

US 15-501 Corridor Study

Traffic Forecast Report

US 15-501 from NC 54 to US 64
Year 2013 - 2040



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North Carolina Department of
Transportation

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1.0 Project Background

1.1 PROJECT DESCRIPTION

This forecast was prepared for the North Carolina Department of Transportation (NCDOT) for a 13 mile section of US 15-501 between NC 54 in Orange County and US 64 in Chatham County. The intent of the forecast is to anticipate travel demand along US 15-501 in future year 2040 for the purposes analyzing corridor design alternatives.

The following scenarios are included in this forecast:

- 2013 No-Build
- 2040 No-Build

1.2 AREA INFORMATION

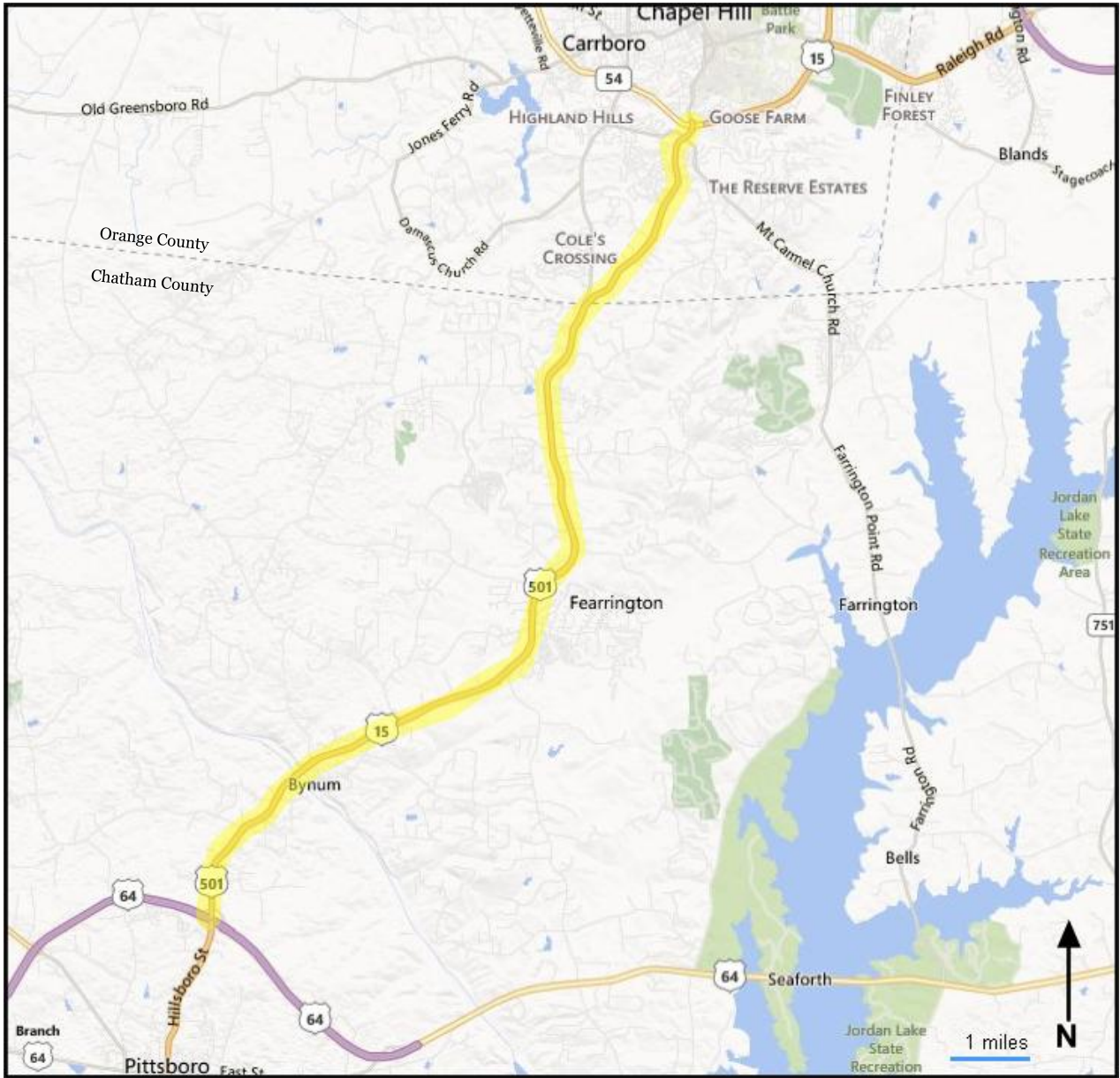
The US 15-501 corridor is functionally classified as a north-south principal arterial which serves the inter-county travel demands between Chatham and Orange Counties. US 15-501 is considered a Strategic Corridor between the growing towns of Pittsboro and Chapel Hill and is classified as a Boulevard in the study area. The corridor has recently seen an increase in retail and residential development serving individuals working in nearby commercial, high-tech, medical, and research centers. US 15-501 serves many different land uses such as: residential, retail and office. The speed limit along US 15-501 is 55 miles per hour, but is also reduced to 45 mph near NC 54 and the Orange and Chatham County Line.

NC 54, which is located on the northern end of the project in Orange County, is functionally classified as an east-west principal arterial and connects Chapel Hill and smaller rural areas to the west with I-40 to the east. The speed limit along NC 54 in the vicinity of US 15-501 is 45 miles per hour.

US 64 is located on the southern end of the project in Chatham County. US 64 is functionally classified as an east-west principal arterial and connects to I-540 to the East and US 421 to the west of the project. The speed limit along US 64 in the vicinity of US 15-501 is 65 miles per hour.

The project location map for the US 15-501 forecast is shown in Exhibit 1.1.

Exhibit 1.1: Project Vicinity Map



2.0 Sources of Information and Data

2.1 FIELD DATA COLLECTION

Turning movement counts were collected for the AM (7-9) and PM (4-6) peak hours at 25 project intersections, and 48-hour classification counts were collected or attained for seven locations along US 15-501. 48-hour classification counts were factored to Average Annual Daily Traffic (AADT) volumes using a seasonal adjustment factor furnished by the NCDOT Traffic Survey Unit.

A list of project count locations is provided in Table 2.1 on the following page.

Table 2.1: Data Collection

Mainline Count Location	Type	Date	County	Seasonal Adjustment Factor
US 15-501 S of NC 54	48 Hr Class	Tuesday, April 23 - Wednesday April 24, 2013	Orange	0.99
US 15-501 S of Culbreth Road (SR 1994)				
US 15-501 S of Arlen Park Drive (SR 1913)				
US 15-501 N of Smith Level Rd. (SR 1919)				
US 15-501 N of Mt. Gilead Church Rd. (SR 1700)				
US 15-501 S of US 64				
Sidestreet Count Location				
NC 54 W of 15/501	48 Hr Class	Tuesday, April 23, 2013	Orange	0.99
NC 54 Westbound Ramps at 15/501	Peak Hr TMC	Weds. April 24, 2013		Orange
NC 54 Eastbound Ramps at 15/501				
Culbreth Road (SR 1994) at 15/501				
Mount Carmel Church Rd. (SR 1008) at 15/501				
Arlen Park Drive (SR 1913) at 15/501				
Bennett Road (SR 1913) at 15/501				
Market Street at 15/501				
Dogwood Acres (SR 1962) at 15/501				
Smith Level Rd. (SR 1919) at 15/501				
Old Lystra Road (SR 1724) at 15/501				
Mann's Chapel Road (SR 1532) at 15/501				
Plaza Road at 15/501				
Polks Landing Road (SR 1530) at 15/501				
Lystra Rd (SR 1721) at 15/501				
Briar Chapel Pkwy at 15/501				
Vickers Rd. (SR 1719) at 15/501				
Jack Bennett Road (SR 1717) at 15/501				
Taylor Road (SR 1529) at 15/501				
Andrews Store Rd. (SR 1528) at 15/501				
Morris Rd. (SR 1527) at 15/501				
Village Way at 15/501				
Weathersfield Road (SR 1807) at 15/501				
Mt. Gilead Church Rd. (SR 1700) at 15/501				
Hamlet Chapel Rd. (SR 1525) at 15/501				
E. Cotton Rd. (SR 1525) at 15/501				
Bynum Rd. (SR 1713) at 15/501				
Moore Mountain Rd. (SR 1524) at 15/501				
Durham Eubanks Rd. (SR 1708) at 15/501				
Russell Chapel Church Rd. (SR 1520) at 15/501				
Proposed Chatham Park Driveway E of 15/501				
Northwood HS (SR 1599) at 15/501				
Russet Run (SR 1658) at 15/501				
US 64 Westbound Ramps at 15/501				
US 64 Eastbound Ramps at 15/501				
		Tuesday, April 23, 2013	Chatham	
		Thursday, May 23, 2013		
		Tuesday, April 23, 2013		
		Tuesday, May 14, 2013		
		Tuesday, April 23, 2013		
		Tuesday, May 14, 2013		

Seasonal Adjustment Factors provided by NCDOT Traffic Survey Group

2.2 HISTORIC AADT

Historic Annual Average Daily Traffic volumes for 26 locations were obtained from the NCDOT Traffic Survey Unit. Taken in consideration with 48-hour classification counts, this data was a primary consideration when determining base year projected traffic volumes for the study area. Historic AADT data is displayed below in Table 2.2.

Table 2.2: NCDOT Historic AADT Data

US 15-501 Locations	NCDOT Historic Traffic Count Data							
	1999	2001	2003	2005	2007	2009	2011	2012
S. Columbia St. N of NC 54	16,000	16,000	17,000	15,000	16,000	16,000	13,000	
US 15-501 S of NC 54	27,000	31,000	30,000	30,000	33,000	32,000	32,000	
US 15-501 S of Culbreth Road (SR 1994)	17,000	20,000	20,000	18,000	21,000	22,000		
US 15-501 N of Smith Level Rd. (SR 1919)	13,000	15,000	14,000	13,000	17,000	16,000	17,000	
US 15-501 N of Mann's Chapel (SR 1532)	20,000	20,000	20,000		21,000	21,000	22,000	23,000
US 15-501 S of Mann's Chapel (SR 1532)		22,000	20,000		19,000	19,000	20,000	22,000
US 15-501 N of Mt. Gilead Church Rd. (SR 1700)	11,000	14,000	12,000	12,000	14,000	14,000	15,000	
US 15-501 N of Bynum Ridge Rd. (SR 1713)	10,000	11,000		11,000	12,000	13,000	13,000	
US 15-501 N of Haw River	10,000	10,000		11,000	12,000	19,000	13,000	15,000
US 15-501 N of Northwood HS Rd. (SR 1599)	11,000	11,000	11,000	12,000	14,000	19,000	15,000	18,000
US 15-501 S of US 64			9,900	10,000	11,000	11,000	13,000	15,000

Extrapolated 2013 volumes trended linearly from 1999-2011 AADT volumes.

