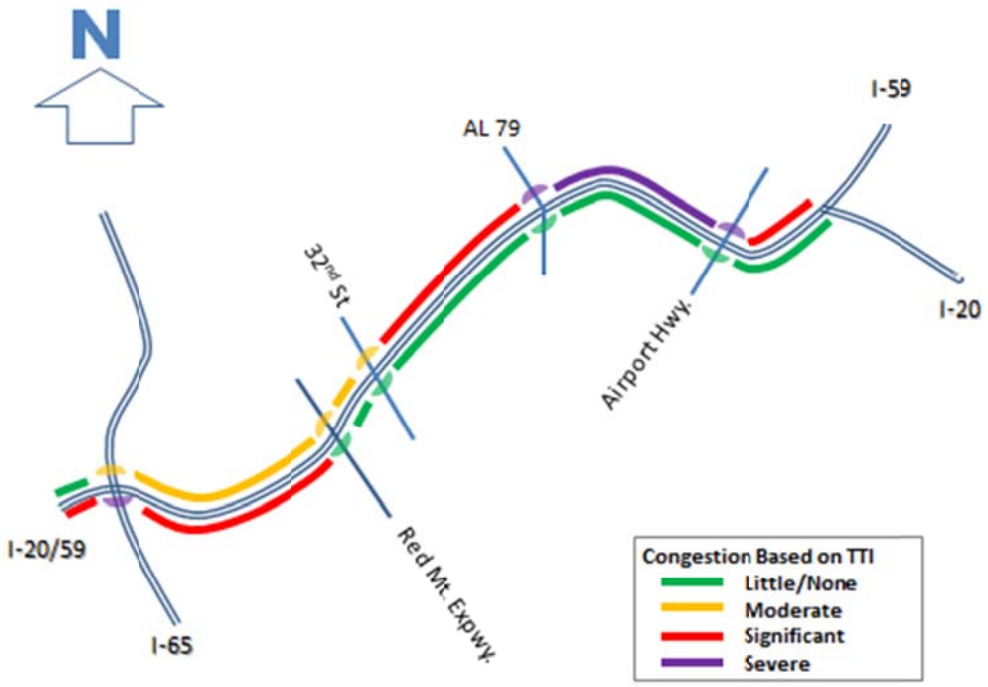


Figure 6. TTI Indices for I-20/59 between I-65 and the 20/59 Split (AM Peak)

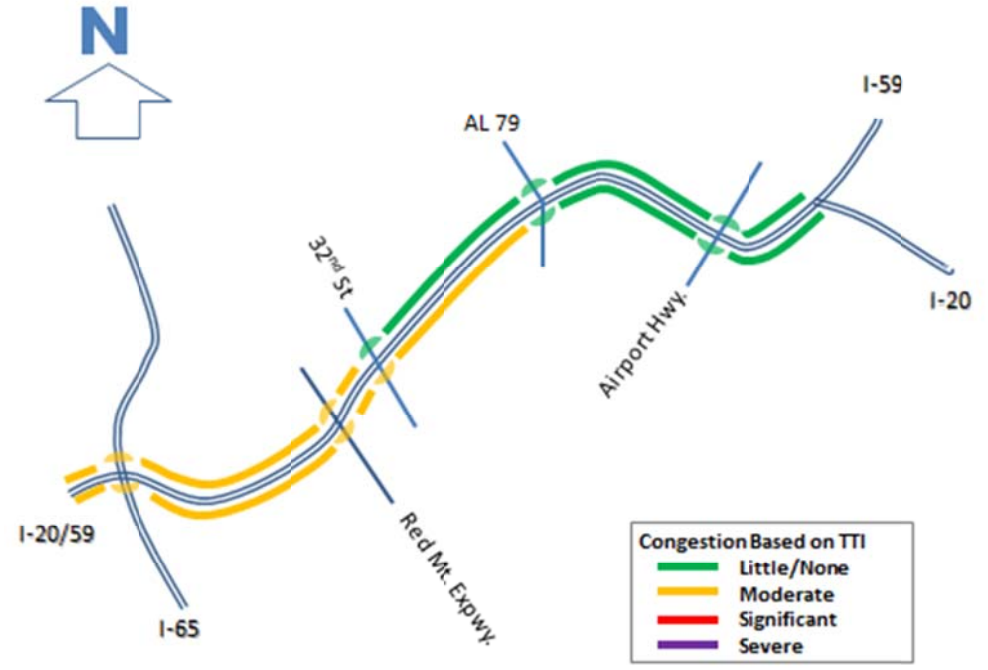


Figure 7. TTI Indices for I-20/59 between I-65 and the 20/59 Split (PM Peak)

During the AM peak there is significant congestion in both directions on I-20/59 between I-65 and the I-20/I-59 split. The causes are high through volumes and high merge volumes at AL 79 and the downtown exits. In the afternoon peak the congestion is less severe but more prominent in the eastbound lanes. The primary cause seems to be high merge volumes and capacity constraints.

Congestion on the segments of I-20 and I-59 east of the split is less pronounced than it is closer to downtown. Congestion during the AM peak is found only on the inbound segments of I-59 in the vicinity of the I-459 and AL 75 interchanges. During the afternoon peak some congestion is found in the outbound direction primarily at interchanges.

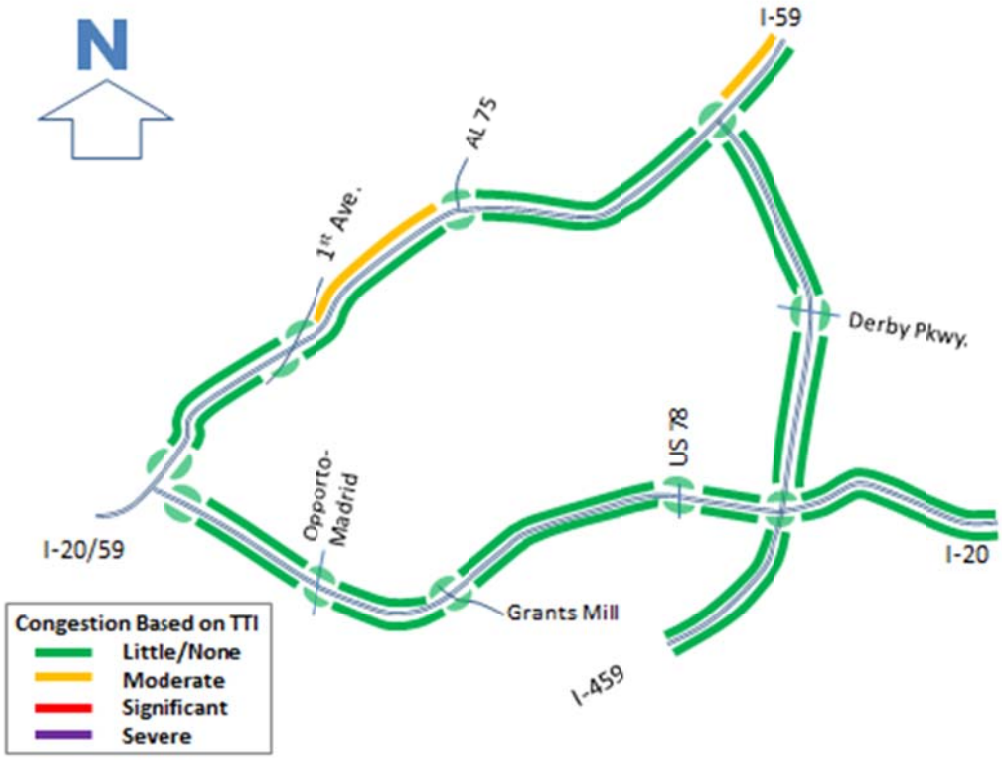


Figure 8. TTI Indices for I-20 and I-59 east of downtown (AM Peak)

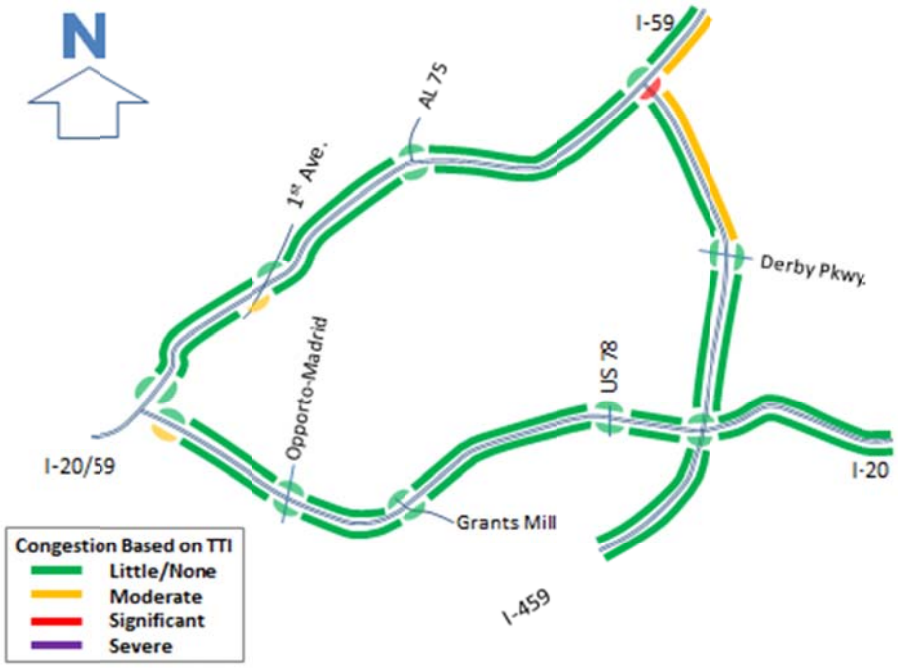


Figure 9. TTI Indices for I-20 and I-59 east of downtown (PM Peak)

Congestion on I-20/59 west of I-65 occurs primarily between the interchanges at Bush Boulevard and I-65. During the AM peak, the heaviest congestion is caused by merging delays at the I-65 interchange. During the PM peak, the heaviest delays occur between I-65 and the US 78 interchange at Arkadelphia.

