Baseline and Future Year Mobility Conditions

North Carolina Department of Transportation

Strategic Transportation Corridor Vision Plans

Corridor X: Jacksonville to Greenville (U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258)

U.S. 17 in Onslow County to U.S. 64E in Edgecombe County

Updated: May 19, 2022

May 2022

Kimley»Horn

Table of Contents

Tables

Figures

1. Overview and Project Background

This memorandum presents base and future year mobility analyses for Corridor X (U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258) of the North Carolina Strategic Transportation Corridors (STC).

1.1. Overview of Strategic Transportation Corridors

In 2015, the North Carolina Department of Transportation (NCDOT) identified a network of key multimodal transportation corridors called Strategic Transportation Corridors (STC) to support smart planning, help set long-term investment decisions, and ensure that North Carolina's economic prosperity goals are achieved. The STCs are intended to promote transportation system connectivity, provide high levels of mobility, and improve access to important state and regional activity centers. A key element in the advancement of the STCs is the development of corridor master plan visions.

The purpose of the master plan visions is to:

- identify high-level corridor mobility visions and associated improvement strategies,
- guide improvements and development in a manner that defines a long-term vision and performance level for the corridors, and
- help protect the corridor's key functions as defined in the corridor profiles.

1.2. Corridor Description

U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 is approximately 90 miles in length and spans from Jacksonville to Greenville. U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 is primarily used to transfer freight from Jacksonville to Greenville. The corridor provides rural connection to economic development centers in Jacksonville, Kinston, and Greenville, including Camp Lejeune, Global TransPark, and East Carolina University. The principal expectation of the corridor is to provide safe, reliable mobility to these activity centers.

2. Highway Mobility

Highway mobility was analyzed for U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 for existing conditions and future scenarios based on the relationship of travel speed, congestion, and travel time. Existing conditions data was based on NCDOT traffic count data, GIS data, and third-party data (Google Maps satellite and travel time data). Future scenario analysis was based on the N.C. Statewide Travel Demand Model (NCSTM), Metropolitan Planning Organization (MPO) Travel Demand Models, the Statewide Transportation Improvement Program (STIP), and transportation plans from communities along the corridor.

2.1. Existing Conditions Analysis

Existing conditions analysis was completed using 2018 NCDOT Annual Average Daily Traffic (AADT) Segment Data, 2019 NCDOT Route Characteristics Data, the NCSTM, and third-party data (Google Maps). The 2015 NCSTM was used as the base year for most existing conditions analyses in this report. For some analyses, 2018 was used as the base year when more recent data was available. This section presents the process of identifying corridor segments and mobility measures.

2.1.1. Definitions of Segments

For analysis of the project corridor, the corridor was divided into "mobility segments." These segments represent sections that are generally homogenous and/or represent a uniform cross-section of roadway. The process of identifying segments included the review of the following attributes along the corridor:

- Major changes in roadway characteristics (cross-section, facility type, lanes)
- NCDOT Division Boundaries
- Interstate Crossings
- MPO Model boundaries
- Urban/rural transition

Segment breaks were not created for every occurrence of these characteristics: for example, small segments were avoided unless it was justified based on the uniqueness of the roadway attributes in that section. Although speed limits were a consideration, other factors were considered more heavily due to the frequency of speed limit changes.

A total of seven segments were identified for U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258, as shown in **Table 1**. These segments varied in length from 4 miles to 25 miles. Analysis was completed for these segments based on AADT information, NCDOT systems level planning capacities, NCSTM analysis, and MPO model analysis. The U.S.258/N.C. 11/U.S. 13 alignment is proposed to change based on the list of planned projects. The base year and future year segments are shown on **Figure 1** and **Figure 2**.

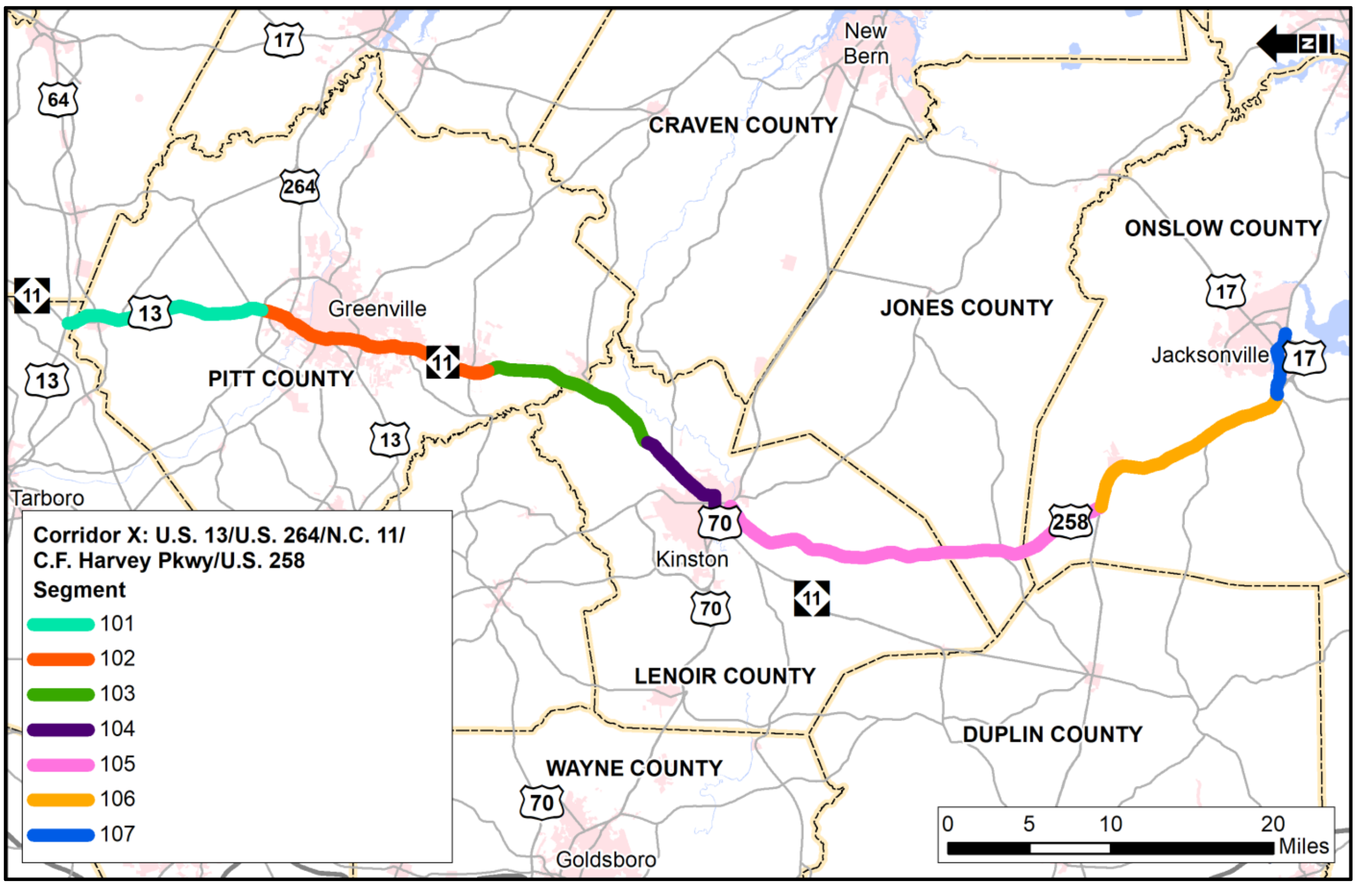


Figure 1. Base Year (2015) Corridor Segments

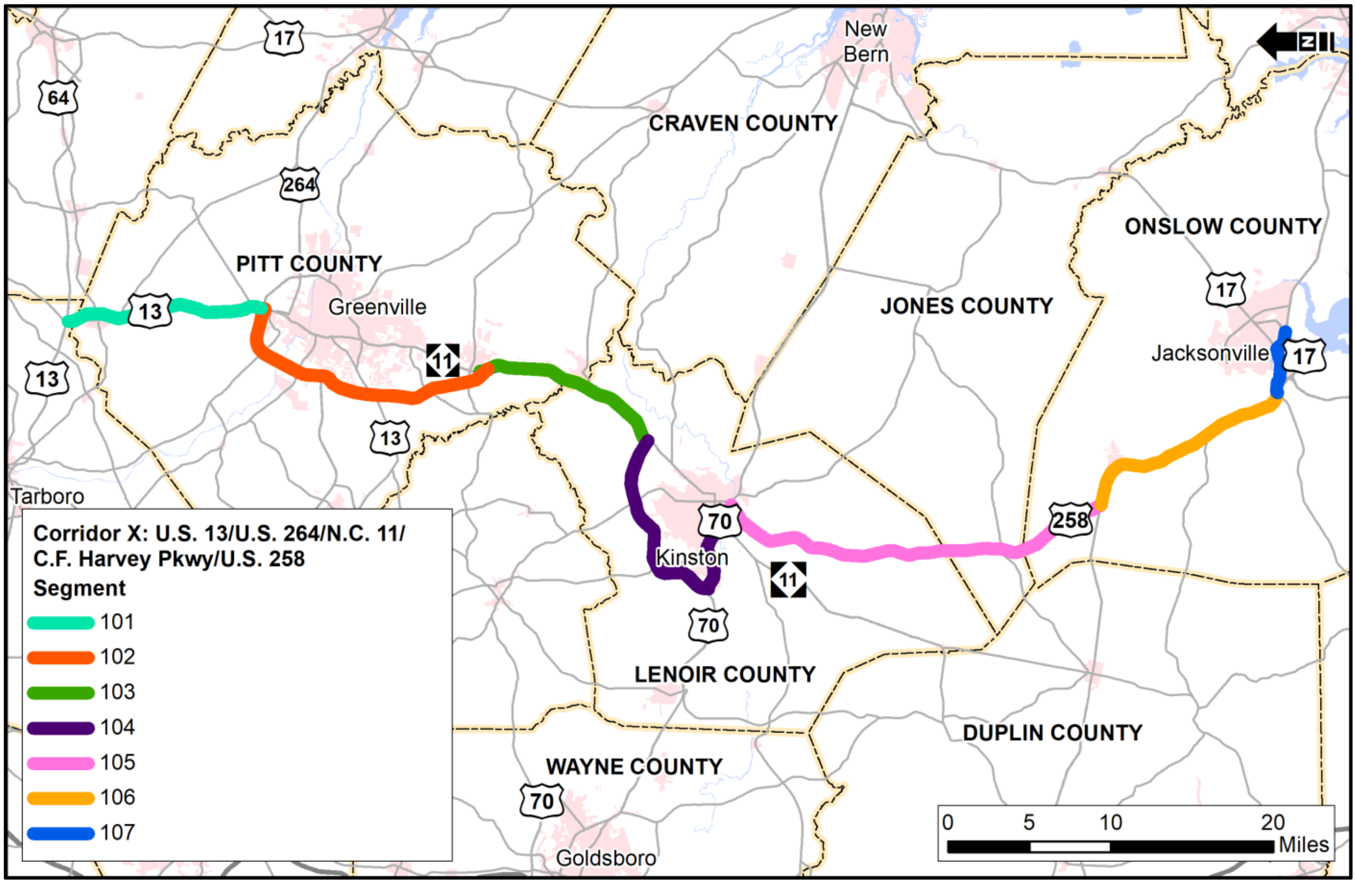


Figure 2. Future Year (2040) Corridor Segments

The 2018 AADT is based on NCDOT AADT segment data, which contains different segments than the mobility segments defined for U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258. AADT for the mobility segments was calculated as a weighted average of the 2018 NCDOT AADT data within each segment. The 2018 AADT ranges and average AADT are presented in **Table 1**.

Table 1. U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Mobility Segments

Segment	From	To	Length (miles)	Division	2018 AADT* Range	Average 2018 AADT
101	U.S. 64/U.S. 13 Interchange	U.S. 264	12	2	650 - 22,000	12,200
102	U.S. 264	N.C. 11/ N.C. 11 Bypass Junction	15	2	2,100 – 37,000	23,700
103	N.C. 11/ N.C. 11 Bypass Junction	C.F. Harvey Parkway	12	2	800 – 21,000	15,800
104	C.F. Harvey Parkway	U.S. 258/ N.C. 11	7	2	8,100 – 17,000	13,300
105	U.S. 258/N.C. 11	N.C. 24	26	2 and 3	5,000 - 9,500	6,800
106	N.C. 24	N.C. 53	14	3	11,500 - 44,500	23,300
107	N.C. 53	U.S. 17/Lejeune Blvd Interchange	4	3	4,600 – 34,000	21,900

*AADT = Annual Average Daily Traffic

2.1.2. Segment Capacity and Travel Time

Typical planning-level highway capacity was developed for each segment along the corridor using the predominant cross-section representative of each segment. Capacities are based on NCDOT Transportation Planning Division's "Level of Service (LOS) D Standards for Systems Level Planning" (updated October 14, 2011) as shown in Appendix A. Segment facility type, typical number of lanes, area type, percent trucks, terrain, and travel speed were used to identify the daily planning-level capacity for comparison against traffic volumes. Segment capacities are shown in **Table 2**.

Travel times were calculated based on a weighted average of posted speeds for each segment (by length), existing Volume-to-Capacity (V/C) ratios, and a volume-delay curve similar to what is used in the NCSTM. **Table 2** presents the travel time to traverse each segment based on this calculation. As a point of comparison, Google Maps travel times are provided for each segment to provide "observed" ranges based on third party data.

Table 2. Segment Capacity and Travel Times

Segment	Facility Type	Typical Speed (mph)	Lanes	Median Type	Area Type	Planning Capacity	Travel Time	
							Google Maps*	2018 Est.**
101	Boulevard	55	4	Divided	Rural	49,000	10-13	13
102	Boulevard	45	4	Divided	Suburban	43,900	20-40	20
103	Boulevard	55	4	Divided	Suburban	43,900	9-11	13
104	Major Thoroughfare	50	4	Divided	Suburban	17,200	10-16	8
105	Major Thoroughfare	50	2	Undivided	Rural	16,400	28-35	31
106	Major Thoroughfare	55	4	TWLTL	Rural	35,700	15-20	15
107	Major Thoroughfare	45	6	TWLTL	Suburban	34,500	5-10	5

*Google Maps travel times captured during off-peak travel times in March 2020, prior to the COVID-19 Pandemic**2018 Estimated travel times calculated based on a weighted average of posted speeds for each segment, existing volume-to-capacity ratios, and a volume-delay curve

2.2. Future Scenario Analysis

Future scenario analysis was completed using growth rates developed for the corridor based on historical count data, the NCSTM, and relevant regional MPO models. Two future scenarios were analyzed, both which used the NCSTM Existing plus Committed (E+C) scenario, which incorporates the fiscally constrained projects from the STIP. One scenario also includes local fiscally constrained and unconstrained projects in order to identify the local vision for the corridor:

- 2040 NCSTM E+C: Existing network plus committed (in the 2020-2029 STIP with either Right-of-Way/Construction funding) corridor projects
- 2040 NCSTM E+C + Metropolitan Transportation Plan (MTP)/Comprehensive Transportation Plan (CTP): NCSTM E+C (existing plus committed in STIP) plus fiscally constrained and unconstrained projects included in MTPs and CTPs

Typically, these projects are on the corridor itself; however, if the project is on a parallel facility and is of regional significance, it was included in the future scenario analysis. For each scenario, annual growth rates for each segment were prepared to project 2018 AADT to 2040. Using this information, future V/C ratio, travel time, average speed, vehicle-miles traveled (VMT), and vehicle-hours traveled (VHT) were calculated for each segment and the entire corridor. Population and employment growth data along the corridor are in Appendix G (based on the statewide travel demand model) and Appendix H (based on the regional travel demand models).

2.2.1. Committed and Fiscally Constrained Projects

For the 2040 E+C scenario, committed projects are those which are programmed in the 2020-2029 STIP. **Table 3** shows projects included in the 2040 E+C scenarios for the U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 corridor.

Table 3. 2040 E+C Scenario Projects

STIP ID	Segment	Counties	Roadway	Location/Description
R-2553C	104	Lenoir	U.S. 70 Bypass	Construct Kinston Bypass from NC 148 (Harvey Parkway) to NC 58.
R-5703	104	Lenoir	C.F. Harvey Parkway	Construct N.C. 148 (C.F. Harvey Pkwy) on new location from N.C. 58 to N.C. 11
U-5716	106/107	Onslow	N.C. 24	Convert at-grade intersection of N.C. 24 and U.S. 258 to an interchange
U-5719	106	Onslow	N.C. 24	Realign Blue Creek Road/Ridge Road at U.S. 258/N.C. 24 to form an at-grade intersection

For the 2040 E+C + MTP/CTP scenario, the other fiscally constrained and unconstrained projects from the Greenville Urban Area MPO MTP, Kinston CTP, Edgecombe County CTP, Jones County CTP, Lenoir County CTP, and Pitt County CTP included in the project analysis are listed in **Table 4**.

Table 4. 2040 E+C + MTP/CTP Fiscally Constrained and Unconstrained Projects

Plan	Segment	Counties	Roadway	Location/Description
CTP	101	Edgecombe	N.C. 11/U.S. 13	Recommended for improvement from U.S. 13 to north of U.S. 64
CTP	101	Edgecombe	U.S. 13	Freeway Needs Improvement from U.S. 64 to Pitt County Line
CTP	101	Pitt	U.S. 13	Freeway Needs Improvement from N.C. 30 to Allpine-Taylor Road
MTP	101	Pitt	U.S. 13	Recommended to upgrade to interstate standards, including shoulder work, access control, and interchange improvements from U.S. 13 from U.S. 264 to U.S. 64
MTP	102	Pitt	U.S. 264/ Greenville Bypass	Widening from MPO boundary to US 264
CTP	103	Lenoir	N.C. 11	Upgrade existing facility to interstate standards from proposed Harvey Parkway Ext to Pitt County
CTP	103	Lenoir	N.C. 11	Freeway Needs Improvement from Greenville SW Bypass to Hanrahan Road
MTP	103	Pitt	N.C. 11	Interstate upgrade from Southwest Bypass to Pitt County Line
CTP	103, 104	Lenoir	N.C. 11	Freeway Needs Improvement from Pitt County Line to N.C. 55
CTP	105	Jones	U.S. 258	Recommended to upgrade to expressway standards from Onslow County to Lenoir County
CTP	105	Lenoir	U.S. 258	Other Major Thoroughfare Needs Improvement from Will Baker Road to Jones County Line
CTP	105	Lenoir	U.S. 258	Recommended to be widened to a four-lane, median-divided facility with control of access from proposed U.S. 258 and U.S. 70 interchange to Kinston planning boundary
CTP	105	Lenoir	U.S. 258	Recommended to increase capacity from U.S. 70 Bypass to the southern planning boundary
CTP	105	Lenoir	U.S. 258	Recommended to add an alternating passing lane, improve intersection visibility, add rumble stripes, and add more reflective thermoplastic paint from Jones County to Tyree Road (S.R. 1341)
CTP	105	Lenoir	U.S. 258	Widen to a four-lane boulevard from Tyree Road to the proposed Kinston Bypass

2.2.2. Existing and Future Cross-Sections

With the buildout of the 2040 E+C and 2040 E+C + MTP/CTP scenarios, the characteristics of each segment along the corridor change over time, typically resulting in higher throughput capabilities and increased travel speeds. **Table 5** summarizes the facility type, lanes and typical posted speed for 2018, 2040 E+C and 2040 E+C + MTP/CTP scenarios. Shaded grey fields indicate a change from existing ("2018 Conditions") to the 2040 scenarios.

Table 5. Volume-to-Capacity Ratios by Scenario

Segment	2018 Conditions			2040 NCSTM E+C			2040 NCSTM E+C + MTP/CTP		
	Facility Type	Typical Posted Speed	Lanes	Facility Type	Typical Posted Speed	Lanes	Facility Type	Typical Posted Speed	Lanes
101	Boulevard	55	4	Boulevard	55	4	Freeway	70	4
102	Boulevard	45	4	Freeway	70	4	Freeway	70	4
103	Boulevard	55	4	Boulevard	55	4	Freeway	60	4
104	Major Thoroughfare	50	4	Expressway	60	4	Expressway	60	4
105	Major Thoroughfare	50	2	Major Thoroughfare	50	2	Major Thoroughfare	55	3
106	Major Thoroughfare	55	4	Major Thoroughfare	55	4	Major Thoroughfare	55	4
107	Major Thoroughfare	45	6	Major Thoroughfare	45	6	Major Thoroughfare	45	6

Note: Shaded grey fields indicate a change from 2018 Conditions to 2040 scenarios

2.2.3. Travel Demand Model Analysis

Travel Demand Model analysis was completed using the NCSTM. The most recent NCSTM uses a base year of 2015 and a future year of 2040. Data from this model was used to calculate growth rates. **Table 6** presents NCSTM model output related to volumes and speeds from the 2015 and 2040 E+C network.

Table 6. 2015/2040 NCSTM E+C Comparison

Segment	2015 NCSTM				2040 NCSTM E+C			
	Ave. AADT*	Daily VMT**	Daily VHT***	Ave. Speed (mph)	Ave. AADT	Daily VMT	Daily VHT	Ave. Speed (mph)
101	6,000	136,100	2,500	55	8,000	195,900	1,800	55
102	6,000	165,800	4,100	42	10,000	393,000	2,800	70
103	6,000	319,700	20,100	54	9,000	207,800	3,800	55
104	9,000	204,800	12,700	49	4,000	95,500	1,800	52
105	7,000	138,600	24,800	51	9,000	333,000	6,600	51
106	17,000	213,500	4,000	53	21,000	294,200	5,500	55
107	12,000	64,100	1,700	38	17,000	97,000	2,000	43
Total	9,000	1,242,600	69,900	49	11,143	1,616,400	24,300	54

*AADT = Annual Average Daily Traffic; **VMT = Vehicle-Miles Traveled; ***VHT = Vehicle-Hours Traveled

MPO models were also used as part of the Travel Demand Model analysis. For the MPO models, an E+C scenario was not evaluated; rather, the adopted MTPs were utilized for future year analysis. Information from these models was used to support development of growth rates to apply to each segment. **Table 7** shows a comparison of the MPO data. When comparing growth data from the NCSTM and MPO models, it should be noted that corridor segments may be represented in multiple local travel demand model models or only partially represented.

Table 7. Base Year and Future Year Scenario, MPO Model Output

				Base Year Data				Future Year Data			
Segment	Travel Demand Model	Base Year	Future Year	Ave. AADT*	Daily VMT**	Daily VHT***	Ave. Speed (mph)	Ave. AADT	Daily VMT	Daily VHT	Ave. Speed (mph)
101	Greenville	2016	2045	8,200	174,500	700	57	10,100	216,900	900	57
102	Greenville	2016	2045	14,100	165,800	1,000	38	13,900	166,400	1,000	38
103	Greenville/ Kinston	2015	2045	10,000	236,100	1,900	49	9,500	234,700	1,800	49
104	Kinston	2015	2045	10,000	42,800	1,000	38	10,100	38,200	900	38
105	Greenville/ Kinston	2010	2045	6,700	46,600	1,200	43	7,200	54,700	1,400	40
106	Jacksonville	2010	2040	17,500	251,900	5,500	51	25,100	373,200	8,700	43
107	Jacksonville	2010	2040	16,200	83,900	2,300	42	21,900	113,400	3,500	34

*AADT = Annual Average Daily Traffic; **VMT = Vehicle-Miles Traveled; ***VHT = Vehicle-Hours Traveled

2.2.4. Projected Growth Rates

Projected growth rates were developed based on AADT data from the NCSTM and MPO models by corridor segment. **Table 8** shows the projected growth rate for each corridor segment.

Table 8. Projected Growth Rates by Segment

	NCSTM/MTP/CTP		MPO	STC Growth Rate	
Segment	Annual Growth Rate, 2015-2040 E+C	Annual Growth Rate, 2015-2040 E+C + MTP/CTP	Annual Growth Rate	E+C + MPO	E+C + MTP/CTP + MPO
101	1.2%	2.5%	0.7%	0.9%	1.7%
102	2.1%	2.1%	0.0%	1.0%	1.5%
103	1.6%	1.6%	-0.2%	0.7%	1.2%
104	-3.2%	0.0%	0.0%	-1.8%	-0.8%
105	1.0%	1.8%	0.2%	0.6%	1.2%
106	0.8%	1.0%	1.2%	1.0%	1.0%
107	1.4%	1.4%	1.0%	1.2%	1.3%

2.3. Mobility Measures

While there are many mobility measures that can be considered for each corridor based on quantitative and qualitative data, this mobility analysis is based on the relationship of travel speed, congestion, and travel time. For each scenario, a projected volume was compared against available capacity to estimate the travel time (i.e., V/C ratio). VMT, VHT, and average speed are also presented for each scenario.

2.3.1. Volume-to-Capacity Ratio

The V/C ratio is a representation of a daily planning-level capacity versus an average daily traffic volume. It is not a measure of peak traffic or congestion, but rather an overall measure of the how well the roadway will function over the course of a day. According to the "Level of Service D Standards for Systems Level Planning," typical capacities shown are the points at which traffic transitions from LOS D to LOS E; therefore, segments with a V/C ratio exceeding 1.0 are considered greater than LOS D (i.e., LOS E or F) in this analysis. **Table 9** presents V/C ratios by scenario. Shaded grey fields indicate a change from existing ("2015 NCSTM") to the 2040 scenarios

Table 9. Volume-to-Capacity Ratios by Scenario

Segment	2015 NCSTM			2040 NCSTM E+C			2040 NCSTM E+C + MTP/CTP		
	Ave. Vol.	Capacity	Ave. V/C*	Ave. Vol.	Capacity	Ave. V/C	Ave. Vol.	Capacity	Ave. V/C
101	5,980	49,000	0.12	8,490	49,000	0.17	11,500	64,700	0.18
102	6,700	39,700	0.17	10,300	62,400	0.17	10,400	62,400	0.17
103	6,800	43,900	0.15	9,150	43,900	0.21	9,100	65,400	0.14
104	9,750	17,200	0.57	3,560	57,100	0.06	9,500	57,100	0.17
105	6,930	16,400	0.42	9,590	16,400	0.58	12,200	17,800	0.69
106	17,740	35,700	0.50	22,800	35,700	0.64	23,000	35,700	0.64
107	12,330	34,500	0.36	18,440	34,500	0.53	18,400	34,500	0.53

*V/C = Volume-to-Capacity ratio
Note: Shaded grey fields indicate an increase from 2015

2.3.2. Average Travel Time and Speed

Average travel time and speed are measures of the relationship between the V/C ratio of a segment and its typical travel speed. Volume-delay curves by facility type were used to estimate travel time and speed in the 2018 conditions. These volume-delay curves, based on adjusted NCSTM volume-delay function curves, represent the typical "congested" speed on a daily planning level. **Table 10** shows average travel time and speeds by scenario. Shaded grey fields indicate a change from existing ("2018 Conditions") to the 2040 scenarios.

Table 10. Average Travel Speed and Travel Time by Scenario

Segment	2018 Conditions			2040 NCSTM E+C			2040 NCSTM E+C + MTP/CTP		
	Typical Posted Speed (mph)	Ave. Travel Speed (mph)	Ave. Travel Time (min)	Typical Posted Speed (mph)	Ave. Travel Speed (mph)	Ave. Travel Time (min)	Typical Posted Speed (mph)	Ave. Travel Speed (mph)	Ave. Travel Time (min)
101	55	53	13	55	55	14	70	66	11
102	45	41	20	70	70	15	70	69	15
103	55	51	13	55	55	13	60	56	13
104	50	41	8	60	52	18	60	57	8
105	50	46	31	50	51	31	55	55	30
106	55	48	15	55	55	16	55	55	16
107	45	40	5	45	43	14	45	43	6
Total Travel Time (min)			**107**			**120**			**98**

Note: Shaded grey fields indicate a change from 2018 Conditions to 2040 scenarios

2.3.3. Vehicle-Miles Traveled and Vehicle-Hours Traveled

VMT and VHT represent overall demand on each segment for each scenario, shown on **Table 11**.

Table 11. VMT and VHT Scenario

Segment	2015 NCSTM		2040 NCSTM E+C		2040 NCSTM E+C + MTP/CTP	
	VMT	VHT	VMT	VHT	VMT	VHT
101	136,100	2,500	195,900	1,800	267,600	2,000
102	165,800	4,100	393,000	2,800	395,900	2,800
103	319,700	20,100	207,800	3,800	208,900	1,900
104	204,800	12,700	95,500	1,800	125,300	1,500
105	138,600	24,800	333,000	6,600	358,500	6,700
106	213,500	4,000	294,200	5,500	296,900	5,500
107	64,100	1,700	97,000	2,000	96,900	2,000
Total	**1,242,600**	**69,900**	**1,616,400**	**24,300**	**1,749,900**	**22,400**

*VMT = Vehicle-Miles Traveled; **VHT = Vehicle-Hours Traveled

2.3.4. Highway Mobility Summary

Table 12 presents a summary of highway mobility measures for 2015 NCSTM, 2040 NCSTM E+C, and 2040 NCSTM E+C + MTP/CTP. The table shows that in both 2040 scenarios, the corridor serves more travelers at higher speeds with less delay. **Figure 3** presents the key highway mobility measures graphically.

Table 12. Highway Mobility Summary

Measure	2015 NCSTM	2040 NCSTM E+C	2040 NCSTM E+C + MTP
Length (Miles)	90	103	103
Average Travel Time (Hours)	1.83	1.70	1.63
Vehicle-Miles Traveled	1,242,600	1,616,400	1,749,900
Vehicle-Hours Traveled	69,900	24,300	22,400
Annual Average Daily Volume	9,461	11,761	13,443
Average Speed	49	54	57

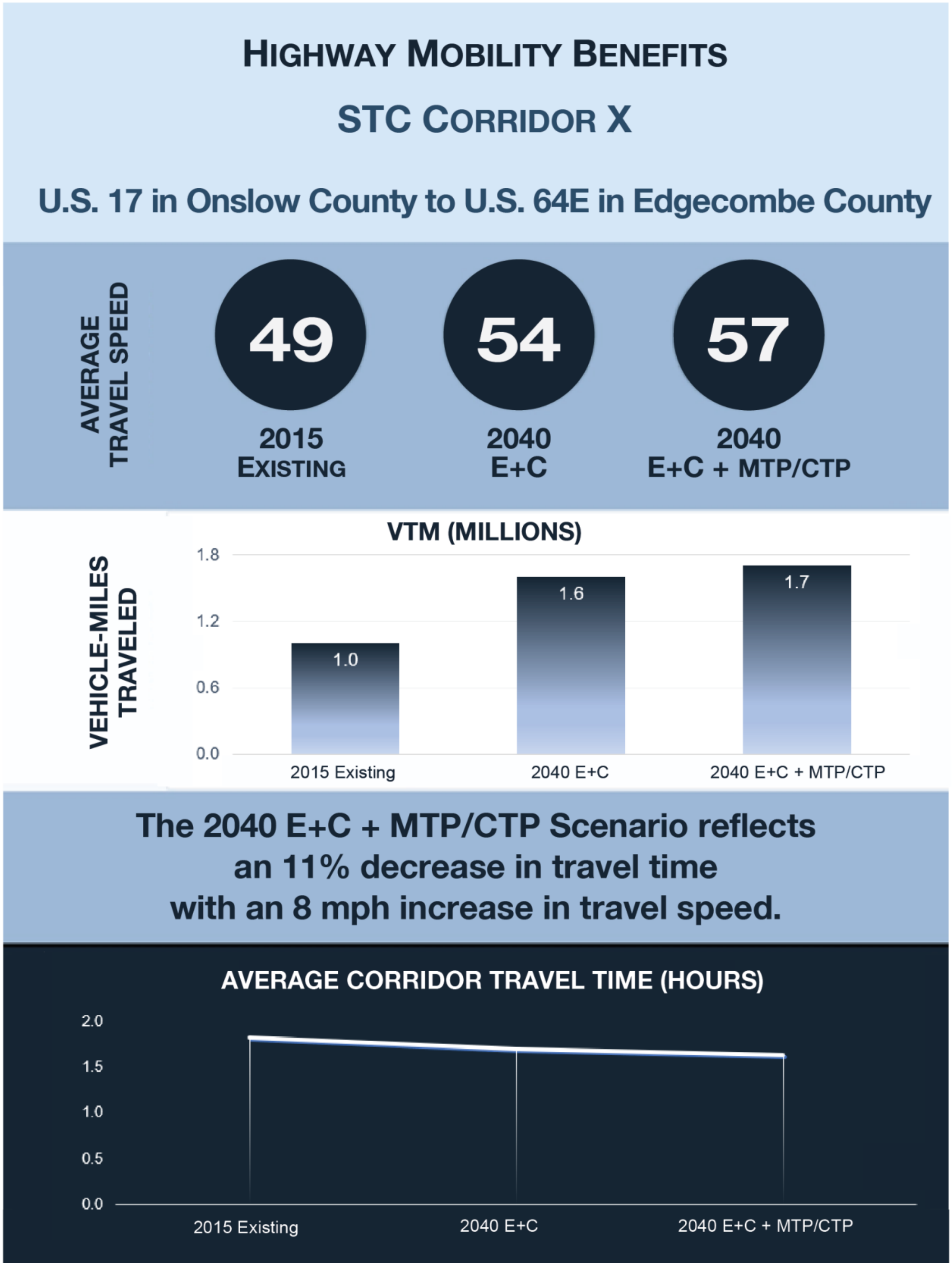


Figure 3. Highway Mobility Summary

2.4. Truck Percentage

The percent of trucks on the corridor was reviewed using AADT GIS data from NCDOT, which is collected for routes on the National Highway System and the North Carolina Truck Network. Truck percentage data and maps are in Appendix E.

2.5. Electric Charging Stations

Electric charging stations within a 5-mile and 10-mile buffer of the corridor are illustrated on figures in Appendix F.

3. Freight Mobility

The U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor runs from U.S. 17 in Onslow County near Jacksonville to U.S. 64 East in Edgecombe county near Greenville along segments of U.S. 258, N.C. 11, and U.S. 13 as shown in **Figure 4**. Freight mobility into, out of, and within the U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor counties was analyzed using freight flow data downloaded from the North Carolina Freight Flow tool. The freight flow data is presented as volume (tonnage) and value (dollars). It is based on the Federal Highway Administration's (FHWA) Freight Analysis Framework Version 4.1 (FAF4.1) with county-level disaggregation processed by Cambridge Systematics for 2012 and 2015, and it was forecasted to 2045 using FHWA's FAF4.1 origin-destination and commodity growth rates for rail flows.[1]

[1] North Carolina Statewide Multimodal Freight Plan, Freight Flow Tool Reference Guide: https://connect.ncdot.gov/projects/planning/Statewide-Freight-Plan/Documents/Freight_Tool_User_Guide.pdf

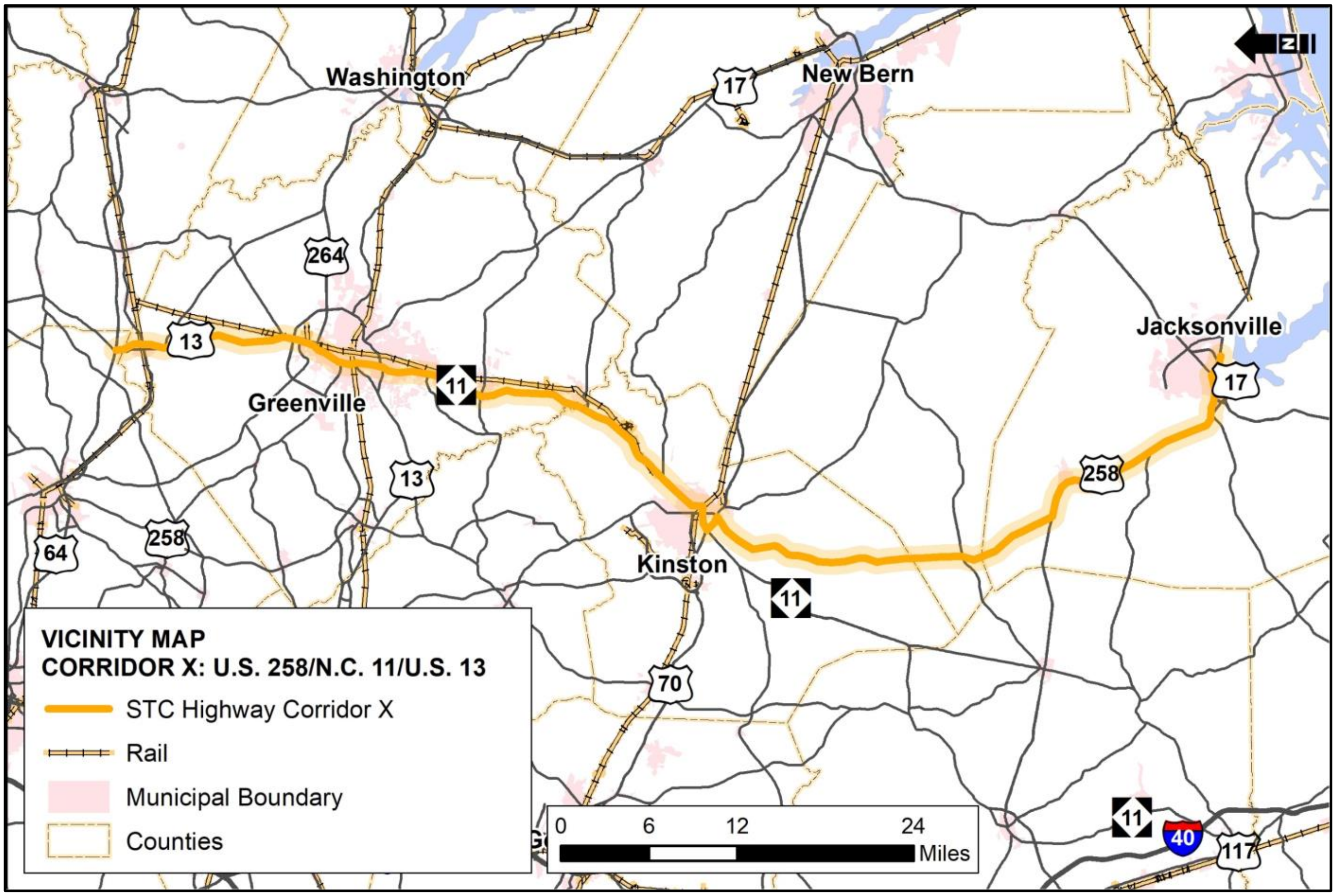


Figure 4. U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor

Freight flow estimates for the U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor include county totals for five counties (Edgecombe, Pitt, Lenoir, Jones, and Onslow) within eastern North Carolina. Results are presented for 12 different commodity groups and associated trade partners. Results by trade partners are presented regionally for the United States, at the county level for trade between the corridor and the rest of North Carolina, and at the FAF regional level for all other trade which includes states, large metropolitan areas, the remainder of states with large metropolitan area(s), and international regions for foreign freight flows.