Mainline 48-hour counts taken during April of 2013 and seasonally adjusted to an AADT estimate.

Shaded cells represent points where data was unavailable.

Side-street Locations	NCDOT Historic Traffic Count Data							
	1999	2001	2003	2005	2007	2009	2011	2012
NC 54 W of 15/501	33,000	31,000	34,000	32,000	32,000	31,000	30,000	
NC 54 E of 15/501	41,000	39,000	40,000	40,000	43,000	41,000	-	
Culbreth Road (SR 1994) W of 15/501	4,700	5,100	5,800	5,600	5,300	5,100	5,000	
Mount Carmel Ch. Rd. (SR 1008) E of 15/501	8,100	10,000	11,000	11,000	11,000	9,900	9,600	
Dogwood Acres (SR 1962) W of 15/501	550	560	550	540	630	960	940	
Smith Level Rd. (SR 1919) W of 15/501	7,400	7,600	7,500	6,700	6,900	7,000	7,100	
Mann's Chapel Road (SR 1532) W of 15/501	6,700	6,500	6,000	5,400	6,000		6,400	
Lystra Rd (SR 1721) E of 15/501	2,400	2,700	2,900	3,000	3,300	4,500	4,800	
Jack Bennett Road (SR 1717) E of 15/501	2,300	2,400	2,400	2,500	2,900	2,700	3,400	
Mt. Gilead Church Rd. (SR 1700) E of 15/501		2,200	2,100	2,200	2,200	2,100	2,500	
Bynum Rd. (SR 1713) E of 15/501	880	860	720	600*	610*	590*	680	680
Durham Eubanks Rd. (SR 1708) E of 15/501	490	450	500	460	600	390	780	
Russell Chapel Ch. Rd. (SR 1520) W of 15/501	830	920	1,000	1,200	1,500	1,200	1,200	
US 64 W of 15/501			9,600	9,700	11,000	10,000	11,000	12,000
US 64 E of 15/501			7,500	7,800	8,600	7,600	12,000	9,000

Shaded cells represent points where data was unavailable.

*Reduction in traffic along Bynum Road occurred due to permanent closure of Haw River crossing.

2.3 RELATED TRAFFIC STUDIES & DEVELOPMENT

The following traffic studies were provided by participating town, county and NCDOT representatives:

- Briar Chapel Traffic Impact Assessment (March 2006)
- Ferrington Place Traffic Impact Assessment (April 2006)
- Polks Village Traffic Impact Assessment (April 2013)
- Williams Corner Traffic Impact Assessment (August 2005)

These projects are still under development and their approved build-out was only factored into 2040 traffic volumes. The table on the following page shows the TIA-approved land uses for each of these developments along with Triangle Regional Model 'Traffic Analysis Zone' (TAZ) anticipated land uses. In the locations where the actual TIA produced higher trips than projected in the TAZ, estimated volumes were increased to accommodate the TIA along with projected growth.

Additional information regarding the estimated trips that will be generated by the proposed Obey's Creek development was provided by Town of Chapel Hill staff, and this information was used to estimate travel demand for year 2040. The primary Obey's Creek site driveway is assumed to connect at the Market Street intersection.

A new Wal-Mart development was still in construction at the time of traffic counts within the study limits at the intersection of US 15-501 and Smith Level Road. This development was discussed at the kick-off meeting for this project and added to the project as additional development. The site driveway is directly across from the western leg of Smith Level Road. Counts for the US 15-501 & Smith Level Road that were collected after the Wal-Mart had been open for a few months were provided by the Town of Chapel Hill. These numbers were incorporated into the traffic projections included in this report.

Table 2.3: Model Anticipated Land Use compared to Approved TIA Land Use

Project Side Street	Development Assigned	DU Exp. (Model)	DU Prop. (TIA)	Add'l Res. Trips	Office Exp. (Model)	Office Prop. (TIA)	Add'l Office Trips	Retail Exp. (Model)	Retail Prop. (TIA)	Add'l Retail Trips	Total Add'l Trips	% Added to Street	2040 Trips Added
Mann's Chapel Road (SR 1532) W of 15/501	Assigned 25% of Briar Chapel	1,002	2,389	10,713	29,231	270,000	2,277	259,203	252,000		12,761	25%	3,200
Briar Chapel Pkwy W of 15/501	Assigned 30% of Briar Chapel											30%	3,800
Taylor Road (SR 1529) W of 15/501	Assigned 15% of Briar Chapel											15%	1,900
Andrews Store Rd. (SR 1528) W of 15/501	Assigned 30% of Briar Chapel											30%	3,800
Polks Village Driveway W of 15/501	Assigned 75% of Polks Village	209	96		4,000	23,600	324	37,000	56,380	1,121	1,445	75%	1,100
Polks Landing Road (SR 1530) W of 15/501	Assigned 25% of Polks Village											25%	400
Williams Corner Driveway E of 15/501	Assigned 30% of Williams Corner*	246	40		3,692	211,500	2,213	39,077	160,500	5,549	7,762	30%	2,300
Williams Corner - Polks Landing Rd E of 15/501	Assigned 20% of Williams Corner*											20%	1,600
Lystra Rd (SR 1721) E of 15/501	Assigned 30% of Williams Corner*											30%	2,300
Morris Rd. (SR 1527) W of 15/501	Assigned 60% Fearington Place	00			12,000			30,378	107,200	3,975	3,975	60%	2,400

*10% remaining Williams Corner trips assigned to unsignalized non-project intersection.

Further discussion of land use comparison is provided in section 4.4.

The information shown in Table 2.3 is further illustrated in Appendix B.

3.0 Base Year No-Build Forecast

3.1 ASSUMPTIONS

In order to project future year traffic, base year traffic volumes are needed along US 15-501 and on each project side-street. Since conducting 48-hour counts at each of these locations would be prohibitively expensive, base year forecast volumes were developed from available 48-hour classification counts, trended historic AADT data, and factored peak hour counts.

It was assumed that steady traffic growth along the corridor will continue at rates observed over the last 5 years, with increased growth expected as economic growth continues in the area. Population growth trends for the area were obtained from the 2000 and 2010 US Census data for Orange and Chatham counties. From 2000 to 2010, Orange County had a total population growth rate of 13%, or 1.2% annually. Chatham County's population grew 29% during the same period, or 2.6% annually.

It is assumed that the developments mentioned in section 2.3 are still in the pre-construction phase or have not attained full build-out; therefore, they were assumed to not have a significant impact on base year 2013 volumes. Their full build-out travel demands were applied to the 2040 traffic network, and discussion on the application of these developments is provided in section 4.

3.2 METHODOLOGY

NCDOT historic AADT volumes were compared with 48-hour classification counts to develop 2013 projections along US 15-501. In cases where counted volumes deviated significantly from trended NCDOT historic AADT volumes, forecasted 2013 volumes were assumed to be more aligned with historic trends to provide a conservative estimate of current traffic volumes.

Peak hour counts were taken for the intersections included in the project, and projected 2013 average annual daily traffic were developed by applying a peak-hour 'K-factor' to available counts. Further discussion of this design factor is provided in section 3.3. Factored AADT's were then compared to trended historic AADT data where available to develop forecasted AADT for the side-streets.

Volume projections from the Triangle Regional Model were interpolated for year 2013 from available 2010 and 2017 projections. These 2013 model volumes were on average 40% greater than volumes in traffic counts and trended historic AADT data. It is fairly common for base year model volumes to not reflect existing conditions, and for this reason, the model plays a minimal role in developing 2013 forecast volumes.

Historic AADT data and forecasted 2013 traffic volumes are shown in Tables 3.1 and 3.2.

Table 3.1: US 15-501 Historic AADT Data and Projections

US 15-501 Locations	NCDOT Historic Traffic Count Data								48-Hour Counts	Trended AADT	Balanced Forecast
	1999	2001	2003	2005	2007	2009	2011	2012	2013	2013	2013
S. Columbia St. N of NC 54	16,000	16,000	17,000	15,000	16,000	16,000	13,000			14,100	15,000
US 15-501 S of NC 54	27,000	31,000	30,000	30,000	33,000	32,000	32,000		22,100	33,600	33,500
US 15-501 S of Culbreth Road (SR 1994)	17,000	20,000	20,000	18,000	21,000	22,000			19,400	23,000	24,600
US 15-501 N of Smith Level Rd. (SR 1919)	13,000	15,000	14,000	13,000	17,000	16,000	17,000		17,300	17,400	18,200
US 15-501 N of Mann's Chapel (SR 1532)	20,000	20,000	20,000		21,000	21,000	22,000	23,000		22,400	22,200
US 15-501 S of Mann's Chapel (SR 1532)		22,000	20,000		19,000	19,000	20,000	22,000		20,100	20,800
US 15-501 N of Mt. Gilead Church Rd. (SR 1700)	11,000	14,000	12,000	12,000	14,000	14,000	15,000		15,100	15,100	15,900
US 15-501 N of Bynum Ridge Rd. (SR 1713)	10,000	11,000		11,000	12,000	13,000	13,000			13,600	14,700
US 15-501 N of Haw River	10,000	10,000		11,000	12,000	19,000	13,000	15,000		16,000	15,600
US 15-501 N of Northwood HS Rd. (SR 1599)	11,000	11,000	11,000	12,000	14,000	19,000	15,000	18,000		18,100	15,500
US 15-501 S of US 64			9,900	10,000	11,000	11,000	13,000	15,000	13,400	14,300	13,600

Extrapolated 2013 volumes trended linearly from 1999-2011 AADT volumes.

Mainline 48-hour counts taken during April of 2013 and seasonally adjusted to an AADT estimate.

Shaded cells represent points where data was unavailable.