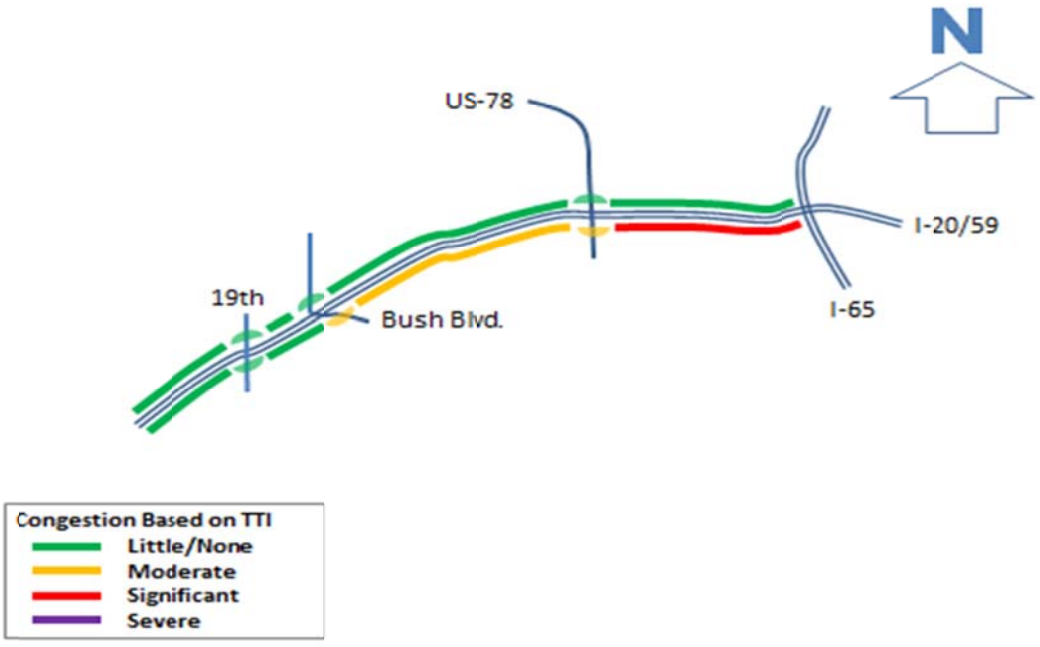


Figure 10. TTI Indices for I-20/59 west of I-65 (AM Peak)

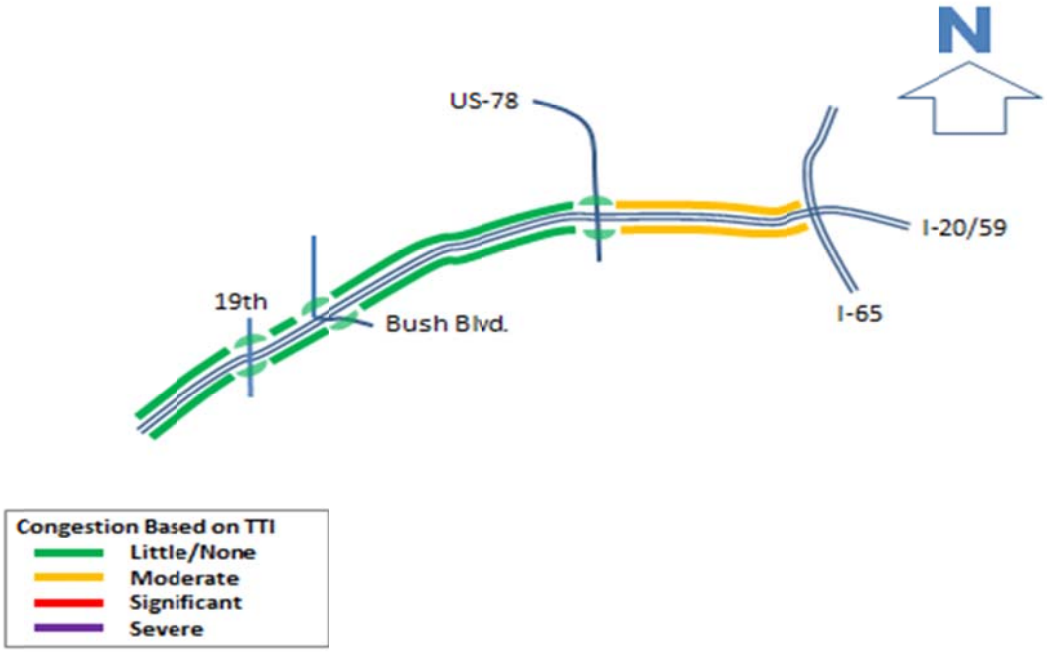


Figure 11. TTI Indices for I-20/59 west of I-65 (PM Peak)

Congestion indices for US Highway 280 are shown in Figures 12 and 13. Congestion during the AM peak is severe in the inbound direction from beyond AL 119 to the Red Mountain Expressway. The primary cause is high volumes combined with high traffic signal densities and high driveway densities. The congestion is even more severe during the PM peak, and almost equally severe in both inbound and outbound directions. This is due to the high volumes of traffic traveling in both directions to the I-459 interchange.

Congestion indices for US Highway 78 west of I-20/59 are shown in Figures 14 and 15. The primary area of congestion is between Finley Boulevard and the I-20/59 interchange, during both the AM and PM peak periods. This congestion is caused by capacity constraints at the interchange and a design that combines multiple intersections and traffic signals in a very short distance.

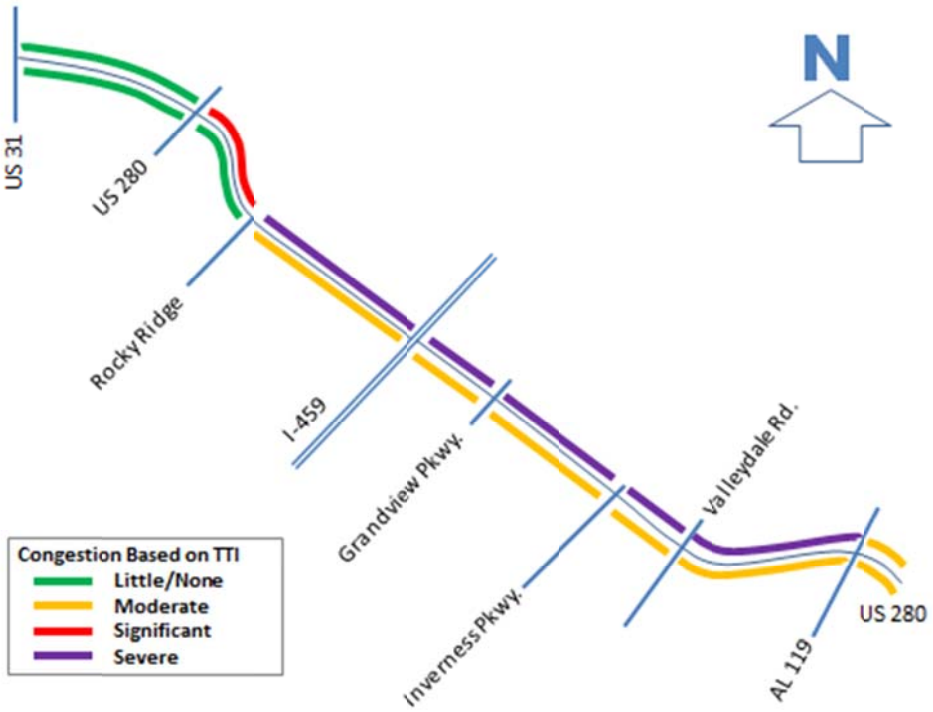


Figure 12. TTI Indices for US 280 south of I-459 (AM Peak)

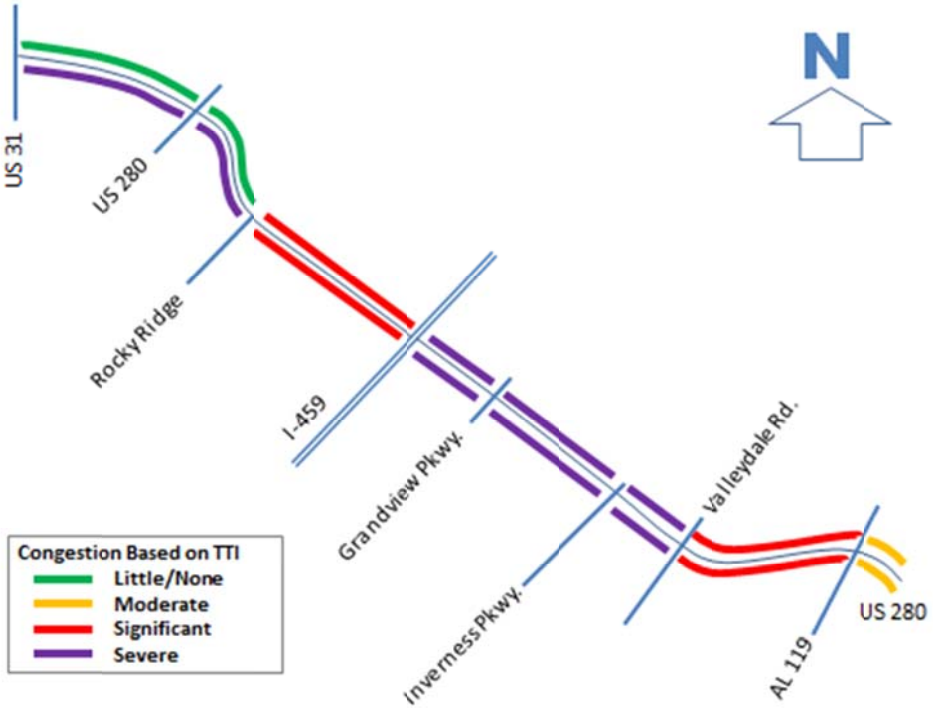


Figure 13. TTI Indices for US 280 south of I-459 (PM Peak)

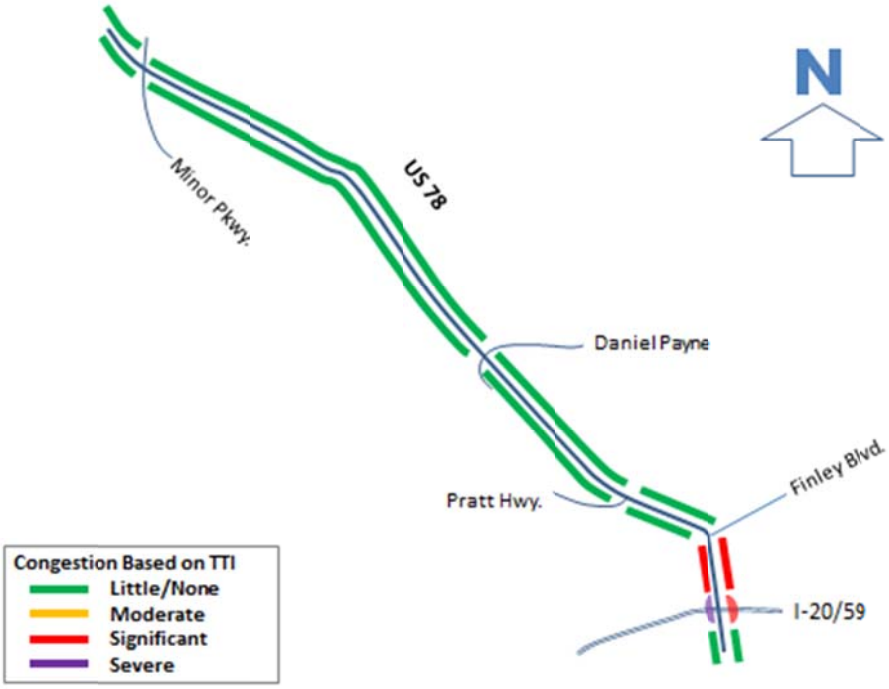


Figure 14. TTI Indices for US 78 north of I-20/59 (AM Peak)

