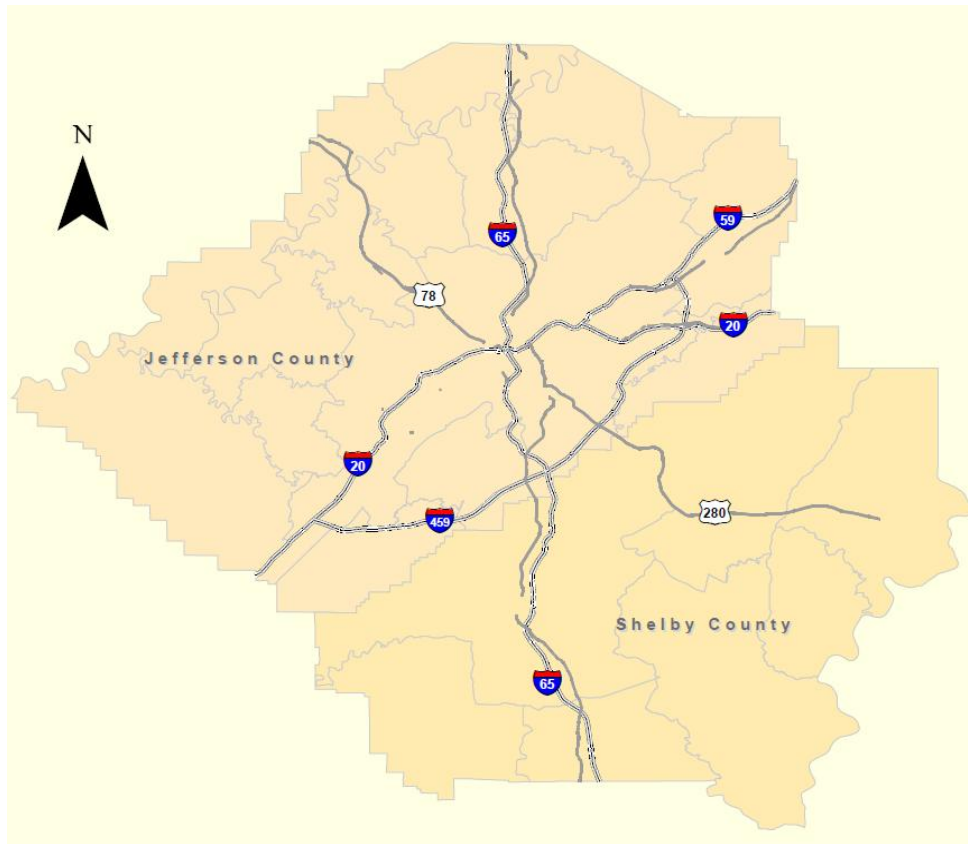


# 2010 BIRMINGHAM REGIONAL CONGESTION MONITORING REPORT



Prepared for:

**The Regional Planning Commission of Greater Birmingham**

By:

**The Birmingham Regional Transportation Data Center  
The University of Alabama at Birmingham**

**October 2011**

## 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, will collect regional performance data and develop measures to assess the state of the transportation system. This report is the first of the series. It is intended to identify areas of significant congestion and serve as a baseline for the future evaluation of congestion and transportation projects.

## 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

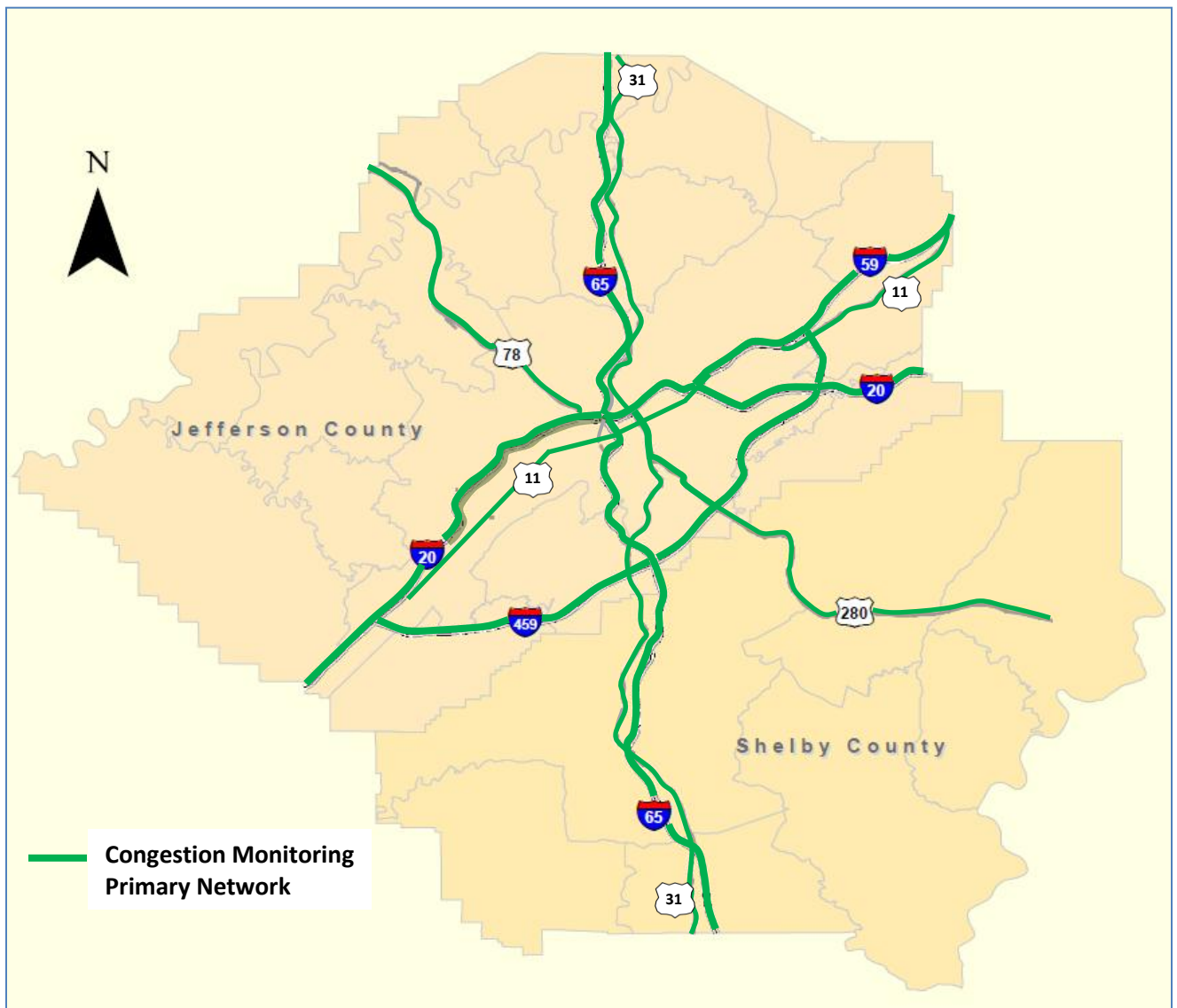


Figure 1. Congestion Monitoring Primary Network

A secondary congestion monitoring network including arterial and major collector roadways will be added when data become available.

## 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 average, 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 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 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

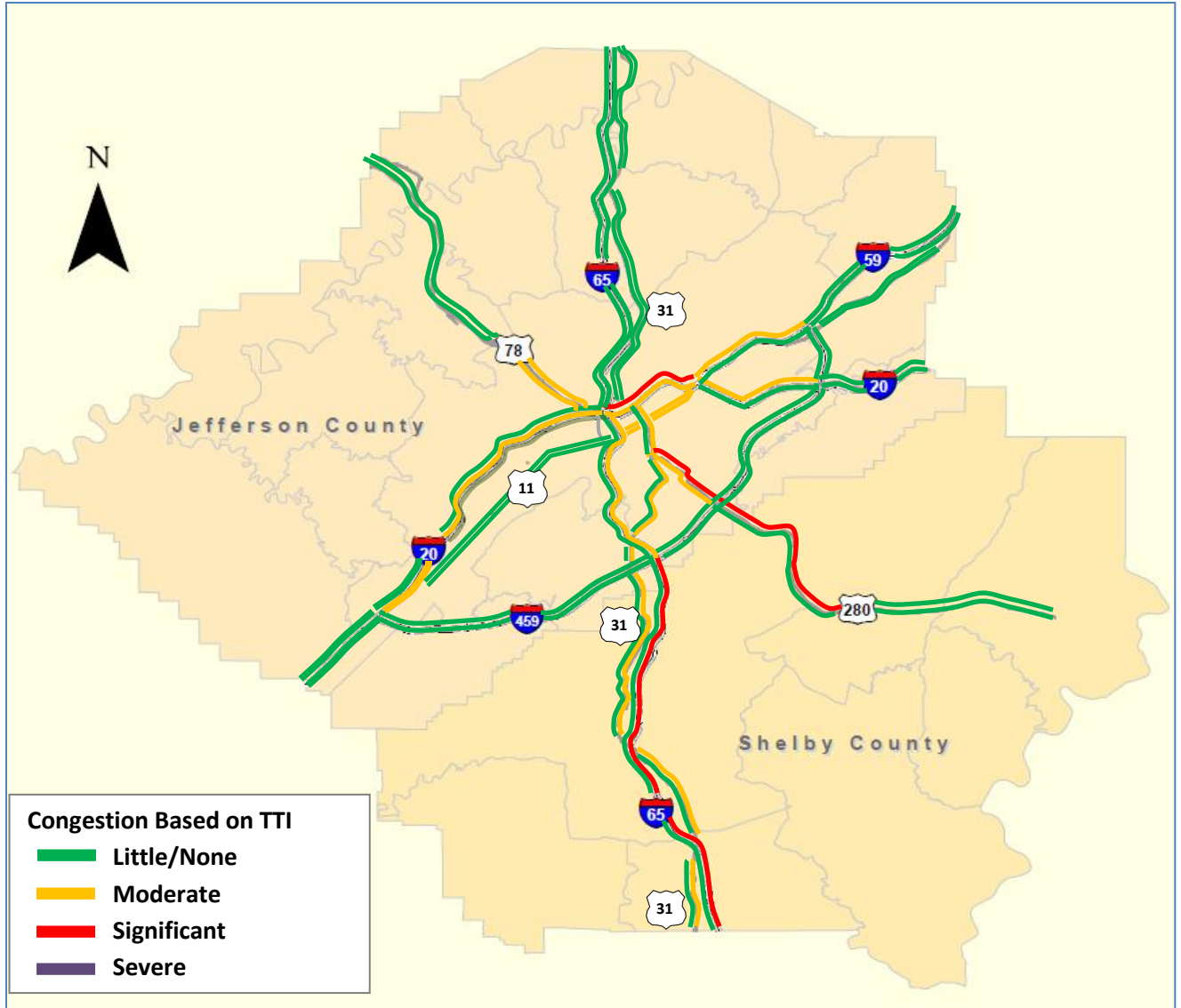
using real-time position and speed data broadcast from commercial fleet vehicles. From these archived data, we can compute average travel times for all roadway segments in the network at 5 and 15 minute intervals. Two weeks of speed data collected in October 2010 were used to compute average travel time 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 2010 Data)**