3.1. Flow Type Totals

Freight flows to, from, and within the U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor counties (including domestic trade and the domestic leg of foreign trade) totaled an estimated 21.7 million tons worth $27.4 billion in 2015, as shown in **Figure 5**. Inbound flows represented a higher percentage of volume compared to value, while outbound flows represented a lower percentage of volume compared with value. Internal flows to the corridor made up only 1 percent of the volume and less than 1 percent of the total value. Flows were forecasted to increase to 31.1 million tons worth $47.5 billion in 2045 (an increase of about 43 and 73 percent, respectively). The differences in growth of volume and value reflect anticipated changes in type of businesses.

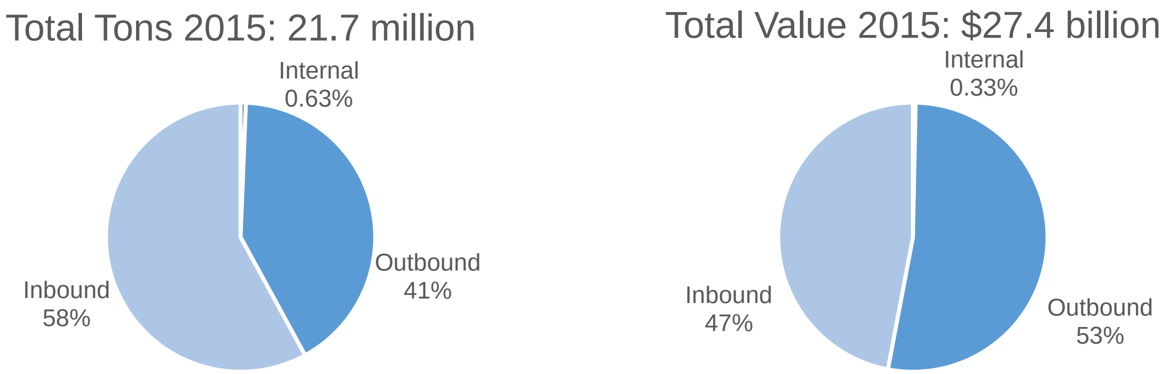


Figure 5. Freight Flow Totals, 2015

3.2. Modal Splits

Trucking dominates the market, moving approximately 92 percent of the corridor's freight and accounting for almost 90 percent of the total value, as shown in **Figure 6** and

Figure 7. Pipeline approximately 5 percent of volume and value in 2015, while carload rail carried about 3 percent of the total volume and 1 percent of the total value, and air cargo carried less than 1 percent of the total volume but about 3 percent of the total value. Water cargo and other modes of freight movement represented minimal volume and value, at less than 1 percent, respectively. Modal share forecasts for 2045 show little change in terms of volume, but indicate a small decrease in air and truck freight by about two and 3 percent share of the total value, respectively. Conversely, water freight's share of the total value is projected to increase by almost 4 percent of the total value.

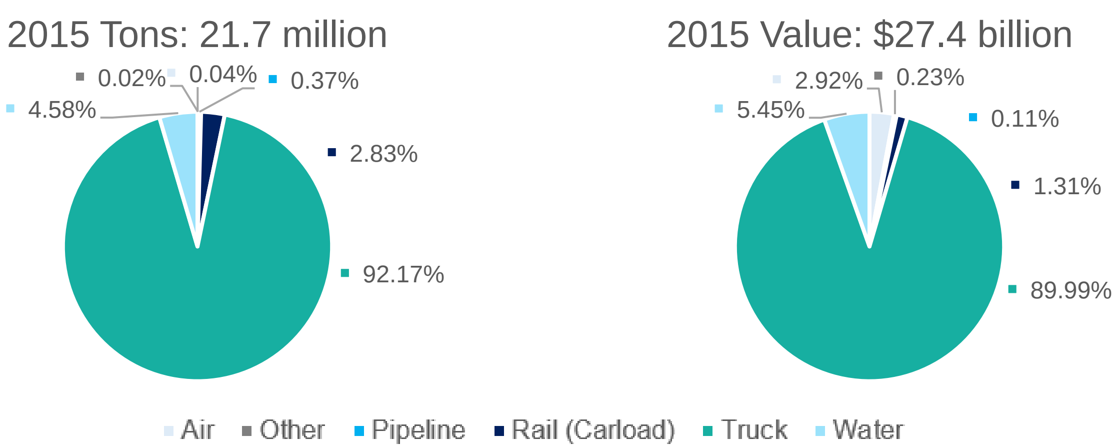


Figure 6. Modal Freight Flows by Volume, 2015

Figure 7. Modal Freight Flows by Value, 2015

3.3. Commodity Comparison, 2015 and 2045

Aggregates, with about 4.0 million tons, accounted for the largest volume of commodities moving into, out of, and within the corridor, shown in **Figure 8**, of which approximately 64 percent was imported to the region. Agriculture and Fish; Nonmetallic Mineral and Base Metal Products; Chemicals, Pharmaceuticals, Plastics, and Rubber; Raw and Finished Wood Products; and Energy Products each accounted for more than 2.0 million tons of freight volume in 2015. By 2045, flows of Machinery, Electric, and Precision Instrument and Chemicals, Pharmaceuticals, Plastics, and Rubber are forecasted to increase by approximately 153 percent and 102 percent, respectively. This growth is forecasted to make Chemicals, Pharmaceuticals, Plastics and Rubber the largest traded commodity by volume in 2045. Other commodity groups with high growth forecasts include Waste (73 percent), Mixed Freight (64 percent), and Food, Alcohol, and Tobacco (61 percent). Energy Products are the only commodity with an anticipated decrease (20 percent) in volumes by 2045.

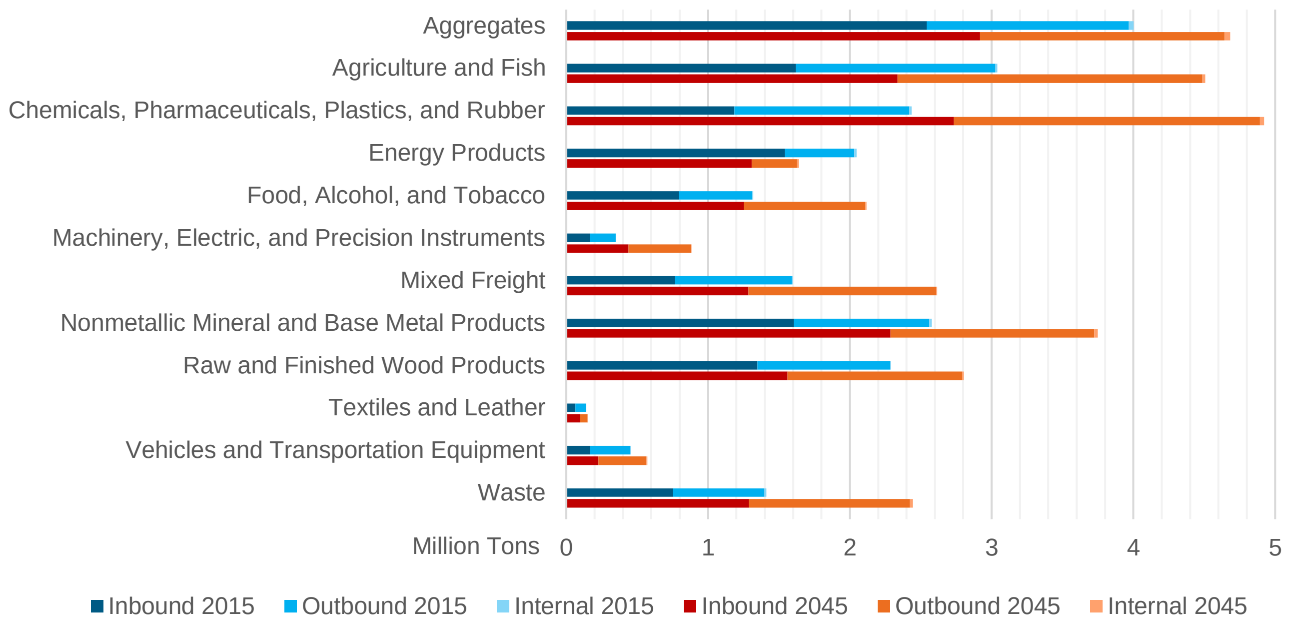


Figure 8. Commodity Volumes, 2015 and 2045

As shown in **Figure 9**, Mixed Freight, at more than $6.4 billion, accounted for the largest share of the value of freight in 2015, which was closely followed by Chemicals, Pharmaceuticals, Plastics, and Rubber at $6.2 billion. The forecasted growth by 2045 is 68 percent for Mixed Freight and 97 percent for Chemicals, Pharmaceuticals, Plastics, and Rubber. This makes Chemicals, Pharmaceuticals, Plastics, and Rubber the largest commodity by value of freight by 2045. Machinery, Electric, and Precision Instruments is forecasted to have the highest growth in value by 2045 (135 percent), but remains the third highest traded commodity by value in 2045. Other commodities with high forecasted growth by 2045 include Waste (90 percent), Aggregates (62 percent), Food, Alcohol, and Tobacco (62 percent), Nonmetallic Mineral and Base Metal Products (59 percent), and Agriculture and Fish (57 percent). The only commodity with a forecasted decline in value by 2045 (24 percent) is Energy Products.

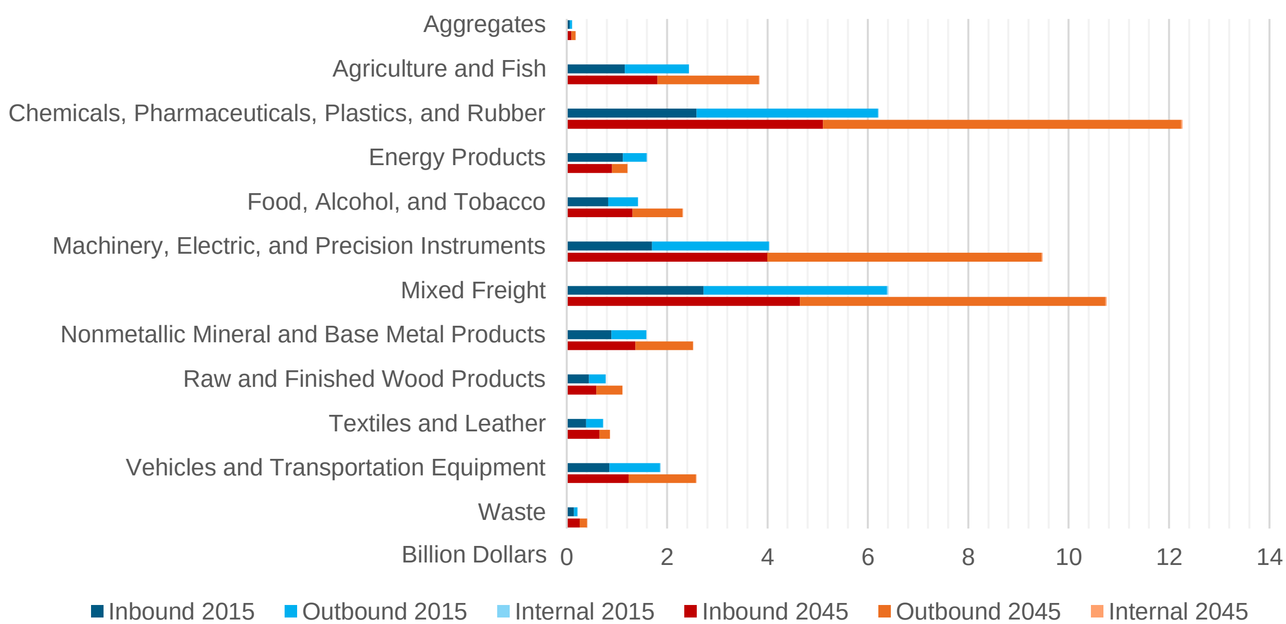


Figure 9. Commodity Values, 2015 and 2045

3.4. Top Trading Partners — by Volume and Value

The U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor counties traded the largest volume and value of goods within North Carolina when compared to all other U.S. trading regions identified in **Figure 10**. In 2015, this was estimated to be over 18.8 million tons valued at over $17.6 billion with a forecasted growth to 26.5 million tons worth $28.9 billion by 2045, as shown in **Table 13**. In 2015, trade within North Carolina represented more than 80 percent of the volume and 60 percent of the value of all trade and is forecasted to maintain that level in 2045. Outside of North Carolina, the largest trading partner by volume and value is within the Southeast region. The Southeast region represented just over 1.1 million tons of freight worth about $4.2 million which represented about 40 percent of the trade volume and value outside of North Carolina.

Table 13. Top Regional Trading Partners

Region	Tonnage		Value	
	2015	2045	2015	2045
Internal (North Carolina)	18,833,145	26,551,106	$17,567,694,320	$28,943,755,438
Great Lakes	400,568	649,458	$1,822,697,313	$3,222,110,419
Mideast	857,869	1,385,963	$1,852,893,330	$3,659,941,574
New England/New York	124,812	239,608	$579,842,401	$1,326,535,162
Southeast*	1,165,525	1,788,244	$4,231,480,999	$8,041,290,838
West of the Mississippi River	282,830	470,340	$1,354,963,856	$2,339,474,346
Total	**21,664,749**	**31,084,720**	**$27,409,572,218**	**$47,533,107,777**

*Freight internal to North Carolina was excluded from totals within the Southeast

Figure 10. Trading Regions

Figure 11 shows the top ten domestic trading partners with the U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor by volume by county within NC, metropolitan area, and "other" state FAF region outside of NC. "Other" state FAF regions refer to the remainder of a state trading region which does not include separately analyzed metropolitan areas. New Hanover County, N.C. and New Orleans, LA were the two largest trade partners for the U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor in 2015 by volume and represented a combined value of more than 1.3 million tons of freight. New Hanover County is also forecasted to grow to 1.2 million tons by 2045, which represents the second largest growth in volume (72 percent) within the top ten trade partners by 2045. Virginia Beach, VA, which had the largest growth in volume, is forecasted to grow 85 percent by 2045. This increase in trade with Virginia Beach, VA will bring it from the tenth largest trading partner by volume to the sixth largest in 2045.

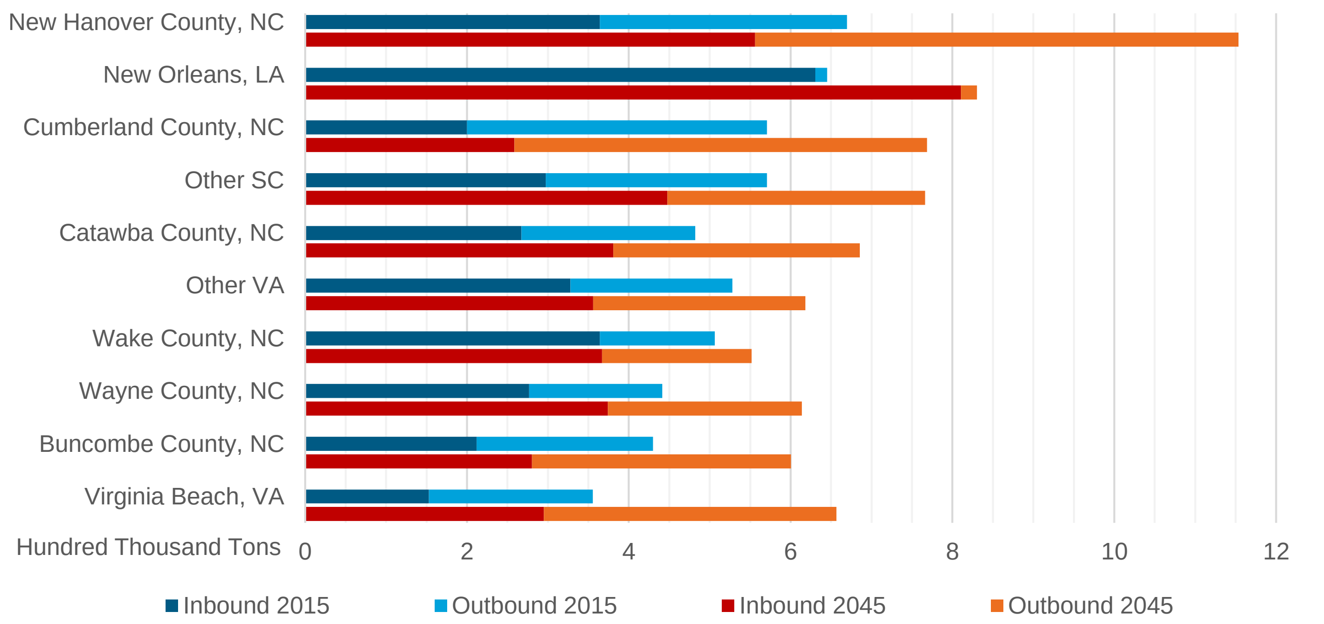


Figure 11. Top Trading Partners by Volume, 2015 and 2045[2]

[2] "Other SC" refers to the remainder of South Carolina not including the Greenville and Charleston metros. "Other VA" refers to the remainder of Virginia not including the Washington, DC, Virginia Beach, and Richmond metros.

Atlanta, GA, far outranked the other top ten trade partners by value for the U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor in 2015, as shown in **Figure 12**. Atlanta represented more than $2.1 billion of trade in 2015, of which approximately 82 percent was outbound freight. Atlanta freight movements are forecasted to grow by 78 percent in value by 2045 to more than $3.8 billion. New Hanover County, N.C. and Other S.C. were the second and third largest trading partners by value in 2015, with approximately $770 million and over $690 million in freight trade, respectively. The remaining top ten trade partners by value for the U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 Corridor ranged between $400 million and $660 million worth of trade in 2015. Savannah, GA, Charleston, SC, Virginia Beach, VA, New Hanover County, NC, Los Angeles, CA, and Chicago, IL are anticipated to more than double in value by 2045 with growths of 252 percent, 234 percent, 174 percent, 119, percent, 107 percent, and 104 percent, respectively. These large growths make Charleston, S.C. and Virginia Beach, VA the projected second and third largest trading partners by value in 2045, respectively. Other trade partners with high increases in value by 2045 are Columbus, OH and Philadelphia, PA with growth of 93 percent and 55 percent, respectively.

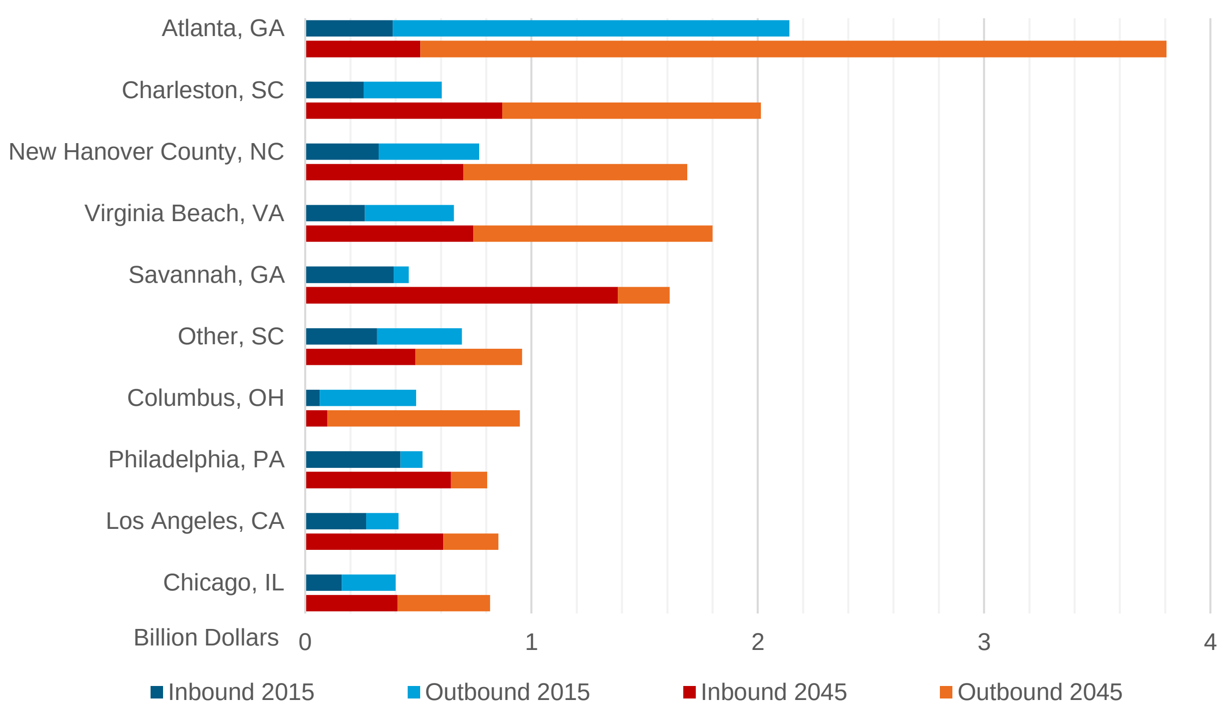


Figure 12. Top Trading Partners by Value, 2015 and 2045[3]

---

[3] "Other SC" refers to the remainder of South Carolina not including the Greenville and Charleston metros.

3.5. Foreign Trade

Foreign trade freight flows of 908,000 tons only represented approximately 4 percent of the corridor's total flows in 2015 and is forecasted to increase in volume by 165 percent to become almost 8 percent of the total volume (31.1 million tons) by 2045. The $6.3 billion worth of foreign trade in 2015 is forecasted to grow by 58 percent to $9.9 billion by 2045. Foreign trade flows account for 23 percent and 32 percent of total trade freight flows by value in 2015 and 2045, respectively.

As shown in **Figure 13**, tonnage of foreign trade in 2015 is dominated by water with 85 percent of freight being moved on the water and trucking and carload rail ranking second at 7 percent each. As shown in **Figure 14**, modal shares of foreign trade by value in 2015 are also dominated by water which accounts for 74 percent of the total, with truck freight ranking second at 16 percent.

The modal share by volume forecasted between 2015 and 2045 remains relatively the same with a small relative decrease in water freight (85 to 81 percent) and increases in truck and carload rail freight (7 to 9 percent each). However, the modal share by value is forecasted to increase for water (74 to 79 percent) and decrease in air freight (5 to 1 percent).

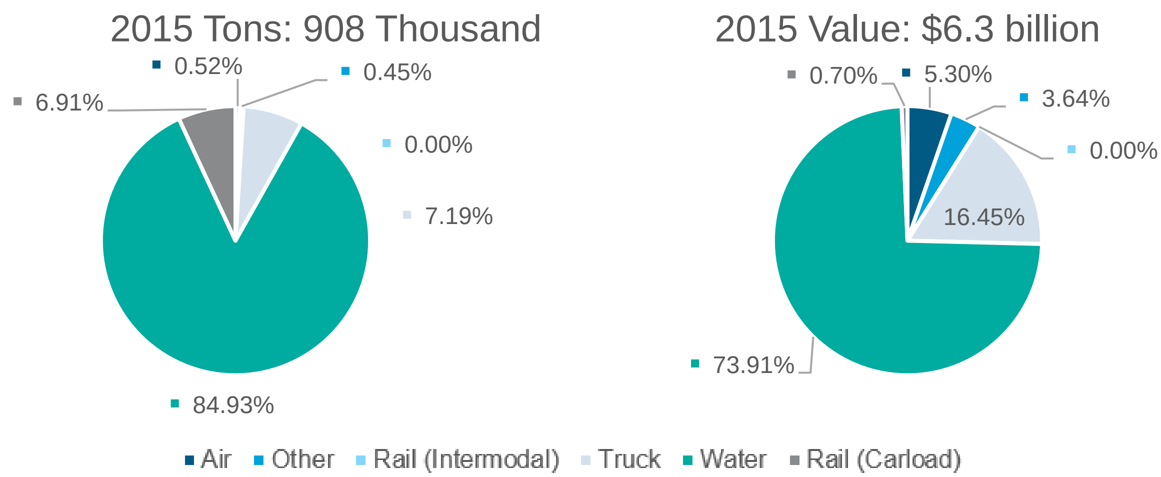


Figure 13. Foreign Trade Freight Flows by Mode and Volume, 2015

Figure 14. Foreign Trade Freight Flows by Mode and Value, 2015

Chemicals, Pharmaceuticals, Plastics, and Rubber was the top foreign traded commodity group by volume in 2015 with more than 230,000 tons, which represented 26 percent of the total foreign trade volume, as shown in **Figure 15**. By 2045 it is forecasted to increase by 183 percent, which would be about 28 percent of the total foreign trade by volume and remain the top foreign traded commodity group by volume. Aggregates was also a high volume foreign traded commodity with about 200 thousand tons of freight traded in 2015, making it the second highest traded commodity in 2015. However, Aggregates is forecasted to have the least growth (45 percent) by 2045 compared to all the other trade commodities, with the exception of Energy Products which is forecasted to decline by 80 percent. By 2045, all of the other commodities are forecasted to grow in volume by more than 120 percent, and by as much as 410 percent. As a result, Aggregates is projected to drop to the third most traded commodity in 2045 and Machinery, Electric, and Precision Instruments is projected to become the second most traded commodity.

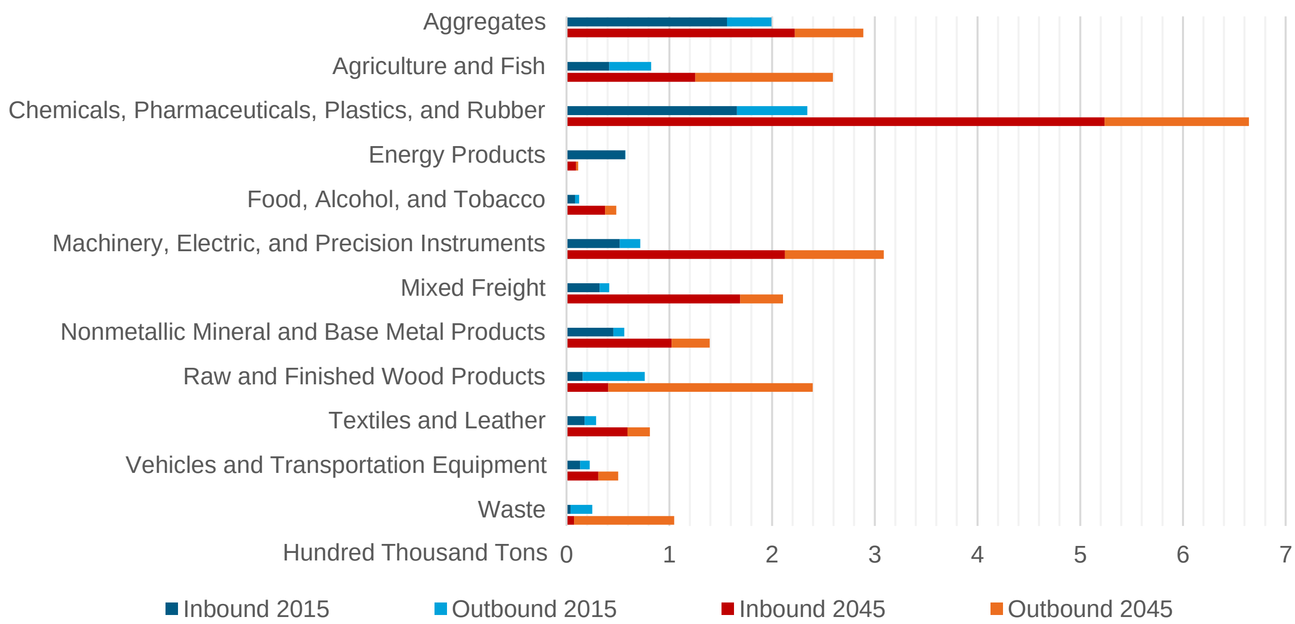


Figure 15. Foreign Trade Commodity Volumes, 2015 and 2045

By value, Machinery, Electric, and Precisions Instruments accounted for 30 percent of the total value of foreign trade value with $1.0 billion, as shown in **Figure 16**. By 2045, the same commodity group is forecasted to account for 36 percent of the total value of foreign trade with over $3.5 billion (243 percent growth). Chemicals, Pharmaceuticals, Plastics, and Rubber and Mixed Freight were the second and third highest traded commodities by value in 2015 at $673 and $610 million, respectively. These two commodities are forecasted to grow in value by 164 percent to $1.8 billion and 212 percent to $1.9 billion, respectively, by 2045. Similar to the projected growth in volume, all of the other trade commodities are anticipated to grow in value by more than 110 percent, and as much as 250 percent, by 2045 with the exception of Aggregates and Energy products, which are forecasted to grow by 75 percent and decrease by 82 percent, respectively, in value by 2045. The corridor's foreign trade imports in 2015 accounted for the majority of foreign trade volume at 67 percent or 609,000 tons, and value at 56 percent or $1.9 billion.

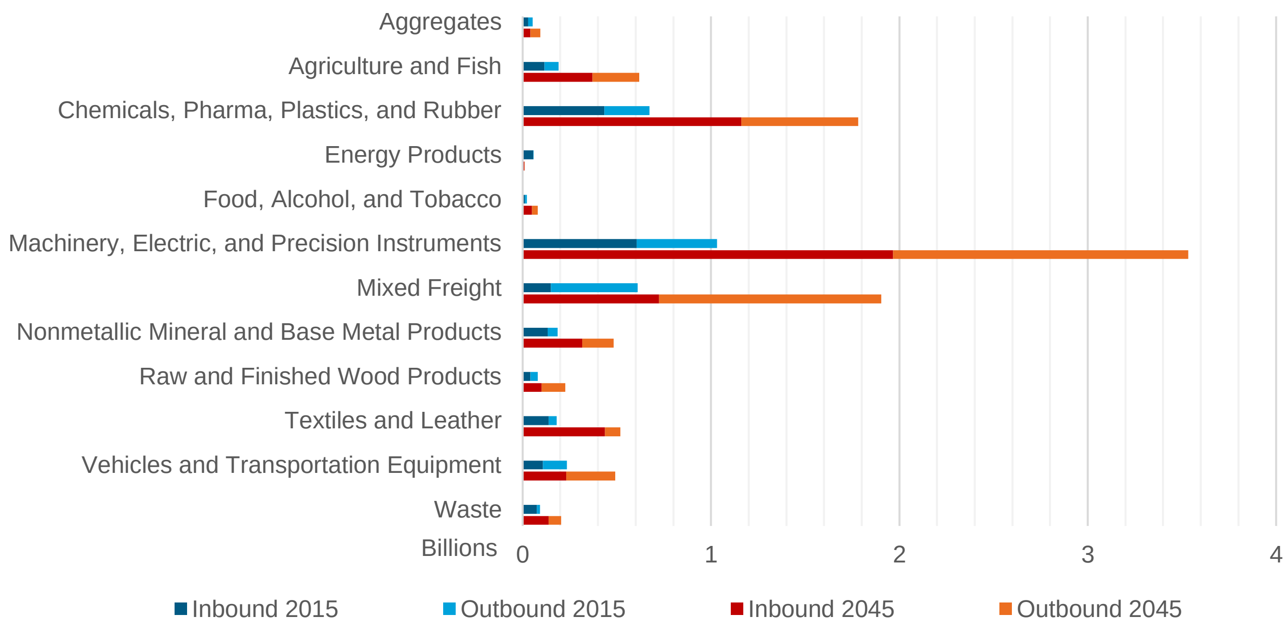


Figure 16. Foreign Trade Commodity Values, 2015 and 2045

Canada was the corridor's top foreign trade partner by volume in 2015 with about 258,000 tons, or 28 percent of the total trade volume, as shown in **Figure 17**. While Eastern Asia was ranked second in 2015 with 205,000 tons, it is forecasted to be the top trade partner by volume in 2045 with 709,000 tons compared to Canada's 570,000 tons. Europe ranked third by volume with almost 153,000 tons in 2015 and 279,000 tons in 2045. The Rest of the Americas and Southwest and Central Asia are forecasted to increase at a higher volume rate than Europe to reach approximately 266,000 and 270,000 tons, respectively, by 2045.

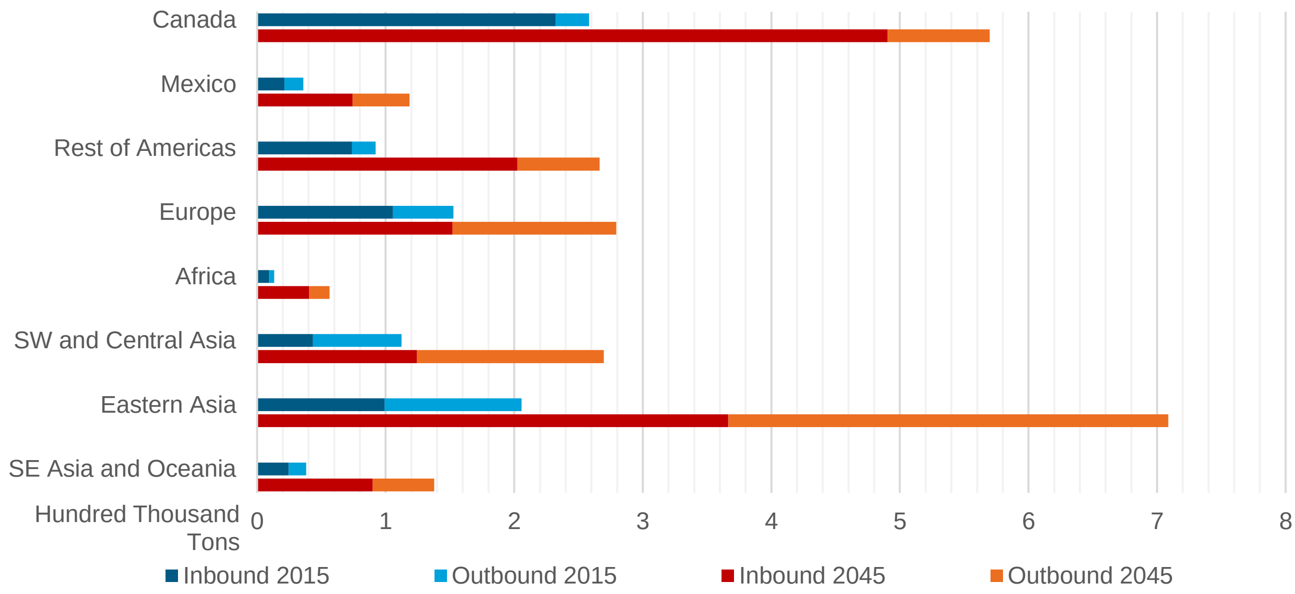


Figure 17. Foreign Trade Partners by Volume, 2015 and 2045

In 2015, Eastern Asia and Europe were the top ranked trade partner by value, worth over $1.0 billion and $684 million, respectively. By 2045, the value of goods is forecasted to grow to $3.2 billion for Eastern Asia and $2.1 billion for Europe. While Canada ranked first in terms of the volume of goods in 2015, it only ranked fourth in value, worth a total of $338 million. Trade with Canada is forecasted to be worth $1.1 billion in 2045, placing it third behind Eastern Asia and Europe, as shown in **Figure 18**.