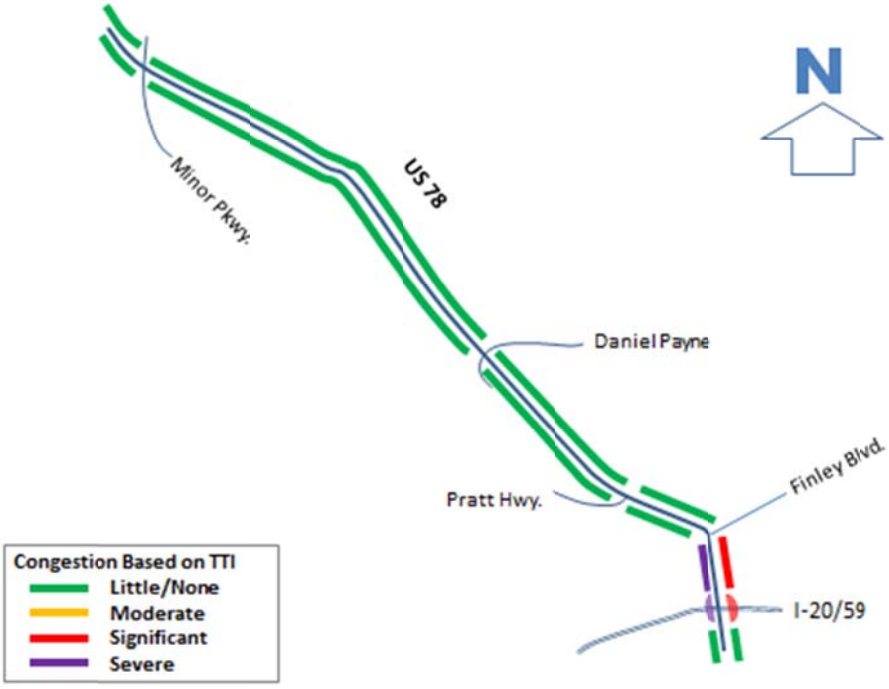


Figure 15. TTI Indices for US 78 north of I-20/59 (PM Peak)

Comparison to 2010 Travel Times

There were significant changes to the travel time indices in several corridors between 2010 and 2012. The most significant changes are summarized below:

- Congestion decreased on I-65 south of I-459 due to the completion of a construction project on this segment.

- The completion of construction on I-65 south of I-459 also resulted in a significant increase in congestion on the NB segment of I-65 between I-459 and I-20/59 during the AM peak, since the choke point to the south had been removed. Motorists on I-65 are now experiencing greater congestion between I-459 and Lakeshore Parkway than in 2010.

- Travel time reductions were noted on US 31 between AL 119 and Homewood. It appears that completion of the construction projects on I-65 resulted in a shift in traffic from US 31 to I-65, resulting in lower congestion levels on US 31.

- Congestion decreased on I-59 between I-459 and the I-20/59 split. The reason is not known but will be monitored in future years.

- Significant travel time reductions were noted on US 280 west of I-459 during the PM peak. It is known that ALDOT was testing a new adaptive signal system on US 280 at the time that the 2012 travel time data was collected. These data will be compared to additional travel time data being collected by ALDOT to see if the reductions continue.

- There were only small observed changes in congestion levels on US 280 east of I-459.

- Many corridors in the study network saw small reductions in congestion from 2010 to 2012. Some of this difference may be due to a larger sample size of data used in 2012. When available, ALDOT count station data from 2012 will be analyzed to see if the reductions in congestion correlate to any reductions in traffic volumes.

Regional Travel Times

Using the travel time data collected, maps were prepared showing travel times to and from downtown Birmingham along major interstate and arterial routes during the most congested periods of the AM and PM peaks. These are shown in Figures 11 and 12.

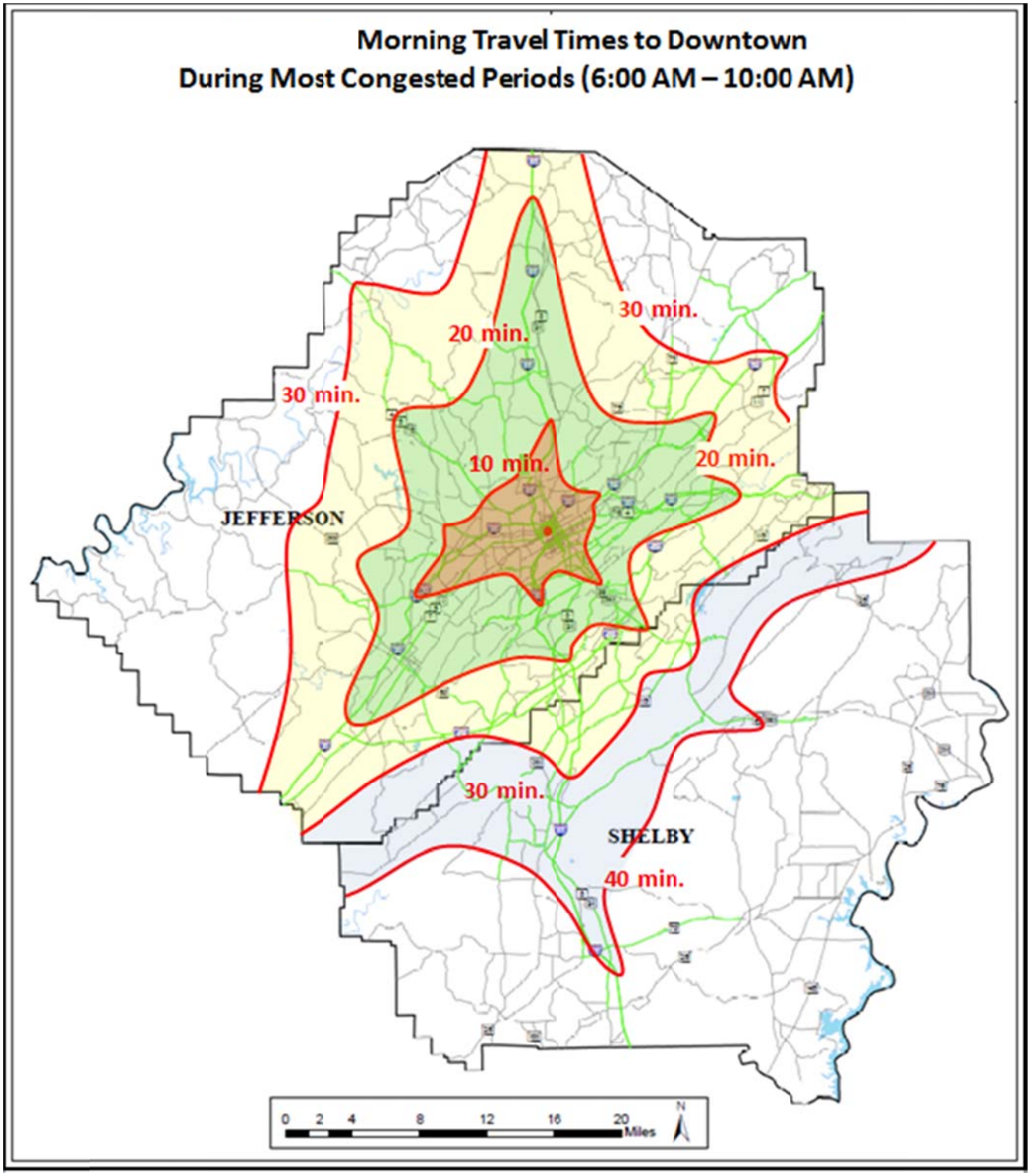


Figure 16. Travel Time Isochrones to Downtown during AM Peak

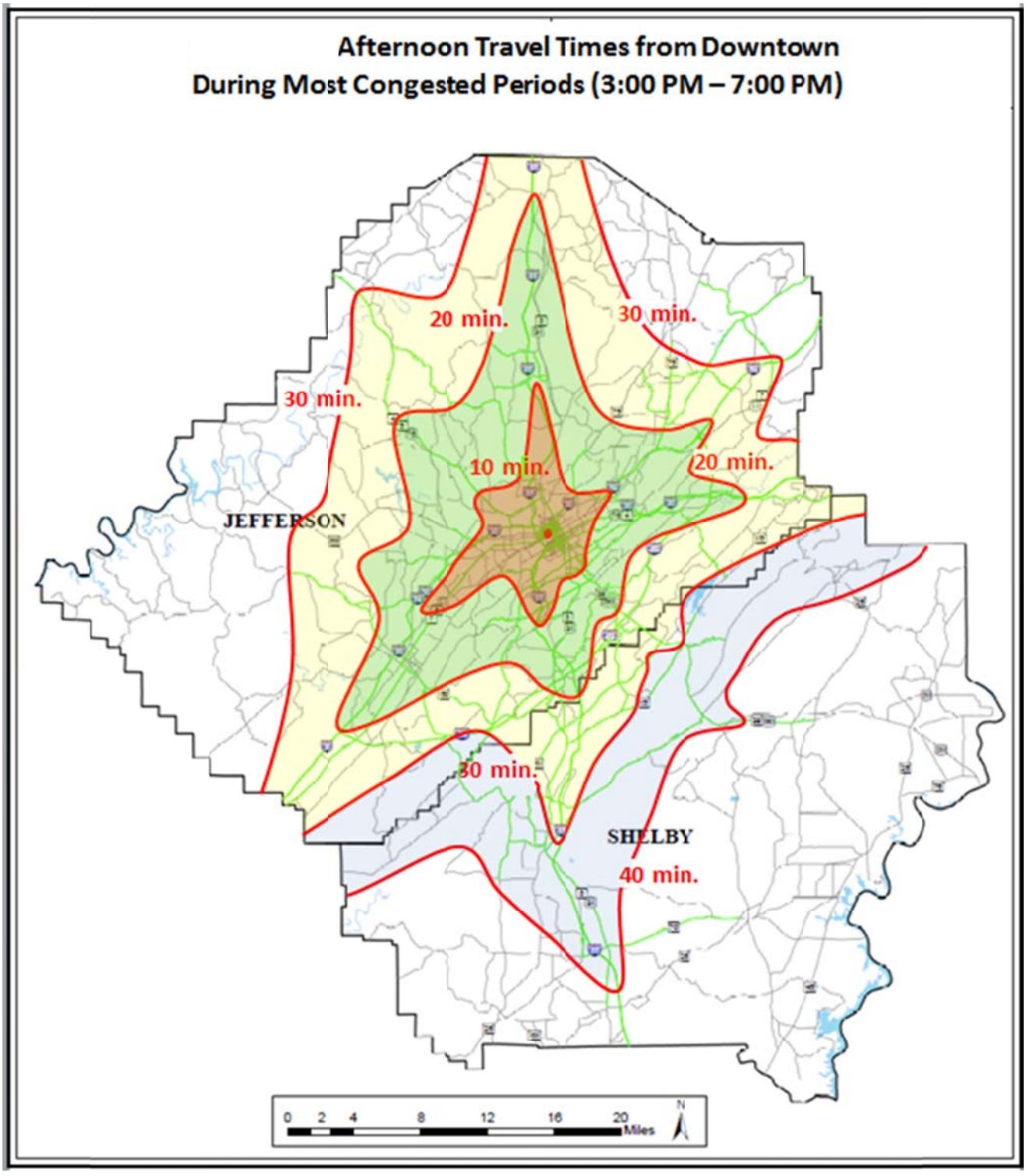


Figure 17. Travel Time Isochrones to Downtown during PM Peak

Speed Profiles

Key locations in the study network were selected for speed profile plots. These plots show average speed on a given roadway segment during October 2010 and October 2012. They were developed primarily to serve as baseline data to monitor the growth and extent of congestion over time. A sample plot is shown in Figure 13. Every 2 years, new speed data is plotted on these same charts and provides an indication of how congestion is changing both in terms of severity and duration. In Figure 6, for example, it can be seen that while, on average, the onset of congestion on I-65 downtown occurred slightly later in the afternoon in 2012, the maximum reduction in speed was greater than in 2010. Recovery from the congestion threshold (red line) and return to free flow conditions (green line) occurred about the same times in both years. Additional speed profile plots are provided in the Appendix.