Route	Segment	Travel Time Index (TTI)	
		Direction 1	Direction 2
I-65	Shelby Co. to I-459	1.51 (NB)	1.01 (SB)
	I-459 to I-20/59	1.36 (NB)	1.11 (SB)
	I-20/59 to N. Jeff. Co.	1.05 (NB)	1.04 (SB)
I-20/59	W. Jefferson Co. to I-459	1.01 (EB)	1.02 (WB)
	I-459 to I-65	1.16 (EB)	1.05 (WB)
	I-65 to I-20/I-59 Split	1.15 (EB)	1.72 (WB)
I-20	I-59 to I-459	1.07 (EB)	1.17 (WB)
	I-459 to St. Clair Co. Line	1.04 (EB)	1.03 (WB)
I-59	I-20 to I-459	1.02 (EB)	1.36 (WB)
	I-459 to St. Clair Co. Line	1.00 (EB)	1.07 (WB)
I-459	I-20/59 to I-65	1.07 (EB)	1.07 (WB)
	I-65 to I-20	1.07 (EB)	1.06 (WB)
	I-20 to I-59	1.07 (EB)	1.02 (WB)
U.S. 280	Red Mt. Expwy. To I-459	1.18 (EB)	2.05 (WB)
	I-459 to Shelby County	1.10 (EB)	1.31 (WB)
U.S. 78	Walker Co. Line to I-20/59	1.13 (NB)	1.14 (SB)
U.S. 31	Shelby Co. to I-459	1.49 (NB)	1.31 (SB)
	I-459 to Red Mt. Expwy.	1.53 (NB)	1.43 (SB)
	I-20/59 to N. Jeff. Co.	1.23 (NB)	1.19 (SB)
U.S. 11	Academy Dr. to I-65	1.30 (EB)	1.27 (WB)
	I-65 to I-459	1.50 (EB)	1.52 (WB)
	I-459 to St. Clair Co. Line	1.38 (EB)	1.35 (WB)

**Table 2. Travel Time Index – PM Peak Period – Peak 15 Minutes (October 2010 Data)**

Route	Segment	Travel Time Index (TTI)	
		Direction 1	Direction 2
I-65	Shelby Co. to I-459	1.13 (NB)	1.28 (SB)
	I-459 to I-20/59	1.12 (NB)	1.68 (SB)
	I-20/59 to N. Jeff. Co.	1.06 (NB)	1.05 (SB)
I-20/59	W. Jefferson Co. to I-459	1.01 (EB)	1.02 (WB)
	I-459 to I-65	1.03 (EB)	1.05 (WB)
	I-65 to I-20/I-59 Split	1.27 (EB)	1.07 (WB)
I-20	I-59 to I-459	1.09 (EB)	1.08 (WB)
	I-459 to St. Clair Co. Line	1.02 (EB)	1.03 (WB)
I-59	I-20 to I-459	1.16 (EB)	1.02 (WB)
	I-459 to St. Clair Co. Line	1.02 (EB)	1.01 (WB)
I-459	I-20/59 to I-65	1.07 (EB)	1.07 (WB)
	I-65 to I-20	1.09 (EB)	1.09 (WB)
	I-20 to I-59	1.03 (EB)	1.03 (WB)
U.S. 280	Red Mt. Expwy. To I-459	2.59 (EB)	1.59 (WB)
	I-459 to Shelby County	1.29 (EB)	1.11 (WB)
U.S. 78	Walker Co. Line to I-20/59	1.18 (EB)	1.21 (WB)
U.S. 31	Shelby Co. to I-459	1.41 (NB)	1.49 (SB)
	I-459 to Red Mt. Expwy.	1.43 (NB)	1.71 (SB)
	I-20/59 to N. Jeff. Co.	1.17 (NB)	1.24 (SB)
U.S. 11	Academy Dr. to I-65	1.28 (EB)	1.33 (WB)
	I-65 to I-459	1.46 (EB)	1.55 (WB)
	I-459 to St. Clair Co. Line	1.40 (EB)	1.43 (WB)



**Figure 2. Travel Time Index – AM Peak**

TTI values are shown 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.