Table 3.2: Side-street Historic AADT and Projections

Side-street Locations	NCDOT Historic Traffic Count Data								48-Hour Counts	Peak Hour Counts	Trended AADT	Balanced Forecast
	1999	2001	2003	2005	2007	2009	2011	2012				
NC 54 W of 15/501	33,000	31,000	34,000	32,000	32,000	31,000	30,000		21,900		30,300	31,500
NC 54 E of 15/501	41,000	39,000	40,000	40,000	43,000	41,000	-				42,200	41,200
Culbreth Road (SR 1994) W of 15/501	4,700	5,100	5,800	5,600	5,300	5,100	5,000			5,500	5,300	5,500
Mount Carmel Ch. Rd. (SR 1008) E of 15/501	8,100	10,000	11,000	11,000	11,000	9,900	9,600			9,600	10,700	10,000
Dogwood Acres (SR 1962) W of 15/501	550	560	550	540	630	960	940			1,500	1,000	1,300
Smith Level Rd. (SR 1919) W of 15/501	7,400	7,600	7,500	6,700	6,900	7,000	7,100			6,600	6,800	7,000
Mann's Chapel Road (SR 1532) W of 15/501	6,700	6,500	6,000	5,400	6,000		6,400			6,800	6,000	6,400
Lystra Rd (SR 1721) E of 15/501	2,400	2,700	2,900	3,000	3,300	4,500	4,800			5,100	5,000	5,000
Jack Bennett Road (SR 1717) E of 15/501	2,300	2,400	2,400	2,500	2,900	2,700	3,400			3,200	3,300	3,300
Mt. Gilead Church Rd. (SR 1700) E of 15/501		2,200	2,100	2,200	2,200	2,100	2,500			2,500	2,400	2,500
Bynum Rd. (SR 1713) E of 15/501	880	860	720	600*	610*	590*	680	680		700	600	700
Durham Eubanks Rd. (SR 1708) E of 15/501	490	450	500	460	600	390	780			300	600	600
Russell Chapel Ch. Rd. (SR 1520) W of 15/501	830	920	1,000	1,200	1,500	1,200	1,200			1,600	1,400	1,500
US 64 W of 15/501			9,600	9,700	11,000	10,000	11,000	12,000			11,700	12,000
US 64 E of 15/501			7,500	7,800	8,600	7,600	12,000	9,000			10,400	10,000

Shaded cells represent points where data was unavailable.

*Reduction in traffic along Bynum Road occurred due to permanent closure of Haw River crossing.

3.3 DETERMINATION OF BASE YEAR NO-BUILD DESIGN FACTORS

Heavy vehicle percentages along US 15-501 were taken solely from 48-hour classification count data. Along the side-streets, overall heavy vehicle percentages measured during peak hour volumes were split into dual and TTST percentages.

The 'K-factor', or percentage of traffic expected to occur during the design peak hour, was determined from 48-hour classification counts where available. Where limited data was available, peak hour counts were compared to historic AADT trends to estimate the total percentage of side-street traffic occurring during the peak hour. Where historic data was unavailable, peak hour factors were assumed based on a side-street's primary land use. Typically, commercial and retail locations have a lower K factor than residential uses, as residential trips are more concentrated during the peak commuting periods. Where actual data was available, volumes derived from proposed land uses were included.

Based on review of the actual traffic counts and counts included in provided traffic studies, the side-street volumes did not follow typical patterns for directional splits. This is likely due to the proximity to a major University and a hospital, which are likely to operate on a non-typical schedule.

Available traffic data and applied factors are shown in Table 3.3 - 3.4. 2013 existing peak hour turning movement volumes are illustrated in Appendix A.

Table 3.3: Design Factor Table – US 15-501

US 15-501 Data	D – Directional Distribution %			K – Peak Hour Factor %		Truck Percentage (Dual / TTST)		
	Count Data		Selected 2013	Count Data		Count Data		Selected 2013
	TMC	48-hr Class.		48-hr Class.	Selected 2013	TMC	48-hr Class.	
S. Columbia St. N of NC 54	65 (S)		65 (S)		9	6.6%		6 , 3
US 15-501 S of NC 54	55 (S)	55 (S)	55 (S)	9	9	3.0%	3 , 3	3 , 3
US 15-501 S of Culbreth Road (SR 1994)	57 (S)	58 (S)	60 (S)	8.5	9	2.1%	9 , 3	5 , 3
US 15-501 S of Arlen Park Drive (SR 1913)	50 (-)	54 (S)	55 (S)	8.7	9	2.3%	4 , 3	4 , 3
US 15-501 N of Smith Level Rd. (SR 1919)	61 (S)	67 (S)	60 (S)	8.5	9	2.1%	5 , 3	5 , 3
US 15-501 N of Old Lystra Road (SR 1724)	61 (S)		60 (S)		9	1.7%		3 , 2
US 15-501 N of Mann's Chapel (SR 1532)	63 (S)		60 (S)		9	1.7%		3 , 2
US 15-501 S of Mann's Chapel (SR 1532)	59 (S)		60 (S)		9	1.6%		3 , 2
US 15-501 N of Mt. Gilead Church Rd. (SR 1700)	65 (S)	65 (S)	65 (S)	9.3	9	3.5%	5 , 3	5 , 3
US 15-501 N of Bynum Ridge Rd. (SR 1713)	64 (S)		65 (S)		9	2.3%		4 , 2
US 15-501 N of Haw River	62 (S)		60 (S)		9	2.3%		4 , 2
US 15-501 N of Northwood High School Rd. (SR 1599)	62(S)		60 (S)		9	2.7%		4 , 2
US 15-501 S of US 64	59 (S)	60 (S)	60 (S)	8.5	9	3.0%	4 , 1	4 , 1

Truck factor splits estimated based on splits observed in 48-hour classification counts.

Turning movement counts were collected during AM and PM peak hours during April & May of 2013.

Table 3.4: Design Factor Table – Side-streets

Side-street Data	D – Directional Distribution %		K – Peak Hour Factor %		Truck Percentage (Dual / TTST)	
	Turning Movement Count	Selected 2013	Turning Movement / AADT *	Selected 2013 /2040	Turning Movement Count	Selected 2013
NC 54 W of 15/501 (Ramps only)		100 (W)		10	2.0%	2 , 1
NC 54 E of 15/501 (Ramps only)		100 (E)		10	4.0%	3 , 1
Culbreth Road (SR 1994) W of 15/501	60 (W)	60 (W)	11%	11	1.0%	1 , 1
Mount Carmel Church Rd. (SR 1008) E of 15/501	60 (E)	60 (E)	10%	10	4.0%	2 , 2
Arlen Park Drive (SR 1913) W of 15/501	55 (W)	55 (W)		10	1.0%	1 , 1
Bennett Road (SR 1913) E of 15/501	65 (E)	65 (E)		10	2.0%	1 , 1
Market Street W of 15/501	60 (E)	60 (E)		10	3.0%	2 , 1
Dogwood Acres (SR 1962) W of 15/501	55 (E)	55 (E)	14%	12	0.0%	1 , 1
Smith Level Rd. (SR 1919) W of 15/501	55 (W)	55 (W)	10%	11	1.0%	1 , 1
Walmart Driveway E of 15/501	80 (E)	70 (E)		10	4.0%	2 , 2
Old Lystra Road (SR 1724) E of 15/501	75 (E)	70 (W)		10	4.0%	2 , 2
Mann's Chapel Road (SR 1532) W of 15/501	65 (E)	65 (E)	11%	10	3.0%	2 , 1
Plaza Road E of 15/501	55 (E)	55 (E)		11	1.0%	1 , 1
Polks Village Driveway W of 15/501		55 (W)		10		2 , 1
Williams Corner Driveway E of 15/501		55 (W)		10		2 , 1
Polks Landing Road (SR 1530) W of 15/501	65 (E)	60 (E)		10	0.0%	1 , 1
Williams Corner / Polks Landing Rd E of 15/501		60 (W)		10		2 , 1
Lystra Rd (SR 1721) E of 15/501	60 (W)	60 (W)	10%	10	1.0%	1 , 1
Briar Chapel Pkwy W of 15/501	60 (E)	60 (E)		12	1.0%	1 , 1
Vickers Rd. (SR 1719) E of 15/501	55 (E)	55 (E)		10	2.0%	2 , 1
Jack Bennett Road (SR 1717) E of 15/501	55 (W)	55 (W)	12%	12	3.0%	2 , 1
Taylor Road (SR 1529) W of 15/501	55 (W)	55 (W)		10	5.0%	3 , 2
Andrews Store Rd. (SR 1528) W of 15/501	55 (W)	55 (W)		10	6.0%	4 , 2
Morris Rd. (SR 1527) W of 15/501	65 (W)	65 (W)		11	0.0%	1 , 1
Village Way E of 15/501 E of 15/501	55 (E)	55 (E)		11	1.0%	1 , 1
Weathersfield Road (SR 1807) E of 15/501	55 (W)	55 (W)		10	3.0%	2 , 1
Mt. Gilead Church Rd. (SR 1700) E of 15/501	55 (E)	55 (E)	10%	10	4.0%	2 , 2
Hamlet Chapel Rd. (SR 1525) W of 15/501	55 (W)	55 (W)	12%	12	9.0%	4 , 3
Hamlet Chapel Rd. (SR 1525) E of 15/501	55 (E)	55 (E)		10	0.0%	1 , 1
Bynum Rd. (SR 1713) E of 15/501	60 (E)	60 (E)	12%	12	4.0%	2 , 2
Moore Mountain Rd. (SR 1524) W of 15/501	60 (W)	60 (W)		10	1.0%	1 , 1
Durham Eubanks Rd. (SR 1524/1708) E of 15/501	65 (E)	65 (E)		10	0.0%	1 , 1
Russell Chapel Church Rd. (SR 1520) W of 15/501	55 (W)	55 (W)	10%	10	5.0%	3 , 2
Proposed Chatham Park Driveway E of 15/501		60 (E)		11		2 , 1
Northwood HS (SR 1599) W of 15/501	55 (W)	55 (W)	11%	11	4.0%	2 , 2
Russet Run (SR 1658) E of 15/501		60 (E)		10		2 , 1
US 64 W of 15/501 (Ramps only)		100 (W)		10	2.2%	2 , 1
US 64 E of 15/501 (Ramps only)		100 (E)		10	5.0%	4 , 2

*In cases where turning movement counts could be compared to trended AADT volumes, K-Factor has been estimated.

Truck factor splits estimated based on splits observed in 48-hour classification counts.

Turning movement counts were collected during AM and PM peak hours during April & May of 2013.

4.0 Future Year No-Build Forecast

4.1 ASSUMPTIONS & METHODOLOGY

Growth Rates observed in the 2010-2040 Triangle Regional model are applied to forecast 2013 volumes to develop initial 2040 volumes. Adjustments were then made to reflect model calibration, volume balancing, approved development, and historic trends.

