Strategic Transportation Corridor K

Phase 1

Master Plan

US 421 / NC 87 / NC 24
from Greensboro (Guilford County)
to I-95 (Harnett or Cumberland Counties)
North Carolina

October 2026

DRAFT

Strategic Transportation Corridor K Phase 1 Master Plan

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from Greensboro (Guilford County)
to I-95 (Harnett or Cumberland Counties)
North Carolina

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October 2026

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CAMBRIDGE SYSTEMATICS

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List of Acronyms

AADT	Annual Average Daily Traffic
AADTT	Annual Average Daily Truck Traffic
AAWDT	Average Annual Weekday Traffic
ADT	Average Daily Traffic
AFC	Alternative Fuel Corridor
AFDC	Alternative Fuels Data Center
AV	Automated Vehicle
CAMPO	Capital Area Metropolitan Planning Organization
CASSI	Connected Autonomous Shuttle Supporting Innovation
CAV	Connected Autonomous Vehicle
CCTV	Closed-Circuit Television
CFR	Code of Federal Regulations
CMF	Crash Modification Factor
CMP	Congestion Management Process
CPRPO	Central Pines Rural Planning Organization
CRF	Crash Reduction Factor
CSC	Corridor Steering Committee
CTP	Comprehensive Transportation Plan
DC	Direct Current
DCHC	Durham-Chapel Hill-Carrboro
DMS	Dynamic Message Sign
DoD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
EJ	Environmental Justice
FAMPO	Fayetteville Area Metropolitan Planning Organization
FAST	Fixing America's Surface Transportation
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
GUAMPO	Greensboro Urban Area Metropolitan Planning Organization

GAP	Gap Analysis Project
GIS	Geographic Information System
GUAMPO	Greensboro Urban Area Metropolitan Planning Organization
HQW	High-Quality Waters
HSIP	Highway Safety Improvement Program
ITS	Intelligent Transportation System
LiDAR	Light Detection and Ranging
LOS	Level of Service
MAP-21	Moving Ahead for Progress in the 21st Century Act
MCRPO	Mid-Carolina Rural Planning Organization
mph	Mile per hour
MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan
NACS	North American Charging Standard
NC	North Carolina
NCDEQ	North Carolina Department of Environmental Quality
NCDOT	North Carolina Department of Transportation
NCHPO	North Carolina Historic Preservation Office
NCNHP	North Carolina Natural Heritage Program
NCSTM	North Carolina Statewide Travel Demand Model
NEPA	National Environmental Policy Act
NEVI	National Electric Vehicle Infrastructure
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O-D	Origin-Destination
ODD	Operational Design Domain
OSBM	Office of State Budget and Management
PTRM	Piedmont Triad Regional Model
PTRPO	Piedmont Triad Rural Planning Organization

RADAR	Radio Detecting and Ranging
RPO	Rural Planning Organization
SAE	Society of Automotive Engineers
SCMS	Security Credential Management System
SHPO	State Historic Preservation Office
SPOT	Strategic Transportation Prioritization
SR	State Route
STC	Strategic Transportation Corridors
STIP	Statewide Transportation Improvement Program
STOC	Statewide Transportation Operations Center
TAC	Transportation Advisory Committee
TAZ	Traffic Analysis Zone
TCC	Technical Coordinating Committee
TDI	Transportation Disadvantage Index
TIP	Transportation Improvement Program
TOD	Transit-Oriented Development
TPM	Transportation Performance Management
TTI	Travel Time Index
US	United States
USC	United States Code
USDOT	United States Department of Transportation
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
V/C	Volume-to-Capacity
V2I	Vehicle to Infrastructure
VMT	Vehicle Mile Traveled
VRU	Vulnerable Roadway User

Executive Summary

The Strategic Transportation Corridor (STC) K corridor, shown in Figure 1, is a vital regional connector in North Carolina, linking the Piedmont Triad region (Greensboro) through Sanford to I-95 near Fayetteville, and ultimately to the Port of Wilmington. This corridor supports economic development, freight movement, military access (notably Fort Bragg), and regional mobility. This STC K Phase 1 Master Plan aims to establish a consistent transportation vision, assess existing and future needs, and evaluate alternatives for improving the northern section of this strategic corridor between Greensboro and I-95 near Fayetteville (see Figure 2).

This plan was developed through a multi-step process:

1. **Data Assembly**: Compiling transportation, land use, environmental, and socioeconomic data to establish baseline and future (2045) conditions.
2. **Stakeholder Engagement**: Coordinating with the North Carolina Department of Transportation (NCDOT), planning organizations, local governments, and the public to align with regional priorities and gather input.
3. **Vision and Goals Development**: Establishing objectives such as improving safety and regional connectivity, reducing congestion, facilitating development opportunities, and enhancing multimodal access.
4. **Alternatives Analysis**: Evaluating new and existing corridor alignments using travel demand modeling, environmental and community screening, and performance metrics.
5. **Master Plan Development**: Synthesizing findings and providing recommendations for future planning and project development.

Stakeholder and Public Engagement

Public surveys were distributed to rank corridor objectives, with top priorities including regional connectivity, direct interstate access, congestion reduction, and safety. Extensive coordination with NCDOT, Metropolitan Planning Organizations (MPOs), Rural Planning Organizations, Fort Bragg, Federal Highway Administration, state and federal environmental agencies, local economic development organizations, and local government agencies shaped the alternative alignments and alternative evaluation criteria.

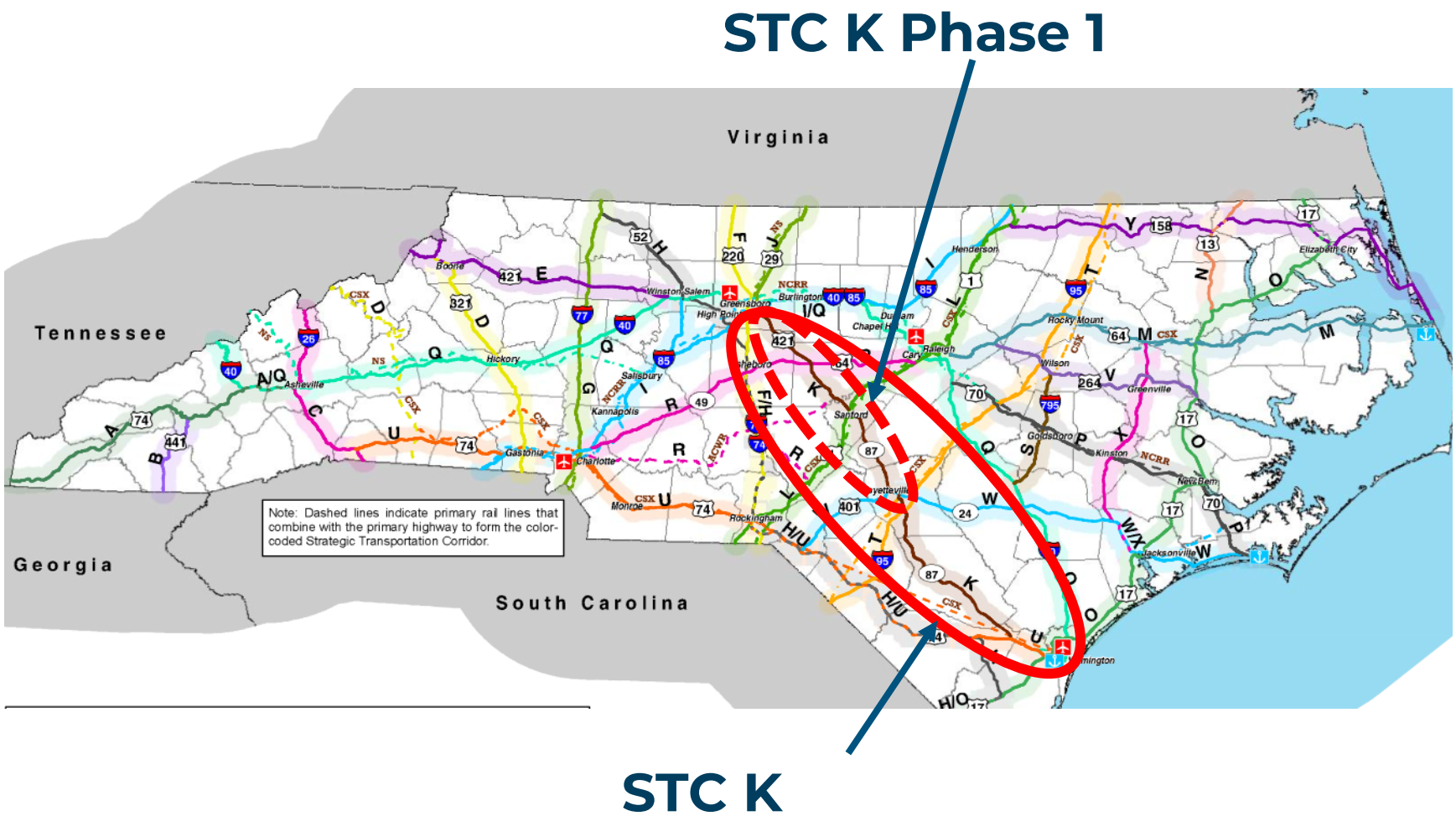
Vision Statement

The STC K Master Plan Phase 1envisions a safe, efficient, and resilient transportation corridor that connects communities, supports economic growth, enhances military mobility, and preserves environmental and cultural resources. The corridor aims to provide reliable access for freight, commuters, and multimodal users while fostering regional prosperity and sustainability.

Goals

- Promote regional connectivity between Greensboro, Fayetteville, and Wilmington
- Promote a direct interstate connection between Greensboro and I-95
- Improve corridor efficiency and reduce congestion for all users

Figure 1. STC K Statewide Map



- Improve safety for all users
- Reduce congestion near Fort Bragg
- Enhance development opportunities and quality of life for residents, workers, and visitors by improving roadway access to areas along the corridor
- Provide a direct connection to megasites and major activity centers and destinations
- Enhance direct access for the military and base staff at Fort Bragg
- Improve air quality by minimizing vehicle miles traveled (VMT) and vehicle emissions
- Enhance pedestrian and bicycle safety and connectivity across the corridor and to regional trails

Key Findings

Baseline and Future Conditions

The corridor currently experiences varying levels of congestion, with the highest volumes near urban centers and Fort Bragg, impeding mobility throughout the local roadway network. By 2045, significant growth in population and employment is projected, especially near Greensboro, Sanford, and Fayetteville. Existing congestion is partially attributable to the corridor being critical for freight movement, connecting major manufacturing megasites to the Port of Wilmington. Highway segments of STC K are designated as part of the North Carolina Priority Highway Freight Network, and some segments are part of Critical Rural Freight Corridors.

Some segments of the corridor are identified as high-risk for crashes, particularly in Chatham and Lee Counties. There are ongoing and planned safety projects along the corridor's entire length.

The corridor traverses sensitive environmental areas, including wetlands, floodplains, and habitats for threatened species (e.g., red-cockaded woodpecker), as well as historic sites and essential community resources.

Performance Metrics

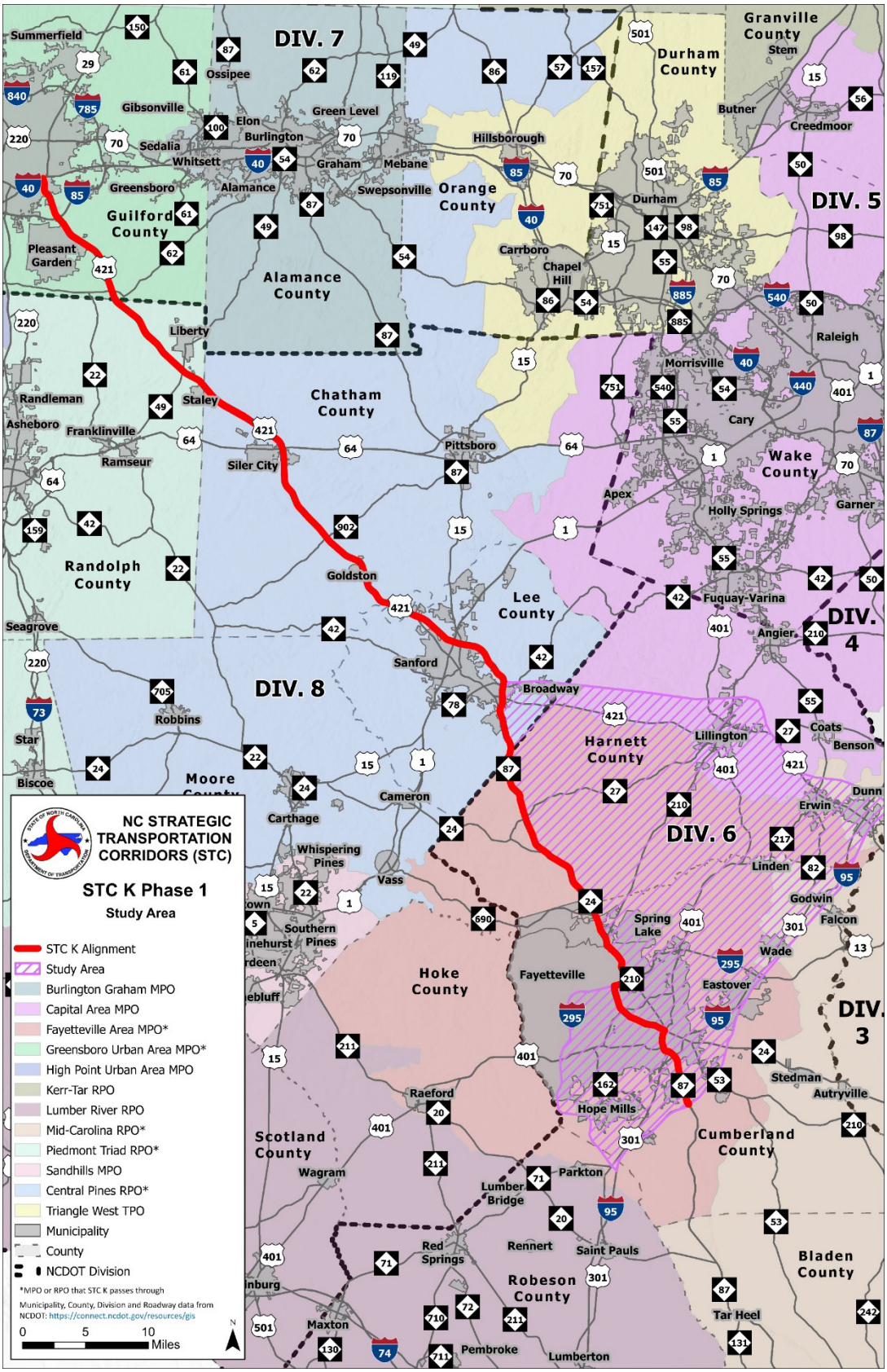
Performance measures were established to evaluate alternatives, including travel time reductions for key origin-destination pairs (e.g., Greensboro to Wilmington, Fort Bragg access), volume-to-capacity (V/C) ratios to assess congestion, VMT and emissions, safety improvements (crash rates), economic prosperity and development opportunities (population/jobs within 2 miles of the corridor), and multimodal connectivity (bicycle and pedestrian connections across the corridor).

Alternatives Analysis

Three primary alternatives, as shown in Figure 2 were evaluated for the southern section (Sanford to I-95) of the study area:

- **STC K Alignment Improvements**: Upgrades to the existing corridor that included Statewide Transportation Improvement Program (STIP) project H-0020, which will add two lanes between Nursery Road and Manchester Road in Spring Lake, along with operational enhancements.

Figure 2. STC K Phase 1 Study Area



- **421 Connector**: A new alignment using US 421, including bypasses to Lillington and Dunn, connecting Sanford to I-95, based on projects from local Harnett County plans.
- **Eastern Connector**: A new alignment east of Fort Bragg, connecting Spout Springs to I-295/I-95, using both new and existing roadway to minimize environmental impacts.

Comparative Results

Each alternative has distinct benefits and challenges:

- The STC K Alignment Improvements would provide the highest prosperity and quality of life indicators with the highest population and job density, most multimodal connections, and the smallest increase in VMT and environmental and community impacts, comparable to the Eastern Connector.
- The 421 Connector would provide the greatest regional mobility and congestion reduction, with the largest travel time savings for freight and economic development, but also the highest increase in VMT and potential impacts to streams, wetlands, floodplains, and building structures.
- The Eastern Connector would provide the most significant improvements for Fort Bragg access and reduced congestion along NC 87, and lowest projected crash rate, with moderate environmental impacts.

Recommendations

- While a consistent transportation vision for STC K Phase 1 was developed, there is no resulting preferred alternative to the existing corridor where alternatives were analyzed. The complexity of local needs and regional needs of connectivity are beyond the scope of an STC Master Plan study.
- The information in this master plan should be referenced as local and regional transportation plans are developed.
- If an alternative to the existing STC K Phase 1 alignment is determined to meet local needs better, while also meeting regional transportation needs, STC K can be updated from the existing alignment.
- As updates are made to the MTPs for FAMPO and CAMPO, and the CTPs for Chatham County, Harnett County, Randolph County, and Lee County, local input, along with this Master Plan, can inform selection of a preferred alternative.

Next Steps

- Address public and agency comments on this Draft STC K Master Plan and its appendices and publish final versions.
- MPOs update applicable Metropolitan Transportation Plans: FAMPO (Cumberland County portion) and CAMPO (Harnett County portion).
- NCDOT and local governments update applicable Comprehensive Transportation Plans: Chatham County, Harnett County, Randolph County, and Lee County.

1. Introduction

In 2015, the North Carolina Department of Transportation (NCDOT) identified a network of key multimodal corridors called Strategic Transportation Corridors (STC) to support smart planning, to help set long-term investment decisions, and to ensure that North Carolina's economic prosperity goals are achieved as outlined in the STC Policy (NCDOT 2015). North Carolina's STCs form the core network of multimodal passageways that move large volumes of people and freight across the regions of the state and to key markets outside the state. The transportation facilities and services within the corridors connect centers of economic activity of statewide and regional significance. Preserving the physical condition of these facilities and the quality of the service they provide supports North Carolina's goals for economic development and will guide long-term planning at statewide, regional, and corridor levels. The statewide strategic corridors are considered the state's highest priority when analyzed within the framework of regional or local transportation plans (NCDOT 2015).

STC K is a vital regional connector that links the manufacturing centers of the Piedmont Triad region to export opportunities at the port in Wilmington. The full reach of STC K follows US 421 south from I-40 in Greensboro (Guilford County), south on NC 87 near Sanford (Lee County), south on NC 24/87 and NC 24, to US 117 in Wilmington, New Hanover County. Phase 1 of STC K is the northernmost half of STC K, beginning in I-40 in Guilford County and ending at I-95 in either Cumberland or Harnett County (Figure 2).

1.1 NCDOT Strategic Transportation Corridors Framework

The STC system is intended to promote transportation system connectivity, provide high levels of mobility, and improve access to important state and regional activity centers throughout the state. In adopting the STC Framework, NCDOT prioritized multimodal modes of transportation essential for economic prosperity, Department of Defense (DoD) domestic operations and military access (notably Fort Bragg), freight movement, and regional mobility (including truck routes).

A key element in the advancement of the STCs is the development of corridor master plans, such as this one, that identify a high-level corridor mobility vision and associated corridor improvement action strategies. Specifically, individual master plans are developed to determine what improvements to the corridor are needed to meet the STC goals.

This Master Plan aims to establish a consistent transportation vision, assess existing and future needs, and evaluate alternatives for improving STC K Phase 1. This vision is based on stakeholder input and sound technical assessment that recognizes statewide economic development objectives, advances subsequent regional planning and corridor project development activities, and can serve to inform and streamline future project programming and funding.

1.2 Study Area

The STC K Phase 1 Study Area consists of the existing 98.6 centerline miles of the STC K corridor from Greensboro to Fayetteville, located predominantly along three main roadways: US 421/US 421 Bypass, NC 87, and NC 24. The width of the study area along the STC K Corridor is 300 feet, 150 feet

on either side of the centerline. As shown in Figure 2, the Study Area also widens to envelop a large area between Sanford, Fayetteville, and Lillington down to I-95, to encircle where alignment alternatives were considered.

For study purposes, the corridor has been broken into two areas – North of Sanford and South of Sanford. Several maps in this document follow this format to assist the reader in evaluating the findings on an overall scale. A more detailed presentation of local projects and planning documents is provided in Tables A-1 through A-3 of Appendix A and large-scale map series in Appendix B.

Two small portions of the STC K Corridor were re-aligned during the development of this study:

- Because Bragg Boulevard was cut off from public access between NC 24 and R. Miller Street, the corridor would instead follow NC 210 east of the military base. This was decided during the meeting with the Capital Area Metropolitan Planning Organization (CAMPO) on December 11, 2024, where NCDOT Division 6 informed the study team that Fort Bragg had made this change.
- The second decision was made on March 21, 2025, where STC K was moved from the US 421 Business route to the US 421 Bypass route through Sanford since the latter is already at freeway standards.

1.3 Study Methodology

The master plan includes a planning level assessment of corridor needs and an alternatives analysis, including digital planning tools. This made use of the existing NCDOT and planning organization data and evaluation tools in place such as the NC Statewide Travel Demand Model (NCSTM) and regional travel demand models. The study team also leveraged a variety of data sources, reviewing and synthesizing statewide or regional studies, including Metropolitan Transportation Plans (MTPs), Comprehensive Transportation Plans (CTPs), statewide modal and freight plans, and other regional or local transportation and land use plans of significance. Existing projects within the study area were reviewed and their funding status and schedule documented. If feasibility studies exist on any of these facilities, those studies were also reviewed and documented.

An alternatives analysis was performed for the section of STC K connecting NC 87 in Sanford to I-95 either in Cumberland or Harnett County (see the Study Area in Figure 2). In coordination with NCDOT's Division of Planning and Programming and in cooperation with local planning organizations within the region, including the Greensboro Urban Area Metropolitan Planning Organization (GUAMPO), Piedmont Triad Rural Planning Organization (PTRPO), Central Pines Rural Planning Organization (CPRPO), Mid-Carolina Rural Planning Organization (MCRPO), CAMPO, and Fayetteville Area Metropolitan Planning Organization (FAMPO), the alternatives analysis was developed based on key corridor planning concepts and requirements. The analysis aligns with Federal Highway Administration (FHWA) guidelines and the goals and visions of the North Carolina STC program, as well as forward looking elements on project feasibility under the National Environmental Policy Act (NEPA).

The study consisted of the following:

- Data assembly to describe existing conditions and future funded projects (no field data were collected).
- Stakeholder engagement and interagency coordination that assessed agency and community priorities.
- Development of a consistent transportation vision for the corridor and study area.
- Evaluation of alternatives for the segments between NC 87 in Sanford and I-95 as well as alternatives for improving the existing roadway segments between I-40 in Greensboro to NC 87 in Sanford.

Details of each facet of the study are presented in the following memoranda (available separately on the NCDOT STC site):

- **Transportation Facilities Inventory and Operating Conditions Technical Memorandum:** Summarizes key transportation data that were used to obtain an understanding of current multimodal transportation facilities and capacities. The data were used to discern existing corridor conditions through an inventory of the transportation facilities and services, including capacity and functional class, active and abandoned rail lines, crash hot spot identification, and congestion and reliability information.
- **Baseline Planning Technical Memorandum:** Summarizes statewide and local transportation and land use plans, as well as a variety of data resources, that were consulted to develop a baseline for programmed transportation projects, environmental information, community resources, planned future development, and priority facilities.
- **Baseline and Future Year Mobility Technical Memorandum**: Summarizes the corridor's travel demand and evaluates existing and future mobility conditions.
- **Technology Readiness Technical Memorandum**: Describes existing and proposed traffic management technologies along the corridor and factors affecting the suitability for automated vehicle deployment.
- **Performance Measures Technical Memorandum**: Summarizes goals, objectives, and performance measures that were used to evaluate corridor alternatives.
- **Alternatives Analysis Technical Memorandum**: Examines three build alternatives between NC 87 in Sanford and I-95 across multiple performance measures to evaluate the viability of each alternative.

2. Baseline Planning Data

The beginning of the study required a review of local comprehensive land use plans, with one objective being to verify planned major growth and employment areas against adopted transportation plans. Existing recommendations were cataloged to ensure consistency along the corridor alignment. Mapping was also performed to gain a preliminary understanding of natural and environmental resources in the study area.

This section includes a high-level overview of the data sources, the review methodology, and any data challenges identified during the review process.

2.1 Planning Data Assembly

Data assembly was a crucial first step in the study to describe the existing and future conditions of the STC K corridor. The study team reviewed relevant data on transportation facilities; Metropolitan Planning Organization (MPO) or Rural Planning Organization (RPO) planned facilities; State Transportation Improvement Program (STIP) programmed improvements; and safety, operational, and environmental issues within the STC K corridor. This inventory and appraisal served as a baseline for developing corridor needs and strategies for evaluation as well as an alternative analysis of optional linkages between Sanford and I-95.

2.2 Planning Data Collection and Plan Evaluation

The study team identified the following data sets as integral steps to understand the existing and future planning efforts for transportation and land use within the study corridor:

- Statewide Transportation Plans
- Planned Projects (STIP/Transportation Improvement Program (TIP) and Strategic Transportation Prioritization [SPOT] projects)
- MPO/RPO/Locality Transportation Plans
- Land Use Planning and Growth Centers
- Environmental Resources and Sensitive Areas
- Community Resources
- NCDOT Environmental Justice (EJ) Areas and Transportation Disadvantage Index (TDI) Results

The study team reviewed the data as it relates to the STC K corridor to identify relevant planned projects, future anticipated growth centers, areas identified as high for environmental justice/disadvantaged communities, and those areas with environmentally sensitive/protected lands.

2.2.1 Statewide Transportation Plans

Statewide plans are required under law (49 USC 5304(f)), and these plans are often necessary for Departments of Transportation (DOTs) to be eligible for federal funding. The plans are also important in setting the existing conditions and future goals for the state, as well as providing an opportunity for stakeholder engagement and public input. The following statewide plans were identified and reviewed (see Table 1 for additional information):

- Comprehensive State Rail Plan (2015)
- WalkBikeNC (2013)
- S-Line Transit Oriented Development Study (2023)
- Statewide Freight Plan (2023)
- Advanced Transportation Mobility Strategic Plan (2024)
- NC MOVES 2050 (2021)
- Electric Vehicle Infrastructure Deployment Plan (2023)

The plans are also important in setting the existing conditions and future goals for the state, as well as providing an opportunity for stakeholder engagement and public input.

Upon review, there were varied development and adoption dates across the statewide plans, spanning nearly 10 years (2015 to 2024), though many of the plans were adopted in 2023. The statewide plans identified high-level strategic goals throughout North Carolina. However, many lacked specific project-related implementation strategies compared to systemic strategies and approaches. This created a challenge in understanding the specific impact of the statewide plans on STC K or the surrounding study area.

Table 1. List of Statewide Transportation Plans

Type of Plan	Adoption	Plan	Plan Elements
State Rail Plan	2015	Comprehensive State Rail Plan	• Rail improvements, baseline data inventory, key stakeholders
Statewide Bike/Pedestrian Plan	2013	WalkBikeNC	• Active transportation improvements, baseline data inventory, key stakeholders
High Speed Passenger Rail	2023	S-Line Transit Oriented Development Study	• Rail improvements, baseline data inventory, key stakeholders
State Long-Range Plan	2020	NC Moves 2050	• Long-range goals, key priorities, regionally significant projects, future assumptions, baseline data inventory, key stakeholders, financial plan
State Freight Plan and associated elements	2023	Statewide Freight Plan	• Identified ways to enhance economic development opportunities and competitiveness • Improve freight system efficiency and reliability while enhancing safety and security • Identify and implement new freight technologies to improve reliability and efficiency • Meeting new federal requirements identified in the Infrastructure Investment and Jobs Act as well as the previous requirements under the Fixing America's Surface Transportation (FAST) Act.

Type of Plan	Adoption	Plan	Plan Elements
Advanced Transportation Mobility Strategic Plan	2024	Advanced Transportation Mobility Strategic Plan	• Aviation technologies • Digital infrastructure, including automation and connected vehicles and data exchange platforms
Electric Vehicle Infrastructure Deployment Plan	2023	NCDOT Electric Vehicle Infrastructure Deployment Plan	• Overview of National Electric Vehicle Infrastructure program

2.2.2 Statewide Plan Findings

The following findings provide an overview of pertinent elements found within the statewide plans.

After a review of six statewide plans, two programmed projects and one planned project were identified within the STC K study area, as noted below:

- Comprehensive State Rail Plan (2015):
  - South Carolina State Line through Hamlet to Raleigh. Runs parallel to US 1 and US 440 (#13) Stewardship Program. Total of $25,100,000, 2020-2035. CSXT. Includes terminal facility and grade separation.
  - South Carolina State Line to Virginia State Line. Runs parallel to I-85 and US 29. Investment Program. Total of $77 million, 2020-2035. Includes siding extensions, yard improvements, grade separations.
- S-Line Transit Oriented Development Study (2023):
  - Catalytic transit-oriented development (TOD) sites identified in Sanford in proximity to US 421 Business Route (North and South Horner Boulevard). No priority infrastructure projects are identified on US 421 Business, but there may be bicycle and facility improvements within a 0.25-mile radius. No funding or timing was identified. Includes priority locations for TOD improvements and strategies for implementation.

The statewide plans also identified the STC K study area in the NCDOT Electric Vehicle Infrastructure Deployment Plan (NCDOT 2023) and Statewide Freight Plan (NCDOT 2023) as key areas for truck parking, electric vehicle infrastructure, and safety concerns.

- Statewide Freight Plan:
  - Identifies I-95 in Cumberland and Harnett Counties as a truck parking need location.
  - Identifies Cumberland County as one of the top 10 in truck crashes.
- NCDOT Electric Vehicle Infrastructure Deployment Plan:
  - Identifies I-95 from South Carolina state line to US 70 interchange as an alternative fuel corridor (AFC).

2.2.3 Planned Transportation Projects

Each state is required to develop a list of planned projects (highway, transit, safety, and multimodal) that are fiscally constrained for the first 4 years, known as the STIP. NCDOT develops its STIP in concert with the MPOs' TIPs as well as RPOs' recommendations from CTPs.

The NCDOT STIP is a 10-year program (2026-2035) and was most recently approved in July 2025 (NCDOT 2025). In this STIP, projects with funding associated with right-of-way or construction in the first five years are considered "scheduled for delivery," while the last five years are considered "developmental" and subject to change. The MPO TIPs and SPOT projects as well as the STIP (as referenced in Table 2) were reviewed for relevant planned projects within the study area and organized by county.

Table 2. List of Transportation Project Resources

Type of Resource	Adoption	Contents	Source
State Transportation Improvement Program (STIP)	2026 - 2035	STIP map, STIP project basic information, STIP project schedules	• 2026-2035 State Transportation Improvement Program
MPO Transportation Improvement Programs (TIPs)	2026 - 2035	TIP map, TIP project funding, TIP project schedules, capital and operating needs	• GUAMPO 2024-2033 Metropolitan Transportation Improvement Program • CAMPO FY 2026-2035 Transportation Improvement Program • 2024-2033 Fayetteville Urban Area Transportation Improvement Program
Strategic Transportation Prioritization (SPOT) Projects	2026 - 2035	Prioritization resources, prioritization scoring methodology and process	• Prioritization Resources • Prioritization Data

2.2.4 STIP Findings

Eighty projects were identified within the STC K study area, with the estimated funding totaling $611.8 million. Table A-1 in Appendix A provides a list of STIP projects, and Figure 60 and Figure 61 display their locations in the study area. Cumberland and Guilford Counties had the most planned projects in the STIP, where Cumberland ($329.6 million) and Lee ($111.5 million) Counties had the highest total funding estimates for the projects. Overall, the project types vary, with lane widening being the most prevalent (14 percent); other project types include paving or pavement rehabilitation (10 percent), intersection improvements (10 percent), bicycle/pedestrian improvements (10 percent), and interchange construction, relocation, or improvements (8 percent). Based on the project phases, over 50 percent of the projects are currently under construction or completed, with 16 percent of the projects funded for preliminary engineering only.

Within the study area and 10-mile buffer of the STC K alignment, the 2026 Highway Safety Improvement Program (HSIP) identifies 542 intersection improvement projects (NCDOT 2026). The projects varied by type, including intersection improvements (63.7 percent), bike/pedestrian intersection improvements (23.8 percent), and sections improvements (12.5 percent) (the latter drawn from 2025 HSIP data, as 2026 HSIP data were not accessible for this category). Eight out of

the 16 HSIP projects fall within Chatham and Cumberland Counties. Section 3.2.3.3 and Table 10 and Table 11 provide more STIP HSIP details.

2.2.5 Local Transportation Plans

MPOs represent urban areas of 50,000 or more residents and make transportation plans and policies at the regional level. According to NC General Statute Section 136-66.2, municipalities not within an MPO are required to develop CTPs in cooperation with NCDOT that will serve present and anticipated travel demand in and around the municipality and shall give consideration to all transportation modes.

RPOs serve the counties not represented by the MPOs with staff of each municipality and county in the RPO serving on the Technical Coordinating Committee (TCC) and elected officials from each serving on the Transportation Advisory Committee (TAC). CTP development is generally coordinated with NCDOT through the RPO. An RPO works with their TCC to consider projects from all the CTPs and other plans within their planning area to take to the TAC for their decision of what to submit to NCDOT for funding consideration through the North Carolina prioritization process and funded through the STIP.

2.2.5.1 Comprehensive Transportation Plans

The CTP represents a community's consensus on the future transportation system (including the existing system and improvements) needed to support anticipated growth and development over approximately a 25- to 30-year timeframe. A CTP is a mutually adopted legal document between the state and the local area partner(s), be it MPO, RPO, or county, that is required to be developed to serve present and anticipated travel demand. When a CTP is adopted by NCDOT, it represents the state's concurrence with the identified transportation needs and proposed recommendations. However, the CTP is not required to be fiscally constrained, has no minimum horizon year, no update timeframes are specified, and does not commit NCDOT to funding or constructing those project proposals, or to a particular noted project's cross-section. NCDOT, along with local agencies (MPOs, RPOs, municipalities, and counties) adopt the CTP maps and recommendations. Projects submitted through NCDOT's project prioritization process are encouraged to come from a mutually adopted CTP.

The following CTPs were reviewed for this study:

- GUAMPO CTP (2020)
- Randolph County CTP (2013) (update in progress)
- Chatham County CTP (2017) (update in progress)
- Lee County CTP (2019)
- Harnett County CTP (2017)
- FAMPO/Cumberland County CTP (2023)

The CTP maps and recommendations s (highway, bicycle, and pedestrian) were reviewed to identify any priority improvements that were located on, intersecting, or within proximity to the STC K study area. The CTPs were also reviewed for any relevant information concerning safety, reliability, electric vehicle infrastructure, and freight, specifically truck parking, within the STC K study area.

Overall, the analysis of the CTPs found most documents and maps were 10+ years old. Many of the recommendations do not incorporate countermeasures and strategies identified in newer statewide plans like the Advanced Transportation Mobility Strategic Plan (NCDOT 2024). One example of this is that none of the CTPs include electric vehicle infrastructure recommendations. Appendix A Table A-2 contains a detailed list of planned projects as detailed in the CTPs.

2.2.5.2 Metropolitan Transportation Plans

MTPs contribute to the continuing, cooperative, and comprehensive transportation planning process. The MTP is required to address the federal planning requirements in 23 United States Code 134, which includes being fiscally constrained, having a minimum 20-year horizon, and being updated every 4 years in air quality non-attainment or maintenance areas (every 5 years in attainment areas). Every MPO develops a TIP that lists fiscally constrained projects from its MTP, which then feeds into the STIP. The MPOs present along the STC K corridor include GUAMPO and FAMPO.

The GUAMPO MTP has a future year of 2050 and was last updated in January 2026 (GUAMPO 2026). The Congestion Management Process (CMP) was also updated in March 2026 (GUAMPO 2026). One challenge identified in the MTP was the population and employment growth forecasted in the Greensboro metropolitan area, particularly as it relates to meeting future travel demand by expanding and maintaining the transportation networks while maintaining community livability. Based on the Piedmont Triad Regional Model (PTRM), GUAMPO estimates the population to increase by approximately 25.6 percent by 2050, adding 100,319 people to the 2022 base of 391,519. The number of households follows a similar trend, with a 34.9 percent increase, adding 57,592 new households by 2050. Employment in the region is expected to grow by 31.3 percent, adding 73,386 new jobs between 2022 and 2050 (GUAMPO 2026). The MTP forecasts are not presented on individual roadways.

The FAMPO CMP and MTP were both reviewed for common goals, performance metrics, and future assumptions for growth as it relates to the STC K Study Area (FAMPO 2019). The CMP was adopted in 2022 and provides forecasted annual average daily traffic (AADT) for NC 24/NC 87/Bragg Boulevard for 2025, 2035, 2045, and 2050. The MTP has a forecast year of 2050 and was adopted in May 2024 (FAMPO 2024). The slight variation in plan development and adoption means slightly different assumptions for the scenario testing (MTP) and forecasted AADT (CMP), though the MTP uses the CMP's growth rate for the NC 24/NC 87/Bragg Boulevard corridor in Fayetteville.

2.2.5.3 Local Transportation Plans

The following findings provide an overview of pertinent elements found within the noted local transportation plans. Additional details and mapping are provided in Chapter 3.

Several project recommendations were identified across six CTPs located within the study area that were reviewed. Within the CTPs, multiple key findings were related to safety, reliability, and freight. None of the CTPs that were reviewed identified the STC K study area as high priority for electric vehicle infrastructure. Other recommendations were found in other local transportation plans not associated with state-involved CTPs (Table 3). Common strategies within the local plans include improving multimodal connectivity and accessibility for all modes, including expanding transit

operations and bicycle/pedestrian facilities and connections, improving safety, managing system reliability and congestion, and preserving the existing transportation system.

Table 3. Planned Transportation Projects Identified in Other Local Transportation Plans

Local Transportation Plan	Proposed Projects in Study Area
Town of Lillington CTP (2017) and Addendum (2023)	• Improve US 421 from NC 87 to proposed new Lillington bypass around northwest and southwest Lillington. • Widen NC 210 from new Lillington Bypass south to Spring Lake.
Town of Hope Mills Multimodal Congestion Management Plan (2018)	• Extend NC 162 (as a bypass to NC 59) from US 301 to I-95 to provide a Hope Mills bypass.

Findings from these local plan reviews that are pertinent to the STC K corridor are listed below by key element.

Safety

- **FAMPO/Cumberland County CTP (2023)**: Locations with the highest number of crashes were at NC 210 (Murchison Road) and Shaw Mill Road (SR 1614).
- **Randolph County CTP (2013)**: US 421 and Shiloh Road/Deviney Road (SR 2407) (11.54 Average Severity; 10 total crashes).

Freight/Truck Parking

- **FAMPO/Cumberland County CTP (2023)**:
  - Identifies freight railroads as Aberdeen & Rockfish Railroad, CSX Transportation, and Norfolk Southern.
  - NC 24 and US 401 are identified as primary freight movement roads.
- **Chatham County CTP (2016)**: The Old US 421/Zion Church Road connector could reduce truck traffic between Sanford and New Hill/Holly Springs.

Reliability

- **GUAMPO CTP (2020)**:
  - Traffic congestion is high on I-40/US 421 and I-40 in eastern Guilford County; therefore, I-73/I-74 could alleviate the congestion.
  - US 29 South at I-40/I-85-BR/US 421 is identified as a bottleneck location for vehicle hours of delay for 2014-2018.
- **FAMPO/Cumberland County CTP (2023)**: NC 24 (from North Bragg Boulevard [SR 1117] to Manchester Road [SR 1451]), US 401, and NC 59 are key highways with capacity deficiencies that were near capacity in 2018 and will be over capacity in 2045.
- **FAMPO Congestion Management Process (2019)**: Identifies two hot spots on NC 24 in Fayetteville, one Level of Service (LOS) E (Rowan Street/ Bragg Boulevard) and one LOS F (Shaw Road/Bragg Boulevard). Future AADT areas are projected to be less along portions of Skibo Road and Ramsey Street. AADT areas along other corridors are expected to increase by

between 500 and 3,000 average daily trips. For some corridors, larger AADT areas are anticipated, including along portions of Murchison Road and US 401.

- **CAMPO CTP (2026)**: I-95 is projected to exceed LOS D by 2035 and needs improvements to relieve congestion and maintain a minimum LOS D on the existing facility.
- **Randolph County CTP (2023)**: US 421 from NC 49 to Guilford County does not meet the future mobility and connectivity needs in central North Carolina. This facility is intended to provide mobility in Randolph County and, ultimately, connectivity between Wytheville, Virginia, and Fayetteville, North Carolina. US 421 is currently an expressway and is proposed to be upgraded to a freeway by implementing full control of access along the facility.

Local Development

- **Chatham County CTP (2016)**:
  - US 421 in Chatham County is recognized as a Strategic Transportation Corridor. It is comprised of both boulevard and expressway cross sections, which is inconsistent with the desired level of speed and mobility for the facility.
  - The 2016 CTP highlights Siler City's concerns about rising traffic on US 64, including congestion on side streets, delays at controlled intersections, and challenges accessing businesses due to traffic. The community generally agrees that a northern alignment to a potential US 64 Bypass would be less impacted by development and could leverage the existing US 421 to accommodate part of a potential bypass.
- **Harnett County CTP (2017)**:
  - Due to Harnett County's close proximity to Fort Bragg, rapid growth related to the DoD Base Realignment and Closure implementation over the next 5 years is expected to continue. Population is also expected to continue increasing through the 2035 planning period due to new residents from Fayetteville and Raleigh migrating to the middle of Harnett County.
  - US 421 improvements (through Lillington and Campbell University) provide the mobility and access needed to handle planned development in the central portion of the county, which is expected to become Campbell University's medical corridor with expansion of medical practices, schools, and clinics.
- **Lee County CTP (2019)**:
  - US 421 is the primary business corridor serving Sanford's urban areas and commercial district.
  - Fort Bragg is expected to draw roughly 40,000 military personnel, dependents, civilians, and contractors to the region. Commercial and residential development in and around Sanford and Broadway, due to military growth, is expected to place added demands on Lee County's roadway system, but particularly along NC 87, which is considered the "Main Street" entrance to Fort Bragg.
- **FAMPO/Cumberland County CTP (2023)**: The military base and proximity to the Raleigh-Durham Area promotes the urban Fayetteville area to grow at a faster rate than the rural area of Cumberland County.

- **FAMPO MTP 2050 (2024)**: The FAMPO planning area population is projected to increase from approximately 394,000 in 2020 to 463,000 in 2050, representing a 17.4 percent increase. Growth is projected to be particularly strong in the Harnett County portion of the planning area, where population is expected to increase by approximately 41 percent over the same period.

Goals

- **FAMPO MTP (2019)**: Adopted eight goals, identifying corresponding objectives and evaluation criteria for roadways, bicycles, pedestrians, and transit.
- **FAMPO CMP (2019)**: The CMP identified two goals and corresponding strategies for Bragg Boulevard, including (1) improve pedestrian safety and access and (2) improve and expand transit service.
- **GUAMPO MTP (2020)**: Adopted eight overall MTP goals and identifies specific objectives and performance metrics for roadways, bicycle/pedestrians, and transit, including six local MPO goals and nine total objectives.

2.2.6 Land Use Planning and Growth Centers

Land use planning in North Carolina is a regulatory practice that is generally performed by cities and larger towns and counties, with smaller towns relying upon their counties to perform long-range land use planning for them. Land use plans can be stand-alone plans but are often included as a chapter of local comprehensive plans, which contain other growth and local service-related elements such as parks and recreation, utilities, pollution reduction, and environmental protection, to name a few. Sometimes general transportation elements are included in local land use plans, but often these plans are separate, due to the funding and coordination needed with NCDOT. Local land use plans are effectuated through the adoption of development regulations, sometimes referred to as development or subdivision ordinances or Unified Development Ordinances (when combined). These regulations spell out the legal requirements and formal approval processes for new development or redevelopment. As these development regulations are the specific legal means by which local governments implement the land use visions and goals presented in their long-range land use plans, they were not reviewed for this study.

The findings from the review of local land use plans in the study area are presented in Appendix A Table A-3. The following sections present an overall summary of land use findings in the study area, including current and future proposed developments and growth plans along or near the STC K corridor that would substantiate the need for the project as well as other planned items that could be negatively or positively affected by improving the proposed corridor. Within the study area between Sanford and I-95, the review includes a summary of proposed growth or desired protection areas that are used within the Geographic Information System (GIS) screening (Chapter 7).

2.2.6.1 Land Use Findings

Future planned land uses in the study area are shown in Figure 3 and Figure 4. Detailed versions of both future land use and existing land cover types are provided in Appendix B. Generally, the mapping shows that existing urban and suburban development is focused around the major localities and military bases in the study area, including Greensboro, Siler City, Goldston, Sanford, Spring Lake, Pope Airfield, Fort Bragg, Fayetteville, Lillington, and Dunn.