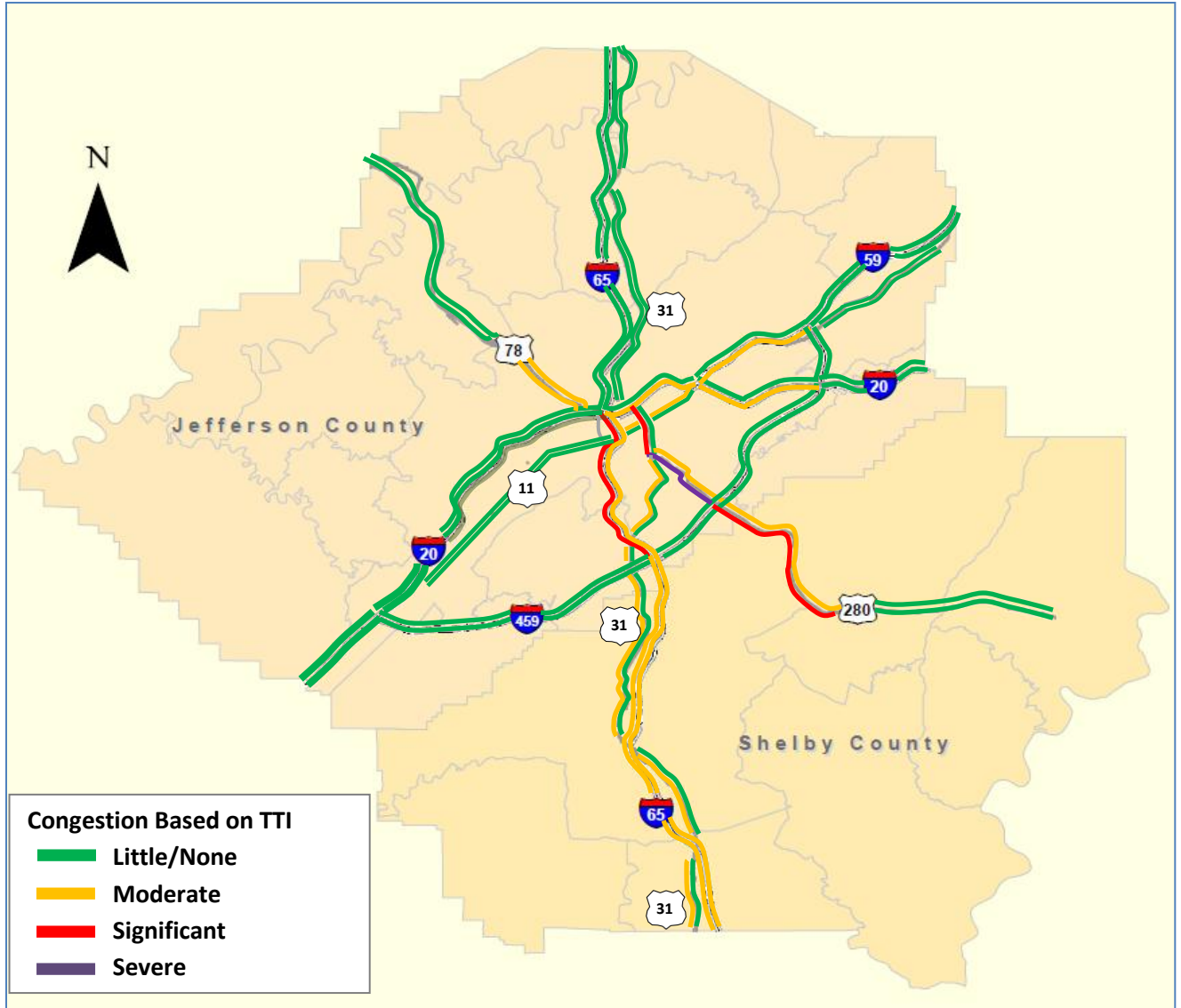


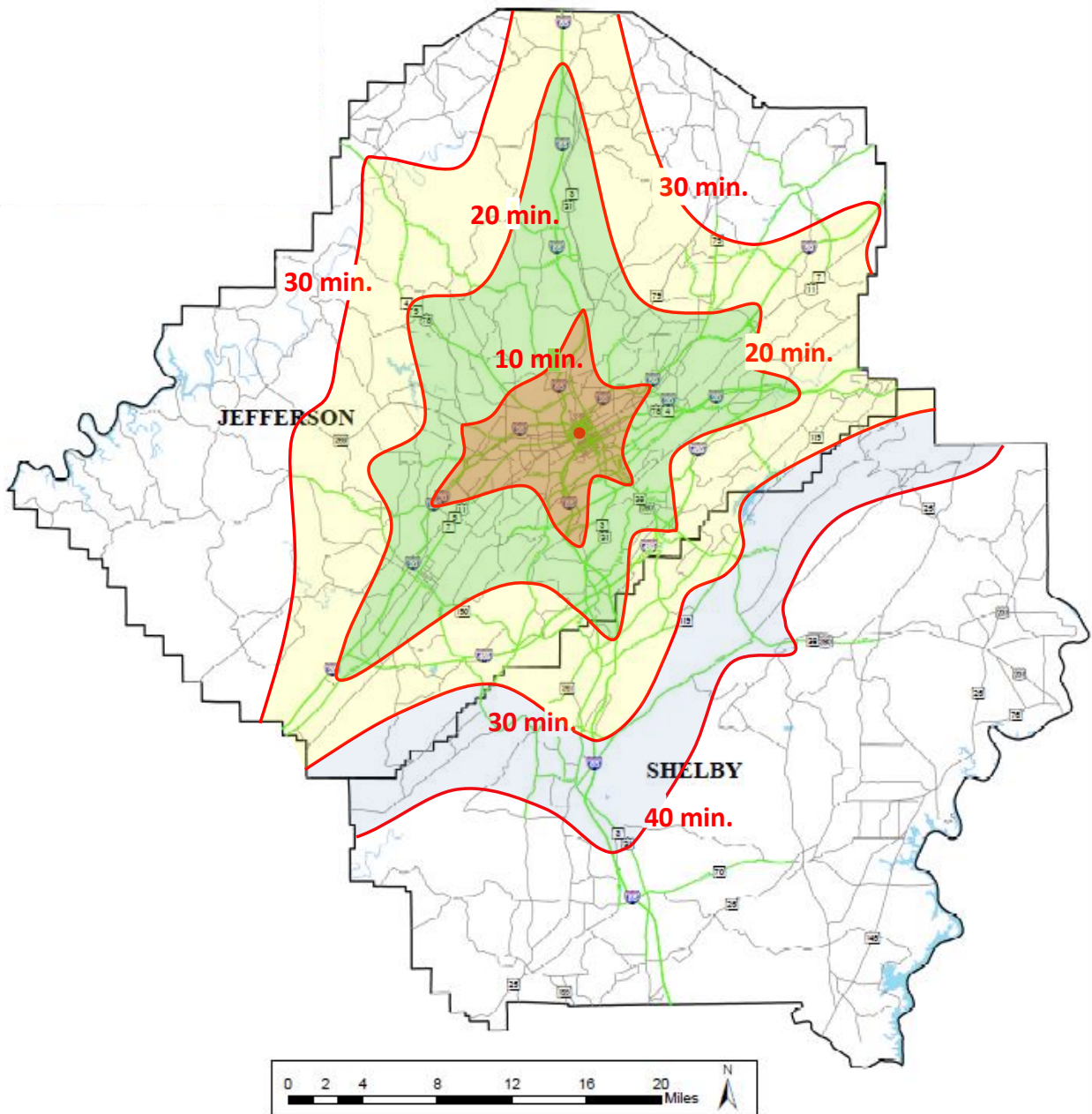
Figure 3. Travel Time Index – PM Peak

### Regional Travel Times

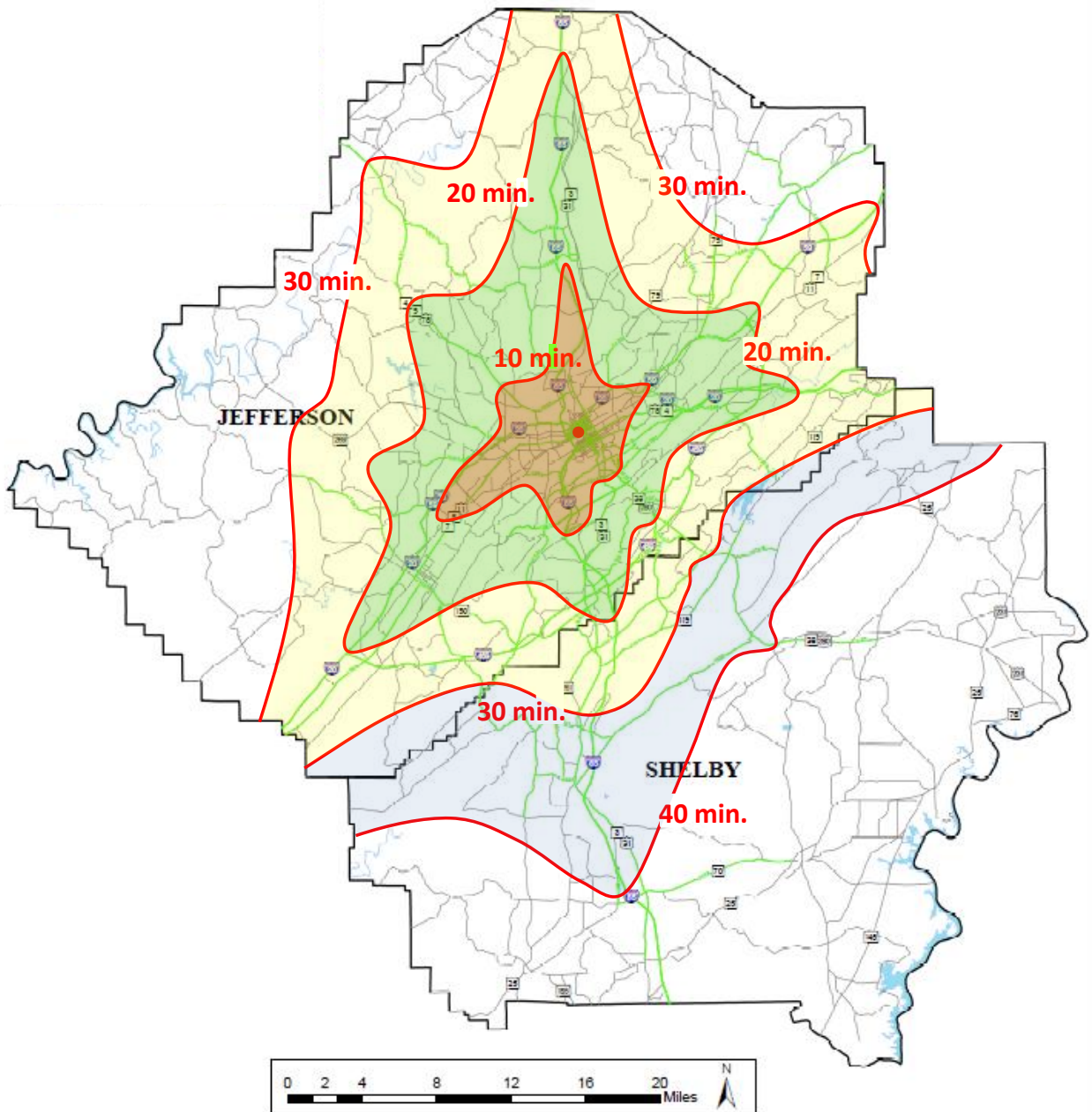
Using the travel time data collected, maps were prepared showing travel times to and from downtown Birmingham along major interstate and arterial routes during the most congested periods of the AM and PM peaks. These are shown in Figures 8 and 9.



**Figure 8 – Morning Travel Times to Downtown  
During Most Congested Periods (6:00 AM – 10:00 AM)**



**Figure 9 – Afternoon Travel Times from Downtown  
During Most Congested Periods (3:00 PM – 7:00 PM)**



### Speed Profiles

Key locations in the study network were selected for speed profile plots. These plots show average speed on a given roadway segment over a 2 week period and were developed primarily to serve as baseline data to monitor the growth and extent of congestion in the future. A sample plot is shown in Figure 6. Every 1-2 years, new speed data will be plotted on these same charts and will provide an indication of how congestion is changing both in terms of severity and duration.