Corner-turn volume splits were assumed as a percentage of side-street volumes observed during peak hour counts. Adjustments were made in cases of significant discrepancy between model estimates and base year traffic counts and to balance through volumes on US 15-501.

Emerging development activity was anticipated by comparing model traffic analysis zones to approved developments by applying the methodology described in section 4.2 to available TIA's. Two significant developments that do not have approved TIA's include Chatham Park in Chatham County outside of Pittsboro and Obey's Creek Development in Orange County. Assumptions regarding these developments were made based on available developer-published data and conversations with town staff.

4.2 MODEL APPLICATION

The Triangle Regional Model version 5 build 1880 was modeled by Stantec using Transcad software for base year 2010, interim year 2017, and future year 2040. The model was calibrated with historic AADT data using a model calibration year of 2010. This matches the Triangle Regional Model base year.

Two scenarios were provided to Stantec for future year 2040 – the “MTP” (Metropolitan Transportation Plan) model which assumes the completion of both funded and unfunded transportation projects, and the “E+C” model, which assumes only the completion of transportation projects currently under construction or which have funds committed. The “E+C” model was selected as the basis of the ‘worst case scenario’ 2040 forecasted traffic volumes as US 15-501 will face greater traffic under a future scenario which offers fewer transportation alternatives.

4.3 DESIGN FACTORS

Design Hour Volume (DHV), TTSTs, Duals, and Peak Hour Directional Split (D) were determined using the methodology outlined in Section 3.3. No changes to these factors were proposed between base year and design year.

4.4 MODEL COMPARISON WITH APPROVED DEVELOPMENT

To compare the 2040 Triangle Regional Model assumptions to recently approved projects along the corridor, Stantec compared model raw inputs with approved projects along the corridor.

Model inputs are assumptions about future land use and travel demand generators divided into Traffic Analysis Zones (“TAZ”). Each traffic analysis zone has a wide variety of inputs. This study focused on dwelling units, retail employees, office employees, and industrial employees. As most approved developments are measured in dwelling units and square footage by use, model employee inputs had to be converted to estimated square footage by use. Dwelling units were compared directly from the model.

Calculations for gross square footage were made by taking the given 2040 employment numbers for each model TAZ and applying Durham-Chapel Hill-Carrboro MPO square footage factors for each category. Number of employees per 1,000 square feet assumed in the MPO process is shown below:

- Retail Square Footage (combined):
 - General Retail: 2.86
 - Highway retail: 3.25
 - Service: 2.86
- Office: 3.25
- Industrial: 2.08

The resulting Triangle Regional Model square footage numbers for each TAZ were compared to approved developments from the Traffic Impact Assessments. These are shown in a map of model predicted build-out and approved developments within each zone, included in Appendix B. The map shows the residential units, industrial square footage, office square footage, and retail square footage for each TAZ in the study, along with available TIA data.

In instances where approved development exceeded anticipated land use square footage in the model TAZ, equations from the ITE Trip Generation Manual (9th edition) were used to calculate travel demand for the additional square footage. This additional traffic was split between project side-streets volumes for year 2040. A complete breakdown of trip assignment is displayed in Table 2.3.

4.5 POTENTIAL CHATHAM PARK DEVELOPMENT

As many variables exist regarding the potential impact and buildout timeline for this project, the forecast team leaned heavily on the Triangle Regional Model for developing forecasted volumes for US 15-501 in the vicinity of Chatham Park. Currently there are an expected 22,000 homes within the development. The project is still waiting on Town approval. The model accounts for a significant amount of growth in the area of Chatham Park, yet other studies have estimated even more intense development and higher traffic volumes.

For the purposes of incorporating some potential impacts, the proposed northern Chatham Park Driveway has been included as a 2040 side-street, along with a larger Russet Run side-street. An additional 30,000 vehicles were added to US 15-501 via these two side-streets and US 64. AADT's of 7,500 were assigned on each of these US 15-501 side streets, and an additional 15,000 AADT was assigned as entering and exiting US 15-501 via US 64.

While these volumes will account for some project impacts on any future traffic operations scenario, a full analysis of traffic impacts of Chatham Park on US 15-501 will require further study outside of the scope of this forecast.

4.6 GROWTH RATES

In determining growth rates during the period between 2010 and 2040, primary consideration was given to anticipated model growth. This growth rate was applied to the 2013 volumes and compounded over a 27 year period, and then adjustments were made to take into account approved development and model calibration.

As mentioned in section 3.2, model calibration indicated that base year model volumes were on average 40% greater than volumes anticipated by traffic counts and historic trends. Despite this inconsistency, future model volumes appear consistent with anticipated land uses set forth in each traffic analysis zone. For this reason,

forecasted 2040 volumes more closely reflect 2040 model volumes. Given the greater increase between base and future forecast volumes than between base and future model volumes, many applied 2013-2040 growth rates appear higher than model growth rates. However, these applied annual growth rates fall between 1.3 - 3.0% for most locations, which corresponds with anticipated regional population growth during the same period.

Table 4.1 and 4.2 provide a comparison of model volumes, historic growth rate, model growth rate, Traffic Analysis Zone adjustments, and applied growth rates used in determining 2040 forecasted volumes. 2040 projected AM and PM peak hour turning movements are illustrated in Appendix A.

Table 4.1: Model Validation and Forecasted Growth, US 15-501

US 15-501 Locations	Model Calibration Year (2010)		Current Year (2013)		Historic Growth Rate	Model Growth Rate	Applied Rate**	Future Year (2040)			
	Model	Hist. AADT*	Model Interp.	Forecast	2001 - 2011	2010-2040	2013-2040	Model (E+C)	TAZ ADJ. %	ADJ. Model	Forecast
S. Columbia St. N of NC 54	26,300	14,500	26,700	15,000	-2.05%	0.71%	1.30%	32,500	Only Applicable to Y-Line Data		21,300
US 15-501 S of NC 54	42,300	32,000	42,800	33,500	0.32%	0.79%	1.30%	53,500		48,000	
US 15-501 S of Culbreth Road (SR 1994)	23,200	22,000	23,600	24,600	2.61%	0.77%	1.50%	29,200		37,200	
US 15-501 S of Arlen Park Drive (SR 1913)	N/A	N/A	N/A	22,400	NA	NA	1.70%	NA		35,600	
US 15-501 N of Smith Level Rd. (SR 1919)	14,900	16,500	15,200	18,200	1.26%	1.13%	1.90%	20,900		30,000	
US 15-501 N of Old Lystra Road (SR 1724)	24,100	N/A	24,900	20,000	NA	1.30%	2.30%	35,500		36,800	
US 15-501 N of Mann's Chapel (SR 1532)	24,500	21,500	25,300	22,200	0.96%	1.30%	2.10%	36,100		38,800	
US 15-501 S of Mann's Chapel (SR 1532)	21,300	19,500	21,800	20,800	-0.95%	1.42%	2.10%	32,500		36,600	
US 15-501 N of Mt. Gilead Church Rd. (SR 1700)	19,000	14,500	19,600	15,900	0.69%	1.56%	2.60%	30,200		31,900	
US 15-501 N of Bynum Ridge Rd. (SR 1713)	17,100	13,000	17,700	14,700	1.68%	1.55%	2.60%	27,100		29,200	
US 15-501 N of Haw River	17,100	16,000	17,700	15,600	2.66%	1.56%	2.60%	27,200		30,900	
US 15-501 N of Northwood High School Rd. (SR 1599)	17,000	17,000	17,700	15,500	3.15%	1.65%	2.30%	27,800		28,600	
US 15-501 S of US 64	7,100	12,000	7,600	13,600	3.33%	2.04%	2.00%	13,000	23,500		

*Interpolated AADT from 2009 and 2011 Data

**Applied rate calculated as $(2040 \text{ Forecast} / 2013 \text{ Forecast})^{(1 / 27)} - 1$. Annual growth falls between 1.3 - 3.0% except where model data or approved development indicates otherwise.

TAZ adjustments only applied to side-streets, and will impact mainline volumes when volumes are balanced along US 15-501.