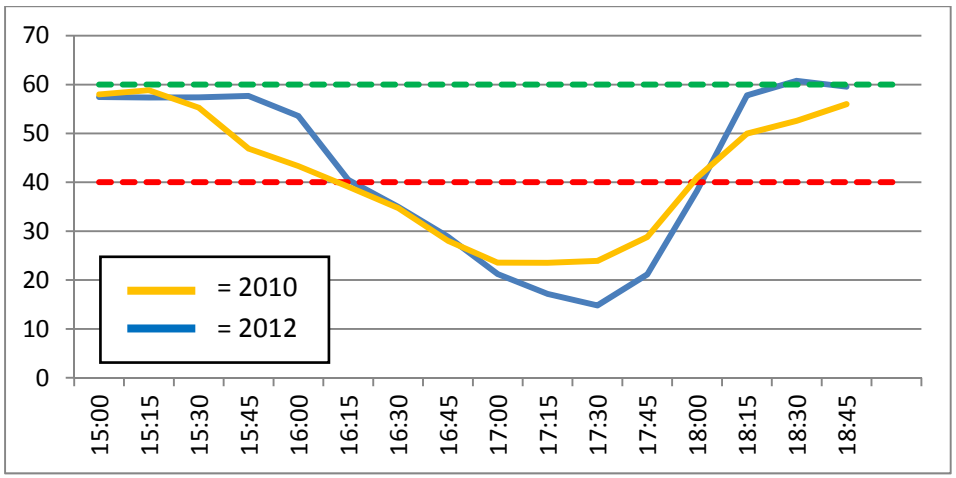


Figure 18. PM Speed Profile – I-65 at University Blvd. (SB)

Figure 19 shows the network locations selected for speed profiles.

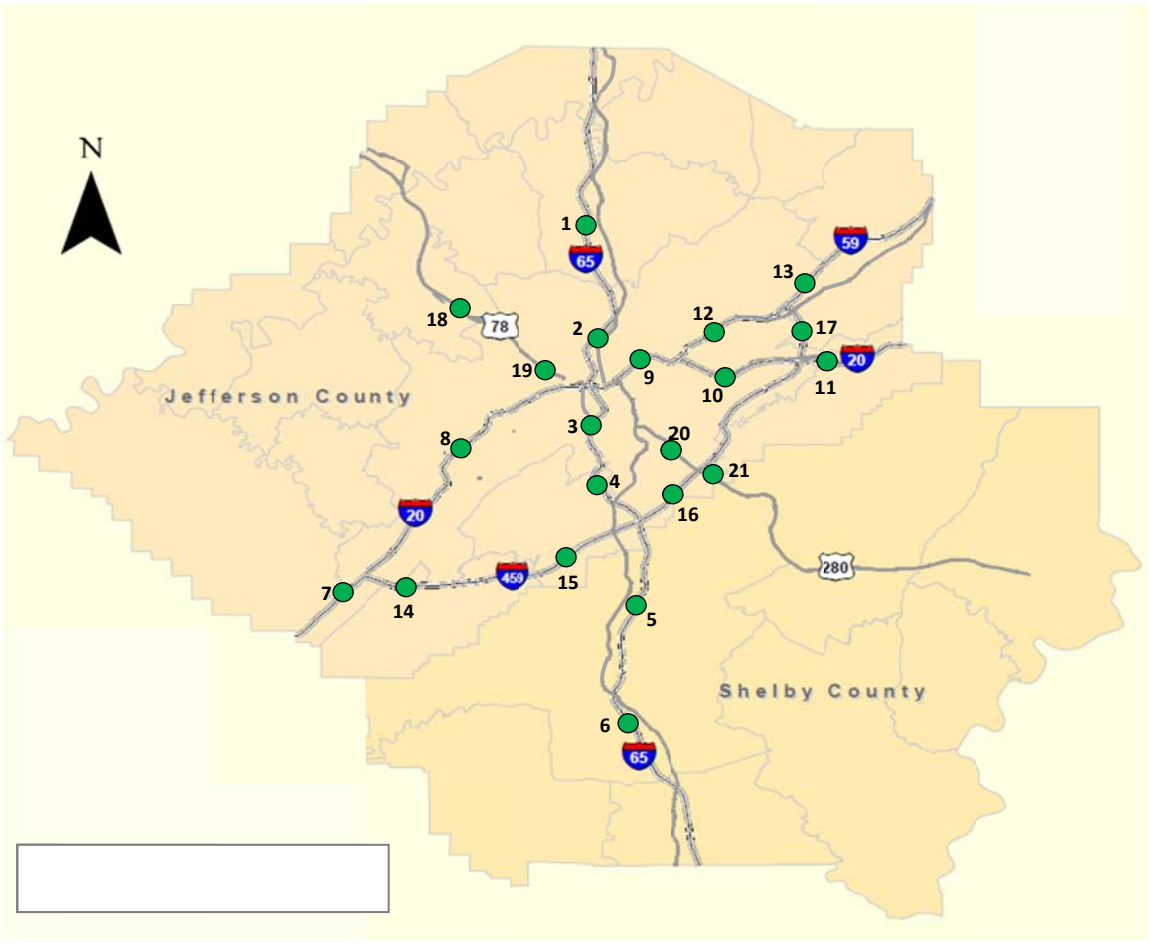


Figure 19. Speed Profile Locations

Duration of Congestion

Where congestion was found to exist, we used the travel time data to measure its duration. Figures 20 and 21 show the duration of congestion on the study routes during the AM and PM peak periods. These figures show that congestion is not only significant on I-65 and US 280 but also persistent, continuing for more than 1 hour during the peaks. Congestion was also found to be persistent on the segment of I-20/59 in downtown Birmingham.