Figure 3. Future Land Use North of Sanford

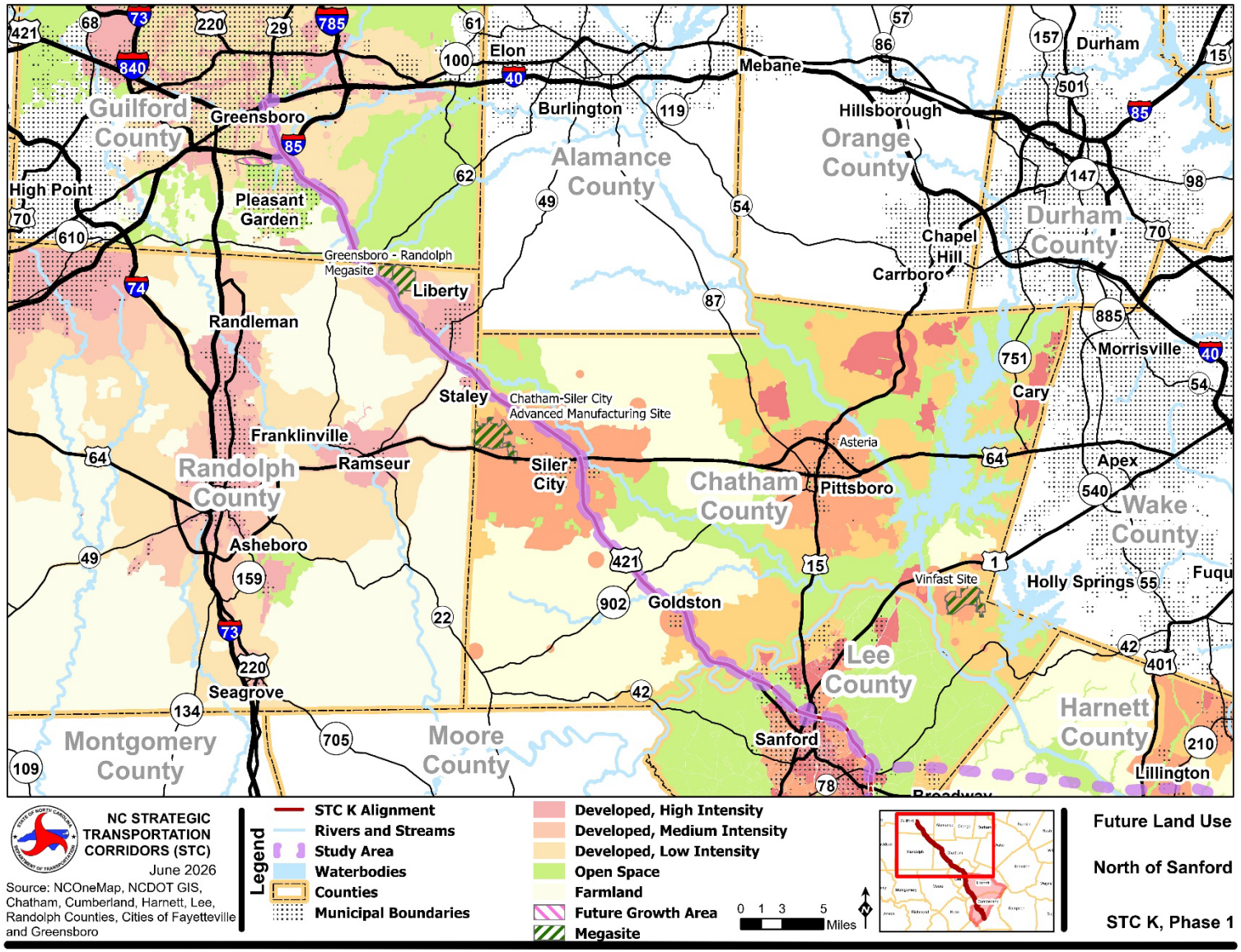
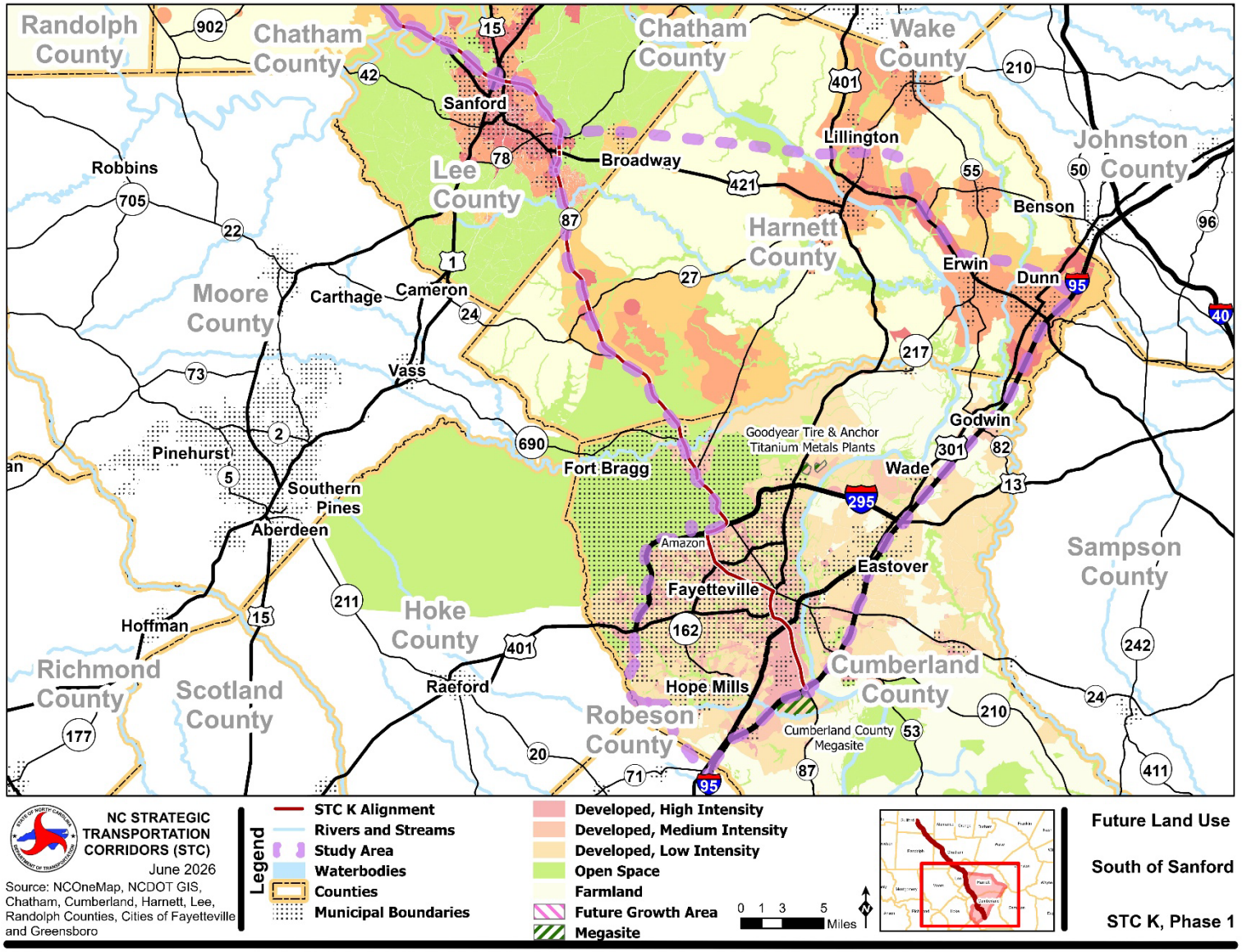


Figure 4. Future Land Use South of Sanford



It should be noted that these maps come from various sources and use differing definitions for some land use categories, especially open space. The Existing Land Cover maps focus on vegetative types in existing land cover for undeveloped lands, which comes from the United States Geological Survey (USGS) National Land Cover Database (USGS 2021). The Future Land Use maps provide individual county interpretations, which were attempted to be standardized, as provided in Table 4. The result is that the Open Space category on both map series is inconsistent, especially between counties, and is shown to either under or over-represent the category. This is especially true for the localities that include office parks, certain subdivisions, golf courses, zoos, and/or military bases as "open space." Major existing true open space (what is considered preserved lands) in the study area would include parks and natural preserved areas as shown in the Natural Environmental Features maps in Appendix B.

2.2.6.2 Growth Center and Megasite Findings

Existing and planned mega employment sites in the study area are shown in Figure 3 and Figure 4, and in the future land use maps in Appendix B, and include:

- Greensboro-Randolph Megasite, a 1,500-acre advanced manufacturing site that relies on the US 421 corridor for access, that Toyota selected for its new US Automotive Battery Plant (see Future Land Use Sheets 2 and 3 in Appendix B).
- Future development for a Megasite located at the southwest quadrant of the I-95 and NC 87 interchange in Cumberland County (Future Land Use Sheet 14 in Appendix B).
- VinFast automobile manufacturing and assembly plant east of Moncure in Chatham County (Figure 3).
- Asteria, a residential community, undergoing construction in Chatham Park on the eastern side of Chatham County northeast of where US 501 intersects US 64 (Figure 3).
- Amazon Fulfillment Site in Cumberland County south of I-295 and between All American Freeway and NC 24 (Figure 4).
- Titanium manufacturing plant being constructed in Fayetteville along US 401 (Future Land Use Sheet 12 in Appendix B).

Table 4. Future Land Use Category Designations Throughout the Study Area

Location	Planned, Low Intensity	Planned, Medium Intensity	Planned, High Intensity	Open Space	Farmland
Chatham County	Rural	Compact Communities/Residential, ETJs	Employment Centers, Centers	Parks and Protected Land, Conservation	Agriculture
Cumberland County	Low Density Residential, Rural, Mixed Use, rural residential, rural area center, suburban residential/ density, One Acre Residential	Commercial, Industrial, Medium Density Mixed Housing/Residential, Office and Institutional, Governmental, Light Industrial, Light Commercial, Planned Commercial/Industrial, Office/flex office/mixed	City, Coliseum Development Area, Airport Oriented Uses, Commercial Node, Downtown, Heavy commercial, Heavy industrial, High Density Residential, Multi-Family, Activity Node, I-295 Area	Open Space (Buffer), Office Institutional and Parks, Flex Area, Proposed City Park, Recommend Fay Divest	Agricultural, Farmland
Harnett County	Low Density Residential, Rural Center, Compatibility Development Target Areas	Medium Density Residential, ETJs	Compact Mixed Use, Employment Mixed Use	Military, Military Corridor Buffer, Environmentally Sensitive Areas, Protected Areas	Agricultural
Lee County	Village Neighborhood	Neighborhood Center, Neighborhood Transition, Suburban Neighborhood, Village Center	Commercial Corridor, Downtown, Industrial Center, Maker District, Mixed Use Activity Center, Professional and Institutional Campus, Urban Neighborhood	Crossroads, Countryside	N/A
Randolph County	Secondary Growth Area	Primary Growth Area	Municipal Growth Area	Zoo Environmental Area	Rural Growth Area

Location	Planned, Low Intensity	Planned, Medium Intensity	Planned, High Intensity	Open Space	Farmland
City of Greensboro	Glenwood Plan, Heath Community Plan, Residential, Lindley Park Plan	Major Campus, Neighborhood/District/Regional Center, College Hill Plan, Jonesboro Scott Park Plan, New Garden Road Strategic Plan	Airport, Central Gateway Corridor Plan, Downtown, Industrial, Commercial, Friendly Ave Plan	Reserve	N/A
Guilford County Unincorporated	Conditional Single Family Residential, Light Commercial, Light Industrial, Residential Single Family	Office, Moderate Commercial, Residential Multi Family	Heavy Commercial, Heavy Industrial,	Rural Residential, Public Institutional Open Space, Missing Area Plan	Agricultural
City of Fayetteville	Low Density Residential	Medium Density Residential, Office/Institutional, Neighborhood Improvement	Downtown, Industrial / Employment, High Density Residential, Regional Center, Community Center, Neighborhood Mixed Use, Highway Commercial, Commercial Strip Redevelopment	Open Space Subdivisions, Park / Open Space, Fort Bragg	Rural

Future growth areas in the study area are also shown in the future land use maps in Appendix B and include:

- Major mixed-use center/ regional employment growth area (Ritters Lake Road corridor) east of Pleasant Garden near US 421 (around Greensboro-Randolph Megasite) (Future Land Use Sheets 1 and 2 in Appendix B).
- Major retail centers proposed near the future US 421/ Woody Mill Road interchange east of Pleasant Garden (Future Land Use Sheets 1 and 2 in Appendix B).
- New potential commercial development proposed near the US 421/ Neeley Road interchange and the Ritters Lake Road corridor (Future Land Use Sheets 1 and 2 in Appendix B).
- Proposed commercial area at the intersection of US 421 and Old Liberty Road (Future Land Use Sheet 3 in Appendix B).
- Several activity centers recommended along major intersections of US 421 and other highways that serve as gateways into Liberty (Future Land Use Sheet 3 in Appendix B).
- Wolfspeed (formerly the Chatham-Siler City Advanced Manufacturing Site) was recently constructed along US 64 northwest of Siler City, spurring residential and commercial growth (Future Land Use Sheet 4 in Appendix B).
- Large employment center identified along US 421 in Goldston (Future Land Use Sheet 4).
- Growth area near the Town of Wade due to the Fayetteville Outer Loop/ US 13 Extension and the availability of water and sewer service (Figure 4).

2.2.7 Environmental Justice and Transportation Disadvantage Index

When this study began (end of 2023), Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994) and Executive Order 14096, Revitalizing Our Nation's Commitment to Environmental Justice for All (2023) had directed federal agencies, to the greatest extent practicable, to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. The United States Department of Transportation (USDOT) therefore required an EJ analysis as part of the NEPA process to (1) share information and provide opportunities for participation and (2) identify disproportionately high and adverse effects that may result from a project's development. Guidance from USDOT on EJ allowed state DOTs and MPOs to further define areas of concern.

With the 2025 rescission of Executive Order 12898 and Executive Order 14096, and subsequent Council on Environmental Quality guidance, EJ analyses are no longer universally required by executive order under NEPA. However, because future administrations or individual agencies could revive similar Executive Orders; NEPA still requires analysis of environmental effects, public involvement, relocation effects, and disclosure of community impacts; and Title VI of the Civil Rights Act and other nondiscrimination requirements still apply to recipients of federal funding, including many transportation projects, a cursory EJ review was conducted to gauge the relative impacts of each alternative on disadvantaged communities, as discussed in Chapter 7.

In addition, NCDOT has developed mechanisms to identify key transportation disadvantaged areas through the TDI tool (NCDOT 2026). Areas identified through the TDI within proximity of the STC K study area could help involve disadvantaged communities through future outreach efforts and to

support future NEPA documentation if/when any project from this plan is approved for future funding.

2.2.7.1 Environmental Justice and Transportation Disadvantage Index Findings

The NCDOT TDI is a relative measure of transportation disadvantaged populations, measured at the census block group level. These demographic groups are likely to face difficulties in accessing transportation and are vulnerable to barriers to transportation. These groups include households without access to a personal vehicle, individuals living below the poverty line, people under 15 years of age or older than 65, people with disabilities, and members of racial and ethnic minority groups. A score from 0 to 21 is assigned to each block group, describing the relative proportion of these populations in comparison to larger geographical divisions; the respective county, MPO, DOT Division, and the State of North Carolina. Communities along the corridor with a high TDI would likely face greater impact from construction of the roadway. As shown in the Transportation Development Index and Disadvantaged Communities maps in Appendix B, communities with a TDI score of 16 or higher with respect to the state include the area around the corridor terminus at US 29 in Greensboro, western Liberty, the town of Siler City, Sanford, east of US 1, communities north of Spring Lake, and downtown and around I-295-W in Fayetteville.

NCDOT has also developed an EJ tool as a measure to assess equity impacts under NEPA. EJ is similar to TDI but is limited to populations of racial and ethnic minorities and individuals living under the poverty line. Each block group is assigned a score from 0 to 12 where a higher score denotes a higher population of these vulnerable groups, and the score is relative to larger geographical divisions. As also shown in the Transportation Development Index and Disadvantaged Communities maps in Appendix B, areas along the corridor with an EJ score of 7 or higher with respect to the state are directly north of the corridor terminus at US 29 in Greensboro, throughout the town of Liberty, in Siler City near the US 421 and US 64 interchange in southern Sanford, and in downtown and central Fayetteville.

Destinations that offer community resources are particularly significant to these vulnerable communities. Broadly, these destinations are hospitals, places of worship, K-12 schools, libraries, public and private colleges and universities, and various government offices. Along the corridor as shown in the Community Resource Destination maps in Appendix B, churches and other places of worship are the most common of the destinations and are widely present throughout rural and unincorporated areas. A high density of government offices exists around Siler City, including offices for social services such as Chatham County Group Homes and the senior center. However, there are relatively few government offices along rural stretches of the corridor, predominantly being small town halls, waste and recycling facilities, and water and sewer plants outside of municipal boundaries. There are similarly few K-12 schools and libraries along the corridor outside of Greensboro, Sanford, and Fayetteville, but most of the smaller municipalities such as Erwin and Broadway have at least one school and library. Hospitals are similarly sparse; between Greensboro and Central Carolina Hospital in Sanford, the only hospital is Chatham Hospital in Siler City. Of the five colleges in the vicinity of the corridor, three are in Fayetteville, and the fourth and fifth are Central Carolina Community College campuses in Sanford and Siler City.

2.2.8 Environmental Data

Environmentally sensitive areas can include natural resources (including federal wetlands, endangered species, protected open space, scenic byways, other federal and state mandated protected areas), as well as human environmental areas (including historic sites) and community resources (such as landfills and hazardous waste sites). These areas are shown in the Environmental Features and Natural Environmental Features maps in Appendix B as well as referenced and defined in Table 5 and Table 6. Identifying these areas in relation to the proximity to the STC K study area is a key part of the NEPA process for future funded projects.

Table 5. List of Environmental Resources

Environmental Area	Data Name	Data Source	Key Insights
Wetlands	National Wetlands Inventory	US Fish and Wildlife Service (geodatabase, shapefile, geopackage)	Wetlands mapper of the nation's wetlands and deepwater resources.
Streams	Surface Water Classification	NC Department of Environmental Quality (GeoDatabase)	Updated as of May 25, 2016. The data contains freshwater surface water classifications for all named streams in North Carolina.
Flood Zones	Flood Maps	FEMA (GeoDatabase, GeoTIFFs, shapefiles)	The National Flood Hazard Layer contains current effective flood hazard data.
Protected Lands	Biodiversity and Wildlife Habitat Open Space and Conservation Lands Agricultural Lands Forestry Lands	North Carolina Natural Heritage Data Explorer (Geospatial files)	Natural Heritage natural areas, managed areas, conservation planning tool, and fire response.

Table 6. Environmental and Natural Environment and Community Resource Map Definitions

Term	Definition
100-year Floodplain	A Federal Emergency Management Agency (FEMA) designated high risk flood zone with a 1 percent annual chance of flooding.
Active Landfill	A geographic representation of the location of active landfills.
Boating Access	Free NC Wildlife Resources Commission public boating access locations.
Brownfield Location	Brownfield redevelopment project sites. Brownfield sites are abandoned, idled or unused properties where the threat of environmental contamination has hindered its redevelopment.
Coal Ash Structural Fill	Fly ash placed in construction projects and compacted as a base material.
Enhanced Voluntary Agricultural District	Voluntary conservation agreement between counties and landowners that restrict certain non-agricultural activities on the land. The program typically includes an irrevocable agreement where the farmer agrees to keep their land in agricultural production for a designated period of time. Enhanced Voluntary Agricultural Districts may provide protection to farmers from encroaching utilities.
Existing Bicycle Route	Statewide signed and mapped bicycle routes that NCDOT has designated.

Term	Definition
Flood Inundation Area	Potential inundation effects from river crossings along primary routes developed by detailed hydraulic model data provided by NC Emergency Management showing water surface elevations for the 25-year flood frequency. Data provided by NCDOT RAFT (Resilience Analysis Framework for Transportation).
Future Growth Area	Area identified as currently experiencing an increase in development or is expected to experience an increase in development due to planning recommendations or commercial interest.
Hazardous Waste	Geographic representation of the location of all active hazardous waste sites as regulated by the NC Hazardous Waste Section.
High-Quality Waters (HQW) watershed	Supplemental classification intended to protect waters which are rated excellent based on biological and physical/chemical characteristics through NC Department of Environmental Quality (NCDEQ) monitoring or special studies, primary nursery areas designated by the Marine Fisheries Commission, and other functional nursery areas designated by the Marine Fisheries Commission.
Historic Resource Point	Historic resources that are on the National Register of Historic Places, the study list and/or have been determined eligible for the National Register.
Inactive Hazardous Waste	Sites of historical and recent accidental releases of hazardous substances and contaminants that are present in or threatening groundwater.
Local Historic District	Historic district in which its eligibility for inclusion on the National Register is undetermined.
Managed Area	A collection of properties and easements managed by federal, state, local, and private entities where conservation of biodiversity and ecosystem function are among goals of the land management programs.
Manufactured gas plant	Manufactured gas plants participating in the Manufactured Gas Plant Assessment and Remediation Program. Manufactured gas was produced from coal, coal and oil mixtures, or from petroleum.
Megasite	Large properties of 1,000 acres or more that are marketed to large economic development projects requiring significant land, utilities, and transportation infrastructure.
Municipal Boundary	Boundaries of municipalities that participate in the Powell Bill.
National Register Historic District	Historic district boundaries that are on the National Register of Historic Places, the study list and/or have been determined eligible for the National Register.
NC Natural Heritage Program (NCNHP) Natural Area	A site (terrestrial or aquatic) the NCNHP has identified as having special biodiversity significance due to the presence of rare species, unique natural communities, important animal assemblages, or other ecological features.
NWI Wetlands	Digital representation of the location, type, and extent of the nation's wetland and deepwater habitats produced by the US Fish and Wildlife Service through the National Wetlands Inventory program.
Outstanding Resource Waters watershed	Outstanding Resource Waters are a subset of High-Quality Waters. Supplemental classification intended to protect unique and special waters having excellent water quality and being of exceptional state or national ecological or recreational significance.
Pre-regulatory Landfill	Any land area, whether publicly or privately owned, on which municipal solid waste disposal occurred prior to January 1, 1983, and does not include any landfill used primarily for the disposal of industrial solid waste.
Scenic Byway	Roadways selected by NCDOT as safe and interesting alternatives to major highways and interstates showcasing North Carolina's history, geography, and scenery.

Term	Definition
Solid Waste Facility	Permitted solid waste facilities including compost, household hazardous waste, incinerators, medical waste, and transfer stations.
Solid Waste Landfill	Active and closed permitted solid waste landfills.
Superfund site	Federal remediation sites enrolled in the Superfund program under the Comprehensive Environmental Response, Compensation and Liability Act of 1980
US Fish and Wildlife Service (USFWS) Critical Habitat	Geographical area of habitat the USFWS believes is essential for a threatened or endangered species' conservation and may require special management and protection.
Voluntary Agricultural District	Voluntary conservation agreement between counties and landowners that restrict certain non-agricultural activities on the land. The program typically includes a non-binding agreement where the farmer agrees to keep their land in agricultural production for a designated period of time. The purpose of the Voluntary Agricultural District is to promote agricultural values and the general welfare of the county by preserving farmland from non-farm development.
Water Supply Watershed	Water Supply Watersheds are classified by the State of North Carolina to assist in the protection of drinking water supplies. Five different categories of protection are given to water supply watersheds. Additional protections are given to areas adjacent to water supply intakes or reservoirs.

2.2.8.1 Environmental Data Findings

As shown in the Natural Environment Features maps in Appendix B, both the northern and southern portions of the study area cross numerous jurisdictional wetlands and streams (as identified using National Wetlands Inventory [NWI] data from the US Fish and Wildlife Service [USFWS]). Additionally, much of the study area within Guilford County is located within the Jordan Lake watershed, in which riparian buffers are protected. No High-Quality Waters or Outstanding Resource Waters watersheds are crossed by the study area; however, numerous water supply watersheds are crossed by both northern and southern portions of the study area. Both portions of the corridor also cross Federal Emergency Management Agency (FEMA)-regulated floodways and 100-year floodplains (1 percent annual chance flood hazard areas). According to NCDOT inundation data there is only one area of frequent roadway inundation north of Sanford and that is in Greensboro where STC K crosses South Buffalo Creek. There are some roadway inundation concerns in the study area around Sanford but none of these occur on US 421 or the US 421 Bypass. There are more areas south of Sanford where road inundations occur more frequently. Crossings of the Upper Little River and Black River are frequently inundated, as are numerous tributaries of the Cape Fear River in Fayetteville's municipal boundaries. NC 210 heading north out of Fayetteville, along Cross Creek, is an area that experiences frequent inundation.

The northern section of the study area crosses numerous conservation easements, wetland mitigation sites, and some municipal/county open space areas and parks. The southern portion of the study area also crosses numerous conservation easements, wetland mitigation sites, and municipal/county open space areas and parks but also encompasses portions of two state parks: Raven Rock State Park and Carvers Creek State Park and Nature Preserve and some smaller state-owned properties. The southern portion also includes NC Land and Water Fund project properties. In addition, portions of Fort Bragg military reservation are also located in the southern portion of the study area. No additional federal lands are in the study area.

The northern portion of the study area crosses a few significant natural heritage areas that are associated with stream and river systems. The southern study area includes many more significant natural heritage areas owing to its larger footprint, although the majority are associated with the Cape Fear River, Little River, or Fort Bragg.

As shown on the Environmental Features maps in Appendix B, numerous hazardous material sites and pre-regulatory landfills are crossed by both the northern and southern portions of the study area and are typically concentrated around municipalities.

As shown on the Community Resources maps in Appendix B, both northern and southern portions of the study area include numerous historic resources and districts identified by the North Carolina Historic Preservation Office (NCHPO). These identified resources include resources included on the National Register of Historic Places (NRHP) and others that have been identified but have not been studied in detail for NRHP designation or are not eligible for inclusion on the National Register. Historic resources and districts are somewhat concentrated around municipalities and are more numerous in the southern portion of the study area. Notable historic districts in the southern portion of the study area are the Averasboro Battlefield Historic Site in Harnett County and Long Valley Farm (Rockefeller Family estate) in Carvers Creek State Park. These NCHPO-listed resources may not be inclusive of all potential resources that may be identified through future NEPA studies.

The STC K study area also crosses numerous Voluntary Agricultural Districts, with the highest concentration being in Chatham and Cumberland Counties, as shown in the Community Resources maps in Appendix B. The northern portion of the study area crosses the Devil's Tramping Ground Road Scenic Byway between Siler City and Goldston and the Averasboro Battlefield Byway south of Dunn. The study area also crosses numerous bicycle routes between Greensboro and Sanford. There are only three bicycle routes in the southern portion of the study area between Sanford and I-95. Only one trail/shared-use path is in the study area north of Sanford. There are far more trails/shared-use paths located in the study area south of Sanford. There are also many proposed trails/shared-use paths in Harnett and Cumberland Counties as well. No boating access points currently exist in the study area between Greensboro and Sanford. Three are south of Sanford.

3. Transportation Facilities and Operating Conditions

The study team reviewed relevant data consisting of transportation facilities, electric vehicle infrastructure, and truck parking and inventoried safety and operational hot spots within the STC K Phase 1 study area. This appraisal served as a baseline for developing corridor needs and strategies for evaluation and an alternative analysis of optional linkages between Sanford and I-95.

The study team also identified the following data sets as integral information to understand the functional features of the primary transportation facilities and services identified in the STC K profile. The focus of this section is on mobility features of the facilities and services such as capacity and functional classification.

- Number of travel lanes
- Mileage
- Functional classification
- Facility capacity
- Existing multimodal accommodations
- At-grade railroad crossings of the corridor
- Active/inactive rail lines
- Bridges/culverts (on the corridor and crossing the corridor)
- Section safety scores
- High crash locations
- Assessment of safety hot spots
- Assessment of reliability hot spots
- Electric vehicle infrastructure
- Truck parking

3.1 Transportation Facilities Data Collection

The study team used various data and mapping tools to build a profile of the transportation facilities in the STC K Phase 1 study area. This included data gathered from NCDOT through project geodatabases, NCDOT online resources, and Streetlight, a private data vendor. This data was used to develop key inputs for Section 3.1.1 and Section 3.1.4, and the outputs were incorporated into ArcGIS to create a cohesive final map series (Appendix B).

3.1.1 Roadway Characteristics

Roadway characteristics include the overall number of travel lanes, mileage, functional classification, and facility capacity for the STC K Phase 1 Study Area. Data were collected using a combination of the Travel Demand Model and GIS to create maps of the facilities and tables of the summarized data.

3.1.2 Transportation Facilities

Transportation facilities include the existing multimodal transportation network comprising active and inactive rail lines, at-grade railroad crossings, multimodal accommodations, adjacent

managed land, and bridges and culverts along the corridor. Data were collected using GIS shapefiles and geodatabases provided by NCDOT and those available online. The findings are summarized in a series of maps and tables in Section 3.2.

3.1.2.1 Railroads

Railroad data were acquired from the NCDOT GIS Data Layers website's NCDOT Rail Layer File geodatabase (NCDOT 2026). These data included current in-service rail track as well as NCDOT-owned rail track. Additionally, the data set included public rail crossing point data for both at-grade and grade-separated crossings. For the purposes of this data, track was differentiated among active rail, inactive rail, and preserved rail corridors and only at-grade crossings were investigated. Maps showing the rail facilities along the corridor and an analysis of the findings are summarized in Section 3.2.2.2.

3.1.2.2 Multimodal Accommodations

Multimodal accommodations included regional bike routes and trails, natural areas, state parks, and managed land classifications. A geodatabase was created based on data provided by NCDOT that was mapped using ArcGIS Pro. A spatial analysis was carried out to identify all multimodal accommodations and key managed areas that intersect at some point with the STC K Phase 1 study area. Maps and results can be found in Section 3.2.2.1.

3.1.2.3 Bridges and Culverts

Bridges and culverts include all bridges and culverts on or that cross the STC K Phase 1 study area. Data were collected from Go! NC, a resource NCDOT publishes on its website as static maps (NCDOT 2026). The bridge and culvert data were mapped using ArcGIS Pro. A 50-foot buffer was placed around the STC K Phase 1 roadway centerline to identify any bridges and culverts located on or in the immediate vicinity of the corridor. Another analysis was carried out using the full study area, including the alternative areas between Sanford and Fayetteville, to identify the total number of bridges and culverts in the full study area. The data were reviewed and summarized to show the total number of bridges and culverts, which is provided in Section 3.2.2.4.

3.1.3 Safety Data

Safety data were compiled through multiple sources with the assistance of the NCDOT Transportation Mobility and Safety Division. The NCDOT Transportation Mobility and Safety Division is responsible for maintaining statewide data of crashes and safety programs, and implementing highway safety improvement plans. A few key units/programs include the Safety Planning Group, the Highway Safety Improvement Group, Spot Safety program, and Spot Mobility program. NCDOT's Safety Data Maps were analyzed at a network level for a 10-year period (2013 to 2023), which included identifying areas of high crash frequency and crash types (NCDOT 2025). The NCDOT Safety Planning Group also maintains a safety scoring dataset to help prioritize roadway projects. Metrics for the safety score include crash density (based on frequency and segment length) and crash severity. Safety presents planning / network level analysis, section safety scoring, total number of potentially hazardous locations by county identified in the HSIP, Spot Safety locations identified through NCDOT's SPOT Safety Program, and other high-crash areas that could benefit

from safety improvements (safety hot spots), along with safety projects in the STC K Phase 1 study area listed in the STIP (STIP Safety Projects).

3.1.4 Reliability Data

Reliability data were collected using StreetLight data, a big data vendor that collects and anonymizes travel times and speeds from mobile devices and connected vehicles to provide a sample of real travel data for further analysis. Data were pulled for a 17-month period extending from January 1, 2022, through May 31, 2023. The average travel times for the combined AM peak (6 am to 10 am) and PM peak (4 pm to 8 pm) were used, for both travel directions, to estimate the average peak period speed. Free-flow speed was estimated by StreetLight data under free-flow conditions, typically during night. These two inputs were used to calculate the travel time index (TTI) for the corridor. Section 3.2.5 contains maps showing the TTI along the corridor along with an analysis of the findings.

3.1.5 Electric Vehicle Infrastructure

Existing and proposed electric vehicle charging infrastructure data were obtained from the US Department of Energy's (DOE) Alternative Fuels Data Center (AFDC), a frequently updated data source for alternative fuel (DOE 2026). The current dataset that includes open, planned, and temporarily unavailable electric vehicle charging stations was downloaded from the AFDC website on September 19, 2024. This data contains information on opening date, location coordinates, electric vehicle charger type (Direct Current [DC] Fast, Level 2, Level 1), number of chargers or charging ports, and whether there were any restrictions on usage such as hours of service or limitations that could preclude use by the public. Data analyzed were limited to stations that opened from 2015 to data collected in 2024 due to the likelihood that earlier charging stations were no longer in use or often had earlier charging connector styles that are no longer being used in consumer vehicles. Additionally, chargers found within car dealerships were excluded from the analysis, as they are not consistently available for public use. Proposed stations indicated in the AFDC data were confirmed by comparing to the Plugshare electric vehicle charging station map (https://www.plugshare.com/) to determine whether there were proposed charging stations that were not part of the AFDC dataset. AFDC proposed station data in the vicinity of the corridor were supplemented with any chargers listed by the North Carolina Department of Environmental Quality (NCDEQ) for Volkswagen's Phase 2 DC Fast Priority Corridors funded project list (NCDEQ 2022). Maps showing the electric vehicle charging station locations along the corridor and an analysis of the findings are summarized in Section 3.2.6.

3.1.6 Truck Parking

Freight truck parking data were acquired from the NC Inventory Update of Trucking Facilities that is administered by the NCDOT ATLAS Group (2024). These data are included in an inventory of current freight truck facilities that was created in 2022, updated September 5, 2024, and represented as point data. This data include current freight truck parking facilities and includes information such as facility name, truck facility type (public, private, weigh station, WalMart), and available spaces.

3.2 Key Facilities and Operating Conditions Findings

3.2.1 Roadway Characteristics

3.2.1.1 Mileage, Number of Travel Lanes, Functional Classification, and Capacity

Figure 5 and Figure 6 display the number of travel lanes north and south of Sanford, respectively. The entirety of the corridor north of Sanford along US 421 is four lanes (two lanes in each direction). From Greensboro to the US 421/US 421 Business interchange north of Sanford is 47.9 centerline miles or 192.6 total lane miles. (Centerline miles represent the total length of a roadway from start point to end point. Total lane miles represent the length of a roadway when factoring in the total number of lanes and is a useful measure when calculating maintenance estimates.) US 421 Bypass runs north of Sanford and ultimately splits to the east towards Lillington. US 421 has four lanes (two lanes in each direction). NC 87 merges with NC 24 in Spout Springs to Fayetteville and I-95. The NC 87/NC 24 corridor is a mix of two to three lanes in each direction, with a short section of four/five lanes in each direction near Fort Bragg. The distance from the US 421/US 421 Business interchange to I-95 is a total of 50.7 centerline miles or 253.1 lane miles. Overall, STC K Phase 1 contains 98.6 centerline miles or 445.7 lane miles.

Figure 7 and Figure 8 show the functional class for STC K Phase 1. North of Sanford, US 421 is mostly classified as "Principal Arterial - Freeway/Expressway," with approximately a third of the corridor classified as "Principal Arterial – Other." Once the corridor splits into two just north of Sanford, the southern portion continues as "Principal Arterial – Other," while the northern portion is classified as "Principal Arterial - Freeway/Expressway." South of Sanford, STC K Phase 1 is classified mostly as "Principal Arterial – Other," shifting to "Principal Arterial - Freeway/Expressway," from Fayetteville to I-95. Except to distinguish between "Principal Arterial - Freeway/Expressway" and "Principal Arterial – Other," the whole corridor is classified as "Principal Arterial."

Figure 9 and Figure 10 show the roadway capacity, presented as hourly capacity for all lanes in both directions, for STC K Phase 1. North of Sanford, most of the corridor has a capacity of 5,000 to 6,000 vehicles per hour. When going through Sanford, the capacity drops below 4,500 vehicles per hour, for the US 421 Bypass. South of Sanford, capacity stays 4,000 to 5,000 vehicles per hour until hitting Spout Springs. Then the capacity varies between Spout Springs and I-295, depending on the number of lanes for specific segments. It peaks at the dense land use area just south of Spout Springs with around 9,000 vehicles per hour (actual capacity may be reduced due to the signalized intersections present in that area), and between NC 210 and I-295 with capacity as high as 11,000 vehicles per hour. After passing I-295 toward the south, the capacity stabilizes between 6,500 and 7,500 vehicles per hour until the end of the corridor at I-95.