Table 4.2: Model Validation and Forecasted Growth, Side-streets

Side-street Data	Model Calibration Year (2010)		Current Year (2013)		Historic Growth Rate	Model Growth Rate	Applied Rate	Future Year (2040)			
	Model	Hist. AADT*	Model Interp.	Forecast	2001 - 2011	2010-2040	2013-2040	Model (E+C)	ADD'L Trips	ADJ. Model	Forecast
NC 54 W of 15/501	29,100	30,500	29,700	31,500	-0.33%	0.94%	0.80%	38,500			39,500
NC 54 E of 15/501	37,700	41,000	38,100	41,200	NA	0.79%	0.60%	47,800			49,000
Culbreth Road (SR 1994) W of 15/501	6,800	5,100	6,800	5,500	-0.20%	0.75%	1.80%	8,500			9,000
Mount Carmel Church Rd. (SR 1008) E of 15/501	16,300	9,800	16,700	10,000	-0.41%	0.96%	2.60%	21,700			20,000
Arlen Park Drive (SR 1913) W of 15/501				2,600			1.60%				4,000
Bennett Road (SR 1913) E of 15/501				2,400			1.90%				4,000
Market Street W of 15/501				7,700			1.70%				12,000
Obey's Creek Driveway E of 15/501				Non-Exist.							7,500
Dogwood Acres (SR 1962) W of 15/501	1,200	1,000	1,100	1,300	5.32%	0.75%	1.00%	1,500			1,700
Smith Level Rd. (SR 1919) W of 15/501	39,000	7,100	40,100	7,000	-0.68%	1.03%	4.00%	53,000			20,000
Walmart Driveway E of 15/501				6,000			1.10%				8,000
Old Lystra Road (SR 1724) E of 15/501	400		400	3,000		1.36%	1.90%	600			5,000
Mann's Chapel Road (SR 1532) W of 15/501	8,400	6,300	8,500	6,400	-0.15%	0.55%	2.70%	9,900	+3,200	13,100	13,100
Plaza Road E of 15/501				5,000			2.00%				8,500
Polks Village Driveway W of 15/501				Non-Exist.					+1,100	1,100	1,100
Williams Corner Driveway E of 15/501				Non-Exist.					+2,300	2,300	2,300
Polks Landing Road (SR 1530) W of 15/501	1,200		1,200	800		1.36%	3.50%	1,800	+400	2,200	2,000
Williams Corner - Polks Landing Rd E of 15/501				Non-Exist.					+1,600	1,600	1,600
Lystra Rd (SR 1721) E of 15/501	2,000	4,700	2,100	5,000	5.92%	1.88%	1.30%	3,500	+2,300	5,800	7,000
Briar Chapel Pkwy W of 15/501				1,600			3.30%		+3,800	3,800	3,800
Vickers Rd. (SR 1719) E of 15/501				400			3.50%				1,000
Jack Bennett Road (SR 1717) E of 15/501	3,400	3,100	3,400	3,300	3.54%	0.54%	1.60%	4,000			5,000
Taylor Road (SR 1529) W of 15/501				400			11.20%		+1,900	1,900	7,000
Andrews Store Rd. (SR 1528) W of 15/501	2,100		2,200	4,000		1.91%	4.20%	3,700	+3,800	7,500	12,000
Morris Rd. (SR 1527) W of 15/501	500		500	400		1.13%	7.90%	700	+2,400	3,100	3,100
Village Way E of 15/501 E of 15/501				3,100			1.80%				5,000
Weathersfield Road (SR 1807) E of 15/501				1,900			1.70%				3,000
Mt. Gilead Church Rd. (SR 1700) E of 15/501	3,200	2,300	3,300	2,500	1.29%	2.49%	3.30%	6,700			6,000
Hamlet Chapel Rd. (SR 1525) W of 15/501	2,000	700	2,300	1,200	14.23%	3.03%	5.70%	4,900			5,400
Hamlet Chapel Rd. (SR 1525) E of 15/501				300			1.90%				500
Bynum Rd. (SR 1713) E of 15/501		600		700	-2.32%		1.70%				1,100
Moore Mountain Rd. (SR 1524) W of 15/501	400		400	1,400		1.88%	2.90%	700			3,000
Durham Eubanks Rd. (SR 1524/1708) E of 15/501	2,000	600	2,000	600	5.65%	0.75%	4.20%	2,500			1,800
Russell Chapel Church Rd. (SR 1520) W of 15/501	1,500	1,200	1,600	1,500	2.69%	2.66%	3.10%	3,300			3,400
Proposed Chatham Park Driveway E of 15/501				Non-Exist.					+7,500**	N/A	7,500
Northwood HS (SR 1599) W of 15/501				2,500			0.70%				3,000
Russet Run (SR 1658) E of 15/501				100			17.30%		+7,500**	N/A	7,500
US 64 W of 15/501	19,700	10,500	20,800	12,000	1.58%	1.92%	4.00%	34,900			34,500
US 64 E of 15/501	11,000	9,800	12,100	10,000	5.53%	2.73%	5.20%	24,700	+15,000	39,700	39,300

*Interpolated AADT from 2009 and 2011 Data

**Chatham Park locations calculated outside of TAZ process. Calculations included in Appendix.

Appendix A: Peak Hour Turning Movement Diagrams

Fordham Blvd WB Ramp
(NC 54)

Fordham Blvd EB Ramp
(NC 54)

Culbreth Rd

Mt Carmel Church Rd

Arlen Park Dr

Bennett Rd

Market St

Dogwood Acres Dr

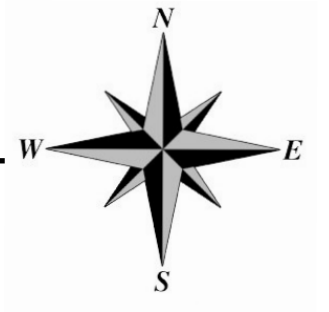
Smith Level Rd

Smith Level Rd

Old Lystra Rd

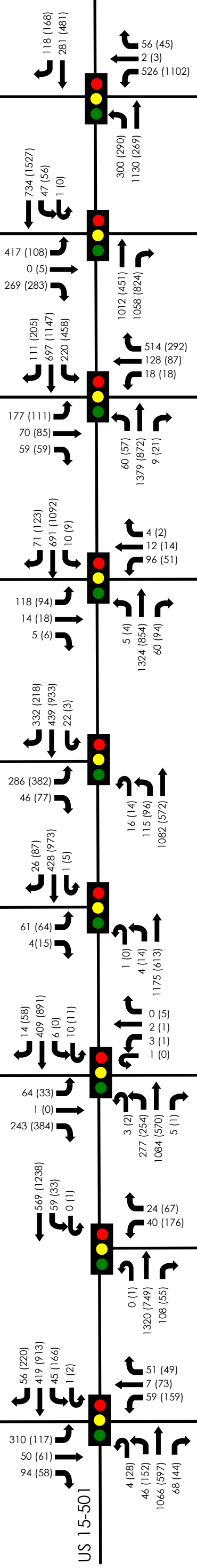
Manns Chapel Rd

Plaza Dr



Key

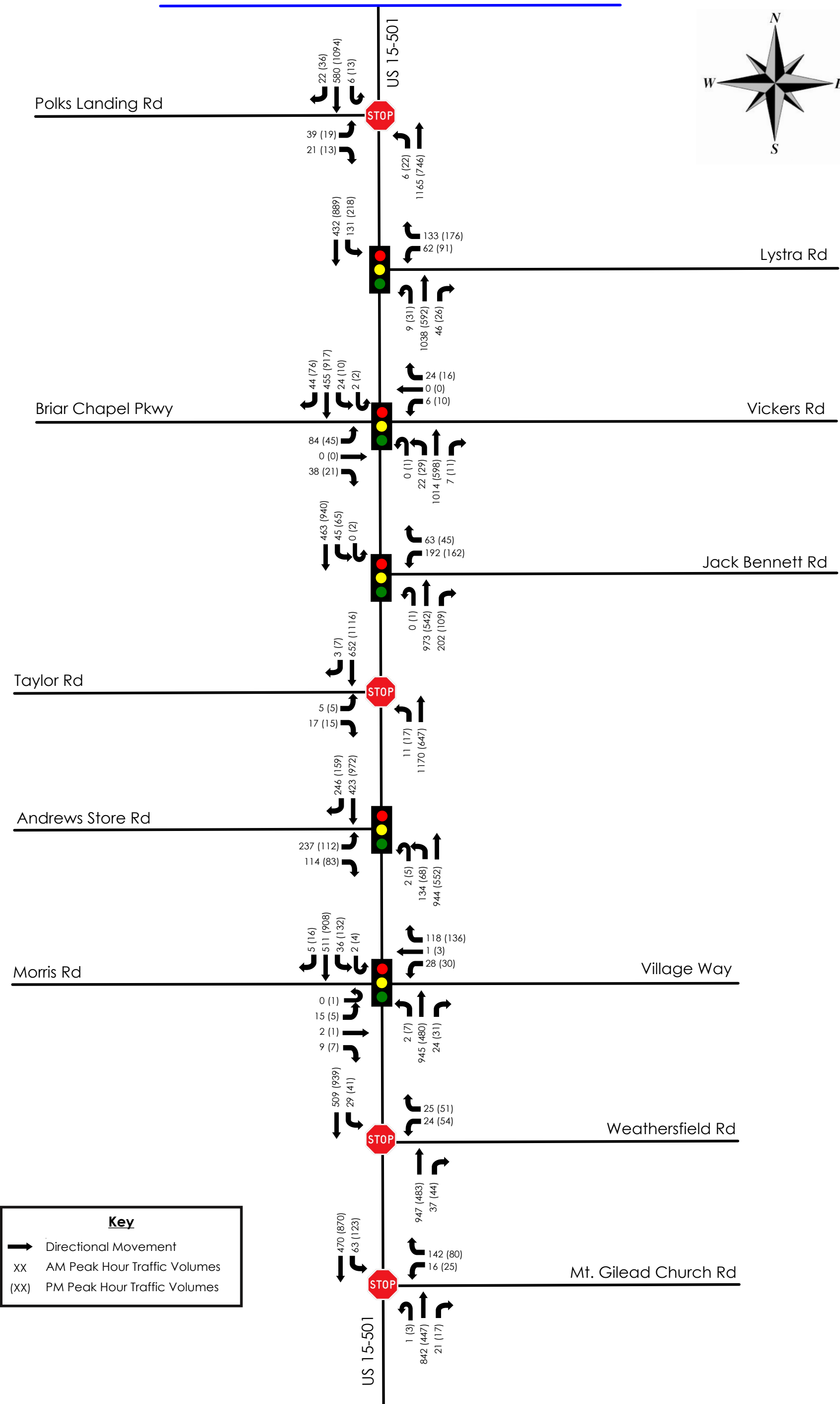
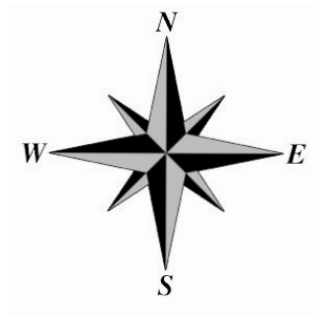
- Directional Movement
- XX AM Peak Hour Traffic Volumes
- (XX) PM Peak Hour Traffic Volumes