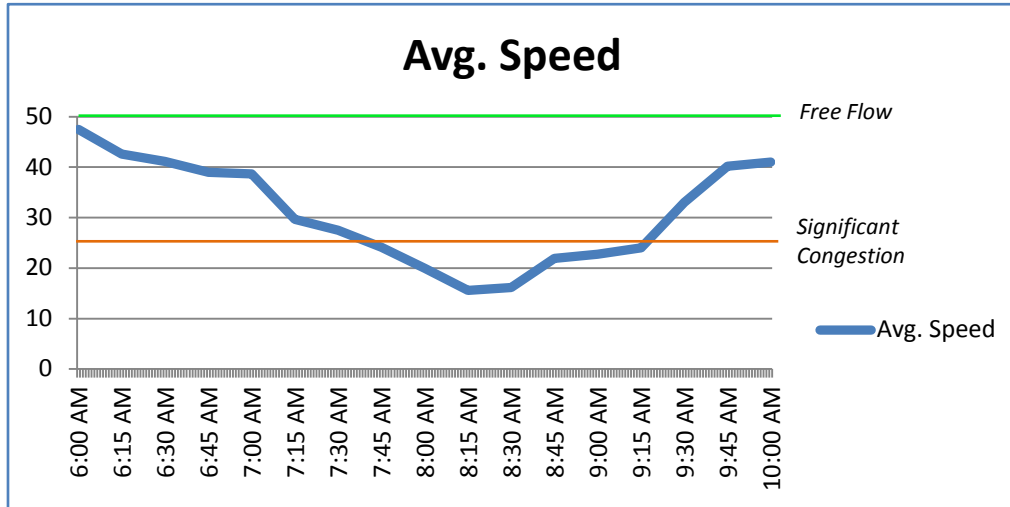
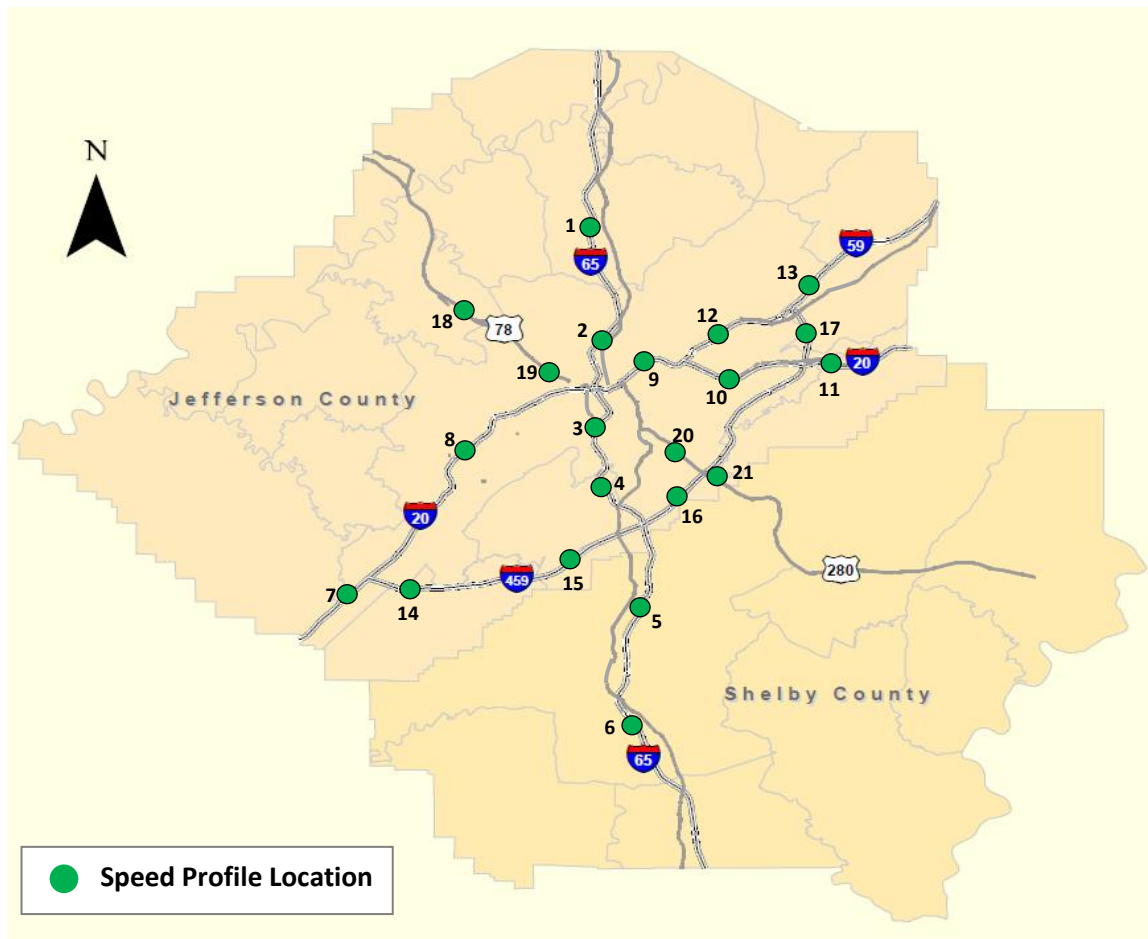


Figure 6. AM Speed Profile – US 280 at Rocky Ridge Road (WB)

Figure 7 shows the network locations selected for speed profiles.



**Figure 7. Speed Profile Locations**

**Duration of Congestion**

Where congestion was found to exist, we used the travel time data to measure its duration. Figures 4 and 5 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 and on the portion of U.S. 78 near I-20/59 in Arkadelphia.