Figure 5. Number of Lanes - North of Sanford

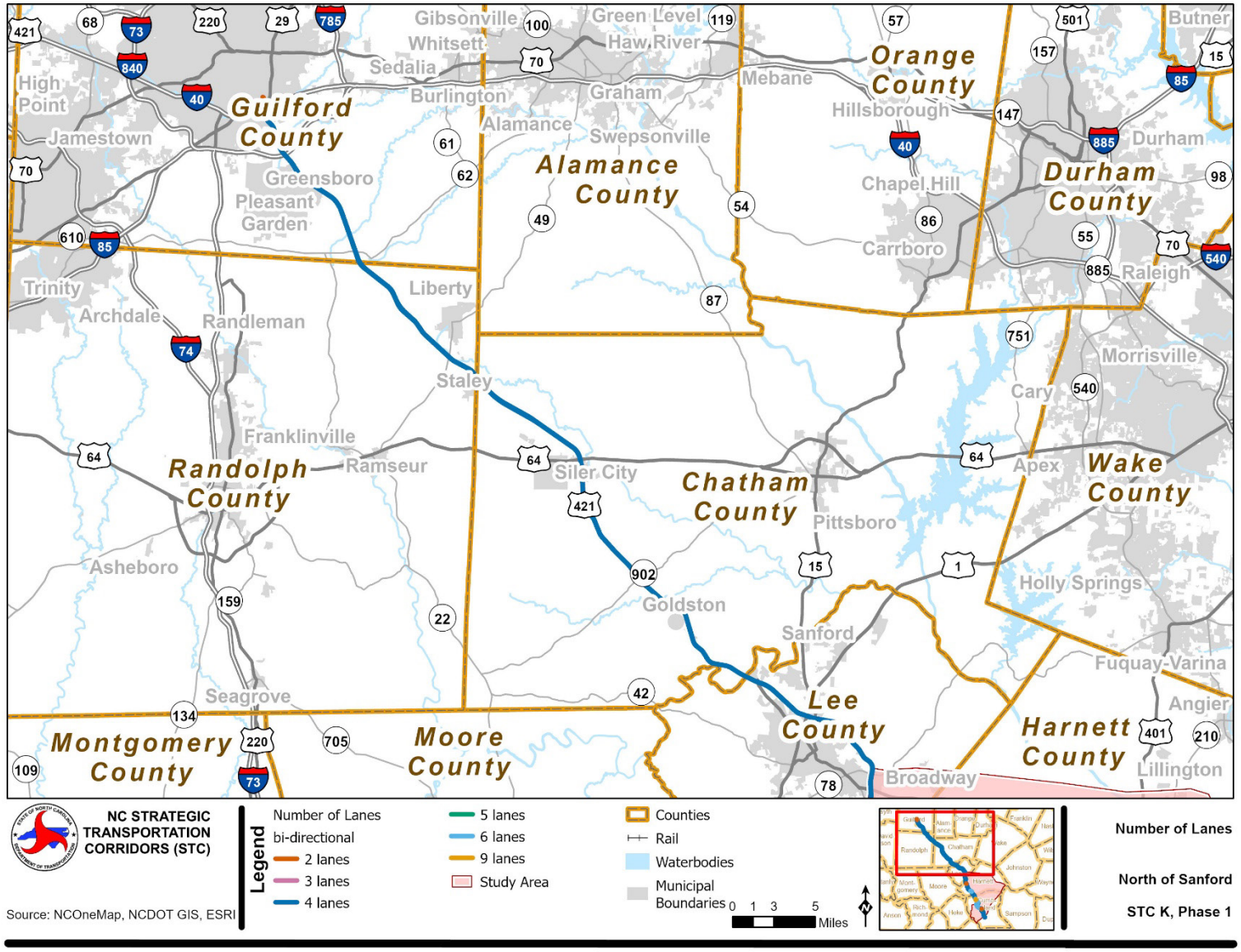


Figure 6. Number of Lanes - South of Sanford

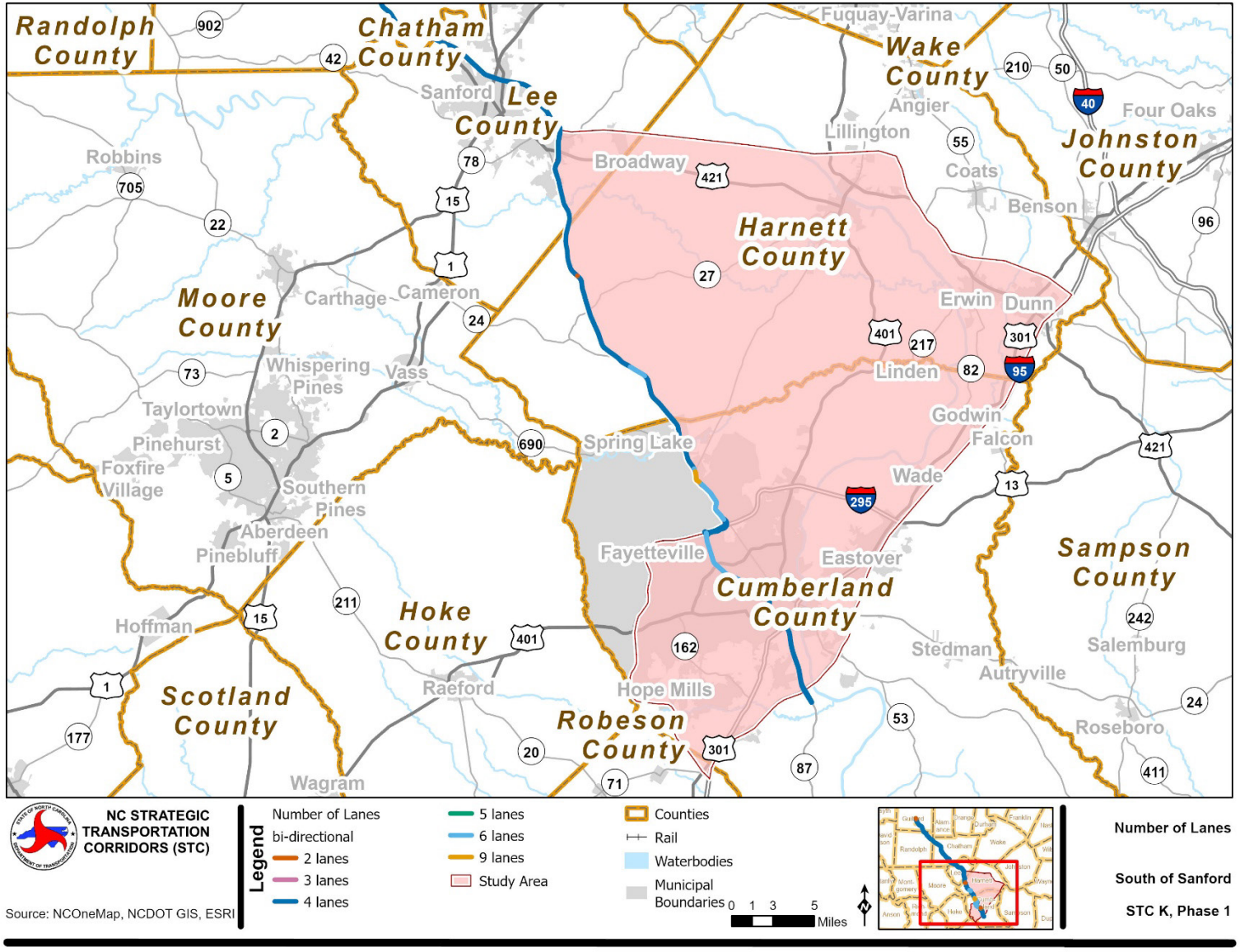


Figure 7. Functional Class - North of Sanford

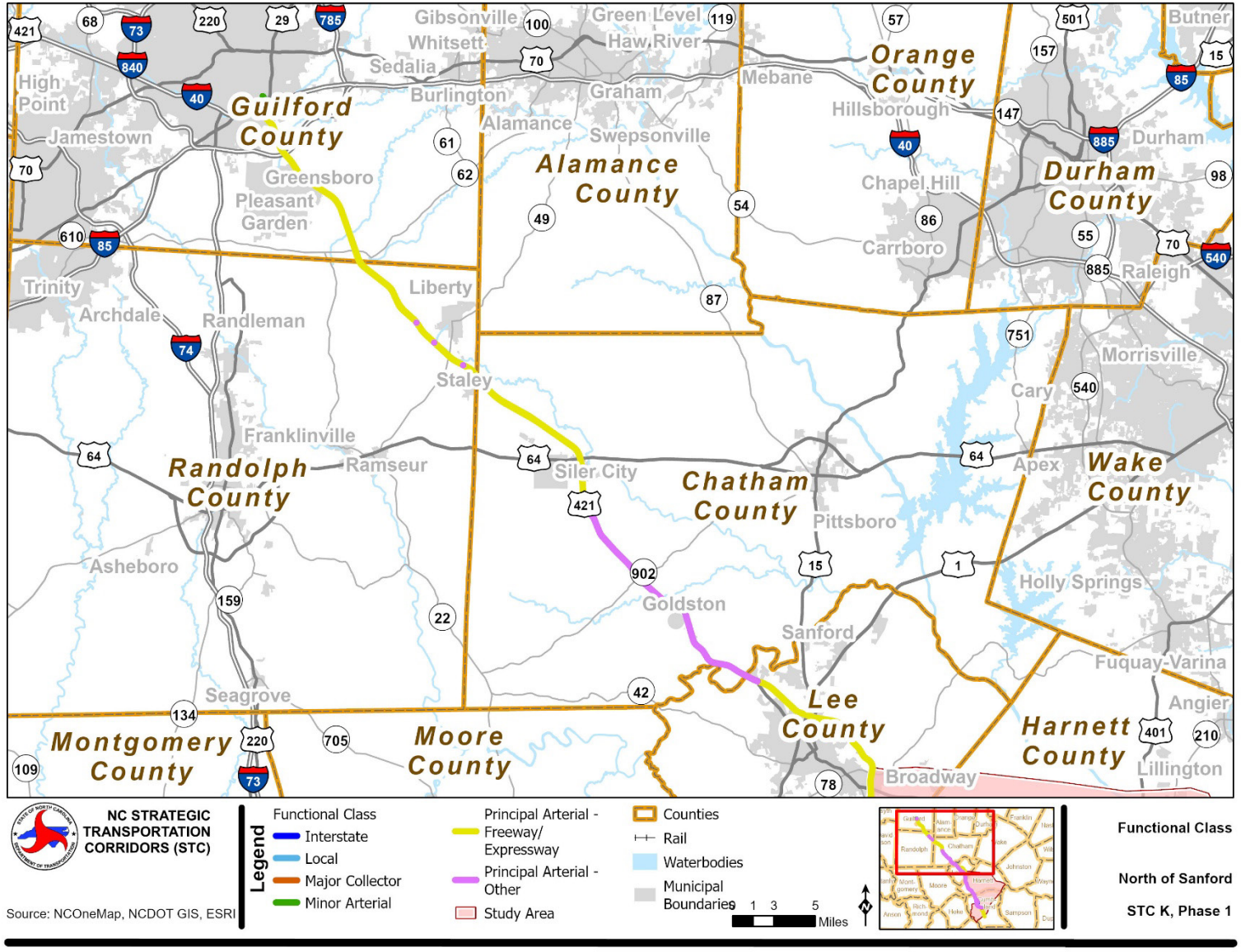


Figure 8. Functional Class - South of Sanford

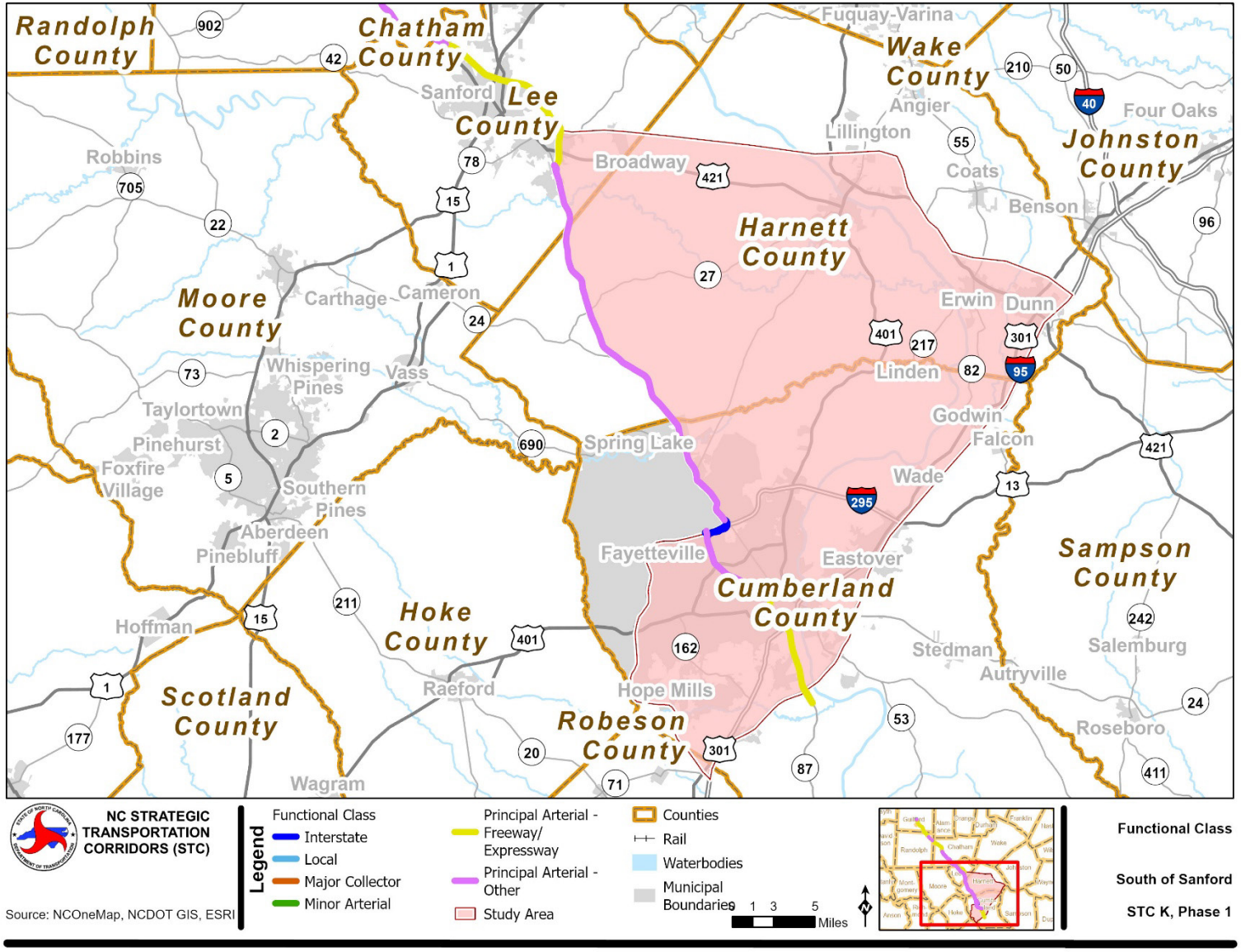


Figure 9. Roadway Capacity - North of Sanford

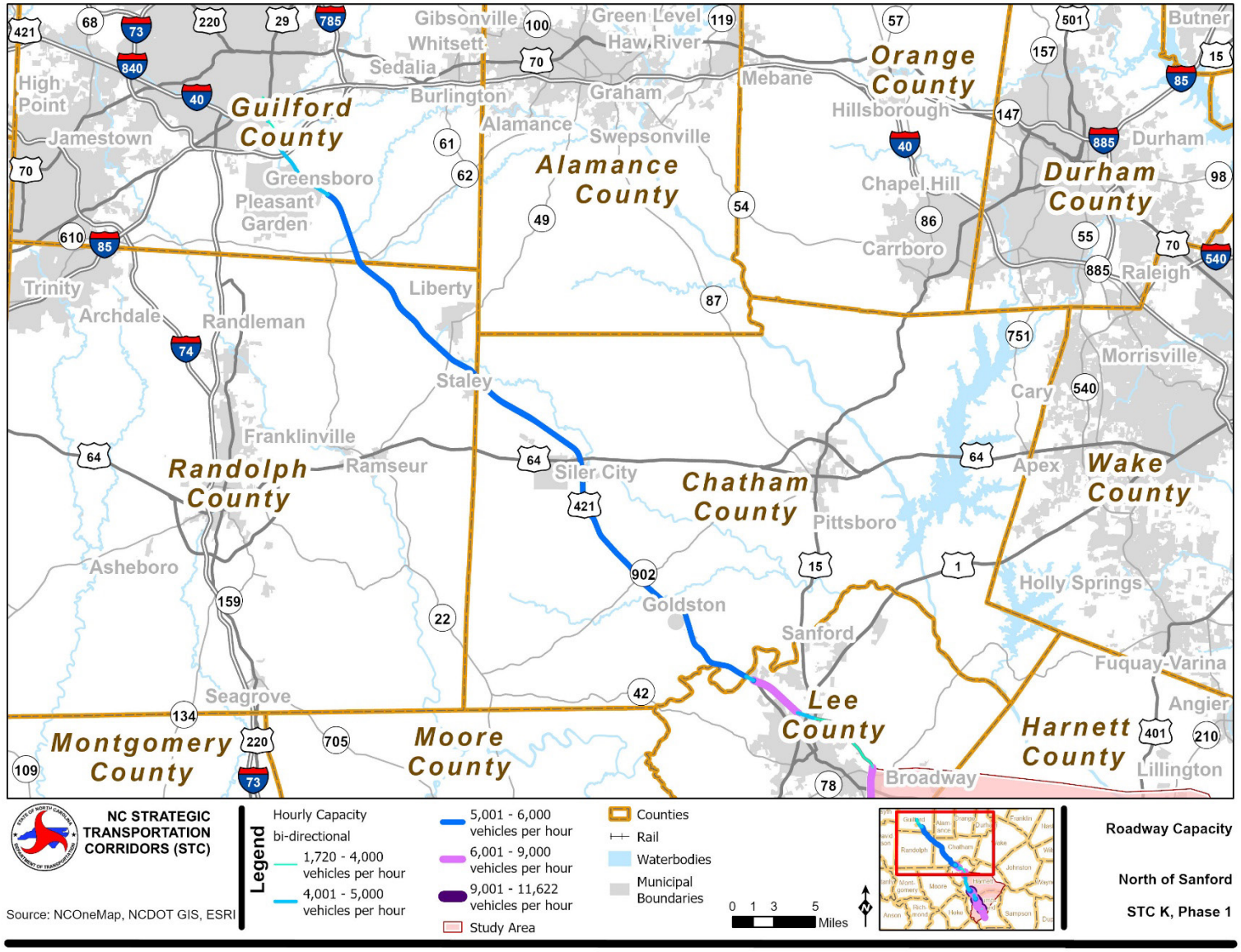
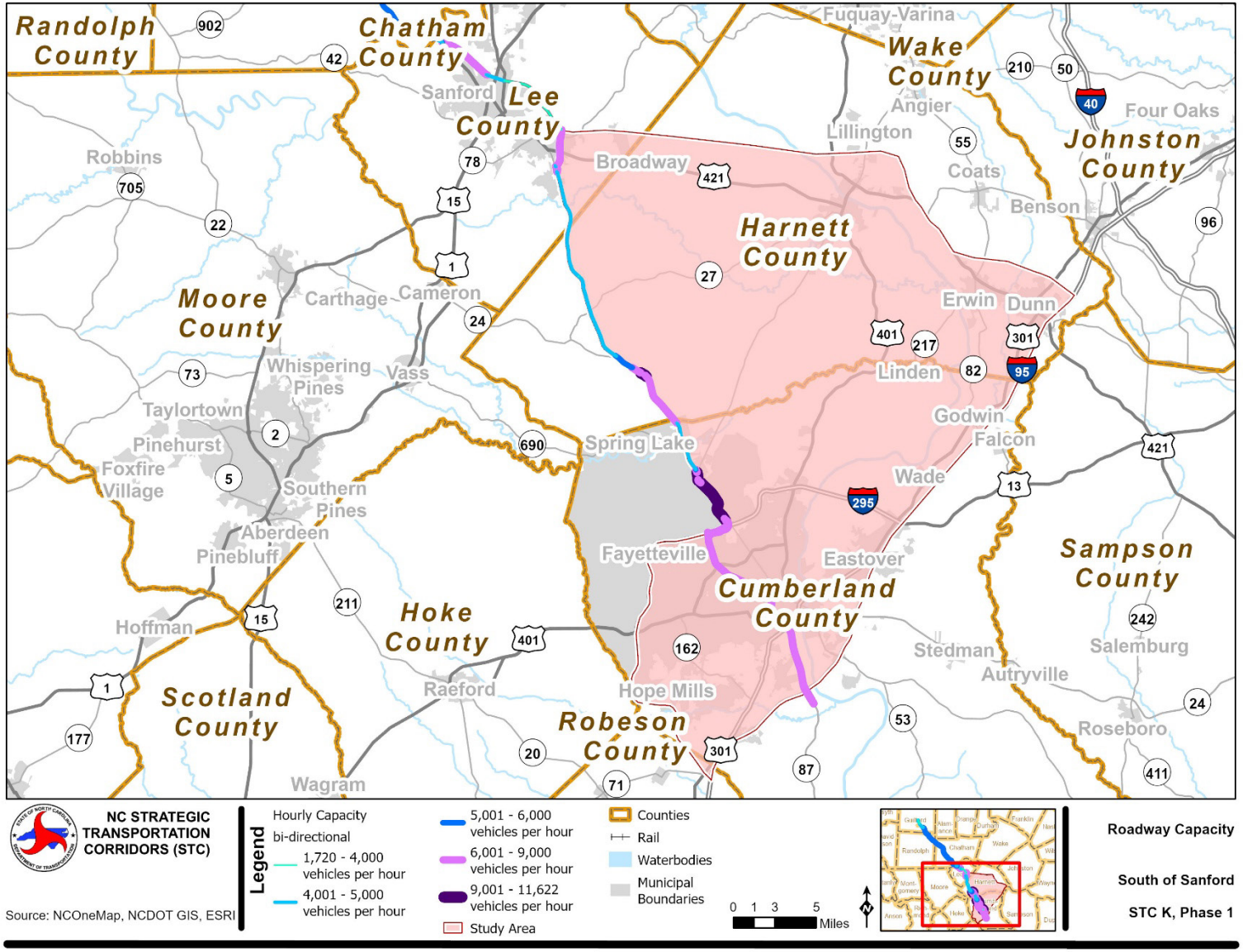


Figure 10. Roadway Capacity - South of Sanford



3.2.2 Transportation Facilities

3.2.2.1 Existing Multimodal Accommodations

Regional Trails and Bike Routes

Figure 11 and Figure 12 show regional trails, bike routes, state parks, and natural areas that intersect with the STC K Phase 1 study area. Some regional bike routes and regional trails in the area cross the study area for a short distance. Within the STC K Phase 1 study area, there are a total of 30.97 miles of bike lanes and 338.17 miles of regional trails. Table 7 and Table 8 show the mileage of each bike route and regional trail within the STC K Phase 1 study area.

Table 7. Bike Route Mileage within STC K Phase 1 Study Area

Bike Route	Length
NC 5 / Cape Fear Run	21.6 miles
Sandhills Section Draft	5.55 miles
NC 3 / Ports of Call	2.17 miles
Chatham County Bicycle Map	0.7 mile
Bicycling Randolph County	0.57 mile
NC 6 / Piedmont Spur route	0.25 mile
NC 2 / Mountains to Sea route	0.13 mile

Source: NCDOT 2026, Pedestrian and Bicycle Infrastructure Network

Table 8. Regional Trail Mileage within STC K Phase 1 Study Area

Regional Trail	Length
Cape Fear River Trail	10.8 miles
Dunn Erwin Rail Trail	4.93 miles
ECG On Road	34.30 miles
Lee County Greenway	5.55 miles
River Park Trail	0.81 mile
Sidewalk	0.21 mile
Unidentified Trails	98.00 miles

Source: NCDOT 2026, Pedestrian and Bicycle Infrastructure Network

Managed Areas

Figure 13 and Figure 14 show the managed area land classifications that intersect with the study area. These include dedicated nature preserves, registered heritage areas, conservation easements, and other protected areas. State parks and natural areas are also shown in these two figures. There are a total of 195,215.09 acres among the 74 managed areas that intersect with the study area.

3.2.2.2 Rail Infrastructure

There are no at-grade rail crossings of the major roadways inclusive of US 421, NC 24, and NC 87 along STC K Phase 1. All intersections with railroads are grade separated as discussed in Section 3.2.3.2. However, if other alignments are selected for the strategic corridor, any crossing of an active rail line should be studied to determine whether grade separation is warranted.

Figure 11. Regional Trails, Bike Routes, State Parks, and Natural Areas - North of Sanford

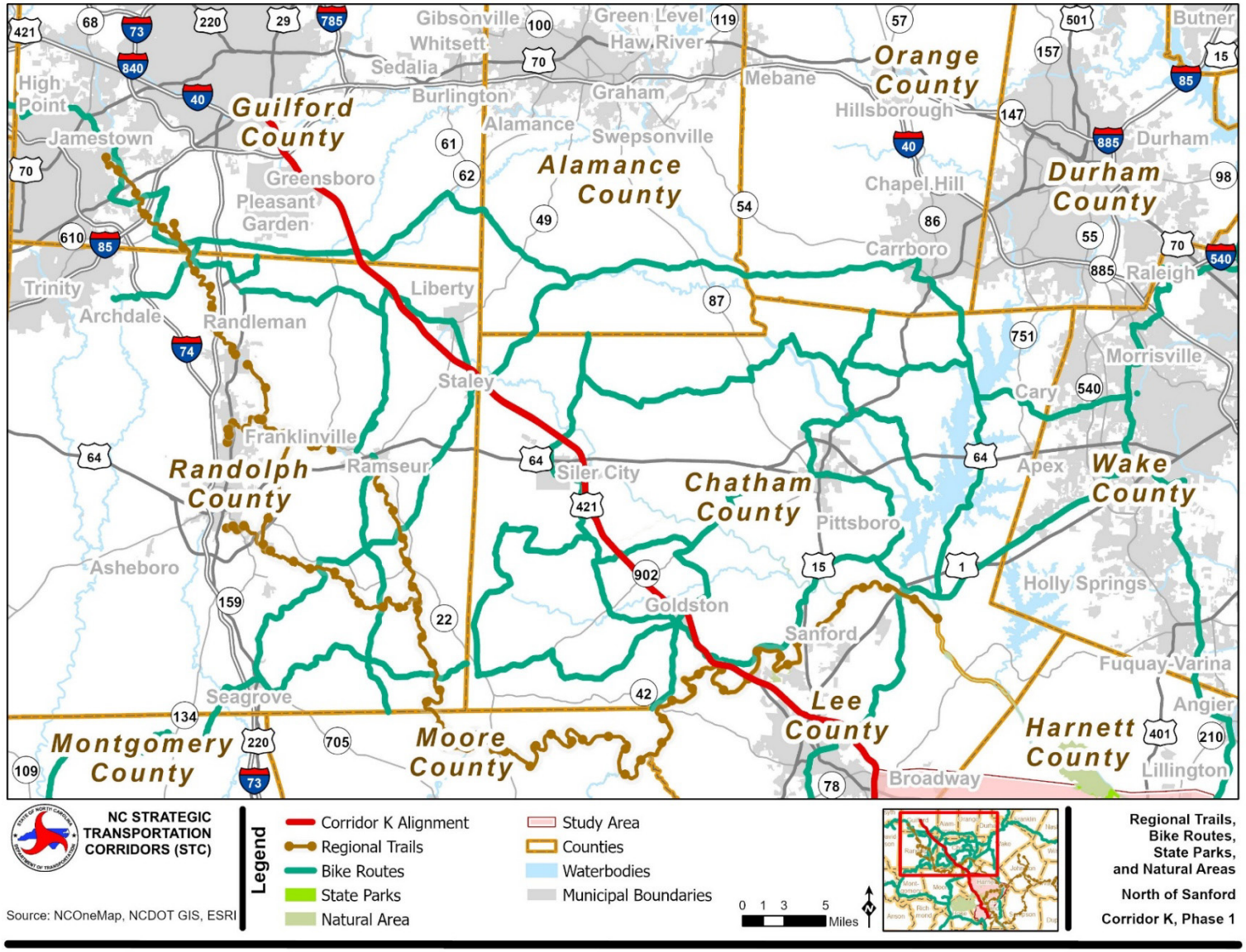


Figure 12. Regional Trails, Bike Routes, State Parks, and Natural Areas - South of Sanford

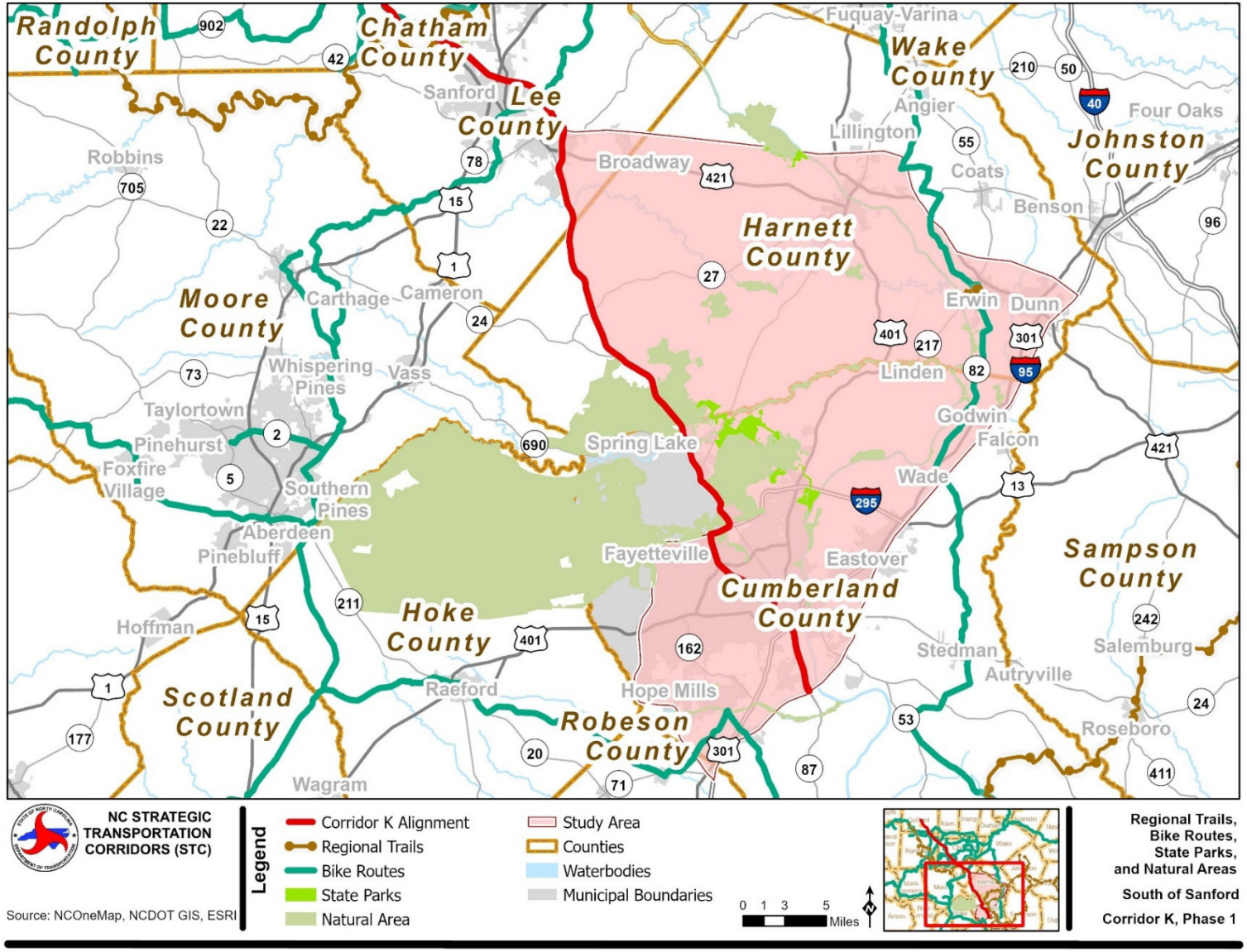


Figure 13. Managed Areas, State Parks, and Natural Areas - North of Sanford

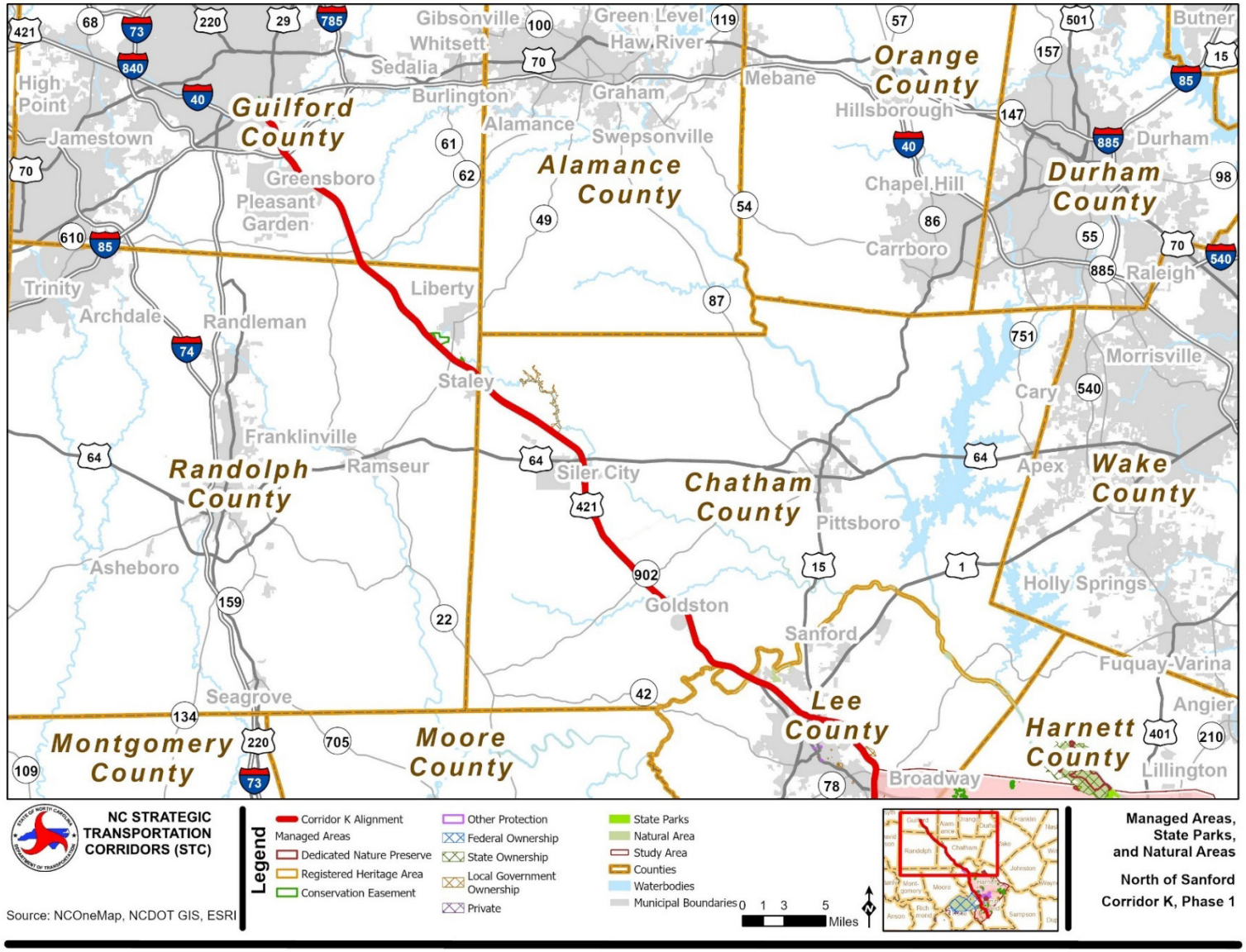
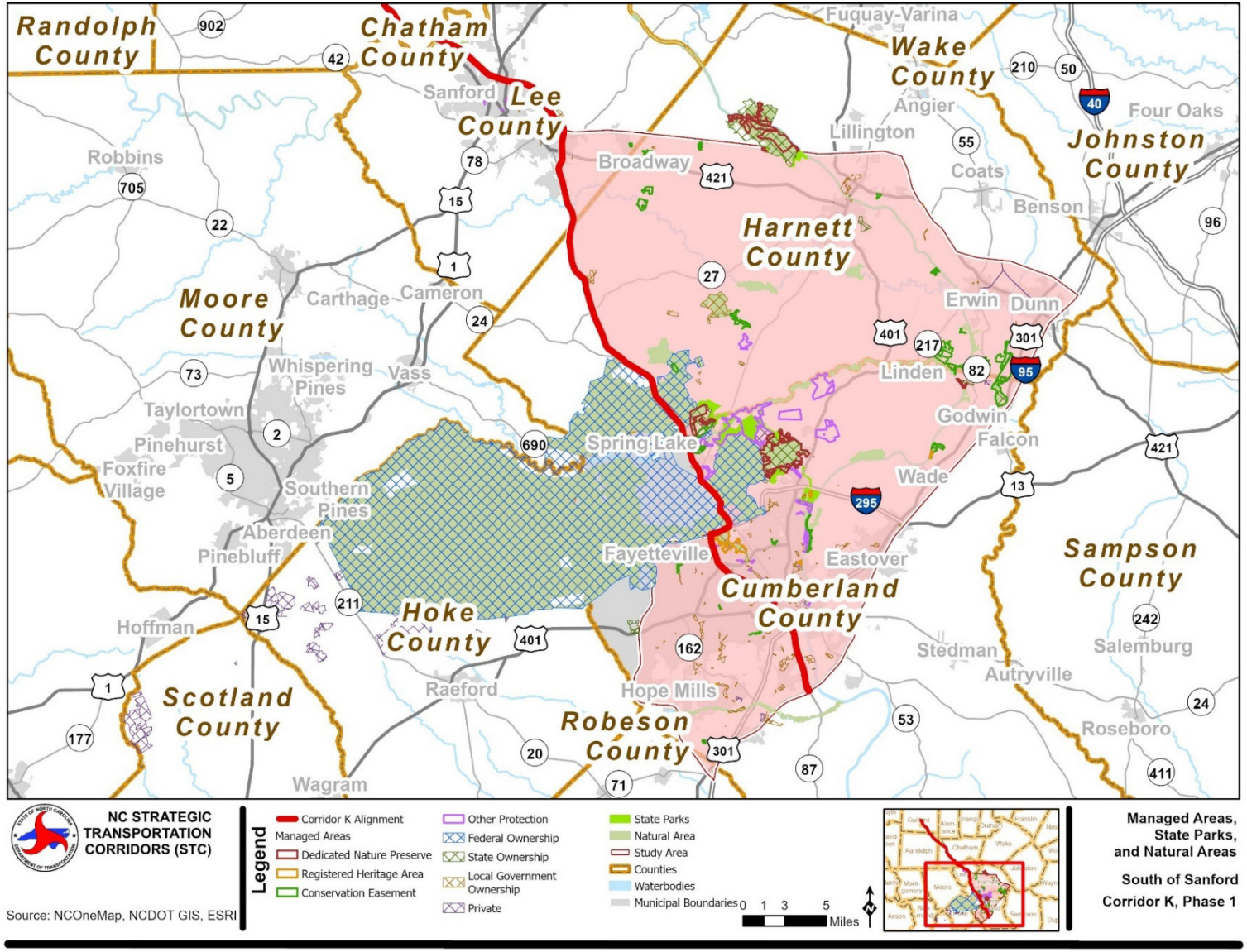


Figure 14. Managed Areas, State Parks, and Natural Areas - South of Sanford



3.2.2.3 Active/Inactive Rail Lines

STC K Phase 1 parallels and crosses the Norfolk Southern Main between Greensboro and Sanford. US 421 has one crossing that is grade separated due to the volume of trains and average daily traffic (ADT) on the roadway. Similarly, NC 24 and NC 87 in and near Fayetteville are grade separations with the ownership and operators including Aberdeen & Rockfish Railroad, CSX, Raleigh and Fayetteville Railroad, and Cape Fear Railroad (DoD). The CSX A-line, which runs north-south through Fayetteville, is a major facility with 22 through-trains operating each day inclusive of Amtrak operations. According to the USDOT Crossing inventory, all rail lines within the study area are active (USDOT 2026).

Figure 15 and Figure 16 show the rail facilities along STC K Phase 1. More details are shown on the Rail Facilities maps in Appendix B.

3.2.2.4 Bridges and Culverts

Figure 17 and Figure 18 show the bridges and culverts within the STC K Phase 1 study area. Overall, there are 238 bridges and 60 culverts within the study area. Of these structures, 40 bridges and 4 culverts are located on or within a 50-foot radius of the corridor.

3.2.3 Safety

The STC K corridor serves a range of road users, including truck drivers, pedestrians, teenage drivers, and elderly drivers, creating a complex environment for safe roadway operation. Safety data and safety related projects are summarized in the following sections from a planning level perspective. This assessment is not intended to be a thorough review of locations requiring immediate or near-term safety solutions but rather a broad review of crash-related conditions and trends in the STC K Phase 1 area based on NCDOT data. This review identifies high-risk areas eligible for funding to implement targeted strategies to reduce fatalities and serious injuries. Several locations are already being addressed through these programs or through the STIP to make the corridor safer and advance NCDOT's Vision Zero initiative to eliminate roadway deaths and serious injuries statewide.

Figure 15. Rail Facilities - North of Sanford

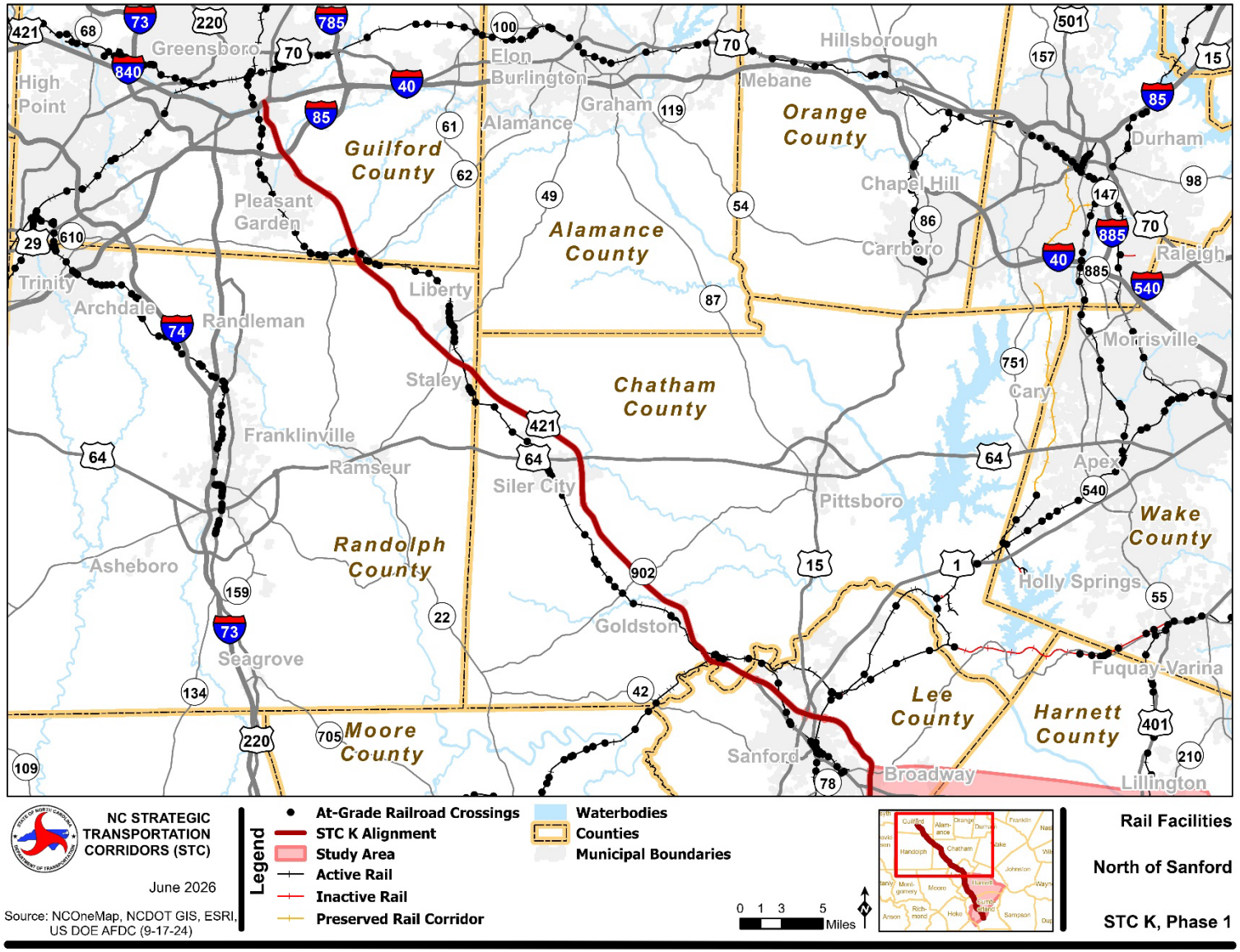


Figure 16. Rail Facilities - South of Sanford

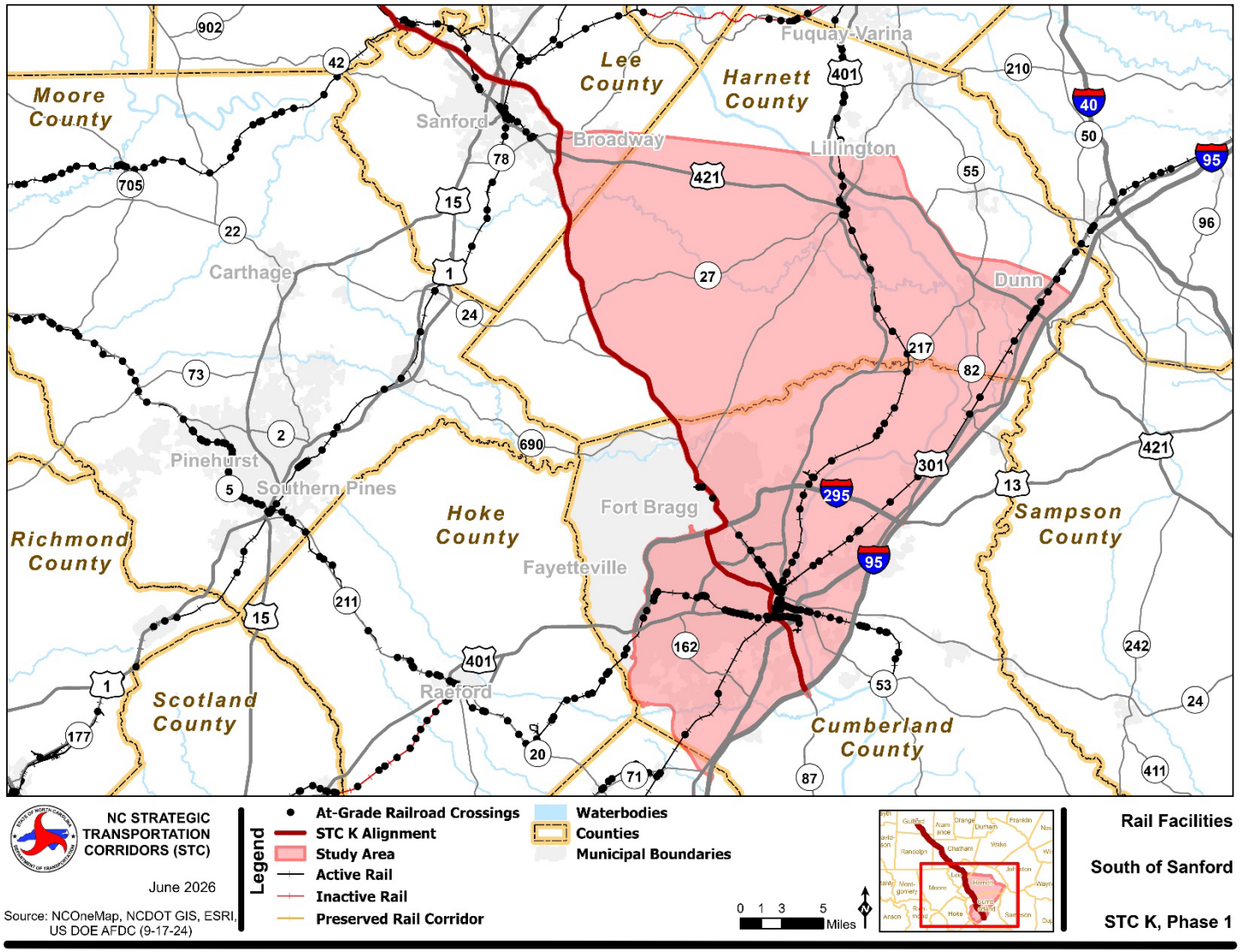


Figure 17. Bridges and Culverts - North of Sanford

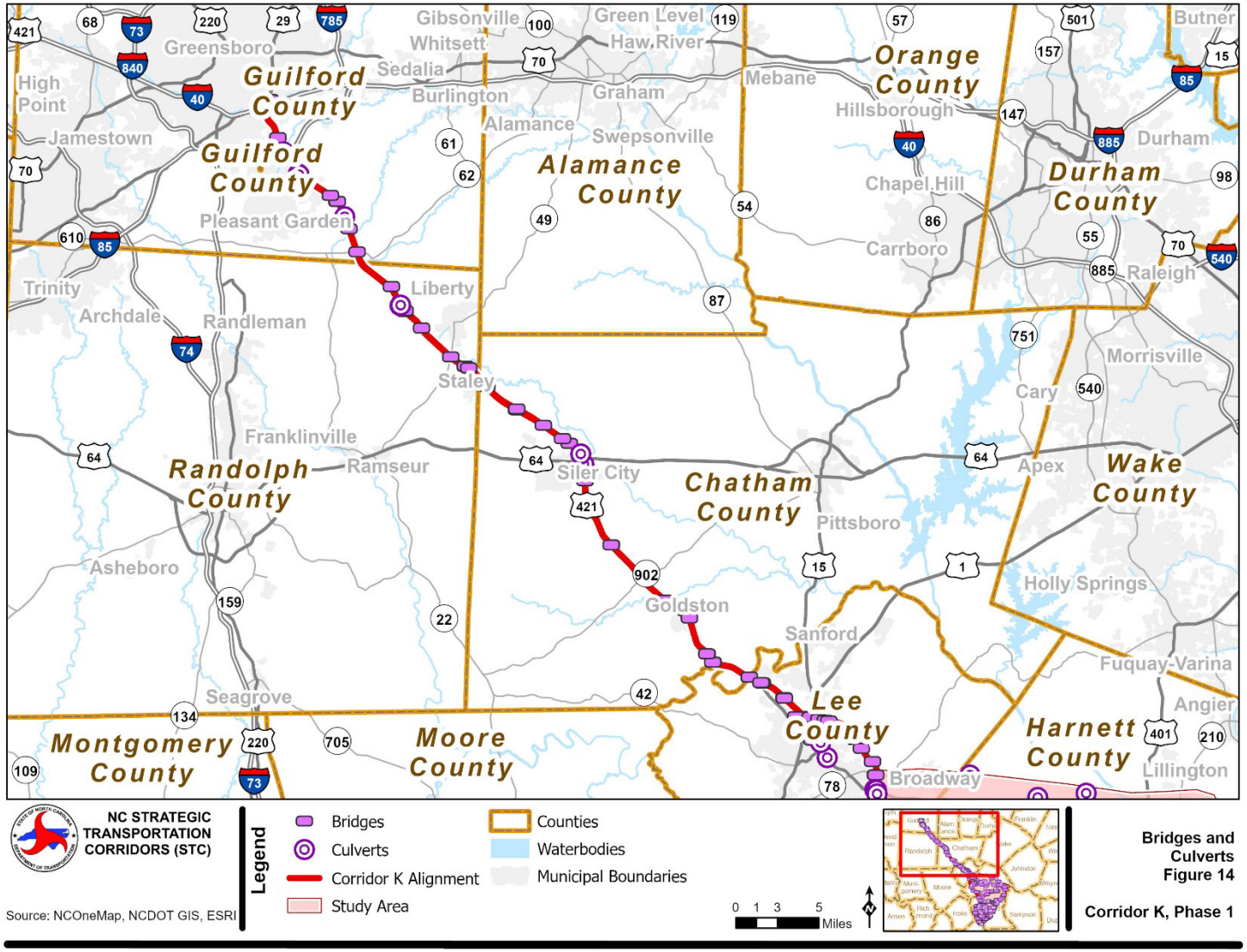
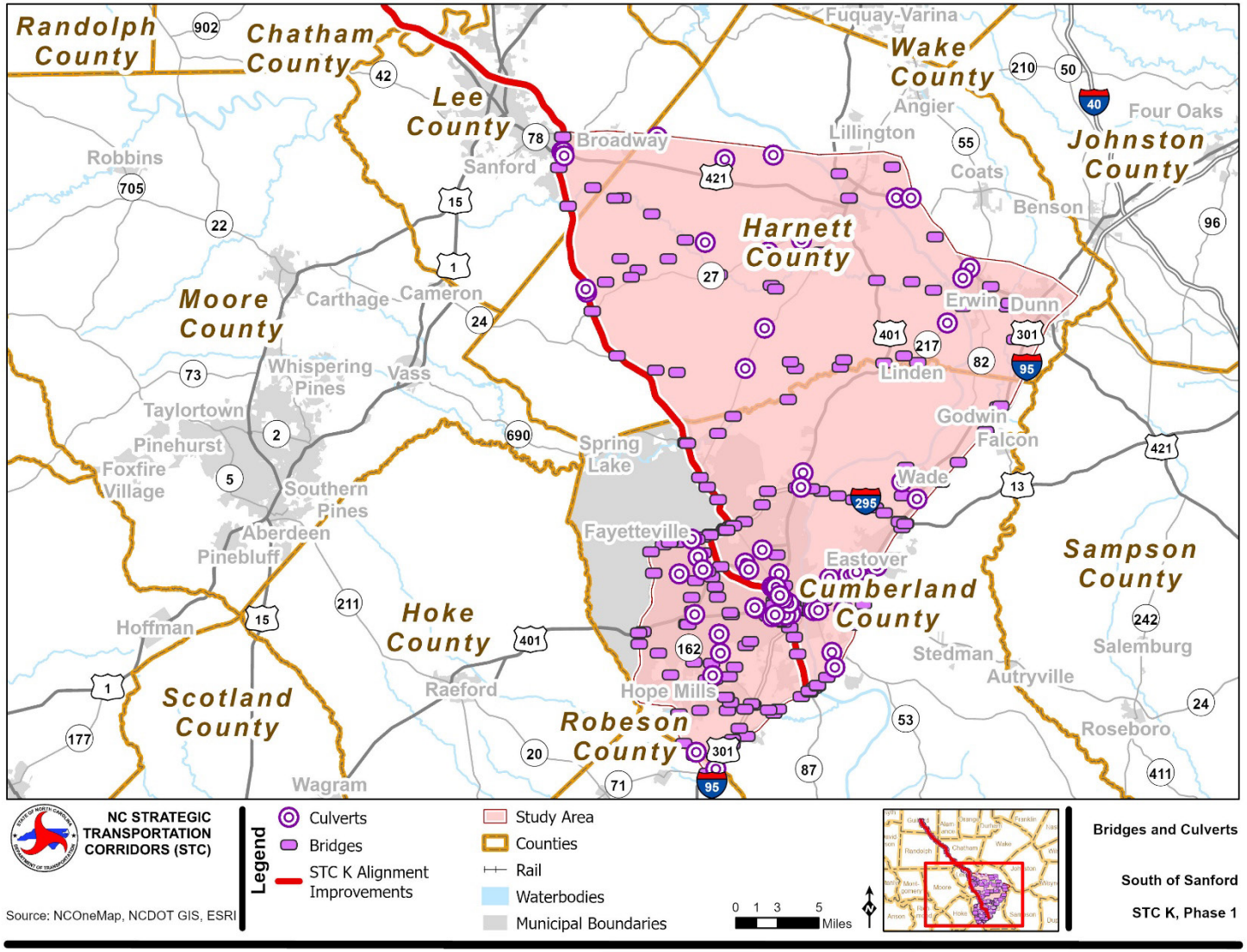


Figure 18. Bridges and Culverts - South of Sanford

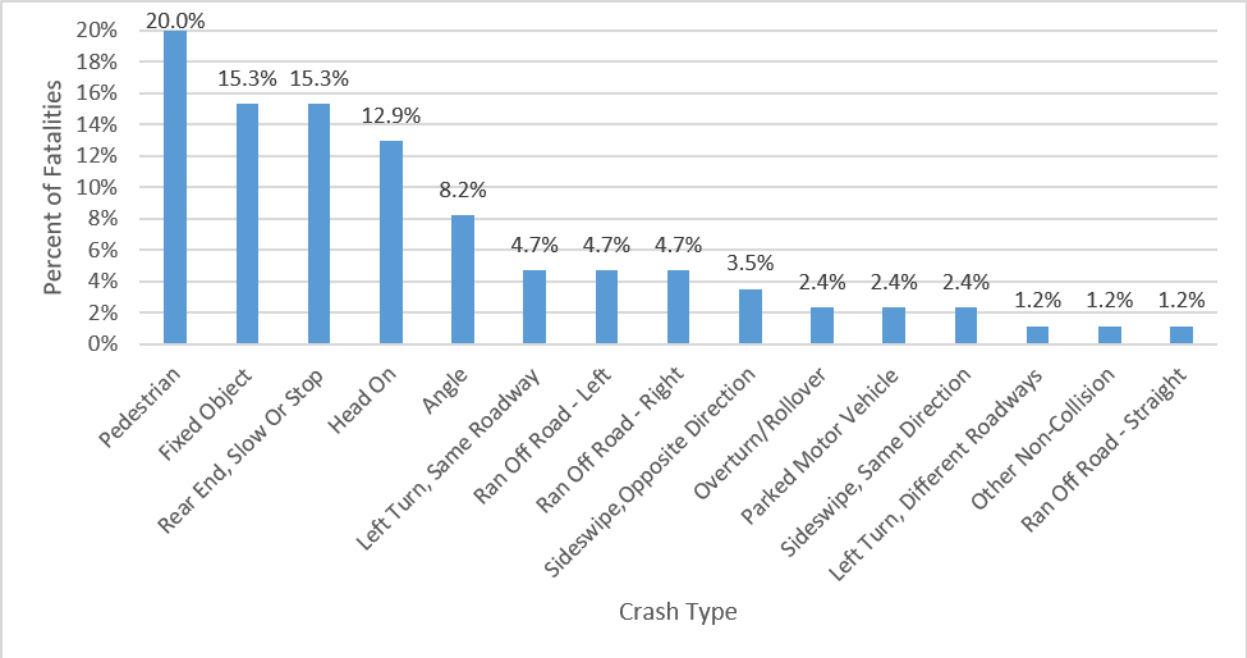


3.2.3.1 Planning / Network Level Analysis

Using safety data maps from NCDOT's Traffic Safety Unit, 85 fatal crashes on STC K Phase 1 from 2014 to 2023 were identified and reviewed to uncover patterns and contributing factors that would inform targeted safety improvements in the future (NCDOT 2025). The review included a spatial analysis and assessment of crash typologies. The key takeaways included the following:

- **More fatalities occurred at interchanges / intersections and in rural areas**. A high density of crashes occurred at the following intersections: US 421 and I-40, US 421 and Jefferson Davis Highway, NC 87 and NC 24, Bragg Boulevard and MLK Jr. Freeway, and MLK Jr. Freeway and S. Eastern Boulevard. This is consistent with national data on intersection safety. Additionally, approximately 59 percent of the fatalities along the corridor occurred in rural areas.
- **The most frequent crash types included pedestrian-involved, rear end, and fixed object**. Pedestrians accounted for 20 percent of fatalities examined along the corridor, 88 percent of which occurred in dark conditions, on both lit and unlit roadways. Rear end crashes contributed to 15 percent of fatalities on the corridor. Truck involvement in these types of crashes is disproportionately high, accounting for 46 percent of rear-end fatalities, despite trucks only being involved in 14 percent of total fatalities on the corridor. Fixed object crashes comprised 15 percent of the fatalities; many involved contributing factors such as alcohol usage or speeding and riskier conditions including driving at night and on unlit roadways. A breakdown of fatalities by crash type is provided in Figure 19.