MATCH LINE A

2013 Existing Traffic Volumes

MATCH LINE A



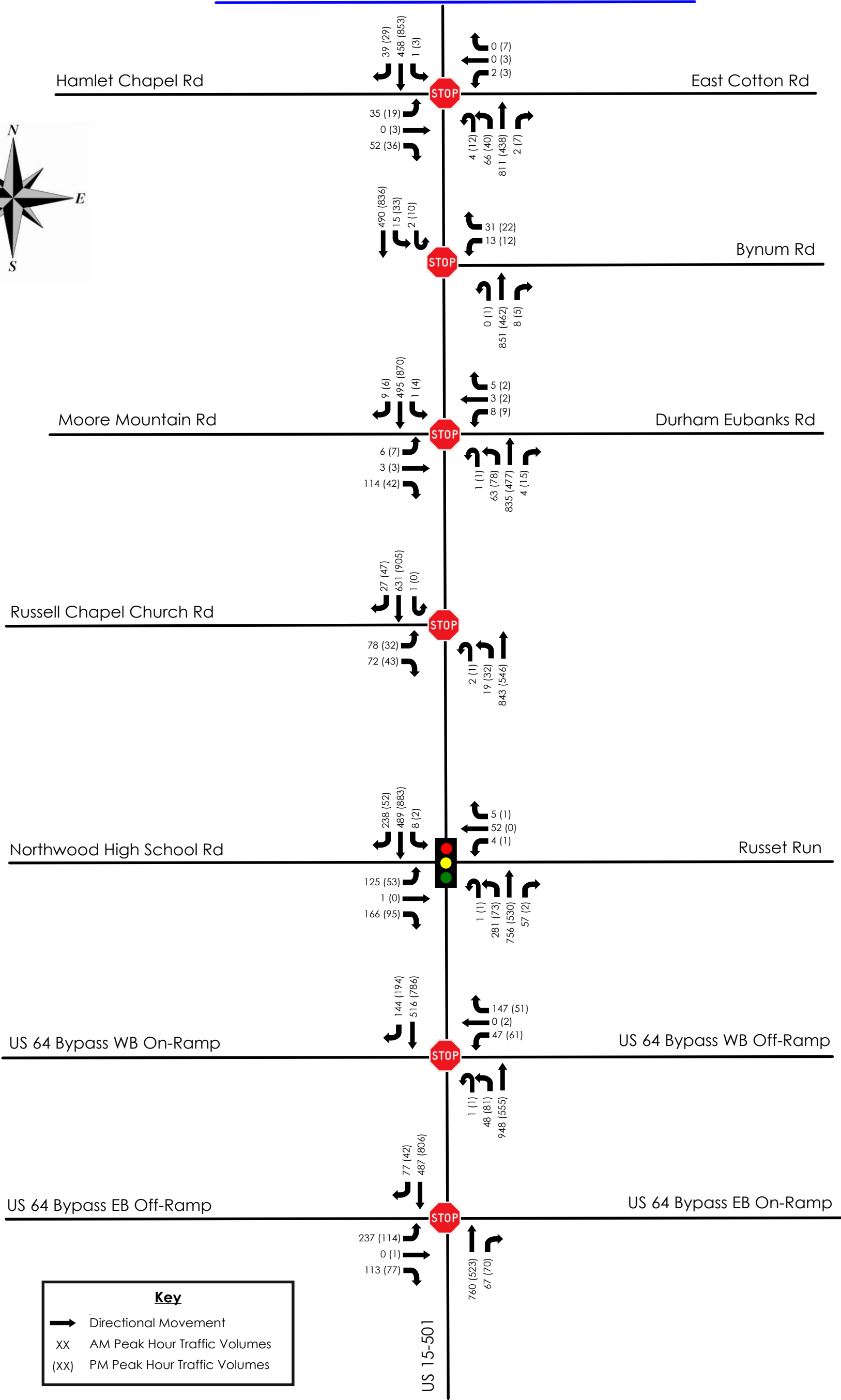
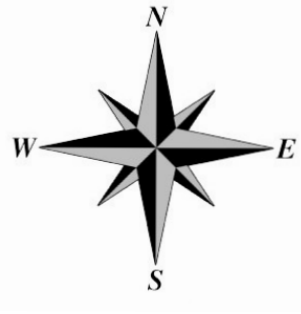
Key

- Directional Movement
- XX AM Peak Hour Traffic Volumes
- (XX) PM Peak Hour Traffic Volumes

MATCH LINE B

2013 Existing Traffic Volumes

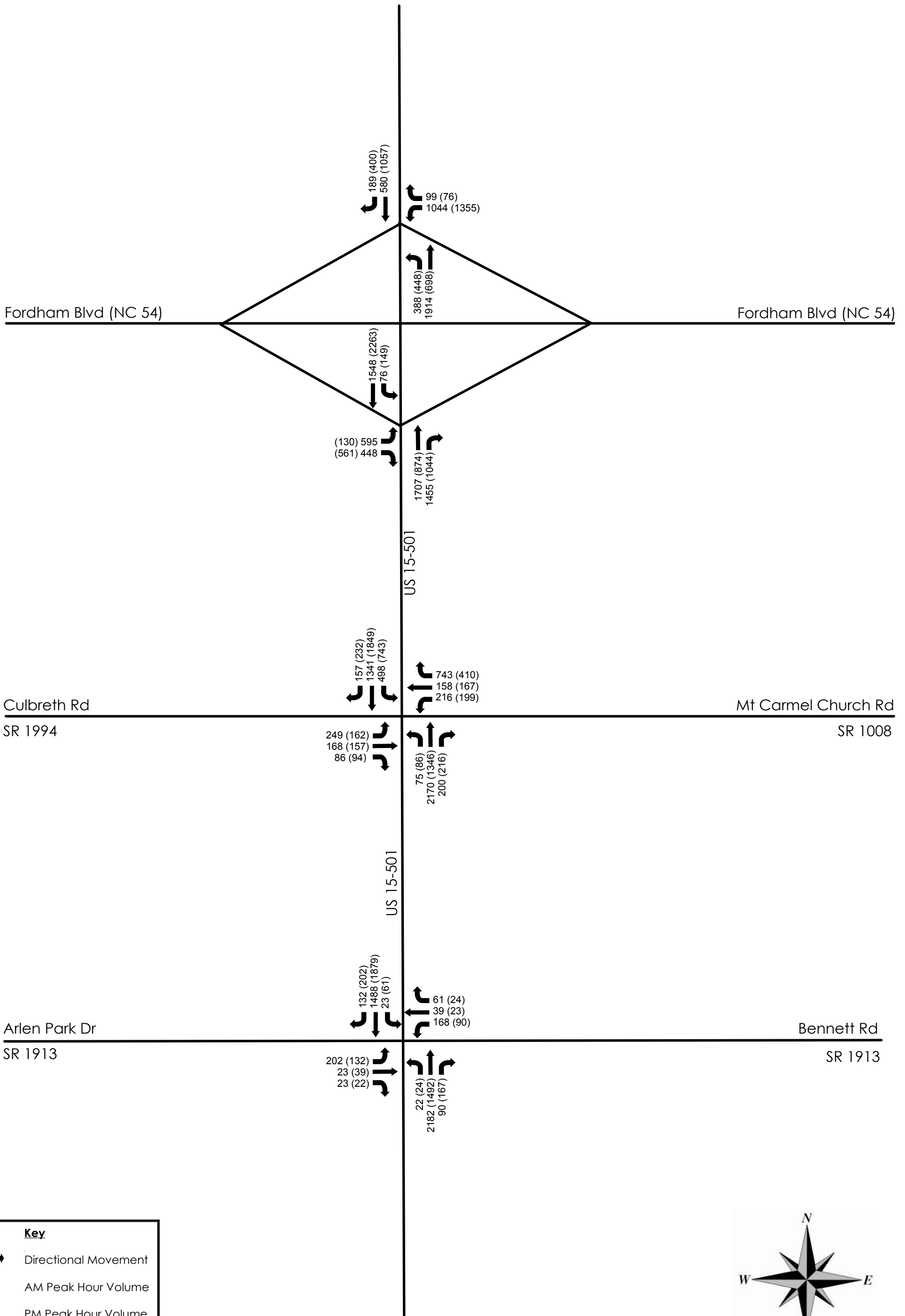
MATCH LINE B



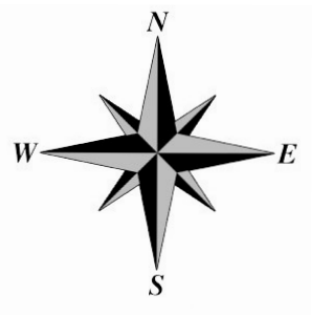
Key

- Directional Movement
- XX AM Peak Hour Traffic Volumes
- (XX) PM Peak Hour Traffic Volumes

2013 Existing Traffic Volumes



Key	
	Directional Movement
XX	AM Peak Hour Volume
(XX)	PM Peak Hour Volume

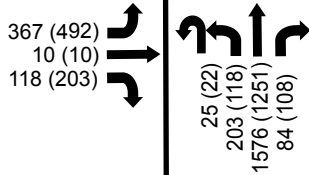
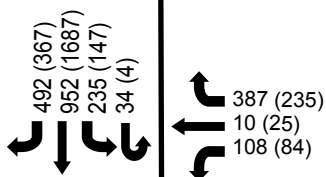


2040 Peak Hour Volumes

MATCH LINE A

Market St

Obey's Creek Driveway



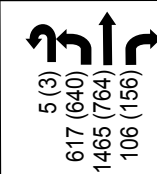
US 15-501

Dogwood Acres Dr
SR 1962

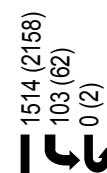


Smith Level Road
SR 1919

Walmart Driveway



US 15-501

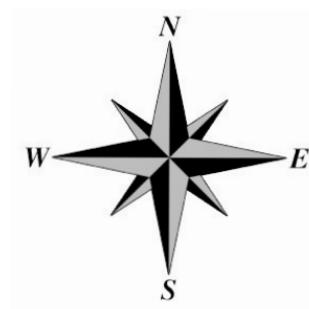


Old Lystra Rd
SR 1724



MATCH LINE B

Key	
	Directional Movement
XX	AM Peak Hour Volume
(XX)	PM Peak Hour Volume

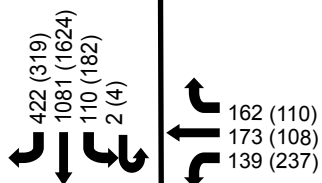


2040 Peak Hour Volumes

MATCH LINE B

Mann's Chapel Rd
SR 1532

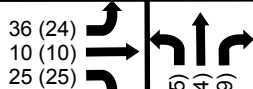
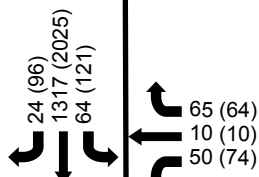
Plaza Rd



US 15-501

Polks Village Driveway

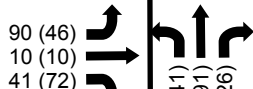
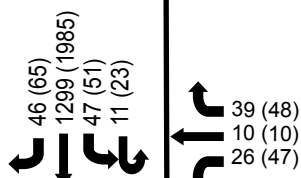
Williams Corner Driveway



US 15-501

Polks Landing Rd
SR 1530

Williams Corner
Polks Landing Rd



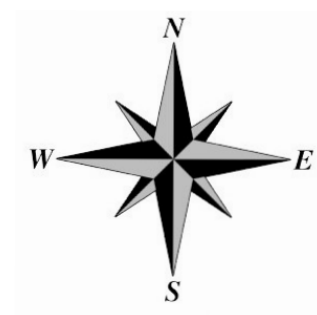
Lystra Rd
SR 1721



MATCH LINE C

Key	
	Directional Movement
XX	AM Peak Hour Volume
(XX)	PM Peak Hour Volume

2040 Peak Hour Volumes

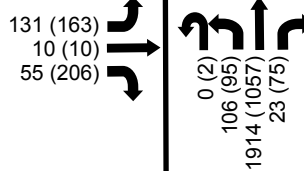
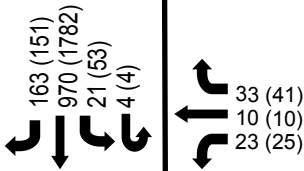


