the TRM regarding traffic speed and vehicle miles traveled on various types of roads are the basis for determining Air Quality Conformity in future years.

The TRM is an industry-standard “four step” regional travel demand model developed in the late 1990s through a regional partnership consisting of DCHC MPO, CAMPO, North Carolina Department of Transportation, and Triangle Transit Authority. Four-step models like the TRM forecast travel activity using the following sub-models, or steps:

- Trip Generation – based on socio-economic data describing household (e.g., population) and employment characteristics, compute the number of trips people take for various purposes, and the number of trips likely to terminate at various destinations throughout the region.
- Trip Distribution – based on the number of trips generated, the observed trip lengths for different trip purposes and various other characteristics of the zones, compute for each zone the number of trips ending up in each other zone, broken out by trip purpose.
- Mode Choice – based on trips by trip purpose, traveler demographics, transit operating routes and schedules, accessibility of transit service in a zone and other zone characteristics, compute the number of trips for each trip purpose on each available mode (e.g., automobile, transit, bicycle, and walking) between each pair of zones.
- Trip Assignment – based on the most time-efficient available routes, travel speeds and other roadway characteristics, compute which specific route is most likely for each trip between each pair of zones and sum up the number of trips on each modeled transit route and roadway segment. The model does include feedback to recompute results since the “shortest” route between a pair of zones will vary depending on levels of traffic congestion.

Specific factors used in the model's computations have been calibrated against available travel behavior information collected in 1995 surveys of several thousand Triangle households and transit riders, traffic count information collected throughout the Triangle, and surveys of travelers entering or leaving the Triangle to destinations outside the modeled area. Where calibration factors were not available locally (for example, determining the characteristics of persons likely to use future rail transit), factors were adopted from surveys conducted in regions with similar demographics and travel patterns using standard methods promulgated by FTA, FHWA and other regulatory agencies. The 2002 model year was validated prior to its use in developing this plan against recent traffic count data, and against updated information from the 2000 US Census to ensure that the results continued to seem reasonable.

Trends, Deficiencies and Needs

Highways -- Overview

Once the long-range transportation development process has established the residential and employment locations of people, the process of identifying the demand location of transportation infrastructure begins. This process basically identifies where new or improved transportation investments will need to be made to meet current and future mobility needs. There are two principal methods for identifying the transportation location demand. The first method analyzes trends in traffic counts to identify those transportation corridors experiencing the fastest growth in traffic counts, and therefore those corridors most likely needing transportation investments. This method has strength in that it relies on factual data that is readily available from the North Carolina Department of Transportation. A trend line can be drawn from past and current traffic counts to get a glimpse of possible future counts. However, this method does not account for expected changes in growth patterns.

The second method uses highway deficiency maps generated by the TRM (transportation model), which forecast the congestion level on the principal roadways. The strength of this method lies in the ability to take into account expected changes in land use development and forecast congestion levels by taking roadway capacities into account. As with any sophisticated forecasting system, the TRM does not predict the future – rather it enables us to visualize possible outcomes of complex processes.

Highways -- Traffic Counts

The DCHC MPO area is experiencing an accelerated pace of traffic growth. Figure 13 displays the annual growth rate of traffic counts for the roadway corridors in which the principal highway projects in the 2030 LRTP are to be constructed. Among the 43 projects for which the growth rate is available, 34 projects (or 79 percent) have an annual traffic growth rate exceeding the annual population growth, which is 1.4 percent for the DCHC area. In fact, seventeen projects (or 40 percent) have a traffic growth rate at five percent or higher – a five percent annual growth rate will double traffic in less than fifteen years. The brisk growth in population, employment and average vehicle miles traveled are elements that are accelerating the pace of traffic growth.

Highways – Deficiency Maps

Deficiency maps, produced by the Triangle Regional Model, show Average Daily Traffic Volumes for 2002 and 2030 on the model's schematic highway network maps. Road segments on these maps are thicker or thinner according to the total daily volume of traffic and they are colored to indicate the relative degree of congestion (ratio of traffic volume to road segment capacity). In general, when the Volume/Capacity ratio is greater than 1.0, drivers will experience some periods of congestion that are great enough to warrant changing departure time (leaving earlier or later) or re-routing the trip. At Volume/Capacity ratios greater than 1.2, the road segment will typically be in a congested state throughout the peak hour periods, and often outside the peak hours as well.