Figure 19. Fatalities by Crash Type on STC K Phase 1 (2013-2023)



3.2.3.2 Section Safety Scoring

The NCDOT Safety Planning Group maintains safety scoring data used to help prioritize roadway projects from a safety perspective. The safety scoring method combines three components related to the safety history of a facility. First, the crash density score is used to measure the crash density

of the segment against the crash density of similar North Carolina roadways. This component is a measure of crash frequencies of a given segment length. The second component of the scoring process is the crash severity index. This index is used to identify locations with above average injury rates and fatal and severe injuries. Third is the crash rate score, which compares the crash rate of a given segment to the critical crash rate for a similar segment. The critical crash rate represents the rate at which crashes are deemed not to be a random occurrence at a 95 percent confidence level. Segments with a crash rate greater than 80 percent of the critical crash rate receive the highest rating for the crash rate score component. The points of the three components are totaled and divided by three. Segments with higher scores have worse highway safety performance.

Figure 20 and Figure 21 illustrate the section safety scoring based on averages of the three components discussed above. These figures also contain HSIP locations, which are discussed and summarized in the next section.

In total, there are nearly 51 miles (out of a total of 253 miles) of STC K Phase 1 (including US 421 Bypass) that rank in the highest category (66 to 100 points). Of those nearly 51 miles, approximately 25 miles are north of Sanford, while approximately 25 miles lie south of Sanford. Table 9 summarizes the map data by focusing on those high scoring segments.

Table 9. Section Safety Scoring Summary by County

County	Length (Miles)	Number of High Score Segments	Length of High Score Segments (Miles)
Guilford County	**11.65**	**4**	**1.95**
US 421	8.21	2	1.00
JM Hunt Jr Expressway (SR 3762)	3.44	2	0.95
Randolph County	**9.96**	**15**	**7.47**
Chatham County	**25.67**	**28**	**13.97**
Lee County	**16.84**	**11**	**5.01**
US 421	11.98	5	2.02
NC 87	3.49	6	2.99
NC 87 Bypass	1.36	0	0.00
Harnett County	**14.08**	**23**	**11.47**
NC 24	5.49	10	4.99
NC 87	8.58	13	6.48
Cumberland County	**21.94**	**22**	**10.95**
US 401 Business	1.48	1	0.49
NC 24	13.44	18	8.96
NC 87	5.52	3	1.50
TOTAL	**100.14**	**103**	**50.82**

Figure 20. Safety Map 2019 - 2023 - North of Sanford

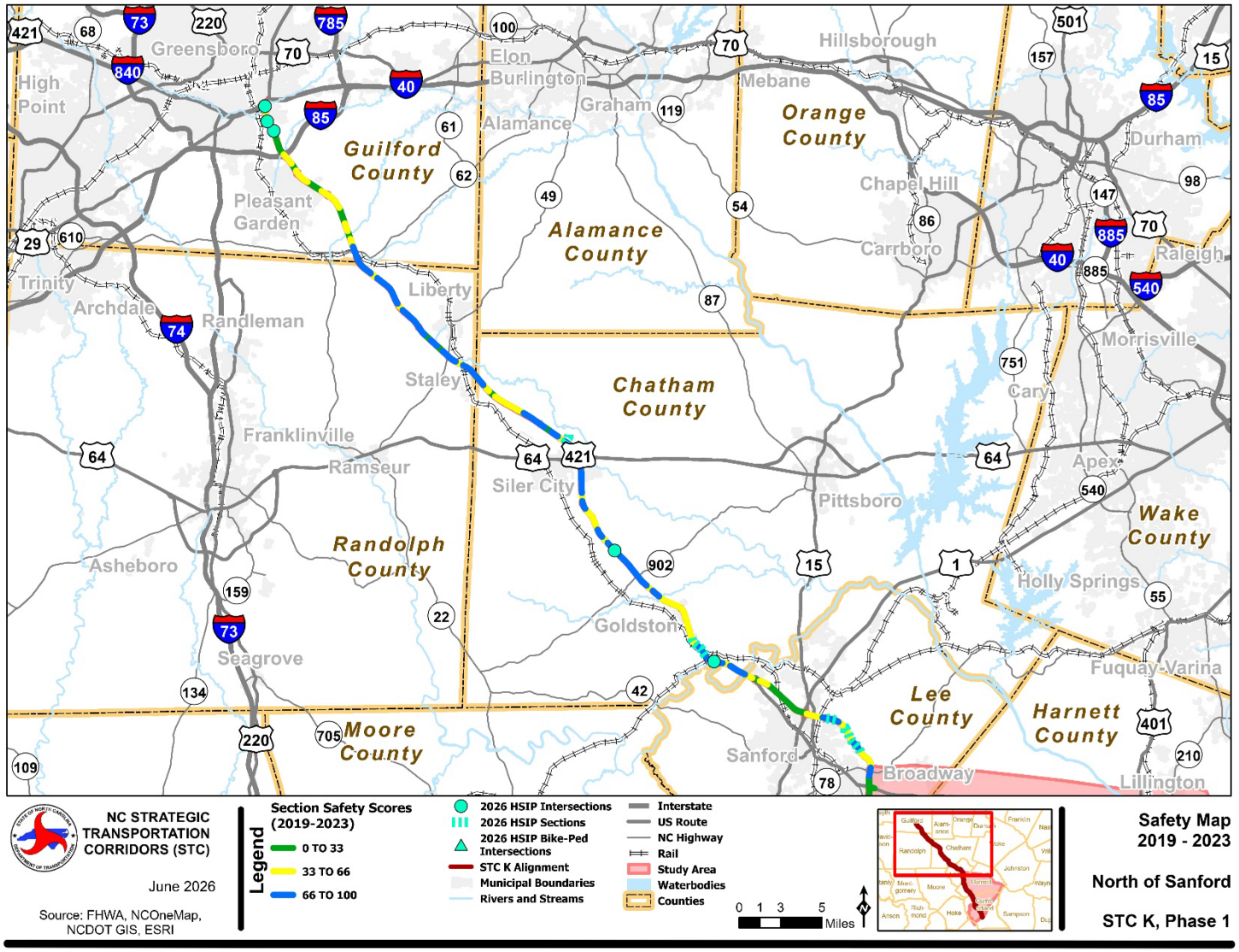
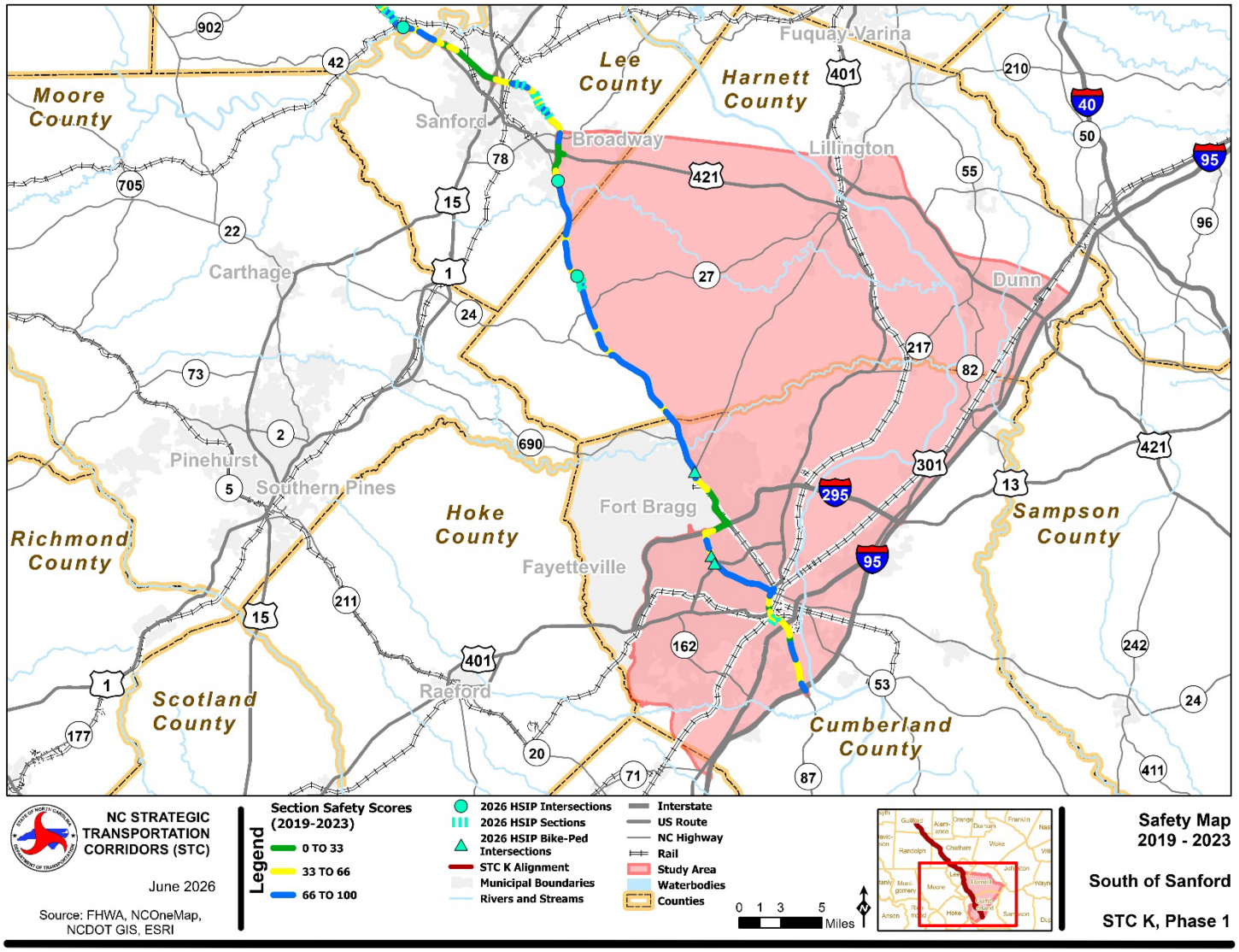


Figure 21. Safety Map 2019 – 2023 - South of Sanford



3.2.3.3 Highway Safety Improvement Program

The NCDOT HSIP provides a continuous and systematic process that identifies, reviews, and addresses specific traffic safety concerns throughout the state. HSIP data are reported annually at segment (roadway sections) and point locations (intersections or bridges). HSIP data are also reported for bicycle-pedestrian intersections and can be used as a surrogate to investigate vulnerable roadway user (VRU) trends. A review of the 2026 HSIP data that identified potentially hazardous locations are depicted in Figure 20 and Figure 21 and summarized in Table 10, then detailed in Table 11.

Table 10. Number of Potentially Hazardous HSIP Locations by County

County	Intersections	Sections	Bike/Ped Intersections
Guilford	3	0	0
Randolph	0	0	0
Chatham	2	2	0
Lee	1	2	0
Harnett	1	1	0
Cumberland	0	1	3
TOTAL	**7**	**6**	**3**

In total, there are 16 HSIP locations along the STC K Phase 1 alignment. Table 11 provides descriptions of the sites.

Table 11. HSIP Locations along the STC K Phase 1 Alignment

County	Type	Location ID	Rural/ Municipal	Location Description
Guilford	Intersection	TSUINT667052	Greensboro	Alamance Church Road (SR 1005 [MP 15.45]) at JM Hunt Jr Expressway (SR 3762 [MP 3.22])
	Intersection	TSUINT699437	Rural	JM Hunt Jr Expressway (SR 3762 [MP 1.57]) at Edgemont Road (SR 33.13 [MP 0.73])
	Intersection	TSUINT126781	Greensboro	JM Hunt Jr Expressway (SR 3762 [MP 2.28]) at Pleasant Garden Road (SR 3505 [MP 4.98])
Randolph	N/A	N/A	N/A	N/A
Chatham	Intersection	TSUINT637451	Rural	US 421 (MP 2.02) at North Plank Road / Fayetteville Road (SR 1007 [MP 0.11])
	Intersection	TSUINT690426	Rural	US 421 (MP 11.36) at Ike Brooks Road (SR 2120 [MP 0.48])
	Section	18S00044	Rural	Siler City Snow Camp Road (SR 1004) in the vicinity of SR 1363 (Pearleman Teague Road)
	Section	18S00033	Rural	US 421 in the vicinity of Murchison Road / Thrift Road (SR 2195)

County	Type	Location ID	Rural/ Municipal	Location Description
Lee	Intersection	TSUINT024828	Sanford	NC 87 (MP 2.87) at Commerce Drive (SR 1290 [MP 0])
	Section	52S00048	Rural	US 421 in the vicinity of San Lee Drive (SR 1509)
	Section	52S00050	Rural	US 421 in the vicinity of Colon Road (SR 1415)
Harnett	Intersection	TSUINT705466	Rural	NC 87 (MP 10.78) at Calvary Church Road / Benhaven School Road (SR 1203 [MP 1.53])
	Section	42S00056	Rural	NC 87 in the vicinity of Olive Farm Drive (SR 2433)
Cumberland	Bike/Ped Intersection	TSUINT653807 BP	Spring Lake	NC 24 at South Bragg Boulevard On-Ramp
	Bike/Ped Intersection	TSUINT215965 BP	Fayetteville	NC 24 at Tophat Street
	Bike/Ped Intersection	TSUINT735247 BP	Fayetteville	NC 24 at US 401 Ramp
	Section	25S00215	Fayetteville	Southern Avenue (SR 1141) in the vicinity of Spencer Street

3.2.3.4 Safety Hot Spots

The state is actively implementing a variety of safety projects aimed at reducing traffic-related fatalities and serious injuries across its roadways. This includes projects funded through the NCDOT Spot Safety Program, a collection of smaller improvement projects that address safety, potential safety, and operational issues (NCDOT 2026). NCDOT also uses the Spot Mobility Program to fund intersections with safety concerns to reduce congestion (NCDOT 2026). However, no Spot Mobility funded projects exist along STC K Phase 1. Table 12 provides the status for safety-related project locations throughout the corridor.

Table 12. NCDOT Spot and Section Safety Projects

Type	FID	Status	Location	Description	Alignment with High-Crash Areas
Spot Safety	SS-4908BM|08-17-5170|1	Completed	US 421 at Shiloh Road/Deviney Road (SR 2407)	Install concrete channelization and extend US 421 southbound right turn storage.	Yes
Safety Section	W-TBD-4-15-21|08-21-63707|1	Design Finished; Not Yet in Construction	US 421 from the Chatham County line to the Guilford County line	Install 1-mile and 0.5-mile markers and revise exit number signs.	Yes
Spot Safety	W-5808B|08-19-57121|1	In Design	US 421 at NC 902	Convert existing signalized intersection to a superstreet.	No

Type	FID	Status	Location	Description	Alignment with High-Crash Areas
Spot Safety	SS-6208G|08-22-69086|1	Completed	NC 87 at Frank Wicker Road (SR 1140) / Carolina Trace Driveway	Install "prepare to stop when flashing" on both approaches on NC 87.	Yes
Safety Section	SS-4908BQ|08-17-8060|1	Completed	US 421 Business/NC 87 (Horner Boulevard) from Frank Wicker Road (SR 1140) to US 1	Revise several traffic signals to flashing yellow arrow along corridor.	Yes
Safety Section	SS-6006P|06-20-59692|3	Completed	US 401 Business between Morganton Road (SR 1404) and Ramsey Street (SR 3950)	Install slippery when wet signs.	Yes
Spot Safety	SS-4906CX|06-16-43390|1	Completed	NC 87 at Broadway Road (SR 1222)	Install near side signal heads on NC 87 and install signal ahead advance warning signs on NC 87.	Yes
Spot Safety	SS-4906CT|06-16-41606|1	Completed	NC 210 at Spring Lake Town Center	Install marked and signalized crosswalks on all four legs of the intersection.	Yes
Spot Safety	SS-6206K|06-21-65041|1	Completed	NC 24/87 (Bragg Boulevard) at Mike Street and Johnson Street	Construct a signalized crosswalk on the north leg of Bragg Boulevard, construct sidewalk and upgrade ramps to meet Americans with Disabilities Act (ADA) requirements.	Yes
Spot Safety	SS-6006O|06-20-59694|2	Completed	US 401 Business northbound ramp at Morganton Road (SR 1404)	Signal upgrade to provide near side head for US 401 Business approach.	No

Type	FID	Status	Location	Description	Alignment with High-Crash Areas
Safety Section	U-6229|06-18-50601|1	In Design	NC 24-87 (Bragg Boulevard), from US 401 (Skibo Road) to Glenville Avenue	Convert existing depressed grass median to raised median. Replace existing monolithic islands. Remove existing guardrail and landscaping. Construct leftovers at existing full movement intersections. Add pedestrian signals at five signalized intersections.	Yes
Spot Safety	SS-6206K|06-21-65041|1	In Design	NC 24/87 (Bragg Boulevard) at Elm Street	Add primary signal heads on both approaches of NC 24.	Yes
Safety Section	SS-6006P|06-20-59692|3	Completed	US 401 Business between Morganton Road (SR 1404) and Ramsey Street (SR 3950)	Install slippery when wet signs.	Yes
Spot Safety	689	Completed	US 401 Business northbound ramp at Morganton Road (SR 1404)	Signal upgrade to provide near side head for US 401 Business approach.	Yes

Almost all the ongoing and completed Spot Safety and Section projects are located in high-risk areas with a concentration of serious injuries and fatalities. However, the safety analysis identified other locations with higher crash density (two or more fatalities in close proximity) that did not have an associated Spot Safety project. Some of these locations included recurring crash types that could benefit from roadway design improvements as listed below.

Pedestrian Fatalities

- Four fatalities (two pedestrians involved) on US 421 Business / Boone Trail Road from McNeill Road to US 501
- Five fatalities (four pedestrians involved) on Bragg Boulevard from Chapel Hill Road to McCormick Road
- Two pedestrian fatalities on NC 87 South at Bragg Boulevard and MLK Jr. Freeway

Rear End Fatalities

- Three fatalities (two rear ends) on US 421 northbound from Cade Road to Monnett Drive

- Seven fatalities (two rear ends and two sideswipes) on NC 87 from Buffalo Lake Road to Linden Oaks Parkway

Fixed Object and Run Off Road Fatalities

- Two fixed object fatalities on NC 87 South from Williams Dairy Road to Chaparral Court
- Four run off road crashes on MLK Jr. Freeway from Ellis Street to Southern Avenue

Angle and Head-on Fatalities

- Eight fatalities (including two left turn crashes and two angle crashes) on NC 87 South from Commerce Drive to Traceway Street, where half happened on a dark or unlit roadway
- Four head-on crashes on NC 87 from Swanns Station Road to Graham Road, all in adverse weather conditions

Other Fatalities

- Two fatalities at the intersection of NC 87 South and NC 27 West
- Three fatalities on US 421 northbound from Carol Street to Cain Road

3.2.3.5 STIP Safety Projects

In addition to the identified Spot Safety projects, other projects identified in the STIP are anticipated for construction in the 2026-2035 STIP with the goal to mitigate these risk areas and enhance safety across the network. There are 16 safety projects currently in the STIP using HSIP or STIP funding with approximately $11.25 million programmed. A list of HSIP and Spot Safety projects in the STIP can be found in Table 13.

Table 13. HSIP and SPOT Safety Projects in 2026-2035 STIP

County	Route	Project ID	Project Description	Construction Year	From/To	Cost
Cumberland	Yadkin Road (SR 1415)	HS-2006A	Add signalized pedestrian crossings and upgrade signal.	2024	US 401 (Skibo Road), Santa Fe Drive (SR 1437), and Southwick Drive intersections.	$567,000
Cumberland	Glensford Drive (SR 1596)	HS-2006O	Install rectangular rapid flashing beacons with refuge islands.	2025	Berean Baptist Academy Entrance and Chambersburg Road intersection.	$334,000
Cumberland	McArthur Road (SR 1600)	HS-2006V	Construct signalized pedestrian accommodations.	2024	Rosehill Road / Stacy Weaver Road (SR 1615) in Fayetteville.	$190,000

County	Route	Project ID	Project Description	Construction Year	From/To	Cost
Cumberland	US 401 (Skibo Road)	HS-2006X	Install signalized pedestrian accommodations.	2024	All American Freeway (SR 1007) northbound and southbound ramps in Fayetteville.	$880,000
Cumberland	Broadfoot Road (SR 1414)	HS-2006Z	Install crosswalks with pedestrian signal head.	2024	Arsenal Avenue intersection in Fayetteville.	$390,000
Cumberland	Morganton Road (SR 1404)	HS-2406R	Install/upgrade crosswalks, crosswalk ramps signalized pedestrian heads, and traffic signal.	2026	McPherson Church Road.	$300,000
Cumberland	US 401 (Skibo Road)	HS-2406S	Install/upgrade crosswalks and traffic signal.	2026	NC 24 / NC 87 (Bragg Boulevard) eastbound ramps (Swain Street).	$730,000
Cumberland	Hay Street / Morganton Road (SR 1404)	W-5706U	Upgrade traffic signals and improve pedestrian crossings.	2025	Fort Bragg Road (SR 3578), Oakridge Avenue, and Highland Avenue intersections in Fayetteville.	$100,000
Cumberland	Rosehill Road (SR 1615)	W-5806C	Construct mini-roundabouts.	2023	Tamarack Drive and Landau Road intersections.	$3,189,000
Guilford	US 29	HS-2007G	Construct directional crossover.	2024	Lakeview Memorial Park Cemetery entrance intersection.	$410,000
Guilford	East Gate City Boulevard (SR 4240) / Lee Street	HS-2007I	Install traffic signal and turn lane improvements.	2026	I-40 Westbound ramp intersection.	$756,000

County	Route	Project ID	Project Description	Construction Year	From/To	Cost
Guilford	Summit Avenue (SR 2526)	HS-2407A	Install pedestrian signal heads, crosswalks, and other intersection improvements.	2025	Textile Drive intersection	$74,000
Guilford	Randleman Road (SR 1007)	HS-2407B	Install traffic signal.	2026	Webster Road intersection	$190,000
Guilford	US 29 Northbound	HS-2407C	Close directional leftovers.	2027	North O'Henry Boulevard (SR 2613) in the vicinity of Joe Brown Drive; North O'Henry Boulevard (SR 2937) in the vicinity of the flea market; Corbin Road (SR 2622 / SR 5235)	$615,000
Guilford	US 220 Eastbound	W-5807A	Modify channelization island, install traffic signal, pedestrian heads, and crosswalks.	2025	Summit Avenue (SR 2526) ramp terminals in Greensboro.	$870,000
Chatham	US 421 (Future I-685)	W-5808B	Construct reduced conflict intersection.	2025	NC 902 intersection.	$1,650,000

3.2.4 Transportation Facilities Conclusions

Safety on roadways is critical to public health, efficient travel, and the timely movement of goods and cargo. With approximately 50 percent of segment lengths scoring in the highest category of safety risks, STC K Phase 1 should be considered as a priority for future safety improvements. Based on the analysis, a prioritization framework should account for the concentration of potentially hazardous roadway segments in Chatham and Lee Counties, potentially hazardous intersections in Lee County and for VRUs in Cumberland County, as well as specific roadway segments with a concentration of crash types throughout the corridor. This will ensure that funding is directed towards the areas with the highest need for safety improvements, advancing NCDOT's Vision Zero strategy.

3.2.5 Reliability

This analysis evaluates the reliability of the corridor using TTI as a key performance indicator. TTI is a widely used measure in transportation planning to quantify travel time reliability and congestion levels. TTI is defined as the ratio of peak period travel time to free-flow travel time and is used as an

indicator for congestion intensity. A TTI value of 1.0 indicates free-flow conditions, while values greater than 1.0 indicate increasing levels of congestion. For example, a TTI of 1.2 means that travel during peak periods takes 20 percent longer than during free-flow conditions. This would mean a 20-minute trip during free flow would require 24 minutes during the peak period. This index allows for a clear and consistent measure of how congestion impacts travel time across the corridor.

The analysis covers the entire corridor north of Sanford, except for a specific portion near Sanford, where the corridor splits into two routes: the north US 421 Bypass and the south US 421 Business route. For this portion of the corridor, only the north US 421 Bypass was evaluated, while the south US 421 Business route was not included. Outside of this specific area, the corridor was evaluated in its entirety.

Figure 22 and Figure 23 show TTI across STC K Phase 1. TTI results were averaged across three larger segments, as detailed below:

- **North End I-40 to Pleasant Garden Road (Near Greensboro)**: This portion of the corridor experiences moderate congestion, with an average TTI of 1.17. This indicates that travel times during peak periods are 17 percent longer than during free-flow conditions.
- **Buffalo Lake Road (Near Spout Springs) to R. Miller Street Interchange**: Congestion is more localized along this segment, particularly at signalized intersections. The average TTI for this portion is 1.16, suggesting that intersections are a primary contributor to slower travel times.
- **I-295 to US 401 Business (West Fayetteville)**: This segment shows an average TTI of 1.13, signifying some congestion. Within this portion, the highest levels of congestion are between Bargain Street and Barrington Cross Street, where the TTI peaked at 1.21, indicating a 21 percent increase in travel times during peak periods.

The rest of the corridor displayed minimal to no congestion, with average travel times close to free-flow conditions. Overall, the corridor's average TTI was around 1.04, indicating generally reliable travel times across most of the corridor, with only localized areas of congestion.

3.2.6 Electric Vehicle Infrastructure

Long-range travel along the corridor for electric vehicles is dependent on the presence of a sufficient charging network in the vicinity of the corridor. DC Fast chargers provide a high power output and allow a range of up to 240 miles per hour of charging, as opposed to an upper limit of 20 miles per hour of charging for Level 2 chargers (USDOT 2025). The former charging type provides greater benefit for drivers traveling along or beyond the entire length of the corridor, while the latter may still be suitable for commuters within the study area making shorter daily trips. However, there are few chargers of both types currently installed along the corridor. Many of the DC Fast charging stations along the corridor are also Tesla brand charging stations, which are compatible with most but not all electric vehicles of different makes. Public level 2 chargers in the area utilize connectors that allow charging of both Tesla and non-Tesla electric vehicles.

Figure 22. Travel Time Index - North of Sanford

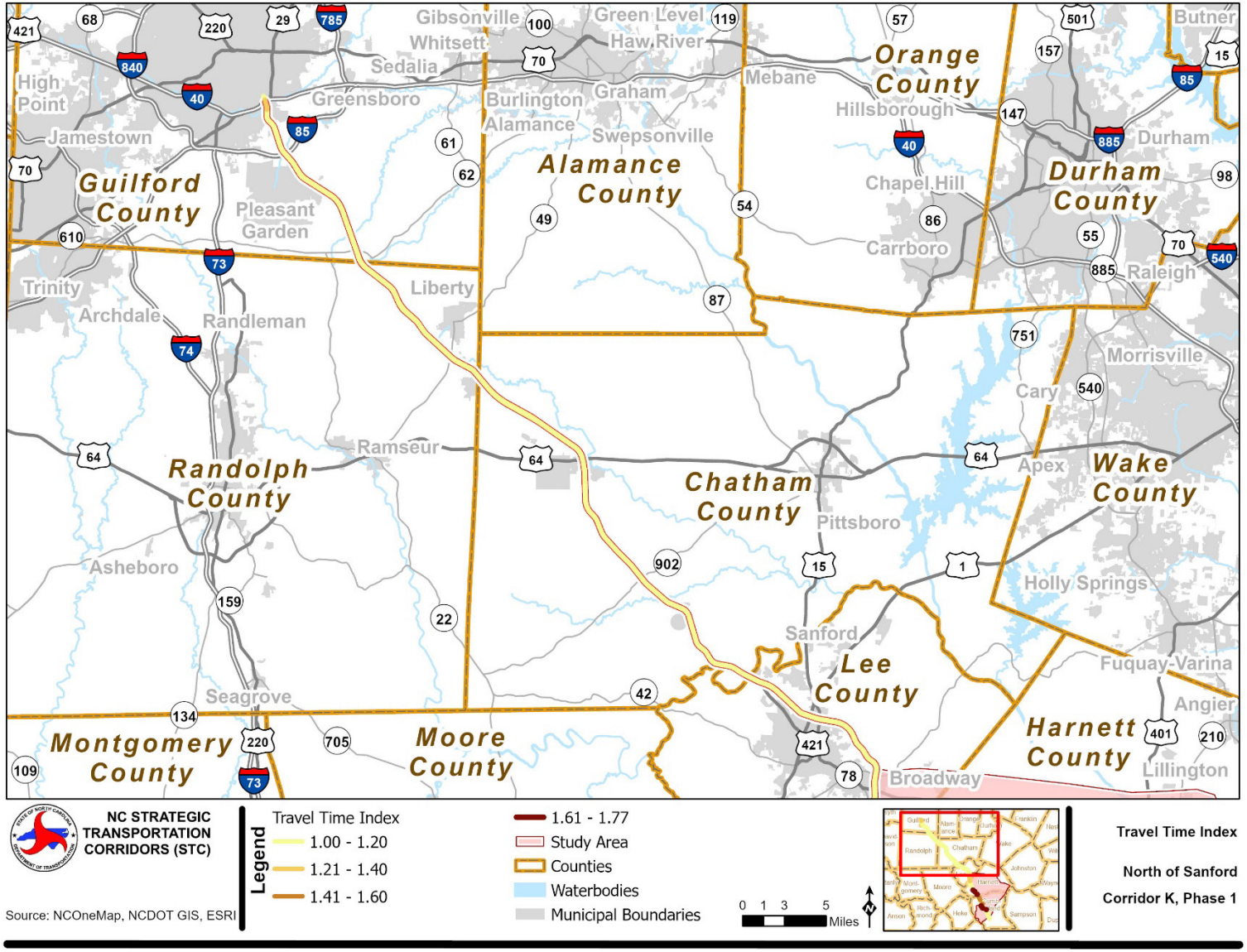
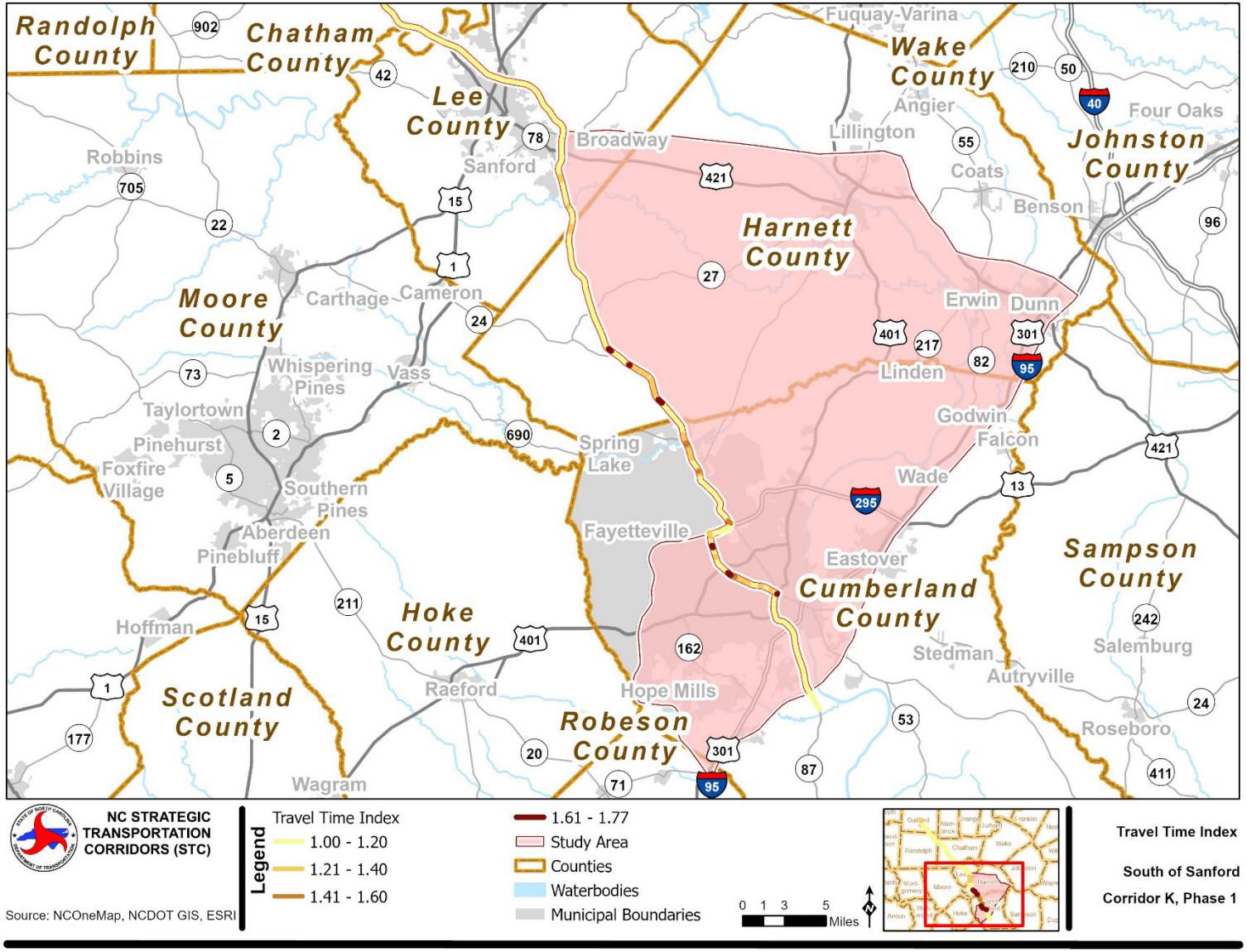


Figure 23. Travel Time Index - South of Sanford



North of Sanford (Figure 24), there are eight Level 2 chargers in proximity to the corridor; five are in Greensboro near the north end of the corridor, one in Siler City off US 64, and two chargers in Goldston. The three charging stations around Greensboro that house the five Level 2 chargers are located at the I-40/I-85 split (two chargers), I-40/US 29 split (three chargers), and two more in the southern part of town near US 421 (two chargers). The single Level 2 charger in Siler City is located west of the US 421/US 64 interchange and the two Level 2 chargers in Goldston are west of US 421 in a single charging station. This part of the corridor also hosts a limited number of DC Fast chargers, with all nine being around the intersection of US 64 and US 421. Eight of these chargers are at a Tesla charging stations that utilize the North American Charging Standard (NACS) plug and allow charging of vehicles that can utilize this standard. Charging stations are more widely distributed throughout Sanford; however, each Level 2 station has a low number of chargers (Figure 24 and Figure 25). The four Level 2 charger stations in Sanford each have two chargers, totaling eight within the city. There are 14 DC fast chargers in Sanford split between two stations, with 12 located at a single Tesla-specific station south of the intersection of US 1 and the US 421 Business route.

In Fayetteville, most stations for both charging types are located along the US 401 Bypass route, spanning both of the route's interchanges with I-295. Two notable exceptions are three clustered Level 2 stations in downtown Fayetteville, and a station with 16 Tesla (NACS) DC Fast chargers by the I-95 and NC 53 junction. Outside of Fayetteville, there are only four chargers in the southern half of the corridor study area, all of which are Level 2 chargers at two stations along NC 210 in Lillington. Just beyond the study area, there are an additional four DC chargers at a station near the interchange of I-95 and Long Branch Road south of Dunn.

At a greater distance, additional chargers are situated outside the study area, but within the same counties that the corridor crosses (Table 14). Most of these chargers can be found north of the corridor's end point in Greensboro and surrounding communities in Guilford County. There are 95 Level 2 chargers in Guilford County within 10 miles of the corridor, and 17 Level 2 chargers in the county within the same corridor boundary.

There are currently two proposed charging stations in the study area. One station is for Level 2 chargers on the campus of Fayetteville State University, and the other station is for DC Fast chargers at Country Inn & Suites along NC 53 by I-95.

More detailed maps of the electric vehicle chargers along the corridor can be found on the Electric Vehicle Infrastructure maps in Appendix B.