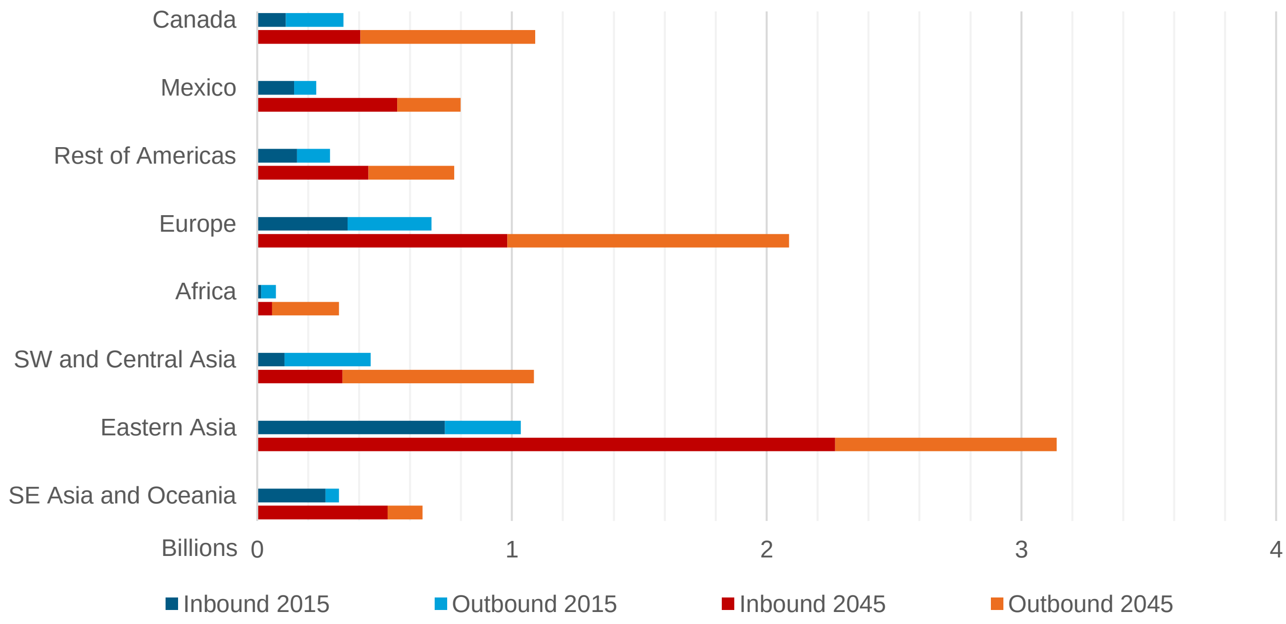


Figure 18. Foreign Trade Partners by Value, 2015 and 2045

4. Highway Safety and Environmental Resiliency

U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 is a key multimodal transportation corridor with a principal mobility expectation to provide safe and reliable travel.

4.1. Corridor Safety

NCDOT planning level safety scoring data from 2015-2019 was analyzed along U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 to identify areas of potential safety concern. Safety scores are based on three components: the class density ratio, the severity index, and the critical crash rate ratio.[4] The points from the three safety score components are averaged. Section safety scores are grouped into three point ranges where higher scores are considered to have the poorer highway safety performance. **Table 14** shows the number of miles along U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 by safety score. Maps of the planning level safety scores along U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 are included in Appendix B.

Table 14. Planning Level Section Safety Scores along U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 from 2015-2019

Section Safety Score**	Length of Corridor per Safety Score (miles)*
0 to 33	10.9
33 to 66	22.9
66 to 100	52.9
Less than 60% Mileposted***	0.1

*Section safety scores were calculated on existing roadways for the portion of the corridor that is not yet existing or under construction.
**Higher scores are considered to have poorer highway safety performance.
***Routes having a mileposted crash percentage of 60% or lower were not scored.

4.2. Corridor Resiliency

The resiliency of U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 is critical to achieving the goal of providing safe and reliable travel. The resiliency is defined by the corridor's ability to continue to provide service during natural disasters and weather events and to recover from crashes, accidents, and other safety concerns in a timely manner.

Environmental resiliency along the corridor was analyzed using North Carolina Flood Risk Information System (FRIS) floodplain data, historic flood events catalogued in the NCDOT Drive N.C. database from 2011 to 2019, and road inundation incidents. A summary of the FRIS flood zones are shown in **Table 15** by the miles of the corridor that are within the floodway, 100-year floodplain, and the 500-year floodplain. Of the corridor's entire length of 101 miles, only about 11 of those miles are within flood zones. Maps of the flood zones along U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 are included in Appendix C.

[4] **Class Density Ratio**: The crash density of the study area versus the average crash density of similar facilities.
Severity Index: A measure of the severity of a crash or series of crashes Locations with a high severity index have higher than average injury rates and/or more severe injuries.
Critical Crash Rate Ratio: The actual crash rate for the study area versus the critical crash rate.

Table 15. Flood Zone Summary

Flood Zone	Length of Corridor in Flood Zone (feet)
Floodway	10,973.8
100-Year Floodplain	25,826.2
500-Year Floodplain	18,898.9
Total	**55,698.9**

Note: total corridor length: 532,237 feet
**Inclusive of floodway*
***Inclusive of floodway and 100-year floodplain*

Roadway flood incidents that occurred along U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 are shown in **Table 16**. A total of 19 flood incidents were recorded along U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 from 2011 to 2019. These incidents were caused by Hurricanes Matthew and Florence and resulted in impassable road conditions and instances where afflicted segments of the corridor were closed. Maps of the flood incidents along U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 are included in Appendix C.

Table 16. Flood Incident Summary

Incident ID	County	Route	Date	Road Condition	Incident Type	Event Name
492781	Pitt	N.C. 11	10/9/2016	Road Closed	Weather Event	Hurrricane Matthew
493403	Lenoir	N.C. 11	10/10/2016	Road Closed with Detour	Weather Event	Hurrricane Matthew
493643	Pitt	N.C. 11	10/11/2016	Road Closed	Weather Event	Hurrricane Matthew
493730	Lenoir	N.C. 11	10/12/2016	Road Closed	Weather Event	Hurrricane Matthew
493845	Lenoir	U.S. 258	10/12/2016	Road Closed with Detour	Weather Event	Hurrricane Matthew
505688	Lenoir	N.C. 11	5/2/2017	Road Closed with Detour	Weather Event	None
542596	Lenoir	N.C. 11	9/14/2018	Road Impassable	Weather Event	Hurricane Florence
542728	Lenoir	N.C. 11	9/14/2018	Road Impassable	Weather Event	Hurricane Florence
542798	Lenoir	U.S. 258	9/15/2018	Road Impassable	Weather Event	Hurricane Florence
542803	Lenoir	U.S. 258	9/15/2018	Road Impassable	Weather Event	Hurricane Florence
542818	Jones	U.S. 258	9/15/2018	Road Impassable	Weather Event	Hurricane Florence
543154	Lenoir	U.S. 258	9/15/2018	Road Impassable	Weather Event	Hurricane Florence
543155	Lenoir	U.S. 258	9/15/2018	Road Impassable	Weather Event	Hurricane Florence
543157	Lenoir	U.S. 258	9/15/2018	Road Impassable	Weather Event	Hurricane Florence
543194	Lenoir	U.S. 258	9/15/2018	Road Impassable	Weather Event	Hurricane Florence
543839	Lenoir	N.C. 11	9/16/2018	Road Closed	Weather Event	Hurricane Florence
544733	Onslow	U.S. 258	9/18/2018	Road Closed	Weather Event	Hurricane Florence
545075	Lenoir	U.S. 258	9/20/2018	Road Closed	Weather Event	Hurricane Florence
545316	Lenoir	N.C. 11	9/21/2018	Road Impassable	Weather Event	Hurricane Florence

*Flood incidents were collected on existing roadways for the portion of the corridor that is not yet existing or under construction.

In addition to the historic flood incidents, road inundation incidents were analyzed along U.S. 13/U.S. 264/N.C. 11/C.F. Harvey Pkwy/U.S. 258 by segment. Segments were defined by clusters of data points for the "100" recurrence interval. Recurrence intervals are the estimated average time between when inundation events caused by flooding are likely to occur; this metric is used for risk analysis. Lower recurrence intervals typically correspond to greater risks of inundation. Road inundation incidents were analyzed at the 10, 25, 50, and 100-year recurrence intervals. **Table 17** summarizes the road inundation incidents by each recurrence intervals' average and maximum depths—where depth is the measure of water flooding a roadway—and the length of the corridor inundated, all per segment. The total of each recurrence interval is also included in the table. Maps of the road inundation incidents along the corridor are included in Appendix C.

Table 17. Road Inundation Incident Summary

Recurrence Interval**	Route*	Average Depth of Inundation (ft)***	Maximum Depth	Linear Feet Inundated (ft)	Percent of Corridor Inundated
Segment 1					
10	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
50	U.S. 264	0.2	0.4	900	0.17%
100	U.S. 264	1.1	1.8	2000	0.38%
Segment 2					
10	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
50	N/A	N/A	N/A	N/A	N/A
100	N.C. 11	0.3	0.5	1550	0.29%
Segment 3					
10	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
50	U.S. 258 & U.S. 70	0.2	0.4	235	0.04%
100	U.S. 258 & U.S. 70	1.2	1.9	700	0.13%
Segment 4					
10	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
50	U.S. 70 & U.S. 70 BUS	0.6	1.0	1100	0.21%
100	U.S. 70 & U.S. 70 BUS	1.8	2.4	1450	0.27%
Segment 5					
10	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
50	U.S. 70	0.4	1.5	6150	1.16%
100	U.S. 70	1.5	2.9	8450	1.59%
Segment 6					
10	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
50	N/A	N/A	N/A	N/A	N/A
100	U.S. 70	0.4	0.8	500	0.09%

*Road inundation incidents were collected on existing roadways for the portion of the corridor that is not yet existing or under construction.
**Gray represents each segment's design frequency as defined in Table 7-1 of the NCDOT Guidelines for Drainage Studies and Hydraulic Design, included in Appendix D.
***"N/A" indicates that there are no road inundation incidents in a given recurrence interval in the segment.

Table 16. Road Inundation Incident Summary (Continued)

Recurrence Interval**	Route*	Average Depth of Inundation (ft)***	Maximum Depth	Linear Feet Inundated (ft)	Percent of Corridor Inundated
Segment 7					
10	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
50	U.S. 258	0.2	0.3	300	0.06%
100	U.S. 258, U.S. 70, & U.S. 70 BUS	0.9	1.6	3660	0.69%
Segment 8					
10	U.S. 258	0.4	0.6	100	0.02%
25	U.S. 258	0.8	1.1	150	0.03%
50	U.S. 258	0.7	1.2	250	0.05%
100	U.S. 258	0.9	1.3	250	0.05%
Segment 9					
10	N/A	N/A	N/A	N/A	N/A
25	N/A	N/A	N/A	N/A	N/A
50	N/A	N/A	N/A	N/A	N/A
100	N.C. 24 BUS	0.2	0.2	150	0.03%
Total					
10	N/A	0.4	0.6	100	0.02%
25	N/A	0.8	1.1	150	0.03%
50	N/A	0.4	1.5	8935	1.68%
100	N/A	0.9	2.9	18710	3.52%

*Road inundation incidents were collected on existing roadways for the portion of the corridor that is not yet existing or under construction.
**Gray represents each segment's design frequency as defined in Table 7-1 of the NCDOT Guidelines for Drainage Studies and Hydraulic Design, included in Appendix D.
***"N/A" indicates that there are no road inundation incidents in a given recurrence interval in the segment.

Appendix A

NCDOT Level of Service D Standards for Systems and Level Planning

Level of Service D Standards for Systems Level Planning

Updated 10/14/2011

Level of Service A

Driver Comfort: High

Maximum Density:

12 passenger cars per mile per lane

Level of Service B

Driver Comfort: High

Maximum Density:

20 passenger cars per mile per lane

Level of Service C

Driver Comfort: Some Tension

Maximum Density:

30 passenger cars per mile per lane

Level of Service D

Driver Comfort: Poor

Maximum Density:

42 passenger cars per mile per lane

Level of Service E

Driver Comfort: Extremely Poor

Maximum Density:

67 passenger cars per mile per lane

Level of Service F

Driver Comfort: The lowest

Maximum Density:

More than 67 passenger cars per mile per lane

General Disclaimer

The Level of Service D Standards for Systems Level Planning was derived from the 2005 North Carolina Level of Service (NCLOS) Version 2.1 Program developed by the Institute for Transportation Research and Education (ITRE) at North Carolina State University. The NCLOS Program is based on the 2000 Highway Capacity Manual, published by the Transportation Research Board (TRB).

These standards are intended for **systems level planning only**. Many assumptions are made and documented in the development of these standards.

CTP FACILITY TYPES

FREEWAYS represent a multi-lane divided facility with complete access control (interchanges only and no traffic signals).

EXPRESSWAYS represent a multi-lane divided facility with a high level of access control (interchanges, limited at-grade intersections, right-in/right out access, and no traffic signals).

BOULEVARDS represent a typically divided facility with moderate access control (at-grade intersections, right-in/right out access, and traffic signals at major intersections).

OTHER MAJOR THOROUGHFARES represent undivided facilities with four or more lanes (US and NC routes may have less than 4 lanes). These facilities typically have low access control (at-grade intersections, access to development, and traffic signals at major and some minor intersections).

MINOR THOROUGHFARES represent a 2-to-3 lane undivided facility that is not signed as a US or NC route. These facilities typically have low access control (at-grade intersections, access to development, and traffic signals at major and minor intersections).

NCLOS (HCM) FACILITY TYPES

FREEWAYS (Freeways) represent a multi-lane divided facility with complete access control (interchanges only and no traffic signals).

EXPRESSWAYS (Multi-lane Highways) represent a multi-lane divided facility with a high level of access control (interchanges, limited at-grade intersections, right-in/right out access, and no traffic signals).

BOULEVARDS (Arterials, 25-55 MPH) represent a typically divided facility with moderate access control (at-grade intersections, right-in/right out access, and traffic signals at major intersections).

OTHER MAJOR THOROUGHFARES (Arterials, 25-55 MPH) represent undivided facilities with four or more lanes (US and NC routes may have less than 4 lanes). These facilities typically have low access control (at-grade intersections, access to development, and traffic signals at major and some minor intersections). These facilities are typically within an urban or suburban area (e.g. within a municipality or ETJ).

MINOR THOROUGHFARES (Arterials 25-55 MPH) represent a 2-to-3 lane undivided facility that is not signed as a US or NC route. These facilities typically have low access control (at-grade intersections, access to development, and traffic signals at major and minor intersections). These facilities are typically within an urban or suburban area (e.g. within a municipality or ETJ).

RURAL 2-LANE HIGHWAY (Two-Lane Highway, 55 MPH ONLY) represents a 2-lane undivided facility outside of a municipality or ETJ. These facilities have a 55 MPH posted speed limit, have low access control with numerous driveways and no traffic signals. These facilities are classified in a CTP as **other major thoroughfares** if they are a **US or NC route** or **minor thoroughfares** if they are a **secondary or local** route.

AREA TYPE

RURAL represents an area outside a municipality or Extraterritorial Jurisdiction (ETJ).

SUBURBAN represents an area within a municipality or ETJ that is not within a Central Business District (CBD) or areas immediately surrounding a CBD.

URBAN represents an area that is within a CBD or areas immediately surrounding a CBD.

LEVEL OF SERVICE D VALUES

MINIMUM CAPACITY VALUES represents conditions/inputs that result in a worst-case Level of Service D for a given facility. This lower value represents worst-case conditions in available data for a given region (Higher K/D Factors, Lower Peak Hour Factor, poor road conditions, etc.).

STANDARD CAPACITY VALUES represents an average Level of Service D for a given facility. This default value is an average of available data for a given region.

MAXIMUM CAPACITY VALUES represents conditions/inputs that result in a best-case Level of Service D for a given facility. This higher value represents best-case conditions in available data for a given region (Lower K/D Factors, Higher Peak Hour Factor, etc.).

These assumptions may not pertain to all systems level planning work; therefore, separate analysis may need to be conducted on a case-by-case basis.

These standards are **not** intended for project specific or corridor analysis. Separate analysis would be required for these types of projects.

Volumes shown represent the point at which traffic transitions from LOS D to LOS E.

Level of Service D Standards for Freeways *

COASTAL	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**67400**	**66900**	**67900**	**102000**	**101300**	**101800**	**137300**	**136200**	**135700**
6-10% Trucks	**65700**	**65400**	**66200**	**99600**	**98900**	**99400**	**134000**	**133000**	**132500**
11-15% Trucks	**64200**	**63800**	**64700**	**97300**	**96600**	**97100**	**130900**	**129900**	**129400**
16-20% Trucks	**62800**	**62400**	**63200**	**95100**	**94400**	**94900**	**127900**	**126900**	**126500**
21-25% Trucks	**61400**	**61000**	**61800**	**9300**	**92300**	**92700**	**125100**	**124100**	**123700**
26-30% Trucks	**60000**	**59700**	**60500**	**90900**	**90300**	**90700**	**122400**	**121400**	**121000**
31-35% Trucks	**58800**	**58400**	**59200**	**89000**	**88400**	**88800**	**119800**	**118800**	**118400**

PIEDMONT	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**61700**	**61400**	**62200**	**93500**	**92900**	**93300**	**125800**	**124900**	**124400**
6-10% Trucks	**60300**	**59900**	**60700**	**91300**	**90700**	**91100**	**122800**	**121900**	**121500**
11-15% Trucks	**58900**	**58500**	**59300**	**89200**	**88600**	**89000**	**120000**	**119100**	**118600**
16-20% Trucks	**57500**	**57200**	**58000**	**87100**	**86500**	**87000**	**117300**	**116400**	**115900**
21-25% Trucks	**56300**	**55900**	**56700**	**85200**	**84600**	**85000**	**114700**	**113800**	**113400**
26-30% Trucks	**55000**	**54700**	**55400**	**83400**	**82800**	**83200**	**112200**	**111300**	**110900**
31-35% Trucks	**53900**	**53500**	**54300**	**81600**	**81000**	**81400**	**109800**	**108900**	**108500**

MOUNTAIN (Level Terrain)	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**56100**	**61400**	**62200**	**85000**	**92900**	**93300**	**114400**	**124900**	**124400**
6-10% Trucks	**54800**	**59900**	**60700**	**83000**	**90700**	**91100**	**111700**	**121900**	**121500**
11-15% Trucks	**53500**	**58500**	**59300**	**81100**	**88600**	**89000**	**109100**	**119100**	**118600**
16-20% Trucks	**52300**	**57200**	**58000**	**79200**	**86500**	**87000**	**106600**	**116400**	**115900**
21-25% Trucks	**51100**	**55900**	**56700**	**77500**	**84600**	**85000**	**104200**	**113800**	**113400**
26-30% Trucks	**50000**	**54700**	**55400**	**75800**	**82800**	**83200**	**102000**	**111300**	**110900**
31-35% Trucks	**49000**	**53500**	**54300**	**74200**	**81000**	**81400**	**99800**	**108900**	**108500**

MOUNTAIN (Rolling Terrian)	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**53500**	**58500**	**59300**	**81100**	**88600**	**89000**	**109100**	**119100**	**118600**
6-10% Trucks	**50000**	**54700**	**55400**	**75800**	**82800**	**83200**	**102000**	**111300**	**110900**
11-15% Trucks	**47000**	**51400**	**52100**	**71100**	**77700**	**78100**	**95700**	**104500**	**104100**
16-20% Trucks	**44300**	**48400**	**49000**	**67000**	**73200**	**73600**	**90200**	**98500**	**98100**
21-25% Trucks	**41800**	**45700**	**46400**	**63400**	**69200**	**69600**	**85300**	**93100**	**92700**
26-30% Trucks	**39700**	**43400**	**44000**	**60100**	**65700**	**66000**	**80900**	**88300**	**87900**
31-35% Trucks	**37700**	**41200**	**41800**	**57100**	**62400**	**62700**	**76900**	**83900**	**83600**

Uses "Freeways" Facility Type in NCLOS
*** Assumes Regional K and D Factor Averages**

See Appendix A1 for HCM 2000 Freeway Equations
Use Appendix A2: Coastal Freeway Inputs for adjustments
Use Appendix A3: Piedmont Freeway Inputs for adjustments
Use Appendix A4: Mountain (Level) Freeway Inputs for adjustments
Use Appendix A5: Mountain (Rolling) Freeway Inputs for adjustments

NOTE: Truck percentage occurs within the peak hour, not a daily truck percentage

Level of Service D Standards for Expressways *

COASTAL	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**47500**	**58500**	**58800**	**71200**	**87700**	**88300**	**95000**	**117000**	**117700**
6-10% Trucks	**46400**	**57100**	**57400**	**69500**	**85600**	**86200**	**92700**	**114200**	**114900**
11-15% Trucks	**45300**	**55800**	**56100**	**67900**	**83700**	**84200**	**90600**	**111500**	**112200**
16-20% Trucks	**44200**	**54500**	**54800**	**66400**	**81800**	**82200**	**88500**	**109000**	**109700**
21-25% Trucks	**43300**	**53300**	**53600**	**64900**	**79900**	**80400**	**86500**	**106600**	**107200**
26-30% Trucks	**42300**	**52100**	**52400**	**63500**	**78200**	**78700**	**84700**	**104300**	**104900**
31-35% Trucks	**41400**	**51000**	**51300**	**62100**	**76500**	**77000**	**82900**	**102100**	**102700**

PIEDMONT	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**47500**	**58500**	**58800**	**71200**	**87700**	**88300**	**95000**	**117000**	**117700**
6-10% Trucks	**46400**	**57100**	**57400**	**69500**	**85600**	**86200**	**92700**	**114200**	**114900**
11-15% Trucks	**45300**	**55800**	**56100**	**67900**	**83700**	**84200**	**90600**	**111500**	**112200**
16-20% Trucks	**44200**	**54500**	**54800**	**66400**	**81800**	**82200**	**88500**	**109000**	**109700**
21-25% Trucks	**43300**	**53300**	**53600**	**64900**	**79900**	**80400**	**86500**	**106600**	**107200**
26-30% Trucks	**42300**	**52100**	**52400**	**63500**	**78200**	**78700**	**84700**	**104300**	**104900**
31-35% Trucks	**41400**	**51000**	**51300**	**62100**	**76500**	**77000**	**82900**	**102100**	**102700**

MOUNTAIN (Level Terrain)	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**47500**	**53200**	**58800**	**71200**	**79800**	**88300**	**95000**	**106400**	**117700**
6-10% Trucks	**46400**	**51900**	**57400**	**69500**	**77900**	**86200**	**92700**	**103800**	**114900**
11-15% Trucks	**45300**	**50700**	**56100**	**67900**	**76100**	**84200**	**90600**	**101400**	**112200**
16-20% Trucks	**44200**	**49500**	**54800**	**66400**	**74300**	**82200**	**88500**	**99100**	**109700**
21-25% Trucks	**43300**	**48400**	**53600**	**64900**	**72700**	**80400**	**86500**	**96900**	**107200**
26-30% Trucks	**42300**	**47400**	**52400**	**63500**	**71100**	**78700**	**84700**	**94800**	**104900**
31-35% Trucks	**41400**	**46400**	**51300**	**62100**	**69600**	**77000**	**82900**	**92800**	**102700**

MOUNTAIN (Rolling Terrian)	2 Lanes Per Direction			3 Lanes Per Direction			4 Lanes Per Direction		
	Urban	Suburban	Rural	Urban	Suburban	Rural	Urban	Suburban	Rural
0-5% Trucks	**41200**	**50700**	**56100**	**61700**	**76100**	**84200**	**82300**	**101400**	**112200**
6-10% Trucks	**38500**	**47400**	**52400**	**57700**	**71100**	**78700**	**77000**	**94800**	**110400**
11-15% Trucks	**36100**	**44500**	**49200**	**54200**	**66700**	**73900**	**72200**	**89000**	**98500**
16-20% Trucks	**34000**	**41900**	**46400**	**51100**	**62900**	**69600**	**68100**	**83900**	**92800**
21-25% Trucks	**32200**	**39600**	**43900**	**48300**	**59500**	**65800**	**64400**	**79300**	**87700**
26-30% Trucks	**30500**	**37600**	**41600**	**45800**	**56400**	**62400**	**61000**	**75200**	**83200**
31-35% Trucks	**29000**	**35700**	**39600**	**43500**	**53600**	**59300**	**58000**	**71500**	**79100**

Uses "Multi-lane Highways" Facility Type in NCLOS
*** Assumes Regional K and D Factor Averages**

See Appendix B1 for HCM 2000 Multi-lane Highway Equations
Use Appendix B2: Coastal Expressway Inputs for adjustments
Use Appendix B3: Piedmont Expressway Inputs for adjustments
Use Appendix B4: Mountain (Level) Expressway Inputs for adjustments
Use Appendix B5: Mountain (Rolling) Expressway Inputs for adjustments

NOTE: Truck percentage occurs within the peak hour, not a daily truck percentage

Level of Service D Standards for Boulevards *

COASTAL	1 Lane Per Direction				2 Lanes Per Direction				3 Lanes Per Direction		
	Urban	Suburban	Rural		Urban	Suburban	Rural		Urban	Suburban	Rural
55 MPH	**21600**	**21900**	**24500**		**43300**	**43900**	**49000**		**64900**	**65800**	**73500**
45 MPH	**18900**	**19800**	**23600**		**38100**	**39700**	**47200**		**57200**	**59600**	**70800**
35 MPH	**14000**	**16900**			**28100**	**34300**			**42200**	**51700**	
25 MPH	**12500**				**25400**				**38400**		

PIEDMONT	1 Lane Per Direction				2 Lanes Per Direction				3 Lanes Per Direction		
	Urban	Suburban	Rural		Urban	Suburban	Rural		Urban	Suburban	Rural
55 MPH	**19900**	**20200**	**22600**		**40000**	**40500**	**45200**		**59900**	**60700**	**67900**
45 MPH	**17500**	**18300**	**21800**		**35100**	**36600**	**43600**		**52800**	**55000**	**65400**
35 MPH	**14000**	**15600**			**28100**	**31600**			**42200**	**47700**	
25 MPH	**12500**				**25400**				**38400**		

MOUNTAIN	1 Lane Per Direction				2 Lanes Per Direction				3 Lanes Per Direction		
	Urban	Suburban	Rural		Urban	Suburban	Rural		Urban	Suburban	Rural
55 MPH	**21600**	**21900**	**22300**		**43300**	**43900**	**44500**		**64900**	**65800**	**66800**
45 MPH	**18900**	**20700**	**21400**		**38100**	**41400**	**42900**		**57200**	**62100**	**64400**
35 MPH	**14000**	**18500**			**28100**	**37400**			**42200**	**56400**	
25 MPH	**12500**				**25400**				**38400**		

Uses "Principal Arterials" Facility Type in NCLOS
*** Assumes Regional K and D Factor Averages**

See Appendix C1 for HCM Urban Arterial Equations
Use Appendix C2: Coastal Boulevard Inputs for adjustments
Use Appendix C3: Piedmont Boulevard Inputs for adjustments
Use Appendix C4: Mountain Boulevard Inputs for adjustments

NOTE: Inputs assume 12-foot lanes. To adjust lane-width downward, subtract 3.33% per foot of pavement and round to the nearest hundred

Coastal Level of Service D Standards for Other Major Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	15100	15800	16400		16600	17200	17800
11 foot lanes	14600	15300	15900		16100	16600	17200
10 foot lanes	14100	14700	15300		15500	16100	16600
9 foot lanes	13600	14200	14800		15000	15500	16000
45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	13200	13800	14600		14500	14900	16000
11 foot lanes	12800	13300	14100		14000	14400	15500
10 foot lanes	12300	12900	13600		13500	13900	15000
9 foot lanes	11900	12420	13140		13050	13400	14400
35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11100	12600			12700	14000	
11 foot lanes	10700	12200			12300	13500	
10 foot lanes	10400	11800			11900	13100	
9 foot lanes	10000	11300			11400	12600	
25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11000				12700		
11 foot lanes	10600				12300		
10 foot lanes	10300				11900		
9 foot lanes	9900				11400		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D2: Coastal Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement and rounded to the nearest hundred

Coastal Level of Service D Standards for Other Major Thoroughfares *

55 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	30400	31600	32800		33300	34500	35700
11 foot lanes	29400	30600	31700		32200	33400	34500
10 foot lanes	29400	29500	30600		31100	32200	33300
9 foot lanes	27400	28400	29500		30000	31100	32100
45 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	26700	27600	29300		29000	29900	32000
11 foot lanes	25900	26700	28300		28000	28900	30900
10 foot lanes	25000	25800	27300		27100	27900	29900
9 foot lanes	24000	24800	26400		26100	26900	29000
35 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22200	25500			24300	28100	
11 foot lanes	21500	24700			23500	27200	
10 foot lanes	20700	23800			22700	26200	
9 foot lanes	20000	23000			21900	25300	
25 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22100				24200		
11 foot lanes	21400				23400		
10 foot lanes	20500				22600		
9 foot lanes	19900				21800		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D2: Coastal Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement and rounded to the nearest hundred

Piedmont Level of Service D Standards
for Other Major Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12900	14600	15100		14200	15900	16500
11 foot lanes	12500	14100	14600		13700	15400	16000
10 foot lanes	12000	13600	14100		13300	14800	15400
9 foot lanes	11600	13100	13600		12800	14300	14900
45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12200	12700	14600		13300	13800	16000
11 foot lanes	11800	12300	14100		12900	13300	15500
10 foot lanes	11400	11900	13600		12400	12900	14900
9 foot lanes	11000	11400	13100		12000	12400	14400
35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11100	11600			12700	12900	
11 foot lanes	10700	11200			12300	12500	
10 foot lanes	10400	10800			11900	12000	
9 foot lanes	10000	10400			11400	11600	
25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11000				12700		
11 foot lanes	10600				12300		
10 foot lanes	10300				11900		
9 foot lanes	9900				11400		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D3: Piedmont Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Piedmont Level of Service D Standards for Other Major Thoroughfares *

55 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	25800	29100	30200		28400	31800	33000
11 foot lanes	24900	28100	29200		27500	30800	31900
10 foot lanes	24100	27200	28200		26500	29700	30800
9 foot lanes	23200	26200	27200		25600	28600	29700
45 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	24600	25500	29300		26800	27600	32000
11 foot lanes	23800	24700	28300		25900	26700	31000
10 foot lanes	23000	23800	27300		25000	25800	29900
9 foot lanes	22100	23000	26400		24100	24800	28800
35 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22200	23500			24300	26000	
11 foot lanes	21500	22700			23500	25100	
10 foot lanes	20700	21900			22700	24300	
9 foot lanes	20000	21200			21900	23400	
25 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22100				24200		
11 foot lanes	21400				23400		
10 foot lanes	20600				22600		
9 foot lanes	19900				21800		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D3: Piedmont Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement and rounded to the nearest hundred

Mountain Level of Service D Standards
for Other Major Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	14000	14600	15100		15300	15900	16500
11 foot lanes	13500	14100	14600		14800	15400	16000
10 foot lanes	13100	13600	14100		14300	14800	15400
9 foot lanes	12600	13100	13600		13800	14300	14900
45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12200	12700	14600		13300	13800	16000
11 foot lanes	11800	12300	14100		12900	13300	15500
10 foot lanes	11400	11900	13600		12400	12900	14900
9 foot lanes	11000	11400	13100		12000	12400	14400
35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11000	11600			12700	12900	
11 foot lanes	10600	11200			12300	12500	
10 foot lanes	10300	10800			11900	12000	
9 foot lanes	9900	10400			11400	11600	
25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11000				12700		
11 foot lanes	10600				12300		
10 foot lanes	10300				11900		
9 foot lanes	9900				11400		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D4: Mountains Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement and rounded to the nearest hundred

Mountain Level of Service D Standards for Other Major Thoroughfares *

55 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	28000	29100	30200		30800	31800	33000
11 foot lanes	27100	28100	29200		29800	30800	31900
10 foot lanes	26100	27200	28200		28700	29700	30800
9 foot lanes	25200	26200	27200		27700	28600	29700
45 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	24600	25500	29300		26800	27600	32000
11 foot lanes	23800	24700	28300		25900	26700	30900
10 foot lanes	23000	23800	27300		25000	25800	29900
9 foot lanes	22100	23000	26400		24100	24800	28800
35 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22200	23500			24300	26000	
11 foot lanes	21500	22700			23500	25400	
10 foot lanes	20700	21900			22700	24300	
9 foot lanes	20000	21200			21900	23400	
25 MPH	2 Lanes Per Direction				2 Lanes Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	22100				24200		
11 foot lanes	21400				23400		
10 foot lanes	20600				22600		
9 foot lanes	19900				21800		

Uses "Principal Arterials" Facility Type in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix D1 for HCM 2000 Urban Arterial Equations
Use Appendix D4: Mountains Major Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Coastal Level of Service D Standards
for Minor Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	15100	15800	16400		16600	17200	17800
11 foot lanes	14600	15300	15900		16100	16600	17200
10 foot lanes	14100	14700	15300		15500	16100	16600
9 foot lanes	13600	14200	14800		14900	15500	16000

45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12700	13300	14600		14200	14300	16000
11 foot lanes	12300	12900	14100		13700	13800	15500
10 foot lanes	11900	12400	13600		13300	13300	14900
9 foot lanes	11400	12000	13100		12800	12900	14400

35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10500	11000			11500	13700	
11 foot lanes	10200	10600			11100	13300	
10 foot lanes	9800	10300			10700	12800	
9 foot lanes	9500	9900			10400	12300	

25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10000				11300		
11 foot lanes	9700				10900		
10 foot lanes	9300				10500		
9 foot lanes	9000				10200		

Uses "Principal Arterials" and "Minor Arterials" Facility Types in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix E1 for HCM 2000 Urban Arterial Equations
Use Appendix E2: Coastal Minor Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Piedmont Level of Service D Standards for Minor Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	12900	14600	15100		14200	15900	16500
11 foot lanes	12500	14100	14600		13700	15400	16000
10 foot lanes	12000	13600	14100		13300	14800	15400
9 foot lanes	11600	13100	13600		12800	14300	14900

45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11700	12200	14600		13100	13200	16000
11 foot lanes	11300	11800	14100		12700	12800	15500
10 foot lanes	10900	11400	13600		12200	12300	14900
9 foot lanes	10500	11000	13100		11800	11900	14400

35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10200	10200			11700	12700	
11 foot lanes	9900	9900			11300	12300	
10 foot lanes	9500	9500			10900	11900	
9 foot lanes	9200	9200			10500	11400	

25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10000				11300		
11 foot lanes	9700				10900		
10 foot lanes	9300				10500		
9 foot lanes	9000				10200		

Uses "Principal Arterials" and "Minor Arterials" Facility Types in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix E1 for HCM 2000 Urban Arterial Equations
Use Appendix E3: Piedmont Minor Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Mountain Level of Service D Standards for Minor Thoroughfares *

55 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	14000	14600	15100		15300	15900	16500
11 foot lanes	13500	14100	14600		14800	15400	16000
10 foot lanes	13100	13600	14100		14300	14800	15400
9 foot lanes	12600	13100	13600		13800	14300	14900

45 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	11700	12200	14600		13100	13200	16000
11 foot lanes	11300	11800	14100		12700	12800	15500
10 foot lanes	10900	11400	13600		12200	12300	14900
9 foot lanes	10500	11000	13100		11800	11900	14400

35 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10200	10200			11500	12700	
11 foot lanes	9900	9900			11100	12300	
10 foot lanes	9500	9500			10700	11900	
9 foot lanes	9200	9200			10400	11400	

25 MPH	1 Lane Per Direction				1 Lane Per Direction WCLTL		
	Urban	Suburban	Rural		Urban	Suburban	Rural
12 foot lanes	10000				11300		
11 foot lanes	9700				10900		
10 foot lanes	9300				10500		
9 foot lanes	9000				10200		

Uses "Principal Arterials" and "Minor Arterials" Facility Types in NCLOS

*** Decrease in Lane Width Capacity calculated via 2000 Highway Capacity Manual lane-width adjustment factor for saturation flow rate**

See Appendix E1 for HCM 2000 Urban Arterial Equations
Use Appendix E4: Mountain Minor Thoroughfare Inputs for adjustments

NOTE: Lane Width is adjusted downward by 3.33% per less foot of pavement

Level of Service D Standards for Rural 2-Lane Highways

Coastal 2-Lane Highway Standard	COASTAL		
	Minimum	Standard	Maximum
12-Foot Lanes	10500	12700*	14700*#
11-Foot Lanes	10000		
10-Foot Lanes	9200	12000	
9-Foot Lanes	7700	10700	

Piedmont 2-Lane Highway Standard	PIEDMONT		
	Minimum	Standard	Maximum
12-Foot Lanes	10300	12400*	14300*#
11-Foot Lanes	9900		
10-Foot Lanes	9000	11800	
9-Foot Lanes	7500	10500	

Mountain 2-Lane Highway Standard	MOUNTAINS (Level)		
	Minimum	Standard	Maximum
12-Foot Lanes	10200	12100*	14000*#
11-Foot Lanes	9800		
10-Foot Lanes	8800	11700	
9-Foot Lanes	7400	10300	

Mountain 2-Lane Highway Standard	MOUNTAINS (Rolling)		
	Minimum	Standard	Maximum
12-Foot Lanes	9600	12100*	14000*#
11-Foot Lanes	9100		
10-Foot Lanes	8200	11100	
9-Foot Lanes	6300	9800	

Uses "2-Lane Highways" Facility Type in NCLOS

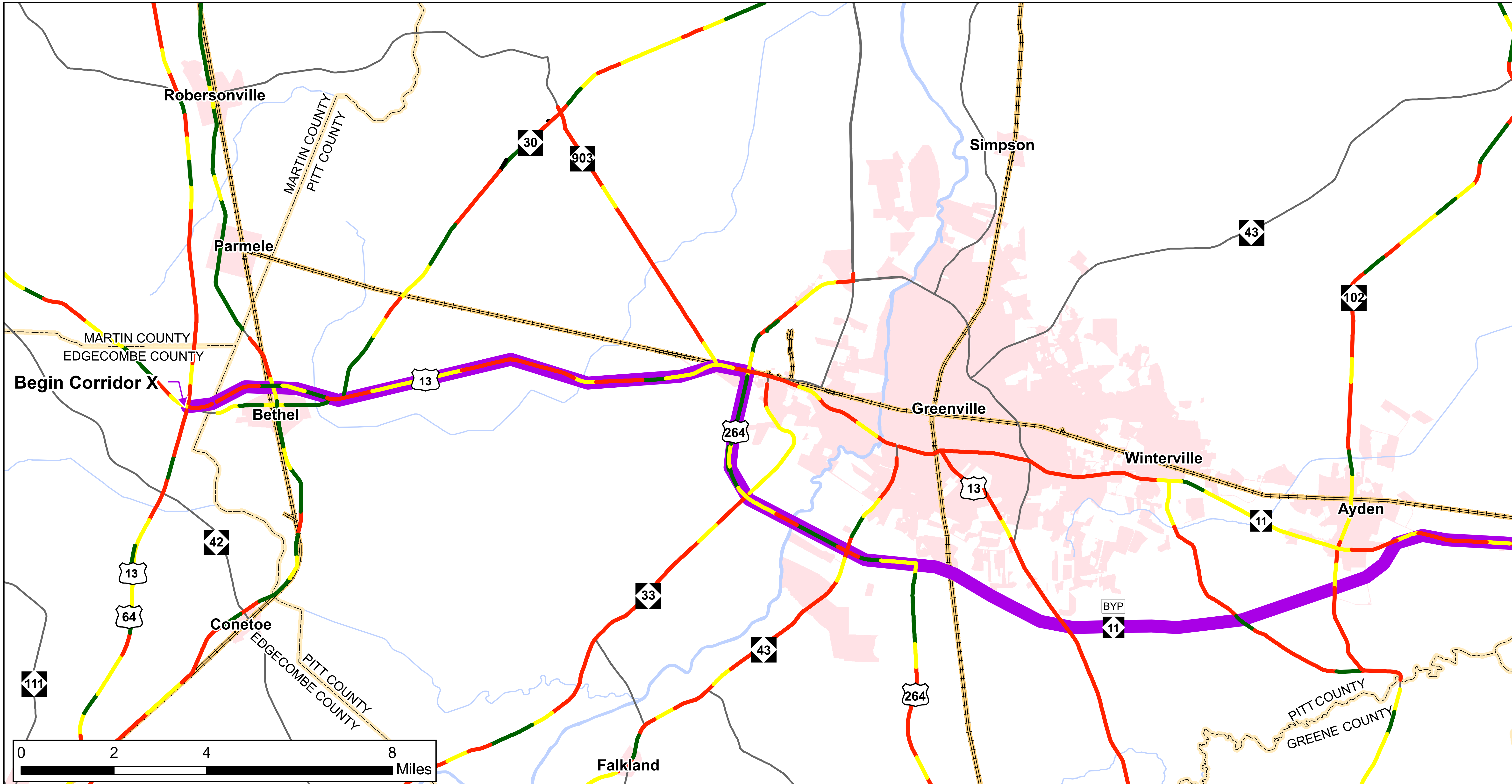
*** All capacities calculated based on HCM 2000 procedures using HCS software. Under some conditions, two-lane highway capacity is not affected by lane width. This occurs where capacity is governed by Percent Time Spent Following rather than by Average Travel Speed.**

 # Best-case/Maximum conditions are less likely to occur where lane widths are below 11 feet. Use caution before selecting "Maximum" values for 9-ft or 10-ft lanes.