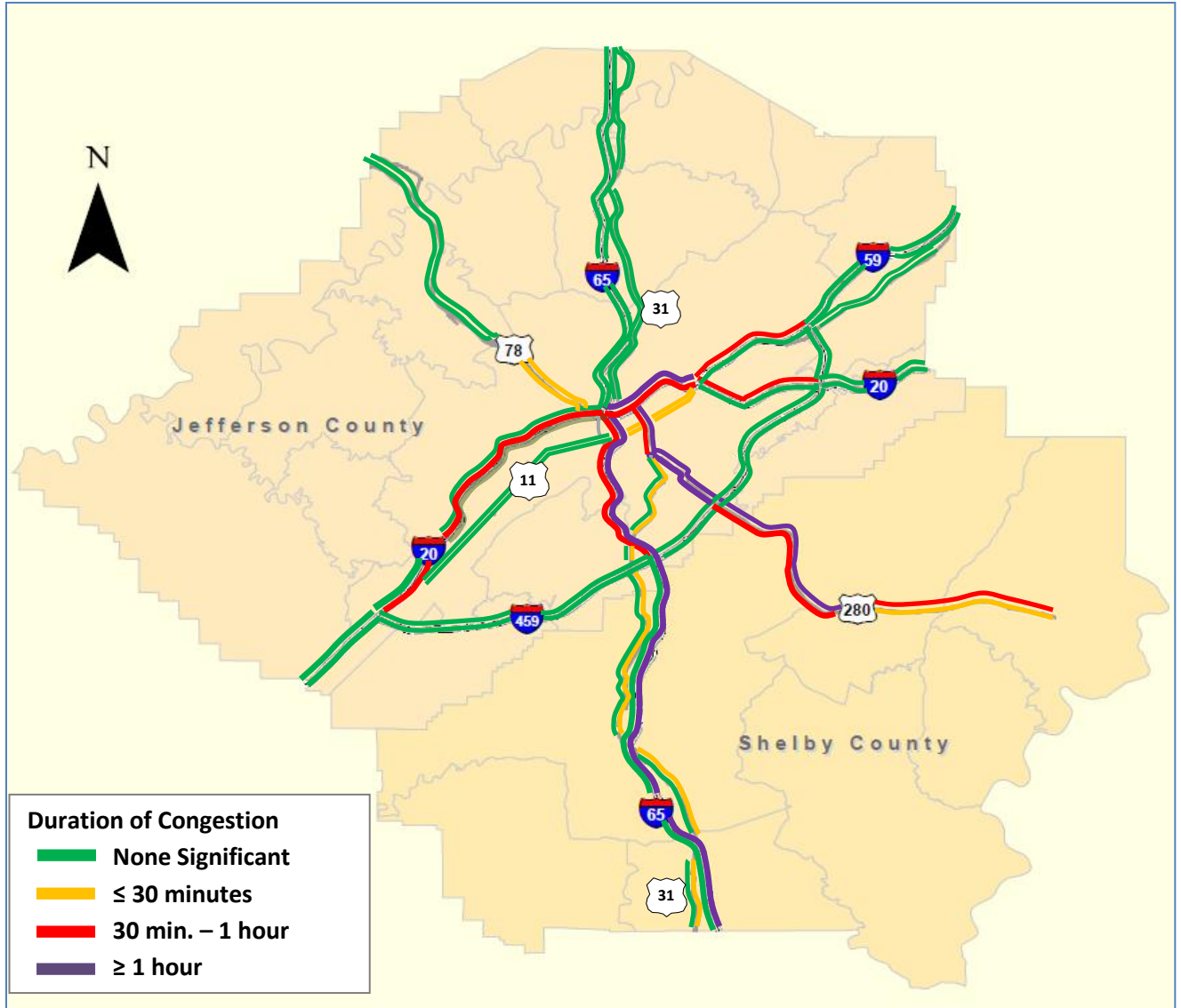


Figure 4. Duration of Congestion – AM Peak

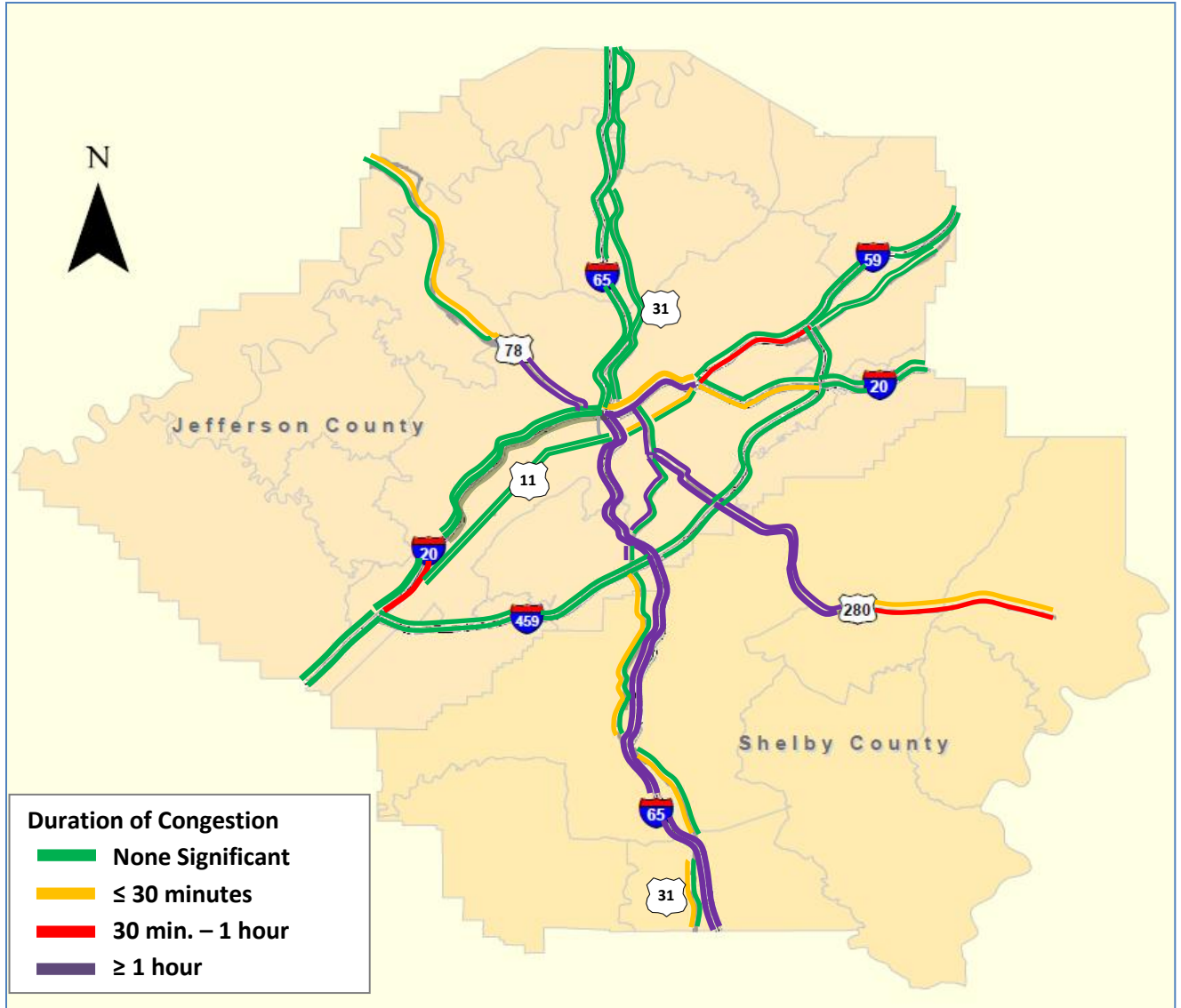


Figure 5. Duration of Congestion – PM Peak

### 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  $\geq 1.10$  for freeways or TTI  $\geq 2.0$  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	
		NB/EB	SB/WB	NB/EB	SB/WB
I-65	Chilton Co. Line to Blount Co. Line	73.5	20.3	62.9	68.9
I20/59	Tuscaloosa Co. Line to I-20/59 Split	22.7	25.1	23.0	12.9
I-20	I-20/59 Split to St. Clair Co. Line	4.3	7.6	4.3	2.8
I-59	I-20/59 Split to St. Clair Co. Line	-	24.1	17.7	0.9
I-459	I-20/59 to I-59	40.3	19.5	42.0	30.7
I-22	Walker Co. Line to Coalburg Road	-	-	-	-
	<b>Totals (by direction)</b>	<b>140.7</b>	<b>96.6</b>	<b>149.9</b>	<b>116.2</b>
	<b>Total (both directions)</b>	<b>237.4</b>		<b>266.1</b>	
	<b>% of Total Interstate Lane-Miles</b>	<b>27%</b>		<b>31%</b>	

**Table 4. Lane-Miles of Congested Arterials**

Route	From/To	AM Peak		PM Peak	
		NB/EB	SB/WB	NB/EB	SB/WB
U.S. 31	Chilton Co. Line to Blount Co. Line	11.2	7.4	8.0	18.0
U.S. 280	Shelby Co. Line to Red Mt. Expwy.	0.6	17.9	22.3	11.0
U.S. 78	Walker Co. Line to St. Clair Co. Line	7.7	11.0	8.1	10.0
U.S. 11	Tuscaloosa Co. Line to St. Clair Co. Line	6.3	6.5	5.2	6.8
	<b>Totals (by direction)</b>	<b>25.8</b>	<b>42.8</b>	<b>43.7</b>	<b>45.7</b>
	<b>Total (both directions)</b>	<b>68.6</b>		<b>89.4</b>	
	<b>% of Total Arterial Lane-Miles</b>	<b>10%</b>		<b>13%</b>	

## **Summary**

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

- I-65 between Shelby County 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.

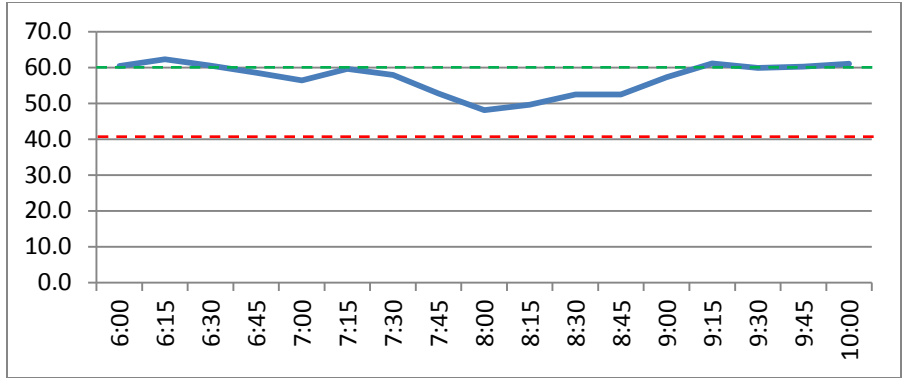
The quality of the speed and travel time data collected for this study represent a significant improvement over past data collection methods and will allow the RPC to better monitor changes in congestion severity and duration in the future. This data presented in this report will serve as the baseline for future congestion monitoring.



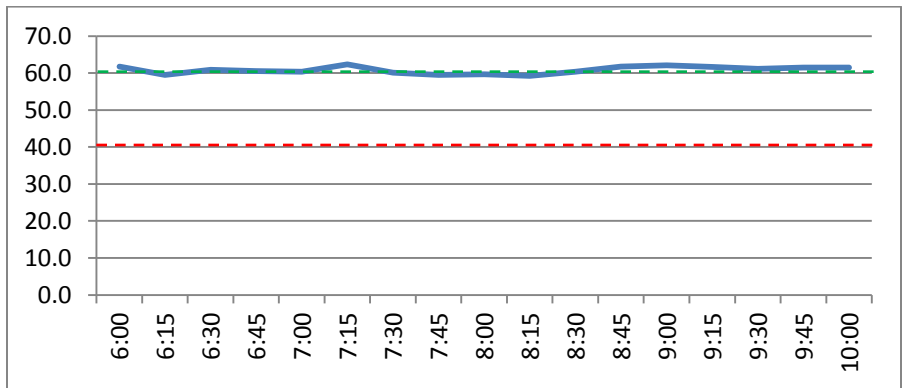
**APPENDIX A**  
**SPEED PROFILES AT SELECTED LOCATIONS**