Table 14. Existing Electric Vehicle Infrastructure in Proximity to STC K Phase 1

Charger Type	Non-Tesla Level 2		Tesla DC Fast		Non-Tesla DC Fast	
	5 Miles	10 Miles	5 Miles	10 Miles	5 Miles	10 Miles
Station Count	34	53	3	5	9	12
Charger Count	93	139	36	52	21	25

Figure 24. Electric Vehicle Infrastructure - North of Sanford

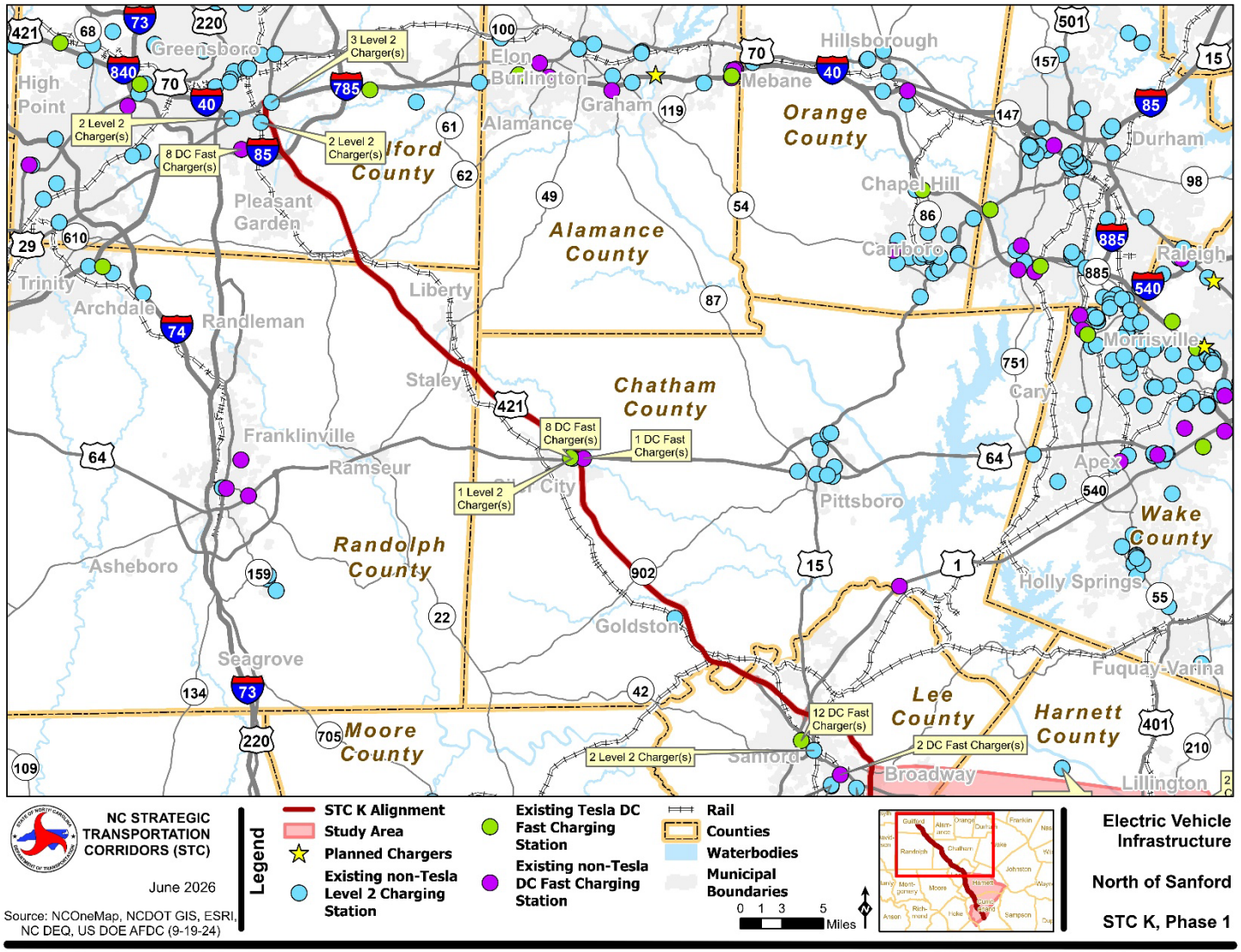
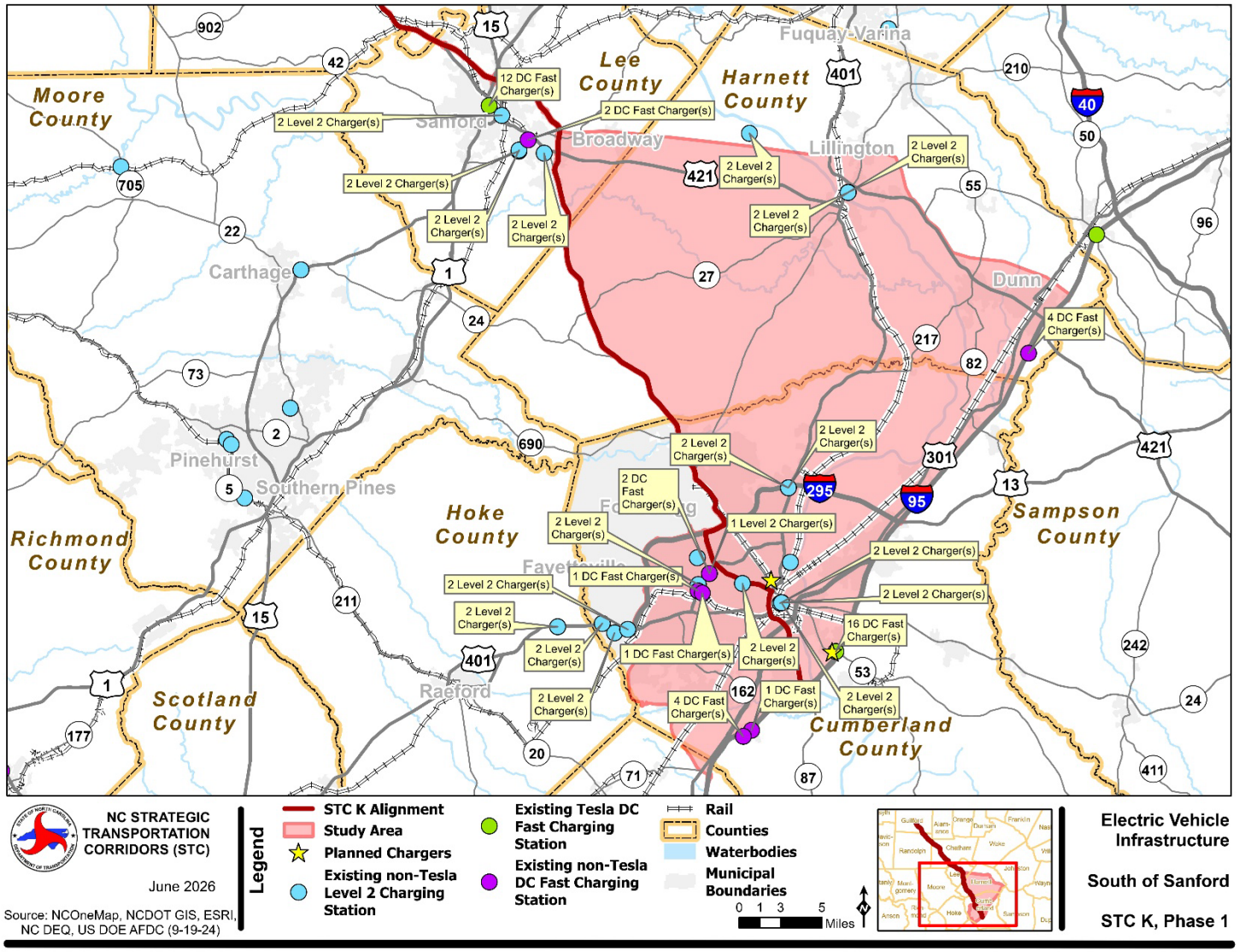


Figure 25. Electric Vehicle Infrastructure - South of Sanford



3.2.7 Truck Parking

Limited freight truck parking exists along the STC K Phase 1 alignment. As shown in Figure 26 and Figure 27, there are two small (0 to 55 spaces) truck lots along STC K north of Sanford – one within Greensboro on Old US 421 and the other at US 64 and US 421, and one small truck lot along STC K in Spring Lake south of Sanford. In total, there are 113 truck parking spaces along I-95 within the STC K Phase 1 study area, 36 of which are located at the public rest area. There are only 32 spaces in the study area outside of I-95. Most parking available throughout the corridor is located in small or medium-sized private truck stops situated along the major highways and interstates (US 421, US 64, and I-95). One public freight truck parking area is available at the Cumberland County Rest Area and has 18 parking spaces at both northbound and southbound rest stops. The remainder are private truck stops. Current parking is concentrated on either end of STC K Phase 1 with only three truck parking areas in the corridor that are not situated along I-95. More detailed maps of truck parking in vicinity of the corridor are in Appendix B.

According to the 2023 North Carolina Statewide Multimodal Freight Plan's Truck Parking Plan Update, the segment of STC K Phase 1 along US 421 between Sanford and Greensboro experiences moderately heavy truck volumes (2,501 to 7,500 annual average daily truck traffic [AADTT]) (NCDOT 2022). A significantly smaller volume travels south from Sanford to Fayetteville along NC 24 and NC 87 (501 to 2,500 AADTT). There is a heavy concentration of freight-intensive industries that include manufacturing, wholesale trade, and transportation and warehousing locations in both Fayetteville and Greensboro and to a much smaller degree in Sanford and Siler City. The Truck Parking Plan Update described 8 percent growth for the AADTT on STC K Phase 1 between Sanford and Greensboro between 2016 and 2019. The segment of STC K Phase 1 using NC 87 and NC 24 experienced variable levels of AADTT growth up to the 4 percent and 8 percent, respectively.

The Truck Parking Plan Update found that truck parking use for the existing truck parking areas in STC K Phase 1 was regularly full Monday through Friday on all but one private truck stop along I--95 north of the Cumberland County rest stops. The three non-interstate truck parking locations along US 421 and NC 24 were also regularly full. The Truck Parking Plan Update assumes that these regularly full parking locations will remain at capacity if their corridor growth rates are positive.

During the focus group meetings, representatives from Greensboro shared that there were truck parking concerns at the Pleasant Gardens intersection with Old US 421 in southern Greensboro and advocated for off-road truck parking along the corridor.

Figure 26. Freight Truck Parking - North of Sanford

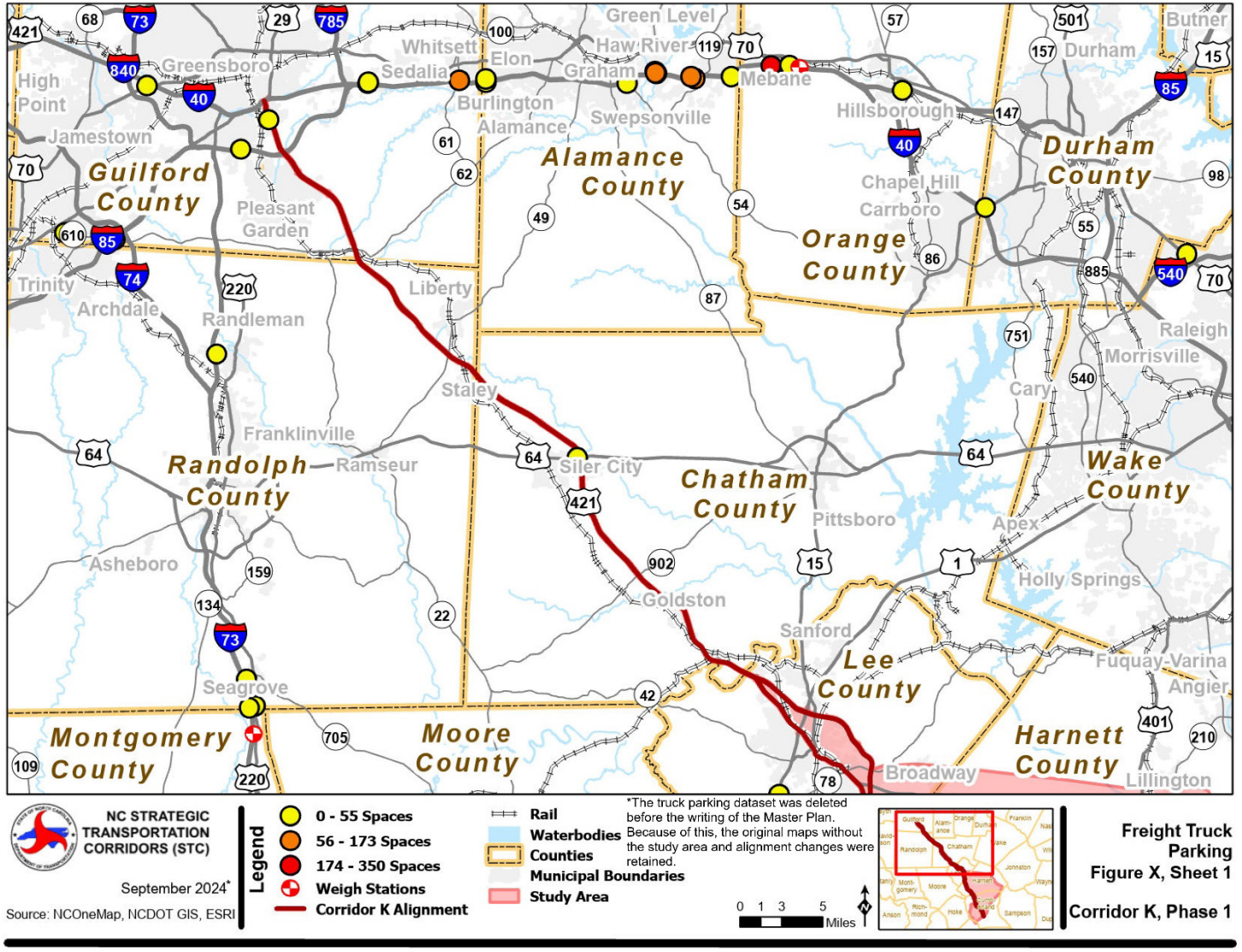
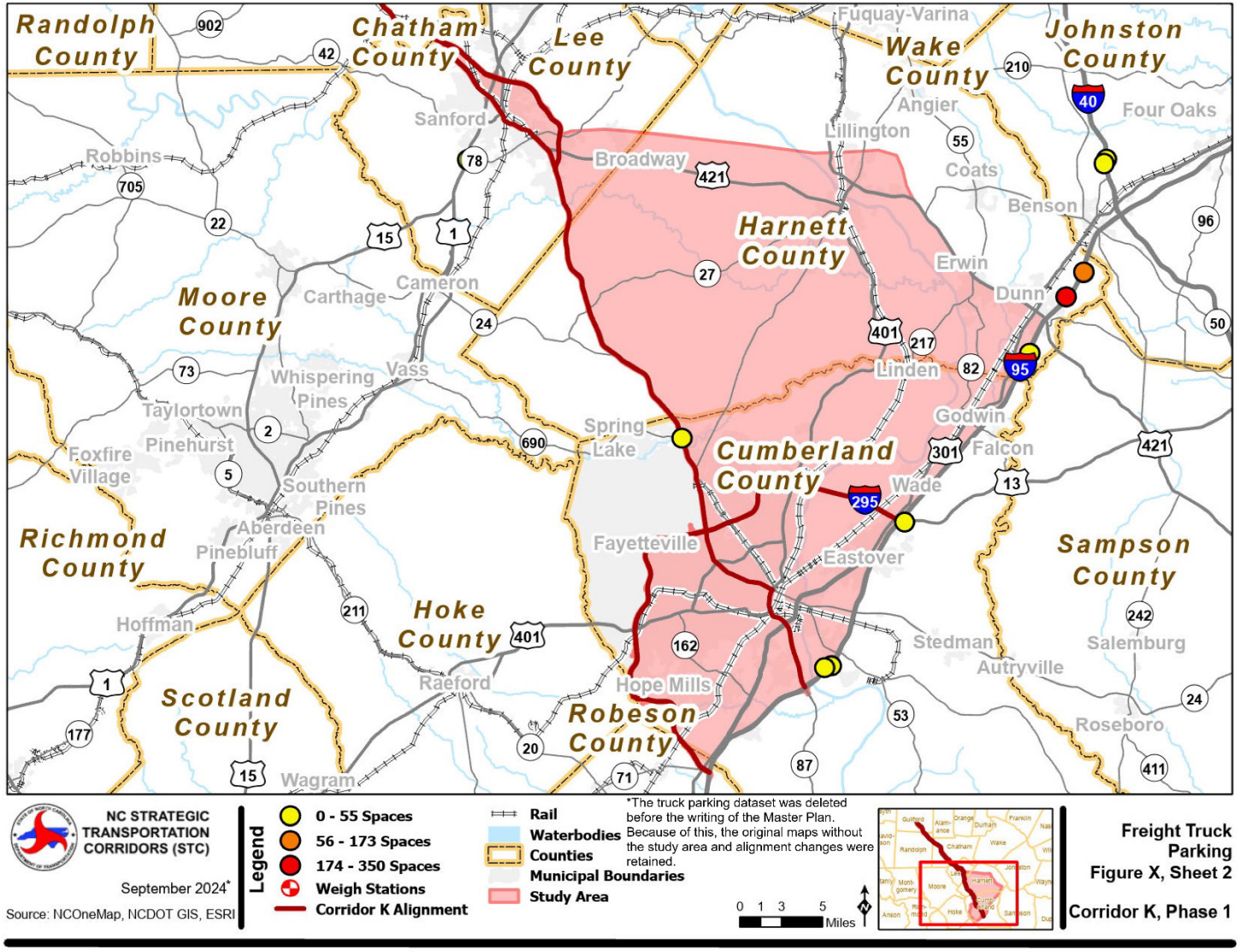


Figure 27. Freight Truck Parking - South of Sanford



4. Baseline and Future Year Mobility Analysis

Corridor data was run through NCSTM Gen 4.5 to both establish existing corridor travel conditions and verify the model's accuracy against the findings in Section 3.2. The study team evaluated the latest planning assumptions used, the availability and adequacy of the model input data in the corridor, and a multitude of other model factors. Model results were used to summarize major travel patterns in the study area and transportation performance measures along the existing corridor alignment.

4.1 Mobility Analysis Objectives and Data Sources

The objectives of the baseline and future year mobility analysis include:

- Understand the demographic and economic factors influencing personal and freight travel demand along the corridor under the existing/baseline (year 2023) and future (year 2045) conditions
- Assess baseline and future traffic and truck volumes along the corridor
- Evaluate baseline and future traffic congestion bottlenecks using a combination of metrics
- Identify "hot spots" that pose a congestion or safety risk that could limit future development potential

The analysis results informed the public and stakeholder outreach and served as a basis for the alternatives evaluation. Section 4.2 summarizes the existing conditions and baseline analysis, and Section 4.3 summarizes the future year analysis and model development process.

The study team used various data and mapping tools to analyze the baseline and future year mobility conditions along the STC K Phase 1 study area. This included data gathered from NCDOT through online resources, from Streetlight, a private data vendor, and other sources, such as the Federal Transit Administration, Google Maps, and OpenStreetMap. NCSTM Gen 4.5 was used to develop key inputs for Existing (2023) / Baseline Performance Metrics. Table 15 presents the key data sources used in the mobility analysis.

Table 15. Data Sources for Mobility Analysis

Name	Year	Data Source
Corridor Context and Priorities	2024	OpenStreetMap, Google Maps, NCDOT, City of Burlington Economic Development (2021)
Public Transportation Systems – Unlinked Trips and Annual Vehicle Revenue-Miles	2023	Federal Transit Administration, Transit Agency Profiles
Transportation Network - North Carolina Public Transit Systems	2022	NCDOT, Map: Public Transit Systems in N.C.
Population and Demographics	2022	US Census Bureau, USDOT, NCDOT.
Employment – Job Counts	2022	US Census Bureau, On the Map.
Employment – Percent Driving to Work	2022	US Census Bureau.
Travel Markets	2024	StreetLight Data OD Analysis
Annual Average Daily Traffic (AADT)	2023	NCDOT's official 2023 traffic monitoring data publication
Truck Volumes and Percentages	2023	NCDOT's official 2023 traffic monitoring data publication

Name	Year	Data Source
Peak Hour Volume-to-Capacity ratio (V/C ratio)	2023	2023 AADT, NCDOT's Traffic Count Data System, NCSTM Gen 4.5
Corridor-Level Annual Vehicle Miles Traveled (VMT)	2023	2023 AADT, NCDOT Traffic Survey GIS Data Products
Annual Average Daily Traffic (AADT)	2045	2023 AADT, NCSTM Gen 4.5
Peak Hour Volume-to-Capacity ratio (V/C ratio)	2045	2045 AADT, NCDOT's Traffic Count Data System, NCSTM Gen 4.5
Corridor-Level Annual Vehicle Miles Traveled (VMT)	2045	2045 AADT, NCDOT Traffic Survey GIS Data Products
Socioeconomic Data at the TAZ level	2023/ 2045	NCSTM Gen 4.5 data for 2020, 2025, and 2045, North Carolina Office of State Budget and Management (OSBM) 2023 county-level population estimates.

4.2 Existing Conditions and Baseline Analysis

4.2.1 Corridor Context and Priorities

STC K connects Greensboro with Fayetteville and continues on to Wilmington (STC K Phase 2), which is a major port on the Atlantic coast. The corridor travels through a combination of rural and urban land uses and is a primary access point to Fort Bragg, one of the largest military installations in United States with over 52,000 military personal. STC K Phase 1 originates in one of the most populous areas in the state, Greensboro, and continues through predominantly rural areas before terminating south of Fayetteville, the sixth largest city in the state. The corridor travels through several cities and towns, as well as unincorporated areas in Randolph, Chatham, and Harnett Counties. In addition to the communities located along the corridor, there are large urban areas to the east and west of the roadway, Raleigh and Charlotte, respectively.

Major activity generators such as schools, military bases, hospitals, and retail centers influence traffic patterns, infrastructure needs, and economic impacts related to the corridor. These destinations induce travel and impact peak travel times as well as roadway capacity requirements. In addition, they often act as hubs for employment, commerce, and public services, making them key to regional accessibility and mobility planning. Most of the activity generators along the corridor are in large urban areas such as Greensboro and Fayetteville or in small communities like Sanford.

Current destinations that are likely to induce trips that may use STC K include:

- **Industrial and Commercial Sites**: Martin Marietta Central Rock Quarry in Greensboro, Boren Clay Products in Pleasant Garden, Greensboro-Randolph Megasite (Toyota Battery Manufacturing), Coty and Moen in Sanford, Pfizer in Sanford, Wolfspeed in Chatham County
- **Higher Education**: Central Carolina Community College in Siler City and Sanford, Fayetteville Technical Community College in Fayetteville, Fayetteville State University, University of North Carolina Greensboro
- **Hospitals**: Chatham Hospital in Siler City, Central Carolina Hospital in Sanford, Womack Army Medical Center in Fort Bragg, Fayetteville Veterans Administration Medical Center in Fayetteville
- **Military**: Fort Bragg in Cumberland County

- **Transportation and Logistics**: Piedmont Triad International Airport in Guilford County, Fayetteville Regional Airport

Several commercial and industrial sites could significantly impact travel patterns in the region and along the corridor. US 421 is part of the Carolina Core, a long-term strategic vision for the region built on direct connections between population centers, advanced technology and manufacturing facilities, and military operations. The newly opened Toyota Battery Plant in Randolph County, for example, employs more than 1,750 workers. Local economic development agencies project that the manufacturing plant will establish this region as a cornerstone for electric vehicle production and future industrial investment, which would continue to increase demands on the existing transportation network. Wolfspeed, a semiconductor manufacturer, is also slated to make a transformative investment with their new manufacturing facility in Chatham County near Old US 421. Other potential trip generators include the Piedmont Triad International Airport megasite in Greensboro, Chatham-Siler City Advanced Manufacturing site in Chatham County, and Triangle Innovation Point in Chatham County. Other future growth areas have been identified in Land Use Planning and Growth Centers. The Future Land Use maps in Appendix B include the locations for identified megasites and future growth areas.

Local land use plans, identified and reviewed in Section 2.2.5, highlight how megasites will shape future growth in these communities. Guilford County and the City of Greensboro highlighted possibilities for residential and supportive land uses along the portion of US 421 near the Toyota Battery Plant. The plant may also incentivize new requests for development and access to city services along the US 421 corridor southwest of Greensboro. The Town of Liberty has recommended a connector street to Starmount Road (SR 2407) to improve access to the plant. In addition, new development from Wolfspeed has led Siler City to consider rezonings for areas suitable for industrial, flex, and warehouse distribution along US 421 east of the city. Many other land use plans reference smaller commercial development such as retail centers that will shape growth as well as the need for zoning that supports residential land uses.

To support burgeoning economic development in the region, the state and local and regional agencies have explored transportation infrastructure expansions and improvements. The following projects will have a marked effect on roadway capacity:

- **R-3830**: NC 42 (Broadway Road/North Main Street) in Sanford from US 421 to NC 42 (Avents Ferry Road) is currently under construction to widen the facility to four lanes, divided. NC 42 to East Harrington Avenue (SR 1538) will also be widened to three lanes. This project is funded in part by Build NC bonds and has a budget of $62.75 million. Estimated completion spring 2028.
- **U-5101A**: SR 1437 (Shaw Road) from NC 24 (Bragg Boulevard) to NC 210 (Murchison Road) will interconnect and widen the facility to multiple lanes. This project is funded in part by Build NC bonds and has a budget of $67.86 million. Currently in preliminary engineering stage only.

In addition, the STIP includes several planned and programmed projects within the study area. Cumberland and Guilford Counties have the most planned projects, and Cumberland and Lee Counties have the highest total funding estimates. The most common project types include highway safety improvements, followed by rail improvements, bridge replacement or rehabilitation, and aviation and highway improvements. Through several state plans, STC K was identified as a

prime area for rail expansions, truck parking locations, and targeted TOD. At the southern end of the corridor, I-95 was also highlighted as an alternative fuel corridor.

Project development and selection is guided by regional and community priorities for the study area. Local transportation plans developed by counties and MPOs in the study area list recurring priorities that will impact development along STC K; these include safety, freight and truck parking, travel time reliability and congestion management, and supporting population growth in the region. Common strategies across the plans include improving multimodal connectivity and accessibility for all modes of travel such as expanding transit operations and bicycle/pedestrian facilities and connections, improving safety, managing system reliability and congestion, and preserving the existing transportation system.

4.2.2 Transportation Network

The Transportation Facilities Inventory and Operating Conditions Technical Memo provided detailed information on STC K Phase 1, including mileage, number of travel lanes, functional classification, and capacity. The entirety of the corridor north of Sanford along US 421 is four lanes (two lanes in each direction). From Greensboro to the US 421/US 421 Business interchange north of Sanford is 48.2 centerline miles or 192.8 total lane miles. Following the interchange, US 421 runs north of Sanford and ultimately splits to the east towards Lillington. US 421 has four lanes (two lanes in each direction). NC 87 merges with NC 24 in Spout Springs to Fayetteville and I-95. The NC 87/NC 24 corridor is a mix of two to three lanes in each direction, with a short section of four or five lanes in each direction near Fort Bragg. The distance from the US 421/US 421 Business interchange to I-95 is a total of 50.7 centerline miles or 253.1 lane miles. Overall, STC K Phase 1 contains 98.6 centerline miles or 445.7 lane miles.

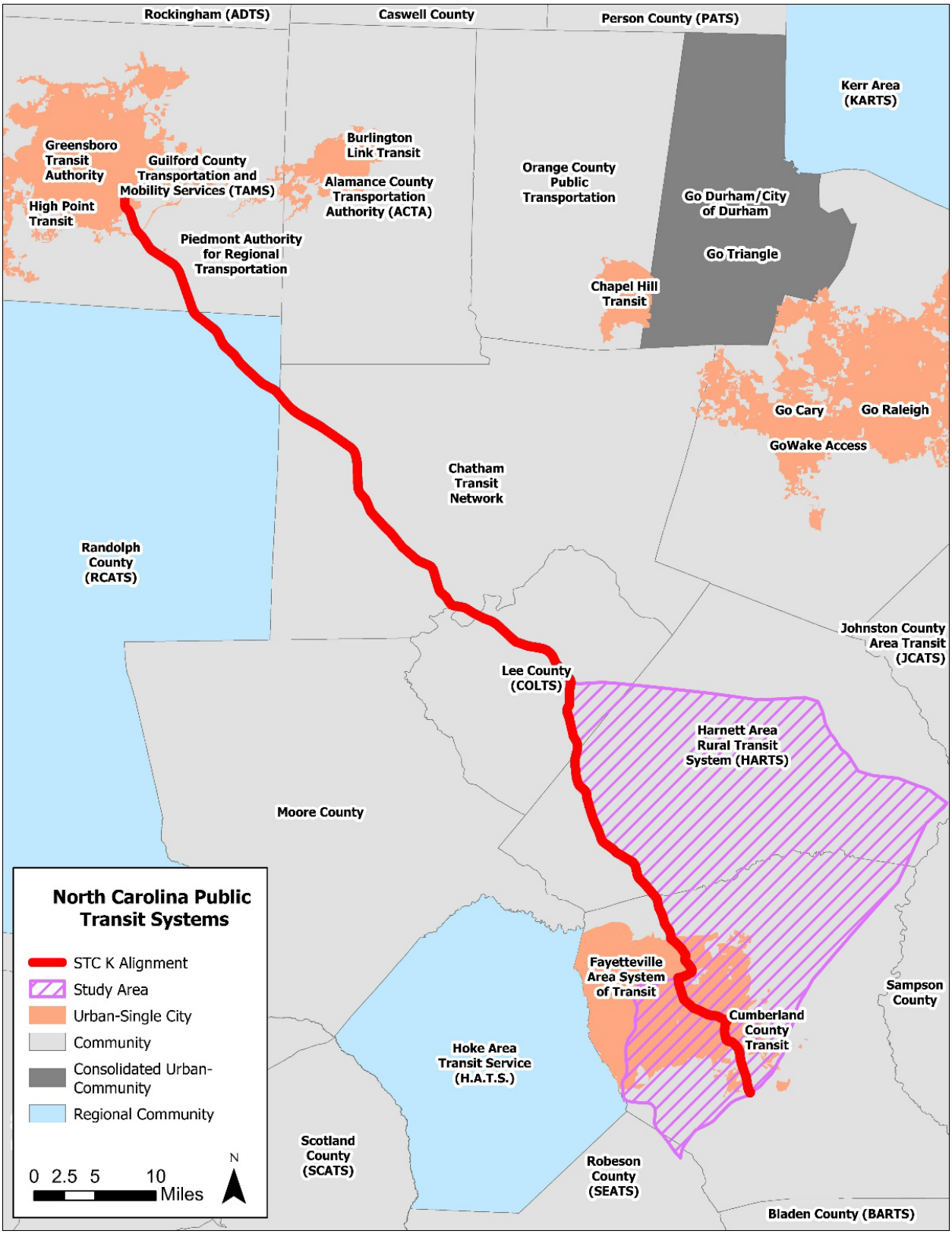
There are nine public transportation systems in the vicinity of the corridor, although very little transit service is located along the corridor itself. Table 16 lists the transit systems, their designation as county, regional, or municipal systems; annual unlinked trips; and annual vehicle revenue miles. Figure 28 depicts the location of these transit systems.

Table 16. Public Transportation System Ridership and Revenue Mileage along STC K (2023)

Agency	Type	Annual Unlinked Trips, Ridership (2023)	Annual Vehicle Revenue Miles (2023)
Guilford County Transportation and Mobility Services (TAMS)	County	31,536	221,415
Piedmont Authority for Regional Transportation	Regional	367,508	2,500,525
Greensboro Transit Authority	Municipality	2,263,152	3,581,735
Randolph County Regional Coordinated Area Transportation System (RCATS)	County	42,428	443,860
Chatham Transit Network	County	61,783	928,626
County of Lee Transit System (COLTS)	County	58,477	430,953
Harnett Area Rural Transit System (HARTS)	County	34,244	527,307
Cumberland County Transit	County	25,247	249,984
Fayetteville Area System of Transit	Municipality	2,195,673	1,600,494

Source: National Transit Database Transit Agency Profiles (FTA 2023)

Figure 28. Regional Public Transit Systems



Source: NCDOT 2026, NCDOT Public Transit Service Areas

4.2.3 Population and Demographics

4.2.3.1 Population

Population and demographics influence traffic levels and trip generation along the corridor. The communities with the highest population density are located at the northern end of the corridor in Greensboro and southern end in Fayetteville. Most of the corridor travels through sparsely populated rural areas except for some small communities including Liberty, Staley, Siler City, Sanford, and around Fort Bragg. Table 17 lists the cities, towns, and counties the corridor passes through along with their respective populations. Figure 29 and Figure 30 depict population density along the northern and southern portions of the corridor.

Table 17. Population of Cities, Towns, and Counties in the Study Area (2022)

Locality	Population (2022)
Guilford County	**539,557**
Greensboro	297,202
Pleasant Garden	4,987
Randolph County	**144,403**
Liberty	2,666
Chatham County	**76,754**
Siler City	7,847
Goldston	375
Lee County	**63,560**
Sanford	30,373
Cumberland County	**335,207**
Spring Lake	11,710
Fayetteville	208,697
Harnett County	**134,718**
TOTAL City/Town Population	563,857
TOTAL COUNTY Population	**1,294,199**

Source: US Census Bureau 2022

Population density varies along the corridor, which impacts traffic volumes and safety. The urban anchors – Greensboro and Fayetteville – serve as major traffic generators, with a variety of traffic compositions that include passenger vehicles, commercial trucks, pedestrians, motorcyclists, and people who ride bikes. Rural areas generally experience lower traffic volumes but are more susceptible to fluctuations in demand, such as increases resulting from the development of new work sites or other economic activities.

4.2.3.2 Demographics

In addition to population density, other demographic factors such as age and income also affect trip generation and travel behavior. Nationally, people aged 25 to 64 make up the majority of trips, followed by those aged 18 to 34 years (FHWA 2017 National Household Travel Survey). In the study area, locations with a high percentage of residents aged 25 to 64 can be expected to take more trips, which can reflect where roadway capacity may be more constrained. Much of the study area is comprised of communities where people aged 25 to 64 make up more than half of the population; a few locations have an even higher concentration including in south Greensboro and near Fort Bragg, as shown in Figure 31 and Figure 32.

Figure 29. Population Density in the Study Area - North of Sanford

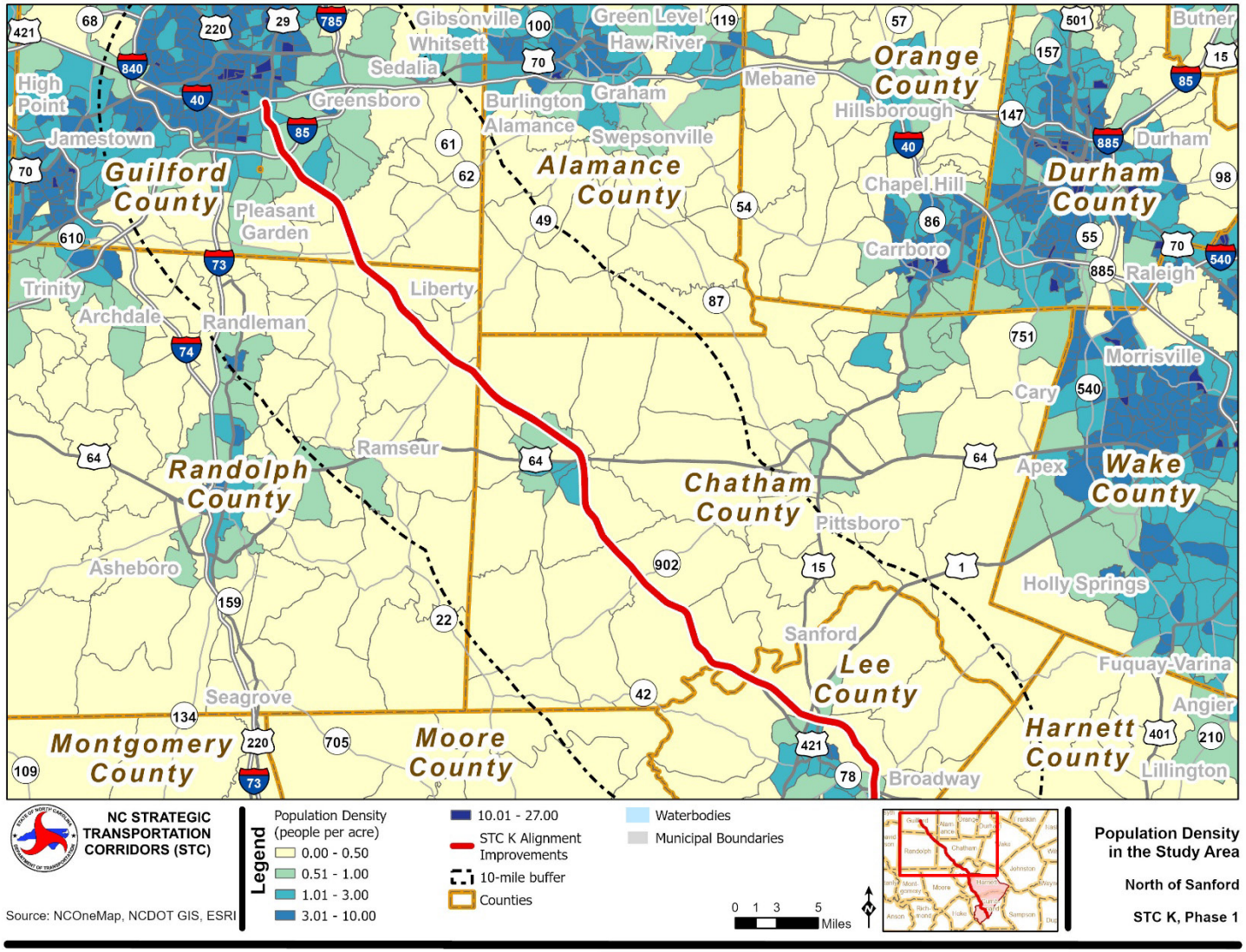


Figure 30. Population Density in the Study Area - South of Sanford

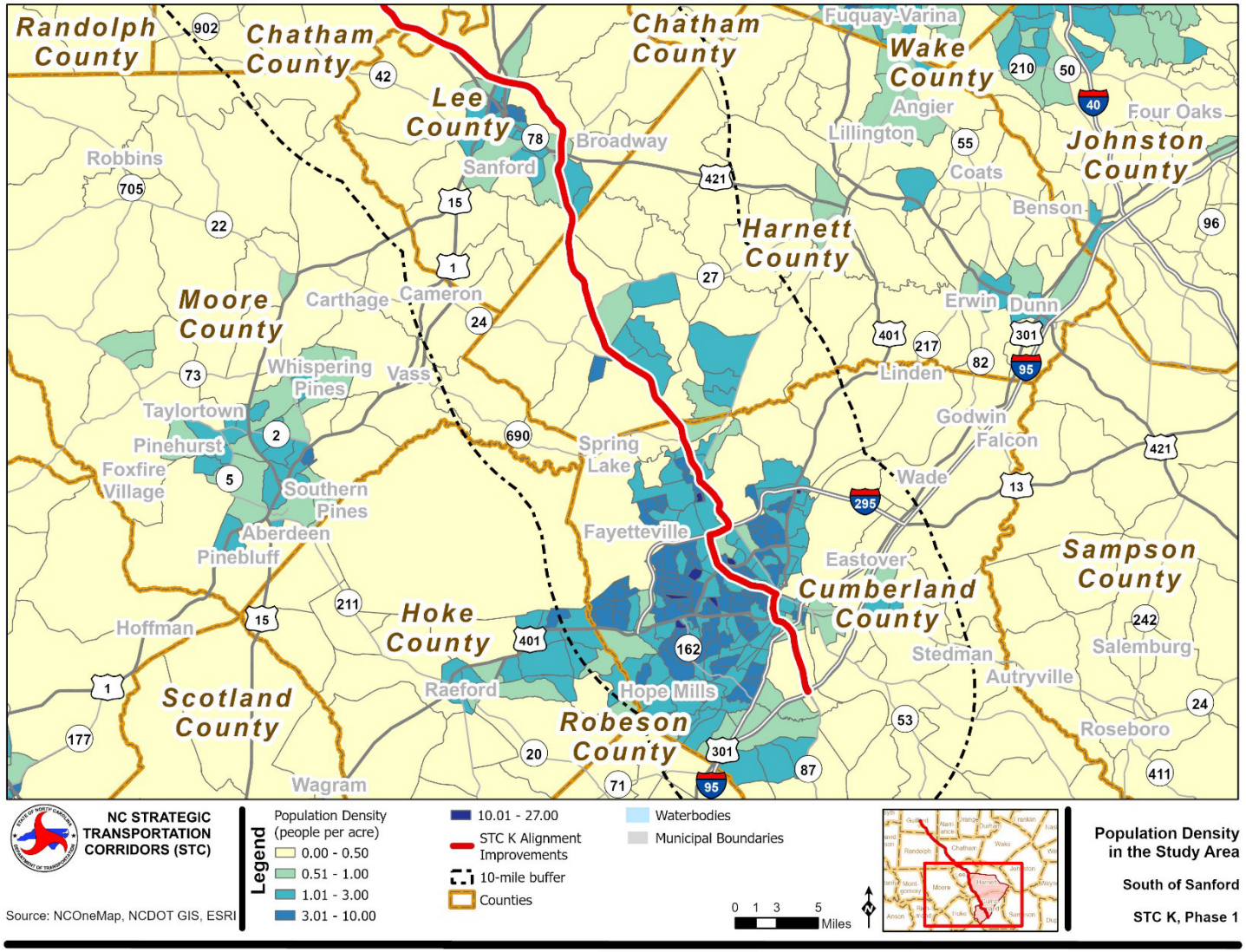


Figure 31. Percentage of Population Aged 25 to 64 Years Old in the Study Area - North of Sanford

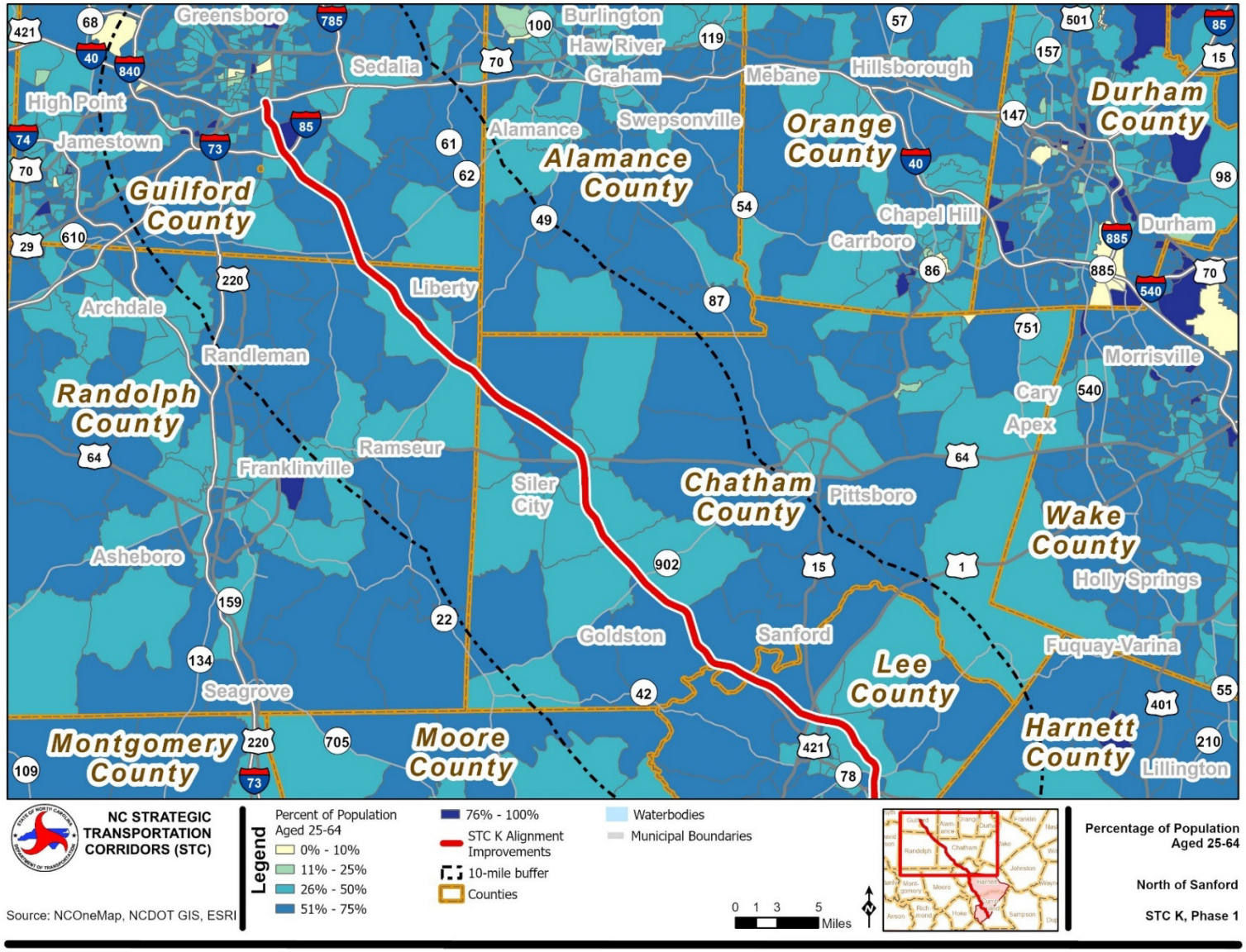
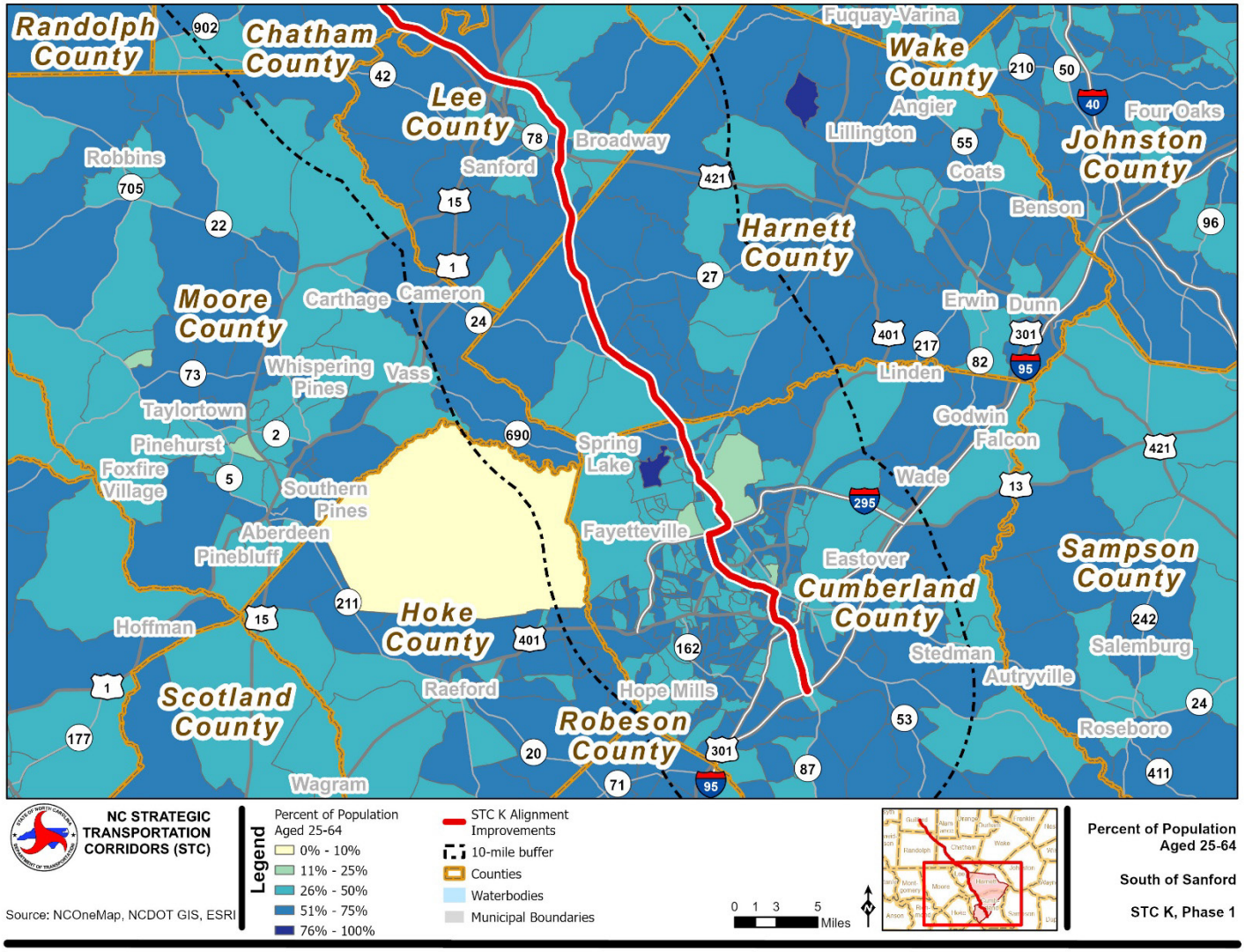


Figure 32. Percentage of Population Aged 25 to 64 Years Old in the Study Area - South of Sanford



Nationally, households with incomes between $50,000 and $100,000 are more likely to make trips compared to households with incomes below and above this threshold. Lower income households may also have fewer vehicles and rely on public transportation or shared trips, while higher income households may substitute personal trips with delivery. The study area is primarily comprised of households that have between 0 and 50 percent of their households within that high income threshold of $50,000 to $100,000. Some communities in the study area have up to 50 percent of their households with income between $50,000 and $100,000, which increases the likelihood that these areas may experience higher trip generation and traffic volumes on segments such as US 421. Areas with high income households include parts of Greensboro; Staley; parts of Ramseur, Franklinville, and Randleman; Goldston; Sanford; parts of unincorporated Chatham and Lee Counties; Spring Lake; and Fayetteville (Figure 33 and Figure 34).

