Chapter 1: Analysis of the Existing and Future Transportation System

A Comprehensive Transportation Plan (CTP) is developed to ensure that the transportation system meets the needs of the region for the planning period. The CTP serves as an official guide to providing a well-coordinated, efficient, and economical transportation and multimodal system for the future of the region. Local officials should use this document to ensure that planned transportation facilities reflect the needs of the public, while minimizing the disruption to local residents, businesses and environmental resources.

In order to develop a CTP, the following are considered:

- ❖ Analysis of the transportation system, including the impact of population and employment forecasts and any local and statewide initiatives;
- ❖ Impacts to the natural and human environment, including natural resources, historic resources, homes, and businesses; and
- ❖ Public input, including community vision and goals and objectives, and the feedback from citizens and local officials.

1.1 Analysis Methodology and Data Requirements

a) Roadway System Analysis – Level of Service (LOS)

<u>Purpose</u>

The highway volume-to-capacity maps show the level of projected congestion of the CTP highway study segments. This information can be used to identify highways that are expected to need future improvements, such as lane additions and intersection improvements, or need capacity increases on parallel routes.

<u>Methodology</u> – Volume-to-Capacity (V/C) Maps

The Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO) highway network was identified for analysis and divided into discrete study segments using information such as the number of lanes and projected volumes to separate the network into segments. The V/C maps show the projected 2040 volume divided by the capacity, thus any value of 1 or greater indicates that the volume is expected to exceed the capacity if no improvements are made. Some key factors in these maps include:

- ❖ This is a <u>no-build</u> scenario developed from the Triangle Regional Model (TRM) which applies the 2040 population and employment data on the current transportation network. This is sometimes referred to as the Existing Plus Committed (E+C) network or no-build scenario. Commonly, the E+C network also includes any highway projects that have right-of-way or construction funding in the first five years of the current Transportation Improvement Program (TIP).

The TRM is a regional travel demand model that includes all of the DCHC MPO planning area and all, or parts of, ten Triangle area counties. Future population, employment and transportation facilities are put into the model to yield future performance measures and trip volumes. Among the many measures that the model produces are travel times, roadway volumes, and trips by mode. TRM version 5.0 was used to help produce the year 2040 roadway volumes for the CTP.

Refer to Appendix G, Socio-Economic Data Forecasting Method, for detailed information on growth expectations and the socio-economic data forecasting methodology.

- The projected 2040 volume is based on traffic counts. The study segment growth rate from the 2010 to 2040 traffic volume (from the Triangle Regional Model) is applied to the most recent traffic count, which is usually NCDOT's Annual Average Daily Traffic (AADT) for the year 2011. Traffic counts were used because some study segments had a large variance between the model's 2010 volume and the 2011 traffic count.

- Each study segment is comprised of several TRM roadway links that many times varied significantly in projected volume. The study segment volume was calculated by using a weighted average of the TRM roadway link volumes.

- The capacity uses Level of Service (LOS) D. The practical existing capacity for each roadway was developed based on the 2000 Highway Capacity Manual using the Transportation Planning Branch's *LOS D Standards for Systems Level Planning*. Recommended improvements and overall design of the transportation plan were based upon achieving a minimum LOS D. Appendix E provides Level of Service definitions and illustrations.

Refer to Appendix C, CTP Inventory and Recommendations, for a table of the highway segments that includes the current and forecasted capacities and volumes, and other performance and attribute information. In addition, the user can view the highway map on the "Adopted" tab of the following CTP Web link: http://bit.ly/DCHCMPO--Adopted-CTP. Click on the targeted highway link in order to display a pop-up table of the performance and attribute data. See the next page for screenshots of the Web site and example interactive online map.

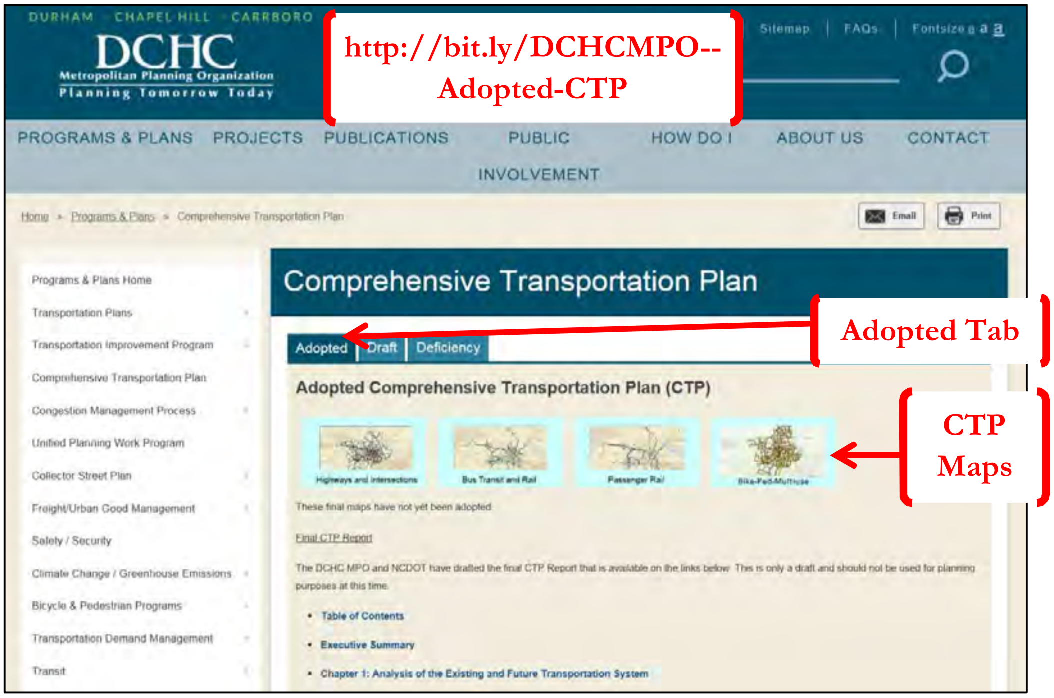

Figure 2: Website Adopted Tab and CTP Maps

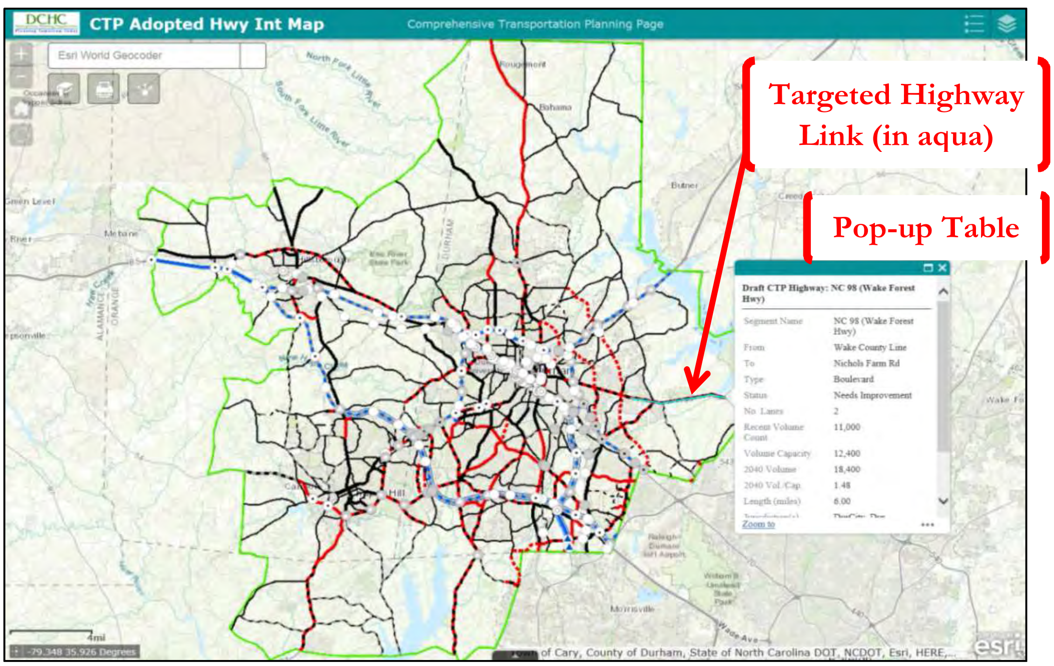

Figure 2a: Website Interactive CTP Map

Content – V/C Maps

The V/C highway maps are presented on the following pages:

- ❖ Durham County maps are pages 1-5 through 1-9,
- ❖ Orange County maps are pages 1-10 through 1-12, and
- ❖ The Chatham County map is page 1-13.

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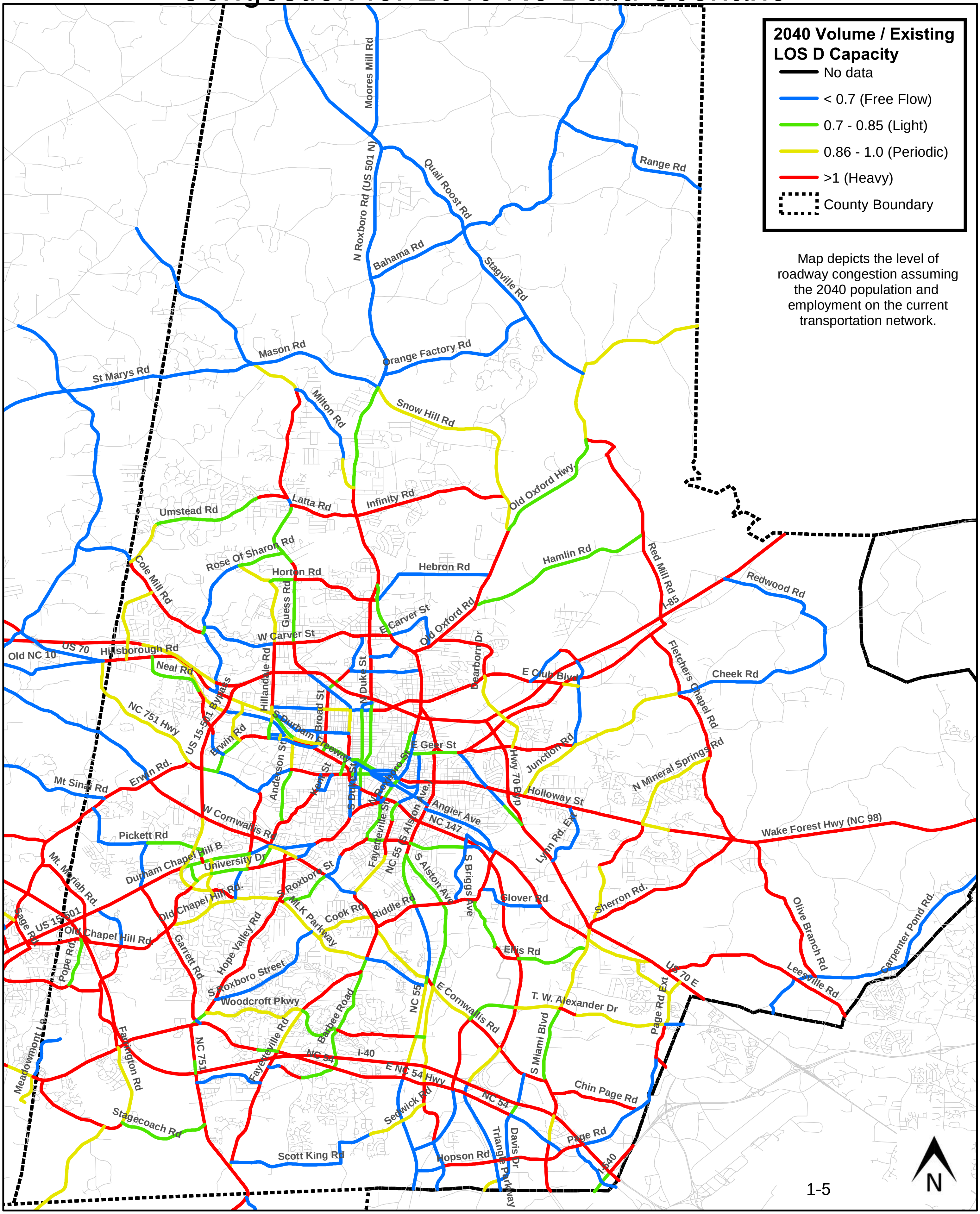
CTP Highways -- Durham County
Congestion for 2040 No Build Scenario