See Appendix F1 for HCM 2000 2-Lane Highway Equations
Use Appendix F2: Coastal Rural 2-Lane Highway Inputs for adjustments
Use Appendix F3: Piedmont Rural 2-Lane Highway Inputs for adjustments
Use Appendix F4: Mountain (Level) Rural 2-Lane Highway Inputs for adjustments
Use Appendix F5: Mountain (Rolling) Rural 2-Lane Highway Inputs for adjustments

Appendix B

Safety Data



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

JULY 2021

Source: NCOneMap, NCDOT GIS, ESRI

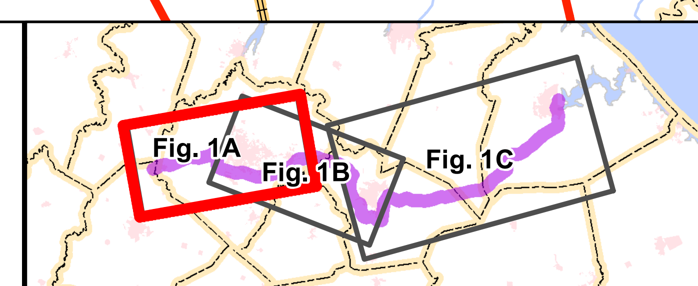
Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Rivers/Streams

Section Safety Scores (2015 - 2019)*

- 0 to 33
- 33 to 66
- 66 to 100
- Less than 60% Mileposted

- Major Water Bodies
- Municipal Boundary
- Counties

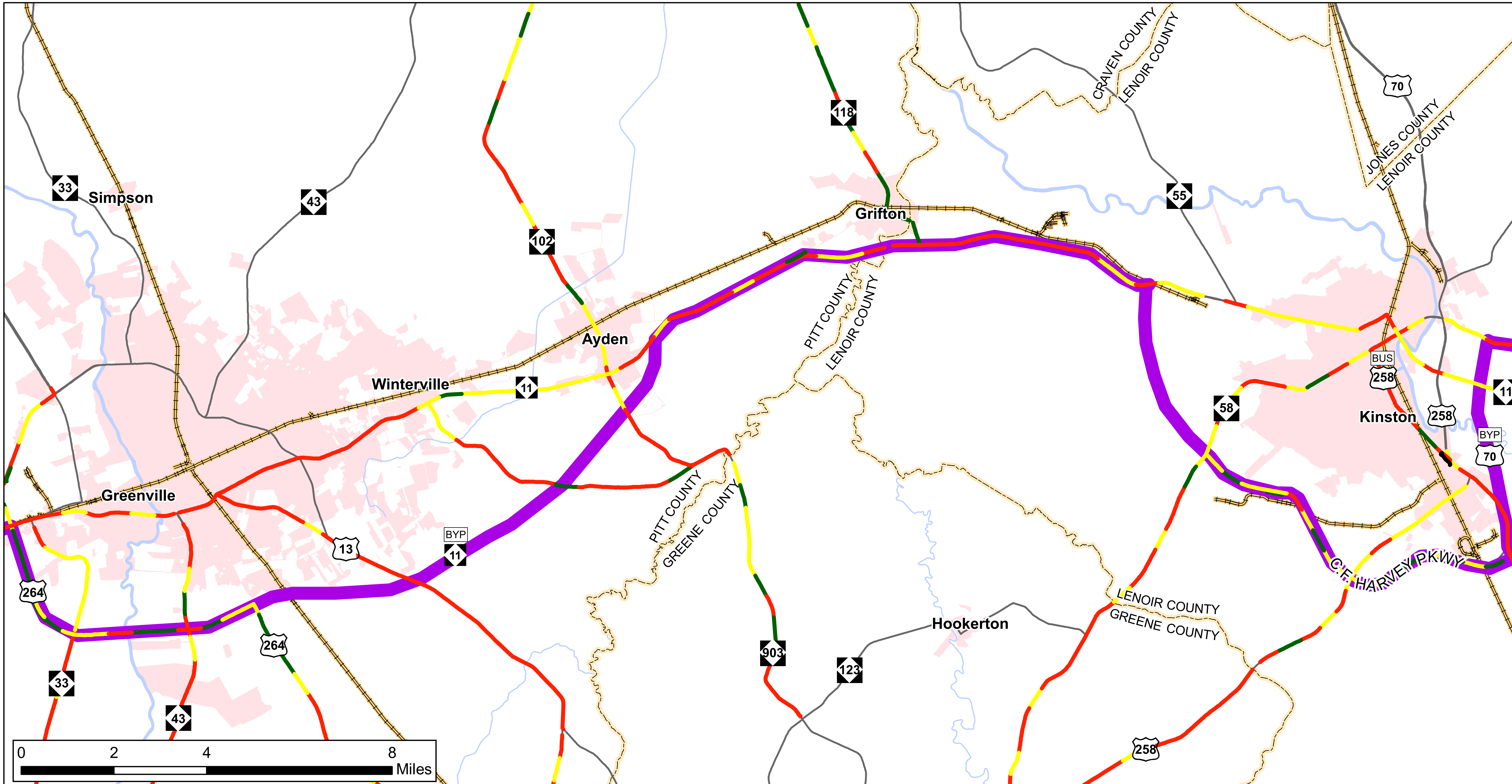


CORRIDOR X: SAFETY MAP

U.S. 13/U.S. 264/N.C. 11/ C.F. HARVEY PKWY/U.S. 258

FIGURE 1A: U.S. 13 TO GREENVILLE

*Safety scores are based on three components: the class density ratio, the severity index, and the critical crash rate ratio. The points are averaged and grouped into three point ranges where higher scores are considered to have the poorer highway safety performance. Routes having a mileposted crash percentage of 60% or lower were not scored.
Safety data is only displayed on STC Corridor P and relevant crossroads and parallel routes.



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

JULY 2021

Source: NCOneMap, NCDOT GIS, ESRI

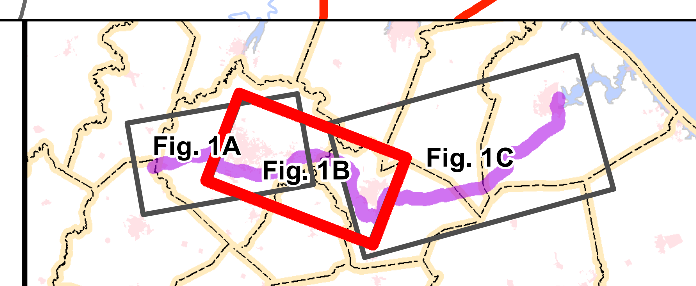
Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Rivers/Streams

Section Safety Scores (2015 - 2019)*

- 0 to 33
- 33 to 66
- 66 to 100
- Less than 60% Mileposted

- Major Water Bodies
- Municipal Boundary
- Counties

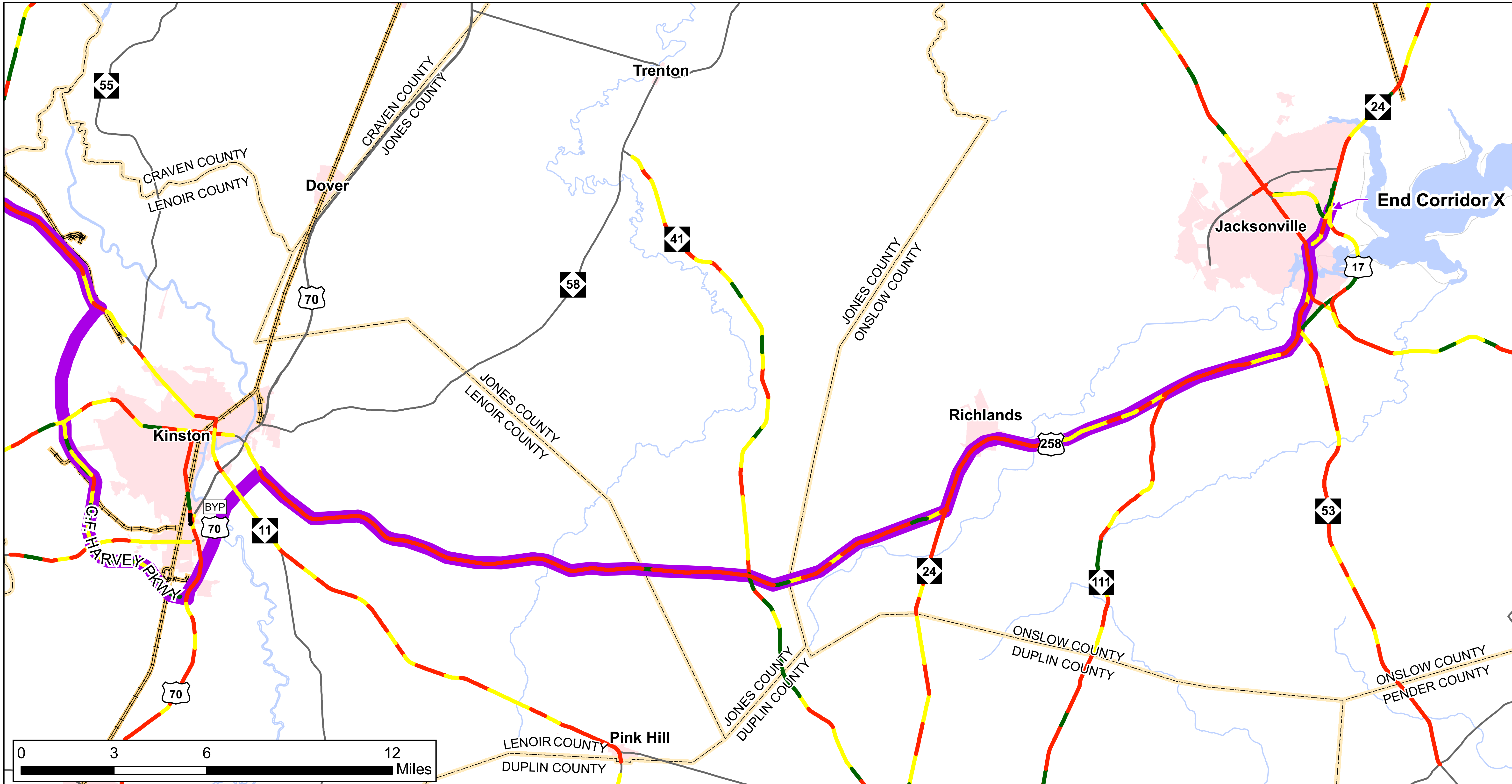


CORRIDOR X: SAFETY MAP

U.S. 13/U.S. 264/N.C. 11/ C.F. HARVEY PKWY/U.S. 258

FIGURE 1B: GREENVILLE TO KINSTON

*Safety scores are based on three components: the class density ratio, the severity index, and the critical crash rate ratio. The points are averaged and grouped into three point ranges where higher scores are considered to have the poorer highway safety performance. Routes having a mileposted crash percentage of 60% or lower were not scored.
Safety data is only displayed on STC Corridor P and relevant crossroads and parallel routes.



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

JULY 2021

Source: NCOneMap, NCDOT GIS, ESRI

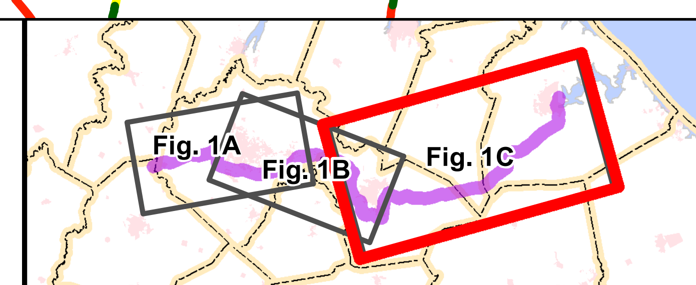
Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Rivers/Streams

Section Safety Scores (2015 - 2019)*

- 0 to 33
- 33 to 66
- 66 to 100
- Less than 60% Mileposted

- Major Water Bodies
- Municipal Boundary
- Counties



CORRIDOR X: SAFETY MAP

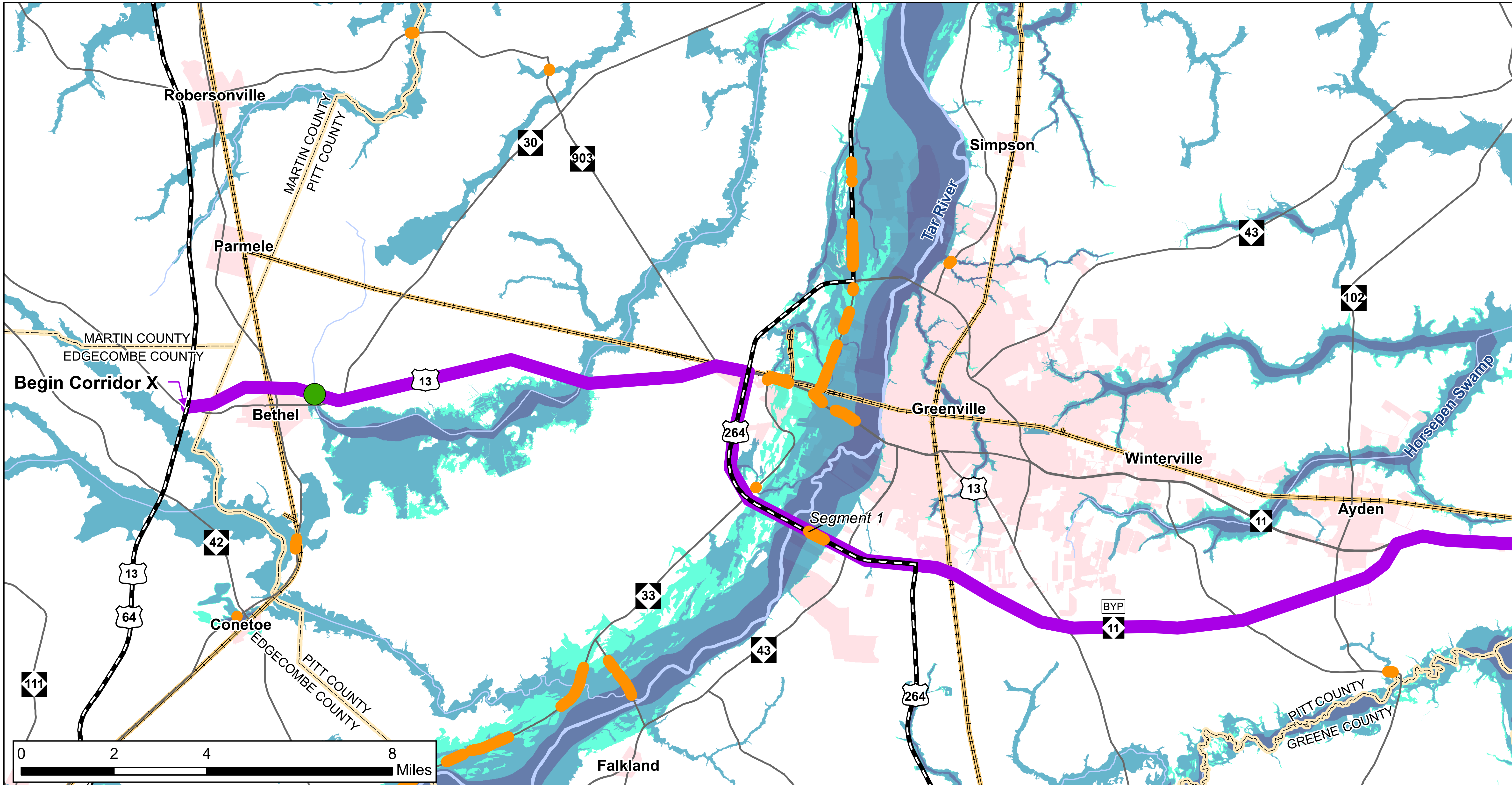
U.S. 13/U.S. 264/N.C. 11/ C.F. HARVEY PKWY/U.S. 258

FIGURE 1C: KINSTON TO JACKSONVILLE

*Safety scores are based on three components: the class density ratio, the severity index, and the critical crash rate ratio. The points are averaged and grouped into three point ranges where higher scores are considered to have the poorer highway safety performance. Routes having a mileposted crash percentage of 60% or lower were not scored.
Safety data is only displayed on STC Corridor P and relevant crossroads and parallel routes.

Appendix C

Resiliency Data



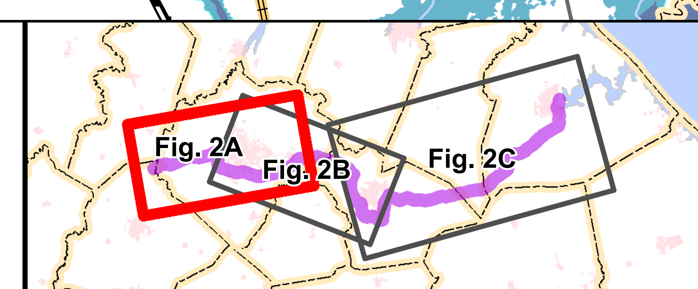
NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

JULY 2021

Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Evacuation Route
- Interstate
- U.S./N.C. Route
- Rail
- Major Rivers/Streams
- Flood Incident*
- **Road Inundation Incident****
  - 100-Year Recurrence Interval
- Major Water Bodies
- 500-Year Floodplain
- 100-Year Floodplain
- Floodway
- Municipal Boundary
- Counties



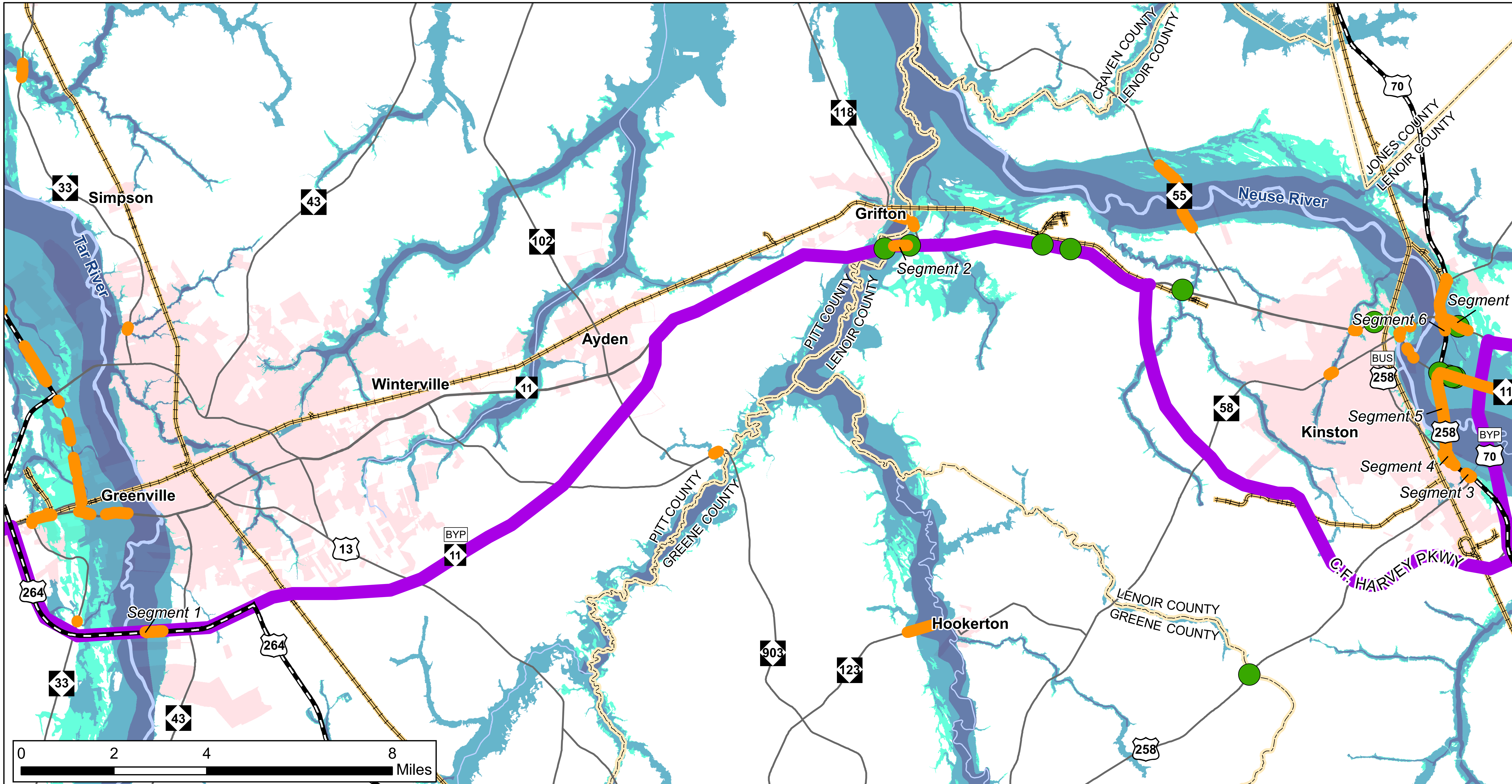
CORRIDOR X: RESILIENCY MAP

U.S. 13/U.S. 264/N.C. 11/ C.F. HARVEY PKWY/U.S. 258

FIGURE 2A: U.S. 13 TO GREENVILLE

*Flood Incidents represent historic flood events catalogued in the NCDOT Drive N.C. database from 2011-2019.

**Road Inundation Incidents are displayed at the 100-year recurrence interval. Segments are defined based on clusters of 100-year recurrence interval incidents. Road Inundation Incidents displayed on this map are those only within 10 miles of the Corridor.



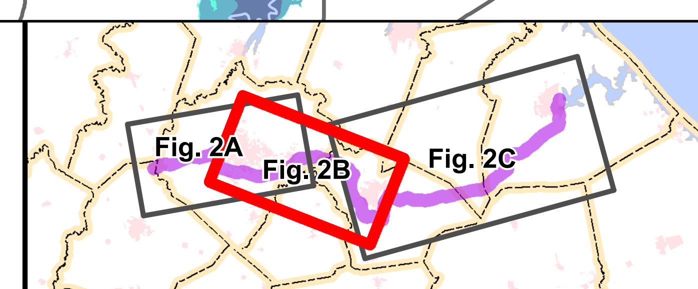
NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

JULY 2021

Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Evacuation Route
- Interstate
- U.S./N.C. Route
- Rail
- Major Rivers/Streams
- Flood Incident*
- **Road Inundation Incident****
  - 100-Year Recurrence Interval
- Major Water Bodies
- 500-Year Floodplain
- 100-Year Floodplain
- Floodway
- Municipal Boundary
- Counties



N

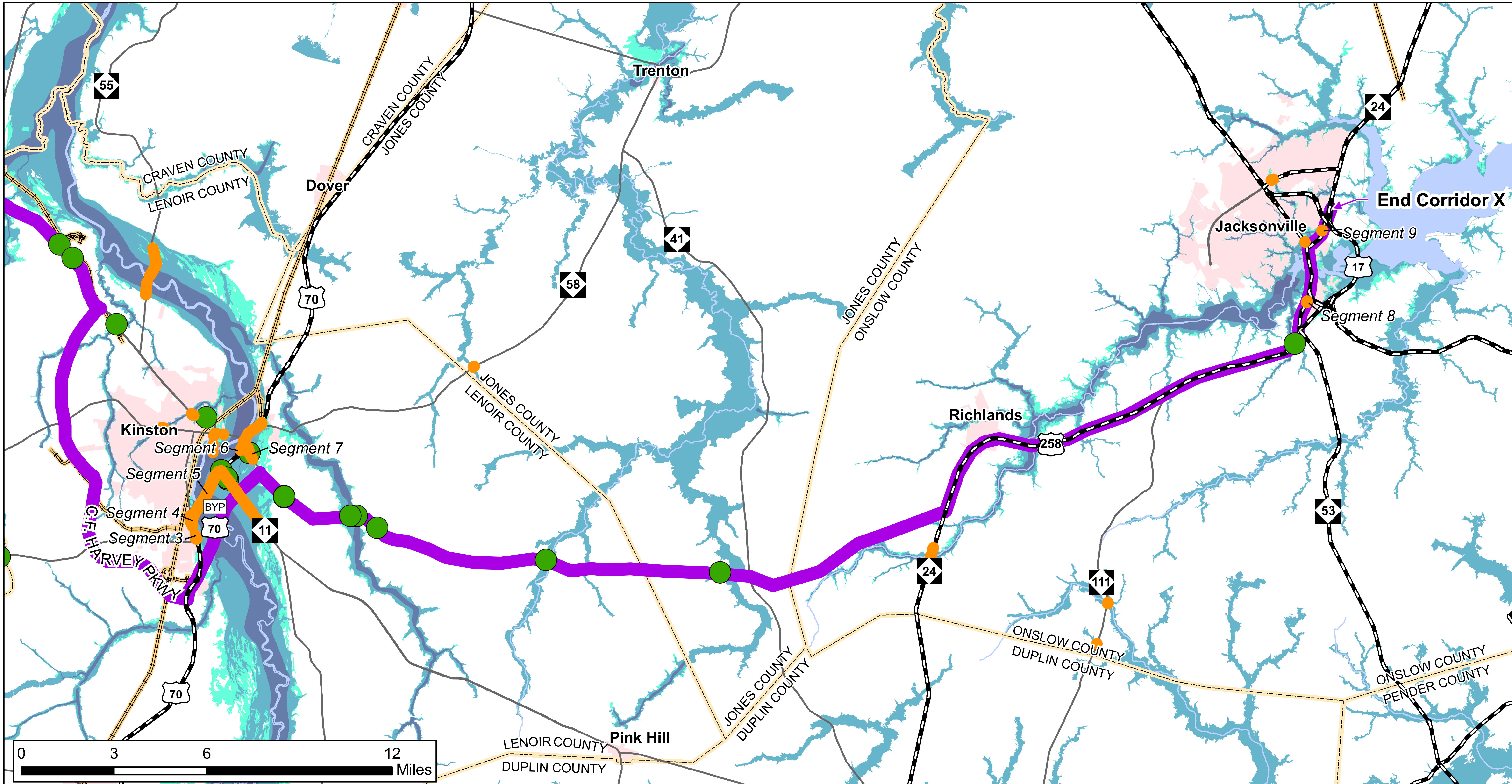
CORRIDOR X: RESILIENCY MAP

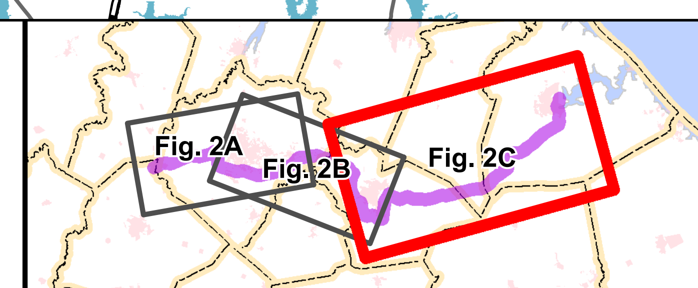
U.S. 13/U.S. 264/N.C. 11/ C.F. HARVEY PKWY/U.S. 258

FIGURE 2B: GREENVILLE TO KINSTON

*Flood Incidents represent historic flood events catalogued in the NCDOT Drive N.C. database from 2011-2019.

**Road Inundation Incidents are displayed at the 100-year recurrence interval. Segments are defined based on clusters of 100-year recurrence interval incidents. Road Inundation Incidents displayed on this map are those only within 10 miles of the Corridor.





NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

JULY 2021

Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Evacuation Route
- Interstate
- U.S./N.C. Route
- Rail
- Major Rivers/Streams
- Flood Incident*
- **Road Inundation Incident****
- 100-Year Recurrence Interval
- Major Water Bodies
- 500-Year Floodplain
- 100-Year Floodplain
- Floodway
- Municipal Boundary
- Counties

CORRIDOR X: RESILIENCY MAP

U.S. 13/U.S. 264/N.C. 11/ C.F. HARVEY PKWY/U.S. 258

FIGURE 2C: KINSTON TO JACKSONVILLE

*Flood Incidents represent historic flood events catalogued in the NCDOT Drive N.C. database from 2011-2019.

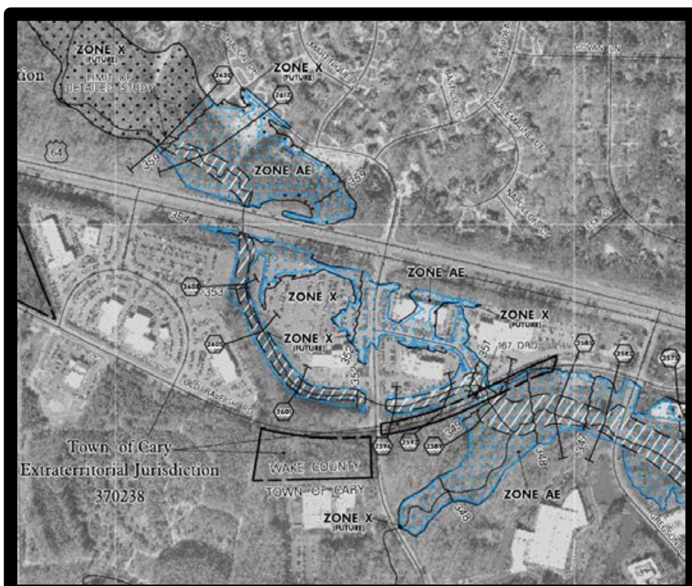
**Road Inundation Incidents are displayed at the 100-year recurrence interval. Segments are defined based on clusters of 100-year recurrence interval incidents. Road Inundation Incidents displayed on this map are those only within 10 miles of the Corridor.

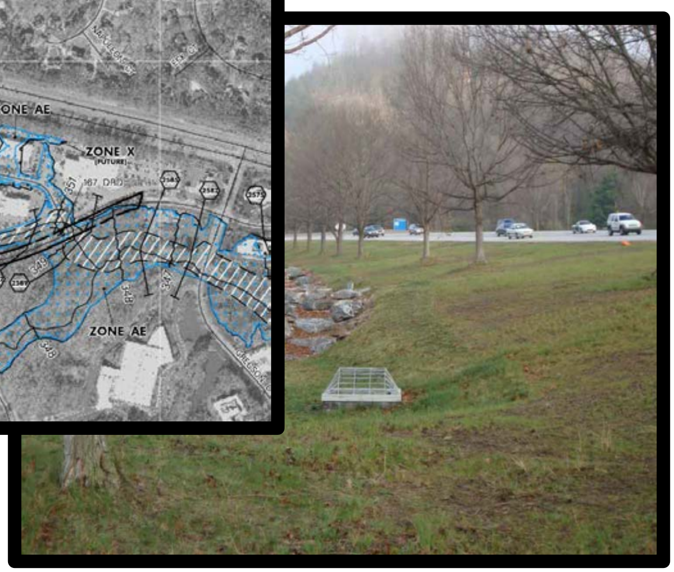
Appendix D

NCDOT Guidelines for Drainage Studies and Hydraulic Design Chapter 7

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

GUIDELINES FOR DRAINAGE STUDIES AND HYDRAULIC DESIGN





DAVID S. CHANG, Ph.D., P.E.
STATE HYDRAULICS ENGINEER

NOVEMBER 21, 2016

7 HYDROLOGY

7.1 Introduction

The hydrologic analysis phase involves the determination of discharge rates and volumes of runoff that drainage facilities will be required to convey. Acceptable hydrologic methods for highway drainage studies and applicable criteria for their use are discussed in this chapter. When the project site involves a FEMA-regulated stream, discharge methods and values provided in the effective published Flood Insurance Study (FIS) report should be used for determining compliance with National Flood Insurance Program (NFIP) regulations (29). (This may result in the need for additional hydraulic modeling to meet NCDOT design criteria, so there may be both a model for NFIP compliance as well as a design model for the NCDOT project.) The results from any hydrological procedure should be calibrated with historical site information. The design engineer should also consider potential future land use changes within a watershed over the life of a roadway structure and include this effect when estimating design discharges.

7.2 Drainage Area Determination

There are a variety of sources for obtaining drainage area data, including USGS topographic contour maps, published lists of drainage areas from study reports (such as FEMA Flood Insurance Studies and USGS water data reports), archived NCDOT Bridge and Culvert Survey and Hydraulic Design Reports (BSR, CSR; Appendix E), digital elevation data (such as Light Detection and Ranging, or LiDAR, data), and the relatively new USGS StreamStats web-based GIS application for North Carolina, which utilizes Digital Elevation Models (DEMs) based on LiDAR data and a combination of local resolution stream data and National Hydrography Datasets (NHD) for automated computation of drainage areas (and other basin characteristics). Drainage areas should be verified during project field review. The design engineer of record is responsible for verifying the accuracy of the drainage area regardless of the method used to obtain it.

7.2.1 USGS StreamStats

StreamStats is a web-based GIS application (http://water.usgs.gov/osw/streamstats/north_carolina.html) that was released by USGS in 2012. It allows users to easily obtain streamflow statistics, basin characteristics, etc., for USGS gage data collection stations and for user-selected ungaged locations. The application will delineate the drainage area at user-selected stream locations. The website includes comprehensive instructions and associated help files (including *Getting Started* and *Quick Tour* links). Users are advised to review and familiarize themselves with this information before attempting to use the application.

7.2.2 USGS Quadrangle Maps

USGS topographic mapping is available through the *National Map Viewer* website http://nationalmap.gov. Additionally, a GIS web map service (WMS) called USA_Topo_Maps provides a base map of national coverage of USGS topographic contour mapping.

7.2.3 Digital Elevation Data

Several sources of digital elevation data are available. The primary and most current, accurate, and readily available data is in the MicroStation TIN (triangular irregular network) file (supplied by NCDOT Location & Surveys and Photogrammetry Units) for the specific project area. However, this coverage is often inadequate for hydrologic studies, so it may need to be supplemented with other digital elevation data sources, such as LiDAR coverage or USGS Digital Elevation Models. Further details on each of these are discussed below.