Labor force participation also impacts potential trip generation along the corridor. Areas with high labor force participation rates typically generate a significant number of daily work-related trips, contributing to peak-period traffic along the corridor. In the study area, the areas with the highest labor force participation primarily include portions of Greensboro, Siler City, Sanford, Broadway, unincorporated Harnett County, Spring Lake, and Fayetteville, as shown in Figure 35 and Figure 36. The type of employment in the area also impacts travel patterns. For example, the STC K Phase 1 study area has a number of industrial and manufacturing facilities, which may have shift schedules that could result in commuting trips outside of peak hours, long commute times if affordable housing is not located near the site, and high volumes of heavy trucks and equipment on the roadway. Large activity generators such as Fort Bragg near Spring Lake and Fayetteville also influence travel patterns and concentrate traffic volumes – particularly during peak periods – on roadways accessing the base.

4.2.3.3 Environmental Justice and Transportation Disadvantaged Populations

People with the greatest transportation need are often concentrated in communities that have been adversely impacted by transportation infrastructure decisions. Several communities in the vicinity of STC K are designated as transportation disadvantaged or EJ areas and are more likely to have difficulty accessing transportation due to factors such as household income, lack of vehicle ownership, age, and ethnicity. Using NCDOT's TDI, there are several communities along STC K with high EJ and TDI scores, which include the following areas: US 29 in Greensboro, western Liberty, the town of Siler City, Sanford, east of US 1, the communities north of Spring Lake, and downtown and around I-295-W in Fayetteville.

Two key characteristics – poverty status and ethnicity – can be used to demonstrate how vulnerable a community is to transportation barriers. Residents below the poverty line may struggle to afford a personal vehicle, making them reliant on public transit or non-motorized modes like walking and biking. Communities of color have historically experienced systemic disinvestment in transportation infrastructure and are likely to live in areas where they are disproportionately affected by transportation concerns such as air or noise pollution. These issues are compounded in low-income communities of color.

Figure 33. Percentage of Households with Income $50,000 to $100,000 - North of Sanford

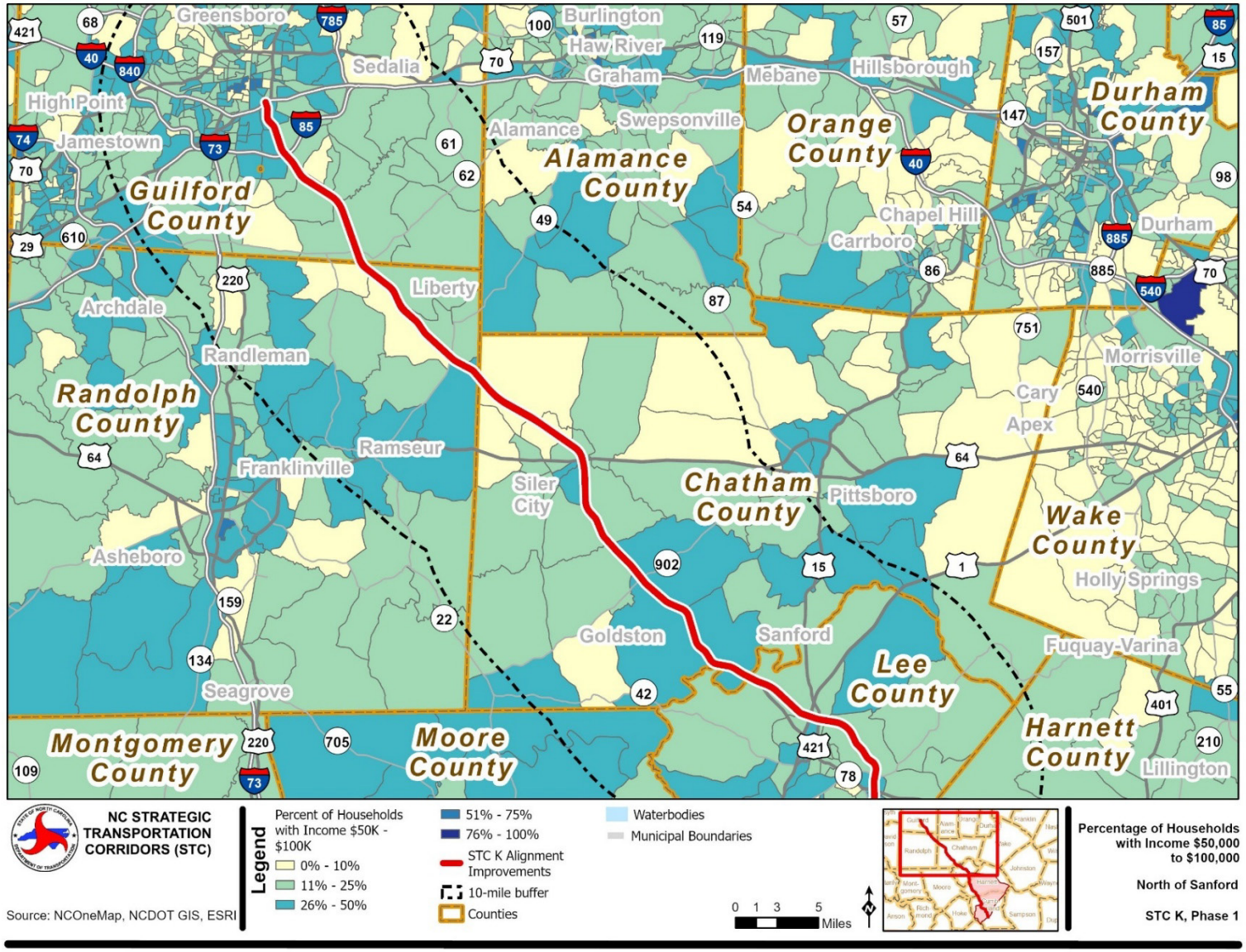


Figure 34. Percentage of Households with Income $50,000 to $100,000 - South of Sanford

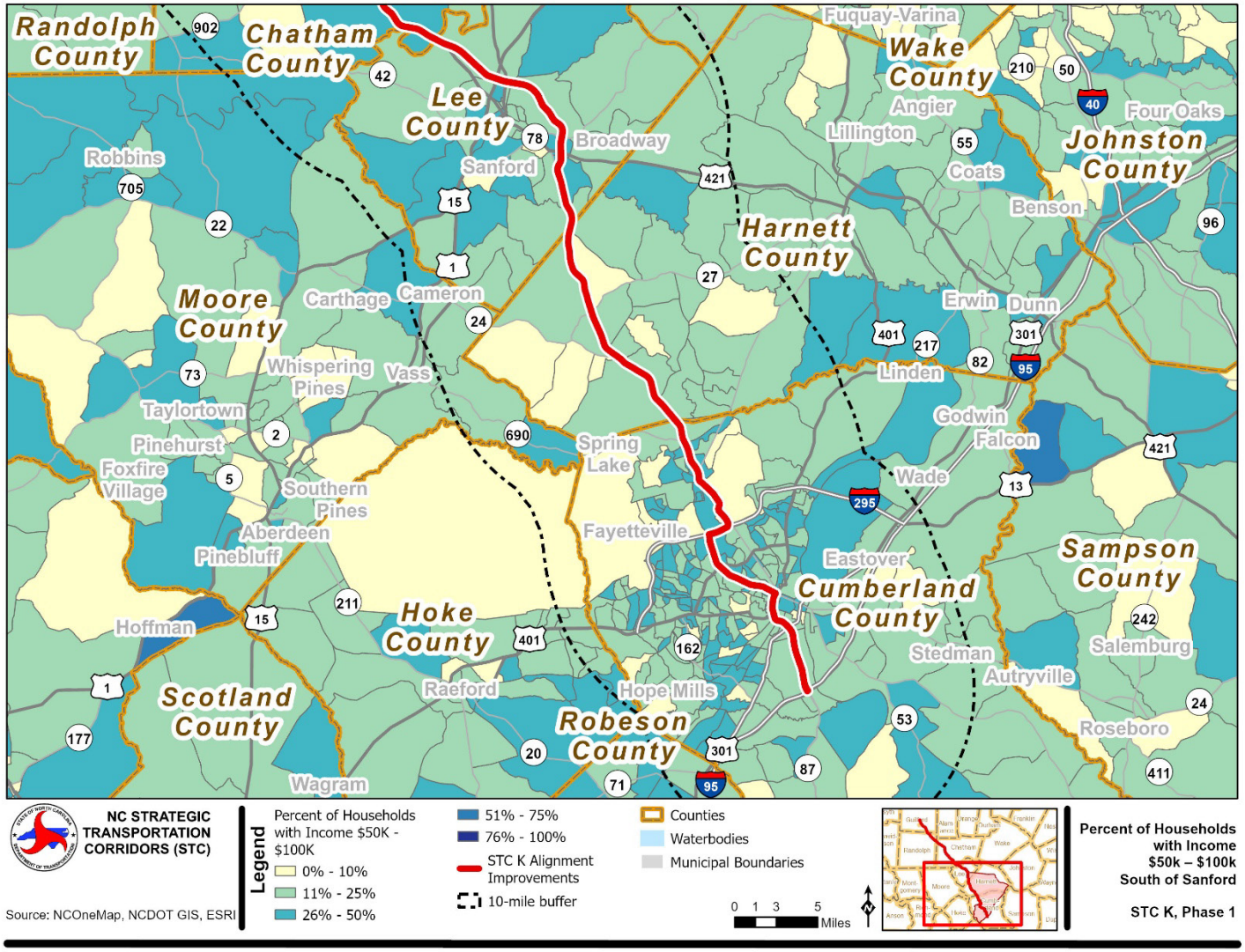


Figure 35. Labor Force Participation Density - North of Sanford

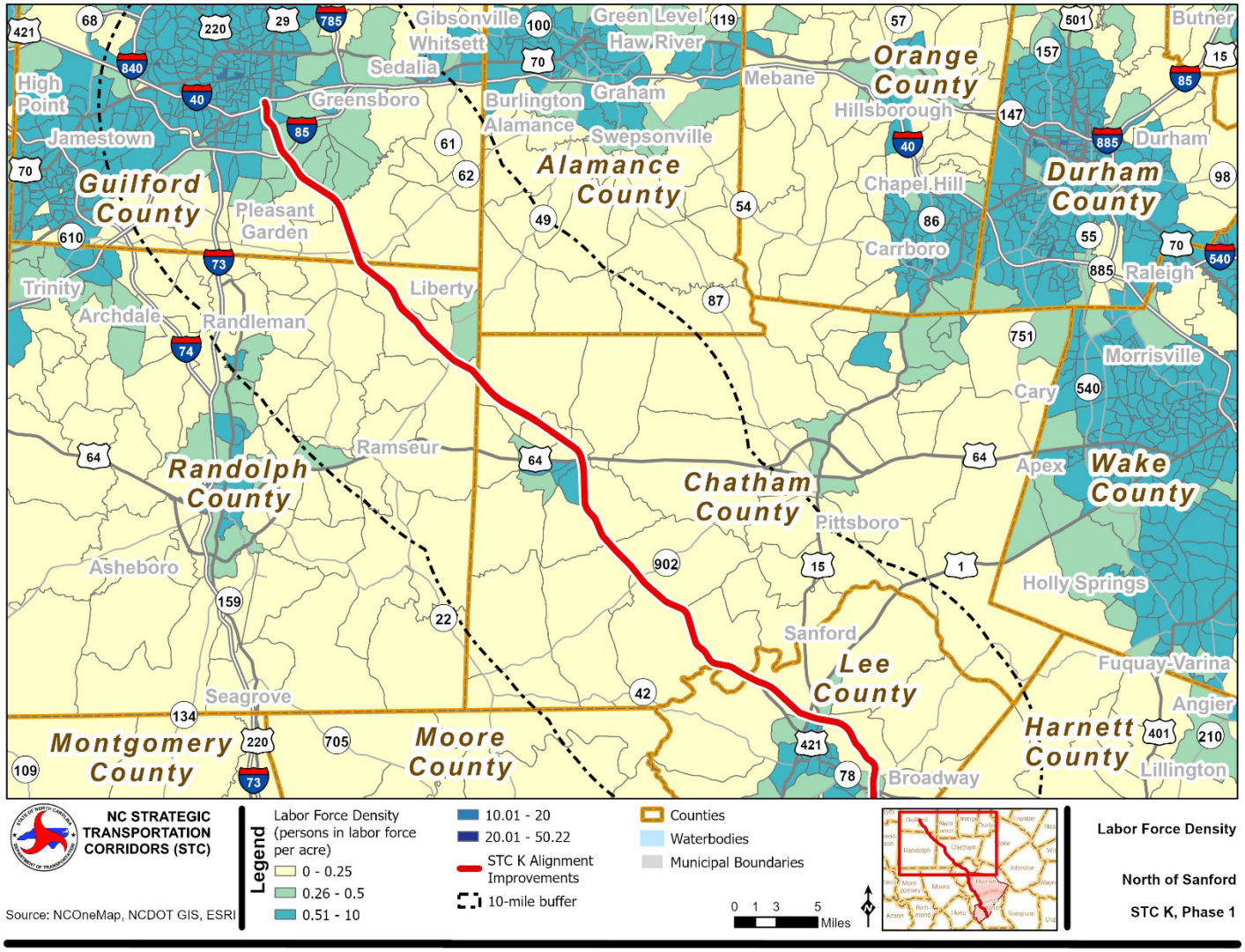
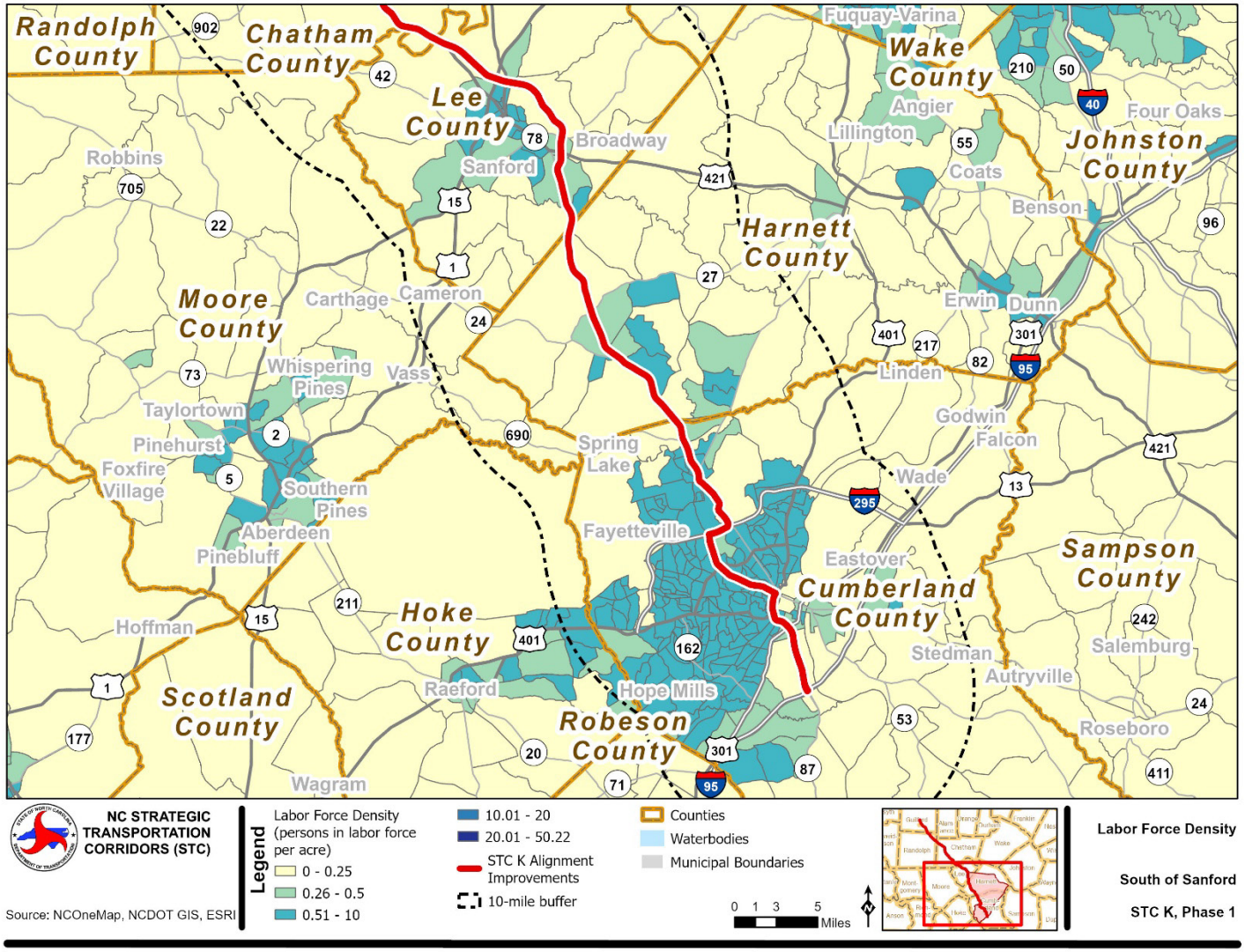


Figure 36. Labor Force Participation Density - South of Sanford



In the STC K Phase 1 study area, most of the region is at or above the federal poverty line. Some portions of the planning area are 50 percent to 75 percent below the poverty line, as shown in Figure 37 and Figure 38. These include parts of Liberty, Siler City, Sanford, unincorporated Lee County, unincorporated Harnett County, and Dunn. Fayetteville has the highest concentration of low-income residents that are 50 percent to 100 percent below the federal poverty level, located primarily east of the corridor. There are higher densities of people of color in the study area than those under the poverty line. The highest population communities of color (over 75 percent) are located at the corridor's northern extent in Greensboro; portions of Siler City and Sanford; and parts of Fayetteville, Spring Lake, and the Fort Bragg area, as shown in Figure 39 and Figure 40. More information on EJ communities in the study area can be found in Section 7.

4.2.3.4 Land Use and Development

Land use and development patterns are major determinants of trip generation and heavily influence travel patterns. Existing urban and suburban development is focused around the major localities and military bases in the study area, including Greensboro, Siler City, Goldston, Sanford, Spring Lake, Pope Airfield, Fort Bragg, Fayetteville, Lillington, and Dunn. The current land use types range from low, medium, and high intensity development (including commercial and residential) and different types of natural area such as forest, pasture, and cropland. Future land use primarily focuses on increases in development and future growth areas, including those with identified megasites. The land use categories were developed and standardized based on a review of the local land use plans; more information is available in Section 2.2.6. Table 18 uses information from the identified locations in the study area with the primary development types projected as their future land use.

Table 18. Future Land Use in the Study Area by Intensity of Development

Location	High Intensity Development	Medium Intensity Development	Low Intensity Development	Future Growth Area or Megasite
US 421 and I-85 Interchange	X	X		X
US 421 at Pleasant Garden			X	X
Liberty and Staley	X	X	X	X
Siler City		X		X
Goldston		X	X	
Sanford	X	X		
Lillington	X	X		
Harnett County	X	X	X	
Erwin and Dunn	X		X	
Spring Lake	X	X	X	
Godwin, Falcon, Wade, and Linden		X	X	
Fayetteville	X	X	X	X
Eastover			X	
Stedman	X	X		
Hope Mills			X	X

Figure 37. Percentage of Population Below the Federal Poverty Level in the Study Area - North of Sanford

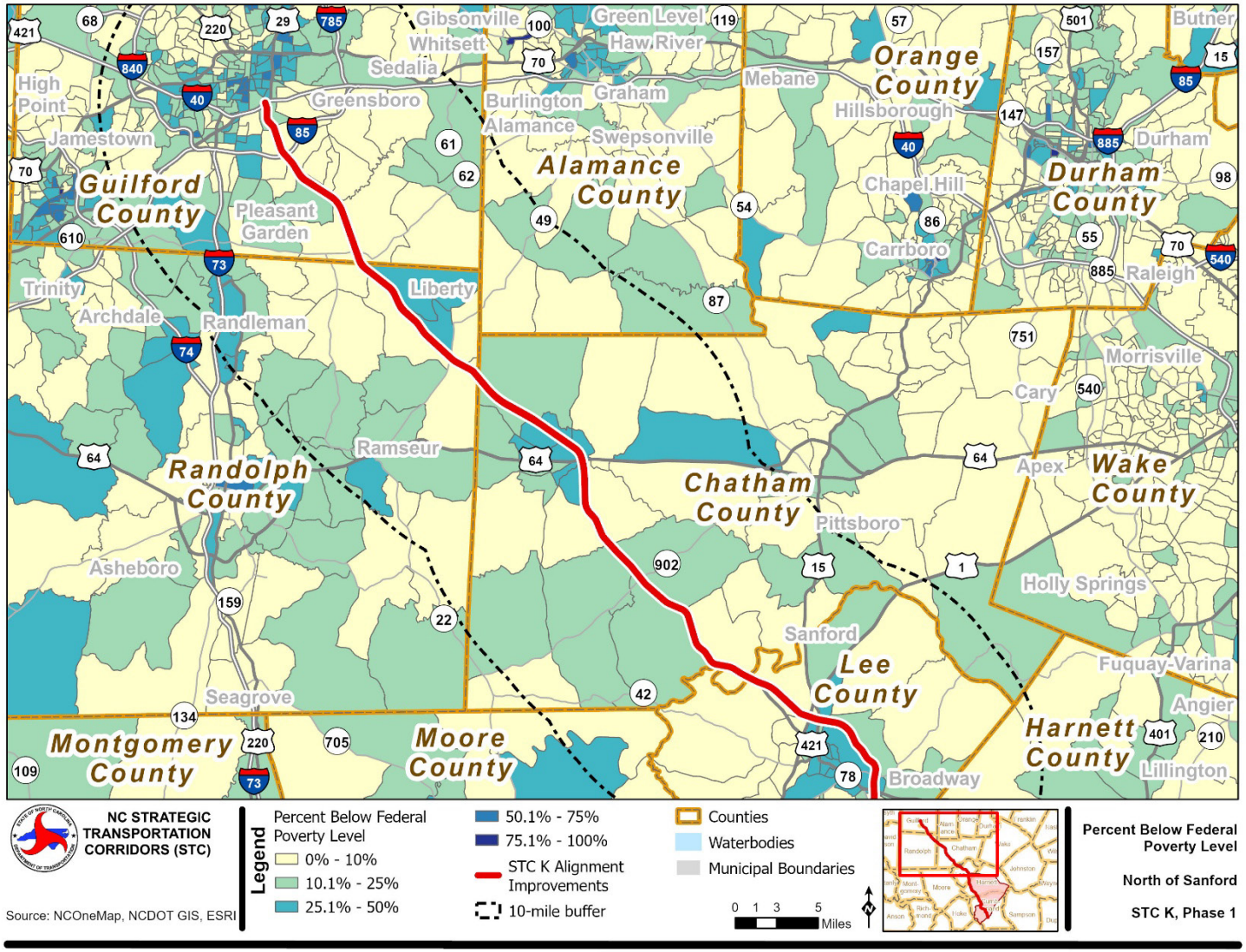


Figure 38. Percentage of Population Below the Federal Poverty Level in the Study Area - South of Sanford

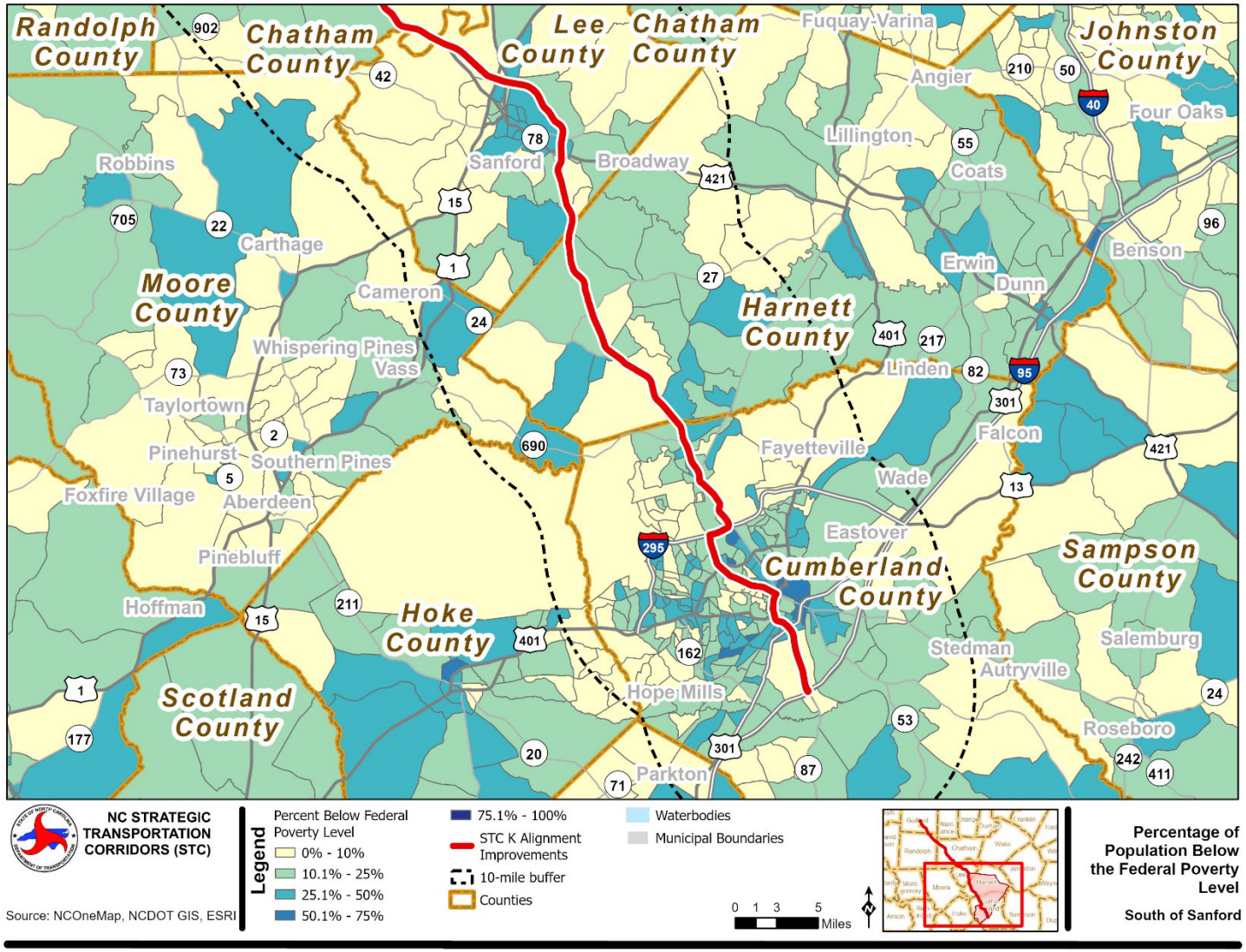


Figure 39. Percentage of Non-White Population in the Study Area - North of Sanford

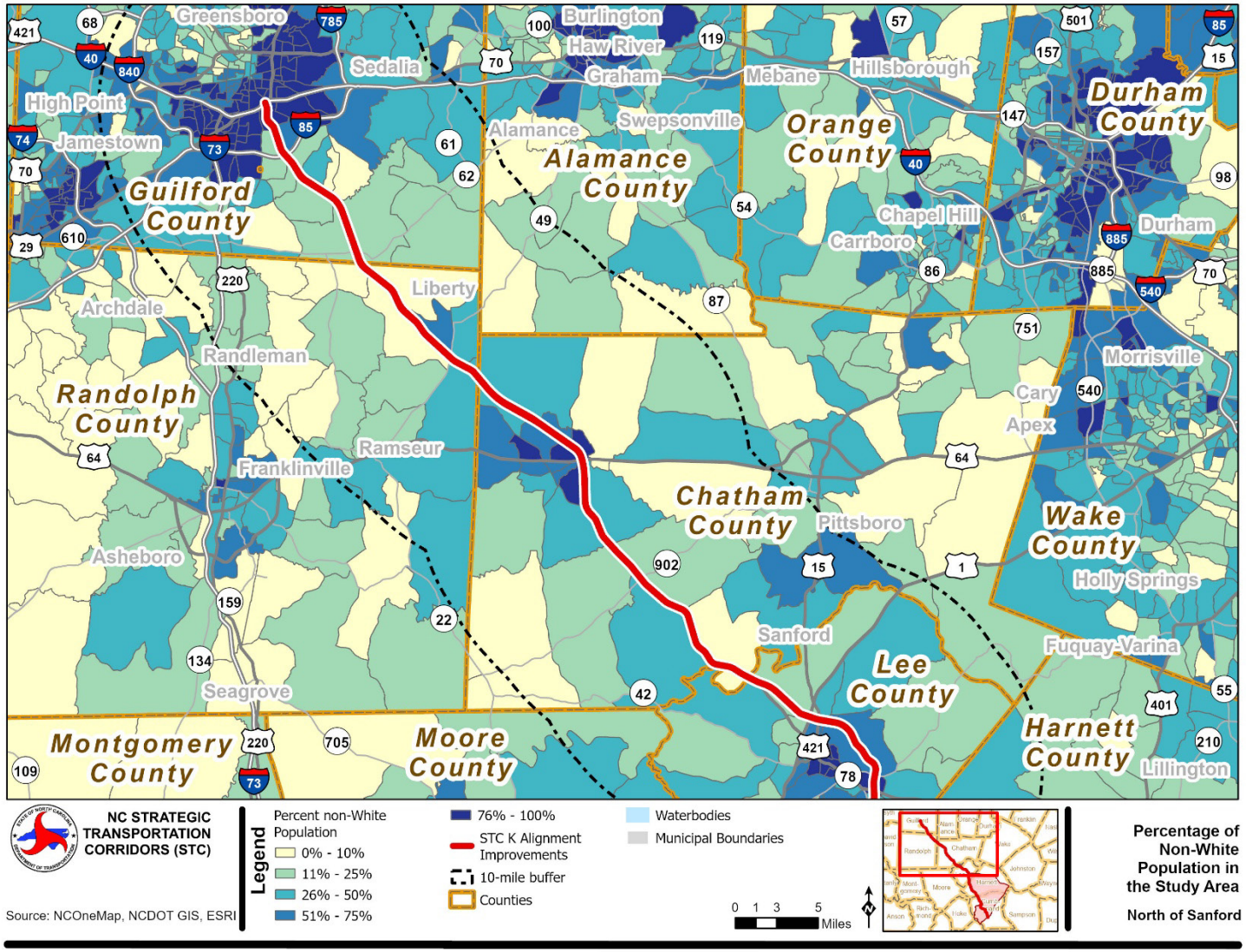
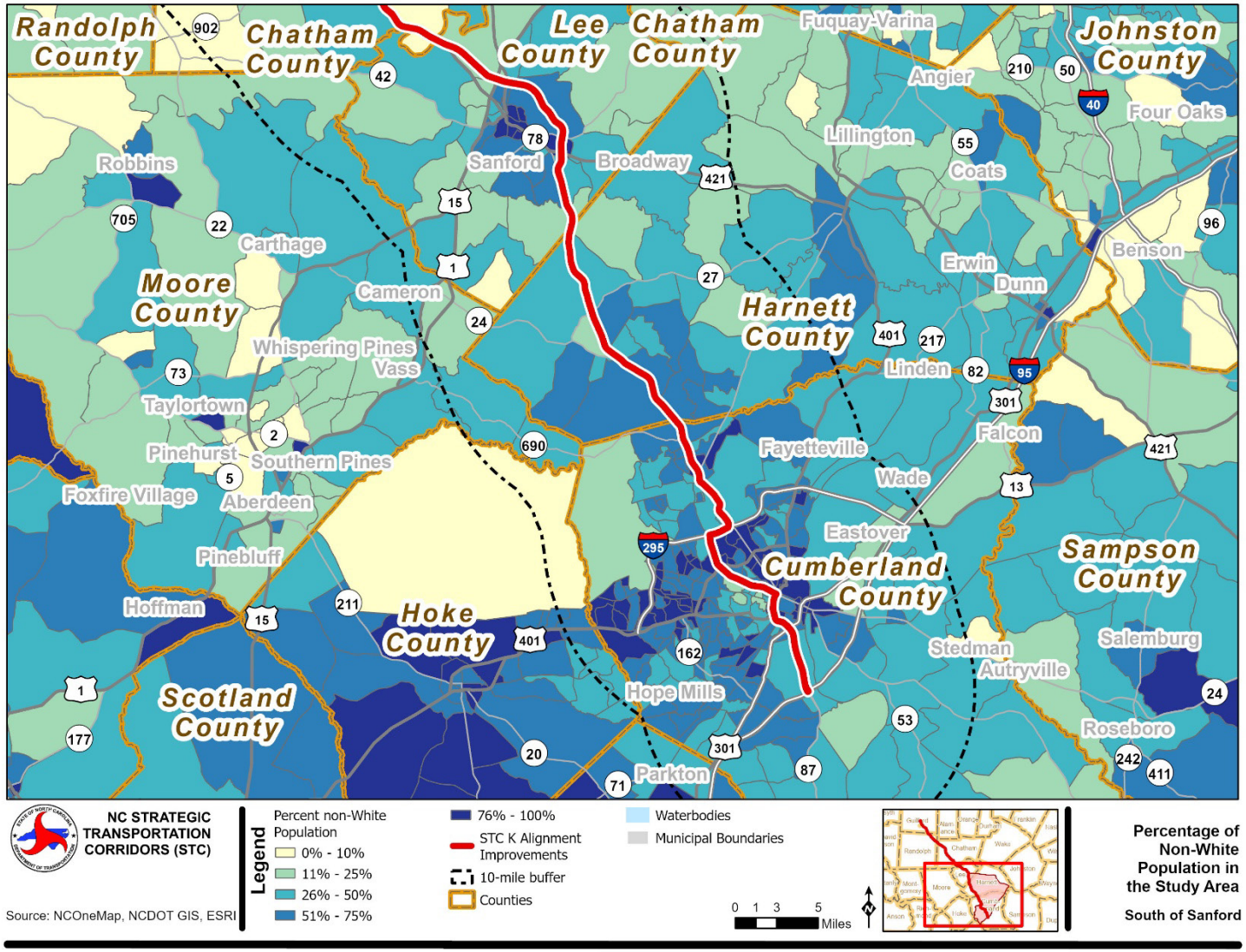


Figure 40. Percentage of Non-White Population in the Study Area - South of Sanford



The future land use projections provide an indication of where travel demand is likely to be greatest. Most of the industrial or commercial development is concentrated north of Sanford. Megasites in this area will draw complementary land uses such as industrial, warehousing, freight, and logistics in addition to the planned housing developments throughout Lee County. Some residential development will also occur farther south in the study area with high rates of growth in locations such as Liberty, Goldston, Sanford, unincorporated Harnett County, and Lillington. These areas will also experience the greatest transformation from low intensity development in their current land use to projected high intensity growth. Appendix B has current land cover and future land use maps of the study area's current and future land use that this analysis was based on.

4.2.4 Employment and Commuting Trends

Mega employment sites within the STC K study area include the Toyota Battery Plant, a 1,500-acre advanced manufacturing site, and future growth areas along and near US 421.

Using US Census Bureau data, this section provides detailed existing employment conditions along STC K. The US Census Bureau OnTheMap online tool provides employment data as of 2021 using data from Unemployment Insurance Wage Records reported by employers in each state, Office of Personnel Management for federal employees, and Quarterly Census for Employment and Wages (US Census Bureau 2021).

A 10-mile buffer was applied to STC K for analysis using OnTheMap. The results are shown in Figure 41 and Figure 42. There are 339,506 jobs within this area, most of which are comprised of workers between the ages of 30 and 54 (52.4 percent). The two highest industry sectors consist of Health Care and Social Assistance (15.8 percent) and Retail Trade (13.9 percent). Job densities are concentrated within the population centers along STC K, including Greensboro and Fayetteville, but also Sanford and Siler City. Outside of these cities, jobs are generally evenly distributed.

US Census Bureau data from the OnTheMap online tool were also used to conduct a destination analysis. Table 19 shows the top 10 employment destinations for residents within 10 miles of STC K. Of the 339,506 total jobs, three of the top 10 destinations account for nearly 30 percent of the total employment destinations and are located within the STC K study area. These destinations are Greensboro (17.8 percent), Fayetteville (10.3 percent), and Sanford (1.7 percent).

The majority of employees (88 percent) near the corridor drive to work. Of these employees, 9 percent carpool as listed in Table 20. This information does not include employees that responded to US Census American Community Surveys with other methods of commuting, which was less than 2 percent in all counties. Working from home and walking to work were most common in urban areas in Guilford, Chatham, and Randolph Counties, as shown in Figure 43 and Figure 44. Note, these figures use a reversed color scale to highlight areas with very low driving to work as a percentage of the block group population.