Deficiency maps display the level of congestion on highway segments by comparing the number of forecast trips (i.e., vehicles) with the capacity for the particular road segment. The deficiency maps in Figure 14 and Figure 15 are schematic layouts of the current and future principal roadways in the DCHC MPO planning area. Of particular importance are the red lines, which signify that the traffic volume is more than 120% of the road capacity, and the orange lines, which signify that traffic volume is between 100 to 120% of road capacity. These two volume-to-capacity ratios signify poor levels of service in which vehicles experience higher rates of accidents, significantly slower travel speeds, and in many cases stop-and-start traffic conditions. The results are longer commute/travel times, traveler dissatisfaction and tension, and higher pollutant emissions.

Figure 13: 2030 LRTP -- Traffic Count Trend for Principal Highway Projects

No.	ID	Project	Project Limits	County	Daily Traffic Counts (1) 1992	1997	2001	2003	Annual Growth
1	3	Alexander Dr	NC 54 to NC 55	Durham		8,300	11,000	14,000	14%
2	4	Alexander Dr	NC 54 to Cornwallis Rd	Durham		9,200	9,700	12,000	7%
3	5	Alston Ave Ext	Holloway St to Old Oxford/Roxoboro	Durham					N/A
4	12	Cornwallis Rd	MLK to Alexander Dr	Durham	8,100		9,800	9,200	1%
5	14	Davis Dr	NC 54 to County Line	Durham		14,000	17,000	15,000	2%
6	15	East End Connector (EEC)	NC 147 to US 70 E; US 70:EEC to NC 98	Durham					N/A
7	16	Elizabeth Brady Rd Ext	US 70 Business to St Mary's Rd	Orange					N/A
8	17	Estes Dr	Greensboro Rd to NC 86	Orange		11,900	13,000	14,000	4%
9	22	Fayetteville Rd	Woodcroft Pkwy to South Point	Durham		13,200	19,000	24,000	16%
10	23	Fayetteville Rd	Woodcroft Pkwy to Cornwallis Rd	Durham	7,800		17,000	15,000	6%
11	24	Garrett Rd	NC 751 to US 15-501	Durham		13,700	16,000	18,000	7%
12	29	Guess Rd	Carver St to Umstead Rd	Durham		16,000	16,700	17,000	2%
13	30	Hillandale Rd	I-85 to Carver St.	Durham	12,000		20,000	11,000	-1%
14	34	Holloway Street	US 70 to east of Junction Rd	Durham	24,000		28,000	23,000	0%
15	36	Homestead Rd	Old NC 86 to High School Rd	Orange		4,700	6,600	5,800	5%
16	41	I-40	NC 147 to Wake Co line	Durham		107,000	143,000	144,000	4%
17	42	I-40	US 15-501 to NC 147	Durham		72,000	89,000	93,000	4%
18	44	I-40	NC 86 to I-85	Orange		50,200	56,000	56,000	3%
19	45	I-40 HOV	County Line to NC 86	Durham		107,000	143,000	144,000	4%
20	46	I-540 (Durham portion)	Durham Co. Portion (I-40/I540)	Durham			35,000	47,000	N/A
21	47	I-85	US 15-501 Bypass N to US 70	Durham		62,100	76,000	75,000	5%
22	48	I-85	I-40 to the Durham Co line	Orange		35,500	50,000	42,000	4%
23	49	I-85	US 70 to Red Mill Rd.	Durham		30,000	40,000	36,000	3%
24	59	Miami Blvd.	Methodist Dr to Angier Ave	Durham	19,000		23,000		2%
25	62	MLK Parkway	Old Chapel Hill Rd to NC 55	Durham					N/A
26	64	NC 147	Alston Ave to I-40	Durham		44,600	56,000	58,000	7%
27	65	NC 147	East End Conn to I-40	Durham		47,100	45,000	55,000	4%
28	66	NC 147 (Triangle Parkway)	I-40 to County Line	Durham		18,400	15,000	12,000	-10%
29	68	NC 54	Miami Blvd to Wake Co line	Durham	8,500		17,000	16,000	6%
30	69	NC 54	I-40 Interchange to NC 55	Durham	11,000		17,000	33,000	11%
31	70	NC 54	I-40 to Barbee Chapel Rd	Durham	26,000		37,000	44,000	5%
32	73	NC 54/US 15-501 Bypass	NC 54 to US 15-501	Orange		45,300	49,000	50,000	2%
33	74	NC 55	Cornwallis Rd to Wake Co.	Durham		27,800	31,000	31,000	3%
34	75	NC 55 (Alston Ave.)	NC 147 to NC 98	Durham		21,400	27,000	17,000	-6%
35	76	NC 751	US 64 (MAB) to Durham Co line	Chatham		5,200	8,800	9,700	17%
36	77	NC 751	Chatham Co line to S Roxboro St	Durham	14,000		21,000	17,000	2%
37	79	NC 86	Homestead Rd to Whitfield Rd	Orange		23,300	29,000	32,000	8%
38	80	NC 86	Old NC 10 to US 70 Business	Orange			8,100		N/A
39	81	NC 86	US 70 Bypass to NC 57	Orange			13,000		N/A
40	83	Northern Durham Pkwy	US 70 E to I 85 N	Durham			N/A		N/A
41	84	Northern Durham Pkwy	I 85 North to Old Oxford Hwy	Durham			N/A		N/A
42	85	Northern Durham Pkw	Old Oxford Hwy to Roxboro Rd	Durham			N/A		N/A
43	86	Old NC 86	I-40 to Lafeyette Dr.	Orange			20,000	19,000	-3%
44	92	Roxboro Road (501N)	Duke Street to Goodwin Rd	Durham	33,000		37,000	36,000	1%
45	97	Smith Level Rd	Rock Haven Rd to NC 54 bypass	Orange		15,000	19,000	19,000	6%
46	98	South Columbia St	NC 54 to Manning Dr.	Orange		12,900	15,000	17,000	7%
47	109	US 15-501	Pittsboro Bypass (MAB) to Orange Co. line	Chatham					N/A
48	111	US 15-501	I-40 to Franklin St	Orange		40,900	42,600	44,000	2%
49	112	US 15-501	Orange Co line to Chapel Hill Bypass	Orange		25,900	31,000	30,000	4%
50	113	US 15-501	Bypass to I-40 (freeway conversion)	Durham		43,900	45,000	44,000	0%
51	114	US 15-501 Bypass	Pickett Rd to Morreene Rd	Durham		36,000	48,000	57,000	12%
52	116	US 70	Lynn Rd to Wake Co line	Durham		26,000	30,000	30,000	4%
53	117	US 70 Bypass	NC 86 to I-85 (exit 170)	Orange			13,000	13,000	0%
54	119	Weaver Dairy Rd	NC 86 to Erwin Rd	Orange		11,500	13,000	14,000	5%