**I-65 at University Blvd.  
(Location 3)**

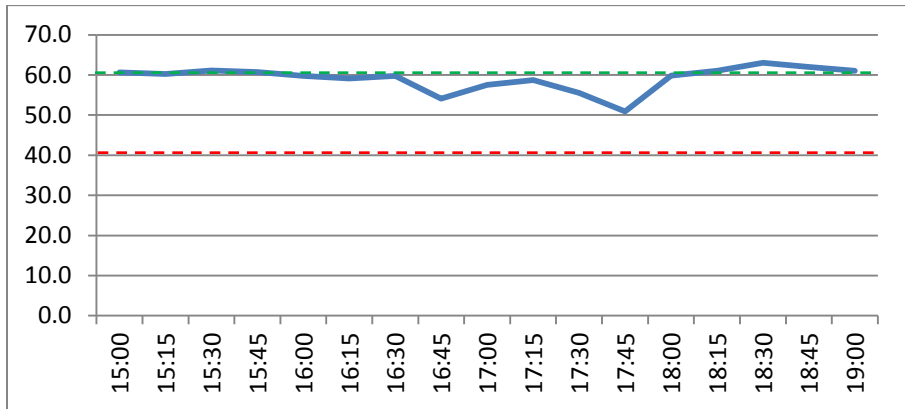
**Northbound  
(AM Peak)**



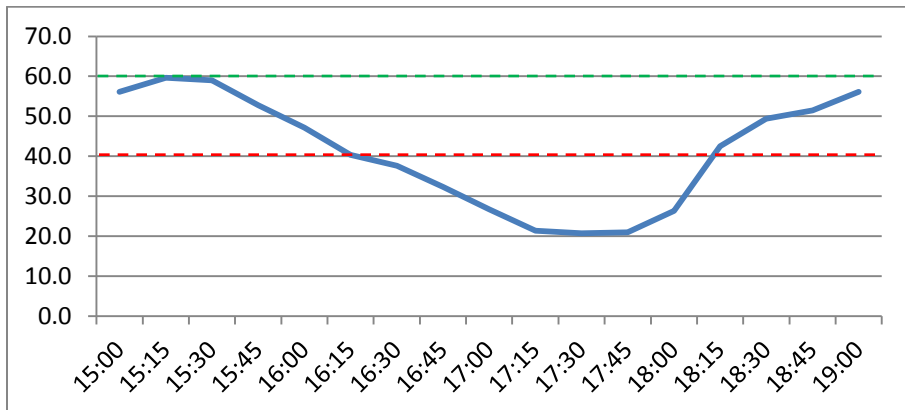
**Southbound  
(AM Peak)**



**Northbound  
(PM Peak)**

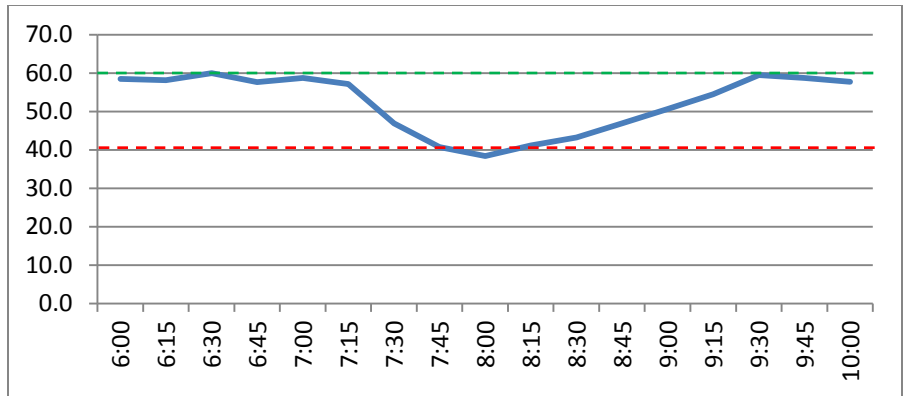


**Southbound  
(PM Peak)**

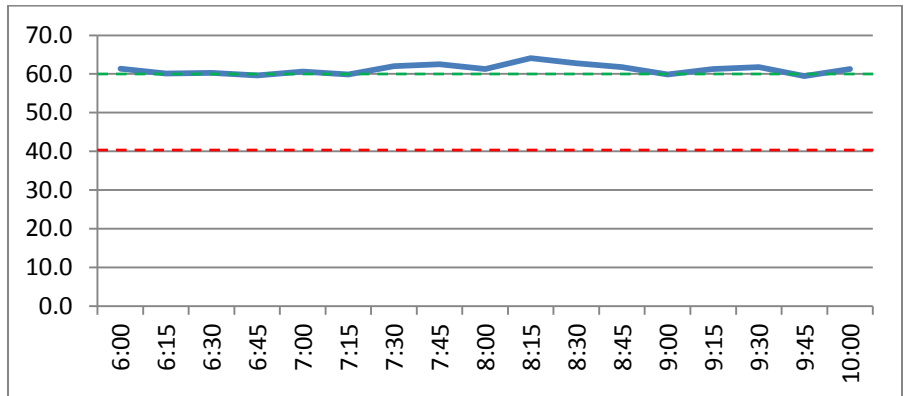


**I-65 between US 31  
and Alford Ave.  
(Location 4)**

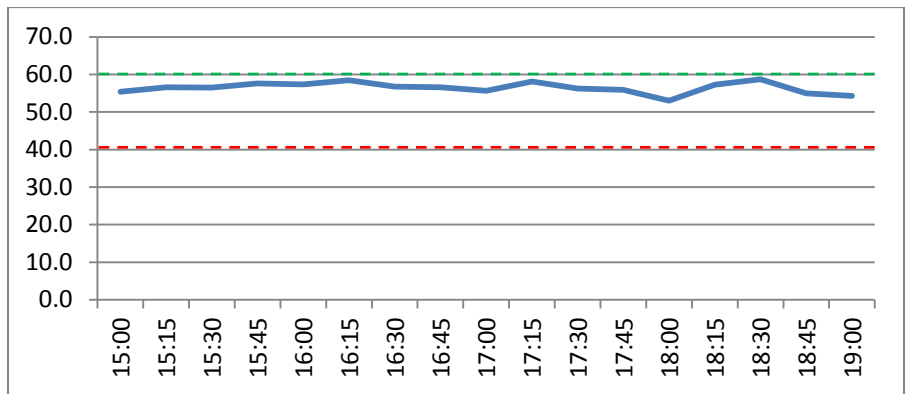
**Northbound  
(AM Peak)**



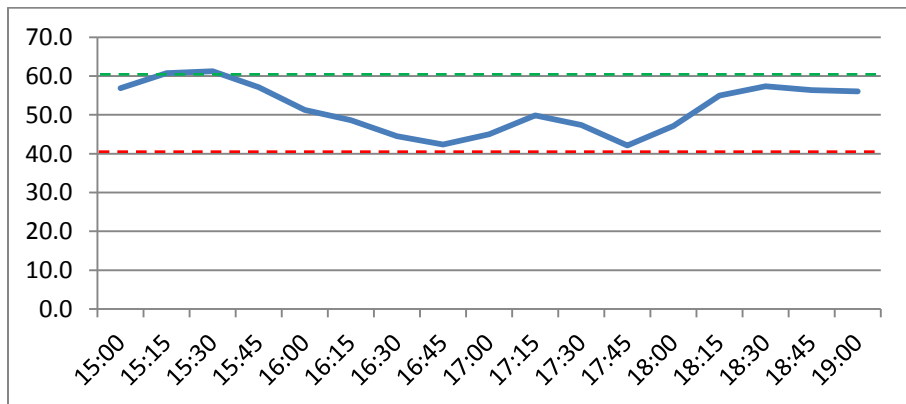
**Southbound  
(AM Peak)**



**Northbound  
(PM Peak)**

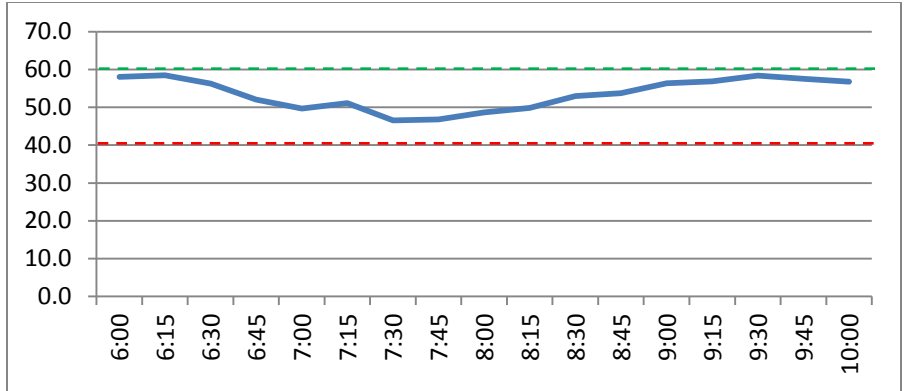


**Southbound  
(PM Peak)**

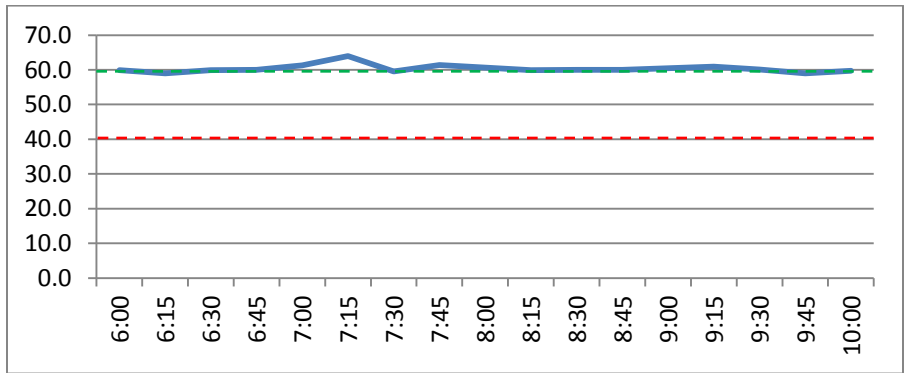


**I-65 at AL 119  
(Location 5)**