Figure 41. Counts of All Jobs within 10 Miles of STC K – 2021 - North of Sanford

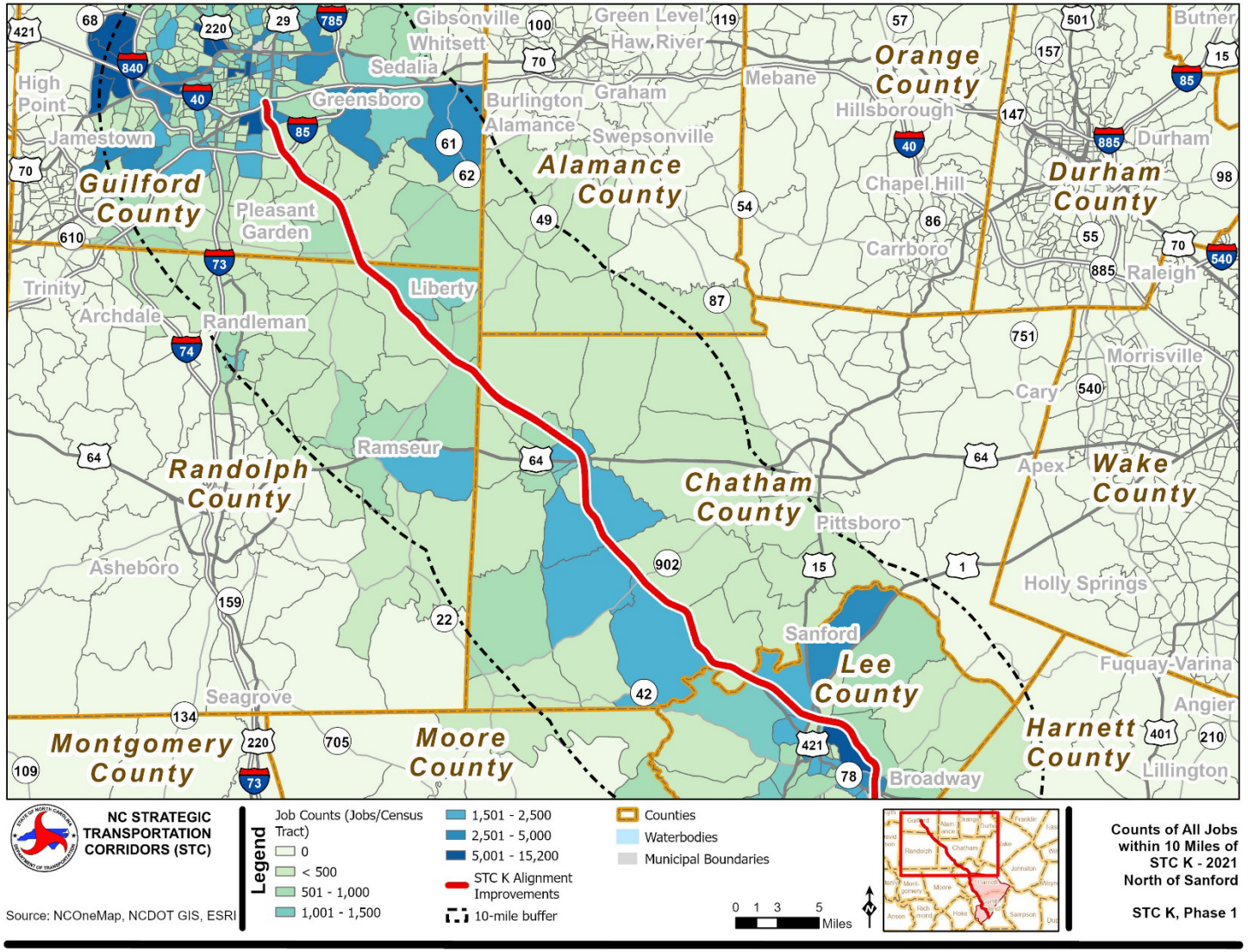


Figure 42. Counts of All Jobs within 10 Miles of STC K – 2021 - South of Sanford

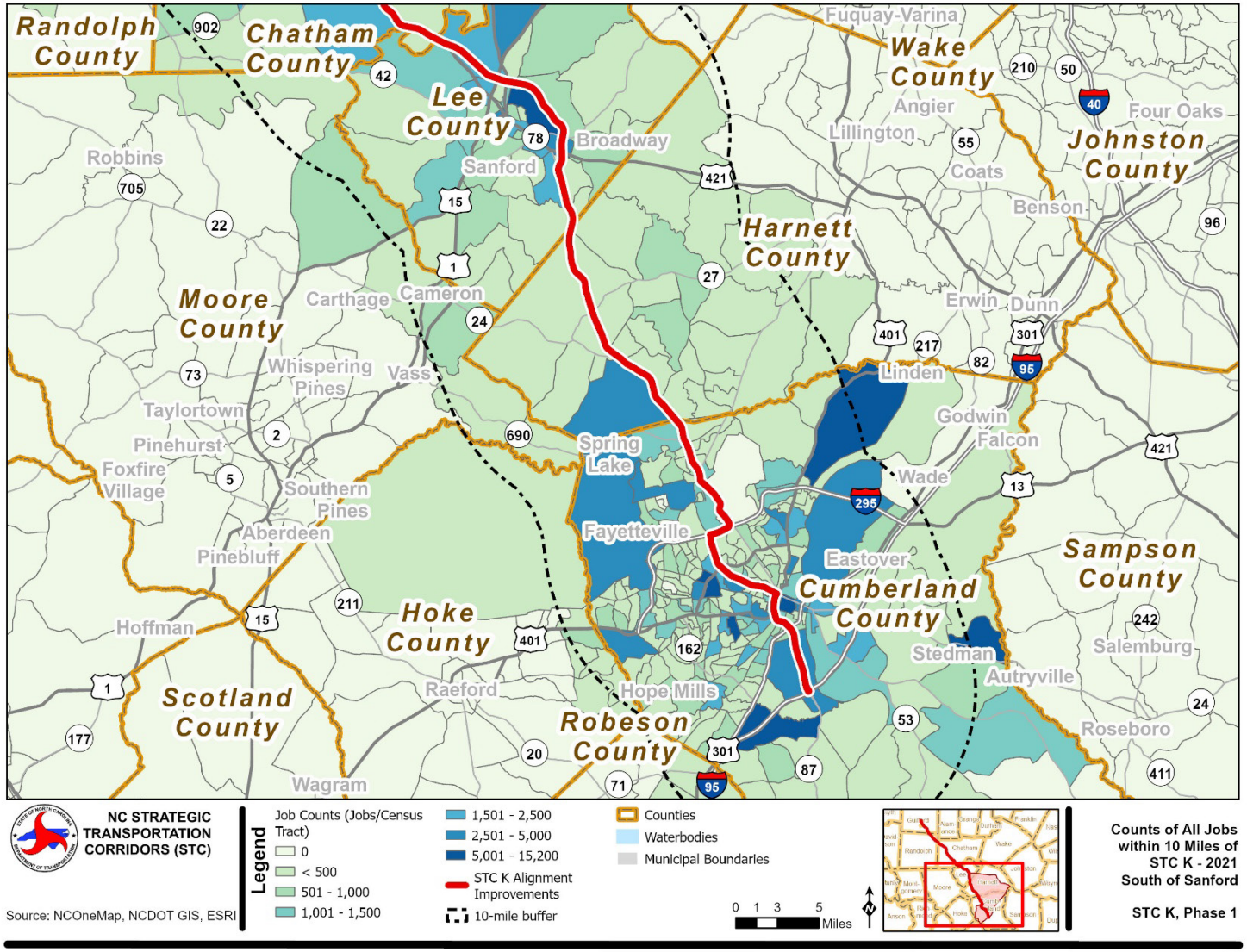


Table 19. Job Destination Counts Where Workers Live within 10 Miles of STC K (2022)

Place (City)	Count	Share (%)
Greensboro	60,499	17.8%
Fayetteville	34,957	10.3%
High Point	13,060	3.8%
Winston-Salem	7,587	2.2%
Charlotte	6,187	1.8%
Sanford	5,729	1.7%
Raleigh	5,008	1.5%
Hope Mills	3,881	1.1%
Durham	3,317	1.0%
Burlington	3,165	0.9%

Source: US Census Bureau 2022

Table 20. Means of Transportation to Work for Block Groups within 10 Miles of STC K (2022)

Counties	Drives to Work (includes taxi, carpool, and motorcycle)	Drives to Work (Carpooled)	Public Transit	Bike	Walk	Work from Home
Guilford	85.3%	8.2%	1.7%	0.2%	2.0%	9.9%
Randolph	92.8%	10.4%	0.0%	0.0%	0.4%	6.2%
Chatham	86.7%	9.4%	0.3%	0.1%	3.7%	7.3%
Lee	93.3%	10.6%	0.2%	0.0%	1.1%	4.7%
Cumberland	88.5%	9.9%	0.4%	0.1%	4.4%	5.5%
Harnett	92.4%	7.6%	0.0%	0.0%	1.6%	5.0%
Total	87.8%	9.0%	0.9%	0.1%	2.7%	7.5%

Source: US Census Bureau 2022

Figure 43. Percent Driving to Work by Block Group 2022 - North of Sanford

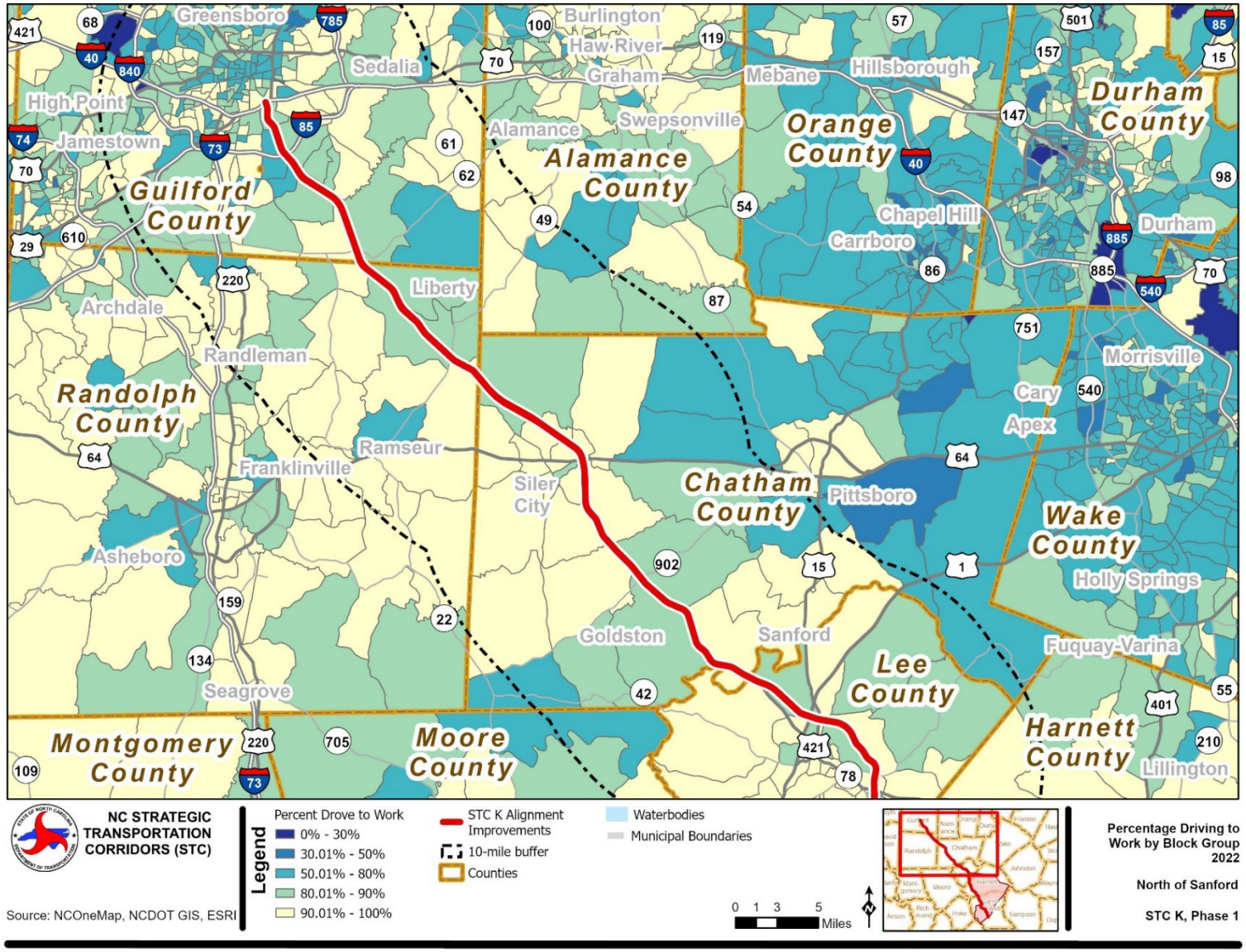
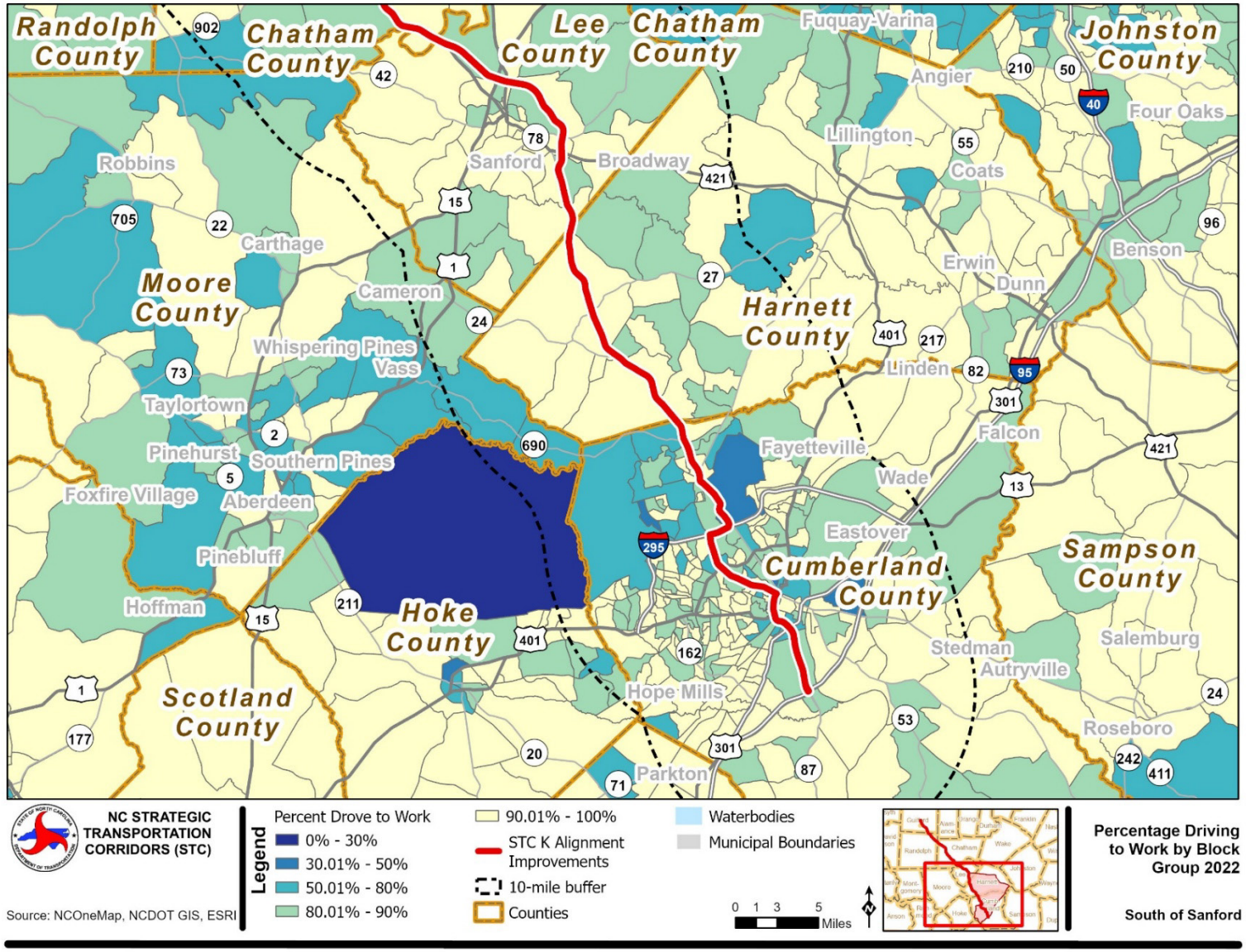


Figure 44. Percent Driving to Work by Block Group 2022 - South of Sanford



4.2.5 Existing 2023 Travel Markets

Travel markets are represented by the traffic flows obtained from Streetlight data between key origin and destination (O-D) zones or road gateways along STC K. StreetLight is a transportation "Big Data" analytics provider that processes anonymized location data from smartphones and connected vehicles to generate O-D metrics for roadway corridors. These StreetLight O-D metrics are an effective way to show how vehicles travel between gateways along a corridor and to identify the importance of various O-D travel markets.

Table 21 presents the winter (January, February, March) 2023 daily O-D vehicle trip information for 11 key gateways and zones on STC K. Origin gateways or zones are shown in the rows and destinations in the columns. Each gateway represents a location or point on an STC K roadway that traffic flows into or out of the network. Large zones are used to represent Sanford, Fort Bragg, and parts of Fayetteville because several roadways within each zone intersect the study corridor. Using zones allows for simplifying the O-D table. This list of zones and gateways does not capture all possible O-D pairs – there are many smaller O-D pairs along the corridor that are not represented as they only generate a small number of trips. However, the pairs in this table represent the largest flows along STC K. Figure 45 and Figure 46 map the daily origin flows that each gateway and zone load onto STC K roadways.

The STC K StreetLight O-D travel market analysis indicates the following:

- Fayetteville and Fort Bragg are the largest trip generators and O-D pair along the corridor.
- Sanford is a major trip generator at the midpoint of the corridor. The city generates over 25,800 daily trips along the corridor, with US 1 north of Sanford generating over 20,600 daily trips and US 501 south of Sanford generating over 16,000 daily trips. Trips originating from Sanford head north to the Triangle region (38 percent), south via US 501 (34 percent), and east via US 421 (20 percent), while trips with Sanford as the destination come from the north (40 percent), south (33 percent), and east (19 percent).
- The south end I-95 gateway generates over 16,200 daily trips. However, most of those trips (more than 90 percent) have a destination in the Fayetteville zone. Only a small number of trips (7 percent) travel north through Fayetteville to Fort Bragg. A smaller number of trips (less than 2 percent) travel to Sanford or highways in the vicinity (US 1, US 421, and US 501).

4.2.6 Freight Flows

North Carolina's freight system plays a critical role for its residents and businesses daily. The freight system is responsible for a range of services including keeping store shelves stocked, allowing manufacturing plants to operate, transporting fuel to keep vehicles moving, and providing an efficient, reliable way for the US military to move troops and equipment. North Carolina's Statewide Multimodal Freight Plan was updated in 2023 and identifies critical infrastructure; operational, institutional, and market-related issues; and chokepoints impacting the state's freight transportation system (NCDOT 2023).

Table 21. STC K Key Daily Origin-Destination Vehicle Trips (January through March 2023)

Origin/ Destination Trips	Fayetteville	Fort Bragg	Greensboro – Medium	North End I-40	Sanford	South End I-95	US 1 North of Sanford	US 421 East of Sanford	US 501 South of Sanford	US 64 East of STC K	US 64 West of STC K	Total Origin
Fayetteville	—	28,003	178	98	891	11,594	1,328	48	94	25	114	45,373
Fort Bragg	30,909	—	16	12	364	1,011	381	3	73	4	16	32,789
Greensboro – Medium	163	4	—	9,969	182	31	87	130	38	417	224	11,245
North End I-40	124	9	10,795	—	114	23	34	70	33	181	91	11,474
Sanford	923	317	194	120	—	131	9,900	5,137	8,750	96	264	25,832
South End I-95	14,640	1,214	26	15	108	—	154	2	16	7	34	16,216
US 1 North of Sanford	1,328	427	94	50	10,540	196	—	777	7,141	47	91	20,691
US 421 East of Sanford	34	4	129	55	4,955	3	1,084	—	303	40	191	6,798
US 501 South of Sanford	102	73	51	39	8,763	28	6,678	272	—	26	67	16,099
US 64 East of STC K	28	2	562	270	104	8	40	34	37	—	7,275	8,360
US 64 West of STC K	166	20	227	107	290	48	93	216	63	6,600	—	7,830
Total Destination	48,417	30,073	12,272	10,735	26,311	16,073	19,799	6,689	16,548	7,443	8,367	202,707

Figure 45. Gateway Originating Trips - North of Sanford

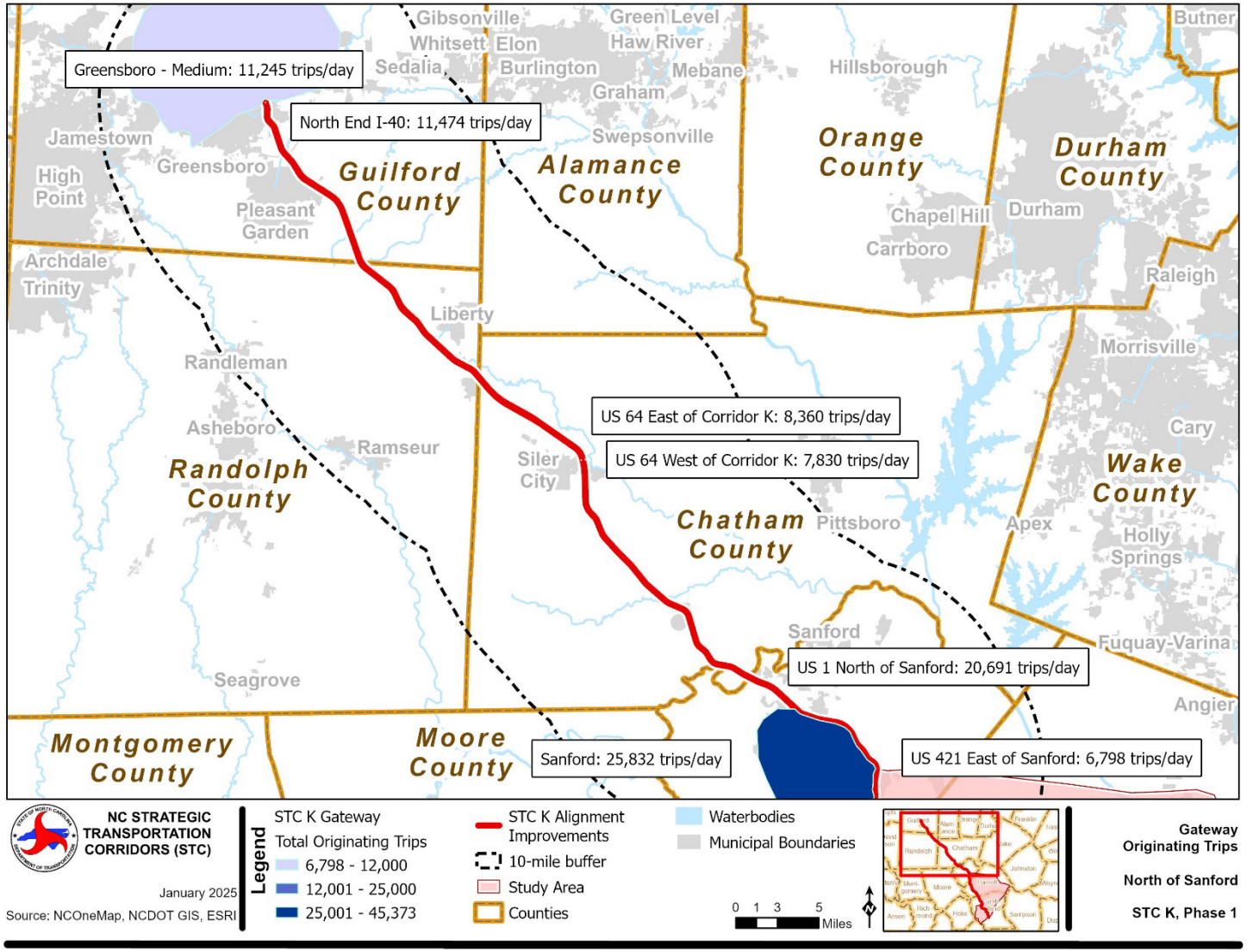
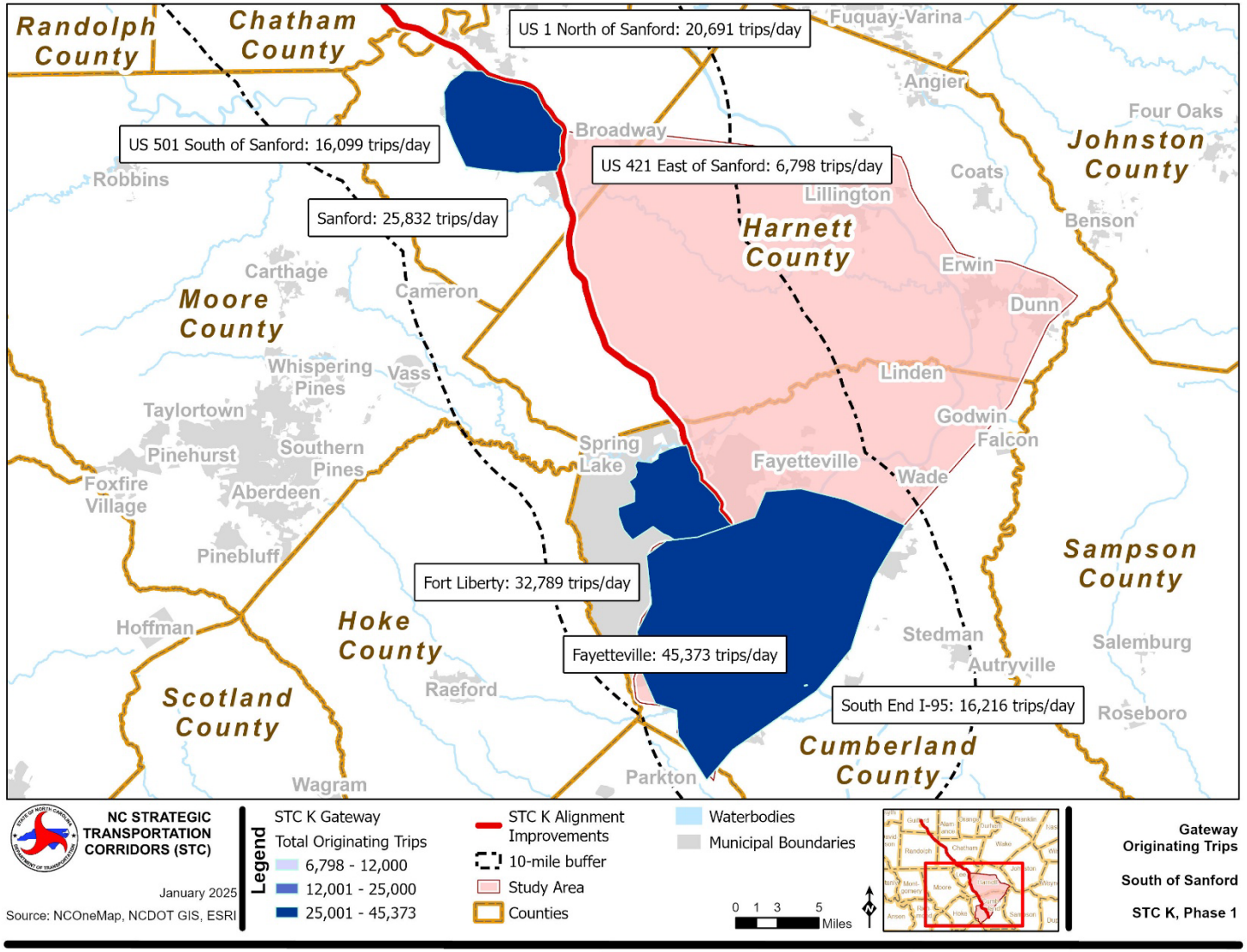


Figure 46. Gateway Originating Trips - South of Sanford



The Statewide Multimodal Freight Plan identifies various freight performance metrics and highlights how STC K plays a key role in the state's freight network, which includes:

- The STC K highway segments (US 421, NC 24, and NC 87) are all identified on the North Carolina Priority Highway Freight Network, which serves as the foundation for designation as a Critical Urban Freight Corridor or Critical Rural Freight Corridor.
- The most northern segment of US 421 from I-85 to the Greensboro-Randolph Megasite (Toyota Battery Manufacturing) has been designated as a Critical Urban Freight Corridor.
- Two segments of STC K have been identified as Critical Rural Freight Corridors: US 421 from the Greensboro-Randolph Megasite to US 64, and US 421 from US 1 to NC 87.

The Statewide Multimodal Freight Plan did not report any truck delays or travel time reliability issues for the highway segments along STC K.

4.2.7 Existing (2023) / Baseline Performance Metrics

The existing 2023/baseline analysis includes the following data and metrics that describe conditions along the corridor:

- Annual Average Daily Traffic (AADT)
- Truck volume percentage
- Peak-hour design volumes and Volume-to-Capacity ratios (V/C ratio)
- Corridor-level annual Vehicle Miles Traveled (VMT)

Additional metrics are provided in Section 3.2, including measures of travel time reliability (travel time index) and traffic safety (crash rate score).

4.2.7.1 Annual Average Daily Traffic

AADT volumes were obtained from NCDOT's official 2023 traffic monitoring data publication (NCDOT 2024). Figure 47 and Figure 48 show how traffic volumes vary along the corridor.

These traffic volume variations are summarized below:

- **Greensboro to North of Sanford**: AADT is approximately 10,000 on Old US 421 between I-40 and I-85 but increases sharply to 30,000 on US 421 south of I-85 as traffic diverts to and from I-85. South of Julian at NC 62, AADT decreases to about 20,000 and remains between 15,000 and 20,000 until reaching Sanford.
- **Sanford Area**: The US 421 Bypass carries approximately 30,000 AADT. After merging south of Sanford, NC 87 carries 25,000 to 35,000 AADT between Sanford and Spout Springs.
- **South of Spout Springs to I-295**: This section experiences the highest traffic levels, with 40,000 AADT north of Fort Bragg and over 60,000 at Fort Bragg to the I-295 interchange.
- **South of Fort Bragg to I-95**: AADT fluctuates between 18,000 and 31,000 along NC 87/Bragg Boulevard. South of US 401 Business, AADT averages around 30,000, with a slight decline approaching the corridor's southern terminus at I-95.

Figure 47. Existing 2023 AADT Traffic Volumes - North of Sanford

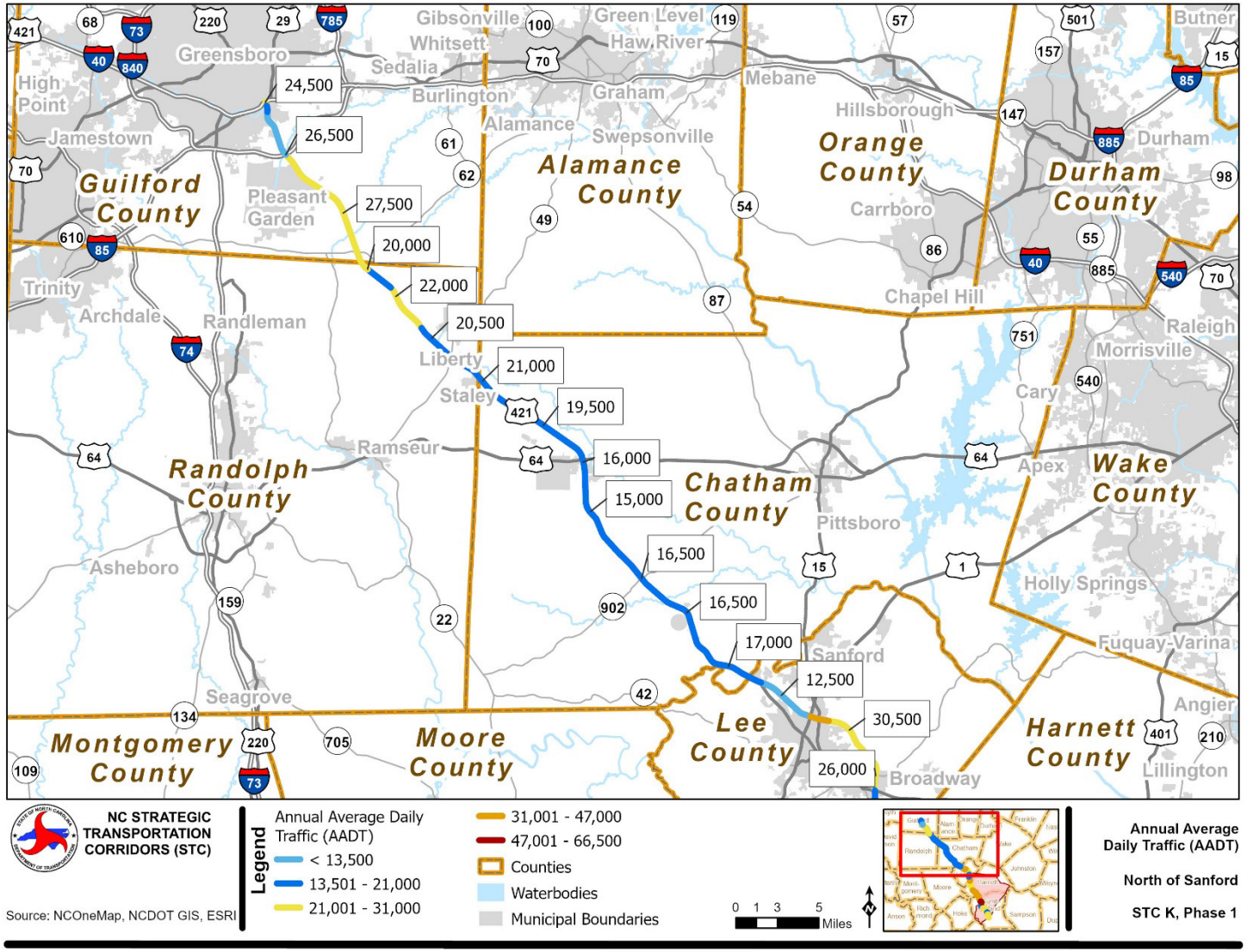
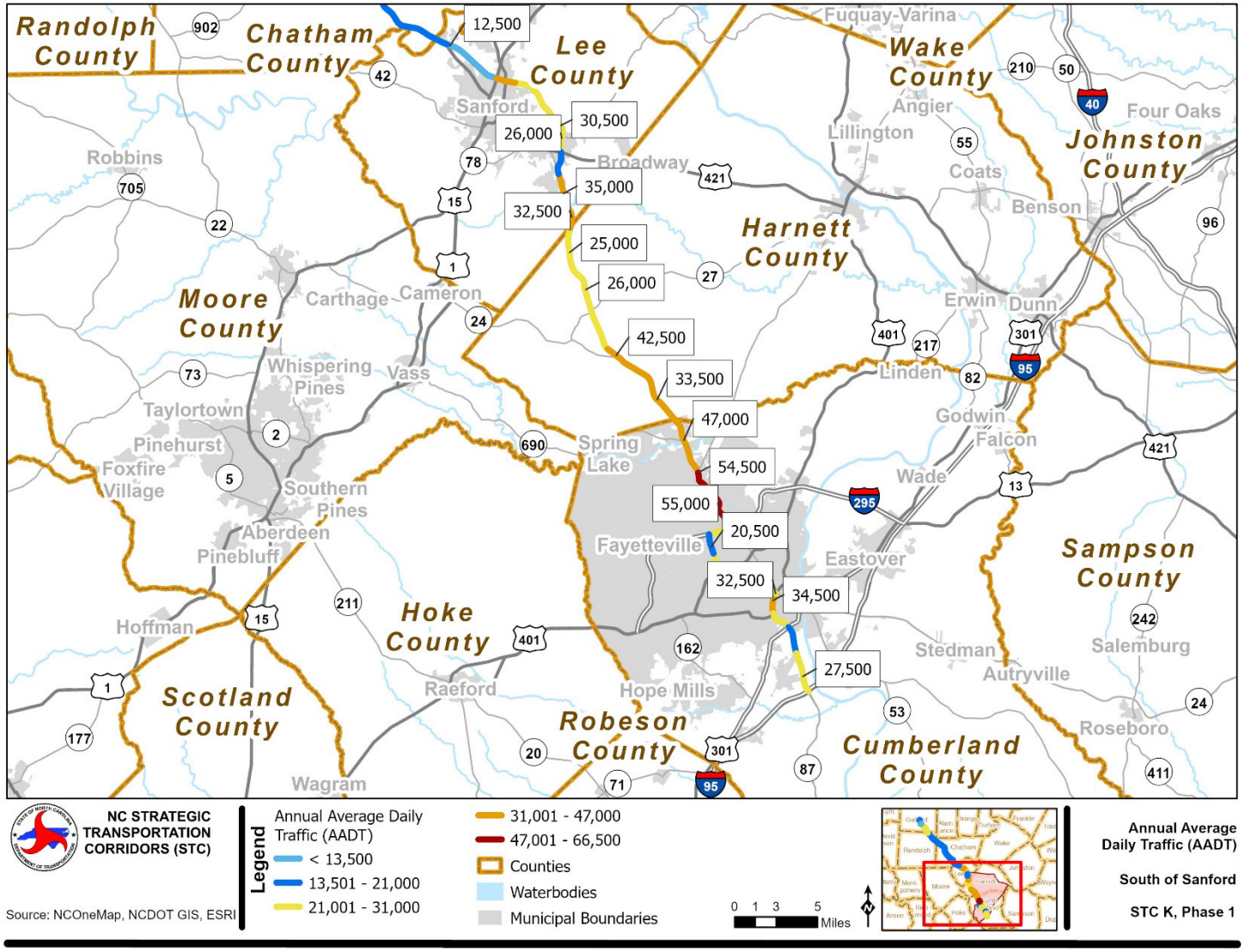


Figure 48. Existing 2023 AADT Traffic Volumes - South of Sanford



4.2.7.2 Truck Volumes and Percentages

The truck volumes were also obtained from NCDOT's official 2023 traffic monitoring data publication, as shown in Figure 49 and Figure 50. The truck percentages were calculated by dividing the daily truck volumes by AADT. The truck percentages also vary significantly from north to south:

- **North of Sanford**: Truck percentages are above 10 percent and peak at 17 percent between Goldston and Sanford.
- **Sanford Area**: The US 421 Bypass has truck percentages of 15.3 percent west of US 1 and 7 percent to 9 percent east of US 1.
- **South of Sanford**: Truck percentages drop below 6 percent along most of the corridor, with a slight increase to just over 6 percent near the southern terminus in Fayetteville between I-95 Business and I-95.

4.2.7.3 Peak-hour Volume-to-Capacity Ratio

The V/C ratio compares the traffic volumes to the roadway capacity and is a measure of congestion. V/C ratios at or close to 1.0 are an indication that the roadway segment is at capacity (e.g., at LOS E), with moderate congestion. Values greater than 1.0 are associated with severe traffic congestion and delay. For this analysis, V/C ratios were calculated based on two-way traffic volumes during the peak "design hour" to capture peak conditions along the corridor.

Figure 51 and Figure 52 present the V/C ratios for STC K north and south of Sanford, respectively.

The design hour volume was calculated by multiplying the AADT by a corridor-level average design hour factor (K factor). This average K factor, determined from traffic counts at key locations from NCDOT's Traffic Count Data System along STC K, was calculated as 8.5 percent (Midwest Software Solutions, LLC 2026). Figure 53, Figure 54, and Figure 55 provide AADT and peak design hour volumes by direction for each analysis segment. Link-level peak hour capacities were obtained from NCSTM Gen 4.5, with necessary adjustments made to account for local conditions.

The peak design hour V/C ratios are generally low across the corridor, which indicate low levels of congestion. The V/C ratios vary across the corridor:

- **North of Sanford**: Peak-hour V/C ratios remain consistently below 0.35, except near the northern end at the I-85 interchange where values are approximately 0.6, which still indicates low levels of congestion.
- **Sanford Area**: V/C ratios exceed 0.7 south of the merge of the US 421 Bypass and US 421 Business route. However, these are still well below the segment's capacity.
- **South of Sanford**: The highest V/C ratio of above 0.8 occurs between Spout Springs and NC 210, indicating moderate congestion. South of NC 210, the corridor transitions to a freeway configuration with more lanes and capacity, which reduces the V/C ratio to below 0.5.

4.2.7.4 Corridor-Level Annual Vehicle Miles Traveled

Annual VMT is calculated at 914,255,408 as of 2023.

Figure 49. Existing 2023 Truck Percentages - North of Sanford

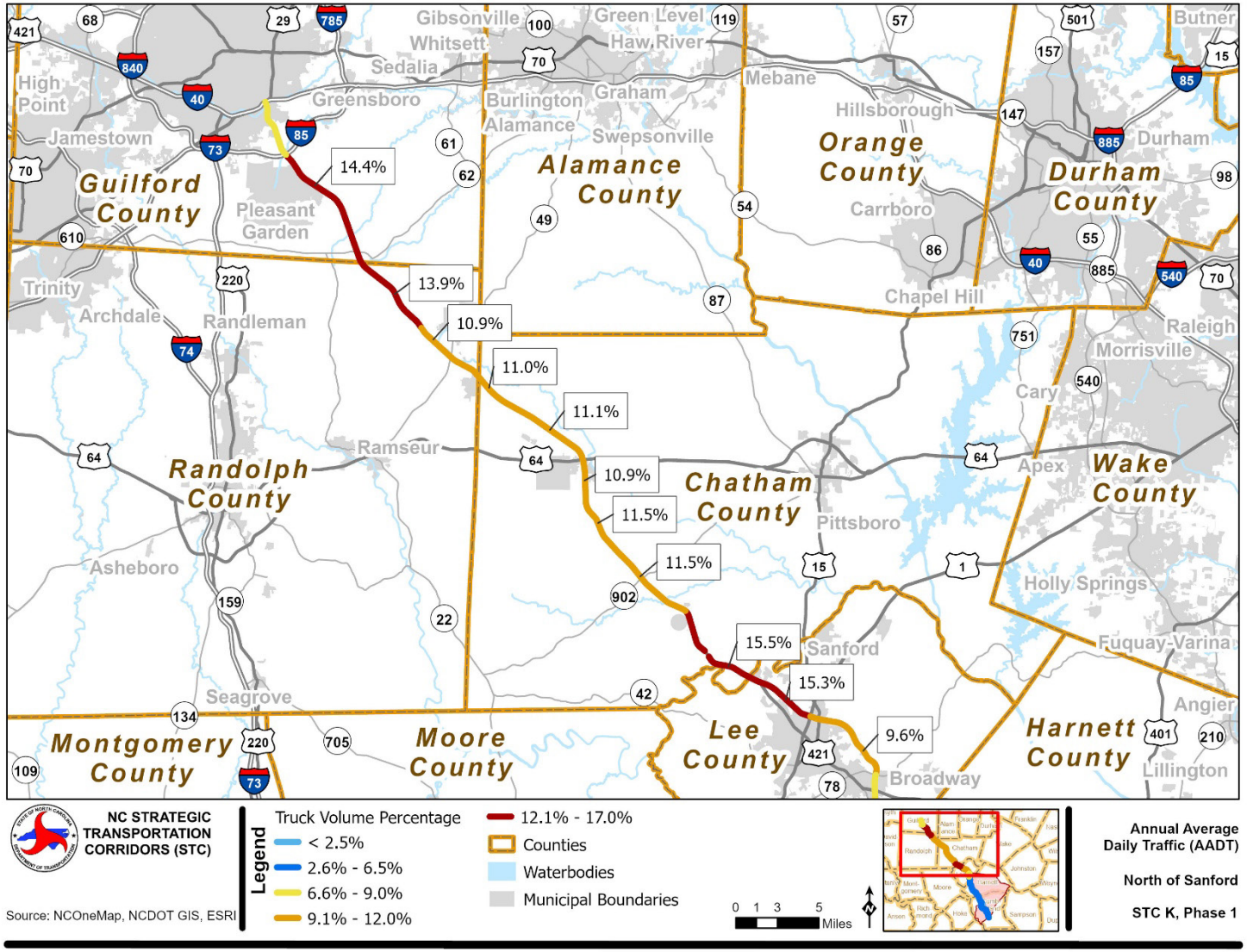


Figure 50. Existing 2023 Truck Percentages - South of Sanford

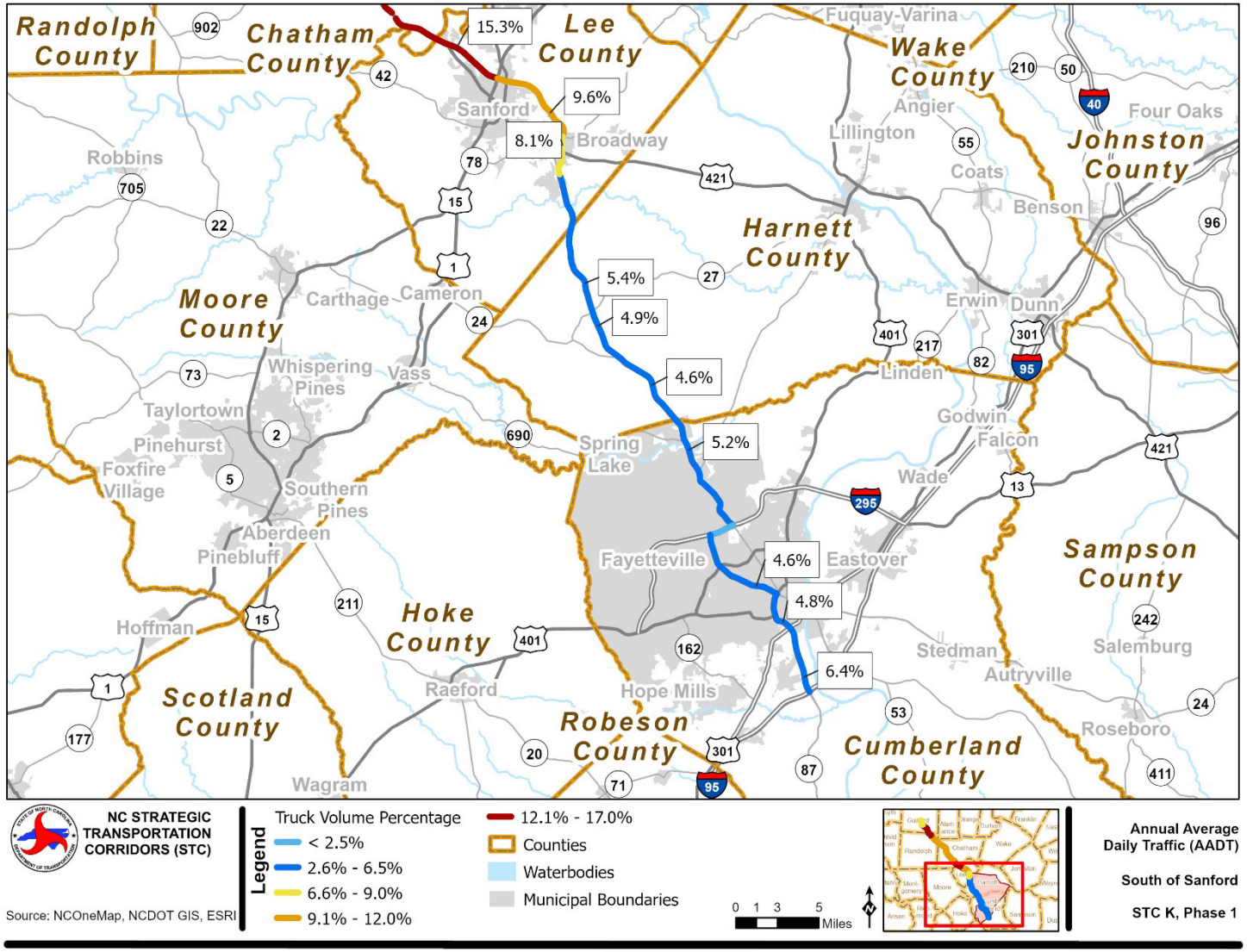


Figure 51. Existing 2023 Volume-to-Capacity Ratios - North of Sanford

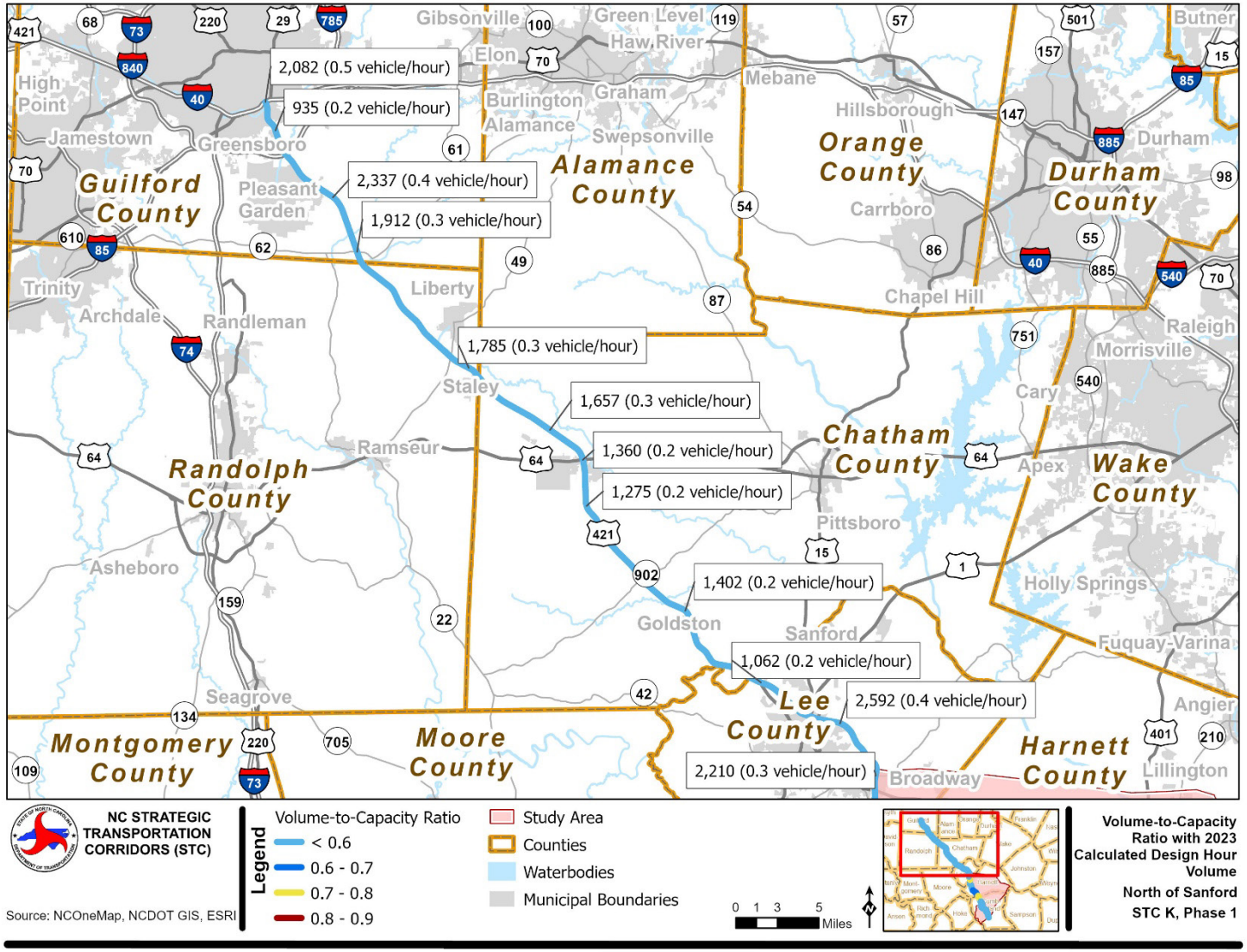


Figure 52. Existing 2023 Volume-to-Capacity Ratios - South of Sanford

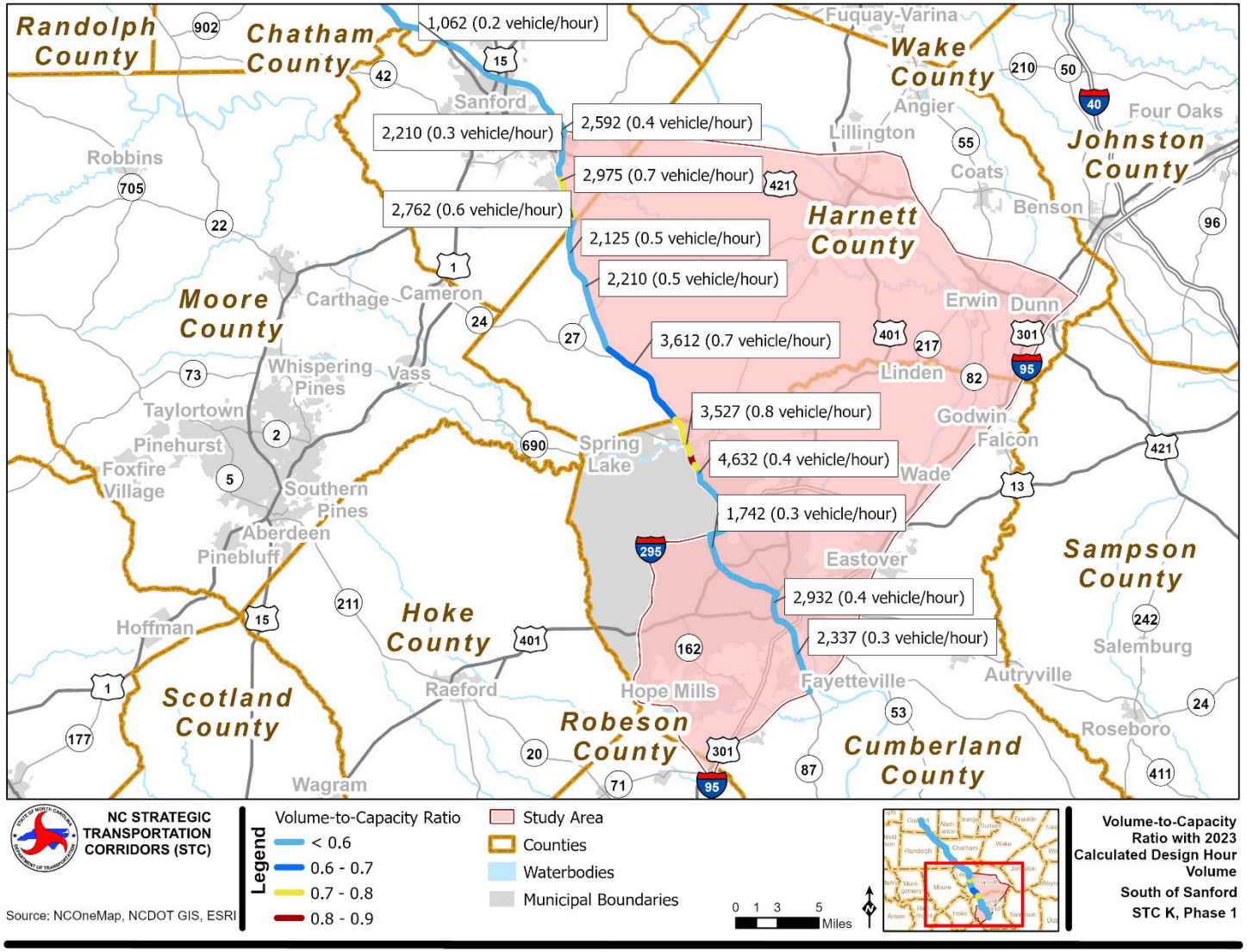


Figure 53. 2023 Daily and Peak Design Hour Directional Volumes (North)