7.2.3.1 MicroStation TIN Files

NCDOT's Location and Surveys Unit and Photogrammetry Unit collaborate to produce the final survey files for NCDOT projects, including planimetric mapping, digital terrain models (DTMs), and associated TIN files. The DTM file is first generated from processing the raw survey data; then, the DTM file is used to generate a TIN file to represent the existing ground surface. Often, the original TIN files provided for a project do not provide adequate geographical coverage for hydrologic analyses (e.g. offsite drainage), so supplemental digital elevation data may be used to generate additional TIN file coverage that can be merged with the original TIN.

7.2.3.2 LiDAR Data

One supplemental source of digital elevation data available in North Carolina is the statewide Light Detection and Ranging (LiDAR) coverage that was developed for the NC Floodplain Mapping Program (FMP). The entire state has been mapped using LiDAR techniques to collect digital elevation data. These data and corresponding metadata are available for download, and can be accessed from FMP's website (http://www.ncfloodmaps.com).

7.2.3.3 USGS Digital Elevation Models and Local Government Topographic Data

Digital elevation model (DEM) data are available from the USGS National Elevation Dataset (NED). Procedures on how these data can be downloaded are provided on the *National Map Viewer* website (see 7.2.2). These DEMs may prove most useful for areas in bordering states; however, within the state, NC FMP's LiDAR coverage will likely be more current, higher resolution, and accurate than that available from the NED. Additionally, large municipalities and some counties have developed topographic and elevation data which may be publically available for use in drainage area determination.

7.2.4 Archived NCDOT Bridge and Culvert Survey and Hydraulic Design Reports

There are thousands of bridge and culvert design reports archived at the Hydraulics Unit (hardcopies and PDF electronic copies). They provide valuable hydrologic and hydraulic information, such as drainage area size, as well as discharge rates and associated computed water surface elevations, methods used for computations, flood history records, etc. Information provided on these reports are only as accurate as methods and technology available as of the date of the report. It is the design engineer's responsibility to verify the information on the report before relying on it.

7.2.5 FEMA Flood Insurance Studies

FEMA Flood Insurance Study (FIS) reports' Summary of Discharges Tables are a good source for drainage areas and associated computed discharges for the FEMA hydraulic models. (See Section 7.4.1 for more information.)

7.3 Peak Discharge Design Frequency

Design frequency for NCDOT drainage structures is determined based on the roadway classification, traffic volume, level of service, flooding potential to properties, maintenance cost, etc. A summary of design frequencies that are typically used for NCDOT roadway drainage facilities is provided in Table 7-1. Consideration for site-specific conditions, such as upstream or downstream potential property impacts, existing level of service provided, length of time a temporary detour will be in place, etc. may warrant exceptions to these and should be discussed and agreed upon, preferably during the pre-design review.

	FREQUENCY (years)			
ROADWAY CLASSIFICATION	Bridges, Culverts and Cross Pipes	Storm Drain System: On Grade	Storm Drain System: At Sags (without relief)	Ditches
Major Arterials (e.g. Interstates, US, NC Routes)	50	10	50	10
Minor Arterials, Collectors, and Local Roads	25	10	25	10
Temporary/Detours	10	-	-	10

Table 7-1 Design Frequency

7.4 Peak Discharge Estimates

The design engineer should select from a number of acceptable peak discharge methods, depending upon the site's watershed characteristics. Table 7-2 lists peak discharge methods which are acceptable for NCDOT hydrologic studies. It also references the NCDOT Highway Hydrologic Charts (digitally corrected reproduction of the 1973 State Highway Commission Charts), which are applicable for limited use as discussed in Section 7.4.4 and Appendix C. It is the hydraulic engineer's responsibility to apply sound engineering judgment and to provide documented justification of methods used. Reported discharges should be expressed to two significant figures for 0.1 cfs to 10,000 cfs, and if higher, to three significant figures (examples: round 135.22 to 140; round 13,522 to 13,500), unless specifying discharges cited identically from a published FEMA Flood Insurance Study report.

Feature \ Hydrologic Methods	FIS (for NFIP compliance)	USGS Methods	Rational Method (up to 20 ac)	NCDOT Hwy. Hydrologic Charts	NRCS Method (for routing)
Bridges	X	X			X
Culverts	X	X			X
Storm Drain Systems			X	X	X
Cross Pipes (≤ 72 in. dia.)	X	X	X	X	X
Gutter Spread			X		
Ditches and Channels	X	X	X	X	
BMP Devices			X		X
Natural Stream Design	X	X	X		X
Storage Facilities					X
Floodplain Impacts	X	X			X

Table 7-2 Peak Discharge Method Selection

7.4.1 FEMA Flood Insurance Study

If a project study site is on a FEMA-regulated stream that is included in a published effective FEMA FIS, then the discharges specified in the FIS Summary of Discharges table should be used in the hydraulic model to demonstrate FEMA regulatory compliance. Those streams which were studied by detailed methods will typically list computed discharges for the 10- , 50 - , 100-, and 500-year recurrence intervals. Streams studied by limited detailed methods will only list the 100-year discharge.

Copies of effective FIS reports can be viewed and downloaded online from NC Floodplain Mapping Program's (NC FMP) website (http://www.ncfloodmaps.com).

7.4.2 USGS Stream Gage Analysis

Precedence should be given to analysis of the published stream gage data records when a USGS gage exists at or near the study site. Published North Carolina flood frequency statistics from continuous record USGS gages are available from the Flood-Frequency Statistics USGS Gaged Sites web link (http://nc.water.usgs.gov/flood/floodstats/gaged/index.html) on the NCDOT Hydraulics Unit website (https://connect.ncdot.gov/resources/hydro/pages/default.aspx).

7.4.2.1 Peak Discharge Estimation at Gaged Site

The above USGS website provides three types of statistical peak discharge estimates. The first is computed by fitting the recorded annual regulated peak flows to the log-Pearson Type III distribution using a localized computed sample skew. A second estimate that is provided is computed from the appropriate regionalized regression equation developed for the hydrologic area of the gage station location. The third, and presumably most accurate and reliable estimate provided combines the results of the first two into a weighted estimate for that gage station. Details on how these estimates are computed are discussed in USGS report SIR 2009-5158 (4). This report also discusses how flood-frequency peak discharge estimates at gaged sites can be adjusted (by transposition) to ungaged sites, as summarized in the following guidance.

7.4.2.2 Peak Discharge Estimation at Ungaged Site near Gaged Site

If the study site is not located at the location of a reference stream gage station on the same stream, and the drainage area at the study location is within fifty percent (50%) of that of the reference gage station, it is acceptable to adjust (or transposition) the discharge from the gage station to compute discharge estimates at the study location. The recommended method for peak discharge transposition is detailed in USGS report SIR 2009-5158 (4). This method is not recommended if the difference in drainage areas between the two locations is greater than fifty percent (50%). If the ungaged site is located between two gaged stations on the same stream, two peak discharge estimates can be made using the above procedure and hydrologic judgment applied to determine which is the more appropriate of the two.

7.4.2.3 Peak Discharge Estimation at Ungaged Site

In 2012, USGS launched the North Carolina StreamStats application website. In addition to the recommended use of this application for its automated drainage area delineation capabilities (see 7.2.1), this application is also recommended for use in computing discharges from USGS regression equations at ungaged sites. Rural discharge estimates are computed from the rural regional regression equations presented in SIR 2009-5158 (4). Urban and small rural basin discharge estimates are computed from the regression equations presented in reports SIR 2014-5030 (62), WRI 96-4084 (5), or USGS Fact Sheet 007-00 (63), as applicable. In the event that the StreamStats website is unavailable, refer to guidance in the referenced reports.

7.4.3 Rational Method

The Rational Method estimates the peak discharge (Q) in cubic feet per second (cfs) as a function of drainage area (A) in acres, mean rainfall intensity (I) in inches per hour (for a duration equal to the time of concentration, t_c), and a dimensionless runoff coefficient (C). The Rational Formula is Q = CIA.

NRCS methods (49) for calculating t_c should be used. Minimum value for t_c should be 10 minutes. An upper limit of 20 acres drainage area is recommended for applicability of this method.

7.4.3.1 Rational Runoff Coefficient

The value of the runoff coefficient (C) increases with the imperviousness of the surface cover. Table 7-3 provides some commonly used values for various surface types (7). The higher values in the ranges shown should be used when the terrain slope is steep. Less permeable soils warrant higher range C values. Likewise, areas such as grassed medians and berms behind curb and gutter may also warrant higher C value because of reduced permeability due to soil compaction performed during construction.

TYPE OF SURFACE	C
Pavement	0.7 - 0.9
Gravel surfaces	0.4 - 0.6
Industrial areas	0.5 - 0.9
Residential (Single-family)	0.3 - 0.5
Residential (Apartments, etc.)	0.5 - 0.7
Grassed, steep slopes	0.3 - 0.4
Grassed, flat slopes	0.2 - 0.3
Woods / Forest	0.1 - 0.2

Table 7-3 Typical Rational Runoff Coefficients

7.4.3.2 Rainfall Intensity

Rainfall intensity (I) data can be obtained from the NOAA Atlas 14 published report (47) and corresponding Precipitation Frequency Data Server (PFDS) website, where "I" values are tabulated for a range of durations and storm event frequencies at user-selected locations. In the PFDS table, the duration which is closest to the computed time of concentration (t_c) value will be used to obtain the corresponding "I" value to use in the Rational Formula. A minimum t_c of ten (10) minutes should be used.

The website to access the PFDS is: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html
See Appendix Q for an example of how to use the PFDS to find rainfall intensity values for a given project location.

Intensity values in GEOPAK Drainage (68) are hard coded into the Drainage Library and may not exactly match the NOAA Atlas 14 values for a given location, but should be relatively close. For routine storm drain system design, use the intensity values generated within GEOPAK Drainage.

7.4.4 NCDOT Highway Hydrologic Charts

The NCDOT Highway Hydrologic Charts, corrected and digitally reproduced from the 1973 State Highway Commission charts, are provided in Appendix C. They should primarily be used for sizing of small pipes.

7.4.5 NRCS Method – Storage Routing

Natural Resources Conservation Service (NRCS, formerly Soil Conservation Service) methods, presented in TR-55 (49) and TR-20 (48), are recommended for hydrographic storage routing. The TR-55 manual presents simplified hydrologic procedures for estimating flood hydrographs and peak discharges in small watersheds. The model begins with a rainfall uniformly imposed on the watershed over a specified time. Mass rainfall is then converted to mass runoff by using a runoff curve number (CN) which is based on soil type, land cover, impervious area, surface storage, infiltration rate, etc. Runoff is then converted to a hydrograph to develop peak discharges applying hydrograph routing procedures, runoff travel time, etc. TR-20 provides computer-aided hydrologic analyses for estimating flood hydrograph peak discharges in both small and large watersheds. For current soils data, the NRCS Web Soil Survey website is recommended (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm). Public domain software programs available from the Army Corps of Engineers Hydraulic Engineering Center (HEC) or NRCS are acceptable to perform hydrograph calculations and routing. Other hydrograph methods supported by FHWA and AASHTO (1,2,7) may be used with approval of the State Hydraulics Engineer.

7.5 Accuracy of Hydrologic Estimates

The USGS scientists used various statistical methods to perform hydrologic analysis to develop regression equations for estimating peak discharges for both gaged and ungaged sites. It takes into account the complex geomorphic system of precipitation, evaporation, evapotranspiration, infiltration, overland flow, impoundments, channel flow, etc. The hydrologic analysis is not an exact science. The accuracy of the estimated discharges may vary significantly depending on location and other contributing factors. For example, the average standard error for the 10-year peak discharge in the Piedmont region is 25%; whereas, it is 73% for the 500-year peak discharge in the Sand Hills region (62).

It can be argued that some hydrologic methods are more accurate than others; however, estimated discharges should be calibrated to locally observed or measured events. Methods should be applied within their limits of applicability and with understanding of the underlying assumptions and hydrologic principles supporting them. While detailed hydrologic analysis is not practicable and would be beyond the scope expected in normal NCDOT hydraulic engineering practice, the design engineer is encouraged to calibrate the results from any hydrologic procedure to historical data. For bridge hydraulic analysis (see Chapter 8), these NCDOT *Guidelines* recommend that comparison be made to at least one historical occurrence.

Appendix E

Truck Transportation Data

Table of Contents

Tables

Figures

Freight Demand and Destination Data

Freight demand and destination data was derived from three sources, detailed below.

1. **STC activity centers** – NCDOT guidelines for the STC contain categories of landmarks, destinations, and major hubs identified as "activity centers." These activity centers include destinations and land uses that will likely have higher demand for trucks than other destinations, including military bases, major airports, colleges/universities, and hospitals, among others. These activity centers were identified because of their dependence on the corridor for the shipping and receiving of goods via trucks, among other things.
2. **Stakeholder organizations** – The NCDOT project team developed a list of stakeholder organizations, including rail and freight representatives, economic development groups, and major employers with 500 or more employees. The stakeholder organizations that have a large facility were included as a freight destination.
3. **Additional freight intensive land uses** – Other land uses that would have higher demand for truck traffic, such as factories and distribution centers, were identified along the corridor through a desktop review of satellite imagery.

Freight destinations within 25 miles of the corridor were mapped (see **Figures 3A-3C**) and are listed in **Table E-1**.

Table E-1. Freight Demand and Destination Data – Corridor X

Location Name	Type	Source*
Lenoir County		
Electrolux Major Appliances	Manufacturing/Distribution Center	2
Global Transpark	Industrial/Business Park	1
Kinston-Regional Jetport	Airport	2
Moen Inc	Manufacturing/Distribution Center	3
Sanderson Farms, Inc.	Manufacturing/Distribution Center	2
Spirit Aero Systems Inc- Composite Fabrication Manufacturing Facility	Manufacturing/Distribution Center	3
UNC Lenoir Health Care	Hospital/Medical Center	2
West Pharmaceutical Services	Pharmaceutical Services	3
Onslow County		
Albert J Ellis Airport	Airport	1
Camp Lejeune Range Control	Military Campus	1, 2
Coastal Carolina Community College	College/University	2
Jacksonville Mall	Shopping Center	3
Marine Corps Air Station, New River	Military Campus	1, 2
Martin Marietta - Onslow Quarry	Quarry	3
New River Air Station Chapel	Military Campus	3
Pitt County		
Attends/Domar Healthcare Warehouse-Shipping and Receiving	Industrial/Business Park	3
DENSO Manufacturing North Carolina, Inc-Greenville Plant	Industrial/Business Park	3
Du Pont Sorona Kinston Pant	Factory	3
East Carolina University	College/University	1, 2
Grady-White Boats Inc	Manufacturing/Distribution Center	3
Greenville Mall	Shopping Center	3
Hyster-Yale Materials Handling Inc,	Industrial/Business Park	2
Hyster-Yale Group	Industrial/Business Park	3
Patheon Inc	Factory	2
Pitt Community College	College/University	2
Pitt-Greenville Airport	Airport	1, 2
Front Gate Shopping Center	Shopping Center	3
Thermo Fisher Scientific	Factory	3
Vidant Medical Center	Hospital/Medical Center	1, 2
Weyerhaeuser	Manufacturing/Distribution Center	3

**Note: The source number corresponds to the following types of freight destinations:*

1. *STC Activity Centers*
2. *Stakeholder organizations*
3. *Additional freight intensive uses*

Truck Parking Data

Truck drivers are required to have a 30-minute break every 8 hours and to stop driving after 14 consecutive hours due to federal hours of service (HOS) requirements. While helping to improve safety, these requirements often result in drivers searching for parking at predictable time intervals, typically at night. This puts a strain on key freight corridors that have insufficient truck parking relative to demand. When drivers can't find spaces at designated truck parking areas, they are faced with the following options:

- Parking in unauthorized and unsafe locations, such as abandoned parking lots or on freeway shoulders, that put personal safety of the driver at risk, or
- Continuing driving and run the risk of getting a citation for driving past the maximum allowable hours of service or driving while fatigued and getting into a harmful accident.

Table E-2 shows truck parking supply and availability along the corridor. Data was gathered as part of the North Carolina Truck Parking Study (January 2017). The table includes the name of the truck parking facility, the County, whether it is publicly or privately owned, and the number of spaces at the facility. For each facility, truck parking utilization is shown in **Figures 3A-3C** and in the table below. Truck parking facilities with "full utilization" are those that are fully occupied at least Monday through Friday.

Table E-2. Truck Parking Facility Data – Corridor X

Location Name	Address	Facility Type	Number of Spaces	Utilization[1]
Pitt County				
County Mart	4787 NC-11, Bethel, NC 27812	Private	38	Available Spaces
Fuel Doc Travel Center	2403 N Memorial Dr, Greenville, NC 27834	Private	32	Full Utilization
Lenoir County				
Kangaroo Express	559 Queen St, Grifton, NC 28530	Private	20	Full Utilization

[1] Based on 2017 Truck Parking Study

Truck Percentage Data

This appendix presents 2015 and 2019 truck percentage data for Corridor X of the North Carolina STC. Truck percentage data in **Table E-3** is presented using the Annual Average Daily Traffic (AADT) GIS data the from NCDOT and is organized numerically by Route ID within each county. Route IDs correspond to individual segments of the roadway and are used by NCDOT to collect and organize traffic data; the Route IDs used for this report are based on the 2019 Route IDs and milepost segment limits. 2015 AADT and truck percentage data is included for the corresponding 2019 Route ID where it is available. The AADT data represent all vehicles counted for each Route ID, and the total truck percentages include both Single Unit trucks (FHWA Class 4 – 7) and Multi Unit Trucks (FHWA Class 8 – 13) (see **Table E-4** for examples of each vehicle class). Truck data is only collected on segments of routes included in the National Highway System (NHS) and the North Carolina Truck Network. Truck percentage data on parallel corridors is included for locations where AADT data is not available on the STC corridor. Truck percentages (based on 2019 data) are shown in **Figures 3A-3C**.

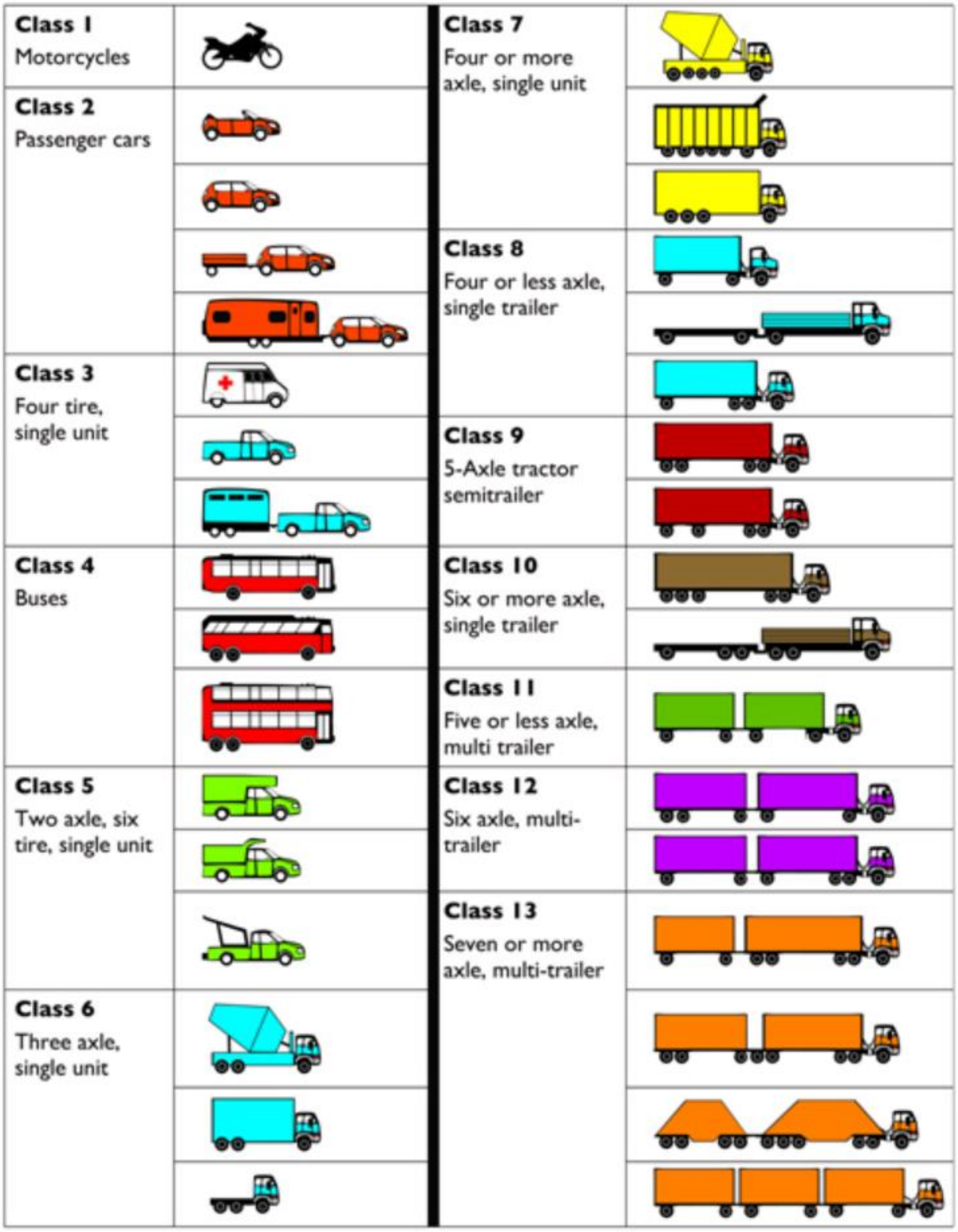
Table E-3. Truck Percentage – 2019 and 2015 Annual Average Daily Traffic

Route ID	Route	Beginning Milepost	End Milepost	2015 Annual Average Daily Traffic (AADT)	2015 Total Truck Percentage	2019 Annual Average Daily Traffic (AADT)	2019 Total Truck Percentage	Change in Truck Percentage from 2015 to 2019
Edgecombe County								
20000013033	US-13	0	0.29	11,000	12.64%	650	11.75%	-0.89%
20000013033	US-13	0.29	0.55	10,000	12.31%	11,000	12.89%	0.58%
Pitt County								
20000013074	US-13	15.649	16.369	20,000	8.18%	22,000	7.78%	-0.40%
20000013074	US-13	16.369	17.209	16,000	10.38%	14,500	9.31%	-1.07%
20000013074	US-13	17.209	18.769	13,000	10.38%	14,000	9.31%	-1.07%
20000013074	US-13	18.769	21.229	14,000	10.38%	13,500	9.31%	-1.07%
20000013074	US-13	21.229	22.819	13,000	10.38%	13,500	9.31%	-1.07%
20000013074	US-13	22.819	24.639	15,000	10.38%	13,000	9.31%	-1.07%
20000013074	US-13	24.639	24.959	13,000	9.43%	14,000	10.78%	1.35%
20000013074	US-13	24.959	26.204	12,000	11.59%	12,500	12.92%	1.33%
20000013074	US-13	26.204	27.614	11,000	12.64%	650	11.75%	-0.89%
20000264074	US-264	13.253	14.774	13,000	11.11%	18,000	11.79%	0.68%
20000264074	US-264	14.774	17.244	14,000	12.51%	20,000	14.34%	1.83%
20000264074	US-13	17.244	20.104	12,000	13.07%	16,500	12.93%	-0.14%
30000011074	NC-11	0	1.92	13,000	5.65%	13,000	5.52%	-0.13%
30000011074	NC-11	1.92	2.17	17,000	5.65%	17,000	5.52%	-0.13%
30000011074	NC-11	2.17	3.66	19,000	5.65%	19,500	5.52%	-0.13%
30000011074	NC-11	3.66	4.97	20,000	5.65%	21,000	5.52%	-0.13%
30000011074	NC-11	4.97	6.81	18,000	5.65%	18,500	5.52%	-0.13%
30000011074	NC-11	6.81	7.99	18,000	6.36%	20,000	5.74%	-0.62%
30000011074	NC-11	7.99	9.76	18,000	6.36%	21,500	5.74%	-0.62%
30000011074	NC-11	9.76	10.77	20,000	6.36%	20,000	5.74%	-0.62%
30000011074	NC-11	10.77	11.29	22,000	5.54%	22,500	4.07%	-1.47%
30000011074	NC-11	11.29	11.83	25,000	5.54%	29,000	4.07%	-1.47%
30000011074	NC-11	11.83	12.18	36,000	5.54%	37,000	4.07%	-1.47%
30000011074	NC-11	12.18	13.07	32,000	5.54%	33,500	4.07%	-1.47%
30000011074	US-264	13.07	13.88	36,000	5.54%	36,500	4.07%	-1.47%
30000011074	US-264	13.88	14.652	27,000	5.82%	26,500	11.69%	5.87%
30000011074	NC-11	14.652	15.31	25,000	5.82%	29,000	11.69%	5.87%
30000011074	US-13	15.31	15.834	21,000	5.82%	20,500	11.69%	5.87%
40001467074	US-264	0	0.5	21,000	4.17%	28,500	4.57%	0.40%
40001467074	SR-1200	0.5	0.96	28,000	4.17%	30,500	4.57%	0.40%
40001467074	SR-1203	0.96	1.494	31,000	4.17%	32,500	4.57%	0.40%
40001467074	SR-1467	1.494	2.116	25,000	4.17%	25,500	4.57%	0.40%
50000904074	US-13	2.154	2.561	No data	No data	10,000	0.00%	N/A
Lenoir County								
20000070054	US-70	9.682	11.35	22,000	10.09%	24,500	10.23%	0.14%
20000070054	US-70	11.35	11.733	34,000	10.09%	31,000	10.23%	0.14%
Lenoir County (cont.)								
20000070054	US-70	12.226	13.431	27	8.43%	31,000	10.27%	1.84%

Route ID	Route	Beginning Milepost	End Milepost	2015 Annual Average Daily Traffic (AADT)	2015 Total Truck Percentage	2019 Annual Average Daily Traffic (AADT)	2019 Total Truck Percentage	Change in Truck Percentage from 2015 to 2019
20000070054	US-70	13.431	14.221	28,000	8.43%	30,500	10.27%	1.84%
20000070054	US-70	14.221	15.417	20,000	11.63%	20,000	14.13%	2.50%
20000070054	US-70	11.733	12.226	40,000	7.12%	40,500	7.01%	-0.11%
20000258054	US-258	0	0.456	4,300	10.77%	5,100	12.11%	1.34%
20000258054	US-258	0.456	1.248	4,600	10.77%	5,200	12.11%	1.34%
20000258054	US-258	1.248	2.158	5,100	10.77%	5,500	12.11%	1.34%
20000258054	US-258	2.158	4.668	5,000	10.77%	5,100	12.11%	1.34%
20000258054	US-258	4.668	8.562	5,400	10.77%	6,000	12.11%	1.34%
20000258054	US-258	8.562	8.959	7,100	10.77%	7,200	12.11%	1.34%
20000258054	US-258	8.959	10.982	6,900	10.77%	7,700	12.11%	1.34%
20000258054	US-258	10.982	12.157	7,700	10.77%	8,300	12.11%	1.34%
20000258054	US-258	12.157	12.348	9,200	10.77%	9,500	12.11%	1.34%
20000258054	US-258	12.348	13.014	8,300	10.77%	7,800	12.11%	1.34%
20000258054	US-258	13.014	13.675	8,300	10.77%	8,100	12.11%	1.34%
20000258054	US-258	13.675	14.188	8,400	10.77%	8,300	12.11%	1.34%
20000258054	US-70	14.188	14.568	9,400	10.77%	8,800	12.11%	1.34%
30000011054	NC-11	23.568	25.124	14,000	7.76%	16,000	7.55%	-0.21%
30000011054	NC-11	25.124	26.584	15,000	7.76%	15,000	7.55%	-0.21%
30000011054	NC-11	26.584	27.794	16,000	7.76%	15,000	7.55%	-0.21%
30000011054	NC-11	27.794	28.557	16,000	7.76%	15,500	7.55%	-0.21%
30000011054	NC-11	28.557	28.914	12,000	7.76%	12,000	7.55%	-0.21%
30000011054	NC-11	28.914	29.684	13,000	5.65%	13,000	5.52%	-0.13%
30000058054	NC-58	13.272	13.602	5,600	5.41%	5,400	5.21%	-0.20%
30000058054	NC-58	13.602	14.653	4,200	5.41%	3,500	5.21%	-0.20%
30000148054	NC-58	0	1.581	2,000	3.95%	3,100	8.38%	4.43%
30000148054	NC-148	1.581	2.244	4,500	3.95%	5,700	8.38%	4.43%
30000148054	US-258	2.244	4.341	3,300	3.95%	5,100	8.38%	4.43%
30000148054	US-70	4.341	8.092	3,000	15.01%	4,800	10.35%	-4.66%
40001735054	NC-11	1.77	2.109	1,500	0.00%	2,500	0.00%	0.00%
40001742054	SR-1732	0	1.895	1,600	0.00%	1,500	0.00%	0.00%
40001742054	NC-58	1.895	2.905	2,300	0.00%	2,200	0.00%	0.00%
Jones County								
20000258052	US-258	0	1.351	4,000	10.98%	5,000	10.72%	-0.26%
20000258052	US-258	1.351	3.28	4,600	10.77%	5,600	12.11%	1.34%
20000258052	US-258	3.28	4.816	4,300	10.77%	5,100	12.11%	1.34%
Onslow County								
20000258067	US-258	0	0.92	19,000	4.98%	22,500	4.89%	-0.09%
20000258067	US-258	0.92	1.404	28,000	4.98%	30,000	4.89%	-0.09%
20000258067	US-258	1.404	1.881	38,000	7.89%	44,500	8.14%	0.25%
20000258067	US-258	1.881	2.804	28,000	7.89%	37,000	8.14%	0.25%
20000258067	US-258	2.804	3.566	27,000	7.89%	31,500	8.14%	0.25%
20000258067	US-258	3.566	4.597	26,000	7.89%	29,000	8.14%	0.25%
20000258067	US-258	4.597	6.424	25,000	7.89%	26,500	8.14%	0.25%

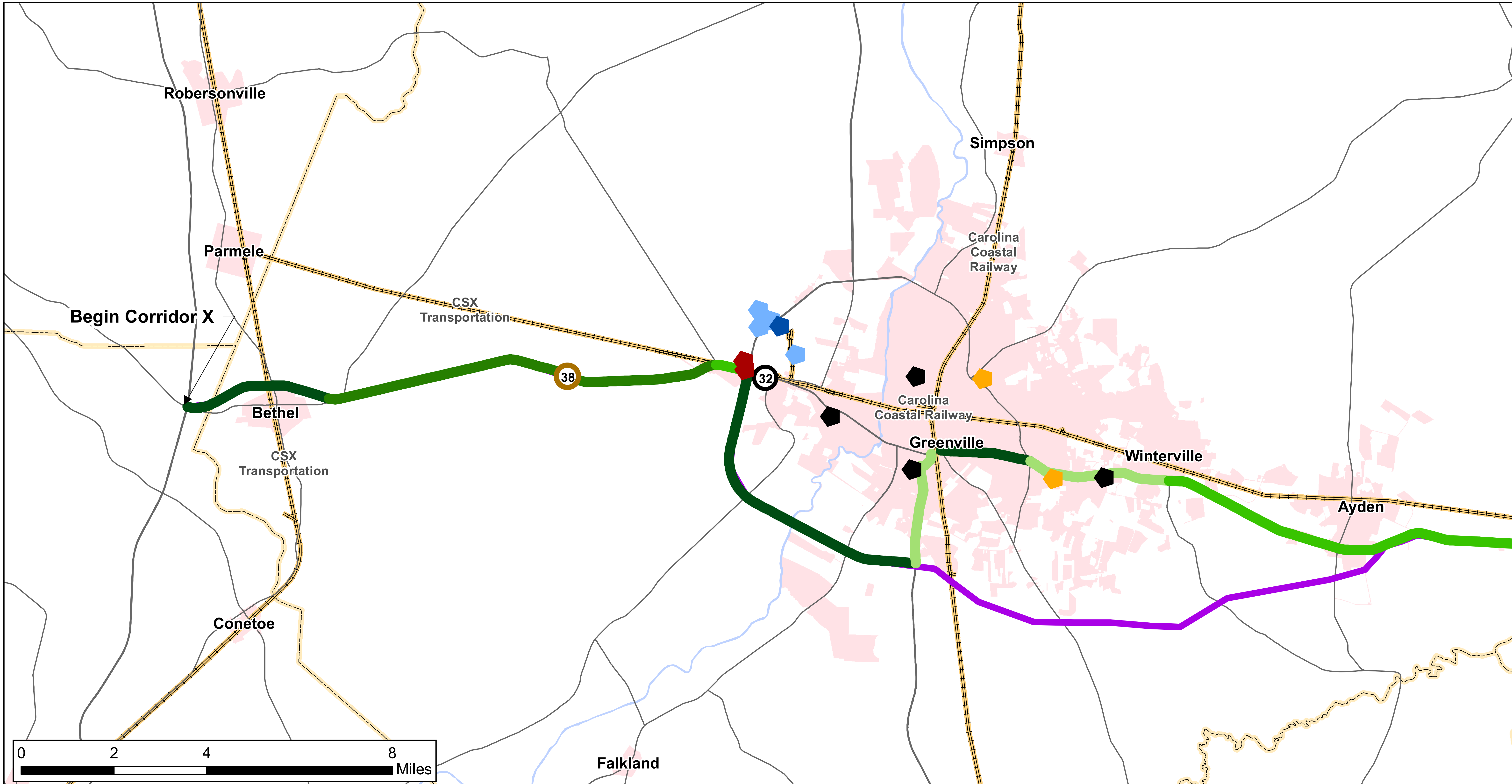
Route ID	Route	Beginning Milepost	End Milepost	2015 Annual Average Daily Traffic (AADT)	2015 Total Truck Percentage	2019 Annual Average Daily Traffic (AADT)	2019 Total Truck Percentage	Change in Truck Percentage from 2015 to 2019
20000258067	US-258	6.424	8.46	17,000	8.21%	20,500	7.44%	-0.77%
20000258067	US-258	8.46	10.569	14,000	8.21%	17,000	7.44%	-0.77%
Onslow County (cont.)								
20000258067	US-258	10.569	12.405	16,000	8.21%	19,500	7.44%	-0.77%
20000258067	US-258	12.405	13.028	14,000	8.21%	18,500	7.44%	-0.77%
20000258067	US-258	13.028	13.296	20,000	8.21%	24,000	7.44%	-0.77%
20000258067	US-258	13.296	14.07	17,000	8.21%	21,000	7.44%	-0.77%
20000258067	US-258	14.07	15.287	14,000	8.21%	16,500	7.44%	-0.77%
20000258067	US-258	15.287	17.009	4,300	10.98%	5,900	10.72%	-0.26%
20000258067	US-258	17.009	19.909	4,000	10.98%	5,700	10.72%	-0.26%
20000258067	US-258	19.909	20.968	4,000	10.98%	5,500	10.72%	-0.26%
29000017067	US-258	1.271	1.698	30,000	2.49%	34,000	2.81%	0.32%
29000017067	US-17	1.698	2.382	26,000	2.49%	30,500	2.81%	0.32%
29000017067	US-17	2.382	2.611	30,000	2.49%	30,500	2.81%	0.32%
39000024067	US-17	2.757	3.327	4,400	2.45%	4,600	2.24%	-0.21%
39000024067	NC-24	3.327	3.427	12,000	2.45%	15,000	2.24%	-0.21%
39000024067	US-17	3.427	4.341	13,000	2.45%	14,500	2.24%	-0.21%

Table E-4. Federal Highway Administration Vehicle Classification Definitions



Class	Definition
Class 1	Motorcycles
Class 2	Passenger cars
Class 3	Four tire, single unit
Class 4	Buses
Class 5	Two axle, six tire, single unit
Class 6	Three axle, single unit
Class 7	Four or more axle, single unit
Class 8	Four or less axle, single trailer
Class 9	5-Axle tractor semitrailer
Class 10	Six or more axle, single trailer
Class 11	Five or less axle, multi trailer
Class 12	Six axle, multi-trailer
Class 13	Seven or more axle, multi-trailer

Source: “FHWA Traffic Monitoring Guide. Appendix C: Vehicle Types” (2014)



NC STRATEGIC TRANSPORTATION CORRIDORS (STC)

FEBRUARY 2022

Source: NCOneMap, NCDOT GIS, ESRI, AADT

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Municipal Boundary
- Major Water Bodies
- Counties

Truck Percentage (2019)*

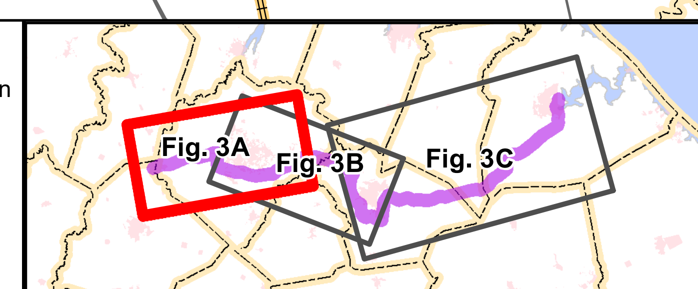
- 0-5%
- 5-8%
- 8-11%
- 11-15%

Truck Parking Facility Utilization**

- Facility with No Utilization
- Facility with Available Spaces
- Facility with Full Utilization

Freight Destinations

- Manufacturing/Distribution Center
- Industrial/Business Park
- Factory
- Shopping Center
- Quarry
- Other***