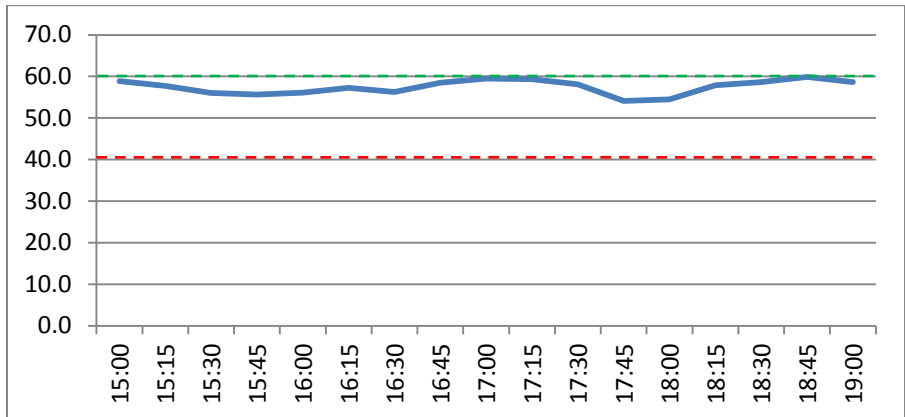
**Northbound  
(AM Peak)**



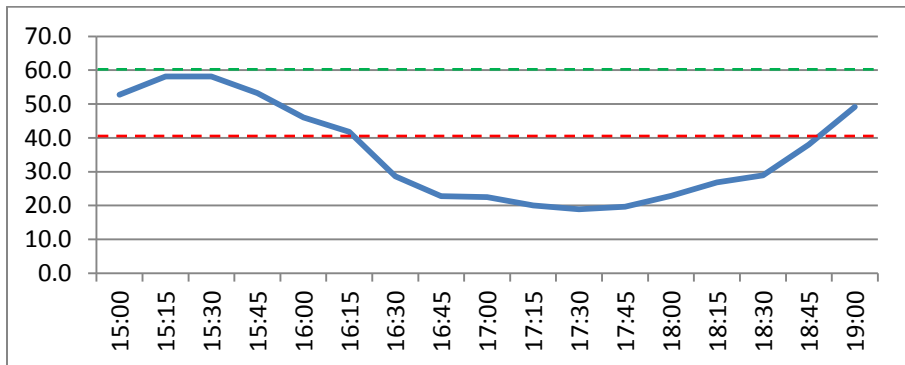
**Southbound  
(AM Peak)**



**Northbound  
(PM Peak)**

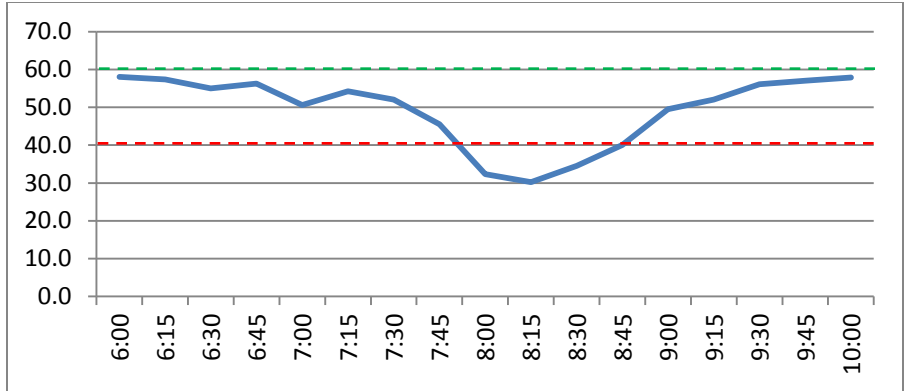


**Southbound  
(PM Peak)**

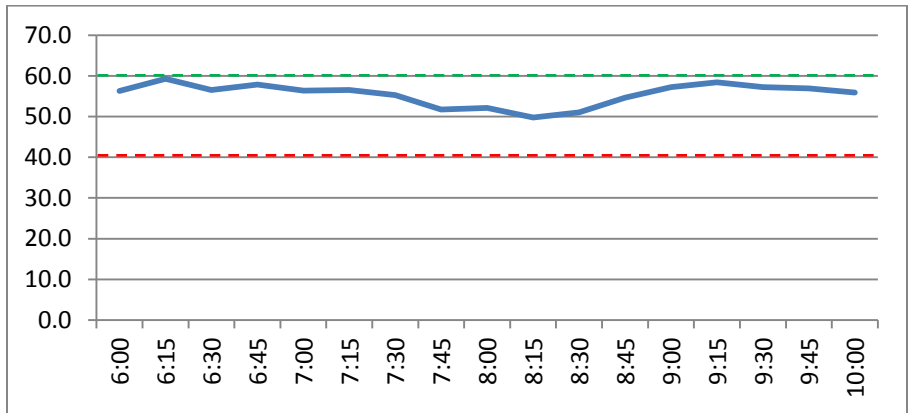


**I-20/59 between I-65  
and I-20/I-59 Split  
(Location 9)**

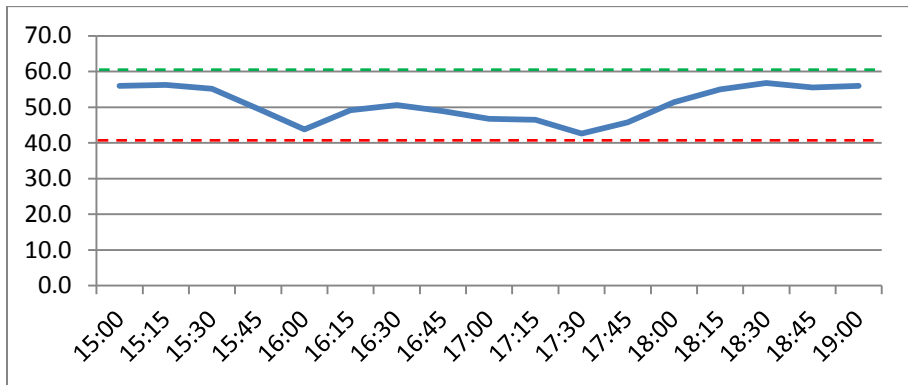
**Eastbound  
(AM Peak)**



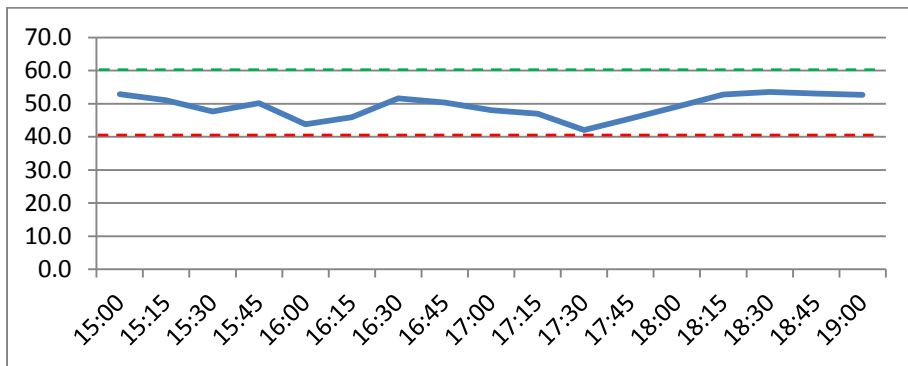
**Westbound  
(AM Peak)**



**Eastbound  
(PM Peak)**

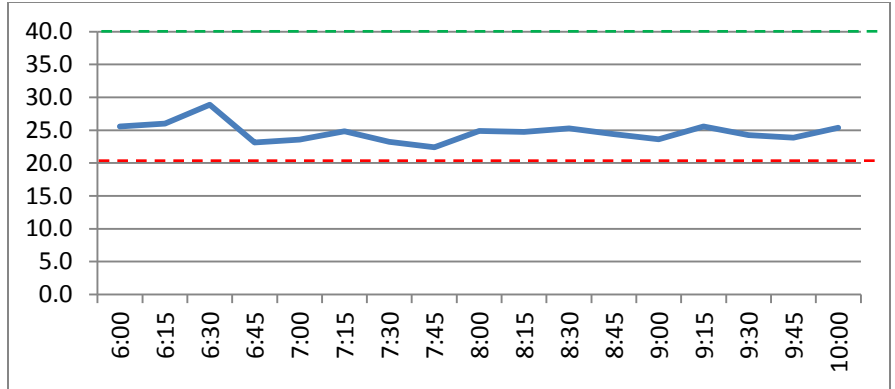


**Westbound  
(PM Peak)**

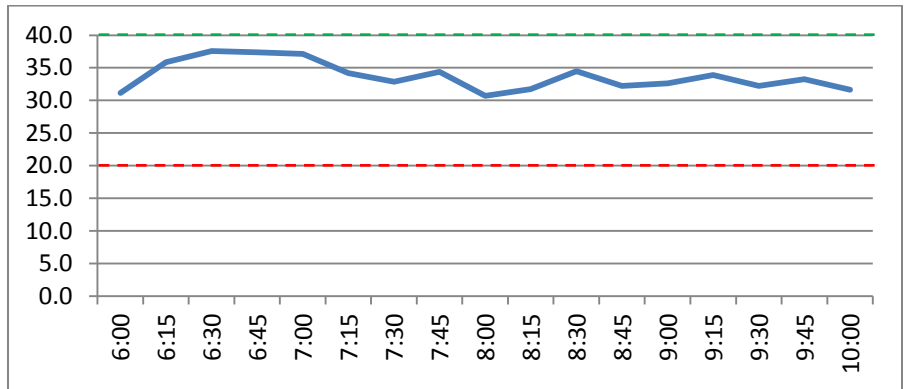


**US 78 at Finley Blvd.  
(Location 19)**

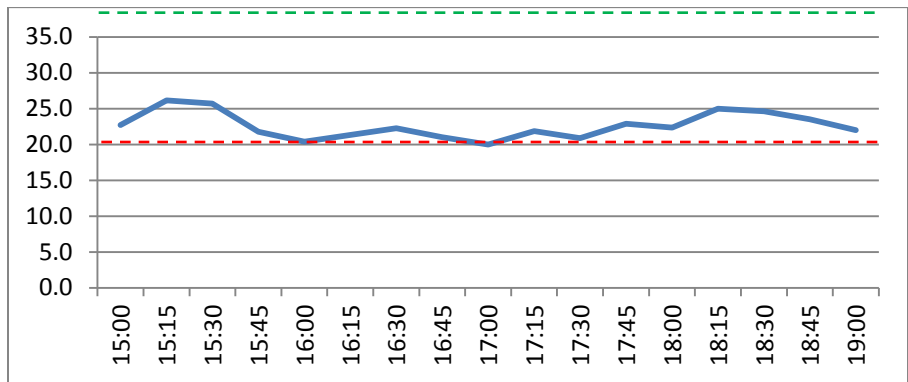
**Northbound  
(AM Peak)**