Figure 3

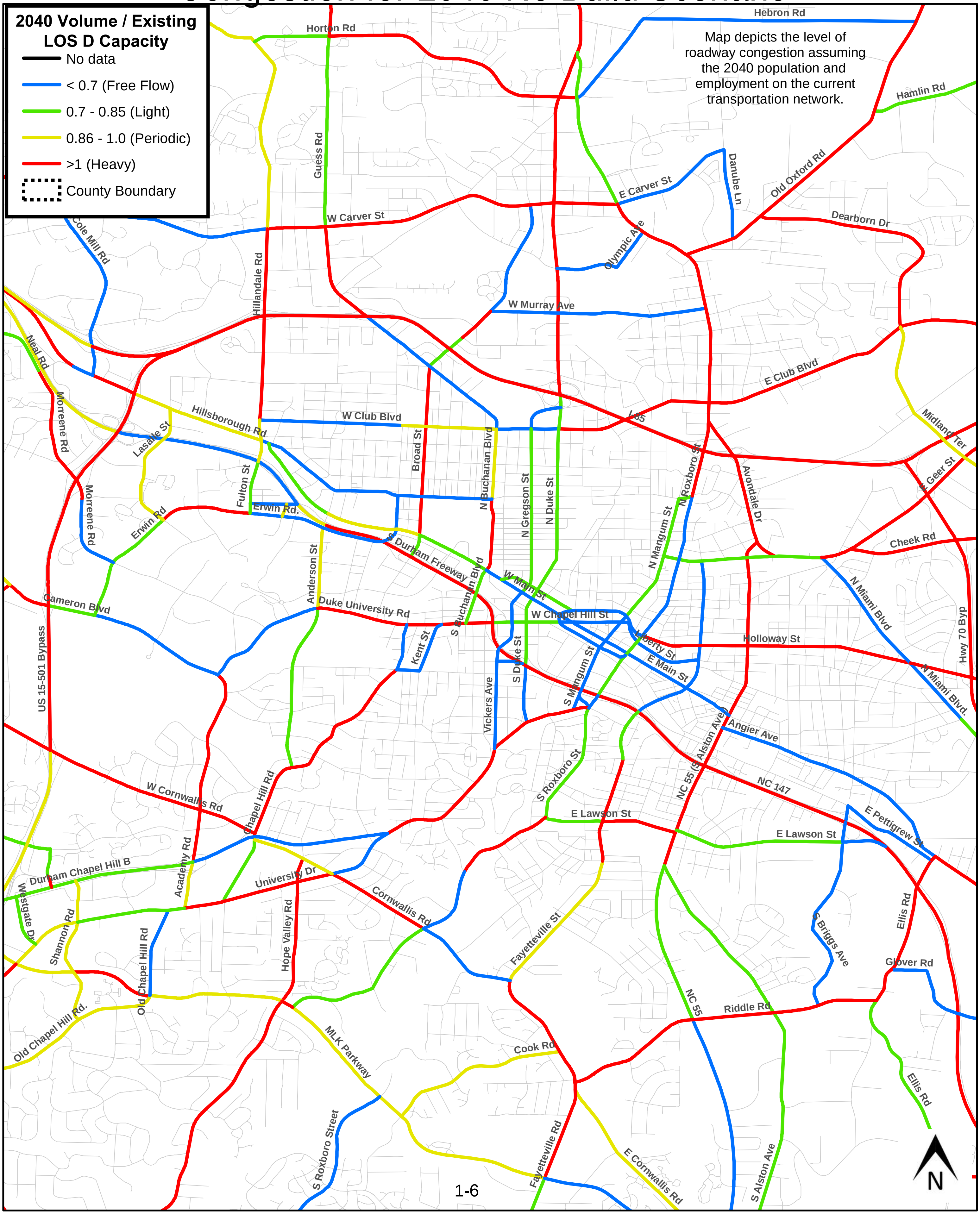
Date: 1/21/2015



CTP Highways -- Central Durham County
Congestion for 2040 No Build Scenario

Figure 3a

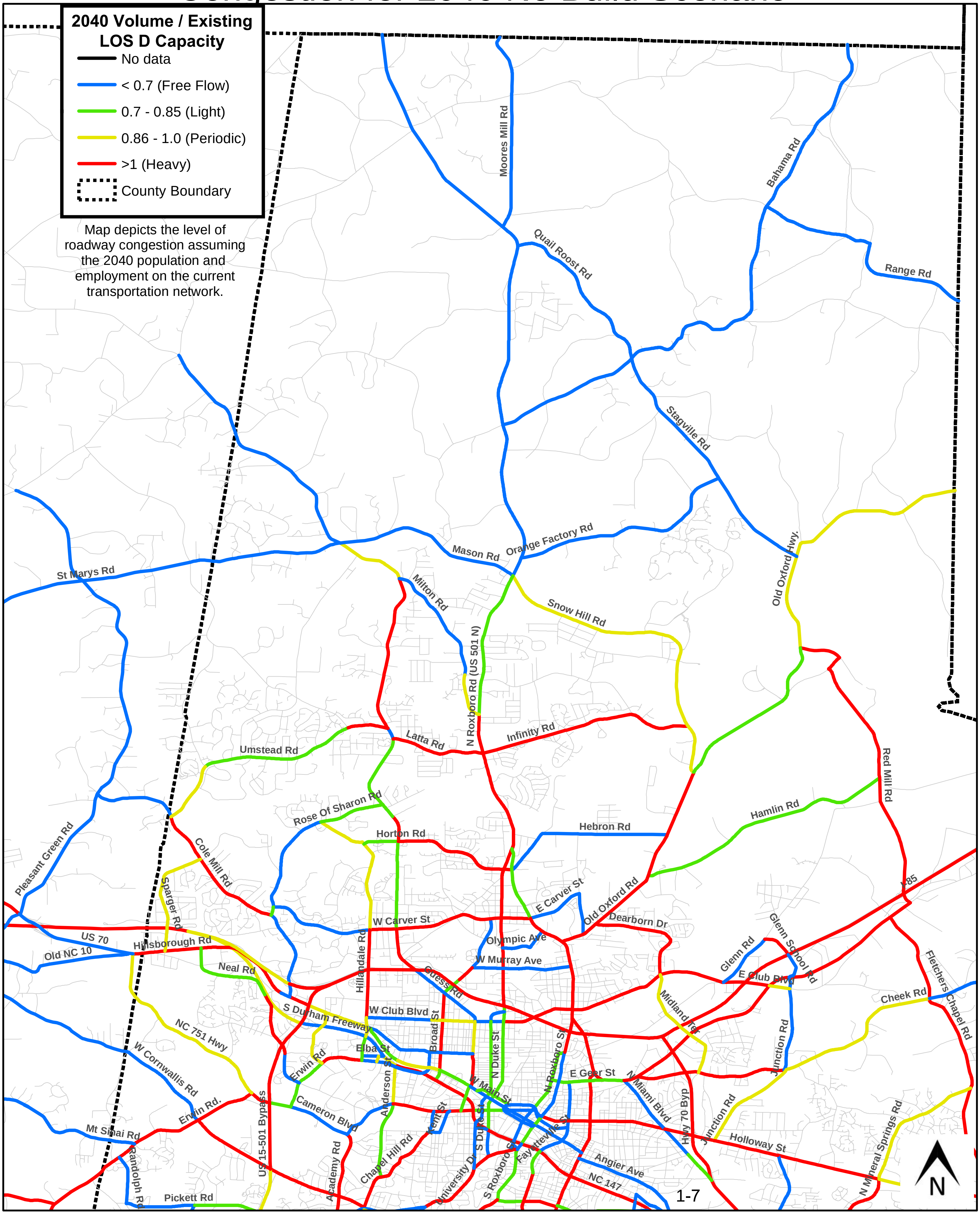
Date: 1/21/2015



CTP Highways -- Northern Durham County Congestion for 2040 No Build Scenario

Figure 4

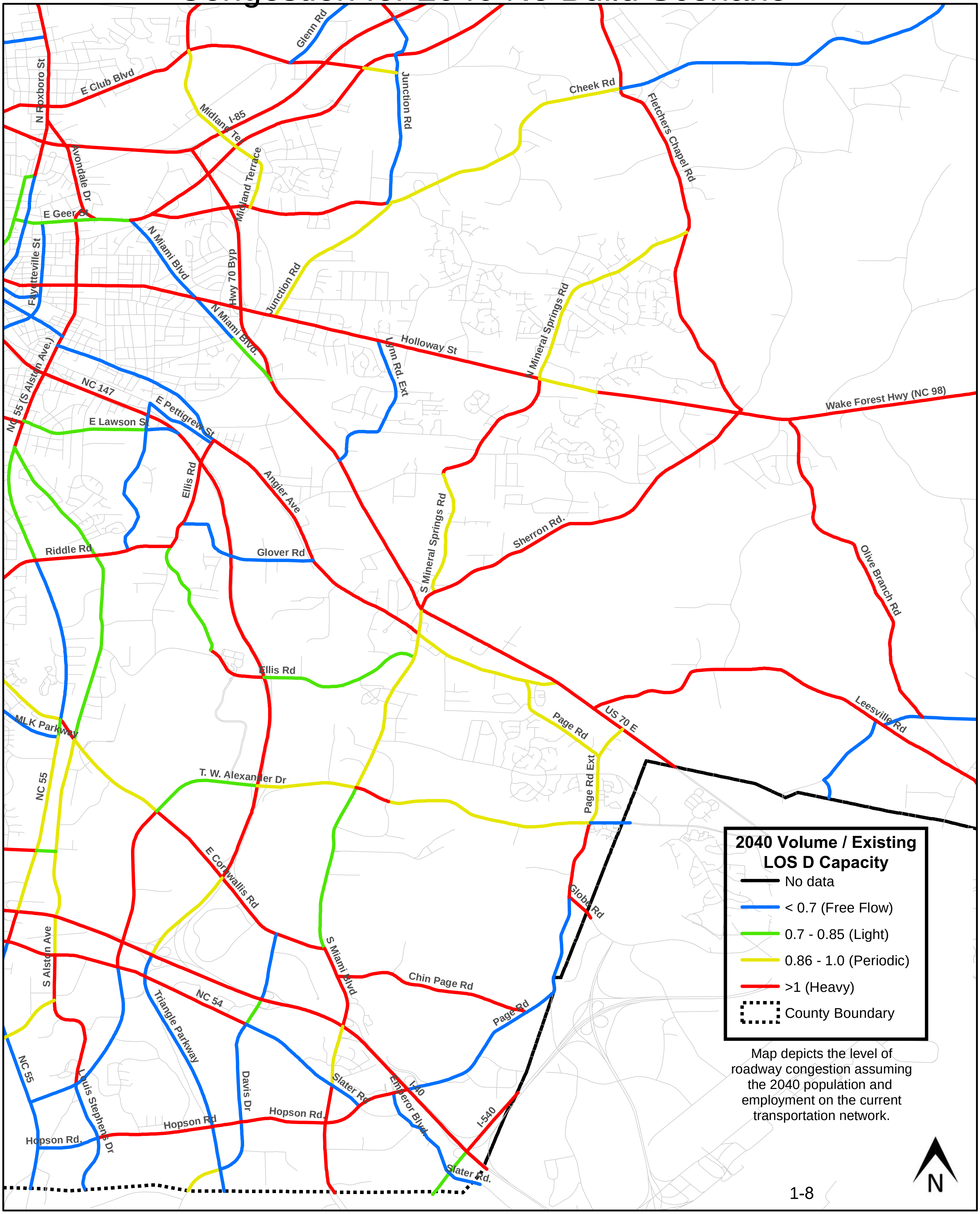
Date: 1/21/2015



CTP Highways -- Southeast Durham County
Congestion for 2040 No Build Scenario

Figure 5

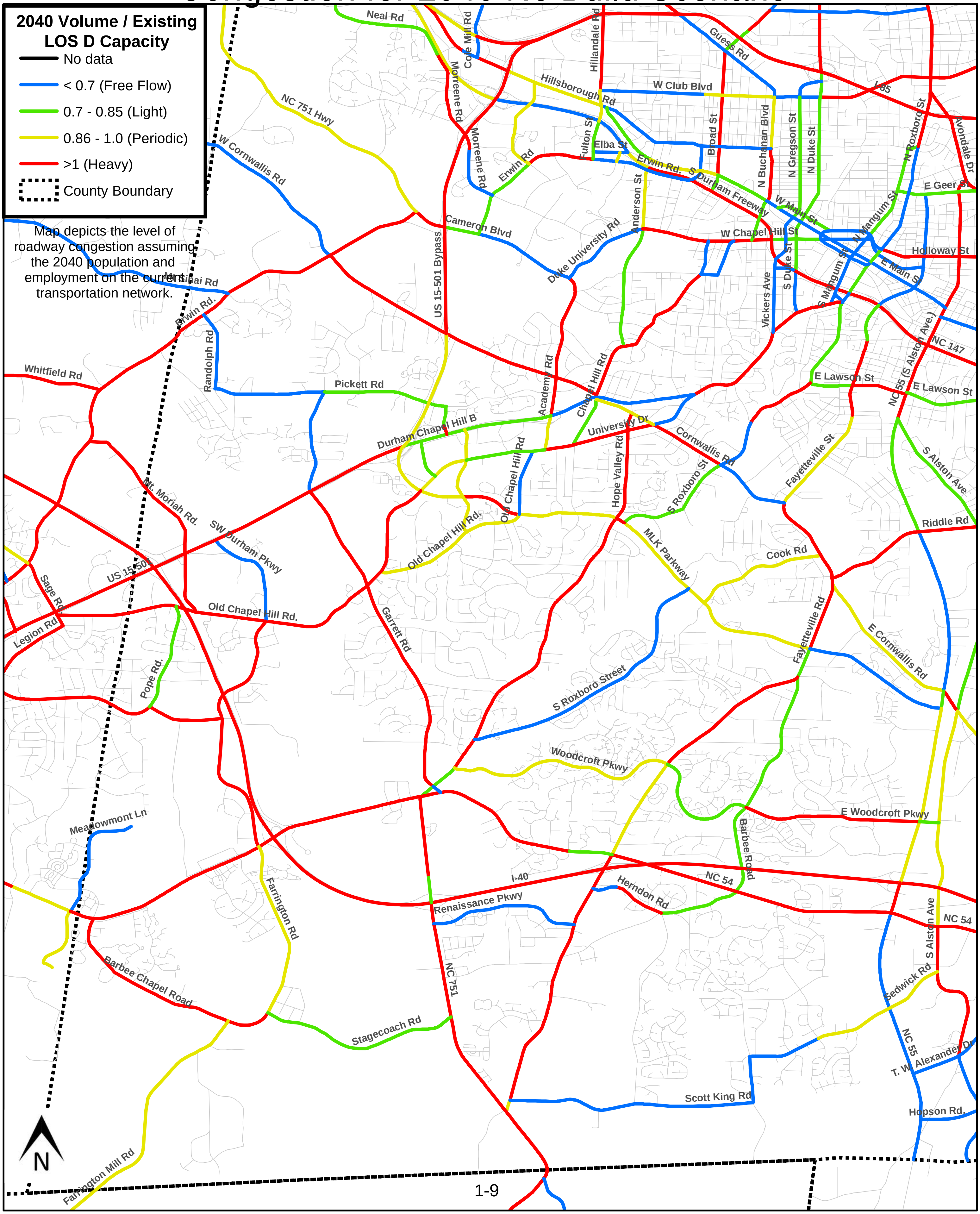
Date: 1/21/2015



CTP Highways -- Southwest Durham County
Congestion for 2040 No Build Scenario

Figure 5a

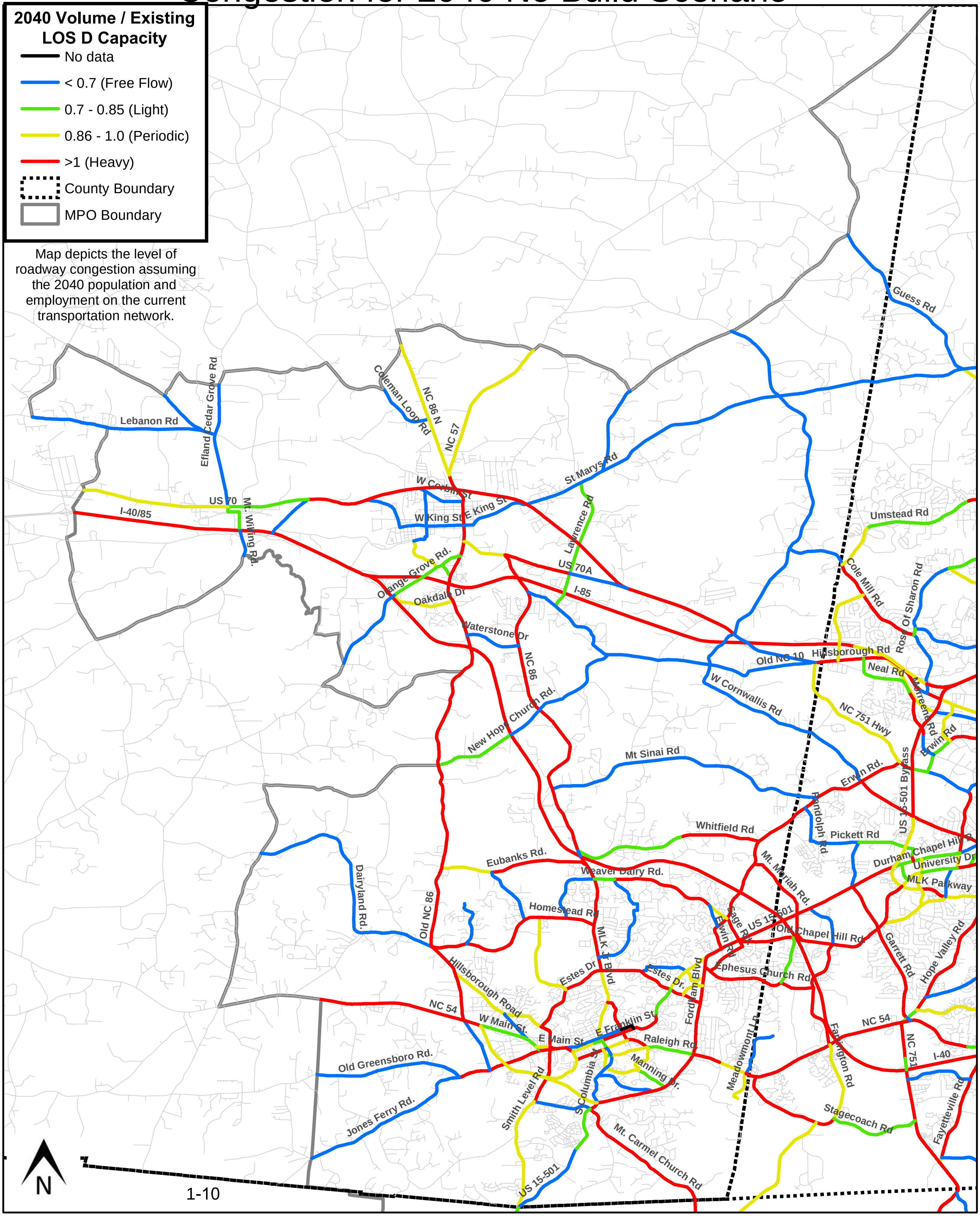
Date: 1/21/2015



CTP Highways -- Orange County
Congestion for 2040 No Build Scenario

Figure 6

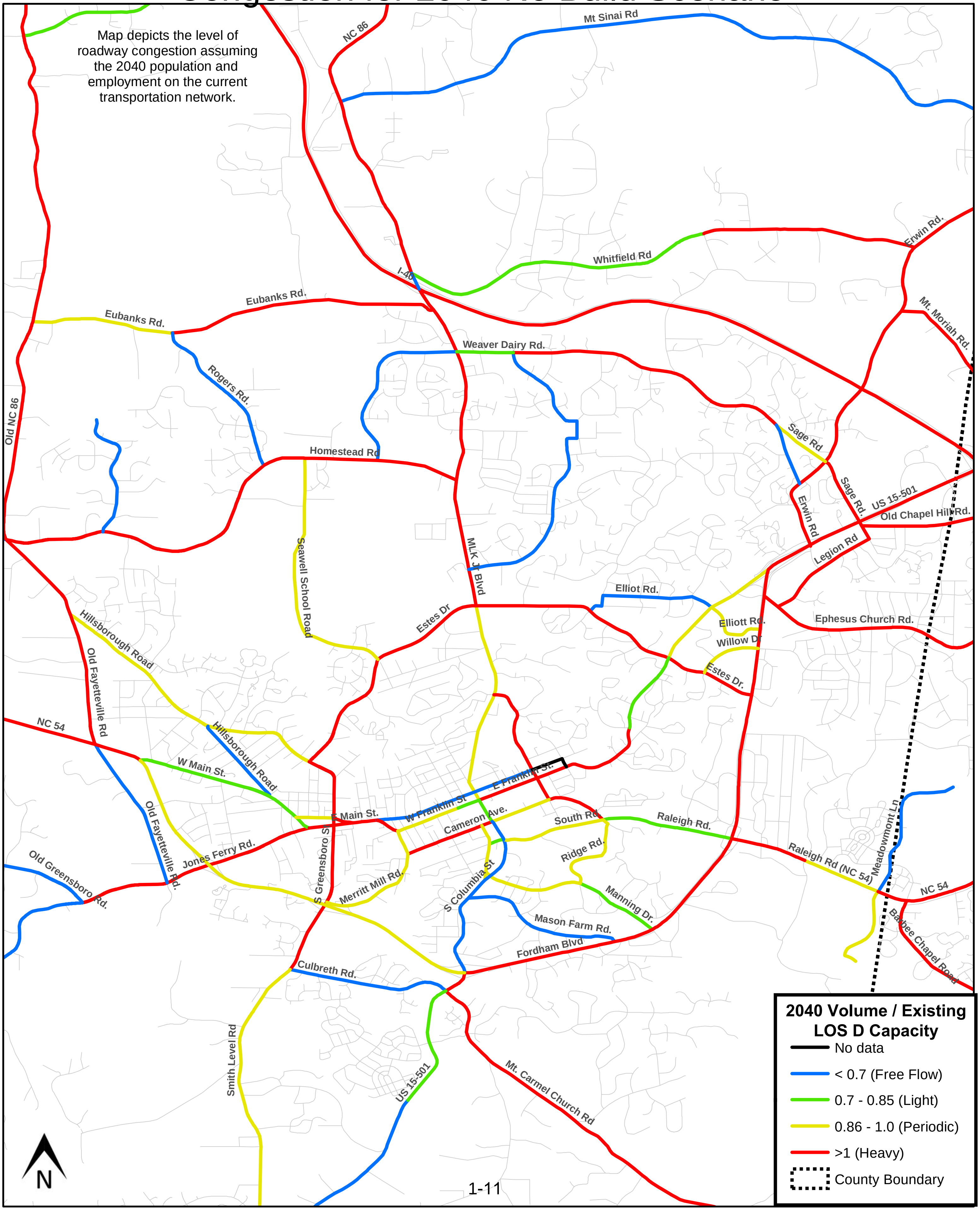
Date: 1/21/2015



CTP Highways -- Chapel Hill/Carrboro
Congestion for 2040 No Build Scenario

Figure 7

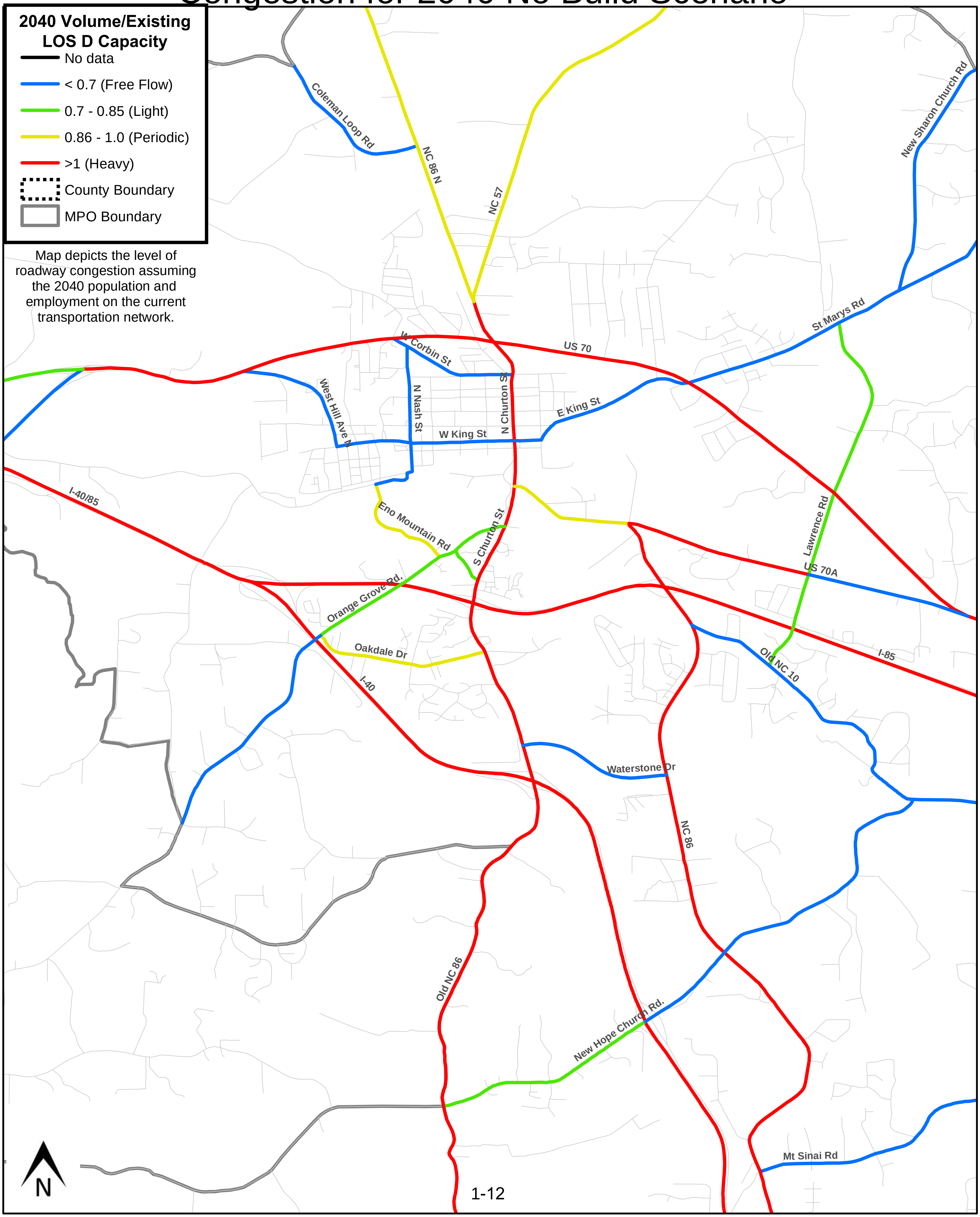
Date: 1/21/2015



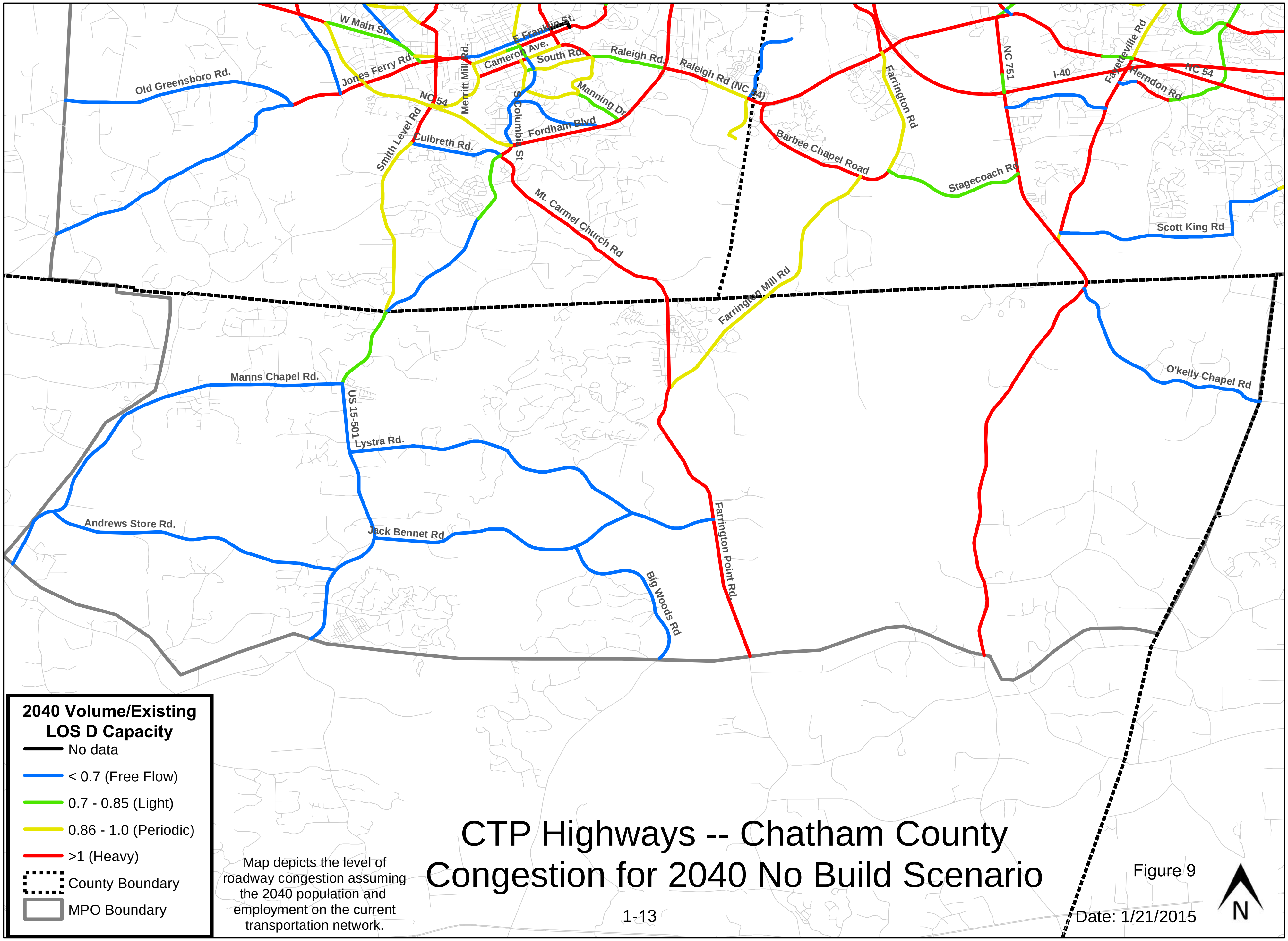
CTP Highways -- Hillsborough
Congestion for 2040 No Build Scenario

Figure 8

Date: 1/21/2015



CTP Highways -- Chatham County
Congestion for 2040 No Build Scenario



Map depicts the level of roadway congestion assuming the 2040 population and employment on the current transportation network.

Figure 9

Date: 1/21/2015

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i. Roadway System Analysis – Traffic Crash Assessment

Purpose

Crash data from the North Carolina Highway Safety Improvement Program (HSIP) safety data identifies intersections and roadway sections that are possibly deficient in terms of safety as well as congestion. These identified intersections and roadway sections were considered in developing CTP recommendations and are identified in the CTP problem statements. Also, the MPO and NCDOT are actively involved with investigating and improving many of these locations. To request a more detailed analysis for any of these locations, or other intersections of concern, contact the Division Traffic Engineer (see Appendix A).

Background

Using HSIP data from 2009 through 2013, the CTP Crash Locations map shows intersections and roadway sections that meet at least one of several warrants to be classified as potentially hazardous (PH).

It is helpful to understand the purpose of HSIP while considering how the CTP might use this safety information. The purpose of the HSIP is to provide a systematic process that identifies, reviews, and addresses specific traffic safety concerns on NCDOT roadways. The basic program steps include:

- A system of safety warrants is developed to identify locations that are possibly deficient.
- Locations that meet warrant criteria are categorized as potentially hazardous (PH) locations.
- Detailed crash analyses are performed on the PH locations with the more severe and correctable crash patterns.
- The Regional Traffic Engineering staff completes engineering field investigations, cost studies and other reviews to develop safety recommendations.
- Depending on the cost and nature of the countermeasures, the investigations may result in requesting adjustments or repairs, developing Spot Safety or Hazard Elimination projects, making adjustments to current TIP project plans or using other funding sources to initiate countermeasures.
- Selected projects are evaluated to determine the effectiveness of countermeasures.

Additional HSIP information can be found at the Web page for the 2014 NC Highway Safety Improvement Program (HSIP) report -- http://tinyurl.com/2014safetyreport. (In the HSIP report, see chapter five, pages 5-7, for Safety Warrant descriptions.)

Content

- ❖ The Crash Locations map is on page 1-17,
- ❖ The table of intersections is on page 1-19 through 1-21,