N

CORRIDOR X:
TRUCK TRANSPORTATION DATA

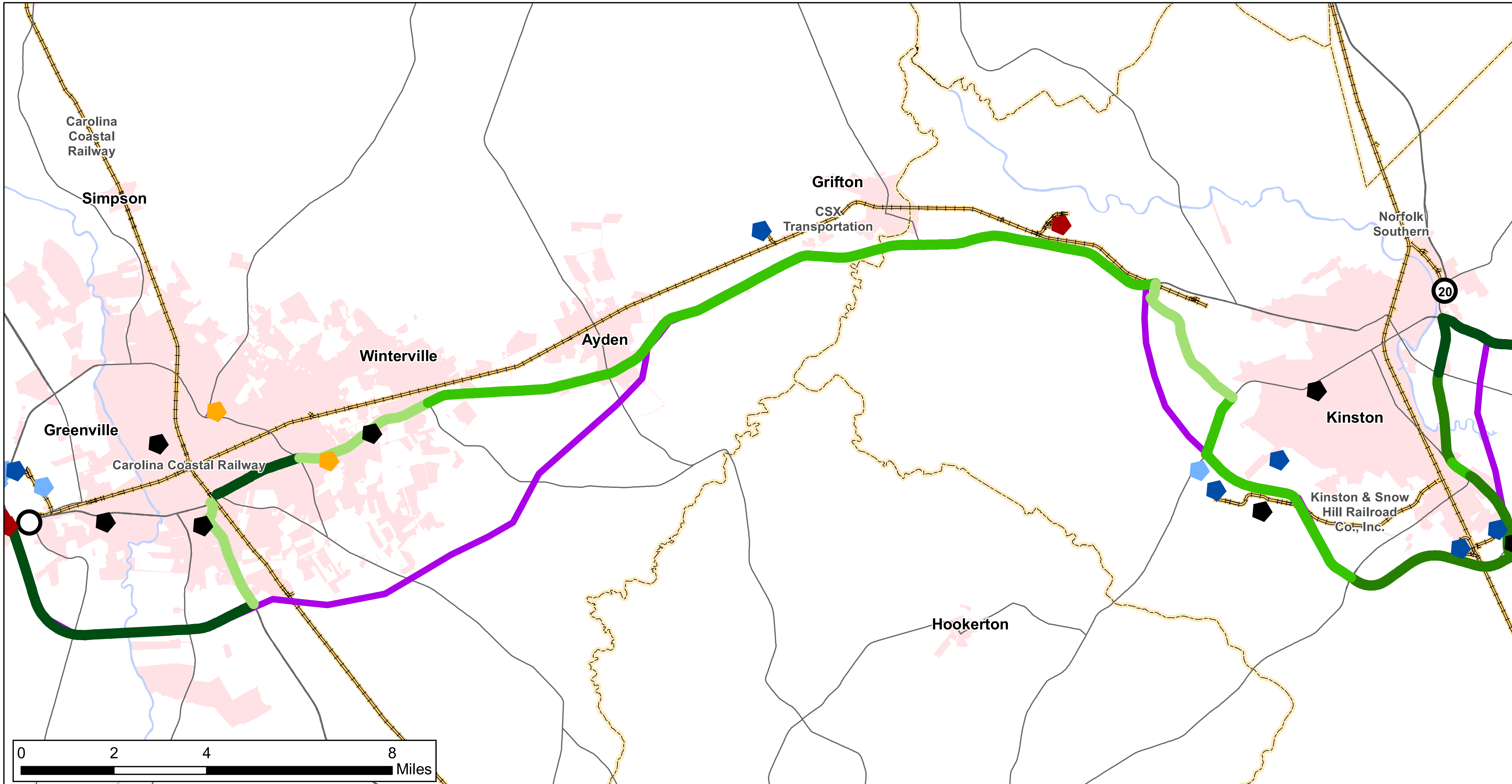
U.S. 13/U.S. 264/N.C. 11/ C.F. HARVEY PKWY/U.S. 258

FIGURE 3A:
U.S. 13 TO GREENVILLE

*Truck percentage data is shown on parallel corridors in locations where it is not available for the STC corridor because it is not open to traffic yet

**The number shown within the circle refers to the total number of truck parking spaces at that parking facility

***Other category for Activity Centers includes colleges/universities, military camps, hospitals/medical centers, and airports



NC STRATEGIC TRANSPORTATION CORRIDORS (STC)

FEBRUARY 2022

Source: NCOneMap, NCDOT GIS, ESRI, AADT

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Municipal Boundary
- Major Water Bodies
- Counties

Truck Percentage (2019)*

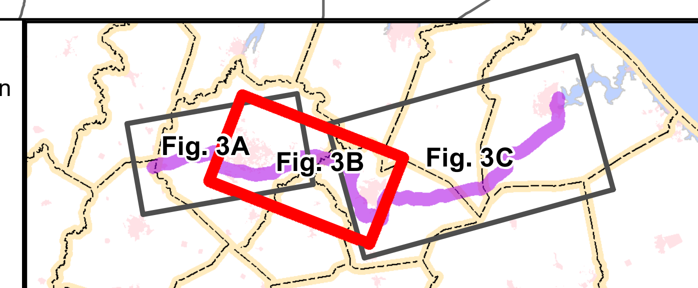
- 0-5%
- 5-8%
- 8-11%
- 11-15%

Truck Parking Facility Utilization**

- Facility with No Utilization
- Facility with Available Spaces
- Facility with Full Utilization

Freight Destinations

- Manufacturing/Distribution Center
- Industrial/Business Park
- Factory
- Shopping Center
- Quarry
- Other***



CORRIDOR X: TRUCK TRANSPORTATION DATA

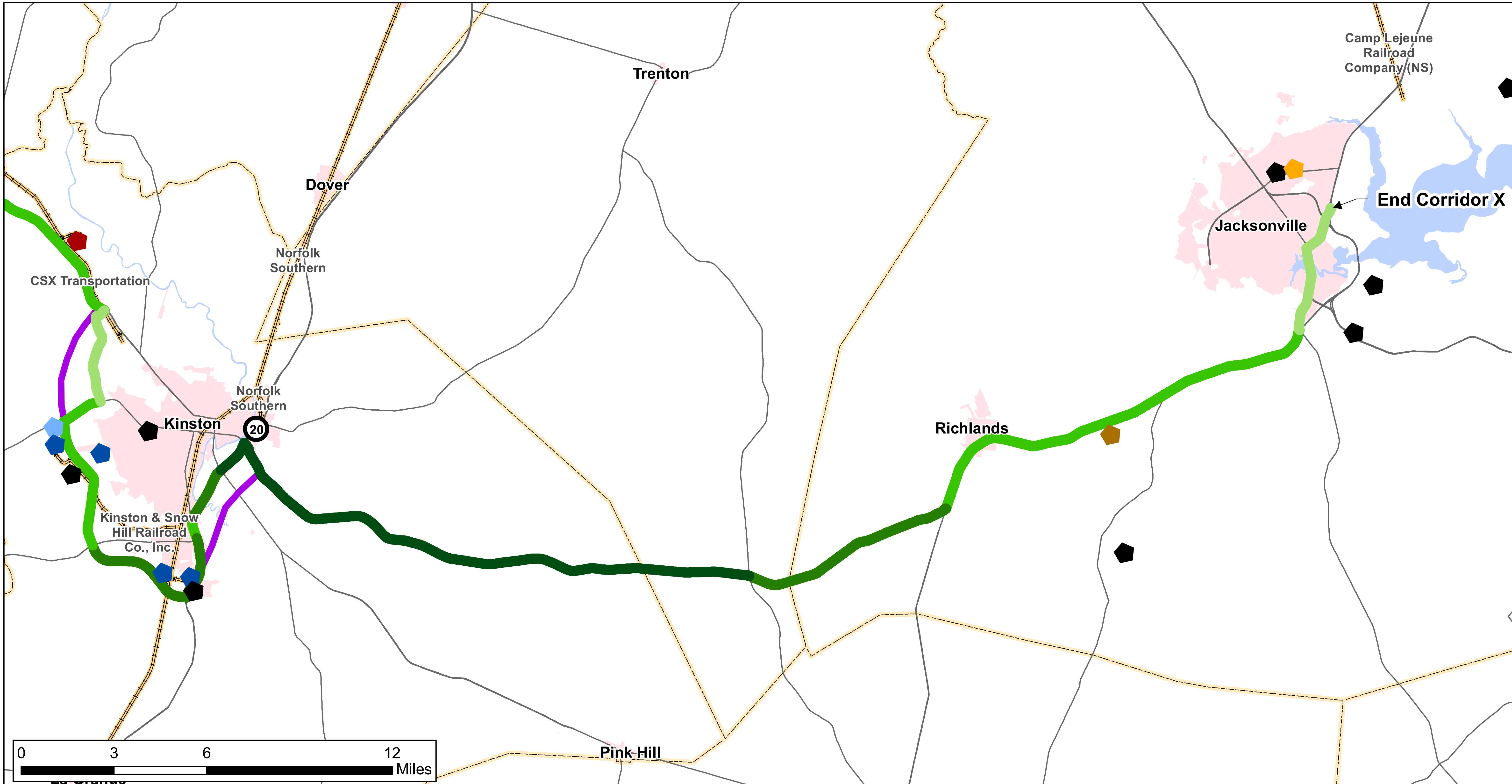
U.S. 13/U.S. 264/N.C. 11/ C.F. HARVEY PKWY/U.S. 258

FIGURE 3B: GREENVILLE TO KINSTON

*Truck percentage data is shown on parallel corridors in locations where it is not available for the STC corridor because it is not open to traffic yet

**The number shown within the circle refers to the total number of truck parking spaces at that parking facility

***Other category for Activity Centers includes colleges/universities, military camps, hospitals/medical centers, and airports



NC STRATEGIC TRANSPORTATION CORRIDORS (STC)

FEBRUARY 2022

Source: NCOneMap, NCDOT GIS, ESRI, AADT

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Municipal Boundary
- Major Water Bodies
- Counties

Truck Percentage (2019)*

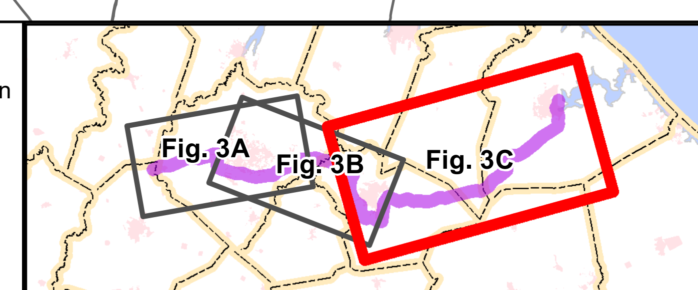
- 0-5%
- 5-8%
- 8-11%
- 11-15%

Truck Parking Facility Utilization**

- Facility with No Utilization
- Facility with Available Spaces
- Facility with Full Utilization

Freight Destinations

- Manufacturing/Distribution Center
- Industrial/Business Park
- Factory
- Shopping Center
- Quarry
- Other***



CORRIDOR X:
TRUCK TRANSPORTATION DATA

U.S. 13/U.S. 264/N.C. 11/
C.F. HARVEY PKWY/U.S. 258

FIGURE 3C:
KINSTON TO JACKSONVILLE

*Truck percentage data is shown on parallel corridors in locations where it is not available for the STC corridor because it is not open to traffic yet

**The number shown within the circle refers to the total number of truck parking spaces at that parking facility

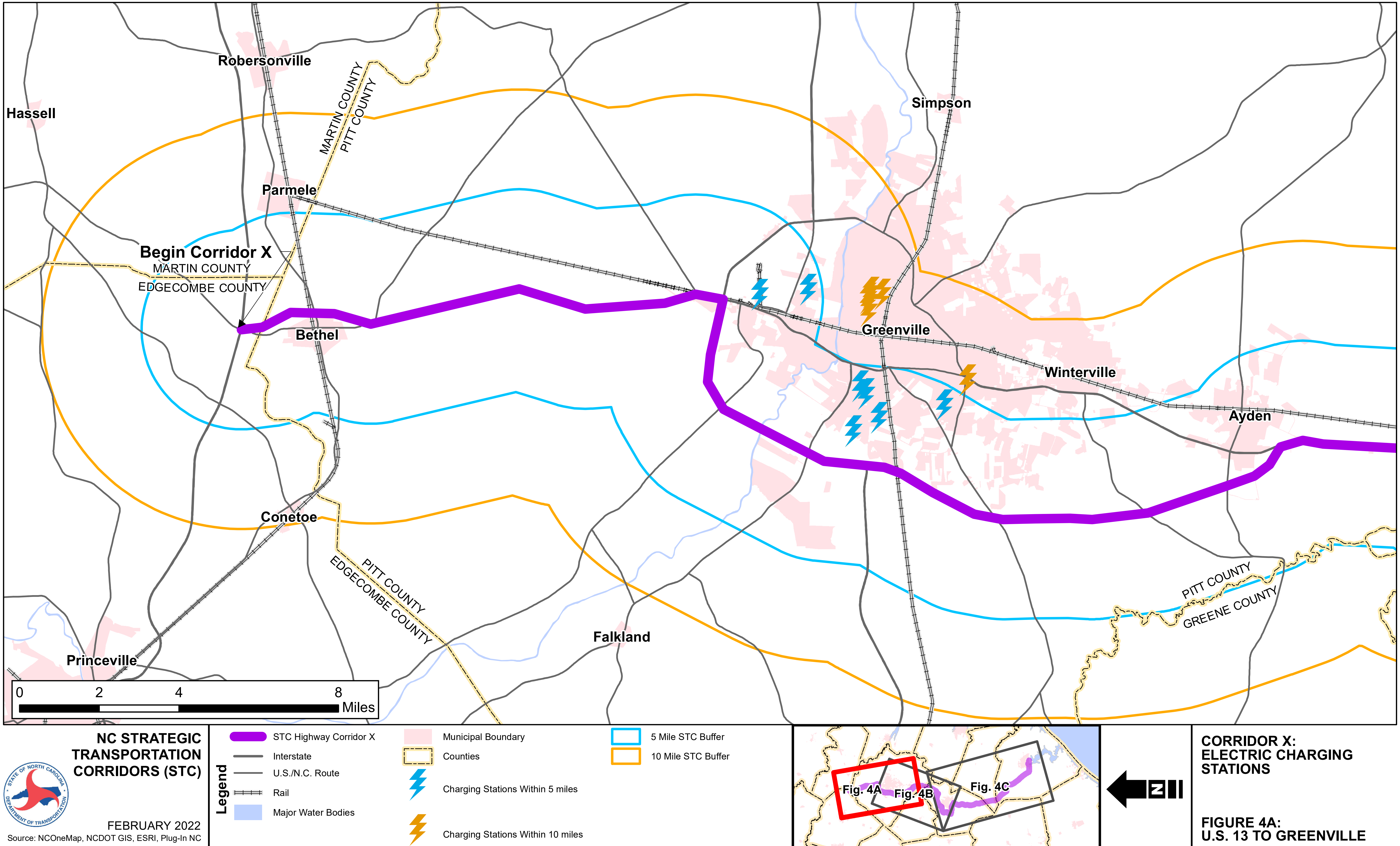
***Other category for Activity Centers includes colleges/universities, military camps, hospitals/medical centers, and airports

Appendix F

Electric Charging Stations

Table of Contents

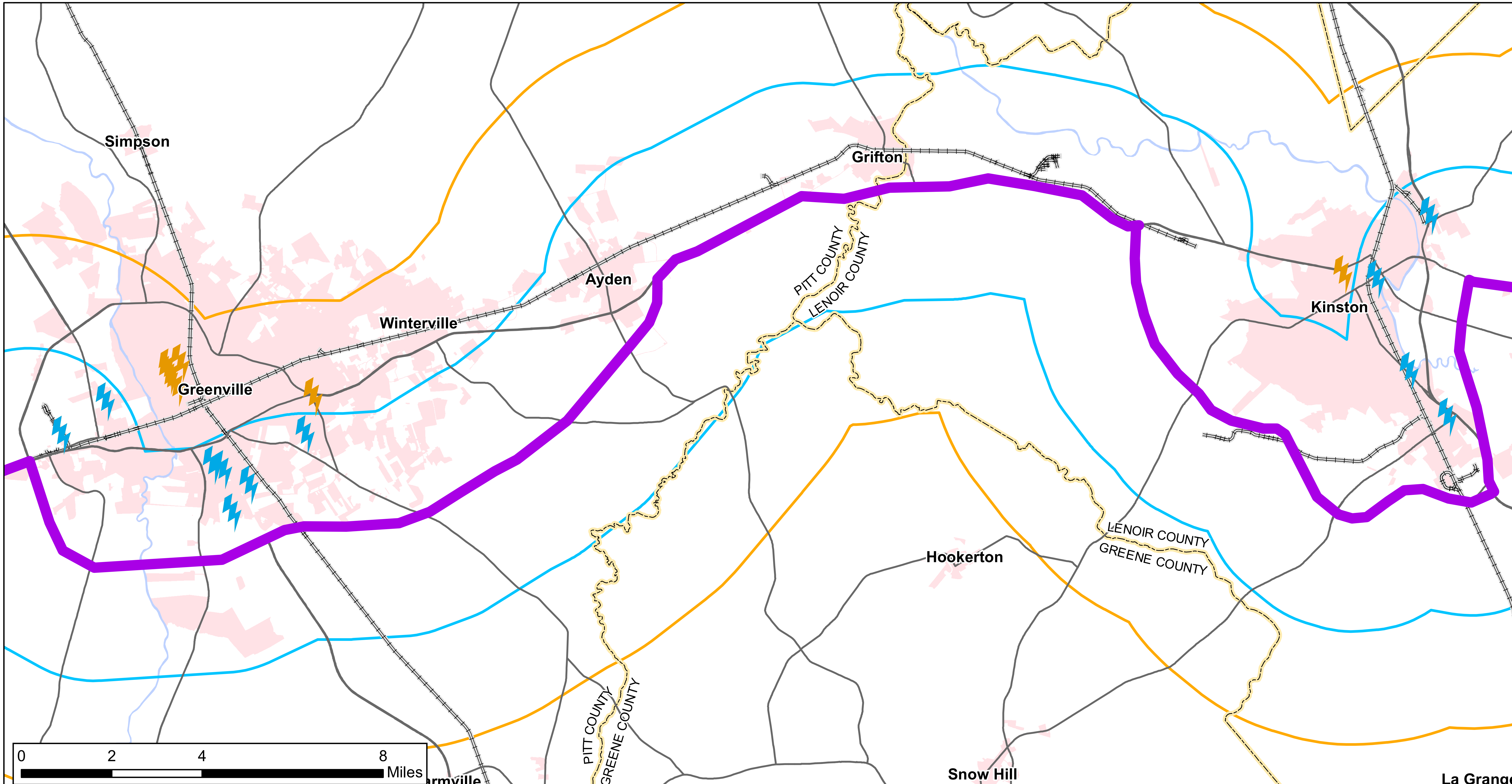
Figures



CORRIDOR X: ELECTRIC CHARGING STATIONS

FIGURE 4A: U.S. 13 TO GREENVILLE

This map is accurate as of October 2021. For updated charging station locations and location addresses, please visit https://pluginnc.com/find-a-charging-station/



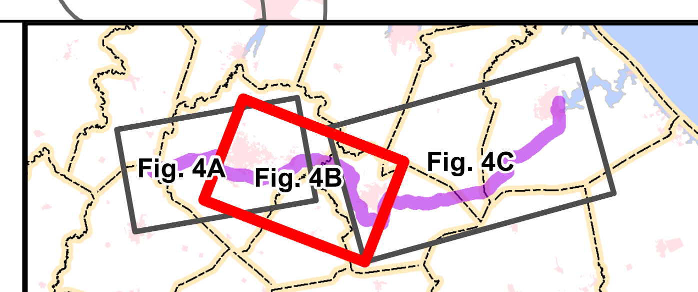
NC STRATEGIC TRANSPORTATION CORRIDORS (STC)

FEBRUARY 2022

Source: NCOneMap, NCDOT GIS, ESRI, Plug-In NC

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties
- Charging Stations Within 5 miles
- Charging Stations Within 10 miles
- 5 Mile STC Buffer
- 10 Mile STC Buffer

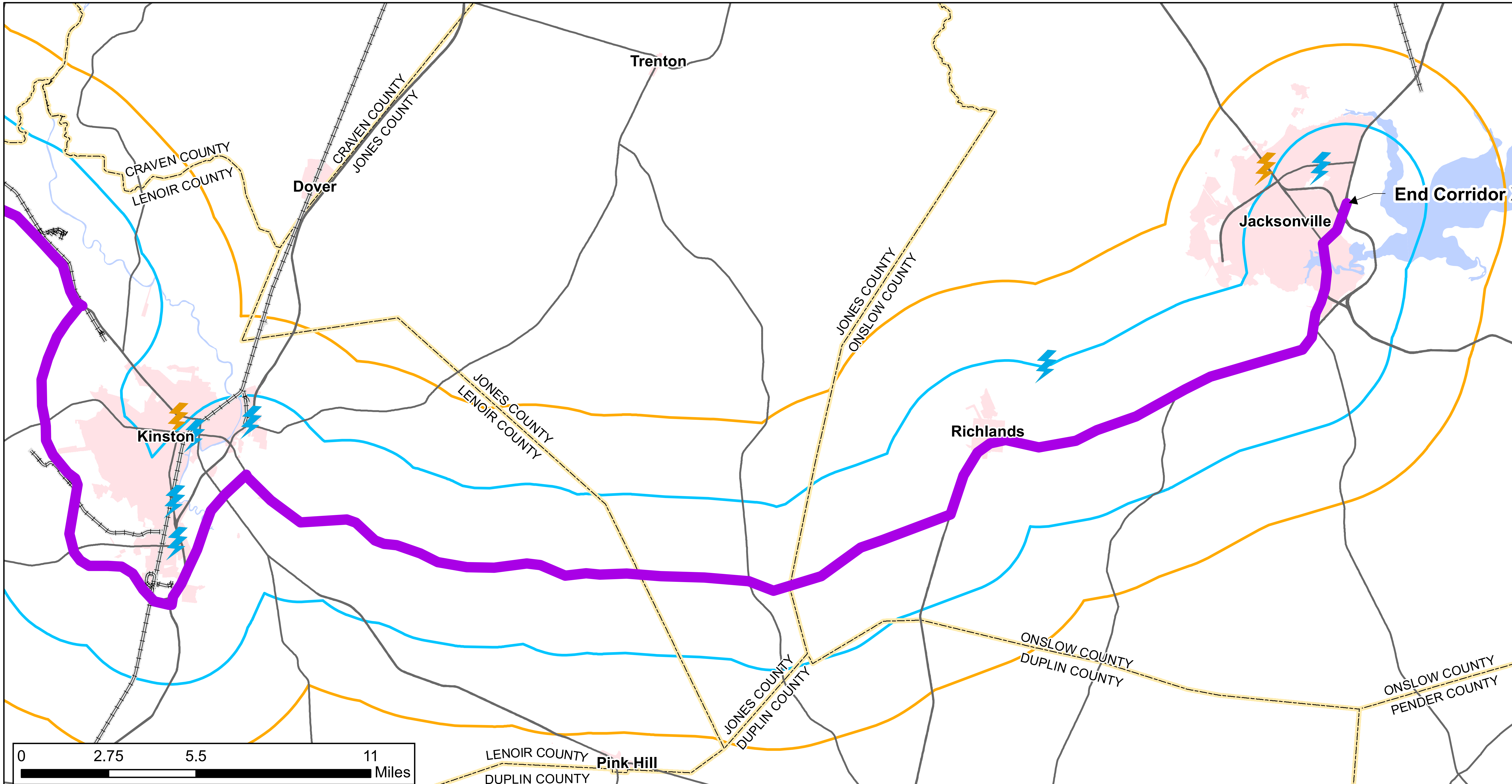


N

CORRIDOR X: ELECTRIC CHARGING STATIONS

FIGURE 4B: GREENVILLE TO KINSTON

This map is accurate as of October 2021. For updated charging station locations and location addresses, please visit https://pluginnc.com/find-a-charging-station/



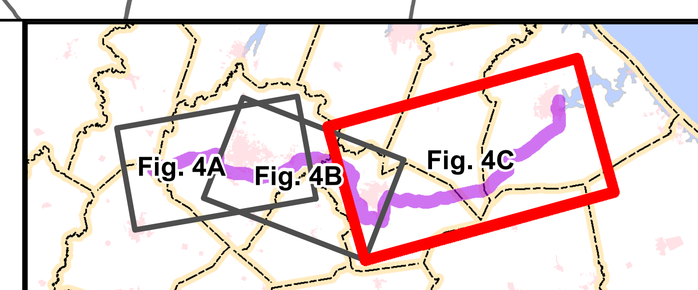
NC STRATEGIC TRANSPORTATION CORRIDORS (STC)

FEBRUARY 2022

Source: NCOneMap, NCDOT GIS, ESRI, Plug-In NC

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties
- Charging Stations Within 5 miles
- Charging Stations Within 10 miles
- 5 Mile STC Buffer
- 10 Mile STC Buffer



CORRIDOR X: ELECTRIC CHARGING STATIONS

FIGURE 4C: KINSTON TO JACKSONVILLE

This map is accurate as of October 2021. For updated charging station locations and location addresses, please visit https://pluginnc.com/find-a-charging-station/

Appendix G

Population and Employment Growth Data
Statewide Model

Table of Contents

Tables

Figures

Population and Employment Growth

This appendix presents base and future year population and employment growth for Corridor X of the North Carolina Strategic Transportation Corridors (STC). The following data is collected using the Traffic Analysis Zones (TAZ) of the North Carolina Statewide Model and is organized numerically by TAZ Number. TAZ within a 2-mile buffer area on both sides of the corridor were used to capture population and employment totals.

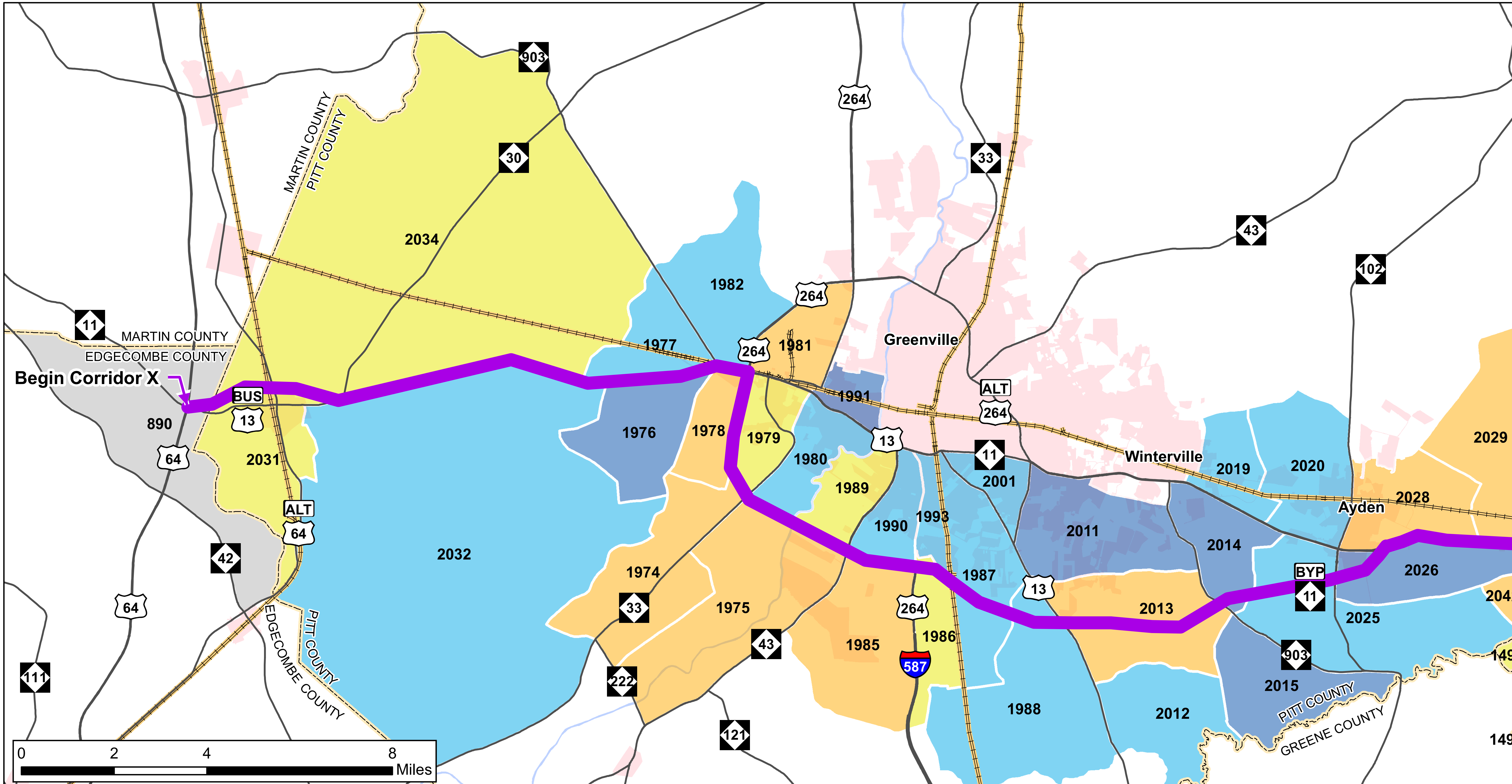
Table G-1. Population and Employment Growth – Statewide Model Traffic Analysis Zone

TAZ Number	Population in 2015	Population in 2040	Annual Population Growth (2015-2040)	Total Number of Employed Persons in 2015	Total Number of Employed Persons in 2040	Annual Employment Growth (2015-2040)
890	114	112	-0.1%	0	0	0.0%
1481	1,522	1,503	-0.1%	258	288	0.4%
1482	2,729	2,711	<0.0%	1,075	1,200	0.4%
1497	3,351	3,356	<0.1%	453	481	0.2%
1498	11,546	11,482	<0.0%	4,679	4,963	0.2%
1499	2,575	2,561	<0.0%	1,941	2,059	0.2%
1500	11,085	11,000	<0.0%	10,410	11,041	0.2%
1501	3,134	3,142	<0.1%	1,943	2,061	0.2%
1502	2,547	2,549	<0.1%	1,956	2,075	0.2%
1503	10,526	10,418	<0.0%	6,110	6,480	0.2%
1505	2,789	2,755	<0.0%	1,813	1,924	0.2%
1506	1,134	1,119	-0.1%	157	167	0.2%
1507	2,493	2,460	-0.1%	1,600	1,697	0.2%
1508	3,237	3,233	<0.0%	951	1,009	0.2%
1875	5,585	9,323	2.1%	1,266	1,380	0.3%
1877	4,544	6,117	1.2%	288	307	0.3%
1878	14,637	23,399	1.9%	966	1,144	0.7%
1881	9,561	12,898	1.2%	977	1,026	0.2%
1882	2,964	3,996	1.2%	892	1,064	0.7%
1883	5,596	6,680	0.7%	4,945	5,164	0.2%
1885	11,110	13,996	0.9%	4,437	4,800	0.3%
1886	1,311	1,413	0.3%	6,934	7,542	0.3%
1889	1,643	2,217	1.2%	150	163	0.3%
1891	1,435	1,935	1.2%	33	64	2.7%
1892	1,389	1,872	1.2%	2,328	2,532	0.3%
1893	4,006	5,239	1.1%	935	987	0.2%
1894	3,767	4,435	0.7%	2,875	3,127	0.3%
1895	7,264	10,140	1.3%	1,474	1,603	0.3%
1896	20,350	26,386	1.0%	6,687	7,360	0.4%
1974	2,536	3,488	1.3%	307	563	2.5%
1975	2,607	3,631	1.3%	244	254	0.2%
1976	671	1,277	2.6%	26	28	0.3%
1977	279	405	1.5%	104	332	4.8%
1978	748	974	1.1%	200	209	0.2%

(Continued on next page)

Table F-2. Population and Employment Growth – Statewide Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2015	Population in 2040	Annual Population Growth (2015-2040)	Total Number of Employed Persons in 2015	Total Number of Employed Persons in 2040	Annual Employment Growth (2015-2040)
1979	1,888	2,100	0.4%	367	381	0.1%
1980	1,221	1,751	1.5%	537	559	0.2%
1981	1,264	1,626	1.0%	4,836	6,383	1.1%
1982	399	570	1.4%	5,477	7,039	1.0%
1985	772	1,001	1.0%	307	321	0.2%
1986	1,540	1,731	0.5%	117	123	0.2%
1987	3,069	4,808	1.8%	923	1,265	1.3%
1988	1,673	2,767	2.0%	210	220	0.2%
1989	2,709	2,944	0.3%	1,403	1,818	1.0%
1990	3,616	5,558	1.7%	14,378	18,408	1.0%
1991	577	1,031	2.3%	701	731	0.2%
1993	2,525	3,621	1.5%	3,062	4,052	1.1%
2001	5,566	7,883	1.4%	1,436	2,076	1.5%
2011	9,922	18,940	2.6%	3,194	4,755	1.6%
2012	427	661	1.8%	110	115	0.2%
2013	1,638	2,215	1.2%	157	165	0.2%
2014	762	1,484	2.7%	62	282	6.2%
2015	413	689	2.1%	79	84	0.2%
2019	1,095	1,532	1.4%	576	864	1.6%
2020	2,800	4,195	1.6%	945	986	0.2%
2025	1,216	1,716	1.4%	360	1,069	4.4%
2026	694	1,355	2.7%	702	1,477	3.0%
2028	2,721	3,540	1.1%	765	1,284	2.1%
2029	1,031	1,289	0.9%	573	598	0.2%
2031	1,754	1,795	0.1%	488	2,707	7.1%
2032	1,868	2,969	1.9%	463	2,568	7.1%
2034	1,250	1,384	0.4%	609	3,380	7.1%
2042	159	216	1.2%	18	104	7.3%
2043	4,242	6,215	1.5%	1,094	6,064	7.1%



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

FEBRUARY 2022

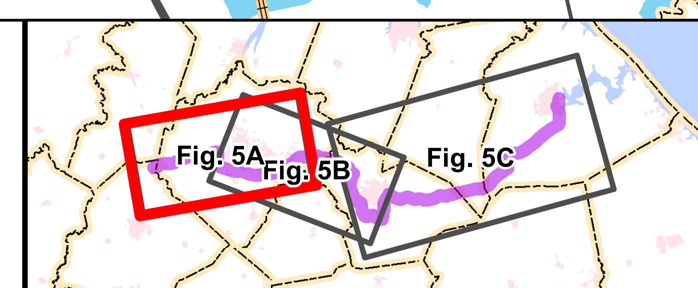
Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties

Annual Population Growth (2015-2040)

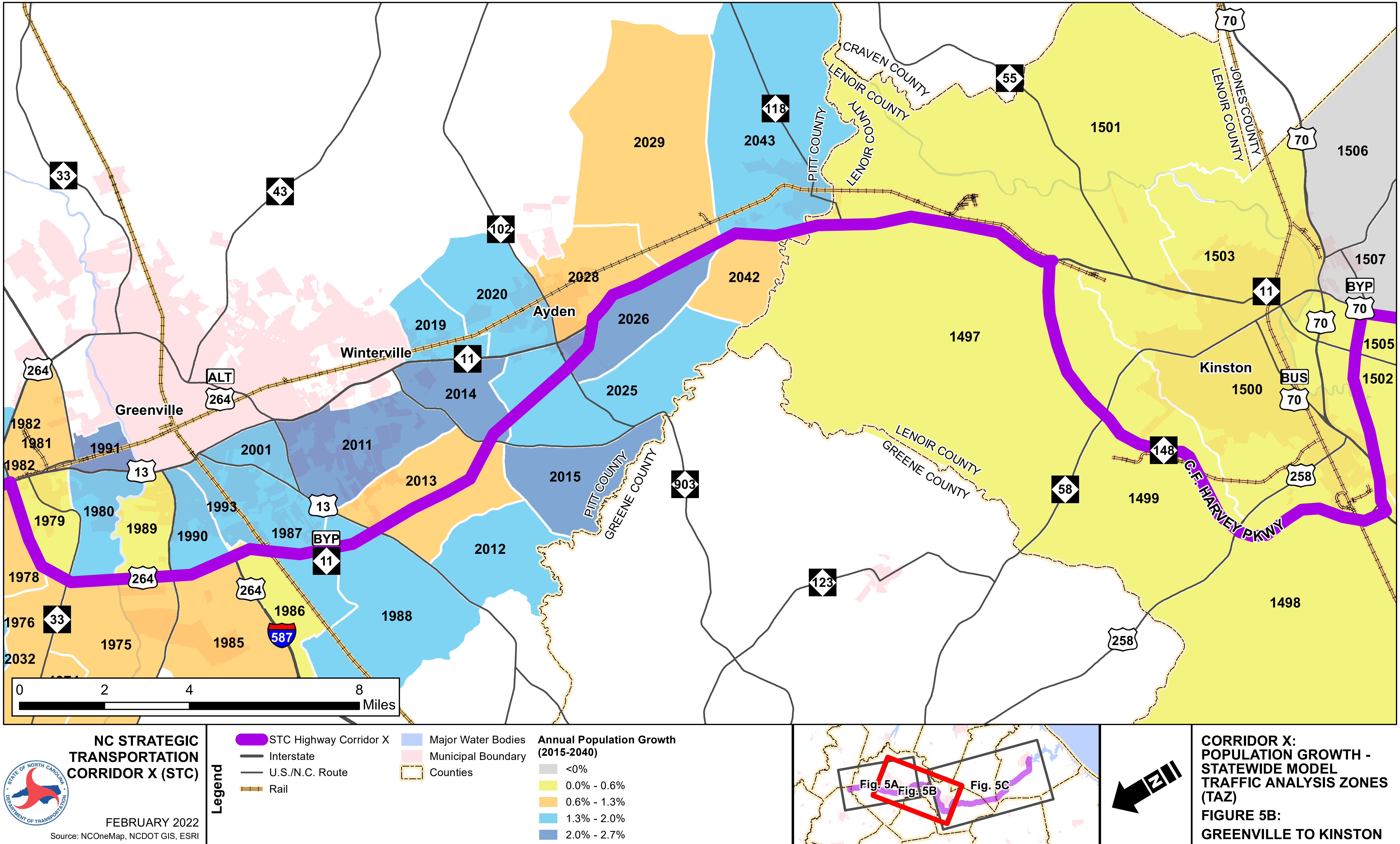
- <0%
- 0.0% - 0.6%
- 0.6% - 1.3%
- 1.3% - 2.0%
- 2.0% - 2.7%



CORRIDOR X: POPULATION GROWTH - STATEWIDE MODEL TRAFFIC ANALYSIS ZONES (TAZ)

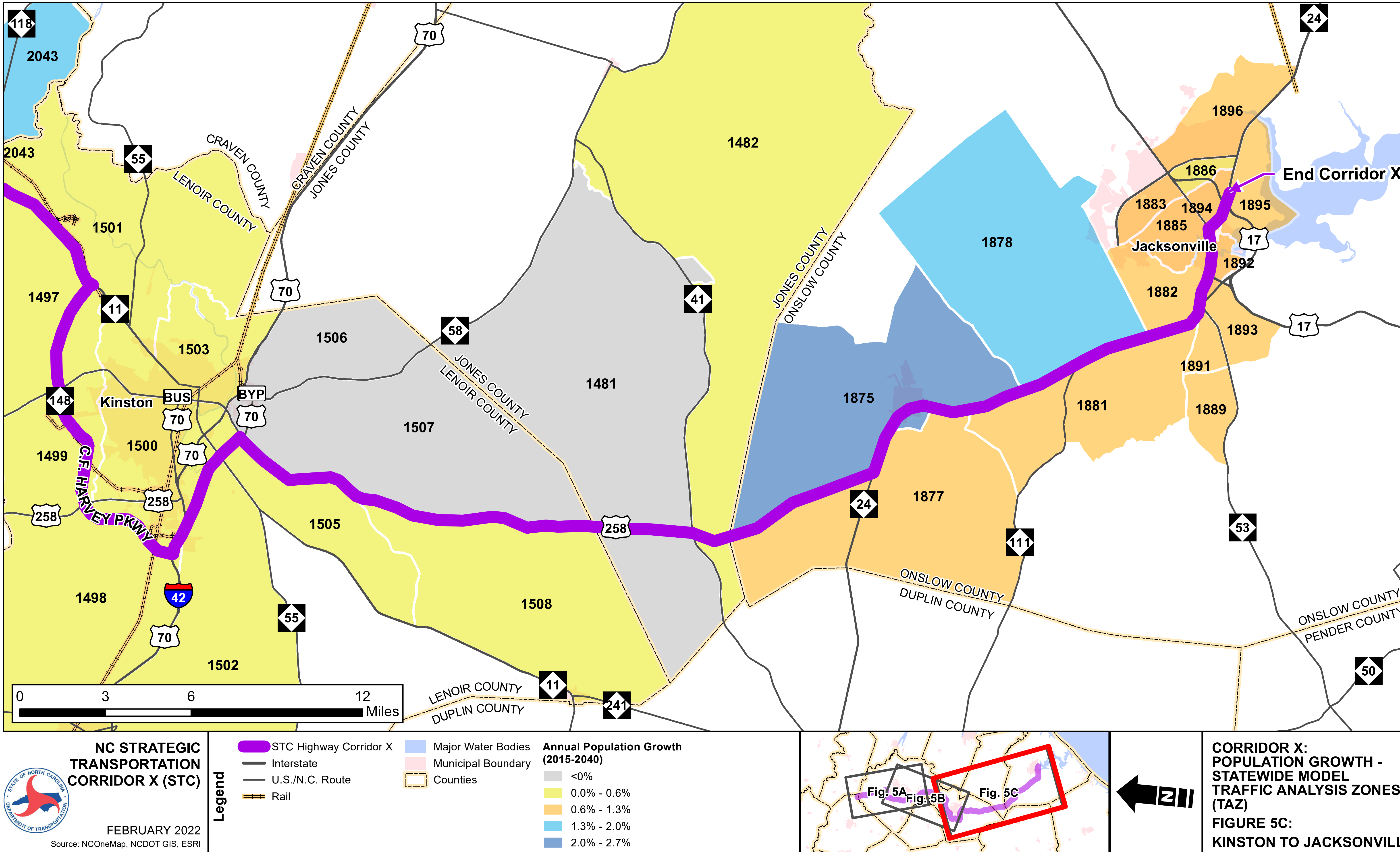
FIGURE 5A: U.S. 13 TO GREENVILLE

TAZ Number on the map correlates to TAZ Number in Appendix F of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.
*TAZ Number is the 1-4 digit solid, bold number in map.