MATCH LINE C

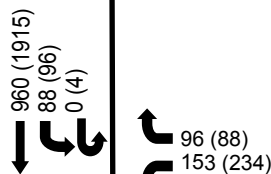
Briar Chapel Pkwy

Vickers Rd

SR 1719



US 15-501



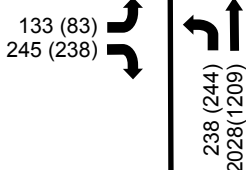
Jack Bennett Rd

SR 1717



Taylor Rd

SR 1529

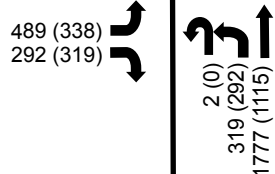


US 15-501



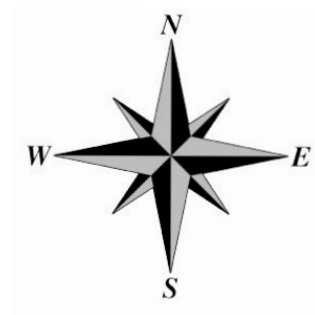
Andrews Store Rd

SR 1528



MATCH LINE D

Key	
	Directional Movement
XX	AM Peak Hour Volume
(XX)	PM Peak Hour Volume

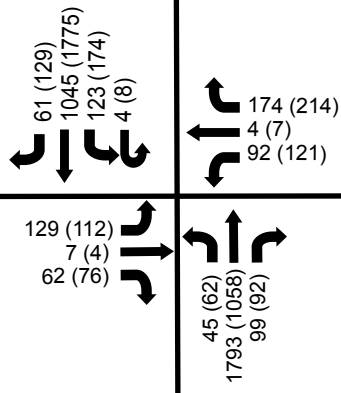


2040 Peak Hour Volumes

MATCH LINE D

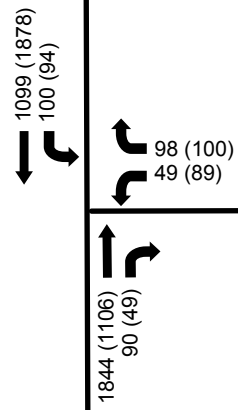
Morris Rd
SR 1527

Village Way

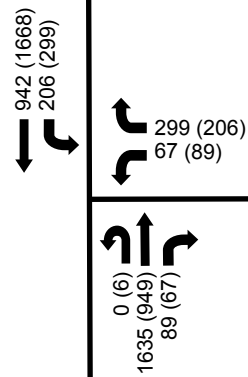


US 15-501

Weathersfield Rd
SR 1807

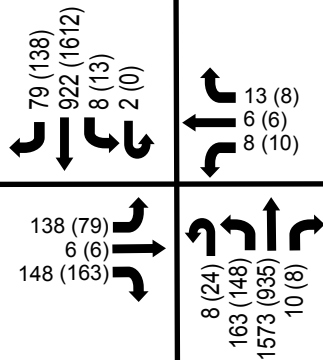


Mt. Gilead Church Rd
SR 1700



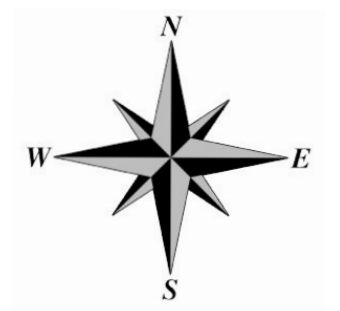
Hamlet Chapel Rd
SR 1525

East Cotton Rd



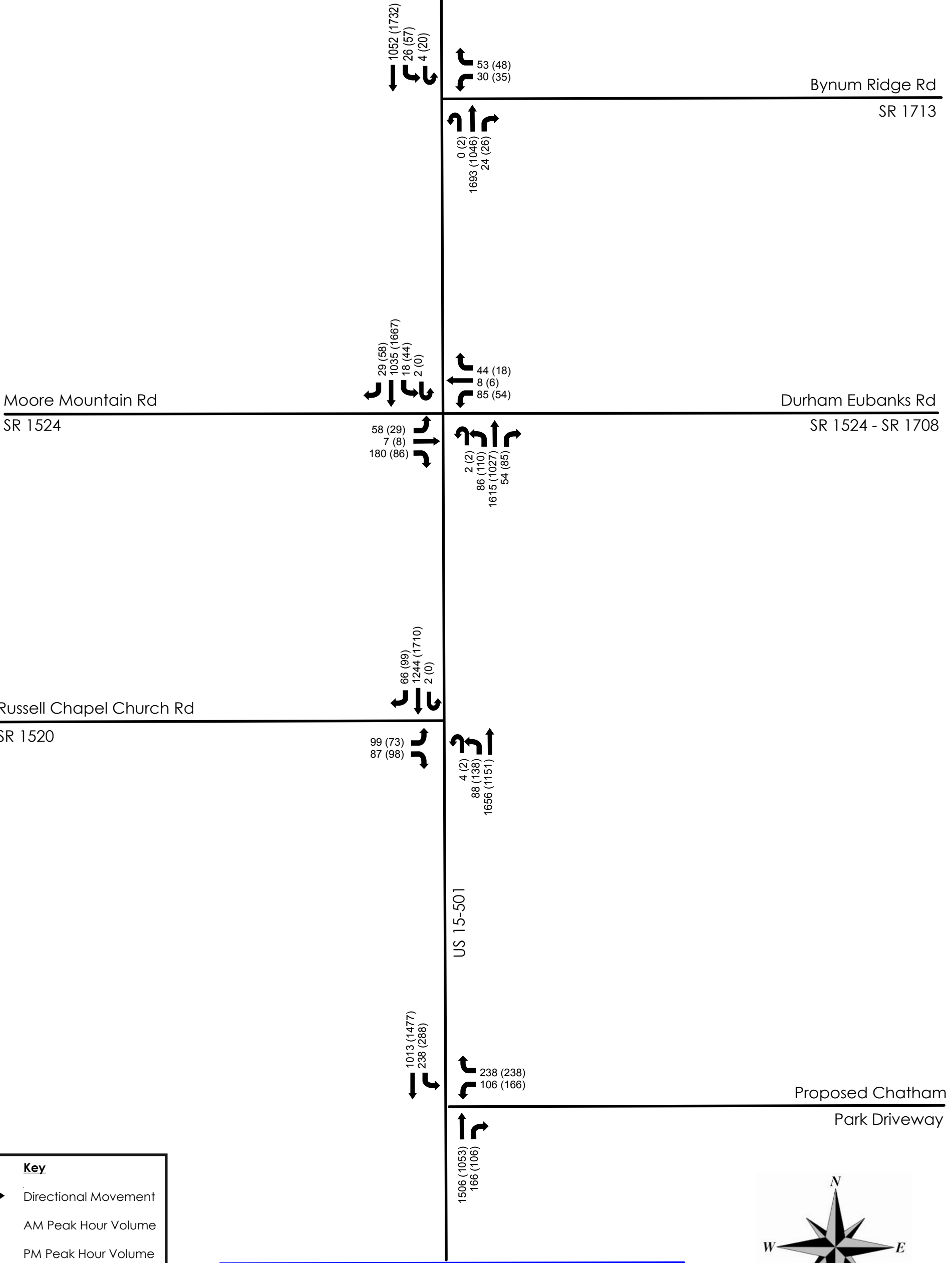
MATCH LINE E

Key	
	Directional Movement
XX	AM Peak Hour Volume
(XX)	PM Peak Hour Volume



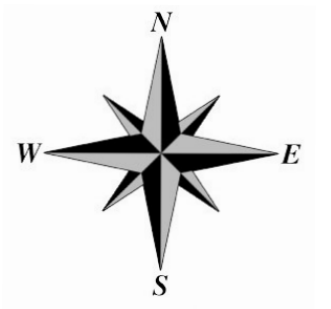
2040 Peak Hour Volumes

MATCH LINE E



Key

- ➔ Directional Movement
- XX AM Peak Hour Volume
- (XX) PM Peak Hour Volume



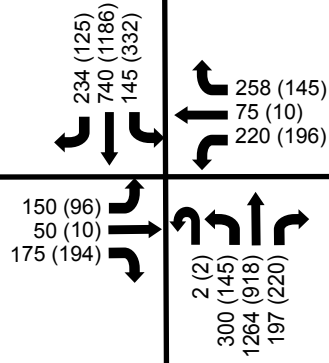
MATCH LINE F

2040 Peak Hour Volumes

MATCH LINE F

Northwood High School Rd
SR 1599

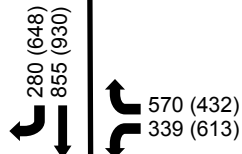
Russet Run
SR 1658



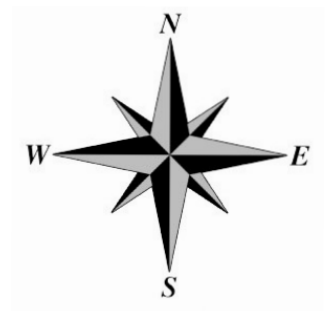
US 15-501

US 64

US 64









Key	
	Directional Movement
XX	AM Peak Hour Volume
(XX)	PM Peak Hour Volume

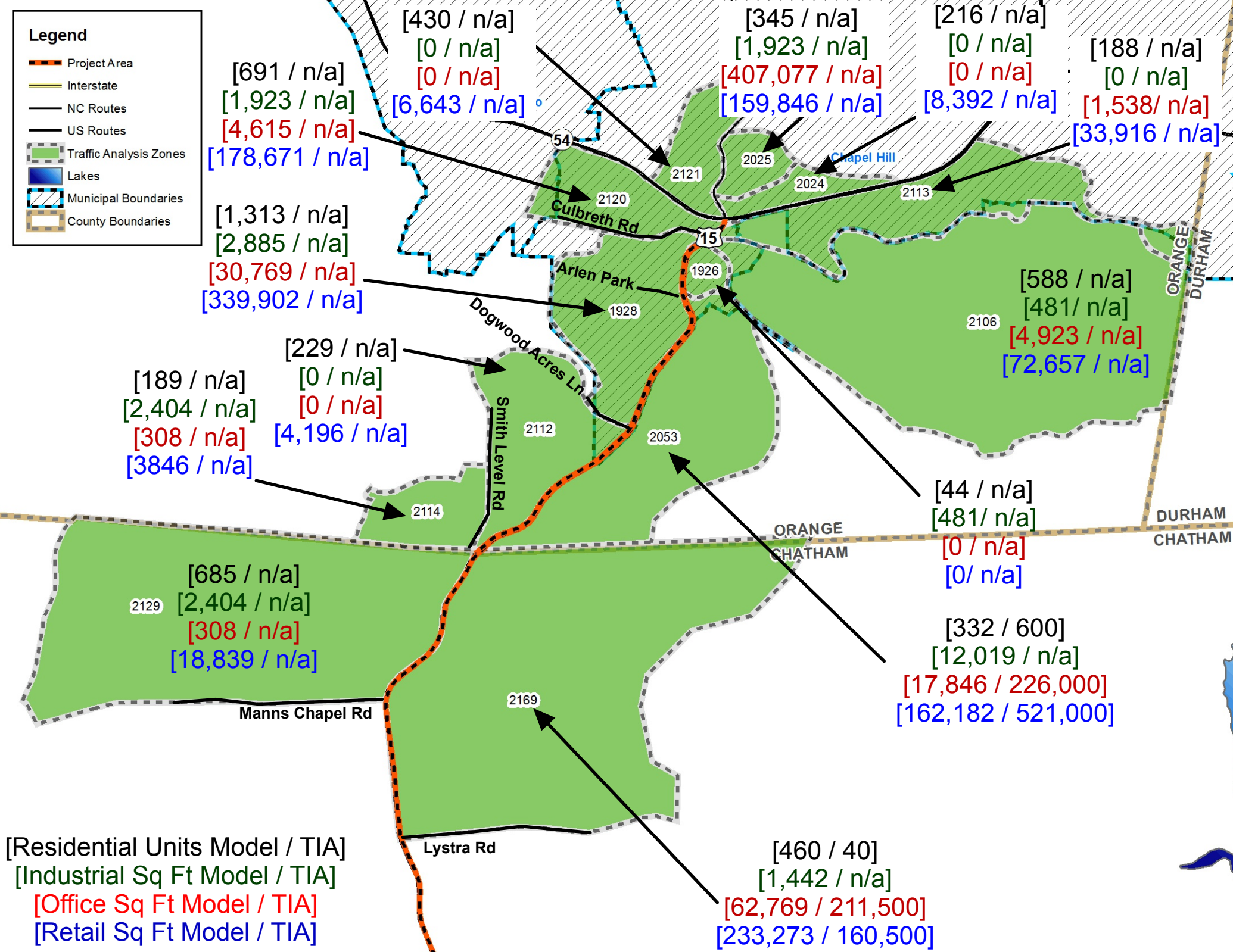


2040 Peak Hour Volumes

Appendix B: Calculations and Related Documents

Legend

-  Project Area
-  Interstate
-  NC Routes
-  US Routes
-  Traffic Analysis Zones
-  Lakes
-  Municipal Boundaries
-  County Boundaries



[430 / n/a]
[0 / n/a]
[0 / n/a]
[6,643 / n/a]

[691 / n/a]
[1,923 / n/a]
[4,615 / n/a]
[178,671 / n/a]

[345 / n/a]
[1,923 / n/a]
[407,077 / n/a]
[159,846 / n/a]

[216 / n/a]
[0 / n/a]
[0 / n/a]
[8,392 / n/a]

[188 / n/a]
[0 / n/a]
[1,538 / n/a]
[33,916 / n/a]

[1,313 / n/a]
[2,885 / n/a]
[30,769 / n/a]
[339,902 / n/a]

[189 / n/a]
[2,404 / n/a]