- ❖ The table of roadway sections is on page 1-22 through 1-23, and
- ❖ The following link provides an interactive online map of HSIP crash locations sponsored by NCDOT -- https://tinyurl.com/HSIPmap.

NOTE: Crash Crash location information is from the NCDOT-Traffic Safety Systems Section, 2014 NC Highway Safety Improvement Program (HSIP) report (http://tinyurl.com/2014safetyreport). See pages 5-7 for Safety Warrant descriptions. This map indicate AUTO ONLY crashes.

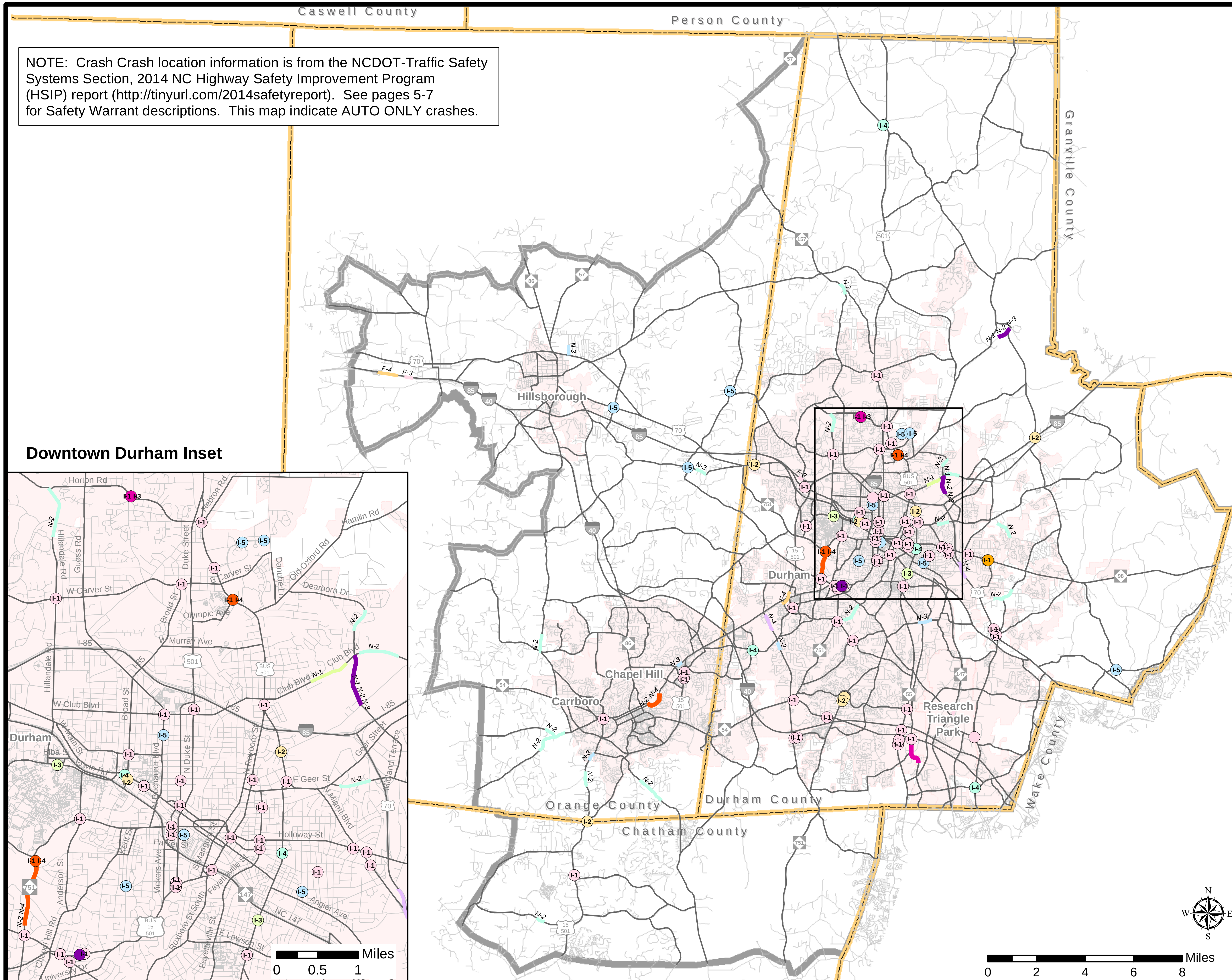

Figure 10

Crash Locations that Exceed One Safety Warrant

2009-2013

Durham-Chapel Hill-Carrboro MPO

Map date: December 5, 2014

Legend

Intersection Safety Warrants

- I-1: Frontal Impact; I-2: Last Year Increase
- I-1: Frontal Impact; I-3: Frequency with a Severity Index Minimum
- I-1: Frontal Impact; I-4: Night Location
- I-2: Last Year Increase; I-4: Night Location
- I-1: Frontal Impact
- I-2: Last Year Increase
- I-3: Frequency with a Severity Index Minimum
- I-4: Night Location
- I-5: Chronic Crossing Pattern

Section Safety Warrants

- N-1: Run Off Road during Wet Road Conditions; N-2: Run Off Road; N-3: Wet Road Condition (Non-Freeway)
- N-2: Run Off Road; N-3: Wet Road Condition (Non-Freeway)
- N-2: Run Off Road; N-4: Non-Intersection Night Location (Non-Freeway)
- F-3: Wet Road Condition (Freeway)
- F-4: Night Location (Freeway)
- N-1: Run Off Road during Wet Road Conditions (Non-Freeway)
- N-2: Run Off Road (Non-Freeway)
- N-3: Wet Road Condition (Non-Freeway)
- N-4: Non-Intersection Night Location (Non-Freeway)
- DCHC MPO Planning Boundary
- County Boundary
- Municipal Boundary

Base map date: September 18, 2009

Back of Figure

2014 HSIP - Potentially Hazardous Intersection Locations

Table 2

Crash Locations that Potentially Exceed at Least One Safety Warrant (2009-2013)

INTERSECTION LOCATIONS

					Warrant				
					I-1	I-2	I-3	I-4	I-5
No.	Road A	Road B	No. Crashes	Severity Index	Frontal Impact	Last Year Increase	Frequency with a Severity Index Minimum	Night Location	Chronic Crossing Pattern
CHATHAM COUNTY									
1	US 15	LYSTRA RD (SR 1721)	25	4.55	Y				
DURHAM COUNTY									
2	ANDERSON ST	DUKE UNIVERSITY RD	30	2.97	Y				
3	ARCHDALE DR (SR 2295)	MARTIN LUTHER KING JR PKWY	39	2.9	Y				
4	BROAD ST (SR 1322)	W MARKHAM AVE	33	2.35	Y				
5	CARPENTER POND RD (SR 1901)	OLIVE BRANCH RD (SR 1905)	26	7.33					Y
6	DOWD ST	N ELIZABETH ST	31	5.35	Y				
7	E CORNWALLIS RD (SR 1121)	S MIAMI BLVD (SR 1959)	40	3.59	Y				
8	ERWIN RD (SR 1320)	TRENT DR	37	6.3			Y		
9	FAYETTEVILLE RD (SR 1118)	GENEVA DR	29	3.55		Y			
10	HILLANDALE RD (SR 1321)	W CARVER ST (SR 1407)	32	2.39	Y				
11	HORTON RD (SR 1443)	STADIUM DR	50	6.4	Y		Y		
12	HYDE PARK AVE	E MAIN ST	32	4.24					Y
13	I 85	RED MILL RD (SR 1632)	35	4.17		Y			
14	JACKSON ST	WILLARD ST	30	2.73					Y
15	KENT ST	W LAKEWOOD AVE	41	4.25					Y
16	MARTIN LUTHER KING JR PKWY	ROXBORO ST	59	4.54	Y				
17	MEDICAL PARK DR	BEN FRANKLIN BLVD	20	3.59					Y
18	MORREENE RD (SR 1317)	ERWIN RD (SR 1320)	53	3.23	Y				
19	N BUCHANAN BLVD	W KNOX ST	48	4.4					Y
20	N DRIVER ST	TAYLOR ST	26	2.99	Y				
21	N DUKE ST (SR 1445)	W CLUB BLVD	56	3.25	Y				
22	N ELIZABETH ST	LIBERTY ST	28	3.38	Y				
23	N GREGSON ST (SR 1327)	W TRINITY AVE	28	3.38	Y				
24	NC 54	HOPSON RD (SR 1978)	34	4.05				Y	
25	NC 54	SOUTHPOINT CROSSING DR	26	2.99	Y				
26	NC 54	S ALSTON AVE (SR 1945)	30	1.99	Y				
27	NC 54	GARRETT RD	55	2.88	Y				
28	NC 55	CAMDEN AVE (SR 1671)	26	1.28		Y			
29	NC 55	SR 2205	29	5.14	Y				
30	NC 55	MEREDITH DR	61	2.21	Y				
31	NC 55	PARK FORTY PLAZA	38	2.75	Y				

*Any ranking of locations are for analysis and investigation purposes ONLY.

This list is not an effective "Top Ten Most Dangerous Locations in the State" type of list.