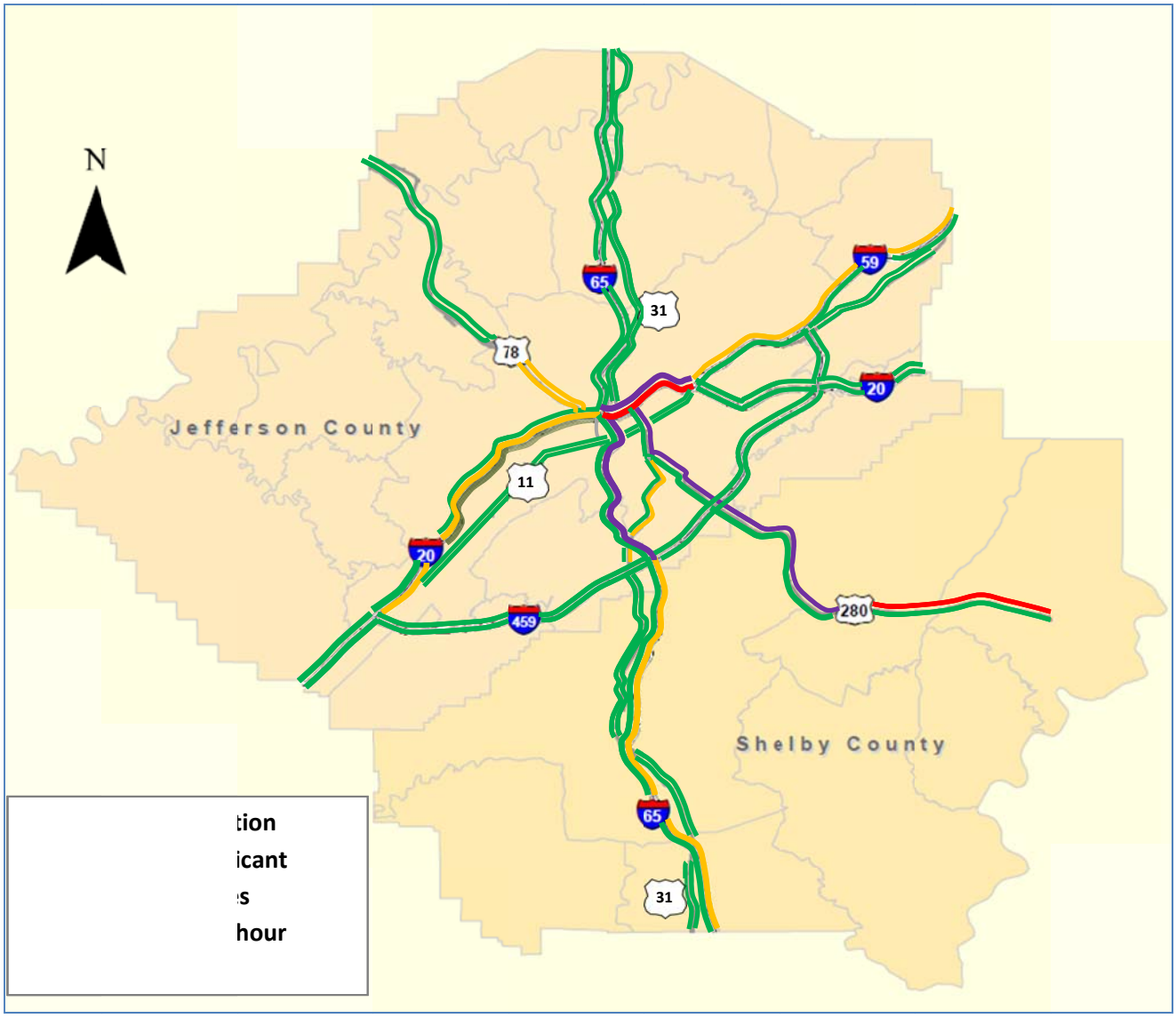


Figure 20. Duration of Congestion – AM Peak

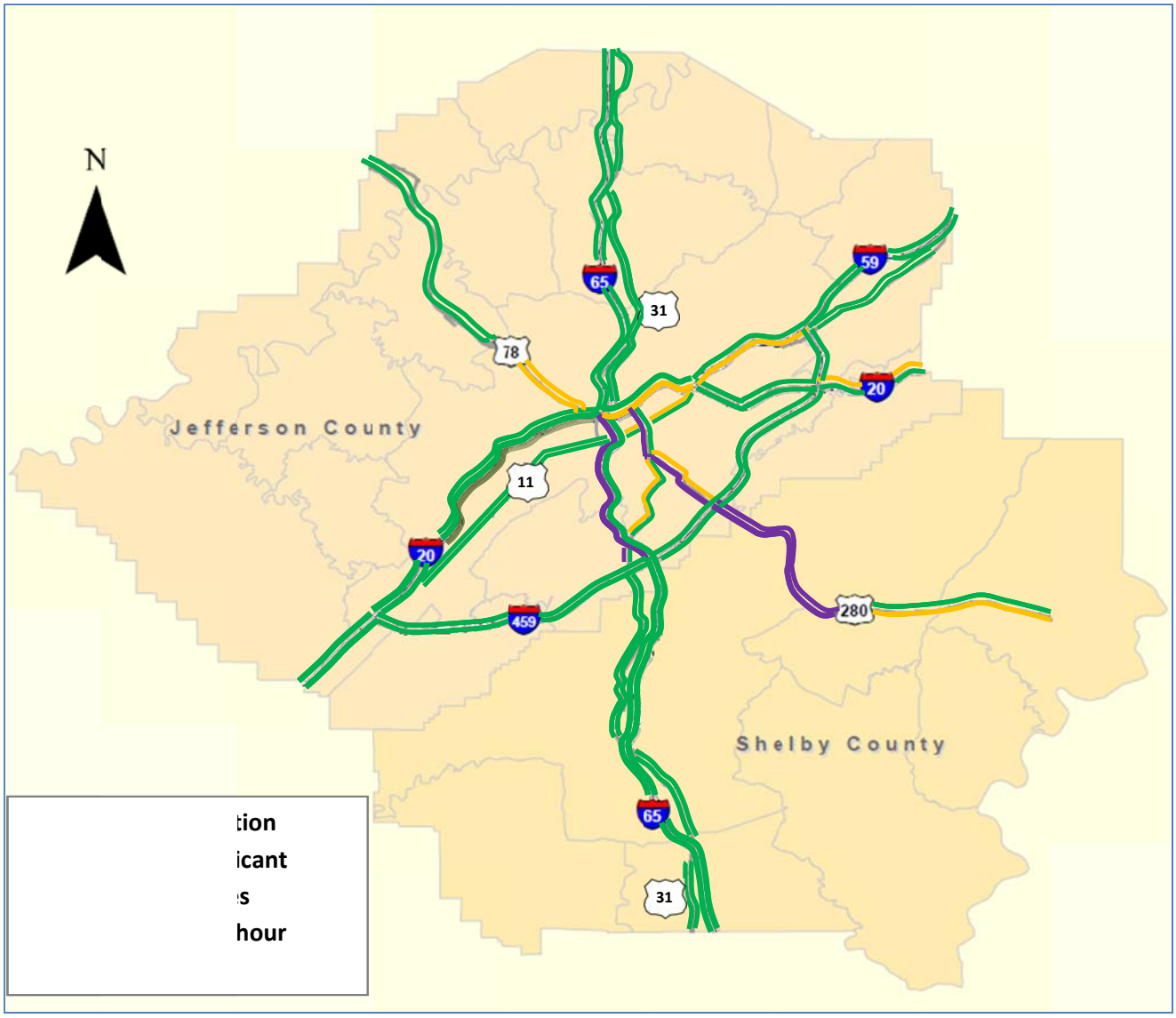


Figure 21. Duration of Congestion – PM Peak

2.3 Regional Congestion Indices

Lane-Miles of Congestion

The data were analyzed to compute the total number of miles of interstates and arterial highways that experience congestion during the AM and PM peak periods. If a roadway segment experienced congestion (TTI ≥ 1.10 for freeways or TTI ≥ 2.0 for arterial routes) for at least 15 minutes during the peak period it was counted as congested. The lane-mile total for that segment is equal to:

Lane-miles = (length of segment) x (# lanes in one direction on segment)

The lane-mile totals were computed by direction since many roadways experience congestion in only one direction during the peak periods, e.g. inbound in the AM and outbound during the PM. The total lane-miles of congested roadways are summarized in Tables 3 and 4.

Table 3. Lane-Miles of Congested Interstates

Route	From/To	AM Peak	PM Peak
I-65	Chilton Co. Line to Blount Co. Line	76.0	42.6
I20/59	Tuscaloosa Co. Line to I-20/59 Split	56.1	39.5
I-20	I-20/59 Split to St. Clair Co. Line	-	5.9
I-59	I-20/59 Split to St. Clair Co. Line	18.5	9.0
I-459	I-20/59 to I-59	-	3.5
I-22	Walker Co. Line to Coalburg Road	-	-
	Total (both directions)	**150.6**	**129.5**
	% of Total Interstate Lane-Miles	**18%**	**16%**
	Change from 2010	**-9%**	**-15%**

Table 4. Lane-Miles of Congested Arterials

Route	From/To	AM Peak	PM Peak
U.S. 31	Chilton Co. Line to Blount Co. Line	34.6	25.8
U.S. 280	Shelby Co. Line to Red Mt. Expwy.	21.2	32.0
U.S. 78	Walker Co. Line to St. Clair Co. Line	19.9	25.6
U.S. 11	Tuscaloosa Co. Line to St. Clair Co. Line	6.8	11.3
	Total (both directions)	**82.5**	**94.7**
	% of Total Arterial Lane-Miles	**11%**	**13%**
	Change from 2010	**+1%**	**-**

There were significant reductions in the percentage of interstate lane-miles experiencing congestion compared to 2010. The reductions resulted primarily from decreases in congestion on I-65 and I-459 after the completion of the I-65 widening and reconstruction projects. These projects had created significant congestion on I-65 south of I-459 which in turn spilled over to I-459 in the vicinity of the I-65 interchange. The percentage of interstate lane-miles experiencing congestion declined from 27% to 18% during the AM peak, and from 31% to 16% during the PM peak.

There were only minor changes in the overall percentage of arterial lane-miles experiencing congestion during the AM and PM peaks. The AM percentage increased from 10% to 11% while the PM percentage remained at 13%.

Summary

Significant congestion occurs on several important routes in the Birmingham region. The most serious congestion occurs on:

- I-65 between I-459 and downtown Birmingham
- U.S. 280 from Shelby County to the Red Mountain Expressway
- I-20/59 between I-65 and the I-20/I-59 split (downtown Birmingham)

The speed and travel time data indicate that congestion on these routes is not only significant but persistent, occurring for more than 1 hour during both the AM and PM peak periods. Congestion also occurs on other primary routes, such as I-20, I-59, and US 78, though it is less severe and persists for shorter periods.

The completion of large construction projects on I-65 reduced congestion on it and neighboring facilities relative to 2010. Significant reductions in congestion were found on the portion of I-65 from I-459 south to the Shelby County line. Overall, the percentage of interstate lane-miles that experience congestion fell from 27% to 18% during the AM peak, and from 31% to 16% during the PM peak largely due to the completion of these projects.

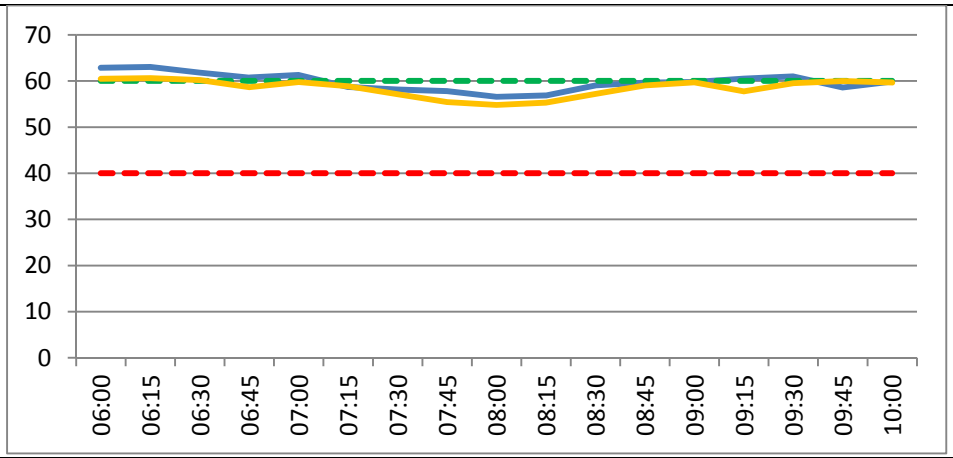
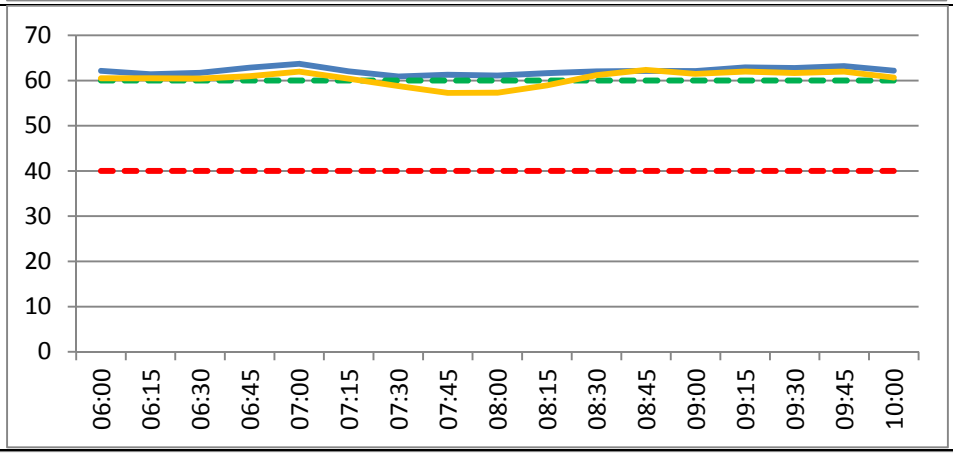
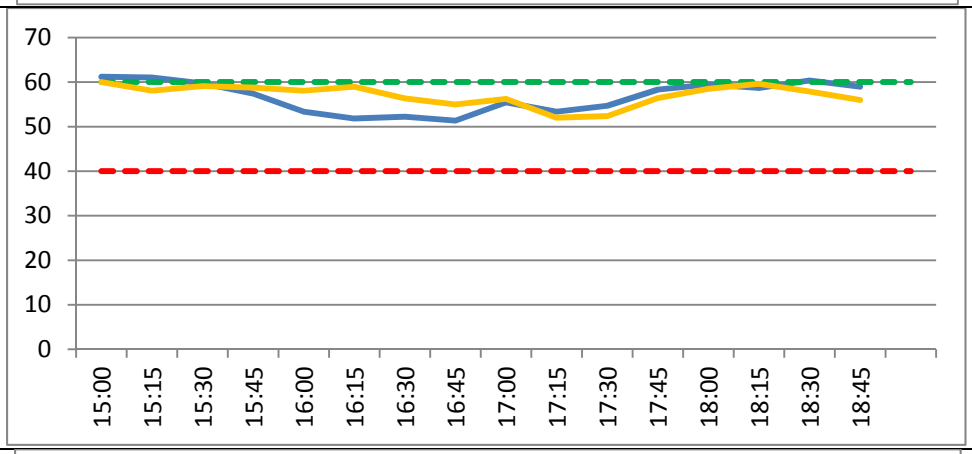
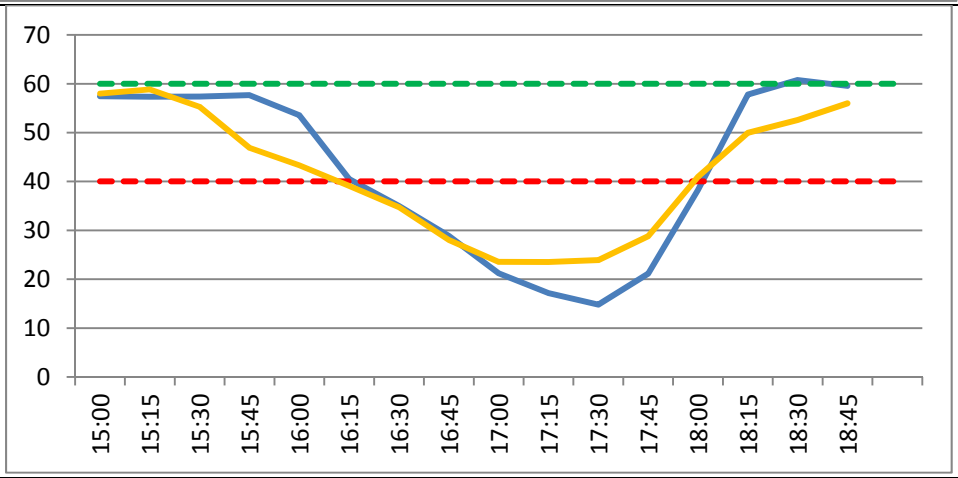
The percentages of arterial lane-miles that experience congestion remained fairly steady at 11% during the AM peak and 13% during the PM peak.