[308 / n/a]
[3846 / n/a]

[229 / n/a]
[0 / n/a]
[0 / n/a]
[4,196 / n/a]

[685 / n/a]
[2,404 / n/a]
[308 / n/a]
[18,839 / n/a]

[588 / n/a]
[481 / n/a]
[4,923 / n/a]
[72,657 / n/a]









[44 / n/a]
[481 / n/a]
[0 / n/a]
[0 / n/a]

[332 / 600]
[12,019 / n/a]
[17,846 / 226,000]
[162,182 / 521,000]

[460 / 40]
[1,442 / n/a]
[62,769 / 211,500]
[233,273 / 160,500]

[Residential Units Model / TIA]
[Industrial Sq Ft Model / TIA]
[Office Sq Ft Model / TIA]
[Retail Sq Ft Model / TIA]

Legend

-  Project Area
-  Interstate
-  NC Routes
-  US Routes
-  Traffic Analysis Zones
-  Lakes
-  Municipal Boundaries
-  County Boundaries

[209 / 96]
 [481 / n/a]
 [4,000 / 23,600]
 [37,000 / 56,380]

[1,002 / 2,389]
 [19,231 / n/a]
 [29,231 / 270,000]
 [259,203 / 252,000]

[166 / n/a]
 [1,442 / n/a]
 [2,769 / n/a]
 [41,958 / n/a]

[328 / n/a]
 [0 / n/a]
 [12,000 / n/a]
 [30,378 / 107,200]

[215 / n/a]
 [962 / n/a]
 [923 / n/a]
 [11,413 / n/a]

[91 / n/a]
 [481 / n/a]
 [0 / n/a]
 [4,336 / n/a]

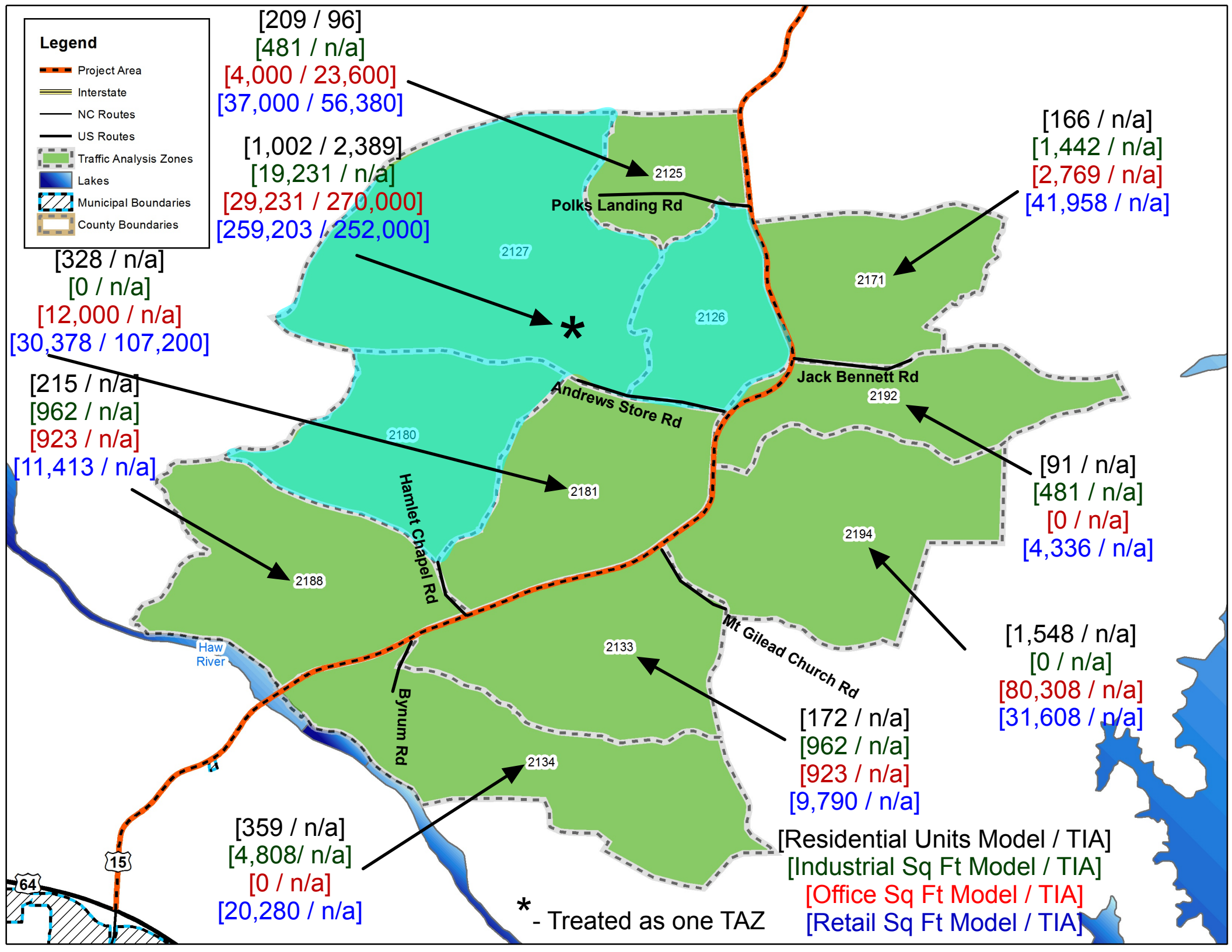
[1,548 / n/a]
 [0 / n/a]
 [80,308 / n/a]
 [31,608 / n/a]

[172 / n/a]
 [962 / n/a]
 [923 / n/a]
 [9,790 / n/a]

[359 / n/a]
 [4,808 / n/a]
 [0 / n/a]
 [20,280 / n/a]

[Residential Units Model / TIA]
 [Industrial Sq Ft Model / TIA]
 [Office Sq Ft Model / TIA]
 [Retail Sq Ft Model / TIA]

* - Treated as one TAZ



Legend

- Project Area
- Interstate
- NC Routes
- US Routes
- Traffic Analysis Zones
- Lakes
- Municipal Boundaries
- County Boundaries

Haw River

[105 / n/a]
[0 / n/a]
[15,385 / n/a]
[25,175 / n/a]

2151

Russell Chapel Church Rd

[175 / n/a]
[0 / n/a]
[0 / n/a]
[5,944 / n/a]

2143

Northwood High School Rd

2153

[382 / n/a]
[4,327 / n/a]
[4,000 / n/a]
[58,965 / n/a]

[1,641 / n/a]
[7,692 / n/a]
[117,538 / n/a]
[842,154 / n/a]

87

64

2146

2148

2144

[1,331 / n/a]
[0 / n/a]
[84,923 / n/a]
[1,080,657 / n/a]

Pittsboro

15

[1,184 / n/a]
[75,962 / n/a]
[20,308 / n/a]
[227,650 / n/a]

902

[Residential Units Model / TIA]
[Industrial Sq Ft Model / TIA]
[Office Sq Ft Model / TIA]
[Retail Sq Ft Model / TIA]