2014 HSIP - Potentially Hazardous Intersection Locations

Crash Locations that Potentially Exceed at Least One Safety Warrant (2009-2013)

INTERSECTION LOCATIONS

No.	Road A	Road B	No. Crashes	Severity Index	Warrant I-1 Frontal Impact	Warrant I-2 Last Year Increase	Warrant I-3 Frequency with a Severity Index Minimum	Warrant I-4 Night Location	Warrant I-5 Chronic Crossing Pattern
32	NC 55	SR 1182	36	3.26	Y				
33	NC 55	DAYTON ST	42	6.02	Y				
34	NC 55	LINWOOD AVE	59	6.86			Y		
35	NC 55	LIBERTY ST	52	4.45				Y	
36	NC 55	AVONDALE DR (SR 1357)	46	3.41	Y				
37	NC 751	DUKE UNIVERSITY RD	27	1.82	Y			Y	
38	NC 751	W CORNWALLIS RD (SR 1308)	27	4.01	Y				
39	NC 98	HARDEE ST	45	3.8	Y				
40	NC 98	ADAMS ST	28	4.7	Y				
41	NC 98	LYNN RD EXT (SR 1919)	61	5.03	Y				
42	NC 98	SR 1844	28	3.38		Y		Y	
43	RENAISSANCE PKWY	LEONARDO DR	27	2.64	Y				
44	S DUKE ST (SR 1445)	W LAKEWOOD AVE	30	1.99	Y				
45	S GREGSON ST (SR 1361)	JACKSON ST	33	2.35	Y				
46	SW DURHAM PKWY (SR 1110)	OLD CHAPEL HILL RD (SR 2220)	35	4.22				Y	
47	SWIFT AVE (SR 1322)	W PETTIGREW ST	43	2.03		Y			
48	UNIVERSITY DR	WESTGATE DR	38	3.14	Y				
49	US 15BUS	W CORNWALLIS RD (SR 1308)	51	4.95	Y				
50	US 15BUS	S DUKE ST (SR 1445)	36	3.06	Y				
51	US 15BUS	S ROXBORO ST (SR 1365)	55	3.96	Y				
52	US 15BUS	NC 98	28	5.49	Y				
53	US 15BUS	E TRINITY AVE	33	3.69	Y				
54	US 15BUS SB COUPLET	S ROXBORO ST (SR 1365)	103	3.87	Y				
55	US 15BUS SB COUPLET	SR 1364	26	4.13	Y	Y			
56	US 501	OMEGA RD	37	2.8	Y				
57	US 501	QUAIL ROOST FARM RD (SR 1468)	23	2.61				Y	
58	US 501BUS	DAVIDSON AVE	53	2.4	Y				
59	US 501BUS	OLYMPIC AVE	27	5.73	Y			Y	
60	US 501BUS	FRASIER ST	28	2.59	Y				
61	US 501BUS	HORTON RD (SR 1443)	93	3.17	Y				
62	US 70	MARLY DR (SR 1957)	45	4.99	Y				
63	US 70	PEYTON AVE (SR 1957)	55	3.99	Y				
64	US 70BUS	SPARGER RD (SR 1400)	31	3.86		Y			

*Any ranking of locations are for analysis and investigation purposes ONLY.

This list is not an effective "Top Ten Most Dangerous Locations in the State" type of list.

2014 HSIP - Potentially Hazardous Intersection Locations

Crash Locations that Potentially Exceed at Least One Safety Warrant (2009-2013)

INTERSECTION LOCATIONS

No.	Road A	Road B	No. Crashes	Severity Index	Warrant I-1 Frontal Impact	Warrant I-2 Last Year Increase	Warrant I-3 Frequency with a Severity Index Minimum	Warrant I-4 Night Location	Warrant I-5 Chronic Crossing Pattern
65	US 70BUS	CHRISTIAN AVE	59	1.88	Y				
66	US 70BUS	BUCHANAN BLVD	35	2.48				Y	
67	US 70BUS	N GREGSON ST (SR 1327)	54	2.64	Y				
68	US 70BUS	N ELIZABETH ST	26	2.71	Y				
69	US 70BUS	RAYNOR ST	40	3.04	Y				
70	US 70BUS	LIBERTY ST	30	3.47	Y				
71	US 70BUS WB COUPLET	N GREGSON ST (SR 1327)	56	2.59	Y				
72	W CARVER ST (SR 1407)	BROAD ST	28	3.38	Y				
73	W CHAPEL HILL ST (SR 1127)	S GREGSON ST (SR 1327)	35	3.33	Y				
74	W CLUB BLVD	GUESS RD	34	2.74	Y				
75	W CORNWALLIS RD (SR 1158)	HOPE VALLEY RD	36	3.26	Y				
ORANGE COUNTY									
76	MAIN ST (SR 1010)	HILLSBOROUGH RD (SR 1772)	26	2.99	Y				
77	OLD NC 10 (SR 1710)	MT HERMON CHURCH RD (SR 1713)	20	8.86					Y
78	PLEASANT GREEN RD (SR 1567)	COLE MILL RD (SR 1569)	20	7.38					Y
79	US 15	SMITH LEVEL RD (SR 1919)	36	2.44		Y			
80	US 15	WILLOW DR	67	4.89	Y				
81	US 15	ELLIOT RD	52	3.13	Y				
82	US 70BUS	LAWRENCE RD (SR 1709)	36	4.08					Y

NOTE: Crash location information is from the NCDOT-Traffic Safety Systems Section, 2014 NC Highway Safety Improvement Program (HSIP) report (http://tinyurl.com/2014safetyreport). See pages 5-7 for Safety Warrant descriptions.

*Any ranking of locations are for analysis and investigation purposes ONLY.
This list is not an effective "Top Ten Most Dangerous Locations in the State" type of list.

Table 3

2014 HSIP - Potentially Hazardous Section Locations

Crash Locations that Potentially Exceed at Least One Safety Warrant (2009-2013)

SECTION LOCATIONS

					Warrant							
					F-1	F-2	F-3	F-4	N-1	N-2	N-3	N-4
					Freeway				Non-Freeway			
No.	Road A	Road B	No. Crashes	Severity Index	Run Off Road during Wet Road Conditions	Run Off Road	Wet Road Condition	Night Location	Run Off Road during Wet Road Conditions2	Run Off Road2	Wet Road Condition2	Non-Intersection Night Location
CHATHAM COUNTY												
1	ANDREWS STORE RD (SR 1528)	PARKER HERNDON RD (SR 1526)	16	3.78						Y		
DURHAM COUNTY												
2	**COOK RD**	**DUNN AVE**	80	3.22						Y		
3	**GLENBROOK DR**	**DUBONNETT PL**	20	2.11						Y		
4	I 85	COLE MILL RD (SR 1401)	30	1.99			Y					
5	NC 147	E CORNWALLIS RD (SR 1121)	30	2.23			Y					
6	NC 157 (GUESS RD)	MILTON RD (SR 1456)	15	14.6						Y		
7	NC 751 (ACADEMY RD)	PINECREST RD	34	4.97						Y		Y
8	GARRETT RD (SR 1116)	CAVALIER AVE	24	2.54							Y	
9	GARRETT RD (SR 1116)	MILLENNIUM DR	19	1.78								Y
10	RIDDLE RD (SR 1171)	S BRIGGS AVE	28	2.59							Y	
11	HILLANDALE RD (SR 1321)	PEPPERTREE ST	36	3.06						Y		
12	DEARBORN DR (SR 1666)	DEER RUN	19	4.51						Y		
13	E CLUB BLVD (SR 1669)	JONES PARK DR	15	2.97						Y		
14	E CLUB BLVD (SR 1669)	KISS DR	30	3.71					Y			
15	MIDLAND TERRACE (SR 1709)	CUSTOM DR	26	3.85					Y	Y	Y	
16	TEKNIKA PKWY (SR 1794)	RED MILL RD (SR 1632)	15	3.96					Y	Y	Y	
17	CHEEK RD (SR 1800)	ANDOVER DR	18	3.47						Y		
18	S MINERAL SPRINGS RD / PLEASANT DR (SR 1815)	S MINERAL SPRINGS RD (SR 1917)	27	4.01						Y		
19	**CLAYTON RD (SR 1825)**	**GLENROSE DR**	21	7.43						Y		
20	S ALSTON AVE (SR 1945)	SEDWICK RD (SR 1977)	37	3.2						Y	Y	
21	S ROXBORO ST / ARCHDALE DR (SR 2295)	OAK RIDGE BLVD	25	3.07						Y		
22	US 15	US 15BUS SB COUPLET	33	1.9				Y				
23	US 70	US 70BUS WB COUPLET	25	1.89								Y
24	W WOODCROFT PKWY	SANDSTONE RIDGE DR	22	3.69							Y	
ORANGE COUNTY												
25	FRANKLIN ST (SR 1010)	CAROLINA AVE	61	3.18						Y		Y
26	FRANKLIN ST (SR 1010)	MILTON AVE	41	2.62							Y	
27	I 40	BUCKHORN RD (SR 1114)	43	4.31				Y				

* Any ranking of locations are for analysis and investigation purposes ONLY.
This list is not an effective "Top Ten Most Dangerous Locations in the State" type of list.

BOLD = Section locations that are not included in the CTP Study Roads.

Yellow fill = Not shown on map.

2014 HSIP - Potentially Hazardous Section Locations

Crash Locations that Potentially Exceed at Least One Safety Warrant (2009-2013)

SECTION LOCATIONS

					Warrant							
					F-1	F-2	F-3	F-4	N-1	N-2	N-3	N-4
					Freeway				Non-Freeway			
No.	Road A	Road B	No. Crashes	Severity Index	Run Off Road during Wet Road Conditions	Run Off Road	Wet Road Condition	Night Location	Run Off Road during Wet Road Conditions2	Run Off Road2	Wet Road Condition2	Non-Intersection Night Location
28	I 40	MT WILLING RD (SR 1120)	30	2.97			Y					
29	JONES FERRY RD (SR 1942)	CRYSTAL SPRINGS CT	29	2.79						Y		
30	JONES FERRY RD / OLD GREENSBORO RD (SR 1005)	OLD SCHOOL RD (SR 1941)	26	15.5						Y		
31	MT CARMEL CHURCH RD (SR 1008)	PARKER RD (SR 1916)	31	5.12						Y		
32	OLD NC 10	MURPHY SCHOOL RD (SR 1714)	17	2.74						Y		
33	OLD NC 86	STONEY HILL RD	18	3.06						Y		
34	ORANGE HIGH SCHOOL RD (SR 1588)	US 70	17	6.76							Y	
35	SMITH LEVEL RD (SR 1919)	ROCK HAVEN RD	15	3.47							Y	
36	SMITH LEVEL RD (SR 1919)	NORTHSIDE DR (SR 1964)	15	2.97						Y		

BOLD = Section locations that are not included in the CTP Study Roads.

Yellow fill = Not shown on map.

NOTE: Crash location information is from the NCDOT-Traffic Safety Systems Section, 2014 NC Highway Safety Improvement Program (HSIP) report (http://tinyurl.com/2014safetyreport).
See pages 5-7 for safety warrant details.

* Any ranking of locations are for analysis and investigation purposes ONLY.
This list is not an effective "Top Ten Most Dangerous Locations in the State" type of list.

ii. Roadway System Analysis – Bridge Deficiency Assessment

Purpose

The deficient bridge data identifies bridges that are structurally deficient or functionally obsolete. Bridges are a vital element of a highway system. They represent the highest unit investment of all elements of the system, and their failure presents the greatest system risk for community disruption and loss of life. For these reasons, it is imperative that bridges be constructed and maintained at a high standard.

The NCDOT Structures Management Unit inspects all bridges in North Carolina at least once every two years. Bridges having the highest priority are replaced as Federal and State funds become available. Ninety (90) deficient bridges were identified within the MPO planning area and are illustrated in Appendix F where more detailed information is available.

The fact that a bridge is designated as deficient does not mean that it is unsafe. The designation attracts continued monitoring and makes the bridge eligible for federal and/or state repair or replacement funding if its sufficiency rating meets a certain threshold. The CTP identifies these bridges in the problem statements of the roadways that are selected for improvements.

Content

Appendix F -- Bridge Deficiency Assessment -- contains:

- Details on bridge definitions and process,
- Maps of deficient bridges, and
- A table of deficient bridges in the MPO planning area.

b) Public Transportation, Rail and Truck

i. Public Transportation

The methodology of analyzing the public transportation systems used a comparison of transit supply and demand to help assist planners, citizens and MPO board members in identifying new or improved transit services in the MPO planning area. This data and any subsequent analysis is not intended to supplant the detailed studies and recommendations of the various transit operators for new and modified bus routes, stops and amenities, or the ongoing environmental analysis and engineering design for the Durham-Orange Light Rail Transit system. Rather, the purpose of this CTP deficiency analysis is to define more general and long-range transit themes.

The transit supply and demand information is provided in a series of introductions, tables and maps, as follows:

- ❖ The transit supply information, maps and tables are on pages 1-25, and 1-27 through 1-37;
- ❖ The transit demand information and maps (based on population and employment densities) are on pages 1-38 through 1-40; and
- ❖ The transit demand information and map (based on mean income) are on pages 1-41 and 1-43.

Public Transportation - Supply

The section shows the routes and frequency of current bus transit service in the MPO planning area. This includes service provided by:

- ❖ GoDurham (formerly Durham Area Transit Authority, or DATA);
- ❖ Chapel Hill Transit (CHT);
- ❖ GoTriangle (formerly Triangle Transit Authority, TT, or TTA);
- ❖ Orange Public Transit (OPT); and
- ❖ Duke University Transit.

There are MPO, and Durham and Chapel Hill inset maps for both peak and off-peak service. The frequency of service shows how many minutes transpire between the arrival of any transit bus along that particular roadway segment. Thus, if four buses that each cover a different route travel up that corridor at the same time every sixty minutes, the frequency is sixty minutes. The frequency is not 15 minutes, i.e., sixty minutes divided by four buses.

Table 4, which follows the maps, lists the routes for each transit provider and has detailed information on the type of service and frequency. Table 5 shows Peak-Hour Periods per Agency, Table 5a lists Suggested Headways from a Rhode Island Public Transit Authority (RIPTA) Study, and Table 5b provides Frequency Conversion values. The use of the RIPTA study table is described in more detail in the Public Transportation – Demand (Density) section.

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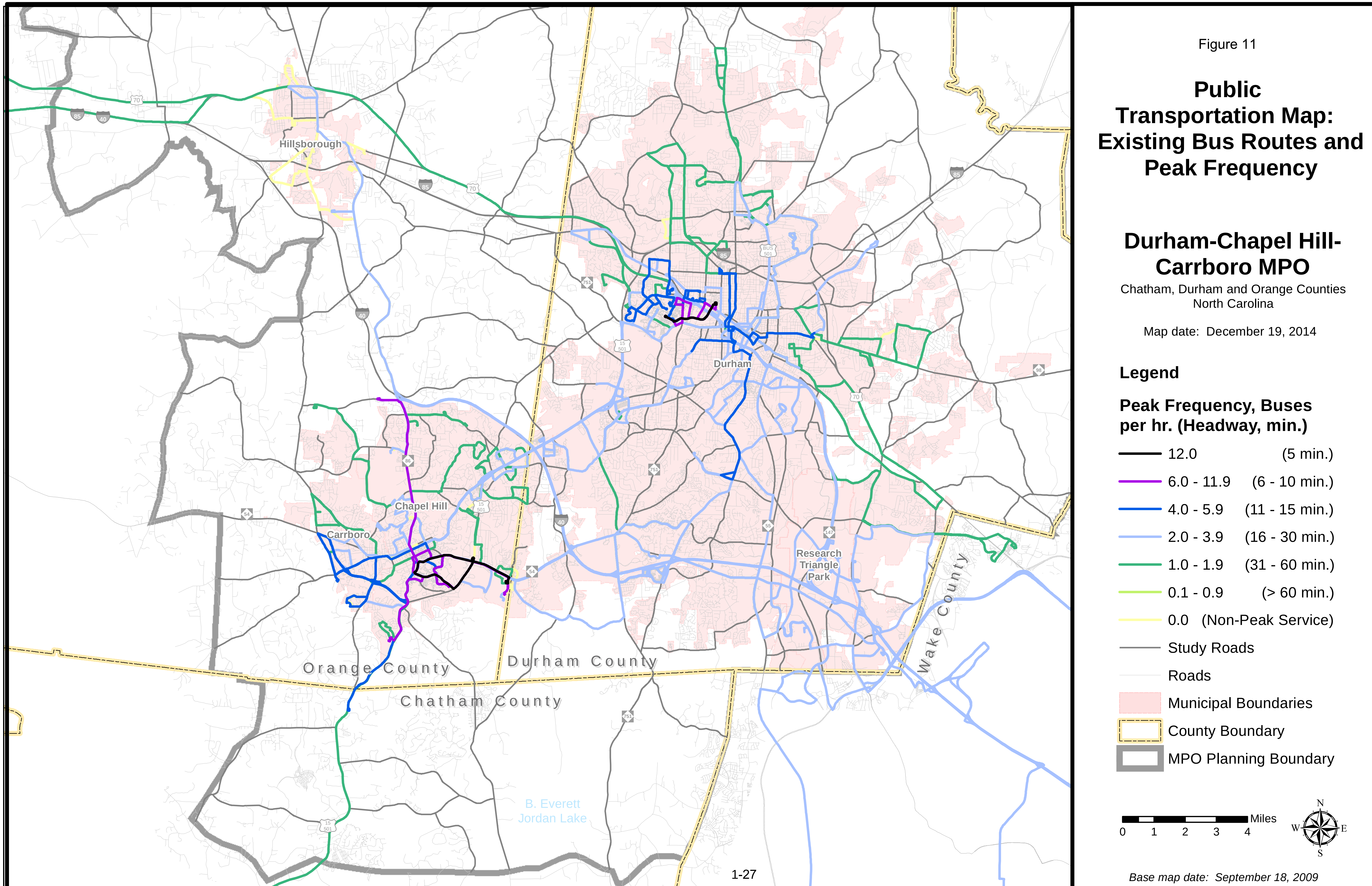
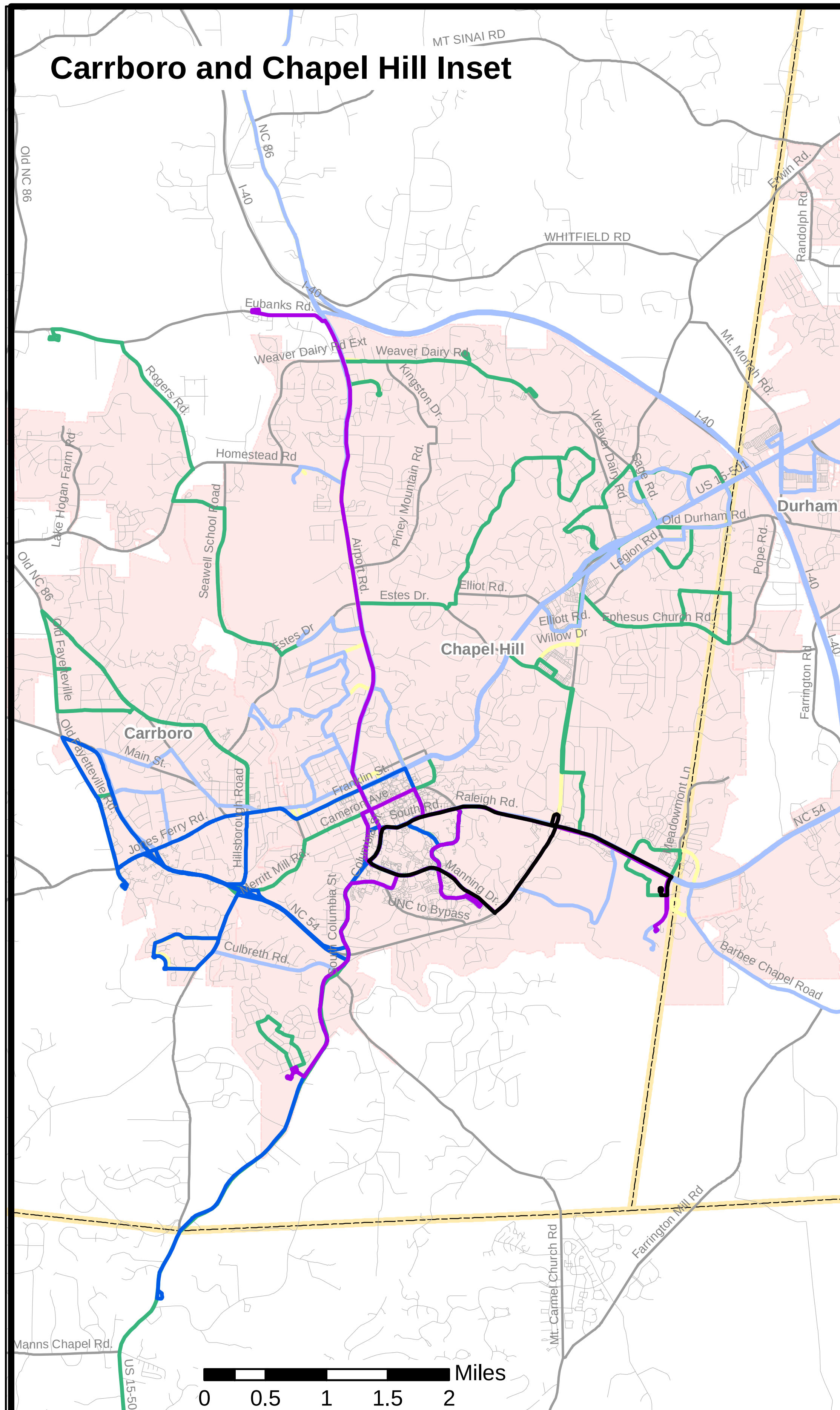