TAZ Number on the map correlates to TAZ Number in Appendix F of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.

*TAZ Number is the 1-4 digit solid, bold number in map.



TAZ Number on the map correlates to TAZ Number in Appendix F of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.
*TAZ Number is the 1-4 digit solid, bold number in map.

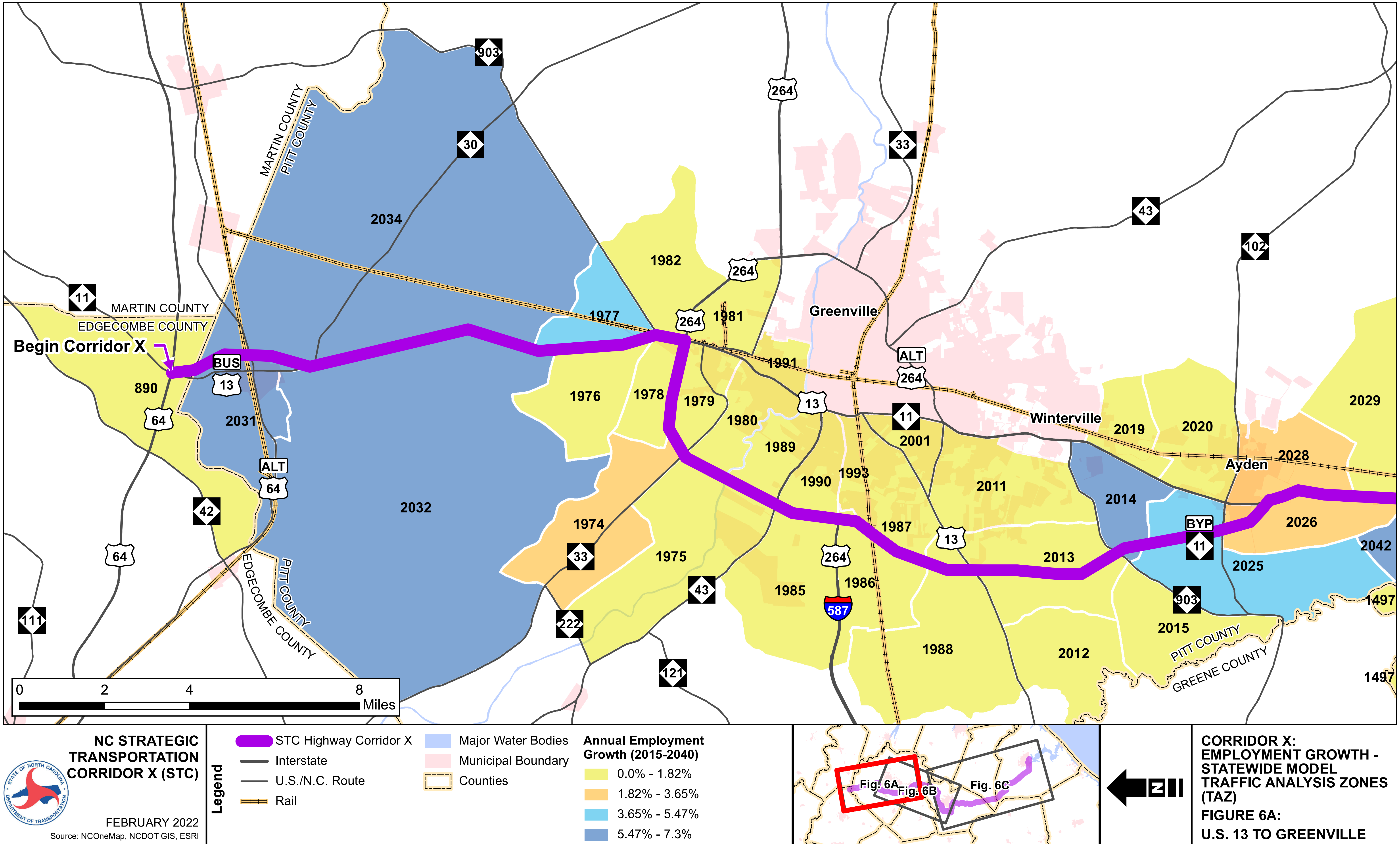
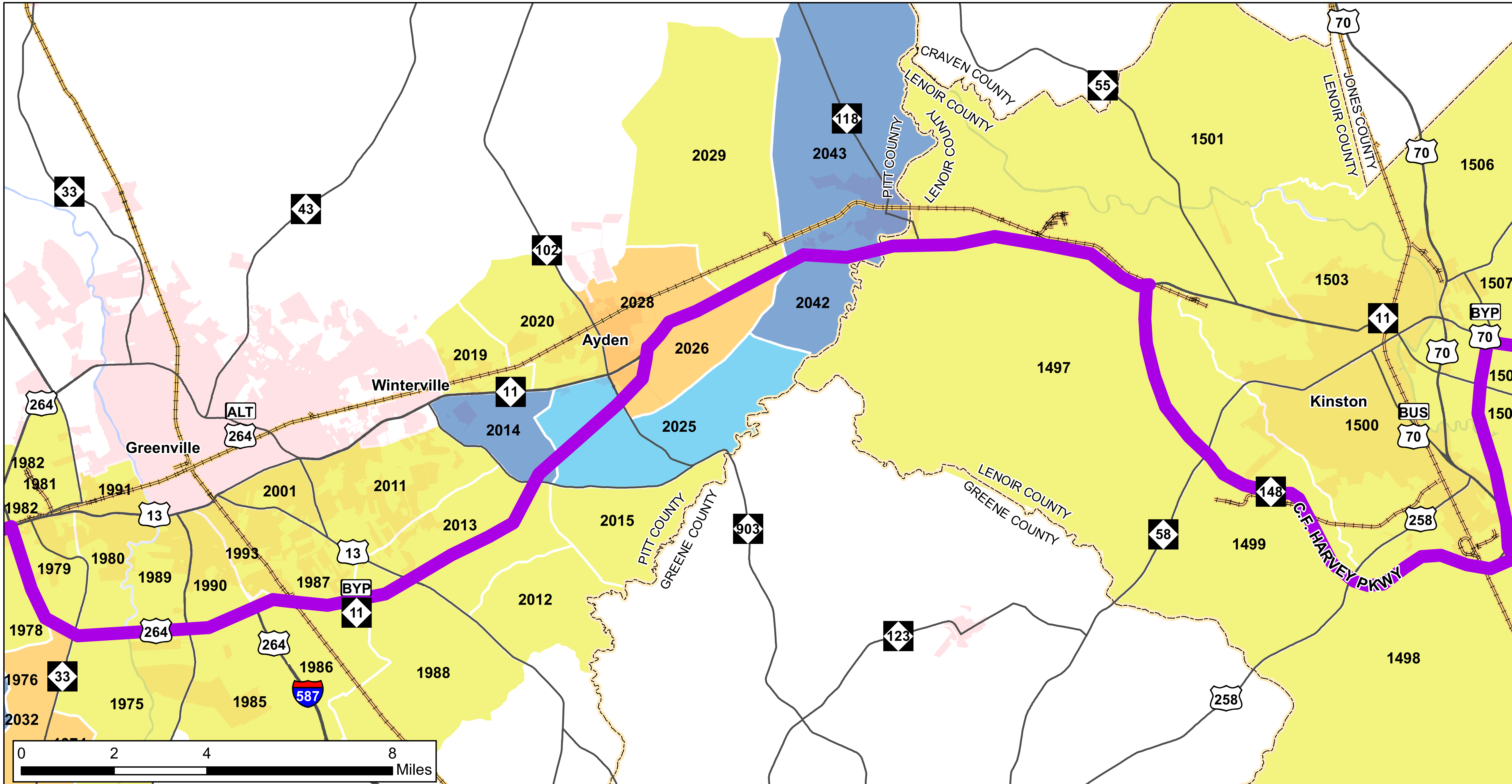


FIGURE 6A: U.S. 13 TO GREENVILLE

TAZ Number on the map correlates to TAZ Number in Appendix F of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.
*TAZ Number is the 1-4 digit solid, bold number in map.



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

FEBRUARY 2022

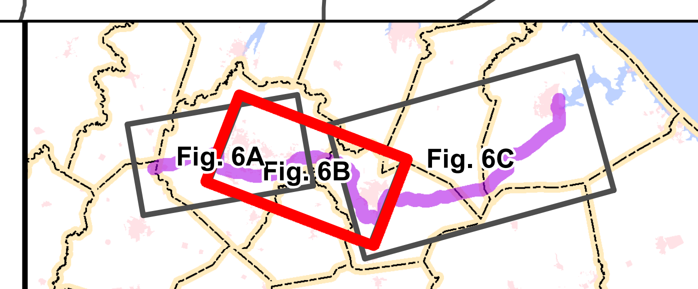
Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties

Annual Employment Growth (2015-2040)

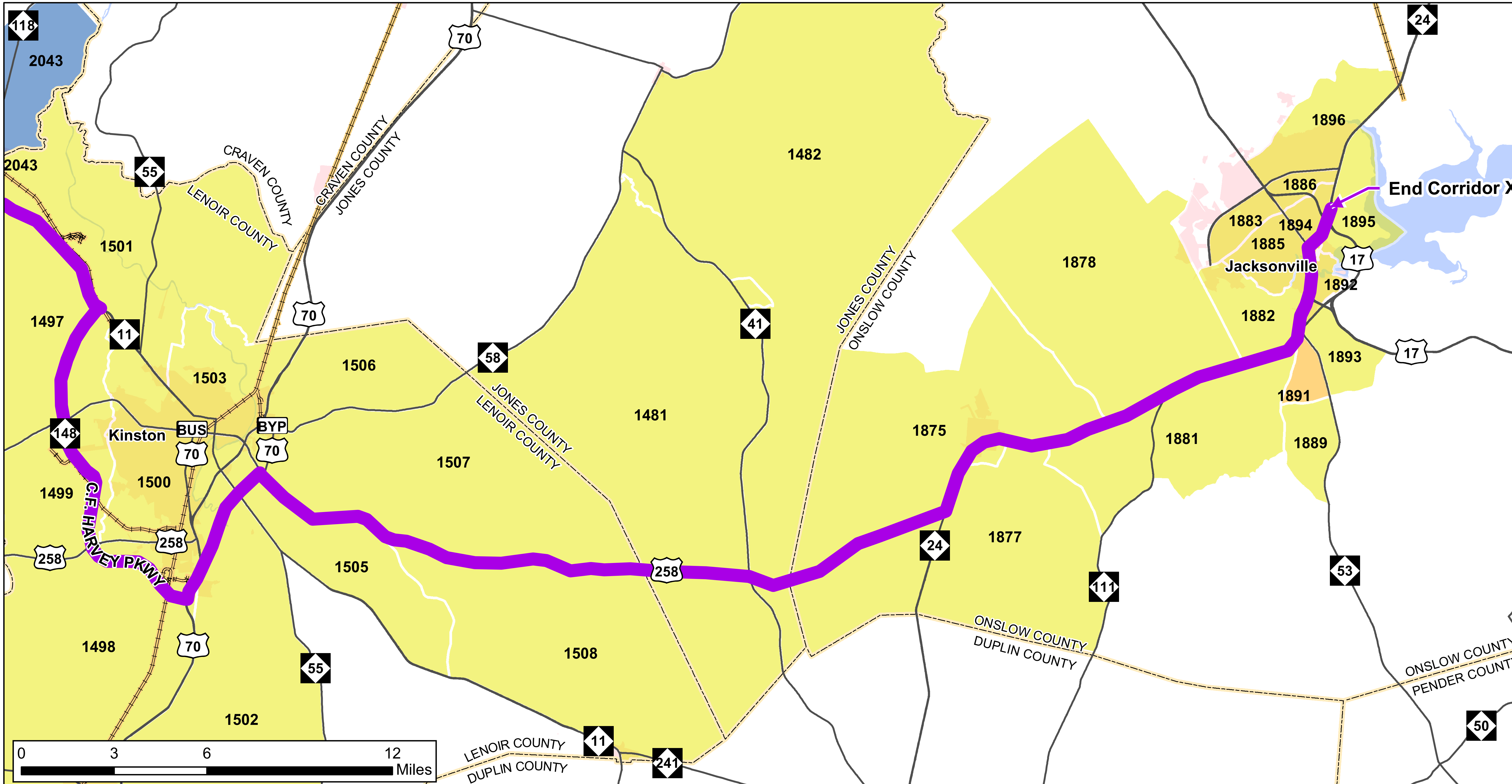
- 0.0% - 1.82%
- 1.82% - 3.65%
- 3.65% - 5.47%
- 5.47% - 7.3%



CORRIDOR X: EMPLOYMENT GROWTH - STATEWIDE MODEL TRAFFIC ANALYSIS ZONES (TAZ)

FIGURE 6B: GREENVILLE TO KINSTON

TAZ Number on the map correlates to TAZ Number in Appendix F of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.
*TAZ Number is the 1-4 digit solid, bold number in map.



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

FEBRUARY 2022

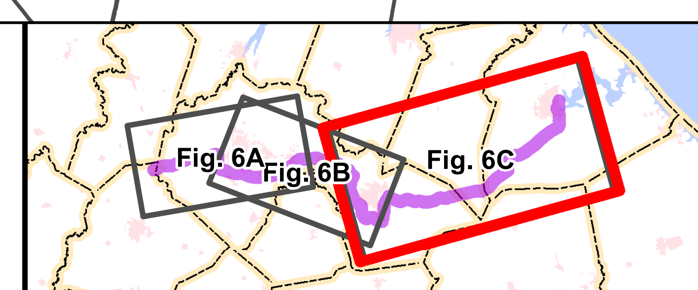
Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties

Annual Employment Growth (2015-2040)

- 0.0% - 1.82%
- 1.82% - 3.65%
- 5.47% - 7.3%



CORRIDOR X: EMPLOYMENT GROWTH - STATEWIDE MODEL TRAFFIC ANALYSIS ZONES (TAZ)

FIGURE 6C:

KINSTON TO JACKSONVILLE

TAZ Number on the map correlates to TAZ Number in Appendix F of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.
*TAZ Number is the 1-4 digit solid, bold number in map.

Appendix H

Population and Employment Growth Data
Regional Models

Table of Contents

Tables

Figures

Population and Employment Growth

This appendix presents base and future year population and employment growth for Corridor X of the North Carolina Strategic Transportation Corridors (STC). The following data is collected using the Kinston, Jacksonville, and Greenville Regional Traffic Model Traffic Analysis Zones (TAZ) and is organized numerically by TAZ Number. TAZs within a 2-mile buffer area on both sides of the corridor were used to capture population and employment totals.

Table H-1. Population and Employment Growth – Kinston Regional Model Traffic Analysis Zone

TAZ Number	Population in 2010	Population in 2040	Annual Population Growth (2010-2040)	Total Number of Employed Persons in 2010	Total Number of Employed Persons in 2040	Annual Employment Growth (2010-2040)
74	111	111	0.0%	9	11	0.7%
85	4	4	0.0%	2	2	0.0%
86	374	374	0.0%	30	32	0.2%
87	4	4	0.0%	4	5	0.7%
102	57	57	0.0%	108	129	0.6%
103	8	8	0.0%	830	942	0.4%
104	55	55	0.0%	7	9	0.8%
105	104	104	0.0%	787	833	0.2%
106	280	280	0.0%	340	369	0.3%
107	195	195	0.0%	412	529	0.8%
108	102	102	0.0%	128	144	0.4%
109	340	340	0.0%	38	53	1.1%
110	231	231	0.0%	55	75	1.0%
111	1554	1554	0.0%	3514	3791	0.3%
112	61	61	0.0%	64	75	0.5%
113	282	282	0.0%	5	5	0.0%
114	705	705	0.0%	25	25	0.0%
115	1808	1808	0.0%	81	94	0.5%
116	87	87	0.0%	90	106	0.5%
117	5	5	0.0%	9	9	0.0%
118	485	485	0.0%	11	12	0.3%
119	215	215	0.0%	10	11	0.3%
120	150	150	0.0%	27	29	0.2%
121	264	264	0.0%	249	290	0.5%
122	217	217	0.0%	276	458	1.7%
123	1251	1251	0.0%	45	104	2.8%
124	0	0	0.0%	84	104	0.7%
125	52	52	0.0%	1	151	18.2%
127	95	95	0.0%	1	1	0.0%
130	131	131	0.0%	5	27	5.8%
131	54	54	0.0%	5	19	4.6%
132	27	27	0.0%	335	606	2.0%
133	378	378	0.0%	13	615	13.7%
134	18	18	0.0%	1086	1410	0.9%

(Continued on next page)

Table H-1. Population and Employment Growth – Kinston Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2010	Population in 2040	Annual Population Growth (2010-2040)	Total Number of Employed Persons in 2010	Total Number of Employed Persons in 2040	Annual Employment Growth (2010-2040)
135	146	146	0.0%	43	312	6.8%
136	0	0	0.0%	30	86	3.6%
137	1072	1072	0.0%	630	750	0.6%
138	399	399	0.0%	16	16	0.0%
139	191	191	0.0%	172	182	0.2%
144	596	596	0.0%	249	260	0.1%
148	351	351	0.0%	281	293	0.1%
161	482	482	0.0%	320	340	0.2%
162	306	306	0.0%	155	158	0.1%
171	2	2	0.0%	373	438	0.5%
172	269	269	0.0%	509	615	0.6%
173	30	30	0.0%	55	57	0.1%
189	18	18	0.0%	305	322	0.2%
193	120	120	0.0%	9	10	0.4%
194	963	963	0.0%	602	636	0.2%
195	72	72	0.0%	219	240	0.3%
205	364	364	0.0%	32	34	0.2%
207	90	90	0.0%	0	0	0.0%
210	48	48	0.0%	132	42	-3.7%
211	33	33	0.0%	14	252	10.1%
212	111	111	0.0%	1	15	9.4%
213	53	53	0.0%	56	0	-100.0%
214	20	20	0.0%	1	67	15.0%
215	0	0	0.0%	12	0	-100.0%
216	325	325	0.0%	3	13	5.0%
217	66	66	0.0%	34	4	-6.9%
218	22	22	0.0%	71	53	-1.0%
219	30	30	0.0%	7	83	8.6%
220	49	49	0.0%	0	0	0.0%
221	66	66	0.0%	97	12	-6.7%
222	210	210	0.0%	2	97	13.8%
223	9	9	0.0%	37	2	-9.3%
224	30	30	0.0%	1	39	13.0%
225	63	63	0.0%	2	0	-100.0%

(Continued on next page)

Table H-1. Population and Employment Growth – Kinston Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2010	Population in 2040	Annual Population Growth (2010-2040)	Total Number of Employed Persons in 2010	Total Number of Employed Persons in 2040	Annual Employment Growth (2010-2040)
226	0	0	0.0%	4	2	-2.3%
228	3	3	0.0%	30	0	-100.0%
229	10	10	0.0%	1	40	13.1%
237	129	129	0.0%	1	4	4.7%
238	11	11	0.0%	10	0	-100.0%
239	76	76	0.0%	3	11	4.4%
240	114	114	0.0%	1	4	4.7%
241	283	283	0.0%	3	0	-100.0%
246	68	68	0.0%	1	2	2.3%
247	85	85	0.0%	0	0	0.0%
252	147	147	0.0%	27	0	-100.0%
287	245	245	0.0%	8	9	0.4%
288	140	140	0.0%	1	9	7.6%
292	425	425	0.0%	21	636	12.0%
293	80	80	0.0%	40	21	-2.1%
296	209	209	0.0%	23	98	5.0%
297	62	62	0.0%	7	23	4.0%
298	3	3	0.0%	2	7	4.3%
299	0	0	0.0%	64	2	-10.9%
300	48	48	0.0%	45	70	1.5%
301	34	34	0.0%	0	0	0.0%
302	650	650	0.0%	5	5	0.0%
303	68	68	0.0%	206	237	0.5%
304	175	175	0.0%	213	231	0.3%
305	119	119	0.0%	249	261	0.2%
306	22	22	0.0%	39	39	0.0%
307	1028	1028	0.0%	6	6	0.0%
308	174	174	0.0%	25	31	0.7%
309	274	274	0.0%	0	0	0.0%
310	52	52	0.0%	42	45	0.2%
313	136	136	0.0%	1	1	0.0%
314	209	209	0.0%	4	5	0.7%
315	183	183	0.0%	54	56	0.1%
317	357	357	0.0%	0	0	0.0%
321	114	114	0.0%	5	5	0.0%

(Continued on next page)

Table H-1. Population and Employment Growth – Kinston Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2010	Population in 2040	Annual Population Growth (2010-2040)	Total Number of Employed Persons in 2010	Total Number of Employed Persons in 2040	Annual Employment Growth (2010-2040)
325	750	750	0.0%	0	0	0.0%
331	0	0	0.0%	0	0	0.0%
332	56	56	0.0%	0	0	0.0%
333	67	67	0.0%	0	0	0.0%
334	98	98	0.0%	0	0	0.0%
335	185	185	0.0%	0	0	0.0%
336	0	0	0.0%	0	0	0.0%
337	0	0	0.0%	0	0	0.0%
338	67	67	0.0%	0	0	0.0%
339	13	13	0.0%	0	0	0.0%
340	0	0	0.0%	0	0	0.0%
341	203	203	0.0%	10	7	-1.2%
342	134	134	0.0%	0	0	0.0%
343	0	0	0.0%	0	0	0.0%
344	471	471	0.0%	0	0	0.0%
345	0	0	0.0%	0	0	0.0%
346	0	0	0.0%	0	0	0.0%
347	50	50	0.0%	86	96	0.4%
348	30	30	0.0%	0	0	0.0%
349	11	11	0.0%	0	0	0.0%

Table H-2. Population and Employment Growth – Jacksonville Regional Model Traffic Analysis Zone

TAZ Number	Population in 2010	Population in 2040	Annual Population Growth (2010-2040)	Total Number of Employed Persons in 2010	Total Number of Employed Persons in 2040	Annual Employment Growth (2010-2040)
39	215	356	1.7%	10	17	1.8%
40	621	1029	1.7%	45	79	1.9%
41	347	575	1.7%	10	17	1.8%
42	295	489	1.7%	13	23	1.9%
43	359	595	1.7%	16	28	1.9%
44	70	116	1.7%	4	7	1.9%
45	27	44	1.6%	32	56	1.9%
48	636	1986	3.9%	4	7	1.9%
49	72	224	3.9%	21	37	1.9%
50	536	1674	3.9%	6	10	1.7%
53	209	652	3.9%	0	0	0.0%
54	200	624	3.9%	31	54	1.9%
55	266	784	3.7%	28	49	1.9%
56	93	154	1.7%	8	14	1.9%
57	77	127	1.7%	46	81	1.9%
58	314	520	1.7%	75	132	1.9%
59	164	271	1.7%	228	403	1.9%
60	299	535	2.0%	52	92	1.9%
61	28	46	1.7%	12	21	1.9%
62	171	283	1.7%	208	368	1.9%
63	203	336	1.7%	4	7	1.9%
64	22	36	1.7%	311	550	1.9%
65	367	608	1.7%	1	1	0.0%
66	104	172	1.7%	23	40	1.9%
67	128	212	1.7%	2	3	1.4%
68	254	421	1.7%	9	15	1.7%
76	185	306	1.7%	2	3	1.4%
77	64	106	1.7%	1	1	0.0%
79	1125	3514	3.9%	57	100	1.9%
80	1164	1930	1.7%	157	277	1.9%
81	978	1621	1.7%	14	24	1.8%
82	690	1144	1.7%	192	339	1.9%
83	296	490	1.7%	140	247	1.9%
84	1136	1883	1.7%	62	109	1.9%
85	655	1086	1.7%	308	545	1.9%

(Continued on next page)

Table H-2. Population and Employment Growth – Jacksonville Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2010	Population in 2040	Annual Population Growth (2010-2040)	Total Number of Employed Persons in 2010	Total Number of Employed Persons in 2040	Annual Employment Growth (2010-2040)
86	293	485	1.7%	66	116	1.9%
87	3438	5700	1.7%	122	215	1.9%
103	845	1401	1.7%	11	19	1.8%
158	944	1565	1.7%	6	10	1.7%
159	52	86	1.7%	101	178	1.9%
160	310	514	1.7%	594	1051	1.9%
161	838	1389	1.7%	10	17	1.8%
162	500	829	1.7%	27	47	1.9%
163	823	1364	1.7%	15	26	1.9%
164	1118	1853	1.7%	115	203	1.9%
165	235	389	1.7%	851	1506	1.9%
166	565	936	1.7%	806	1426	1.9%
167	191	191	0.0%	3	5	1.7%
168	11	11	0.0%	251	444	1.9%
169	312	312	0.0%	26	46	1.9%
170	1389	2303	1.7%	337	596	1.9%
171	1143	1895	1.7%	95	168	1.9%
172	687	1139	1.7%	107	189	1.9%
179	1458	2417	1.7%	89	157	1.9%
186	2703	2703	0.0%	2801	4958	1.9%
187	5188	7415	1.2%	507	897	1.9%
188	1190	1973	1.7%	616	1090	1.9%
189	1200	1989	1.7%	21	37	1.9%
190	1895	2316	0.7%	997	1765	1.9%
191	679	1125	1.7%	551	975	1.9%
192	86	142	1.7%	43	76	1.9%
193	2	3	1.4%	53	93	1.9%
194	17	28	1.7%	142	251	1.9%
195	304	504	1.7%	138	244	1.9%
196	16	26	1.6%	94	166	1.9%
197	1	1	0.0%	125	221	1.9%
198	0	0	0.0%	608	1076	1.9%
199	0	0	0.0%	144	254	1.9%
200	8	13	1.6%	74	131	1.9%
201	3	4	1.0%	35	61	1.9%

(Continued on next page)

Table H-2. Population and Employment Growth – Jacksonville Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2010	Population in 2040	Annual Population Growth (2010-2040)	Total Number of Employed Persons in 2010	Total Number of Employed Persons in 2040	Annual Employment Growth (2010-2040)
202	120	198	1.7%	551	975	1.9%
203	590	978	1.7%	331	585	1.9%
204	143	237	1.7%	182	322	1.9%
205	353	585	1.7%	219	387	1.9%
206	1433	2376	1.7%	1836	3250	1.9%
214	0	0	0.0%	1131	2002	1.9%
216	1505	2495	1.7%	151	267	1.9%
218	2284	2284	0.0%	66	116	1.9%
219	2435	2435	0.0%	526	931	1.9%
220	1670	1670	0.0%	976	1727	1.9%
221	0	0	0.0%	105	185	1.9%
239	774	774	0.0%	349	617	1.9%
240	739	739	0.0%	357	632	1.9%
241	306	306	0.0%	106	187	1.9%
242	151	151	0.0%	294	520	1.9%
243	551	913	1.7%	542	959	1.9%
244	1	1	0.0%	91	161	1.9%
245	592	981	1.7%	20	35	1.9%
246	71	71	0.0%	650	1150	1.9%
247	219	219	0.0%	44	77	1.9%
248	104	104	0.0%	35	61	1.9%
249	343	343	0.0%	2423	4289	1.9%
250	273	273	0.0%	5	8	1.6%
251	15	15	0.0%	383	678	1.9%
252	1	1	0.0%	1308	2315	1.9%
253	61	61	0.0%	855	1513	1.9%
254	0	0	0.0%	427	755	1.9%
501	4742	5508	0.5%	257	454	1.9%

Table H-3. Population and Employment Growth – Greenville Regional Model Traffic Analysis Zone

TAZ Number	Population in 2016	Population in 2045	Annual Population Growth (2016-2045)	Total Number of Employed Persons in 2016	Total Number of Employed Persons in 2045	Annual Employment Growth (2016-2045)
72	1017	1100	0.3%	65	70	0.3%
73	21	23	0.3%	215	233	0.3%
74	0	0	0.0%	8430	9126	0.3%
76	0	0	0.0%	381	413	0.3%
78	0	0	0.0%	1104	1196	0.3%
79	619	670	0.3%	393	426	0.3%
80	1074	1162	0.3%	69	75	0.3%
81	140	151	0.3%	449	486	0.3%
82	1075	1163	0.3%	45	48	0.2%
84	107	116	0.3%	195	210	0.3%
85	3523	3811	0.3%	273	295	0.3%
87	862	933	0.3%	264	286	0.3%
88	1170	1266	0.3%	40	43	0.2%
89	141	153	0.3%	56	61	0.3%
90	3146	3403	0.3%	669	726	0.3%
92	1488	1610	0.3%	499	540	0.3%
115	30	32	0.2%	150	163	0.3%
116	120	130	0.3%	5	5	0.0%
117	22	24	0.3%	190	206	0.3%
118	132	143	0.3%	206	224	0.3%
119	28	30	0.2%	15	16	0.2%
121	0	0	0.0%	442	478	0.3%
122	0	0	0.0%	673	731	0.3%
123	28	30	0.2%	1244	1347	0.3%
124	70	76	0.3%	214	233	0.3%
128	201	217	0.3%	59	64	0.3%
130	0	0	0.0%	0	0	0.0%
131	0	0	0.0%	207	225	0.3%
132	923	999	0.3%	50	53	0.2%
159	50	54	0.3%	32	35	0.3%
160	5	5	0.0%	679	736	0.3%
161	15	16	0.2%	1344	1456	0.3%
168	0	0	0.0%	2397	2597	0.3%
196	1104	1194	0.3%	1522	1649	0.3%
197	362	392	0.3%	85	92	0.3%
198	1841	1992	0.3%	93	100	0.3%

(Continued on next page)

Table H-3. Population and Employment Growth – Greenville Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2016	Population in 2045	Annual Population Growth (2016-2045)	Total Number of Employed Persons in 2016	Total Number of Employed Persons in 2045	Annual Employment Growth (2016-2045)
200	1781	1927	0.3%	600	651	0.3%
215	1288	1393	0.3%	239	258	0.3%
217	990	1071	0.3%	44	48	0.3%
222	55	60	0.3%	1	1	0.0%
224	119	129	0.3%	1	1	0.0%
263	42	45	0.2%	3	3	0.0%
264	428	463	0.3%	10	10	0.0%
265	20	22	0.3%	0	0	0.0%
266	374	405	0.3%	5	5	0.0%
267	53	57	0.3%	10	10	0.0%
268	266	288	0.3%	41	44	0.2%
269	271	293	0.3%	17	18	0.2%
270	98	106	0.3%	13	14	0.3%
271	80	87	0.3%	15	16	0.2%
272	158	171	0.3%	20	21	0.2%
273	88	95	0.3%	6	6	0.0%
315	368	398	0.3%	5	5	0.0%
316	427	462	0.3%	286	310	0.3%
318	281	304	0.3%	76	82	0.3%
320	189	204	0.3%	137	148	0.3%
322	6	6	0.0%	6	6	0.0%
323	593	642	0.3%	41	44	0.2%
324	32	35	0.3%	0	0	0.0%
325	87	94	0.3%	48	51	0.2%
335	10	11	0.3%	0	0	0.0%
336	116	125	0.3%	277	302	0.3%
341	850	920	0.3%	43	46	0.2%
342	698	755	0.3%	35	38	0.3%
343	302	327	0.3%	316	342	0.3%
344	131	142	0.3%	3	3	0.0%
345	22	24	0.3%	3	3	0.0%
346	16	17	0.2%	15	16	0.2%
347	224	242	0.3%	15	15	0.0%
348	520	563	0.3%	30	32	0.2%
349	188	203	0.3%	57	61	0.2%

(Continued on next page)