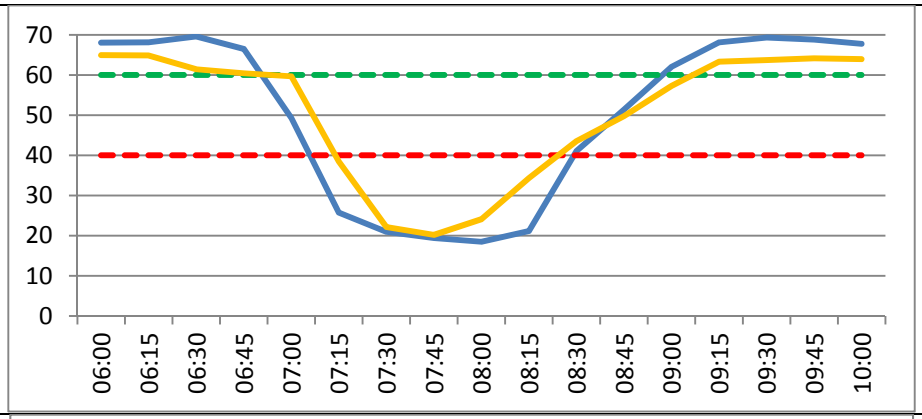
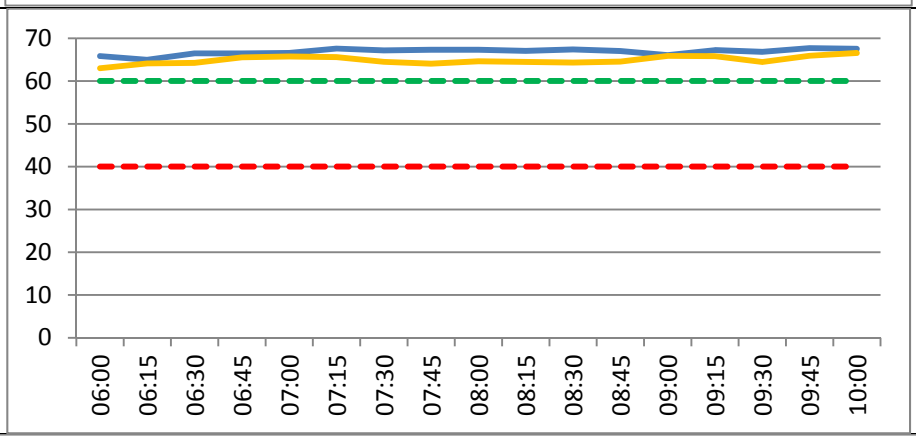
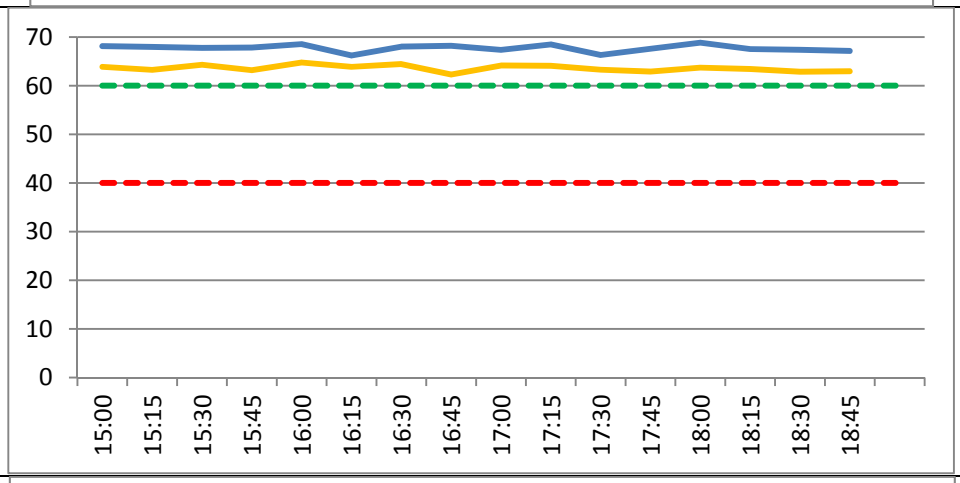
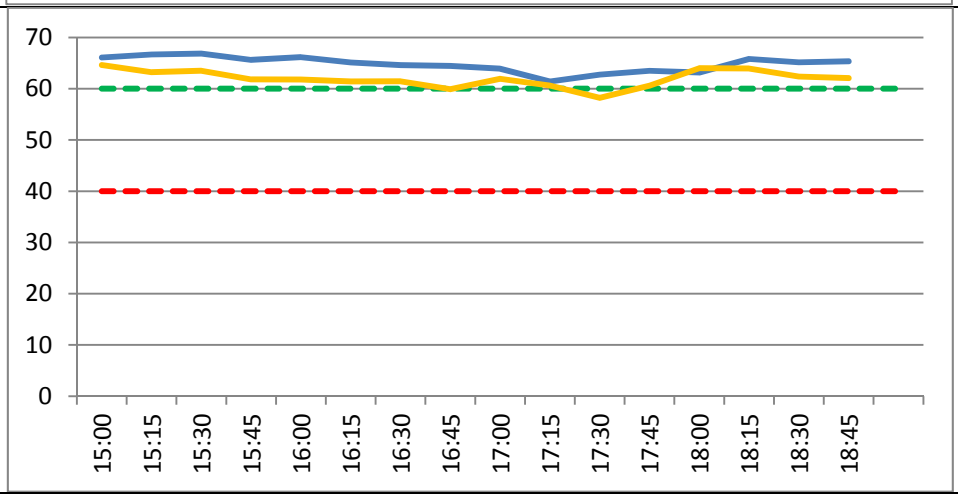
APPENDIX A

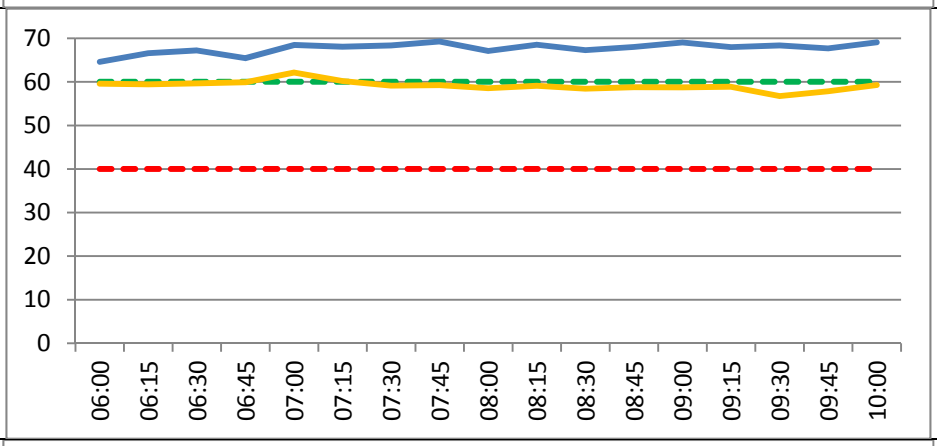
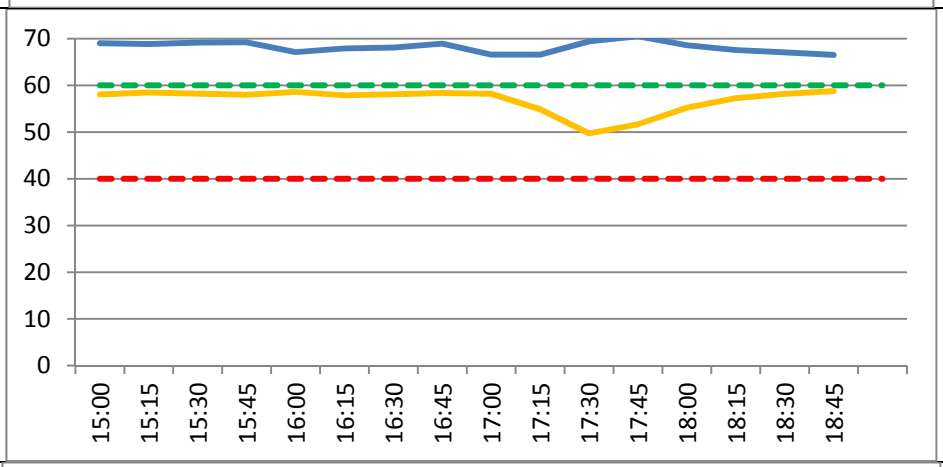
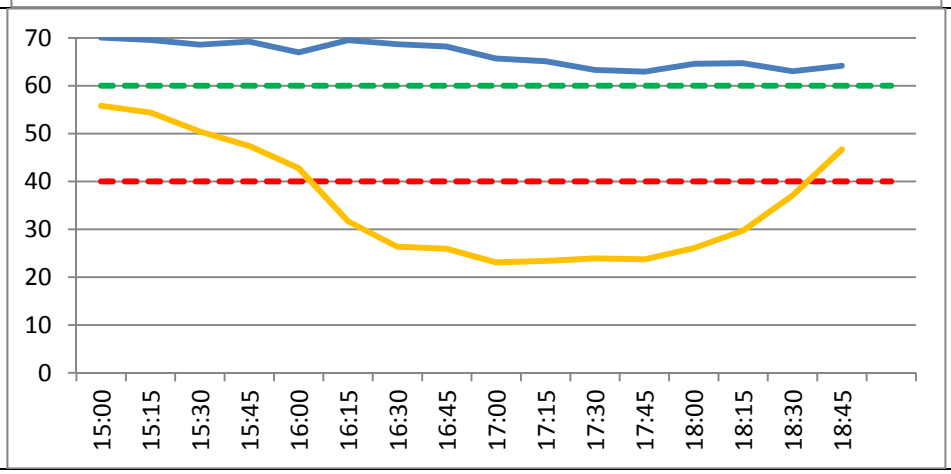
SPEED PROFILES AT SELECTED LOCATIONS