Figure 11
Public Transportation Map: Existing Bus Routes and Peak Frequency
Durham-Chapel Hill-Carrboro MPO
Chatham, Durham and Orange Counties
North Carolina
Map date: December 19, 2014
Legend
Peak Frequency, Buses per hr. (Headway, min.)
12.0 (5 min.)
6.0 - 11.9 (6 - 10 min.)
4.0 - 5.9 (11 - 15 min.)
2.0 - 3.9 (16 - 30 min.)
1.0 - 1.9 (31 - 60 min.)
0.1 - 0.9 (> 60 min.)
0.0 (Non-Peak Service)
Study Roads
Roads
Municipal Boundaries
County Boundary
MPO Planning Boundary
Miles
0 1 2 3 4
N
W
E
S
Base map date: September 18, 2009
Hillsborough
Durham
Chapel Hill
Carrboro
Research Triangle Park
Orange County
Durham County
Chatham County
Wake County
B. Everett Jordan Lake

Back of Figure



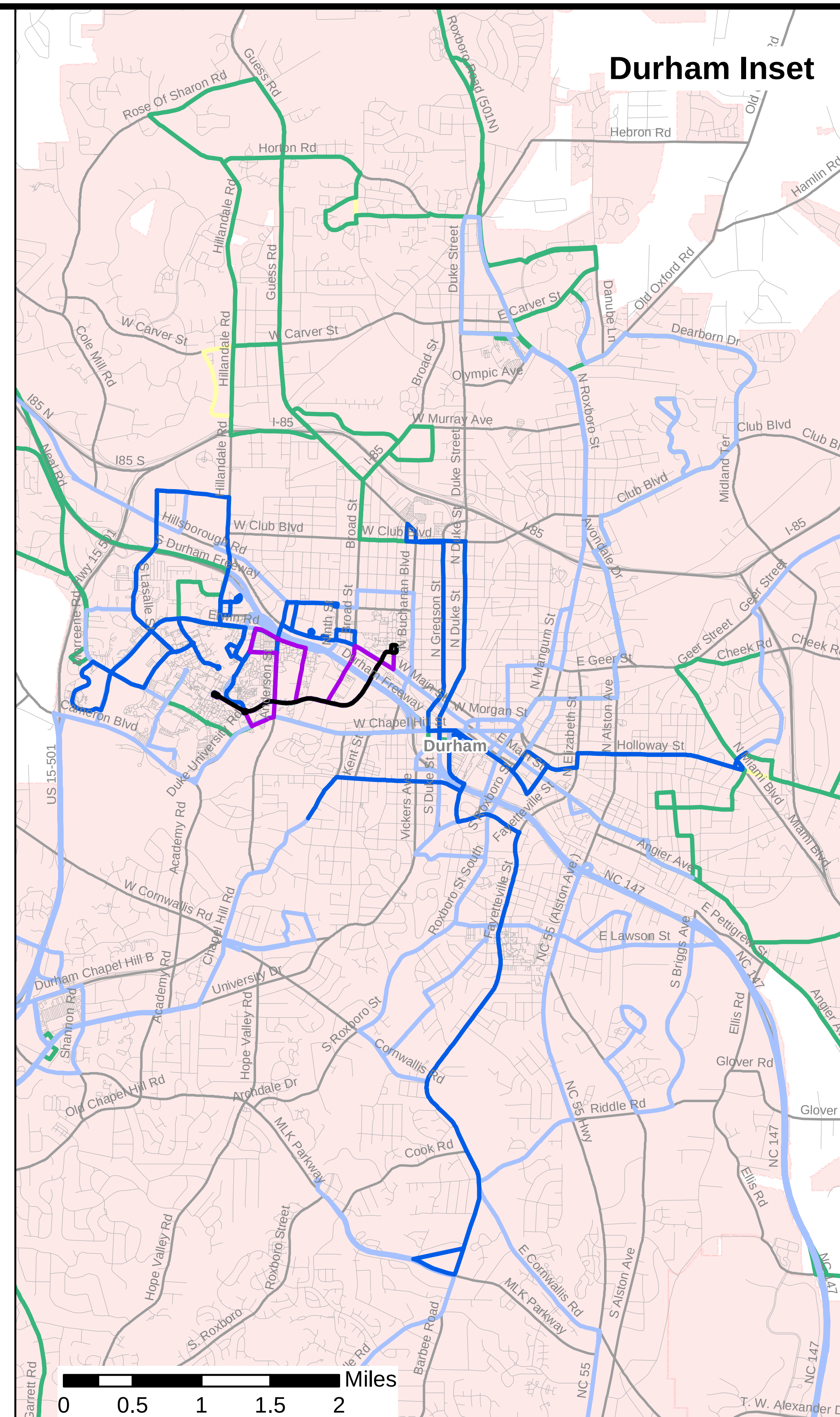


Figure 12

Public Transportation Map: Existing Bus Routes and Peak Frequency

(Insets)

Durham-Chapel Hill-Carrboro MPO

Chatham, Durham and Orange Counties
North Carolina

Map date: December 19, 2014

Legend

Peak Frequency, Buses per hr. (Headway, min.)

- 12.0 (5 min.)
- 6.0 - 11.9 (6 - 10 min.)
- 4.0 - 5.9 (11 - 15 min.)
- 2.0 - 3.9 (16 - 30 min.)
- 1.0 - 1.9 (31 - 60 min.)
- 0.1 - 0.9 (> 60 min.)
- 0.0 (Non-Peak Service)
- Study Roads
- Roads
- Municipal Boundaries
- County Boundary
- MPO Planning Boundary

N W E S

Base map date: September 18, 2009

Back of Figure

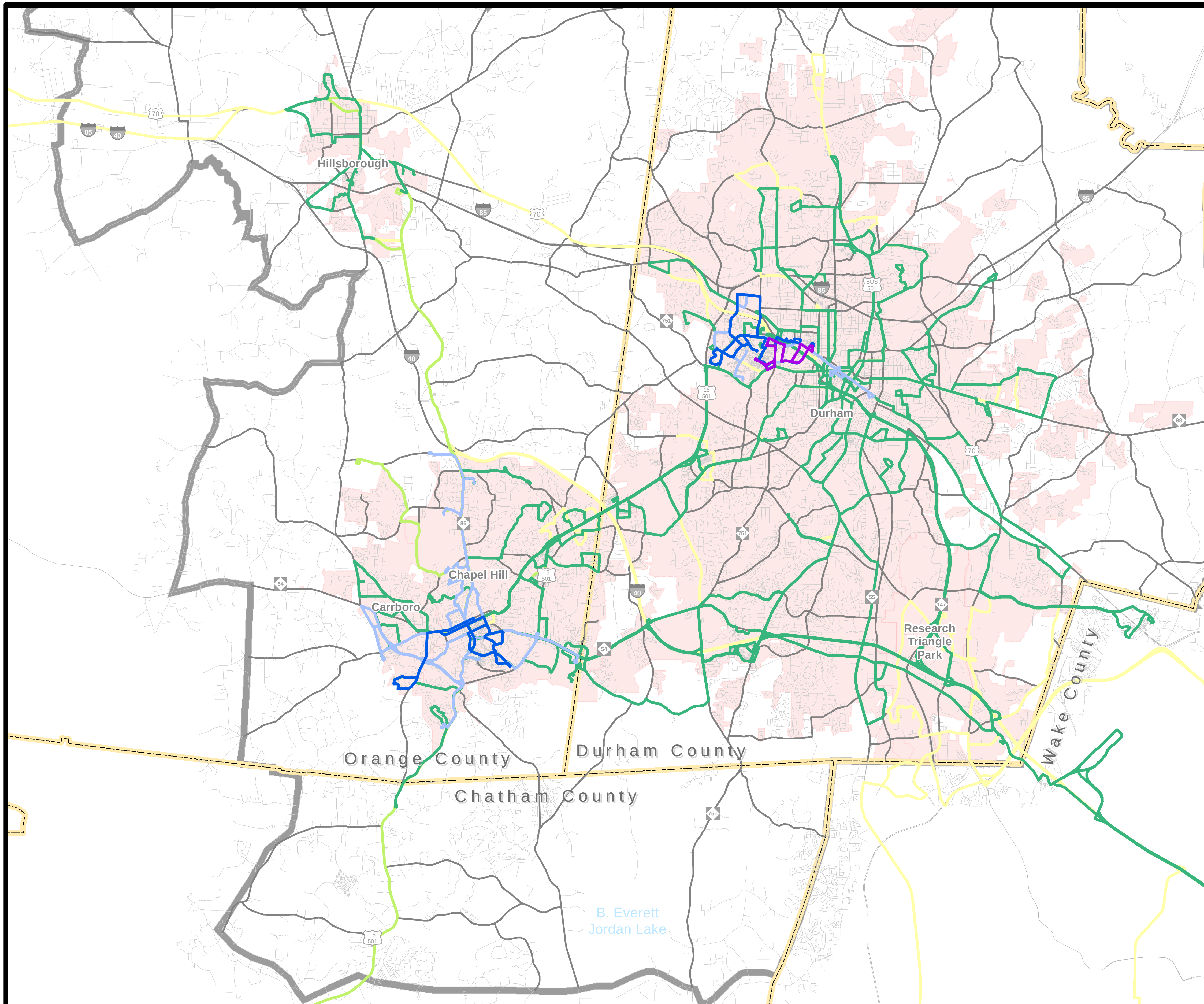
Figure 13

Public Transportation Map: Existing Bus Routes and Off-Peak Frequency

Durham-Chapel Hill-Carrboro MPO

Chatham, Durham and Orange Counties
North Carolina

Map date: December 19, 2014



Legend

Off-Peak Frequency, Buses per hr. (Headway, min.)

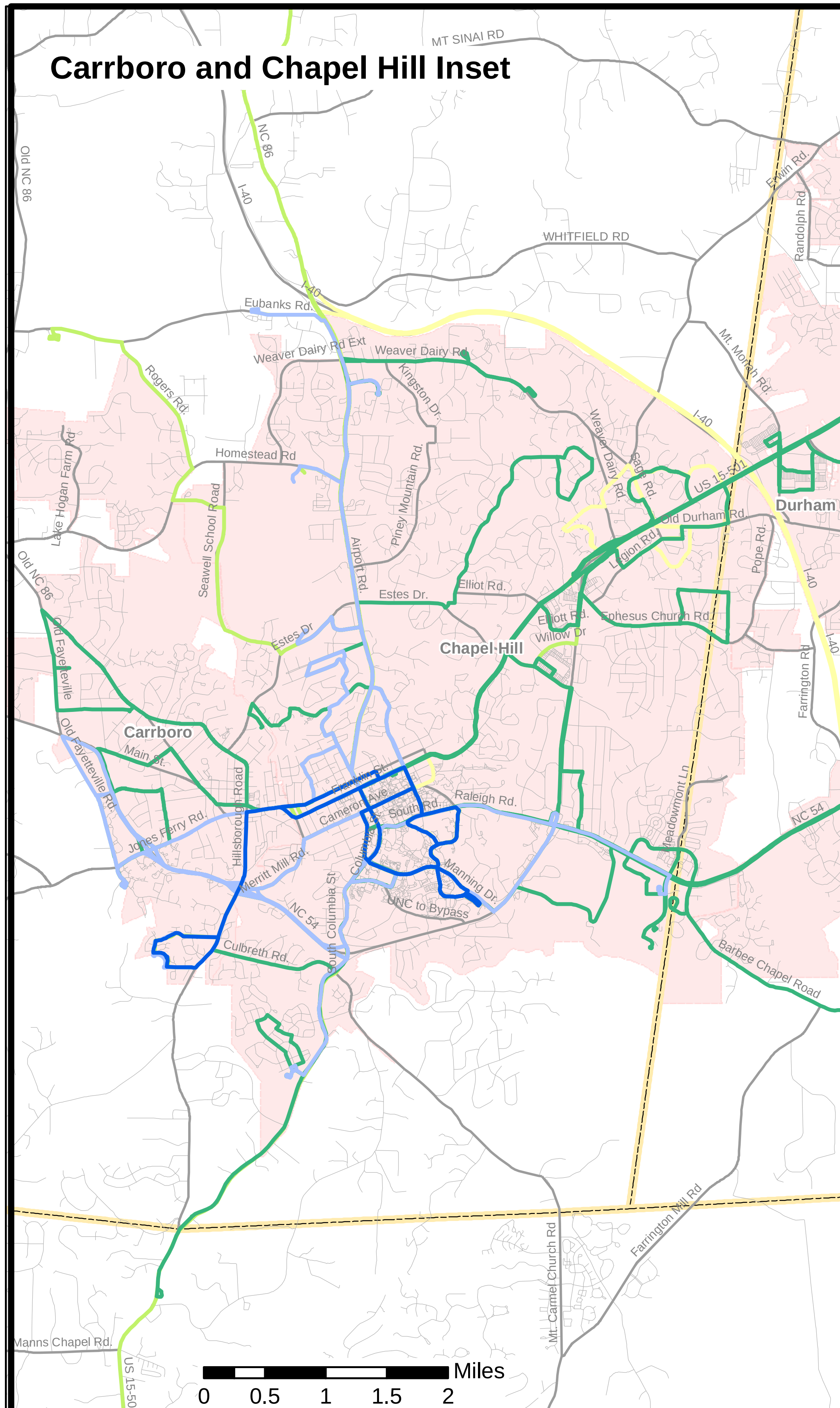
- 12.0 (5 min.)
- 6.0 - 11.9 (6 - 10 min.)
- 4.0 - 5.9 (11 - 15 min.)
- 2.0 - 3.9 (16 - 30 min.)
- 1.0 - 1.9 (31 - 60 min.)
- 0.1 - 0.9 (> 60 min.)
- 0.0 (Peak-Only Service)
- Study Roads
- Roads
- Municipal Boundaries
- County Boundary
- MPO Planning Boundary

Miles: 0 1 2 3 4

N S E W

Base map date: September 18, 2009

Back of Figure



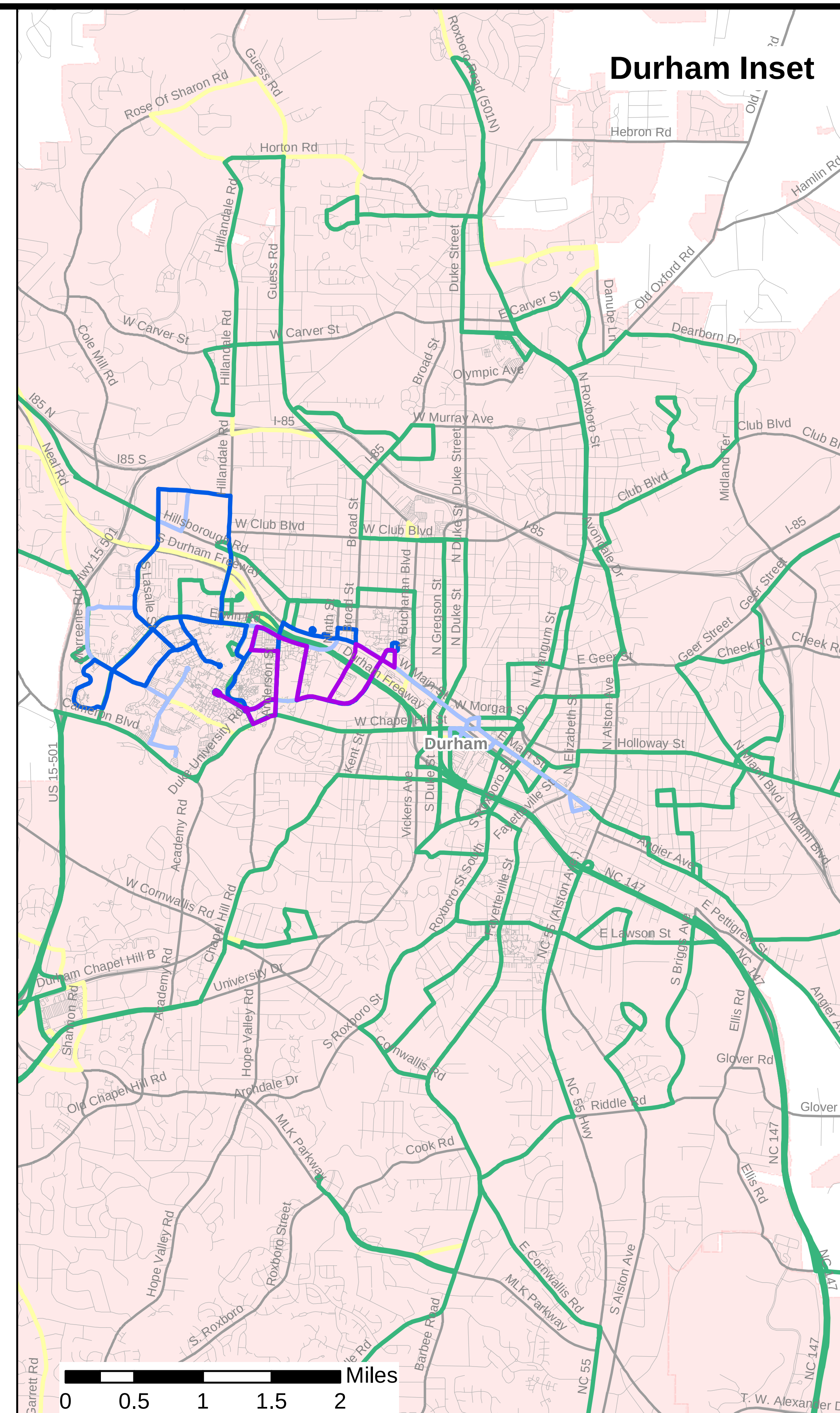


Figure 14

Public Transportation Map: Existing Bus Routes and Off-Peak Frequency

(Insets)

Durham-Chapel Hill-Carrboro MPO

Chatham, Durham and Orange Counties
North Carolina

Map date: December 19, 2014

Legend

Off-Peak Frequency, Buses per hr. (Headway, min.)