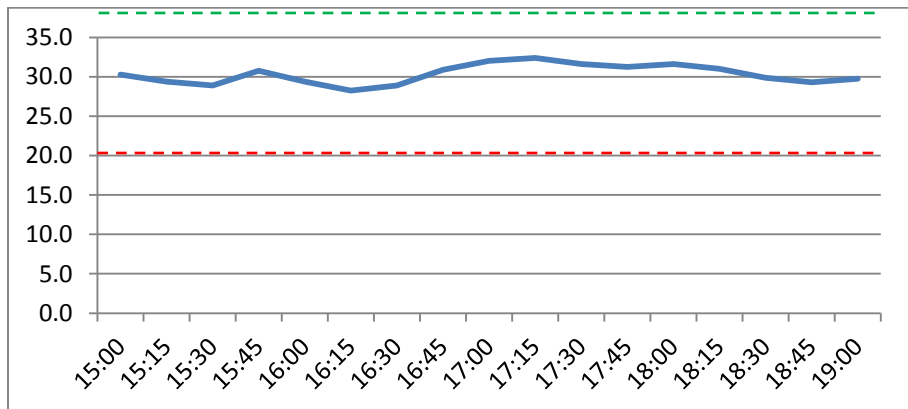
**Southbound  
(AM Peak)**



**Northbound  
(PM Peak)**

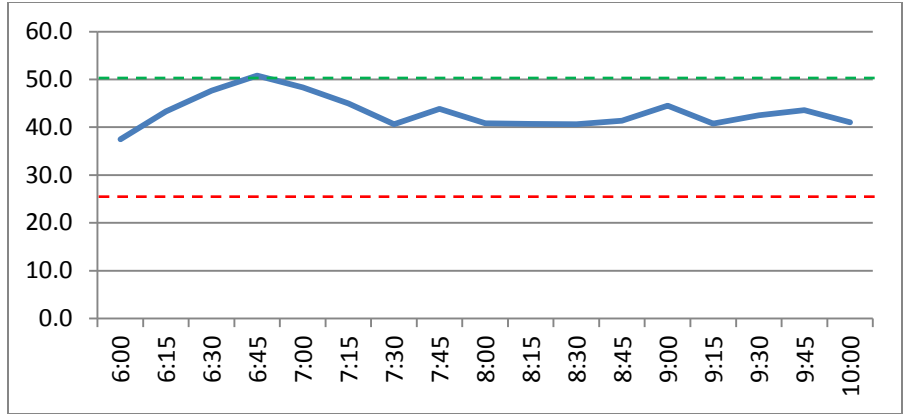


**Southbound  
(PM Peak)**

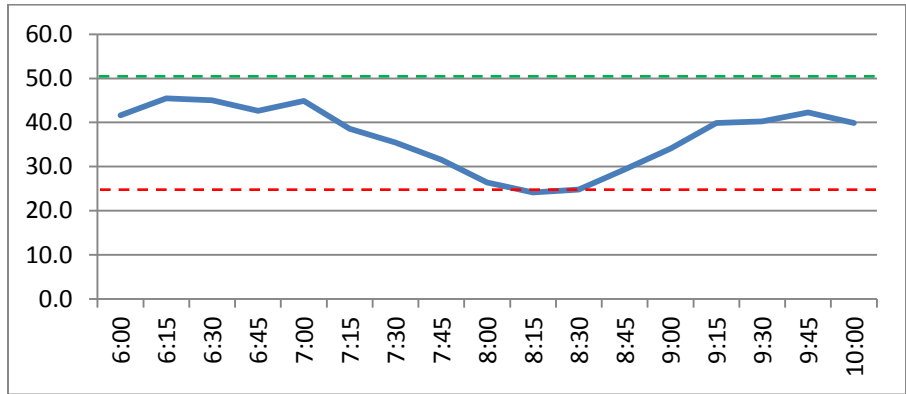


**US 280 at Cherokee Rd.  
(Location 20)**

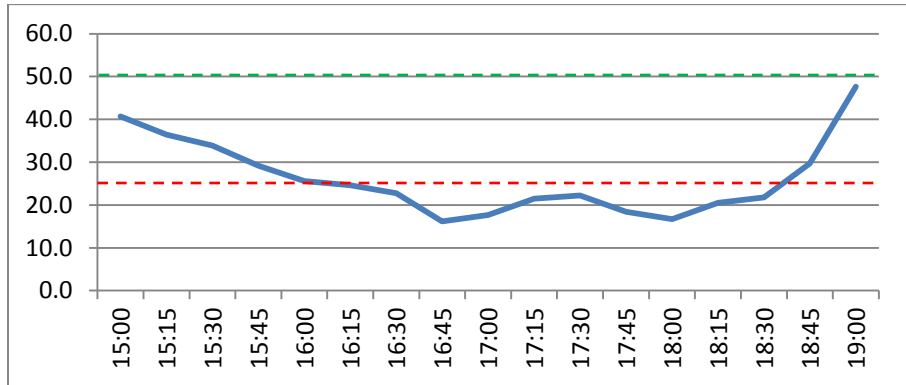
**Eastbound  
(AM Peak)**



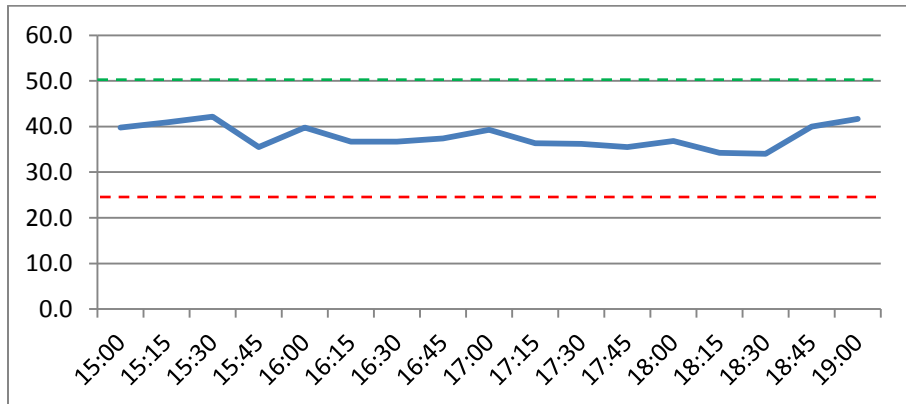
**Westbound  
(AM Peak)**



**Eastbound  
(PM Peak)**

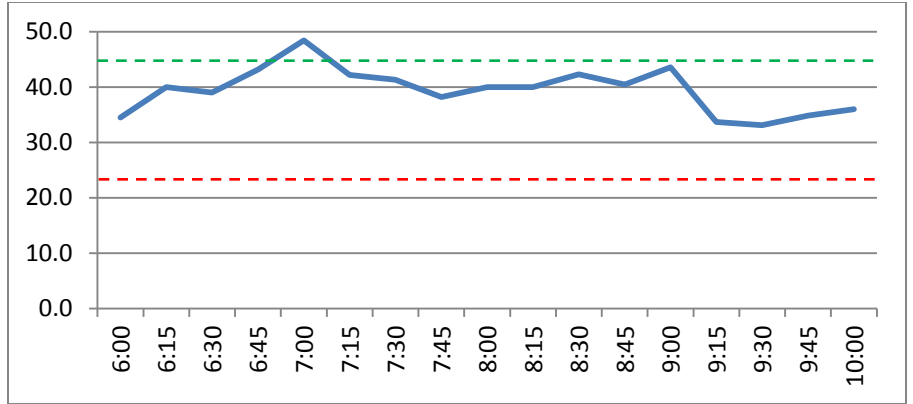


**Westbound  
(PM Peak)**

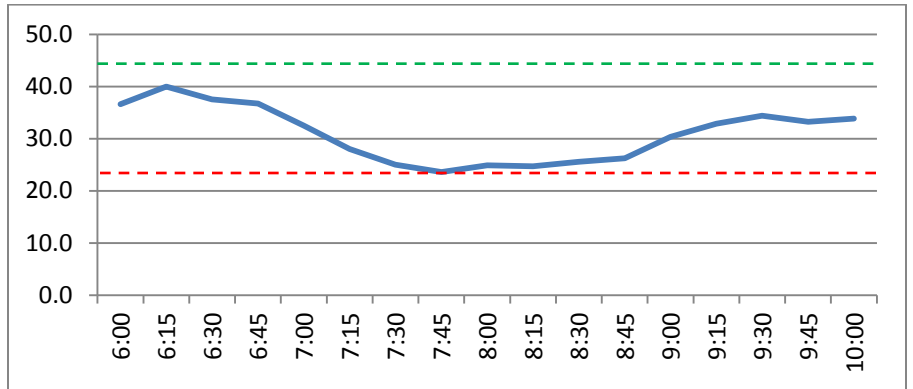


**US 280 at I-459  
(Location 21)**

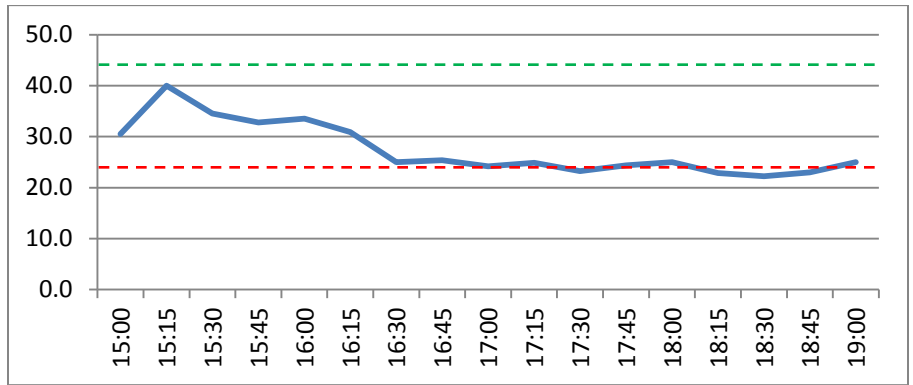
**Eastbound  
(AM Peak)**



**Westbound  
(AM Peak)**



**Eastbound  
(PM Peak)**



**Westbound  
(PM Peak)**