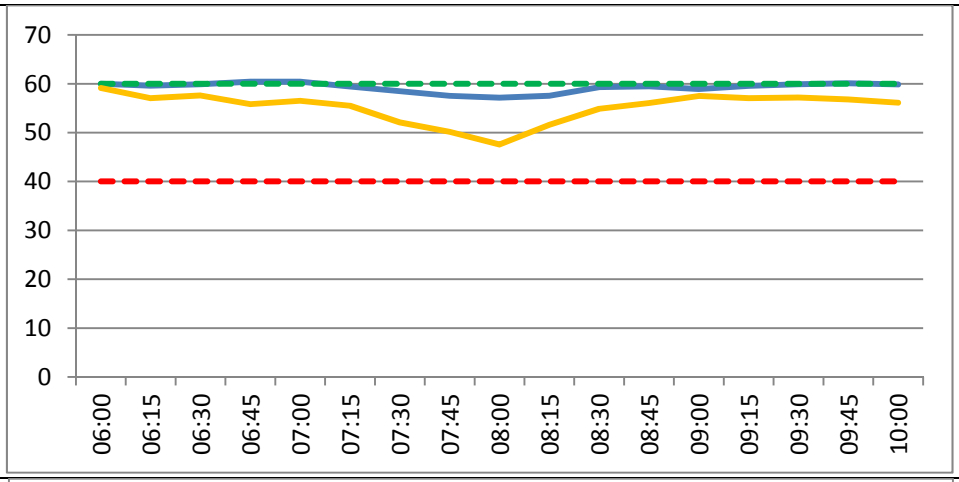
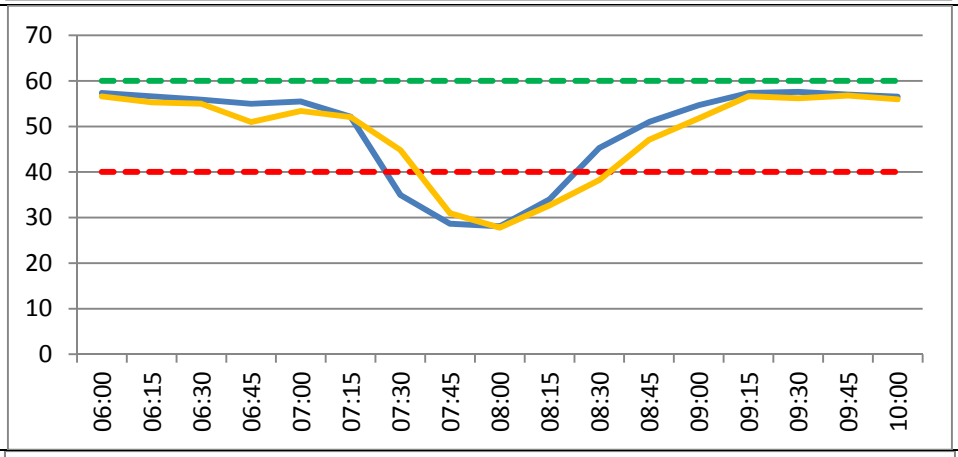
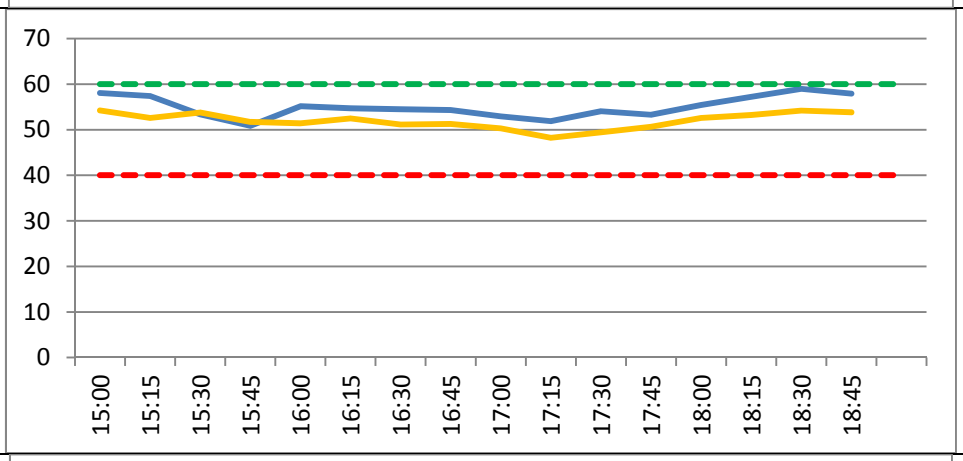
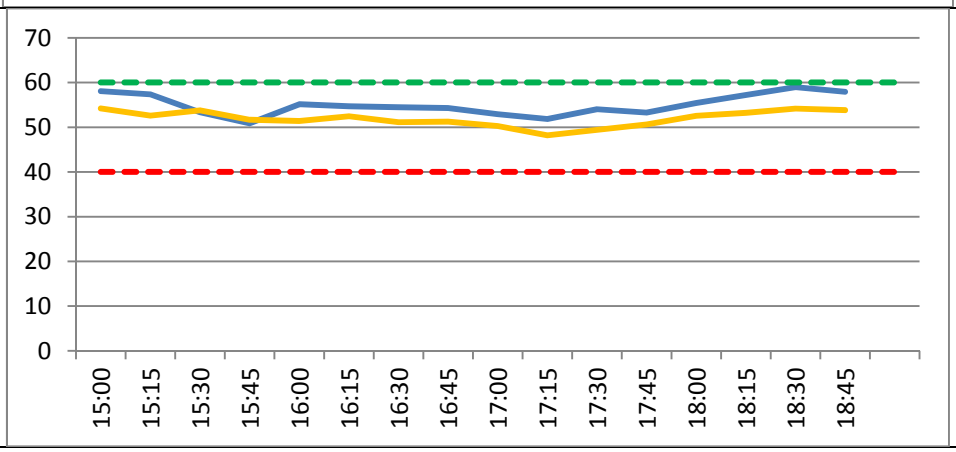
(Orange = 2010 Data

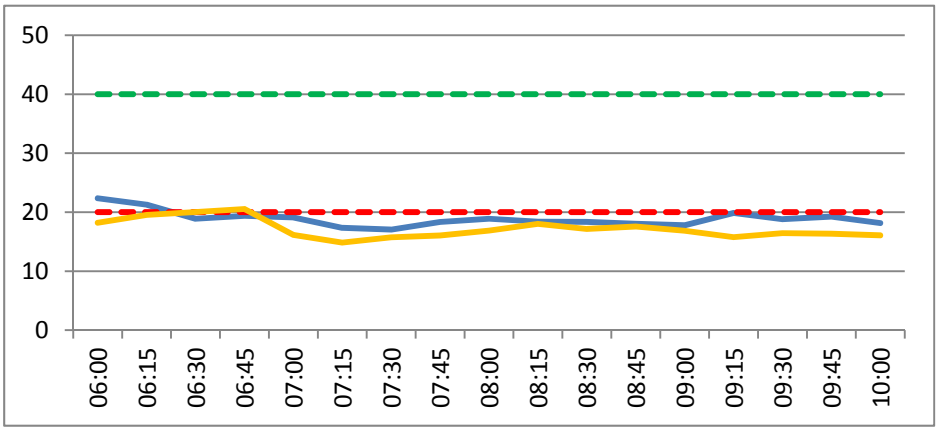
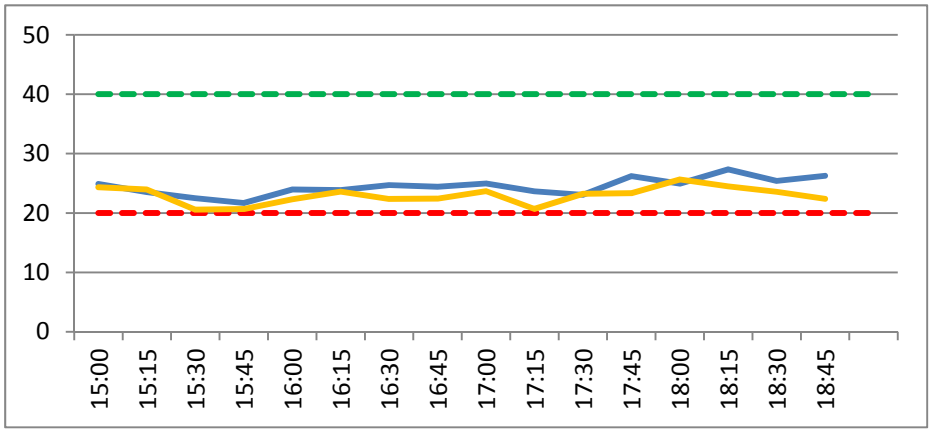
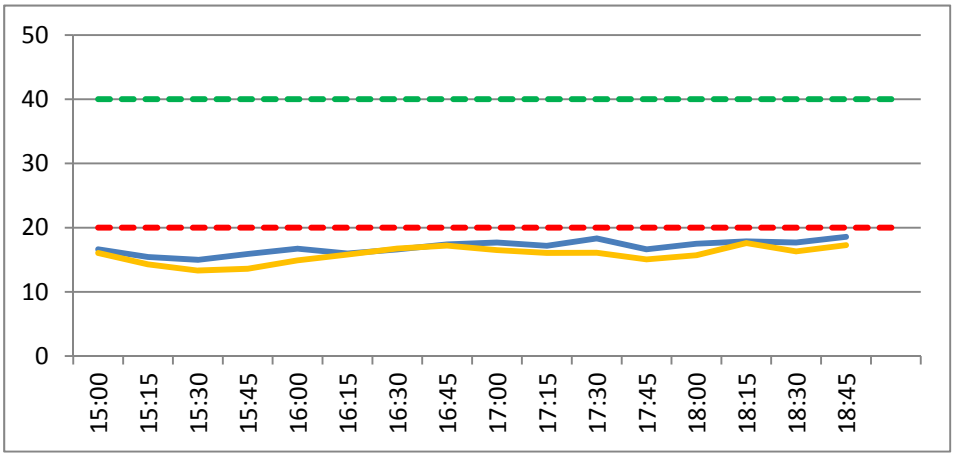
Blue = 2012 Data)