- 12.0 (5 min.)
- 6.0 - 11.9 (6 - 10 min.)
- 4.0 - 5.9 (11 - 15 min.)
- 2.0 - 3.9 (16 - 30 min.)
- 1.0 - 1.9 (31 - 60 min.)
- 0.1 - 0.9 (> 60 min.)
- 0.0 (Peak-Only Service)
- Study Roads
- Roads
- Municipal Boundaries
- County Boundary
- MPO Planning Boundary

N W E S

Base map date: September 18, 2009

Back of Figure

Existing Bus Route Frequency within DCHC MPO

Table 4

					Frequency (Buses/Hr.)		Frequency (Min./Bus)	
Agency	**Route**	**Route Segment**	**Service Type**	**Peak Period**	**Peak2**	**Off-Peak**	**Peak3**	**Off-Peak4**
OPT	H Circ	--	Weekday, Circulator	Off-Peak	0	1	0	60
OPT	420	--	Weekday, Midday	Off-Peak	0	0.333	0	180
Duke	C-1	--	Weekday, Saturday	Peak and Off-Peak	12	3	5	20
Duke	C-1X	--	Weekday, Express	Peak	6	0	10	0
Duke	C-1/Smith (CSW)	--	Weekday	Peak	3	0	20	0
Duke	C-2	--	Weekday, Weekend	Peak and Off-Peak	6	6	10	10
Duke	C-3	--	Weekday	Peak	1.500	0	40	0
Duke	CCX	--	Weekday, Weekend, Express	Off-Peak	0	4	0	15
Duke	H-2	--	Weekday	Peak and Off-Peak	5	1.667	12	36
Duke	H-5	--	Weekday	Peak and Off-Peak	4	4	15	15
Duke	H-6	--	Weekday	Peak and Off-Peak	5	5	12	12
Duke	LL	--	Weekday	Peak and Off-Peak	2	2	30	30
Duke	PR-1	--	Weekday	Peak and Off-Peak	2.069	2.500	29	24
CHT	A	--	Weekday	Peak and Off-Peak	2	2	30	30
CHT	CCX	--	Weekday, Express	Peak and Off-Peak	4	1.500	15	40
CHT	CL	--	Weekday	Peak	1	0	60	0
CHT	CM	--	Weekday	Peak and Off-Peak	1.200	1.200	50	50
CHT	CPX	--	Weekday, Express	Peak	4	0	15	0
CHT	CW	--	Weekday	Peak and Off-Peak	2	1	30	60
CHT	D	--	Weekday	Peak and Off-Peak	3	1.333	20	45
CHT	DX	--	Weekday, Express	Peak	1.333	0	45	0
CHT	F	--	Weekday	Peak and Off-Peak	1.429	1	42	60
CHT	FCX	--	Weekday, Express	Peak and Off-Peak	12	2	5	30
CHT	G	--	Weekday	Peak and Off-Peak	1.200	1.200	50	50
CHT	HS	--	Weekday	Peak and Off-Peak	1.200	0.500	50	120
CHT	HU (Express)	--	Weekday, Express	Peak and Off-Peak	3.333	1.500	18	40
CHT	J	--	Weekday	Peak and Off-Peak	4	3	15	20
CHT	JFX	--	Weekday, Express	Peak and Off-Peak	4	2	15	30
CHT	N	--	Weekday	Peak and Off-Peak	2	1	30	60
CHT	NS	--	Weekday	Peak and Off-Peak	6	3	10	20
CHT	NU	--	Weekday	Peak and Off-Peak	3	2.400	20	25
CHT	PX (part by Chatham Transit)	--	Weekday, Express	Peak	1.395	0.286	43	210
CHT	S	--	Weekday	Peak and Off-Peak	6	1.714	10	35
CHT	T	--	Weekday	Peak and Off-Peak	1.714	1.714	35	35
CHT	U	--	Weekday, Campus Shuttle	Peak and Off-Peak	4	4	15	15
CHT	RU	--	Weekday, Campus Shuttle	Peak and Off-Peak	6	4	10	15
CHT	V	--	Weekday	Peak and Off-Peak	1.538	1.333	39	45
CHT	CM (Saturday)	--	Saturday	Off-Peak	0	2	0	30
CHT	CW (Saturday)	--	Saturday	Off-Peak	0	1	0	60
CHT	D (Saturday) (DM)	--	Saturday	Off-Peak	0	0.923	0	65
CHT	FG (Saturday)	--	Saturday	Off-Peak	0	0.750	0	80
CHT	JN (Saturday)	--	Saturday	Off-Peak	0	0.800	0	75
CHT	NU (Weekend)	--	Weekend	Off-Peak	0	1.333	0	45
CHT	U (Weekend)	--	Weekend	Off-Peak	0	2.400	0	25
CHT	T (Saturday)	--	Saturday	Off-Peak	0	1	0	60
CHT	J (Safe Ride)	--	Thu-Sat, Safe Ride	Off-Peak	0	4	0	15
CHT	G (Safe Ride)	--	Thu-Sat, Safe Ride	Off-Peak	0	1	0	60
CHT	T (Safe Ride)	--	Thu-Sat, Safe Ride	Off-Peak	0	2	0	30
TT	CRX	--	Weekday, Express	Peak	2.400	0	25	0
TT	DRX	--	Weekday, Express	Peak	2	0	30	0
TT	ODX	--	Weekday, Express	Peak	1	0	60	0
TT	ODX (ext2015)	--	Weekday, Express	Peak	1	0	60	0
TT	100	--	Weekday, Weekend, Regional	Peak and Off-Peak	2	1	30	60
TT	105	--	Weekday, Regional	Peak	2	0	30	0
TT	201	--	Weekday, Regional	Peak	2	0	30	0
TT	301	--	Weekday, Regional	Peak	2	0	30	0
TT	311	--	Weekday, Regional	Peak	2	0	30	0

For further information and updates on existing public transportation routes, refer to the local transit agencies.

Existing Bus Route Frequency within DCHC MPO

					Frequency (Buses/Hr.)		Frequency (Min./Bus)	
Agency	**Route**	**Route Segment**	**Service Type**	**Peak Period**	**Peak2**	**Off-Peak**	**Peak3**	**Off-Peak4**
TT	400	--	Weekday, Weekend, Regional	Peak and Off-Peak	2	1	30	60
TT	405	--	Weekday, Regional	Peak	2	0	30	0
TT	420	--	Weekday, Regional	Peak	2	0	30	0
TT	700	--	Weekday, Weekend, Regional	Peak and Off-Peak	2	1	30	60
TT	800	--	Weekday, Weekend, Regional	Peak and Off-Peak	2	1	30	60
TT	805	--	Weekday, Regional	Peak and Off-Peak	2	1	30	60
TT	42	--	Weekday, Shuttle	Peak	2	0	30	0
TT	46	--	Weekday, Shuttle	Peak	2	0	30	0
TT	47	--	Weekday, Shuttle	Peak	2	0	30	0
TT	49	--	Weekday, Shuttle	Peak	2	0	30	0
DATA	1-1A-1B-1N	1A	Mon-Sat	Peak	1	0	60	0
DATA	1-1A-1B-1N	1B	Mon-Sat	Peak	1	0	60	0
DATA	1-1A-1B-1N	1N	Mon-Sat	Peak	2	0	30	0
DATA	1-1A-1B-1N	1A & 1B & 1N*	Mon-Sat	Peak	4*	0	15*	0
DATA	1-1A-1B-1N	1	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	2-2A-2B	2A	Mon-Sat	Peak	1	0	60	0
DATA	2-2A-2B	2B	Mon-Sat, Sunday	Peak and Off-Peak	1	1	60	60
DATA	2-2A-2B	2A & 2B*	Mon-Sat	Peak	2*	0	30*	0
DATA	2-2A-2B	2	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	4	--	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	5-5K-14	5	Mon-Sat	Peak and Off-Peak	2	1	30	60
DATA	5-5K-14	5K	Mon-Sat	Peak	2	0	30	0
DATA	5-5K-14	5 & 5K*	Mon-Sat	Peak	4*	0	15*	0
DATA	5-5K-14	14	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	6-6B	6	Mon-Sat, Sunday	Peak and Off-Peak	1	1	60	60
DATA	6-6B	6B	Mon-Sat	Peak	1	0	60	0
DATA	6-6B	6 & 6B*	Mon-Sat	Peak	2*	0	30*	0
DATA	7	--	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	8	--	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	9-9A-9B	9A	Mon-Sat	Peak	1	0	60	0
DATA	9-9A-9B	9B	Mon-Sat	Peak	1	0	60	0
DATA	9-9A-9B	9A & 9B*	Mon-Sat	Peak	2*	0	30*	0
DATA	9-9A-9B	9	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	10-10A-10B-10L	10A	Mon-Sat	Peak	2	0	30	0
DATA	10-10A-10B-10L	10B	Mon-Sat	Peak	2	0	30	0
DATA	10-10A-10B-10L	10A & 10B*	Mon-Sat	Peak	4*	0	15*	0
DATA	10-10A-10B-10L	10	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	10-10A-10B-10L	10L	Weekday (school days only)	Peak	1.622	0	37	0
DATA	11	--	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	12-14	12	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	12-14	14	Mon-Sat	Peak	1	0	60	0
DATA	15	--	Mon-Sat, Sunday	Peak and Off-Peak	1	1	60	60
DATA	16-16A-16B-3	16A	Mon-Sat	Peak	1	0	60	0
DATA	16-16A-16B-3	3	Mon-Sat, Sunday	Peak and Off-Peak	2	1	30	60
DATA	16-16A-16B-3	16B	Mon-Sat	Peak	1	0	60	0
DATA	16-16A-16B-3	16A & 16B & 3*	Mon-Sat	Peak	4*	0	15*	0
DATA	16-16A-16B-3	16	Mon-Sat, Sunday	Off-Peak	0	1	0	60
DATA	BCC	--	Mon-Sat	Peak and Off-Peak	3	2.400	20	25
DATA	RSX	--	Weekday, Weekend, Express	Peak and Off-Peak	2	1	30	60

* Some Route Segments align to increase frequency for a few stops along that Route during the Peak hours.

NOTES:
When the route frequency is entirely irregular, the average within the peak period is used.
When the route frequency is inconsistent, the most prevalent or consistent frequency within the peak period is used.
If the service is primarily in the Peak periods with only an hour in the Off-Peak, the route is considered "Peak ONLY."
If the service is primarily in the Off-Peak periods with only an hour in the Peak periods, the route is considered "Off-Peak ONLY."

Peak-Hour Periods per Agency

Table 5

Agency	Route	AM Peak Hours	Off-Peak Hours	PM Peak Hours	Days
OPT	H Circ	n/a	Off Peak ONLY	n/a	Mon-Fri
OPT	420 Midday	n/a	Off Peak ONLY	n/a	Mon-Fri
Duke	C Routes	8am-6pm	n/a	8am-6pm	Mon-Fri
Duke	C Routes	n/a	Off Peak ONLY	n/a	Sat-Sun
Duke	H Routes	6am-9am	9am-3pm	3pm-6pm	Mon-Fri
Duke	LL Route	8:30am-10:30am	10:30am-4pm	4pm-6pm	Mon-Fri
Duke	PR1 Route	7:30am-10:30am	10:30am-3:30pm	3:30pm-6:30pm	Mon-Fri
CHT	all	7am-10am	10am-3pm	3pm-7pm	Mon-Fri
CHT	all	n/a	Off Peak ONLY	n/a	Sat-Sun
DATA	all	5am-6:30pm	6:31pm-midnight	5am-6:30pm	Mon-Sat
DATA	all	n/a	Off Peak ONLY	n/a	Sun
TT	all	5am-9am	9:01am-3:29pm	3:30pm-6:29pm	Mon-Fri
TT	all	n/a	Off Peak ONLY	n/a	Sat-Sun

Table 5a

Suggested Headways from a Rhode Island Public Transit Authority Study:

POPULATION AND EMPLOYMENT DATA RELATED TO TRANSIT DEMAND

Transit Mode/ Service Frequencies	Population/ Acre	Jobs/ Acre
Flex Bus	0.5	
Community Circulator	2	
Local Bus		
60 minutes	8-16	4-8
30 minutes	16-31	8-16
15 minutes	31-47	16-24
10 minutes	47-92	24-48
<=5 minutes	>92	>48
Bus Rapid Transit	26-52	>13
Light Rail Transit	31-78	>15

Source: Rhode Island Public Transit Authority, *Comprehensive Operational Analysis, Rhode Island Transit Market Review* (Draft Version 6, July 2012)

Frequency Conversion

Table 5b

hrs/bus	minutes/ bus	buses/hr
0.083	5	12.000
0.167	10	6.000
0.200	12	5.000
0.250	15	4.000
0.300	18	3.333
0.333	20	3.000
0.400	24	2.500
0.417	25	2.400
0.483	29	2.069
0.500	30	2.000
0.583	35	1.714
0.600	36	1.667
0.617	37	1.622
0.650	39	1.538
0.667	40	1.500
0.700	42	1.429
0.717	43	1.395
0.750	45	1.333
0.833	50	1.200
0.917	55	1.091
1.000	60	1.000
1.083	65	0.923
1.250	75	0.800
1.333	80	0.750
1.500	90	0.667
2.000	120	0.500
2.500	150	0.400
3.000	180	0.333
3.500	210	0.286

For further information and updates on existing public transportation routes, refer to the local transit agencies.

Public Transportation – Demand (Density)

Transit demand depicts where there is a need for public transportation services. The CTP used two demand methods; one based on population and employment density and the other based on resident income.

The first set of transit demand maps show the total population and jobs per acre thresholds by Traffic Analysis Zone (TAZ) in the year 2040. In the first map, CTP (Bus Transit Demand) the different thresholds suggest the level of fixed-route bus service for a TAZ's density, which is calculated by adding the total population and the doubling of the employment. Thus, a density from one to eight commonly uses some type of circulator or demand-responsive transit, while a fixed-route service with 30-minute headways is suggested for areas with a density from 31 to 47.

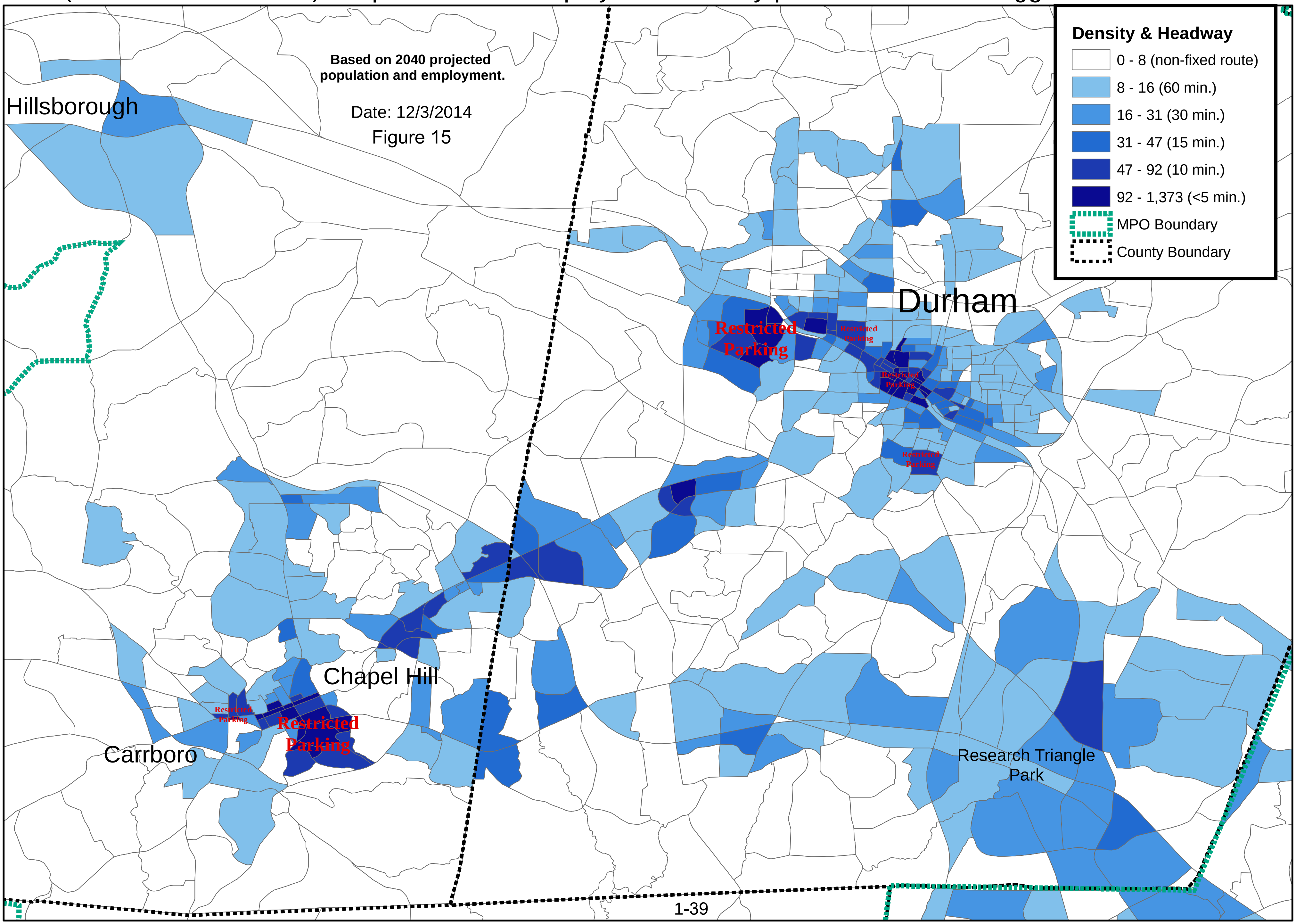
In the second map, CTP (Fixed-Guideway Transit Demand), the different thresholds suggests bus rapid transit or light rail transit service based on the TAZ's density, using the same methodology as described above to calculate the density.