Table H-3. Population and Employment Growth – Greenville Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2016	Population in 2045	Annual Population Growth (2016-2045)	Total Number of Employed Persons in 2016	Total Number of Employed Persons in 2045	Annual Employment Growth (2016-2045)
350	107	116	0.3%	58	63	0.3%
351	77	83	0.3%	4	4	0.0%
353	273	295	0.3%	10	10	0.0%
355	8	9	0.4%	0	0	0.0%
356	50	54	0.3%	8	8	0.0%
357	480	519	0.3%	42	46	0.3%
358	98	106	0.3%	10	11	0.3%
359	804	870	0.3%	15	16	0.2%
363	471	510	0.3%	79	85	0.3%
364	96	104	0.3%	37	39	0.2%
365	540	584	0.3%	299	325	0.3%
366	418	452	0.3%	114	124	0.3%
367	51	55	0.3%	2	2	0.0%
368	0	0	0.0%	62	67	0.3%
370	469	507	0.3%	207	224	0.3%
371	147	159	0.3%	37	40	0.3%
372	19	21	0.3%	9	9	0.0%
373	3	3	0.0%	0	0	0.0%
374	507	548	0.3%	48	51	0.2%
376	1166	1261	0.3%	92	99	0.3%
377	1062	1149	0.3%	37	41	0.4%
381	1219	1319	0.3%	43	46	0.2%
383	61	66	0.3%	10	10	0.0%
390	120	130	0.3%	18	20	0.4%
391	289	313	0.3%	32	35	0.3%
401	62	67	0.3%	8	9	0.4%
407	16	17	0.2%	0	0	0.0%
408	62	67	0.3%	19	20	0.2%
409	30	32	0.2%	0	0	0.0%
410	39	42	0.3%	3	3	0.0%
411	10	11	0.3%	0	0	0.0%
413	74	80	0.3%	26	28	0.3%
414	61	66	0.3%	15	16	0.2%
417	6	6	0.0%	0	0	0.0%
418	103	111	0.3%	10	11	0.3%

(Continued on next page)

Table H-3. Population and Employment Growth – Greenville Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2016	Population in 2045	Annual Population Growth (2016-2045)	Total Number of Employed Persons in 2016	Total Number of Employed Persons in 2045	Annual Employment Growth (2016-2045)
419	24	26	0.3%	0	0	0.0%
420	138	149	0.3%	12	13	0.3%
472	23	25	0.3%	4	4	0.0%
473	553	598	0.3%	265	285	0.3%
474	197	213	0.3%	272	294	0.3%
475	197	213	0.3%	250	272	0.3%
476	50	54	0.3%	5	5	0.0%
477	67	72	0.2%	5	5	0.0%
478	429	464	0.3%	369	399	0.3%
479	0	0	0.0%	250	271	0.3%
480	229	248	0.3%	222	240	0.3%
481	826	894	0.3%	253	274	0.3%
482	279	302	0.3%	53	56	0.2%
483	61	66	0.3%	3	3	0.0%
484	58	63	0.3%	0	0	0.0%
485	678	733	0.3%	121	131	0.3%
486	110	119	0.3%	125	135	0.3%
487	85	92	0.3%	451	489	0.3%
488	94	102	0.3%	51	54	0.2%
489	206	223	0.3%	19	20	0.2%
490	182	197	0.3%	8	8	0.0%
491	41	44	0.2%	4	4	0.0%
494	325	352	0.3%	35	38	0.3%
495	78	84	0.3%	11	12	0.3%
496	29	31	0.2%	17	18	0.2%
497	26	28	0.3%	0	0	0.0%
498	19	21	0.3%	4	4	0.0%
499	143	155	0.3%	12	13	0.3%
501	390	422	0.3%	10	10	0.0%
503	235	254	0.3%	57	62	0.3%
504	91	98	0.3%	10	11	0.3%
505	91	98	0.3%	17	18	0.2%
506	293	317	0.3%	27	29	0.2%
509	273	295	0.3%	105	114	0.3%
510	183	198	0.3%	48	52	0.3%

(Continued on next page)

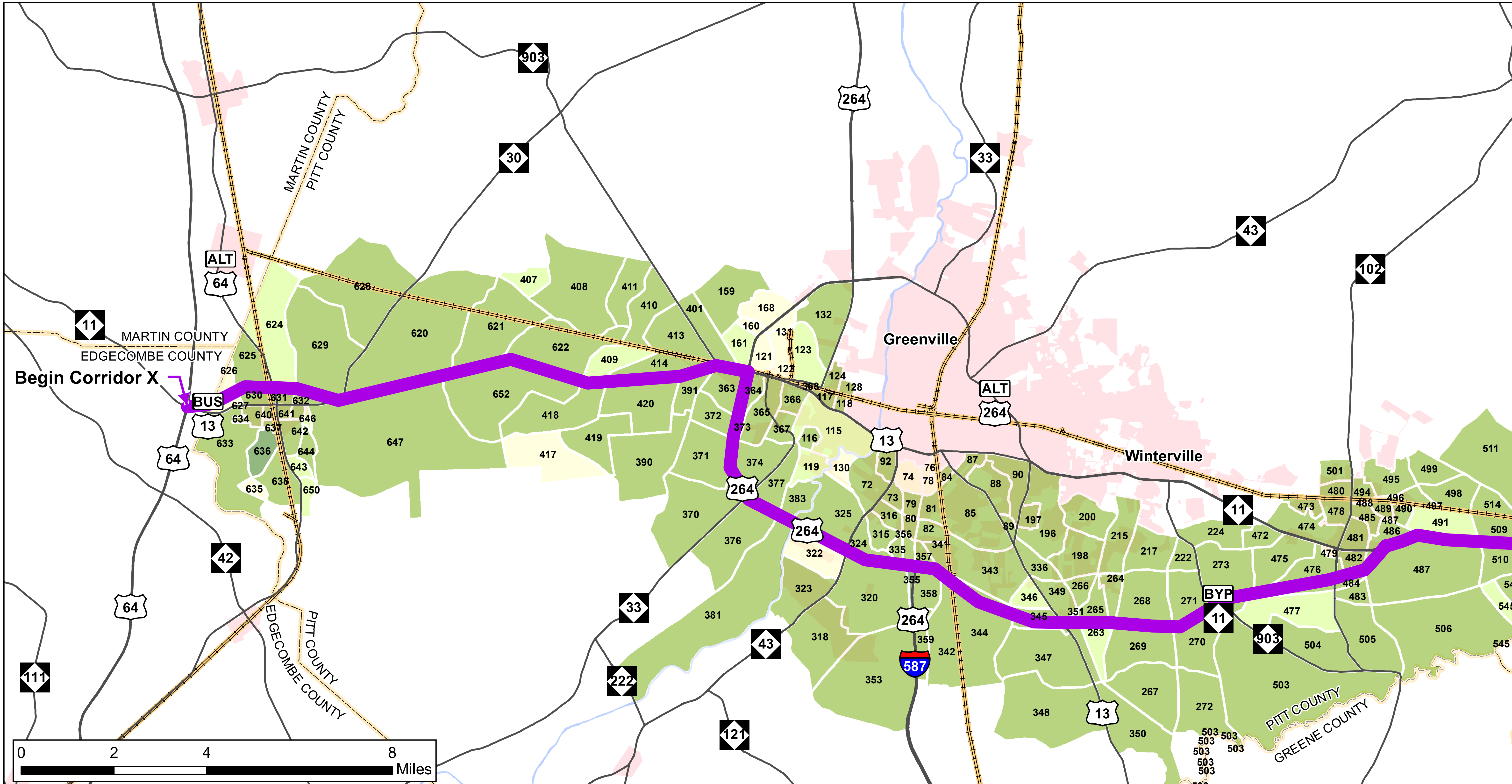
Table H-3. Population and Employment Growth – Greenville Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2016	Population in 2045	Annual Population Growth (2016-2045)	Total Number of Employed Persons in 2016	Total Number of Employed Persons in 2045	Annual Employment Growth (2016-2045)
511	297	321	0.3%	262	283	0.3%
514	34	37	0.3%	0	0	0.0%
515	187	202	0.3%	11	12	0.3%
516	321	347	0.3%	5	5	0.0%
517	341	369	0.3%	25	27	0.3%
518	13	14	0.3%	3	3	0.0%
519	44	48	0.3%	3	3	0.0%
520	224	242	0.3%	16	17	0.2%
521	144	156	0.3%	3	3	0.0%
522	114	123	0.3%	0	0	0.0%
523	86	93	0.3%	200	216	0.3%
524	229	248	0.3%	10	11	0.3%
525	277	300	0.3%	8	8	0.0%
526	25	27	0.3%	63	68	0.3%
527	26	28	0.3%	17	18	0.2%
536	88	95	0.3%	10	11	0.3%
537	118	128	0.3%	42	46	0.3%
538	179	194	0.3%	15	15	0.0%
539	124	134	0.3%	31	33	0.2%
540	49	53	0.3%	10	10	0.0%
541	50	54	0.3%	0	0	0.0%
545	54	58	0.2%	17	19	0.4%
546	32	35	0.3%	0	0	0.0%
620	57	62	0.3%	15	17	0.4%
621	65	70	0.3%	132	142	0.3%
622	108	117	0.3%	6	6	0.0%
624	18	19	0.2%	9	10	0.4%
625	33	36	0.3%	5	5	0.0%
626	0	0	0.0%	0	0	0.0%
627	3	3	0.0%	4	4	0.0%
628	71	77	0.3%	13	13	0.0%
629	86	93	0.3%	15	16	0.2%
630	68	74	0.3%	5	5	0.0%
631	240	260	0.3%	50	54	0.3%
632	131	142	0.3%	55	60	0.3%

(Continued on next page)

Table H-3. Population and Employment Growth – Greenville Regional Model Traffic Analysis Zone (Continued)

TAZ Number	Population in 2016	Population in 2045	Annual Population Growth (2016-2045)	Total Number of Employed Persons in 2016	Total Number of Employed Persons in 2045	Annual Employment Growth (2016-2045)
633	38	41	0.3%	2	2	0.0%
634	339	367	0.3%	0	0	0.0%
635	6	6	0.0%	0	0	0.0%
636	9	10	0.4%	0	0	0.0%
637	120	130	0.3%	0	0	0.0%
638	31	34	0.3%	0	0	0.0%
640	142	154	0.3%	67	72	0.2%
641	275	298	0.3%	6	6	0.0%
642	163	176	0.3%	7	7	0.0%
643	41	44	0.2%	0	0	0.0%
644	33	36	0.3%	0	0	0.0%
645	133	144	0.3%	20	21	0.2%
646	14	15	0.2%	0	0	0.0%
647	21	23	0.3%	0	0	0.0%
650	27	29	0.2%	5	5	0.0%
652	43	47	0.3%	149	162	0.3%



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

FEBRUARY 2022

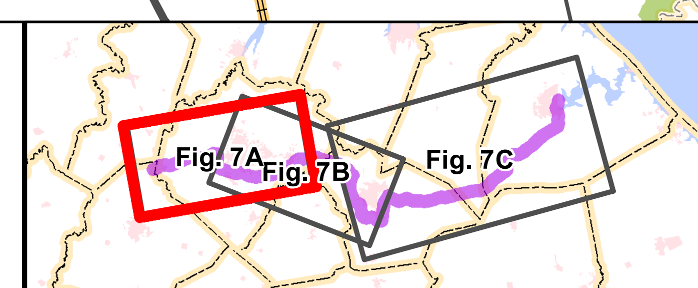
Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties

Greenville Regional Model Annual Population Growth

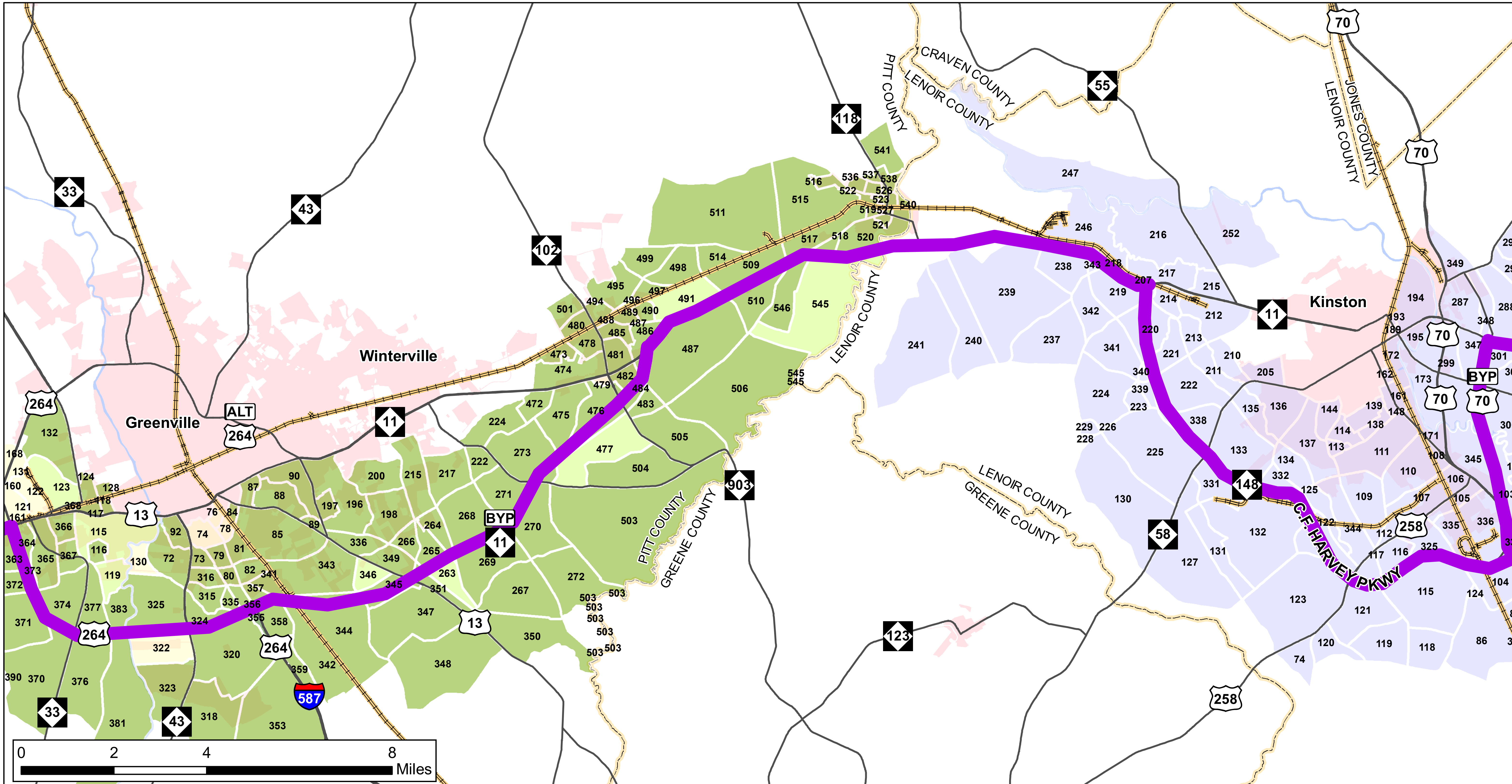
- 0.0% - 0.1%
- 0.1% - 0.2%
- 0.2% - 0.3%
- 0.3% - 0.4%



CORRIDOR X: POPULATION GROWTH - REGIONAL MODEL TRAFFIC ANALYSIS ZONES (TAZ)

FIGURE 7A: U.S. 13 TO GREENVILLE

No regional models were available in other segments of the corridor. TAZ Number on the map correlates to TAZ Number in Appendix G of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.
*TAZ Number is the 1-4 digit solid, bold number in map. Kinston, and Jacksonville Annual Growth is 2010-2040, the Greenville Annual Growth is 2016-2045.



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

FEBRUARY 2022

Source: NCOneMap, NCDOT GIS, ESRI

Legend

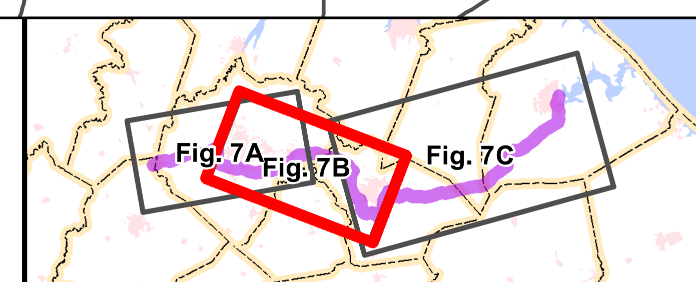
- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties

Greenville Regional Model Annual Population Growth

- 0.0% - 0.1%
- 0.1% - 0.2%
- 0.2% - 0.3%
- 0.3% - 0.4%

Kinston Regional Model Annual Population Growth

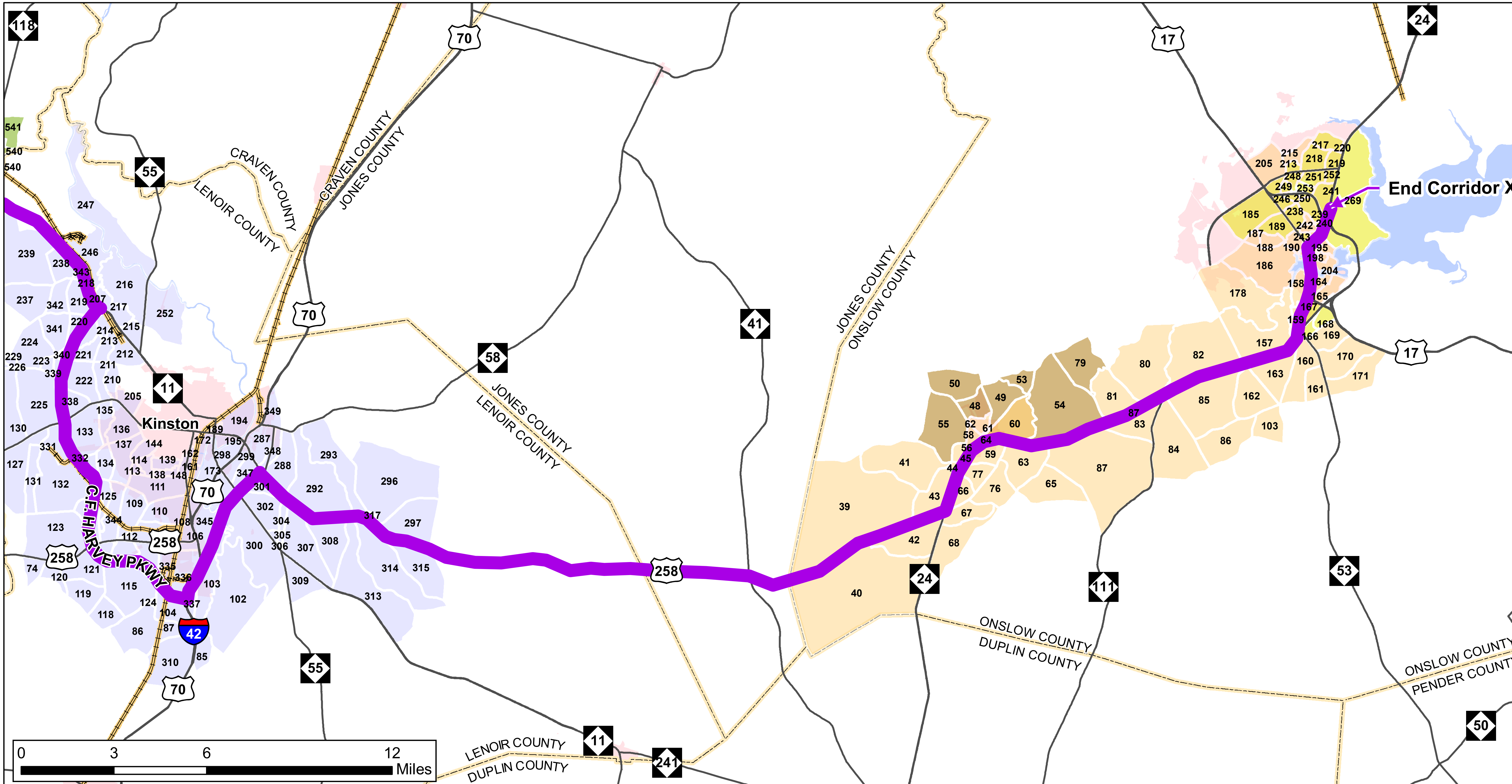
- 0%



CORRIDOR X: POPULATION GROWTH - REGIONAL MODEL TRAFFIC ANALYSIS ZONES (TAZ)

FIGURE 7B: GREENVILLE TO KINSTON

No regional models were available in other segments of the corridor. TAZ Number on the map correlates to TAZ Number in Appendix G of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.
*TAZ Number is the 1-4 digit solid, bold number in map. Kinston, and Jacksonville Annual Growth is 2010-2040, the Greenville Annual Growth is 2016-2045.



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

FEBRUARY 2022

Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties

Greenville Regional Model Annual Population Growth

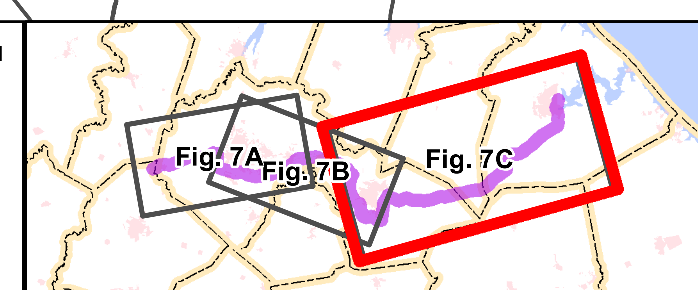
- 0.2% - 0.3%

Kinston Regional Model Annual Population Growth

- 0%

Jacksonville Regional Model Annual Population Growth

- 0.0% - 0.975%
- 0.975% - 1.95%
- 1.95% - 2.925%
- 2.925% - 3.9%

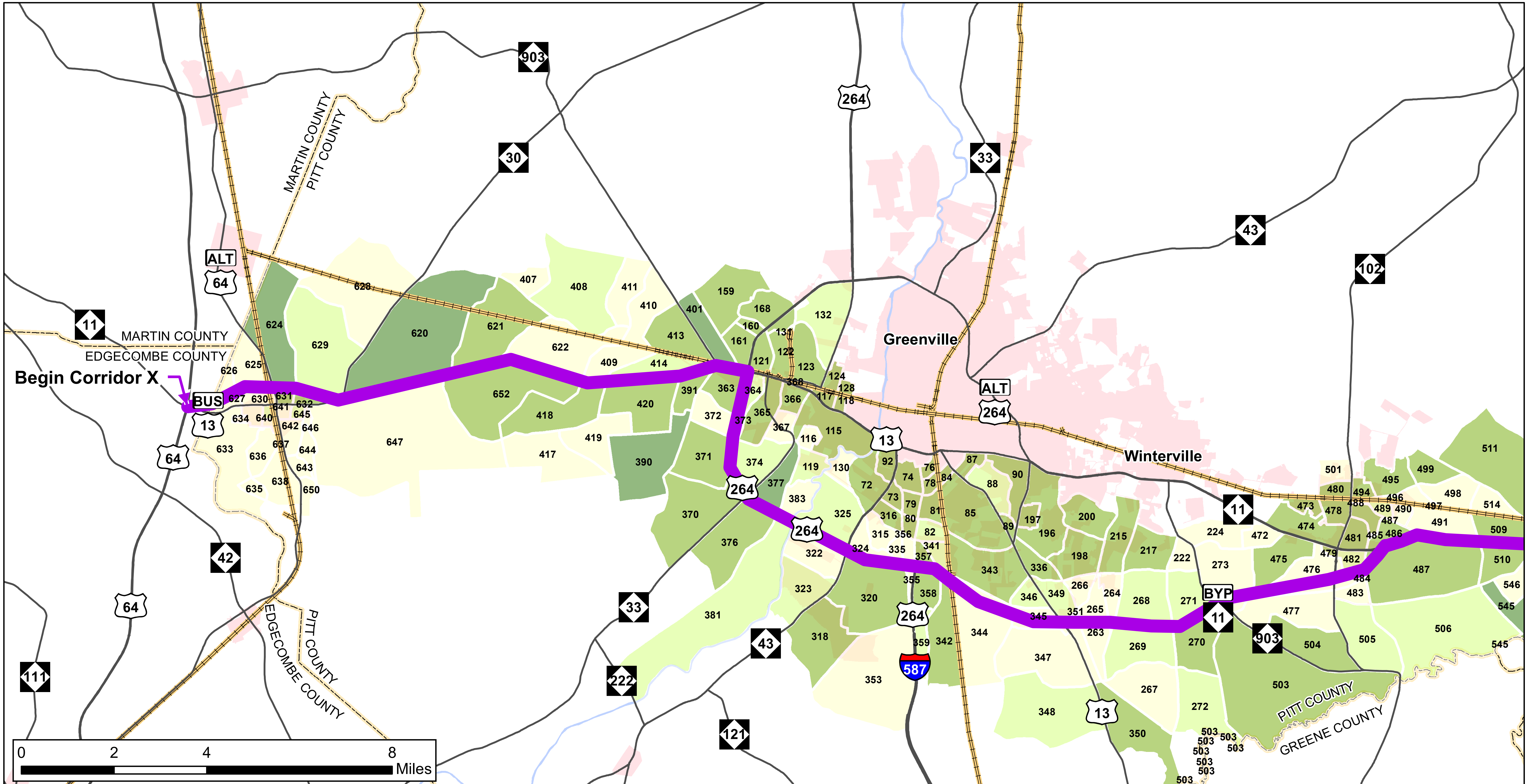


CORRIDOR X: POPULATION GROWTH - REGIONAL MODEL TRAFFIC ANALYSIS ZONES (TAZ)

FIGURE 7C: KINSTON TO JACKSONVILLE

No regional models were available in other segments of the corridor. TAZ Number on the map correlates to TAZ Number in Appendix G of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.

*TAZ Number is the 1-4 digit solid, bold number in map. Kinston, and Jacksonville Annual Growth is 2010-2040, the Greenville Annual Growth is 2016-2045.



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

FEBRUARY 2022

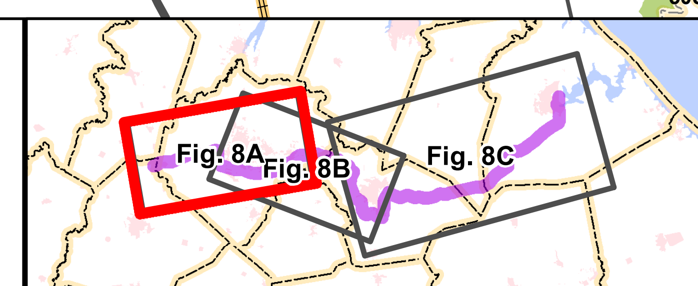
Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties

Greenville Regional Model Annual Employment Growth

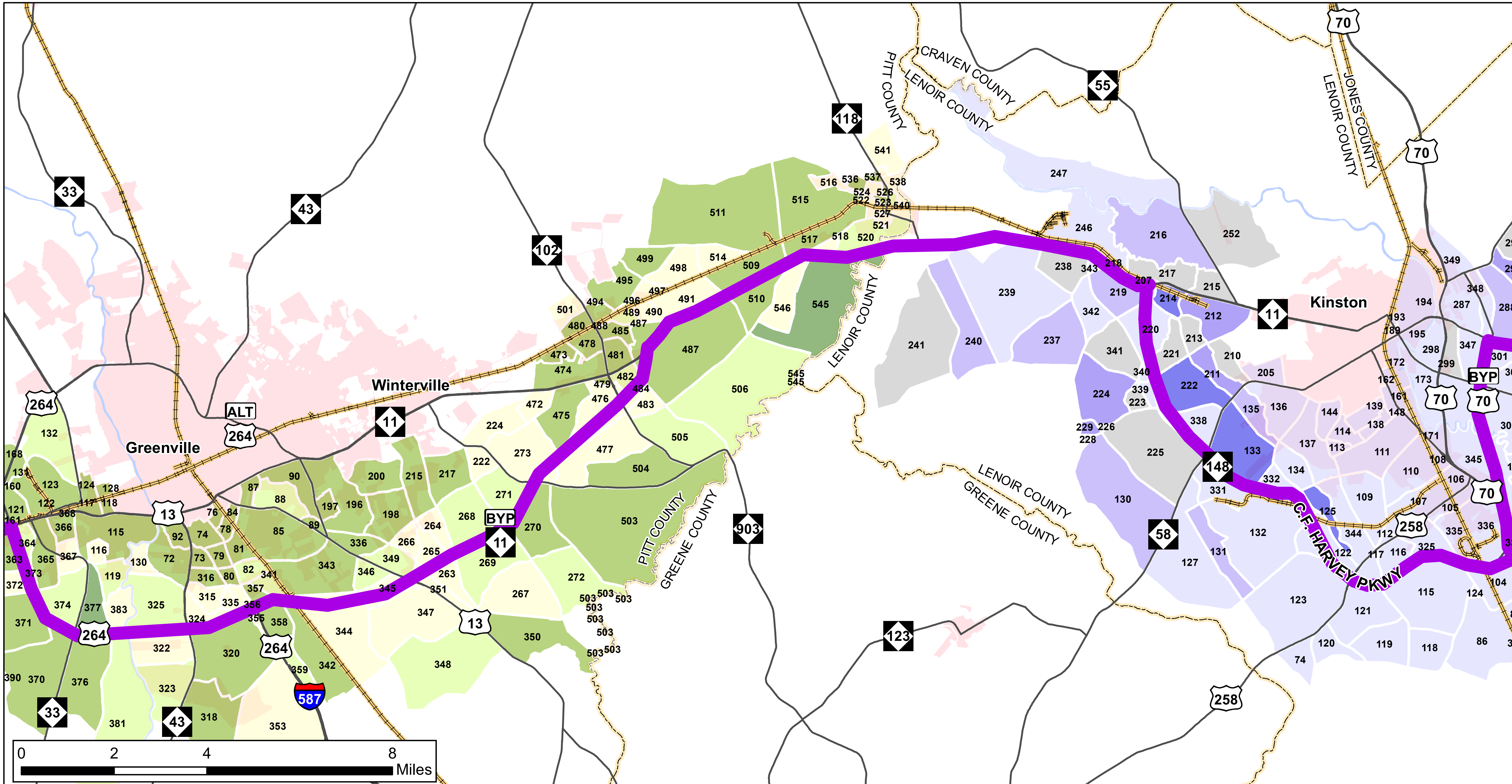
- 0.0% - 0.1%
- 0.1% - 0.2%
- 0.2% - 0.3%
- 0.3% - 0.4%



CORRIDOR X: EMPLOYMENT GROWTH - REGIONAL MODEL TRAFFIC ANALYSIS ZONES (TAZ)

FIGURE 8A: U.S. 13 TO GREENVILLE

No regional models were available in other segments of the corridor. TAZ Number on the map correlates to TAZ Number in Appendix G of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.
*TAZ Number is the 1-4 digit solid, bold number in map. Kinston, and Jacksonville Annual Growth is 2010-2040, the Greenville Annual Growth is 2016-2045.



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

FEBRUARY 2022

Source: NCOneMap, NCDOT GIS, ESRI

Legend

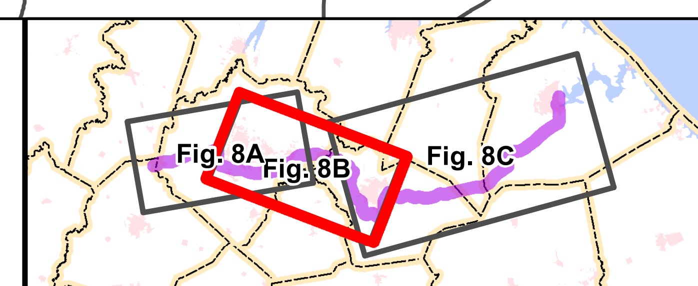
- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties

Greenville Regional Model Annual Employment Growth

- 0.0% - 0.1%
- 0.1% - 0.2%
- 0.2% - 0.3%
- 0.3% - 0.4%

Kinston Regional Model Annual Employment Growth

- <0%
- 0.0% - 4.5%
- 4.5% - 9.1%
- 9.1%- 13.6%
- 13.6% - 18.2%

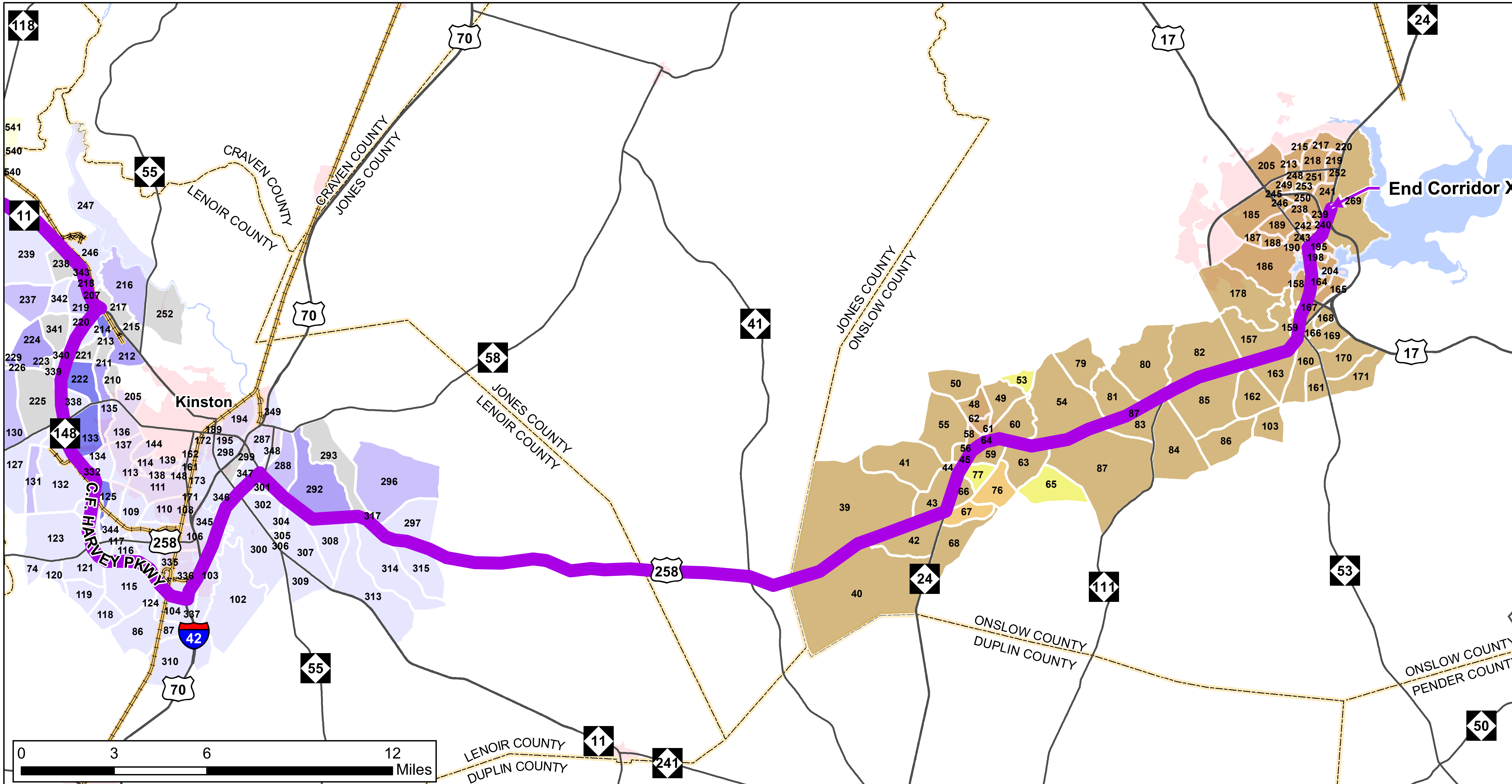


CORRIDOR X: EMPLOYMENT GROWTH - REGIONAL MODEL TRAFFIC ANALYSIS ZONES (TAZ)

FIGURE 8B: GREENVILLE TO KINSTON

No regional models were available in other segments of the corridor. TAZ Number on the map correlates to TAZ Number in Appendix G of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.

*TAZ Number is the 1-4 digit solid, bold number in map. Kinston, and Jacksonville Annual Growth is 2010-2040, the Greenville Annual Growth is 2016-2045.



NC STRATEGIC TRANSPORTATION CORRIDOR X (STC)

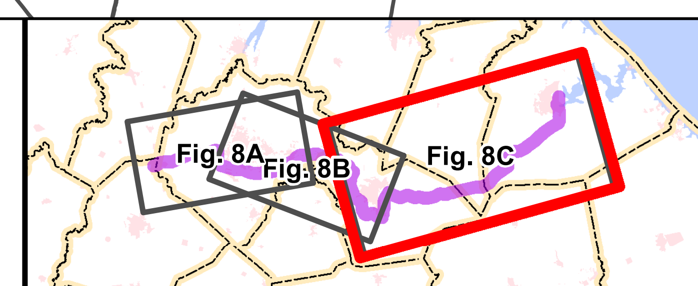
FEBRUARY 2022

Source: NCOneMap, NCDOT GIS, ESRI

Legend

- STC Highway Corridor X
- Interstate
- U.S./N.C. Route
- Rail
- Major Water Bodies
- Municipal Boundary
- Counties

Greenville Regional Model Annual Employment Growth	Kinston Regional Model Annual Employment Growth	Jacksonville Regional Model Annual Employment Growth
0.0% - 0.1%	<0%	0.0% - 0.4%
	0.0% - 4.5%	0.9% - 1.4%
	4.5% - 9.1%	1.4% - 1.9%
	9.1%- 13.6%	
	13.6% - 18.2%	



CORRIDOR X: EMPLOYMENT GROWTH - REGIONAL MODEL TRAFFIC ANALYSIS ZONES (TAZ)

FIGURE 8C: KINSTON TO JACKSONVILLE

No regional models were available in other segments of the corridor. TAZ Number on the map correlates to TAZ Number in Appendix G of the Mobility Analysis Report. Additional population and employment data can be found in the data tables.
*TAZ Number is the 1-4 digit solid, bold number in map. Kinston, and Jacksonville Annual Growth is 2010-2040, the Greenville Annual Growth is 2016-2045.