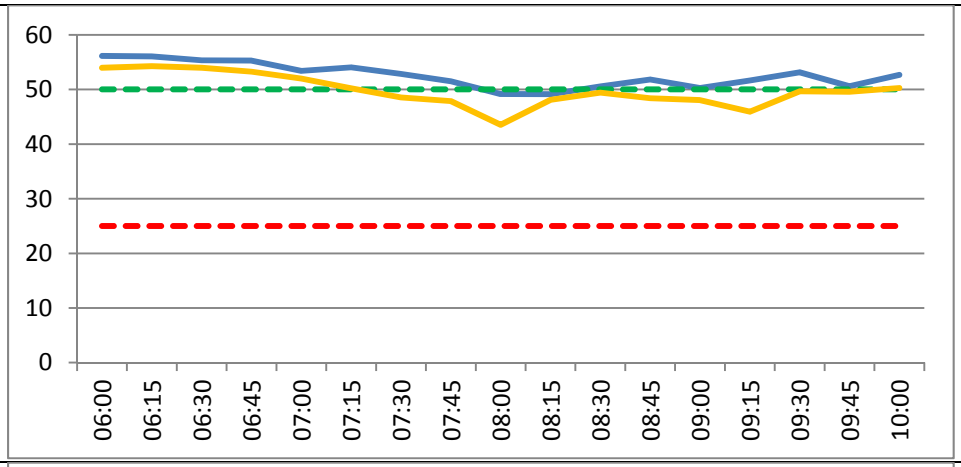
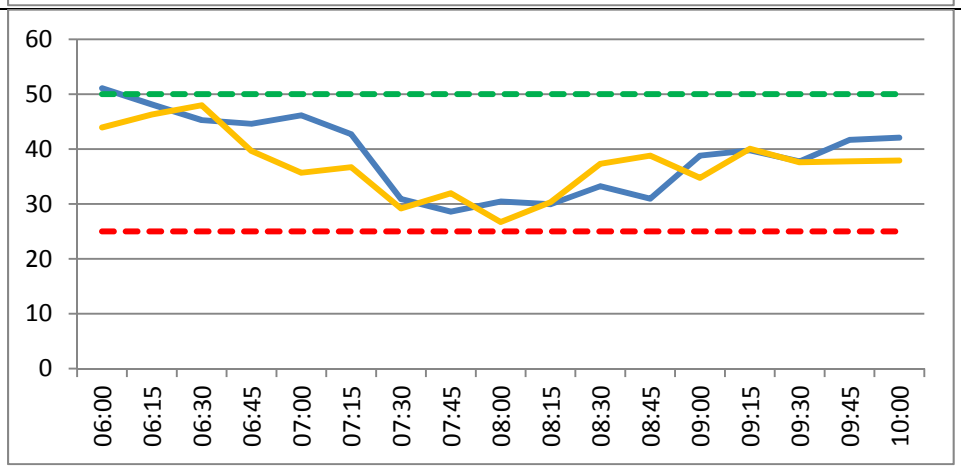
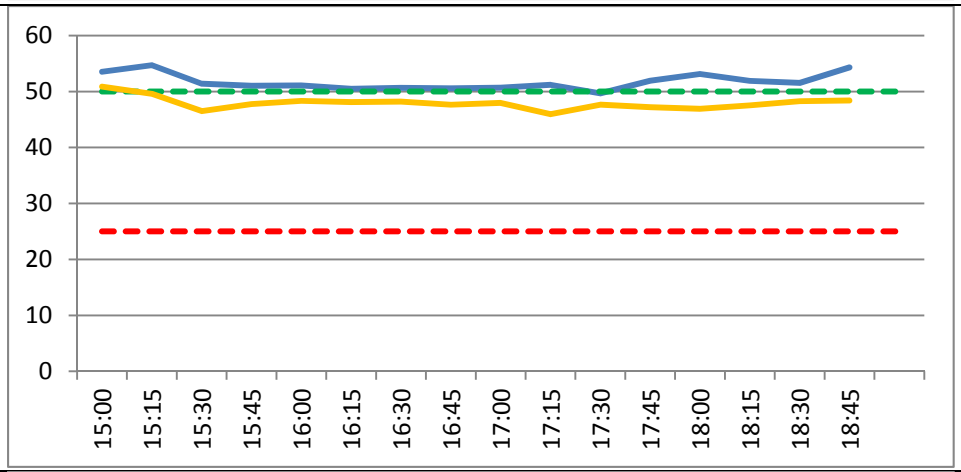
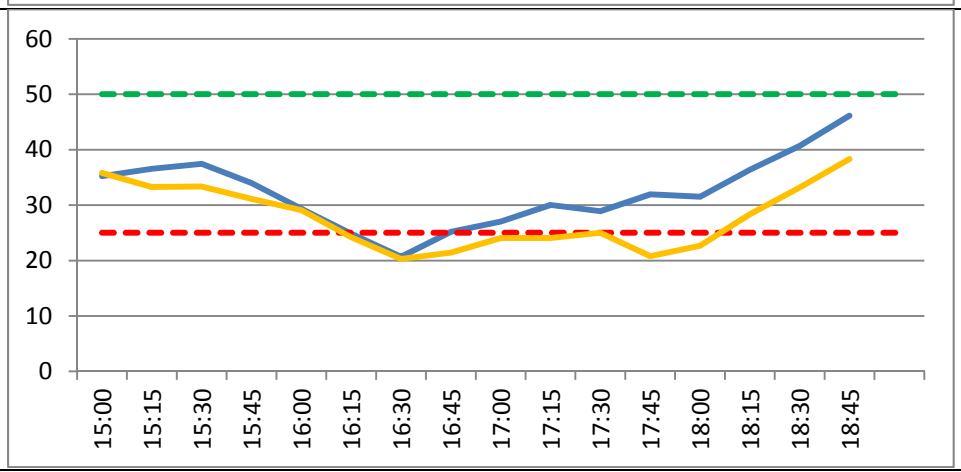
I-65 at University Blvd. (Location 3) **Northbound (AM Peak)**	
Southbound (AM Peak)	
Northbound (PM Peak)	
Southbound (PM Peak)	

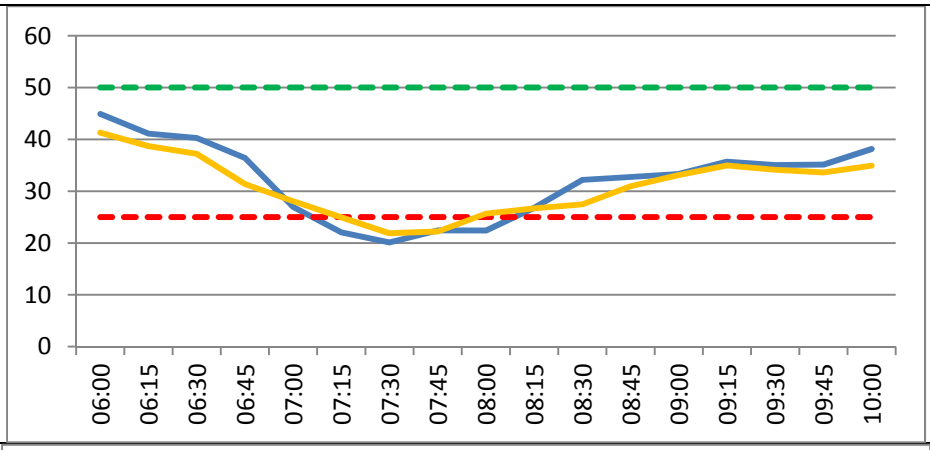
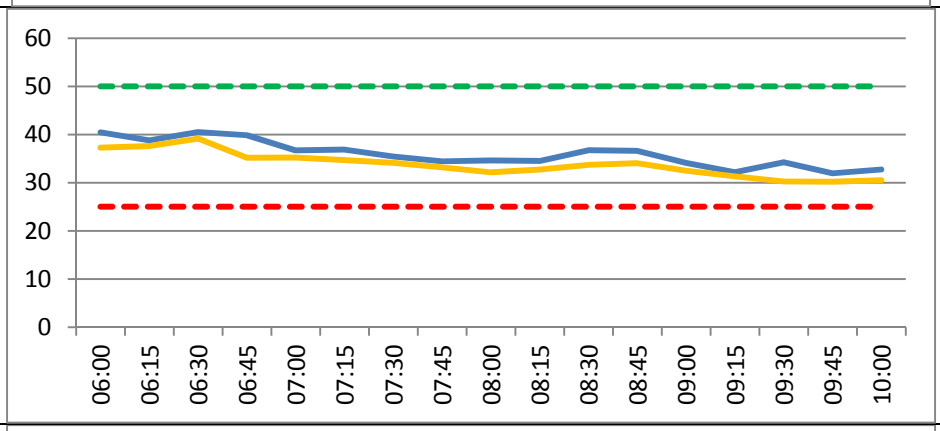
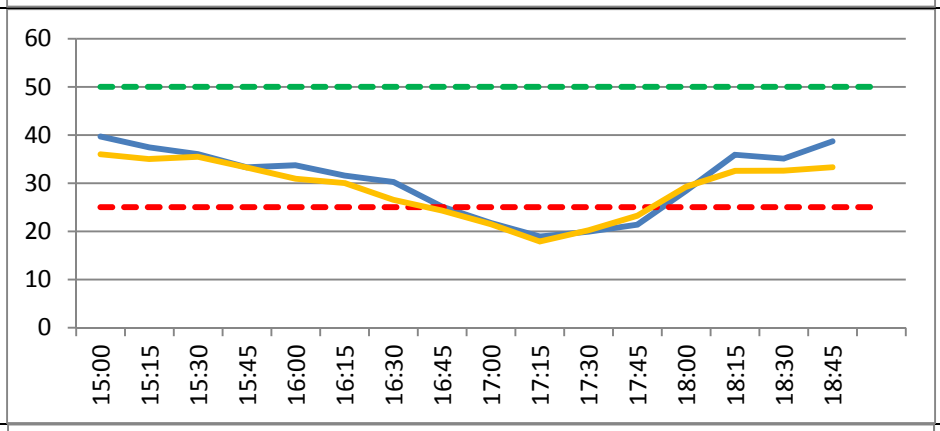
I-65 between US 31 and Alford Ave. (Location 4) **Northbound (AM Peak)**	
Southbound (AM Peak)	
Northbound (PM Peak)	
Southbound (PM Peak)	

I-65 at AL 119 (Location 5) **Northbound (AM Peak)**	
Southbound (AM Peak)	
Northbound (PM Peak)	
Southbound (PM Peak)	

I-20/59 between I-65 and I-20/I-59 Split (Location 9) **Westbound (AM Peak)**	
Eastbound (AM Peak)	
Westbound (PM Peak)	
Eastbound (PM Peak)	

US 78 at Finley Blvd. (Location 19) **Westbound (AM Peak)**	
Eastbound (AM Peak)	
Westbound (PM Peak)	
Eastbound (PM Peak)	

US 280 at Cherokee Rd. (Location 20) **Westbound (AM Peak)**	
Eastbound (AM Peak)	
Westbound (PM Peak)	
Eastbound (PM Peak)	

US 280 at I-459 (Location 21) **Westbound (AM Peak)**	
Eastbound (AM Peak)	
Westbound (PM Peak)	
Eastbound (PM Peak)