The population and employment data provide a rough guide in estimating trip generation (residential location) and trip attraction (job location). However, the reviewer must keep in mind that it does not show high volume travel corridors such as NC 54 and US 15-501 between Durham and Chapel Hill, and I-40, NC 147 and US 70 between Durham, the Research Triangle Park (RTP) and Raleigh.

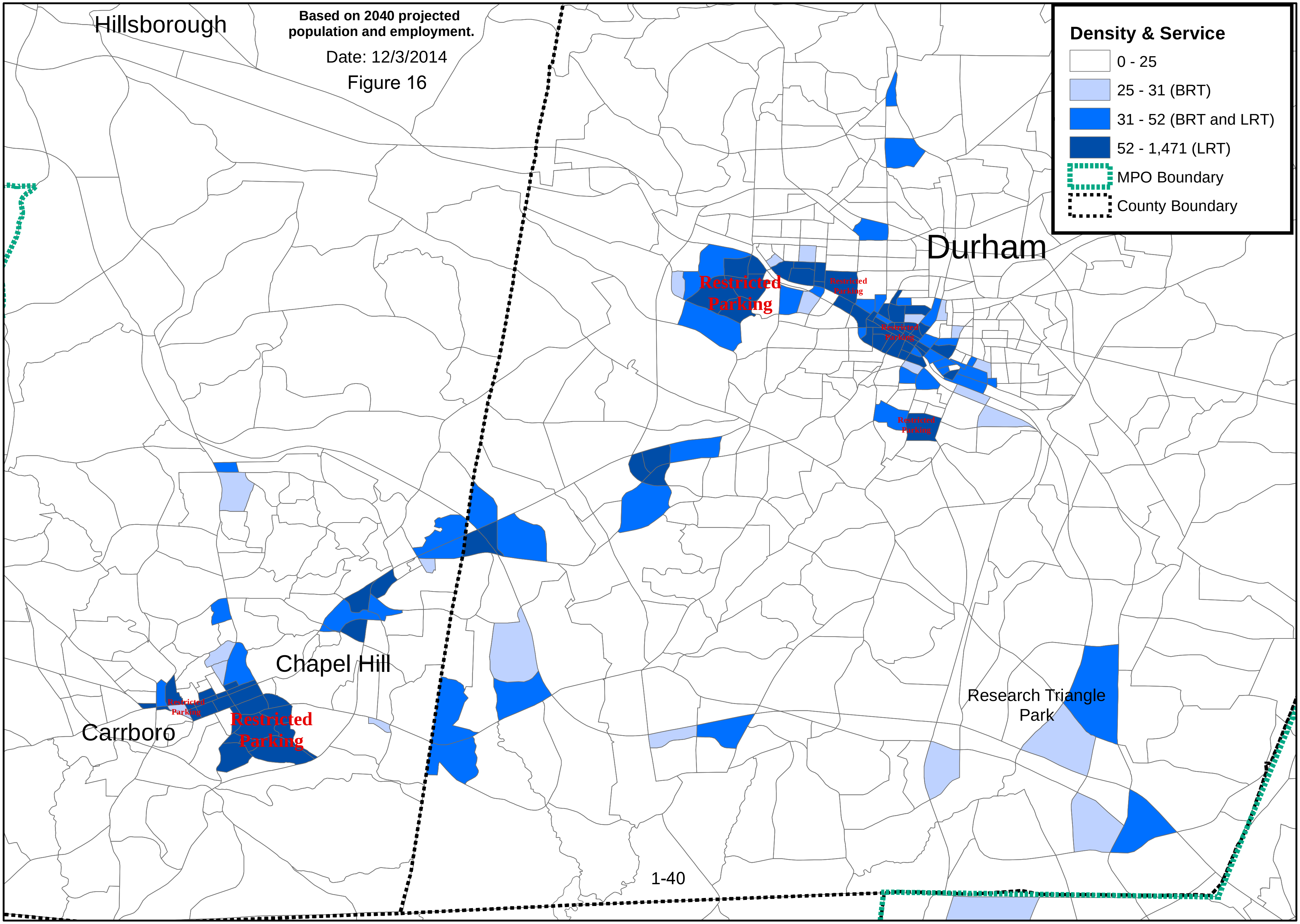
The maps also show areas of restricted parking in which automobile travelers have to either pay for parking or parking supply is limited in relationship to parking demand. You can assume that transit demand is likely to be higher at these areas given that driving an automobile has increased costs (i.e., parking) or is simply not feasible.

This methodology and the suggested headways are from a Rhode Island Public Transit Authority (RIPTA) study. Table 5a on the previous page is from the RIPTA study. The CTP team used the Rhode Island study because of the simplicity of the methodology and not because these thresholds are some type of commonly accepted transit metrics. The study assumed a density because it is a common factor driving transit demand. As an example, a recent transit study connected with Wake County, NC showed that density was the most important single factor in transit demand, at 37%, followed by zero vehicle housing units at 22%. The study, by HDR Engineering, was called "Using Census Data to Identify Areas of High-Transit Propensity."

CTP (Bus Transit Demand): Population and Employment Density per Acre -- and -- Suggested Transit Service



CTP (Fixed-Guideway Transit Demand): Pop. and Emp. Density per Acre - and - Suggested Fixed-Guideway Service



Public Transportation – Demand (Income)

The final transit demand map uses income by showing the low-income TAZs. It compares the TAZ's mean income (based on the Census Bureau's American Community Survey – ACS) and different thresholds for the median income (based on Housing and Urban Development income limits for a four-person household in the Durham-Chapel Hill Metropolitan Area). As the percentage of the mean income declines, it is assumed that transit demand increases given the assumed lower levels of vehicle ownership.

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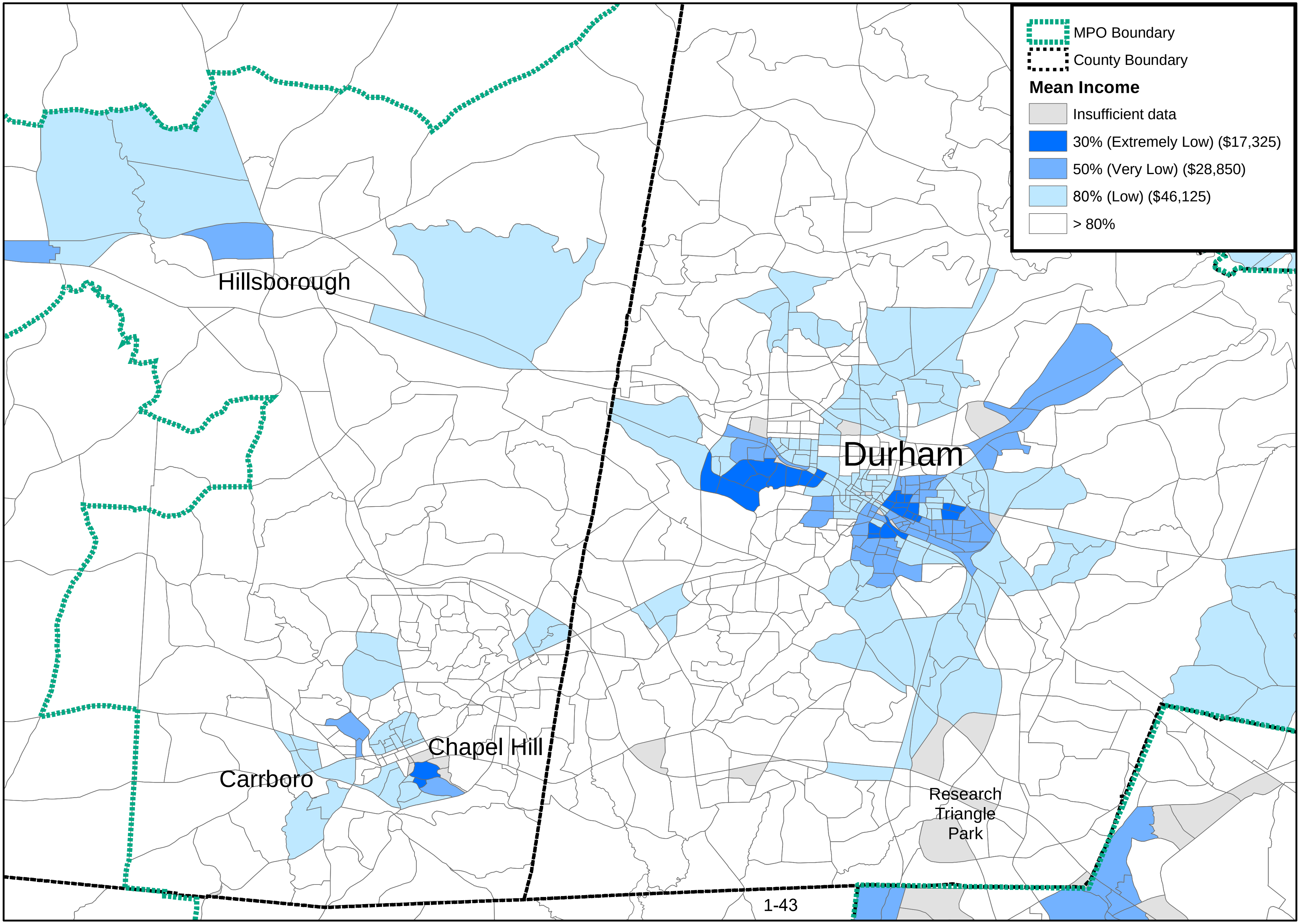
Date: 12/4/2014

CTP Transit: TAZ Mean Income as Percentage of Regional Median Income

Figure 17



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ii. Rail and Truck

The tables and maps in this section show the level and type of activity on the rail lines:

- The level and type of rail line activity is on page 1-46, and
- A data table for active and inactive rail lines is on page 1-47.

The following NCDOT Web page has detailed information on the current designation of highway truck routes and the various truck route restrictions: https://tinyurl.com/NCDOTtrucking.

The following ArcGIS site has an interactive map of the North Carolina truck route designations and state maintained roads: https://tinyurl.com/NCDOTtruckmap.

Freight and urban goods management is identified as an area of key planning consideration for Metropolitan Planning Organizations (MPOs) by federal transportation legislation. The DCHC MPO, the Capital Area MPO, and the NCDOT are jointly developing a Regional Freight Plan for the Triangle region that is to include a priority investment network. The Freight Plan can provide input for this CTP either by a CTP amendment or during the next CTP update. Meanwhile, the DCHC MPO web site can direct users to the completed Freight Plan.

Comprehensive Transportation Plan Rail Data

CTP Name: Durham-Chapel Hill-Carrboro MPO **Date: 8/20/2014**

County: Durham, Orange, Chatham **NCDOT Division #: 5, 7 & 8**

NCDOT Rail Division, 919-707-4714

Name of Railroad(s) operator located within study area, e.g.: (CSX, NS, NCRR, Shortlines): See Table 6

Current number of freight trains operation within study area: 5-6 per day

Current number of passenger trains operation within study area: 6 per day

Is area part of the Federally-designated Southeastern High Speed Rail Corridor?
Yes ☒ No ☐

Is area part of a future intra-state passenger rail corridor, e.g.: (Salisbury-Asheville, Charlotte-Wilmington, Raleigh/Fayetteville/Wilmington or Raleigh/Goldsboro/Wilmington)? Yes ☐ No ☒

Is area part of a future commuter rail corridor, e.g.: (TT, Charlotte, Winston-Salem/Greensboro)? Triangle Transit Yes ☒ No ☐

Are there any abandoned/out-of-service rail corridors? Duke Beltline Yes ☒ No ☐

Existing or proposed Rails-to-Trails projects: American Tobacco Trail
Existing Trail ☒ Proposed Trail ☐

Railroad Right-of-Way (ROW) width in feet: approx. 200’ on NCRR corridor, others Unk

NC GIS Rail maps on GO!NC portal ==> **http://ncdot.maps.arcgis.com/home/index.html**

Active/Inactive Rail Corridor Data

Table 6

Railroad Line/Corridor Durham/Chapel Hill MPO	Active/Inactive	Freight/Passenger	Total Length	From-To	R/W Width	Railroad Class	Timetable Speed	Service Frequency through Study Area	Additional Notes
NS-operator (NCRR H-line)	Active	Freight & Passenger	33.5	Wake/Durham line to Orange/Alamance line MP H65.5-H32	approx 200'	Class 1	40-55 mph	5-6 trains per day	STRACNET corridor
NS	Active	Freight	2.5	Oxford-East Durham MP D53.15-D86.4	Unknown	Class 1	25-35 mph		Branch line
NS-operator State University Railroad (SUR)	Active	Freight	10.2	Glenn to Carrboro MP H46-J10	Unknown	short line	10 mph		Branch line
NS (Duke Beltline)	Inactive		2	Blackwell St to Avondale Dr in downtown Durham	Unknown		N/A	none	Inactive
NS (Timberlake corridor)	Inactive		23	downtown Durham paralleling NC 501 to Durham/Person line	Unknown		N/A	none	Inactive
CSX (Joyland Lead)	Active	Freight	4	W Chapel Hill St to Joyland MP SB151.0-SB154.9	Unknown	Class 1	10 mph		
CSX (D&S Spur)	Active	Freight	8	Genlee to East Durham NS Crossing MP SDS10.7-SDS2.3	Unknown	Class 1	10 mph		

c) Bicycles, Pedestrians and Complete Streets

Bicycle and Pedestrian Demand

Early in the CTP planning process, a deficiency analysis was completed that included the demand for bicycle and pedestrian transportation. Figure 18 – Daily Trip Generation by TAZ -- is a map that shows the bicycle and pedestrian trips generated per square mile base on the projected 2040 SE Data (i.e., population and employment) and the Triangle Regional Model (TRM). It is assumed that the great majority of those trips will originate and end in the same TAZ or an adjacent TAZ. Thus, the greatest demand for bicycle and pedestrian facilities will be in the darkest shaded TAZs, i.e. those TAZs with the highest non-motorized trip generation.

Bicycle and Pedestrian Crashes

The deficiency analysis also identified eight intersections in the MPO area that potentially meet the safety warrant for bicycle and pedestrian travel. See Figure 19, Potentially Hazardous Intersections, and Table 7, Potentially Hazardous Crash Intersections. The warrant requires a minimum of five bicycle or pedestrian crashes reported in the last ten years and a minimum of 50% of all those crashes must have occurred in the last five years. The crash data is from the NCDOT Highway Safety Improvement Program (HSIP). The HSIP Web page on the following link provides more detailed information and maps, and descriptions of warrants and methodology: https://tinyurl.com/NCDOTsafety .

It must be noted that the local governments in the MPO area have already carried out in-depth planning processes and produced detailed plans for bicycle and pedestrian facilities. The high level maps in the CTP deficiency cannot replace those plans. The CTP deficiency analysis, however, can provide a general check on the coverage of those plans.

CTP and Local Plans

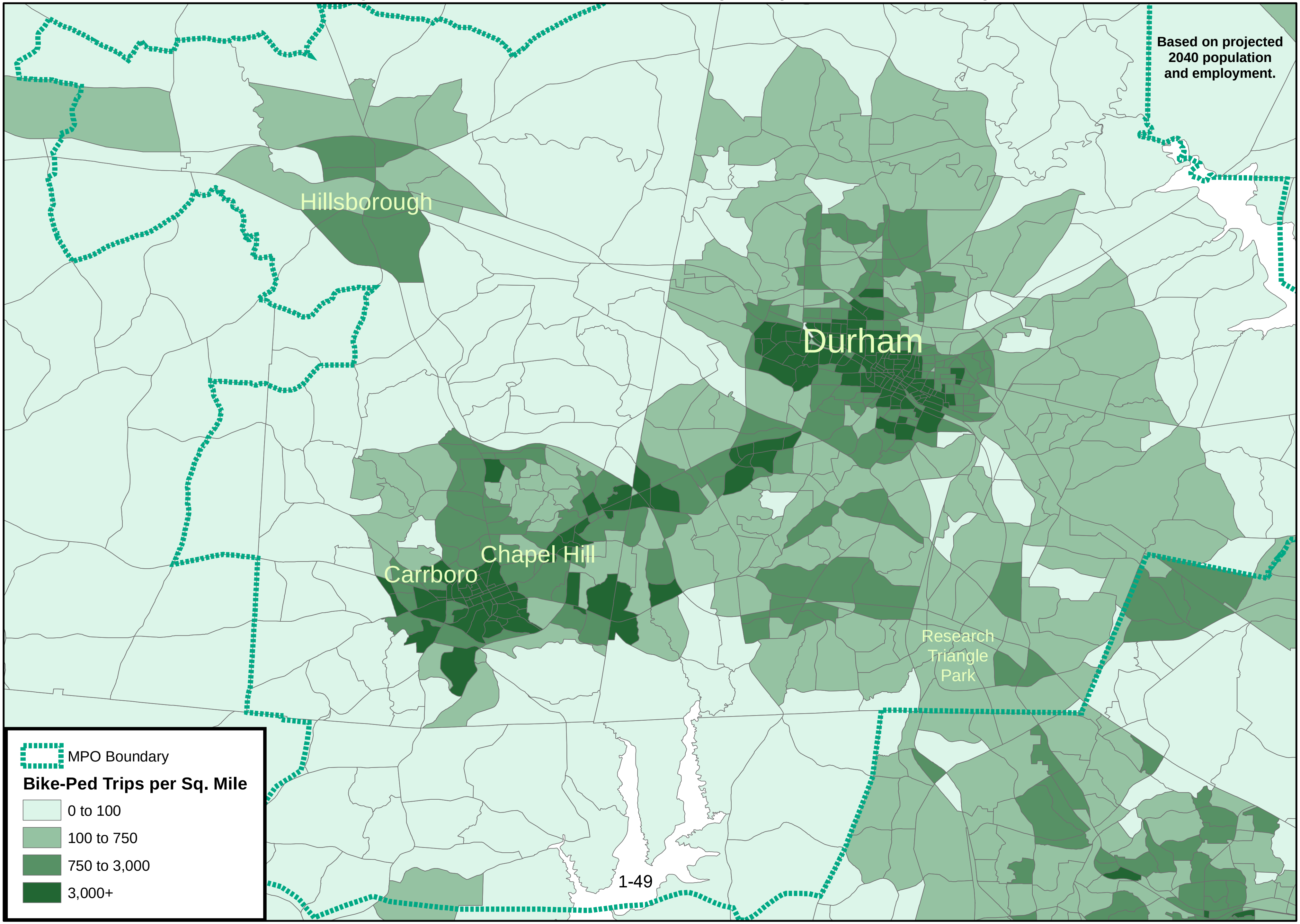
The CTP Bicycle and Pedestrian map, Sheets 4 and 5 of Figure 1, shows the bicycle, multi-use paths and off-road pedestrian paths. The local governments have developed detailed sidewalk plans. Sidewalks, or on-road pedestrian facilities, are not shown on the CTP maps and the reader is directed to the local plans to view these facilities. See Appendix I – Existing Transportation Plans and Policies – for a list of local bicycle, pedestrian and multi-use path plans that have been incorporated into the CTP, and links for those plans.