(1) Source: NCDOT Average Annual Daily Traffic (AADT)
NA = data not available; ID = Project ID in 2030 LRTP
For comparing annual traffic growth, note that population growth is forecast at 1.4 percent in the DCHC MPO from 2002 to 2030

Figure 14

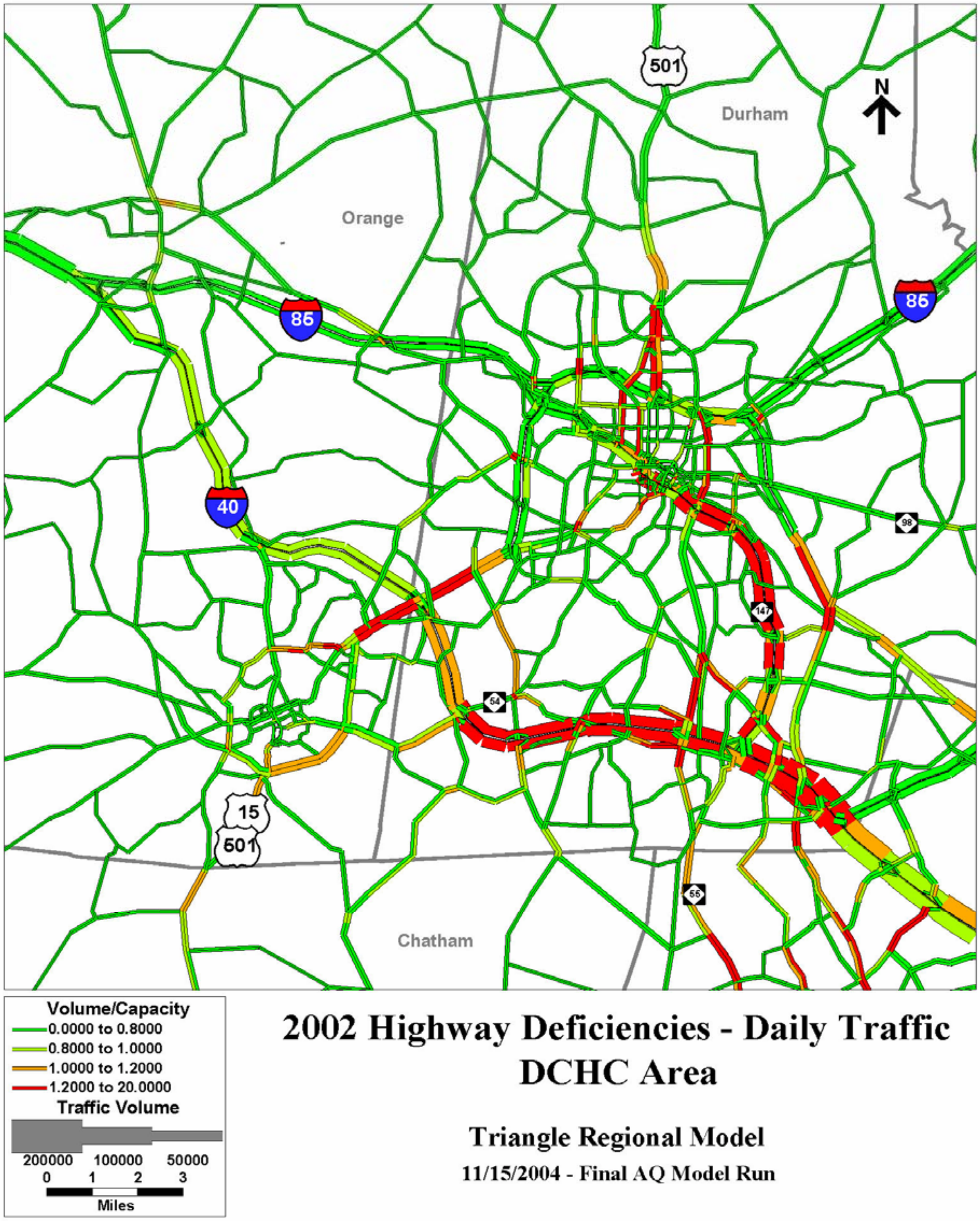
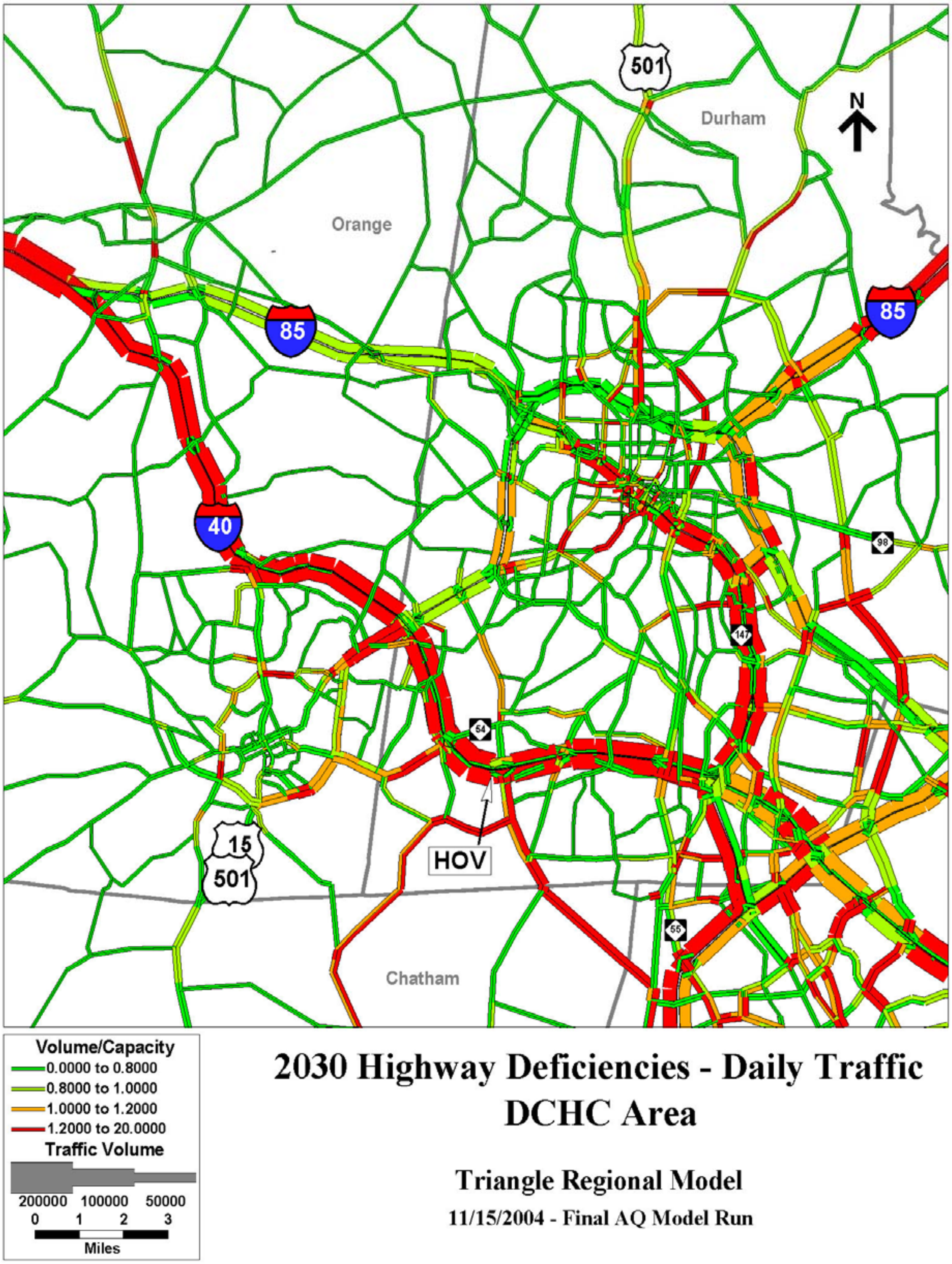