All recommendations for bicycle and pedestrian facilities were coordinated with the local governments. Refer to Appendix A for contact information for the Division of Bicycle and Pedestrian Transportation.

Date: 12/3/2014

CTP Bicycle and Pedestrian: Daily Trip Generation by TAZ

Figure 18

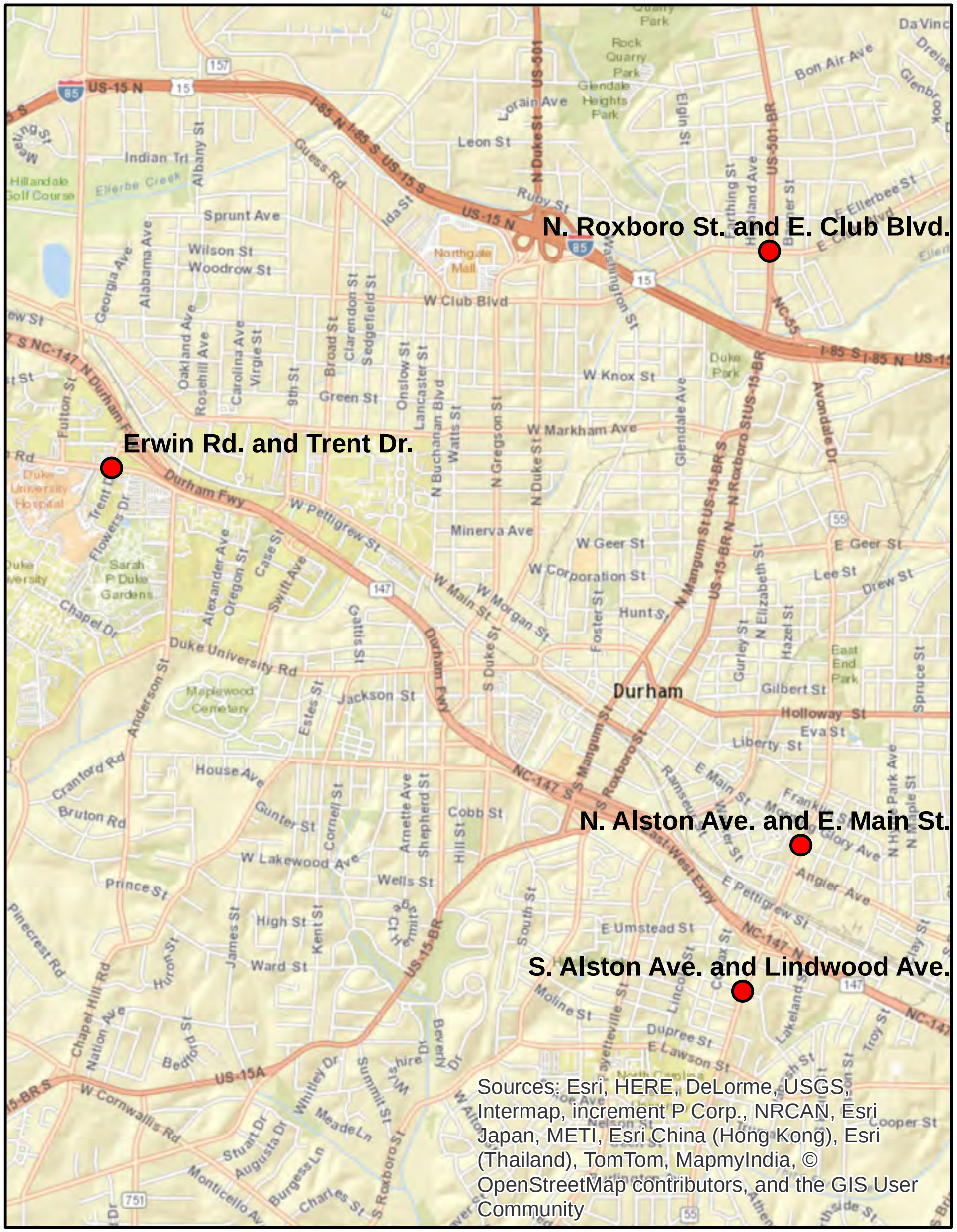


Date: 12/3/2014

CTP -- Bicycle and Pedestrian Potentially Hazardous Intersections

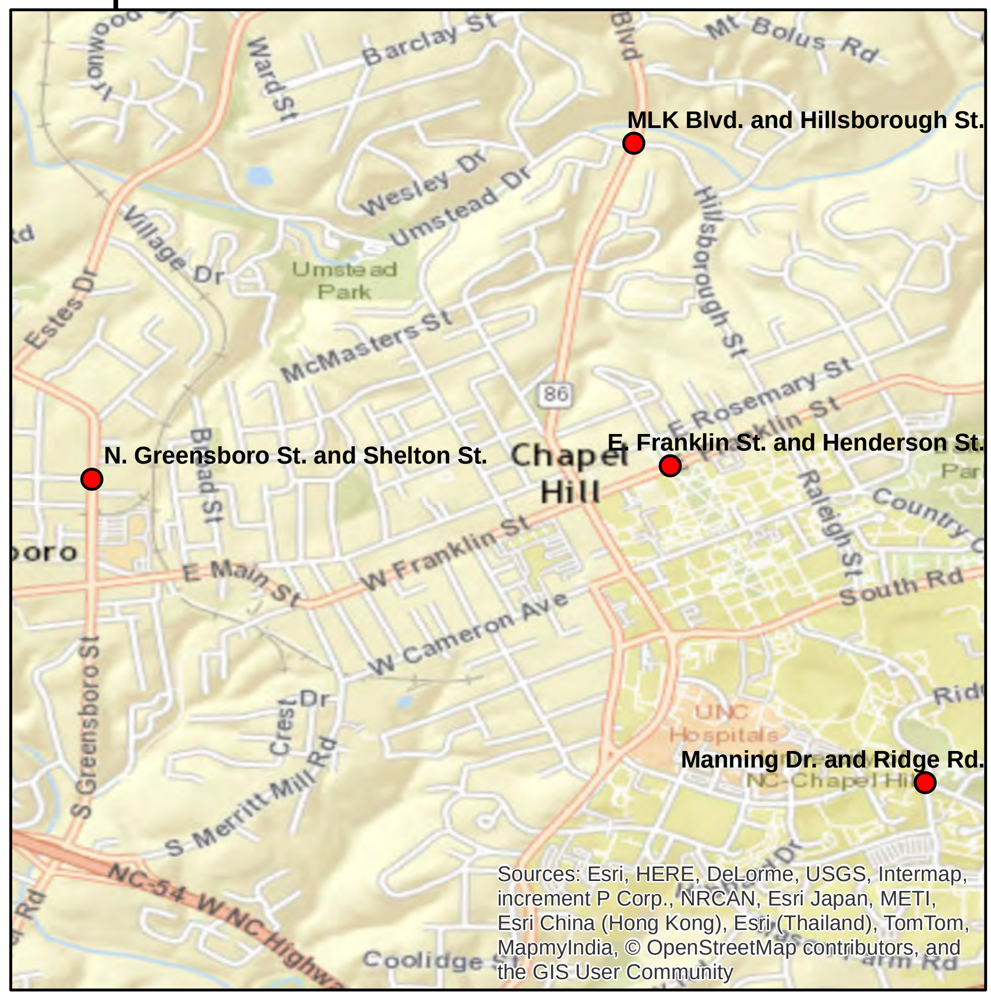
Figure 19

Durham



Pedestrian/Bicycle Crash Intersection

Chapel Hill - Carrboro



These are crash intersections that potentially exceed one safety warrant.

Data is for five a five-year period, 7/1/09 -6/30/14.

Bicycle and Pedestrian Safety

12/8/2014 — Potentially Hazardous Crash Intersections — Table 7

City Name	On Road	From Road	Toward Road	(1) Severity	Date/Time
1--					
DURHAM	NC 55	LINWOOD	MASSEY	A	9-Sep-12
DURHAM	ALSTON	LINWOOD	MINT	B	10-Jan-12
DURHAM	ALSTON	LINWOOD	MINT	C	8-Nov-10
DURHAM	ALSTON	LINWOOD	NC 147	A	30-Mar-13
DURHAM	ALSTON	LINWOOD	*	B	28-Apr-14
2--					
DURHAM	ERWIN RD	TRENT DR	*	C	12-Aug-11
DURHAM	TRENT	IRWIN	FLOWER	C	30-Jul-10
DURHAM	TRENT	IRWIN	FLOWER	B	18-Nov-11
DURHAM	TRENT	IRWIN	EMERGENCY	C	20-Feb-12
DURHAM	TRENT	IRWIN	FULTON	A	22-Mar-12
3--					
DURHAM	ALSTON AVE	MAIN	*	B	13-Aug-09
DURHAM	ALSTON AVE	MAIN	STOKES	C	11-Aug-10
DURHAM	ALSTON AVE	MAIN	MORNING GLORY	C	13-Apr-11
DURHAM	ALSTON AVE	MAIN	*	B	3-Oct-12
DURHAM	ALSTON AVE	MAIN	LIBERTY	C	1-Mar-13
DURHAM	MAIN	ALSTON	*	B	11-Dec-09
4--					
DURHAM	CLUB	ROXBORO	BANNER	C	23-Sep-11
DURHAM	CLUB	ROXBORO	FARTHING	B	8-Nov-11
DURHAM	ROXBORO	ELLERBE	CLUB	B	11-Apr-11
5--					
CHAPEL HILL	MARTIN LUTHER KING	HILLSBORO	*	C	18-May-12
CHAPEL HILL	MARTIN LUTHER KING	HILLSBORO	*	B	5-Nov-12
CHAPEL HILL	MARTIN LUTHER KING	HILLSBORO	LONGVIEW	C	12-Nov-13
6--					
CHAPEL HILL	FRANKLIN	HENDERSON	PICARD	C	15-Nov-12
CHAPEL HILL	FRANKLIN	HENDERSON	RALEIGH	C	18-Oct-10
CHAPEL HILL	FRANKLIN	PICARD	HENDERSON	B	17-Oct-10
7--					
CARRBORO	GREENSBORO	SHELTON	PLEASANT	C	20-May-11
CARRBORO	SHELTON	GREENSBORO	OAK	B	28-Feb-12
8--					
CHAPEL HILL	MANNING	PAUL HARDIN	*	B	29-Jan-12
CHAPEL HILL	MANNING	PAUL HARDIN	RIDGE	B	7-Sep-11
CHAPEL HILL	MANNING	PAUL HARDIN	RIDGE	B	11-Apr-12

* Data not available.

(1) For injury severity level (or injury status) definitions, see the following website:
https://tinyurl.com/injury-definitions

Note: Any ranking of locations that might occur would be for analysis purposes ONLY.
It would not be a "Top Ten Most Dangerous…" list.

Note: Franklin Street is missing two crash entries; Greensboro Rd is missing one crash entry.

Complete Streets and Related Initiatives

It is important to understand that the DCHC MPO strongly supports bicycle and pedestrian facilities. This support is evident in the MPO funding and plans. The MPO dedicates its Surface Transportation Block Grant (STBG) and other related funding entirely to the design and construction of non-motorized transportation projects. The CTP designates the expected urban cross-sections for improved and recommended roadways. Also, the Comprehensive Transportation Plan maps, including the Bicycle and Pedestrian Maps on Sheets 4 and 5 of Figure 1, contain the following note, which requires multimodal consideration in the design of cross-sections:

> The Strategic Transportation Investments (STI) law (House Bill 817) establishes design elements that emphasize safety, mobility, complete streets, and accessibility for multiple modes of travel. The "typical" highway cross sections used in this CTP were updated on May 5, 2014 in response to STI law.
>
> NCDOT's Complete Streets Policy "requires that NCDOT's planners and designers will consider and incorporate multimodal alternatives in the design and improvement of all appropriate transportation projects within a growth area of a town or city unless exceptional circumstances exist." (For more information on Complete Streets, go to http://www.completestreetsnc.org/.)

NCDOT has relevant policies that go back even further than Complete Streets. NCDOT's Bicycle Policy, updated in 1991, clarifies responsibilities regarding the provision of bicycle facilities along the 77,000-mile state-maintained highway system. The policy details guidelines for planning, design, construction, maintenance, and operations pertaining to bicycle facilities and accommodations. All bicycle improvements undertaken by NCDOT are based upon this policy.

The 2000 NCDOT Pedestrian Policy Guidelines specifies that NCDOT will participate with localities in the construction of sidewalks as incidental features of highway improvement projects. At the request of a locality, state funds for a sidewalk are made available if matched by the requesting locality, using a sliding scale based on population.

NCDOT's administrative guidelines, adopted in 1994, ensure that greenways and greenway crossings are considered during the highway planning process. This policy was incorporated so that critical corridors which have been adopted by localities for future greenways are not severed by highway construction.

Beyond NCDOT, AASHTO "Guide for Development of New Bicycle Facilities" provide planning and design guidelines for use when building new projects or making changes to existing infrastructure.

d) Land Use

This CTP uses the same land use model and socioeconomic data as the 2040 MTP. The county-level population and employment forecasts are based on those from the North Carolina State Demographer and Woods-n-Poole, respectively. Woods-n-Poole is a respected private source of population and employment forecasts that are based on economic activity. These county-level forecasts are spatially distributed based on the local long-range land use plans and zoning. The MPO uses a software tool called Community Visualization to manage and carry out this forecasting effort. In turn, the socioeconomic data is a key input into the Triangle Regional Model (TRM) that helped to produce the traffic forecasts for the CTP.

Appendix G – Socio Economic Data Forecasting Methodology -- provides details of the socioeconomic data forecasting methodology, including population and employment growth maps.

1.2 Consideration of Natural and Human Environment

Environmental features are a key consideration in the transportation planning process. Section 102 of the National Environmental Policy Act (NEPA) requires consideration of impacts on wetlands, wildlife, water quality, historic properties, and public lands. While a full NEPA evaluation was not conducted as part of the CTP, an effort was made to minimize potential impacts to the most salient features utilizing the best available data. Prior to implementing transportation recommendations of the CTP, a more detailed environmental study needs to be completed in cooperation with the appropriate environmental resource agencies. For more information on NEPA, see: https://ceq.doe.gov/.

Any potential impacts to these resources were identified as a part of the project recommendations in Chapter 2 of this report. The Unaddressed Deficiencies section identifies congested highway segments that are currently not planned to be improved so as to avoid negative impacts on the natural environment and community. The CTP utilized the 2040 MTP Critical Environmental Resources maps that are online (http://www.dchcmpo.org/programs/transport/2040mtp/) to evaluate the CTP projects. These maps have the features shown in Table 8 which assisted in the natural and human environment evaluation.

Table 8 – Environmental and Community Features

- Hydrology
- River and stream buffers
- Water bodies
- Water supply facilities
- Wetlands
- Watersheds
- Wildlife resources
- Parks and game lands
- Future urbanized areas
- Fish Nursery Areas
- Schools
- Airports
- Hospitals
- Railroads
- Bicycle and pedestrian facilities
- Churches and cemeteries
- Colleges and universities
- Buildings and structures
- Water and sewer service
- Water Supply Watersheds

1.3 Public Involvement

The CTP was released for a public comment period of 2 ½ months (72 days). The MPO Board released the draft CTP for comment on December 14, 2016, through February 24, 2017. Notification of the draft CTP was extensive. Staff presented the CTP to the many transportation related boards and commissions within the MPO's jurisdictions and counties to get their input, and also conducted four public workshops. The draft CTP was advertised in the Herald Sun and Triangle Tribune newspapers and by the public relations offices of some of the MPO member jurisdictions and counties. Additionally, staff used an email notification system to inform several hundred citizens who have shown an interest in planning and transportation issues during past planning efforts.

Appendix H – Public Involvement – provides a summary of the public meetings conducted to gather feedback on the CTP.

The MPO formed a CTP subcommittee to guide the development of the plan. Appendix H – Public Involvement – contains a list of subcommittee members.

The email notices, public workshops, and local board and commissions meetings produced many comments. A compilation of the comments received through email and the comment forms at the public workshops totals 29 pages and is available in the Public Comments section of the CTP Web page: http://bit.ly/DCHCMPO-Adopted-CTP.

The boards, commissions, councils and staff of the various local governments and one statewide agency provided formal feedback. A compilation of this feedback, which totals 18 pages, can be found at the same Web page above.

At the close of the public comment period, the public comments and board input, and other feedback were organized into a single document. Responses were added to the compiled comments and this Comments & Responses document describes how the comments received were addressed in the final CTP. The Comments & Responses document was presented to the MPO Board and the MPO Technical Committee before adopting the CTP. A copy of this document can be found at the same CTP Web page that is identified above.

A public hearing was held on February 8, 2017 during the DCHC MPO Board meeting. The purpose of this meeting was to discuss the plan recommendations and to solicit further input from the public. The CTP was adopted at the DCHC MPO Board meeting on May 10, 2017. The North Carolina Department of Transportation mutually adopted the DCHC MPO CTP on August 3, 2017.

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