501
Durham
N
Orange
86
86
40
98
147
54
15
501
55
Chatham
Volume/Capacity
0.0000 to 0.8000
0.8000 to 1.0000
1.0000 to 1.2000
1.2000 to 20.0000
Traffic Volume
200000
100000
50000
0
1
2
3
Miles
2002 Highway Deficiencies - Daily Traffic
DCHC Area
Triangle Regional Model
11/15/2004 - Final AQ Model Run

Figure 15


501
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Volume/Capacity
0.0000 to 0.8000
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1.0000 to 1.2000
1.2000 to 20.0000
Traffic Volume
200000 100000 50000
0 1 2 3
Miles
2030 Highway Deficiencies - Daily Traffic
DCHC Area
Triangle Regional Model
11/15/2004 - Final AQ Model Run

A review of Figure 14, 2002 Highway Deficiencies, shows that the following facilities are currently experiencing high levels of congestion (i.e., have volumes that are at120% of capacity, or higher):

- I-40 between NC 54 and Wake County, and throughout the Research Triangle Park (RTP);
- Durham Freeway (NC 147) between downtown Durham and the (RTP);
- US 70 between Miami Blvd. and Lynn Rd.;
- NC 55 and Cornwallis Rd. in the central RTP area;
- NC 54 in the RTP area;
- US 15-501 between Franklin St. in Chapel Hill and Garrett Rd. in the City of Durham;
- Segments of arterials in the City of Durham such as Duke St., Buchanon Blvd., Broad St., Alston Ave., Roxboro Rd., Hillandale Rd., Erwin Rd., and University Dr., and;
- Estes Dr. in Chapel Hill.

A review of Figure 15, 2030 Highway Deficiencies, shows congestion levels will, for the most part, expand and intensify throughout the DCHC MPO area in the future. The "2030 Highway Deficiencies" map uses the same line/color thresholds as the "2002 Highway Deficiencies" map to forecast the level of congestion in the year 2030, and assumes that the population and employment growth described in the Socio-economic forecast become reality, and the highway, public transportation, and other projects in the 2030 LRTP will be implemented as planned. The most notable deteriorations in congestion include:

- I-85 north of the City of Durham;
- I-40 from west of Hillsborough to Wake County, and throughout the RTP;
- Most of the Durham Freeway (NC 147);
- NC 751 south of I-40;
- Farrington Mill Rd. and Stagecoach Rd. in southwest Durham County;
- Additional arterial segments around the City of Durham such as Duke St., Hillandale/Fulton St., Chapel Hill St., University Drive; Cornwallis Rd. (RTP), Page Rd., Sherron Rd., and Old Oxford Rd.;
- NC 54, NC 54 Bypass and Horace Williams Access Rd. in Chapel Hill;
- Greensboro Rd in Carrboro; and,
- Churton St. and NC 86 in Hillsborough.

Several new projects, i.e., constructed after 2002, are forecast to experience congestion, including:

- East End Connector;
- Northern Durham Parkway (US 70 to NC 98)
- I-40 and Durham Freeway (NC 147) (at six lanes);
- Triangle Parkway (NC 147); and,
- Alston Ave. Extension on the east side of the City of Durham.

There are a few notable examples in which the level of congestion is forecast to decline in 2030, including:

- Broad St. and Buchanon Blvd. between I-85 and the Durham Freeway;
- US 15-501 between I-40 and the Bypass/Business route split near South Square (most likely the result of an upgrade from a six-lane arterial to a six-lane freeway);
- NC 55 (widened to 4-lanes); and
- US 70 (upgraded to freeway).