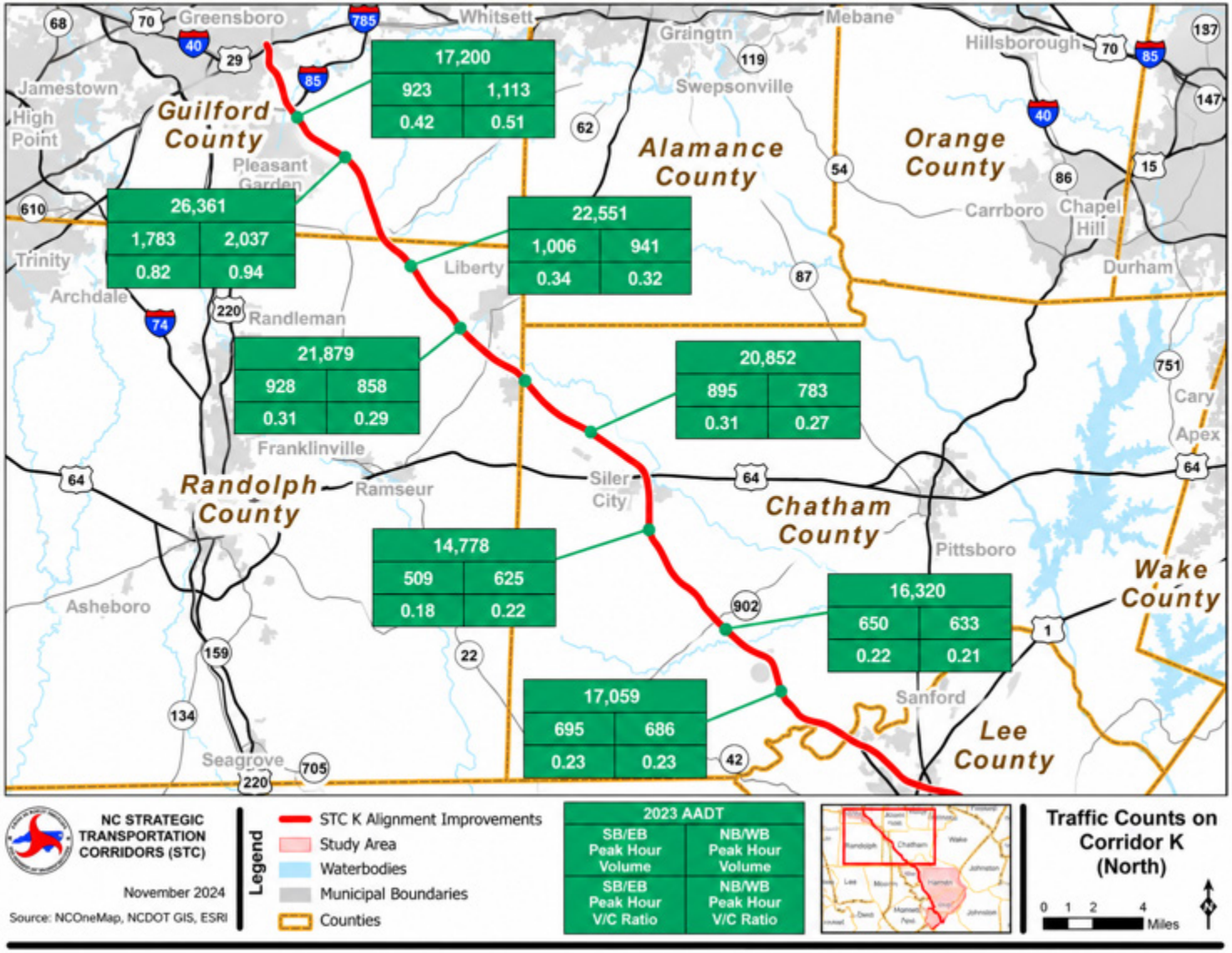


Figure 54. 2023 Daily and Peak Design Hour Directional Volumes (Middle)

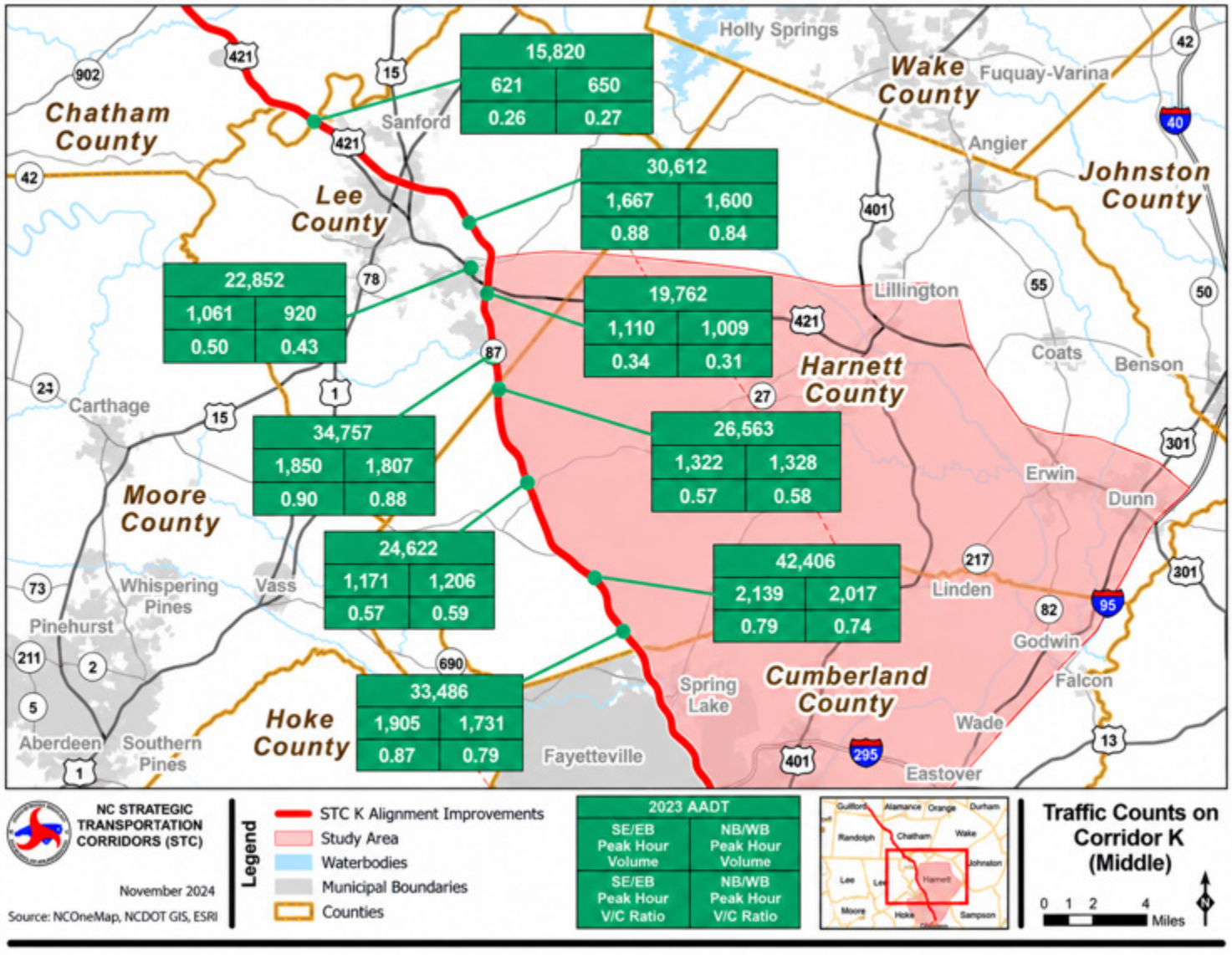
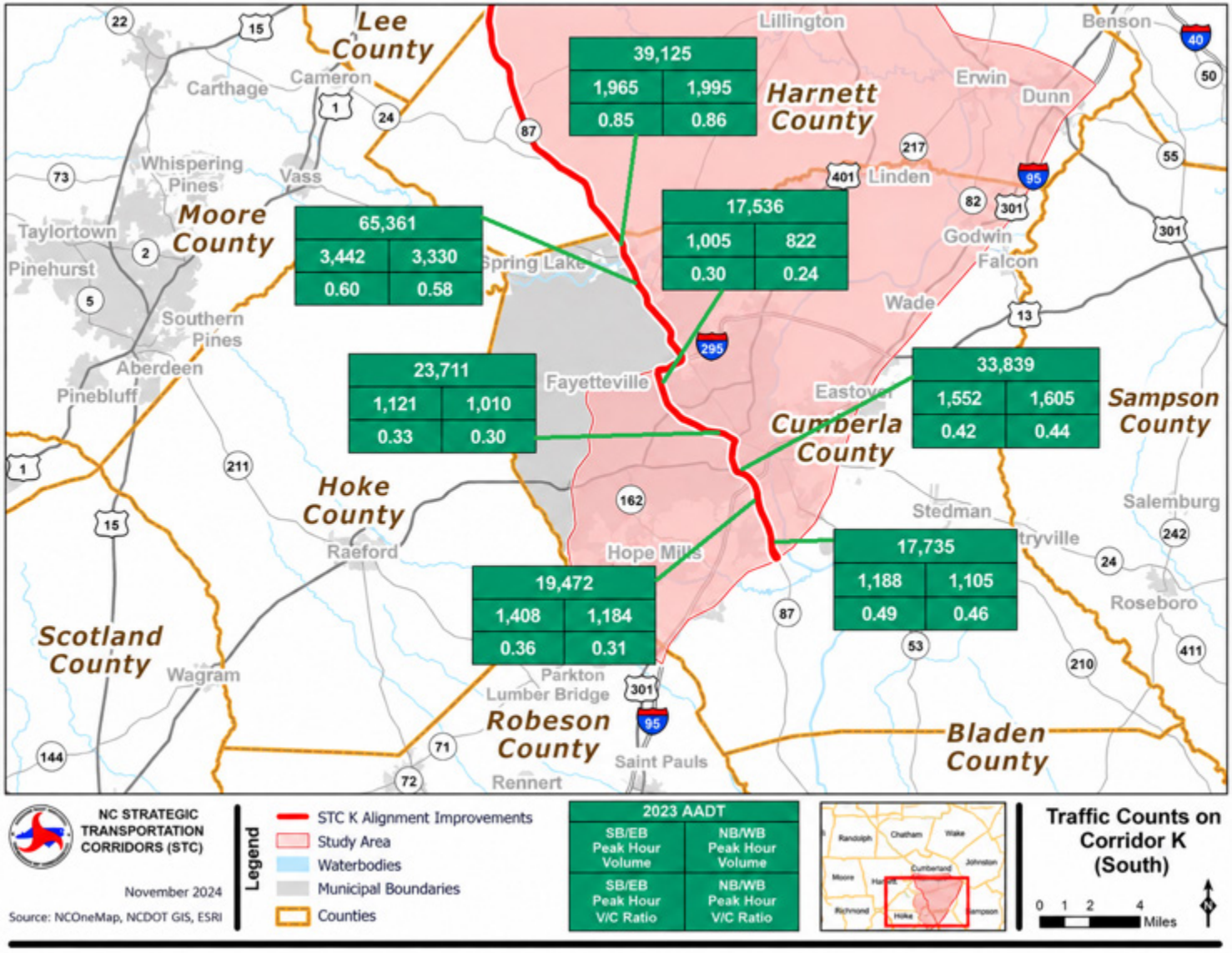


Figure 55. 2023 Daily and Peak Design Hour Directional Volumes (South)



4.3 Future Year (2045) Conditions

This section summarizes the forecasting approach for developing the results describing future year 2045 conditions. This analysis provides an estimate of future conditions that capture current assumptions about population and employment growth along the corridor and planned transportation projects. This provides a baseline for assessing future mobility needs along the corridor and developing corridor alternatives.

4.3.1 Forecasting Approach, Assumptions, and Process

The baseline and future year mobility forecasts were developed using NCSTM as the primary tool, which includes the entire STC K study area. This study used NCSTM Gen 4.5, which has a base year of 2017 and a horizon year of 2045, with intermediate years of 2020, 2025, 2030, 2035, and 2040. The Gen 4.5 model has four time periods in the model, including AM and PM peak periods, to represent the most congested travel conditions. The Gen 4.5 model's network includes all statewide and regionally tiered roadways, with additional roadway networks added in urban areas. Statewide model zones for North Carolina were developed based on the aggregation of regional model transportation analysis zones (TAZs) in urbanized areas and RPOs and census geographies elsewhere. The model uses base year socioeconomic data from the 2017 American Community Survey data and InfoUSA employment data, which may differ between regional models.

Consistency and reasonableness checks were applied to the model inputs and results within the study area, including a review of the following: socioeconomic data, transportation improvement projects coded for the horizon year, and a comparison of the model estimates of traffic volumes to Average Annual Weekday Traffic (AAWDT) published by NCDOT, which reflect average weekday daily traffic conditions (NCDOT 2023).

The NCSTM dataset includes socioeconomic data for 2020 and 2025, in addition to the base and horizon years, 2017 and 2045, respectively. The 2020 and 2025 data were used to create an estimate of 2023 socioeconomic data for the NCSTM model using interpolation. The 2023 socioeconomic estimates were compared to regional data from the following travel demand models:

- Piedmont Triad Regional Model Version 5.2 (PTRMv5.2)
- Fayetteville Regional Travel Demand Model for 2050 MTP
- Triangle Regional Model Generation 2 (TRMG2)

The model incorporates 2023 estimates of population and employment for areas covered by these models derived by applying an interpolation process to the model socioeconomic data. The comparisons of these estimates with the 2023 estimates based on the NCSTM data show small differences in population but large differences in employment, which could be attributed to differences in data sources as mentioned previously, and differences in employment definitions.

For the jurisdictions in STC K, the NCSTM 2023 population estimates were compared with the 2023 county-level population estimates published by the North Carolina Office of State Budget and Management (OSBM), which represent the official state estimates for planning and other purposes (NCDOT 2026). The differences range from 1 percent to 9 percent at the county level. These data

were used to adjust the original population estimates using the OSBM's 2023 county-level population estimates as control totals. For employment, there are no official employment estimates by the state that can be used as control totals. Since employment is less important than population and households in trip generation estimates, no further adjustments to employment data were performed.

The modified model was run to generate 2023 model volume estimates, which were compared to 2023 AAWDT data published by NCDOT. The model results are reasonably consistent with the 2023 AAWDT for most segments in the corridor, except for a few locations in Sanford. Deviations of model estimates from observed data are typical in these types of model forecasting processes and are generally adjusted during post-processing.

Changes in travel demand and traffic are driven largely by the growth and distribution of population and land use and changes in socioeconomic characteristics. Figure 56 and Figure 57 show the estimated population and employment growth between 2023 and 2045 for TAZs in the model. Figure 58 and Figure 59 provide additional detail on retail and non-retail employment growth.

Some of the socioeconomic distribution and growth characteristics in the corridor are highlighted below:

- Population is concentrated in urbanized areas along the corridor especially in places such as Greensboro, Fayetteville, Sanford, and Siler City in both 2023 and 2045. Most other areas, especially in the central section of the corridor, have population of less than 2,000 in 2023, which is projected to increase to just under 5,000 by 2045.
- The largest population increases between 2023 and 2045 are projected to occur in two TAZs located north of Fort Bragg and Fayetteville, which are expected to increase by over 7,100 and 6,400, respectively; the TAZ with the third-largest population increase (5,900) is located at the southern end of STC K (south of Fayetteville).
- Areas located in the central section of STC K (between Sanford and Siler City) are projected to see a moderate population increase, ranging from 500 to 2,000.
- The distribution of employment is concentrated in the urbanized areas, with limited distribution (less than 2,000 increase in 2045) in other areas such as the central section of STC K.
- Employment growth is concentrated at the northern and southern ends of STC K. The largest employment increases (over 1,000) are located primarily in urban areas such as Greensboro and Fayetteville. Areas north of Fayetteville within the study area are expected to see a modest employment increase ranging from 500 to 1,000, while the majority of areas along STC K are projected to experience only modest employment growth (less than 500).
- Non-retail employment and retail employment show a growth pattern similar to total employment. Areas with an increase of over 100 retail jobs and an increase of over 500 non-retail jobs are concentrated in Greensboro, Fayetteville, and Siler City. In contrast, most areas along STC K are expected to see modest retail employment increases of less than 100 and a non-retail employment increase of less than 500.

The programmed transportation projects along STC K and in the study area were reviewed and compared to those coded in the NCSTM's existing and committed network.

Figure 56. Population Growth from 2023 to 2045

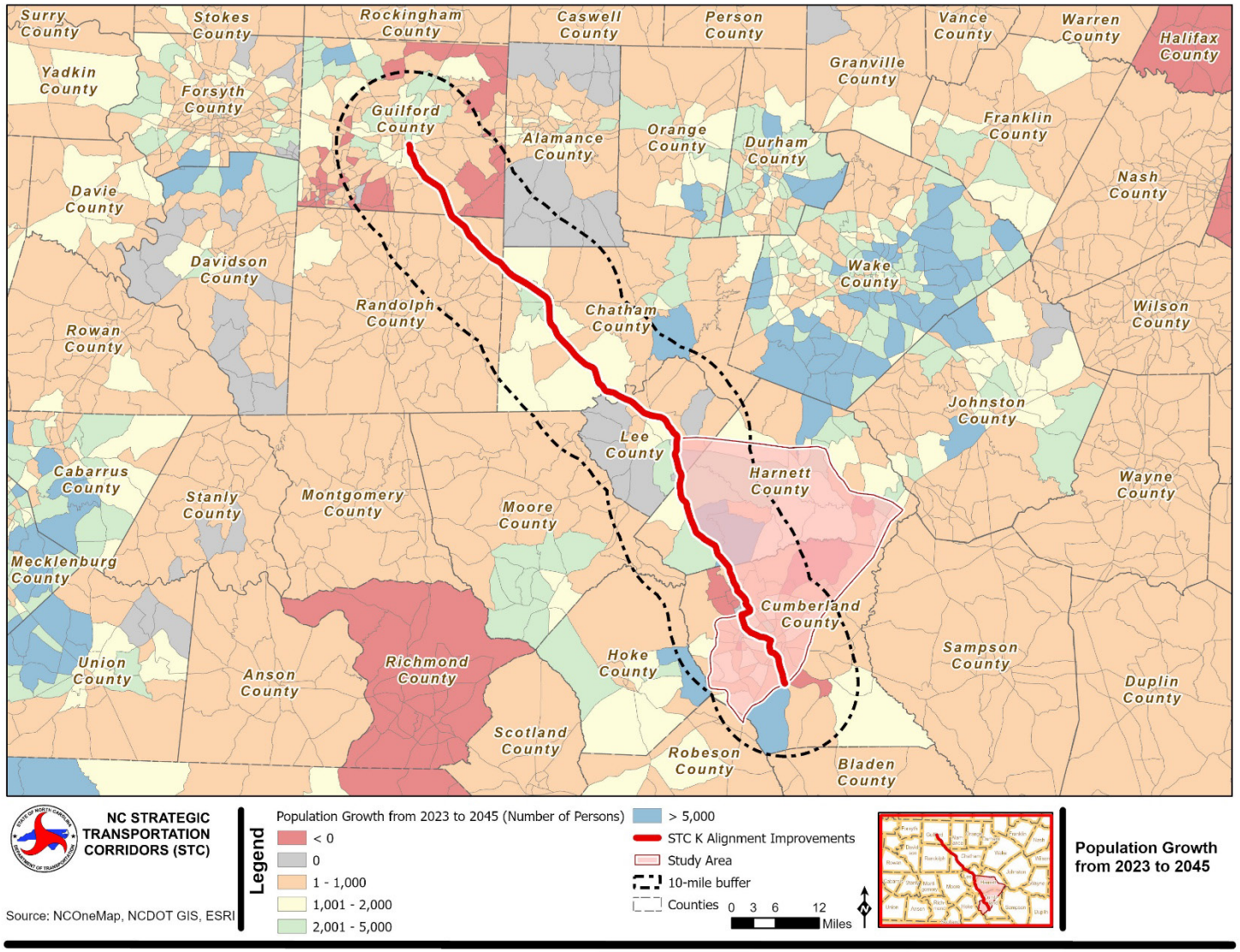


Figure 57. Employment Growth from 2023 to 2045

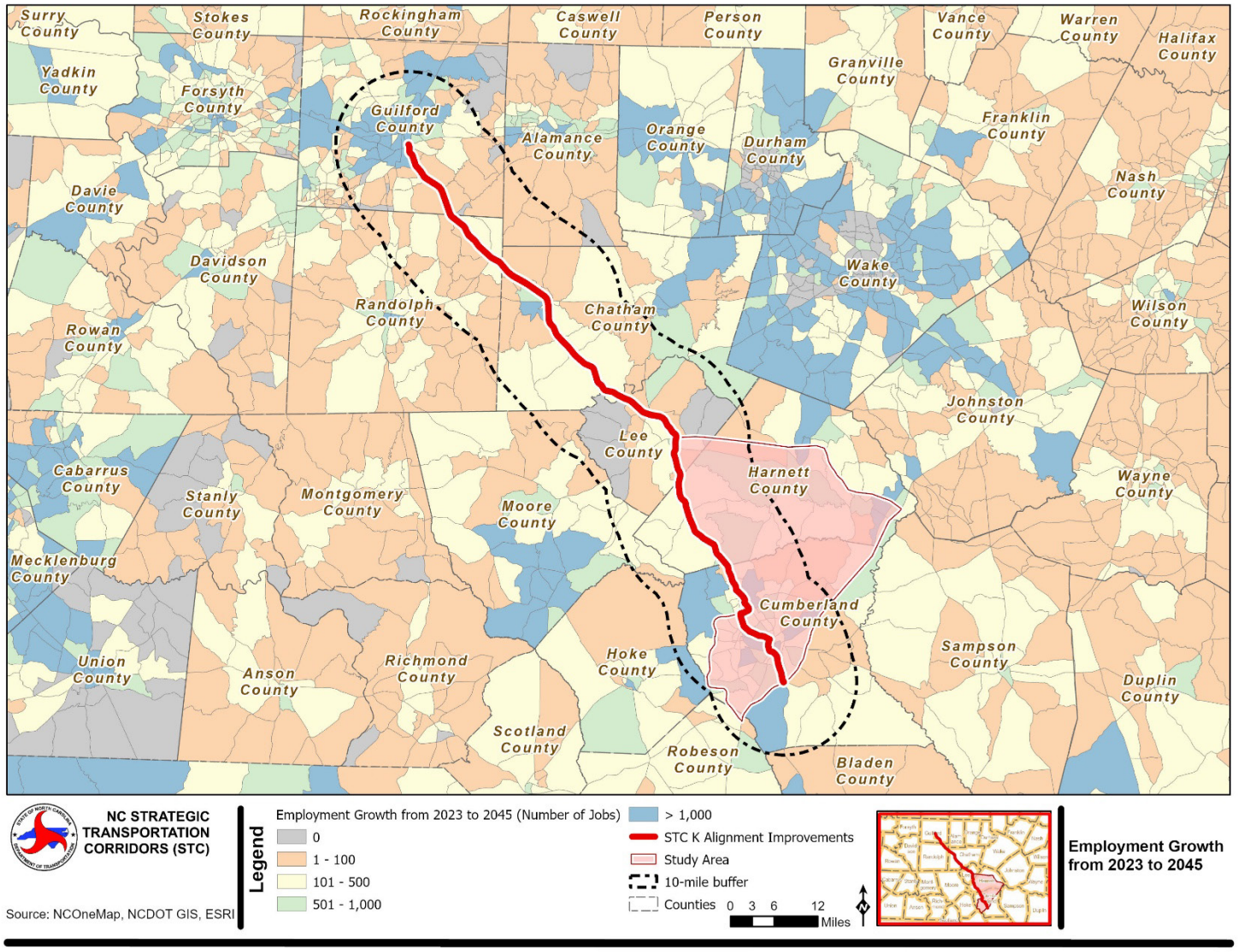


Figure 58. Retail Employment Growth from 2023 to 2045

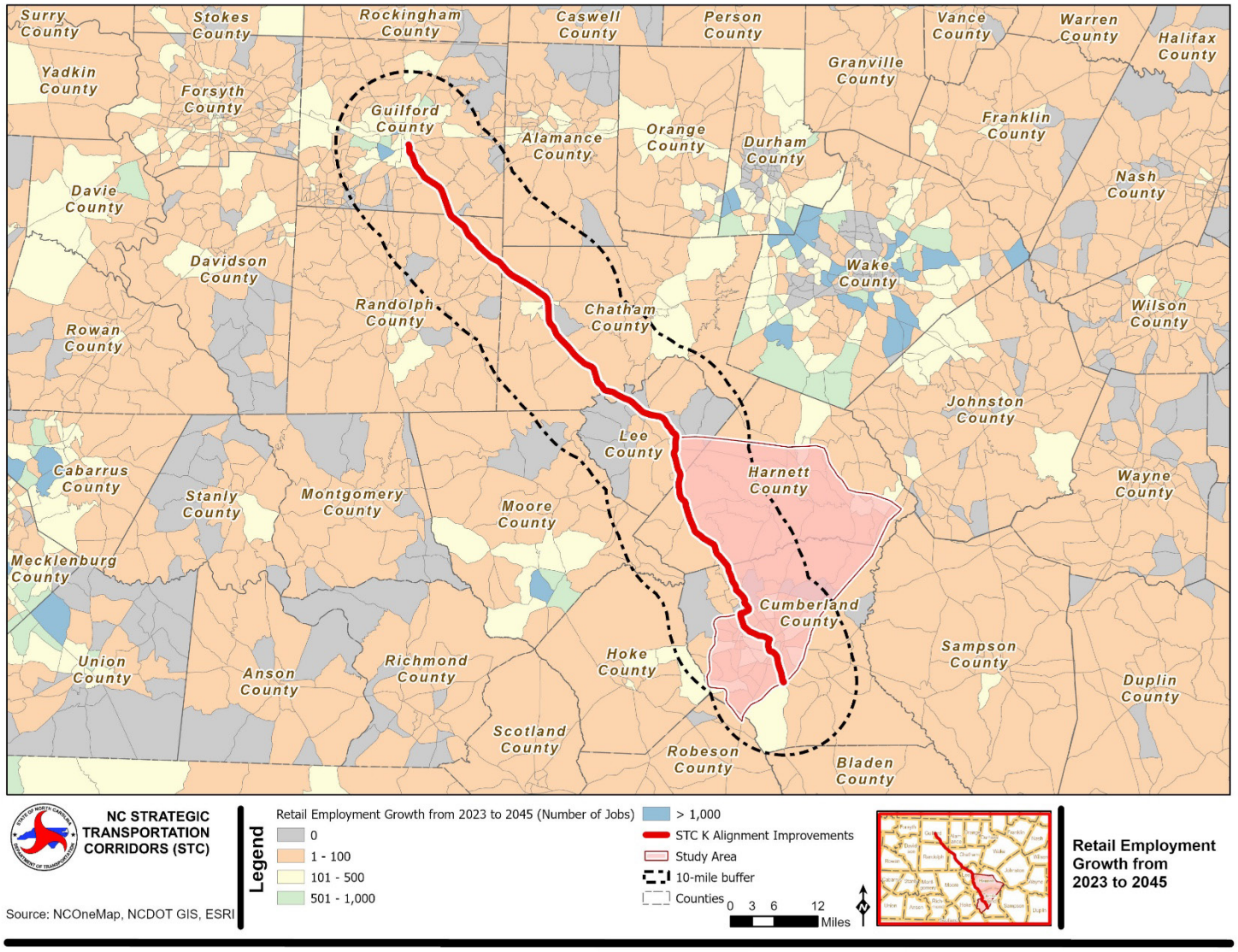


Figure 59. Non-Retail Employment Growth from 2023 to 2045

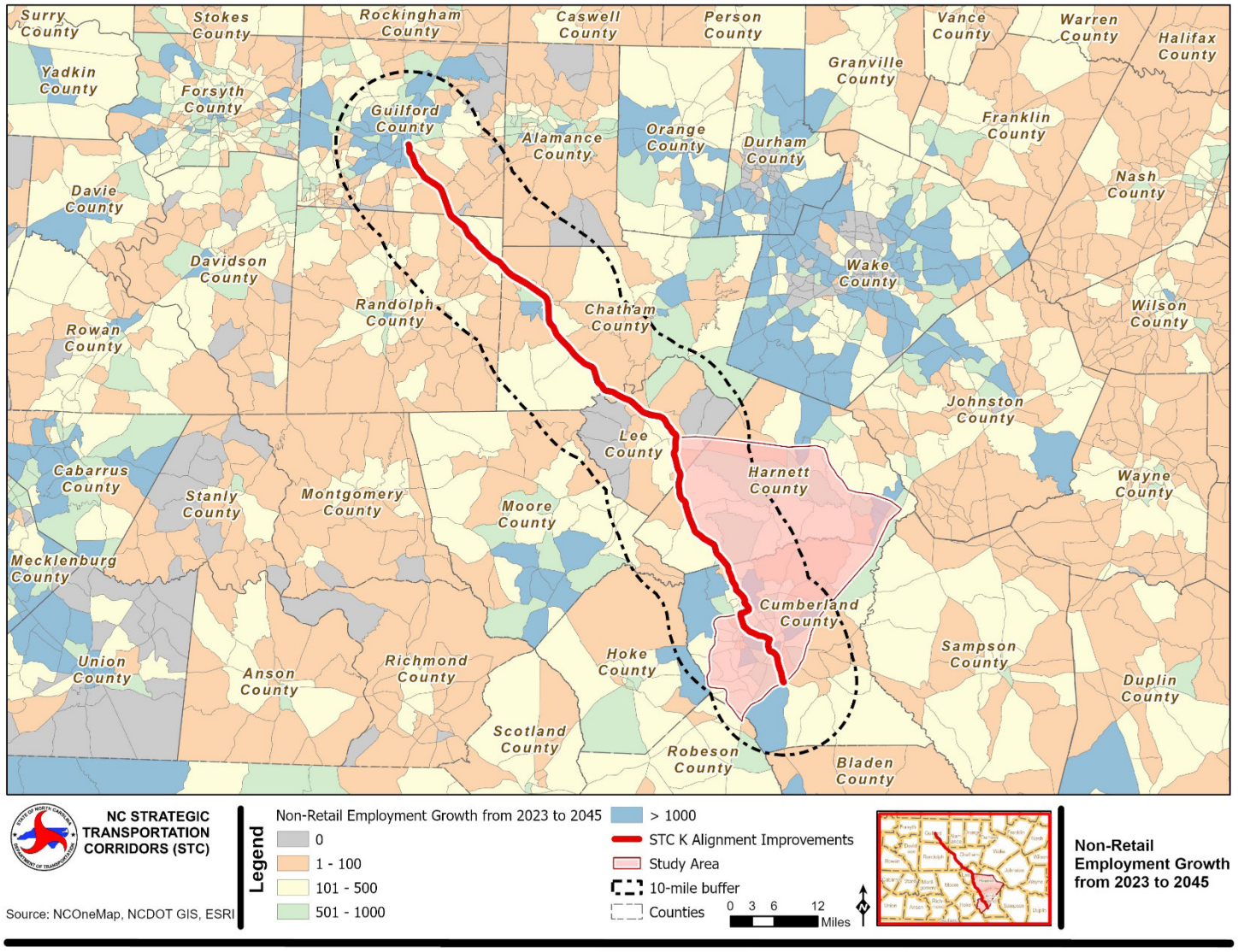


Figure 60 and Figure 61 present the planned and programmed STIP projects for the northern and southern parts of the corridor.

4.3.2 Future Year (2045) Performance Metrics

Similar to the existing/baseline 2023 analysis, the following performance metrics were assessed for all segments of the corridor for the forecast year 2045:

- AADT
- Peak-hour V/C ratio
- Corridor-level annual VMT

Truck percentages and other metrics such as TTI are not reported for the future conditions. The 2045 AADT numbers were developed by applying projected link-level growth between 2023 and 2045 to the base year 2023 AADT. The projected link-level growth was derived from NCSTM Gen 4.5 with necessary adjustments made to account for deviations from the observed volumes. For the V/C ratio calculations, link-level capacities were assumed to remain unchanged from 2023 for the future year 2045 scenario unless a programmed future project would add lane capacity. Corridor-level VMT calculations used the 2045 AADT values.

The key findings for the future year 2045 performance metrics are summarized below.

4.3.2.1 Annual Average Daily Traffic

Future year 2045 AADT volumes were developed using NCSTM Gen 4.5 with the assumptions and adjustments described in Section 4.3.1. Figure 62 and Figure 63 present the future year 2045 AADT forecasts. Detailed link-level data for 2023 and 2045 volumes along with growth rates were generated and evaluated. The key findings from the 2045 AADT forecasts are summarized below:

- **North of Sanford**:
  - AADT is approximately 15,000 between I-40 and I-85, increasing sharply to around 40,000 south of I-85.
  - South of Julian (NC 62), AADT decreases to about 30,000 before reaching Siler City. This section experiences the fastest growth along the corridor, averaging around 50 percent from 2023 to 2045.
  - South of Siler City (US 64), AADT decreases to around 20,000 until reaching Sanford.
- **Sanford Area**:
  - US 421 Bypass: AADT grows to approximately 40,000 in 2045.
  - After merging US 421 Bypass and US 421 Business, STC K (NC 87) carries 25,000 to 40,000 AADT to Spout Springs, with relatively low to moderate growth of approximately 12 percent.
- **South of Spout Springs to I-295**: This section continues to experience the highest overall future traffic levels, with AADT exceeding 87,000 just east of Fort Bragg.
- **South of Fort Bragg to I-95**: AADT fluctuates between 15,000 and 38,000 along NC 87/Bragg Boulevard. After US 401 Business, AADT varies between 22,000 and 38,000, reflecting the lowest growth projected along the corridor at approximately 9 percent.

Figure 60. STIP Programmed Projects - North of Sanford

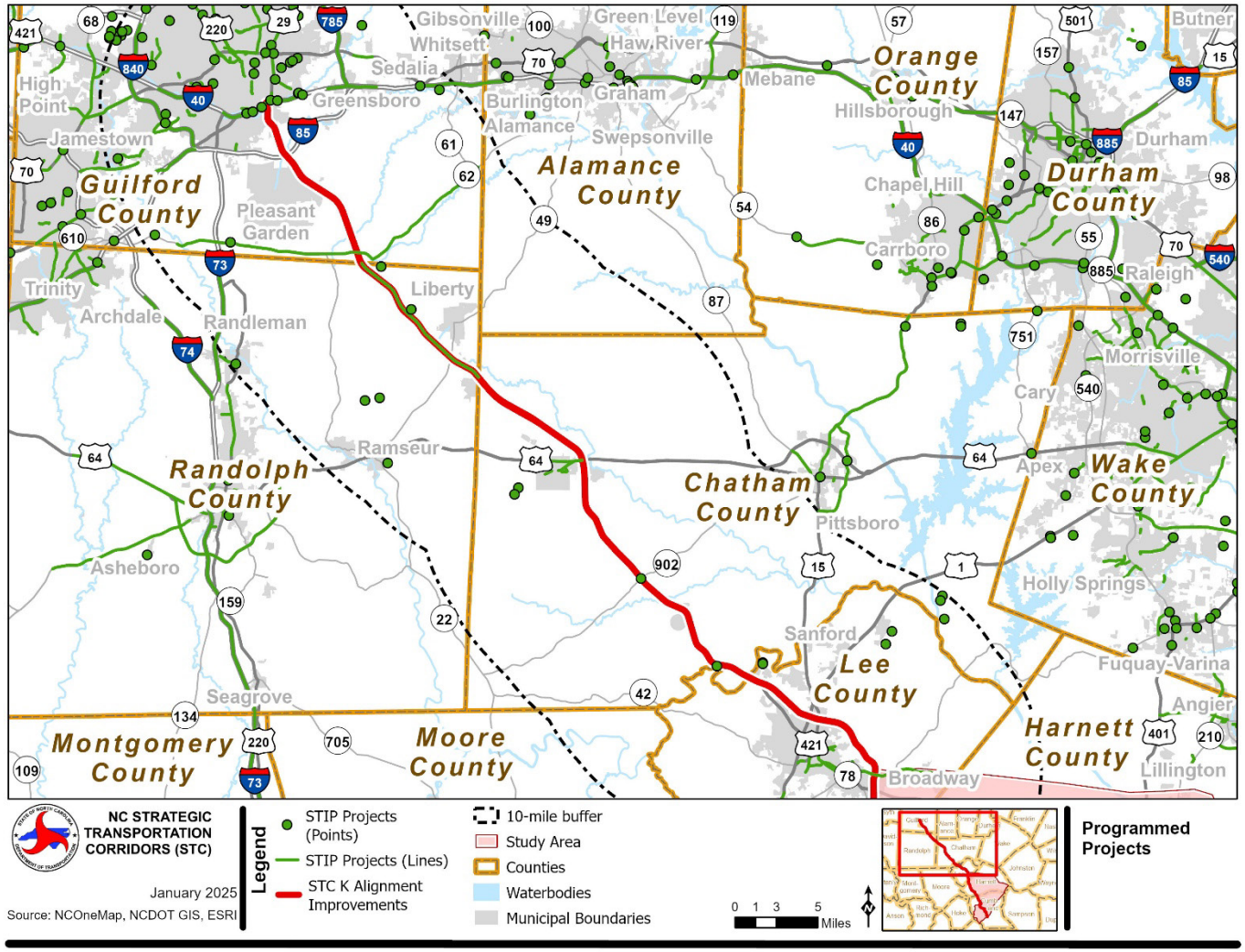


Figure 61. STIP Programmed Projects - South of Sanford

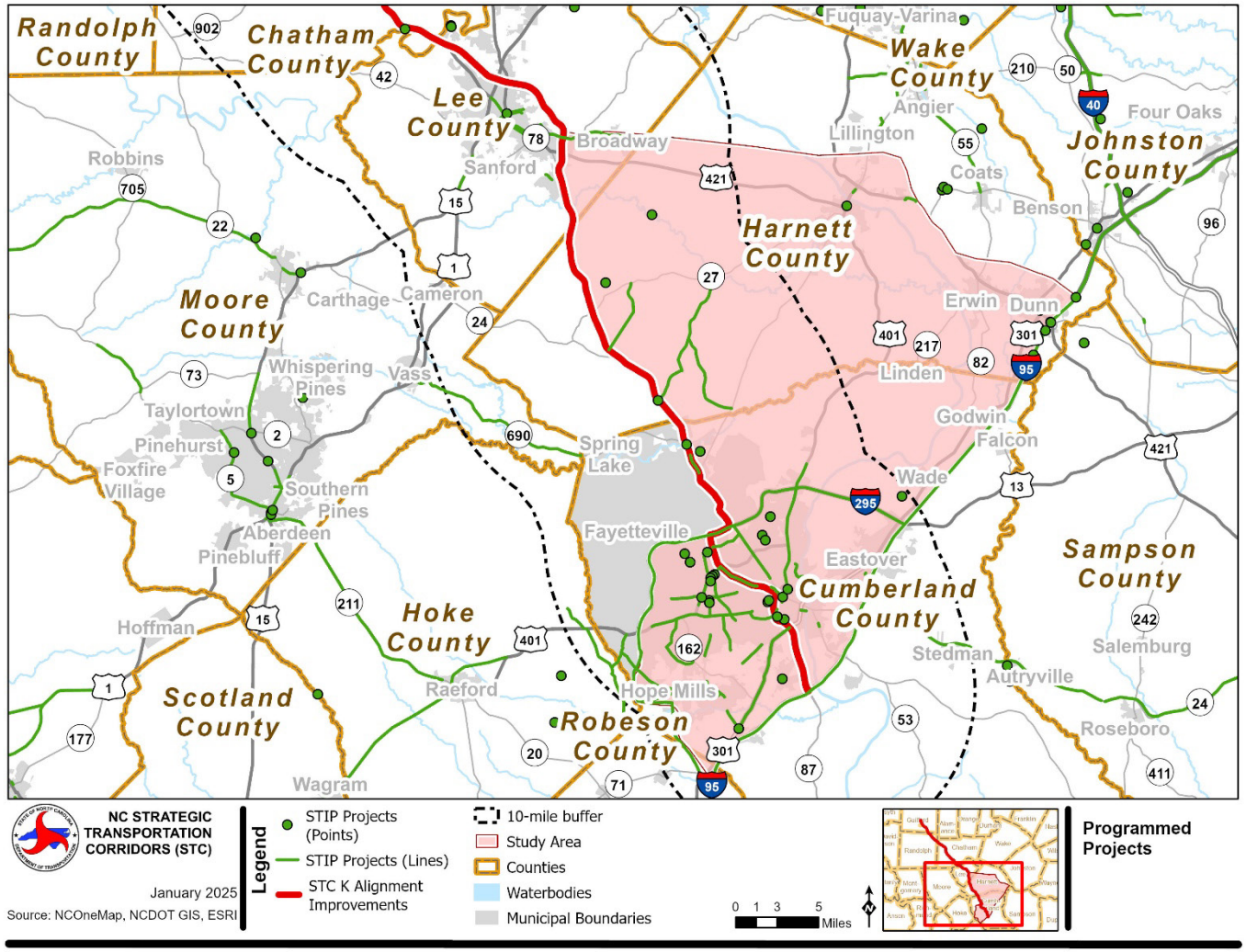


Figure 62. Future Year (2045) AADT Forecasts - North of Sanford

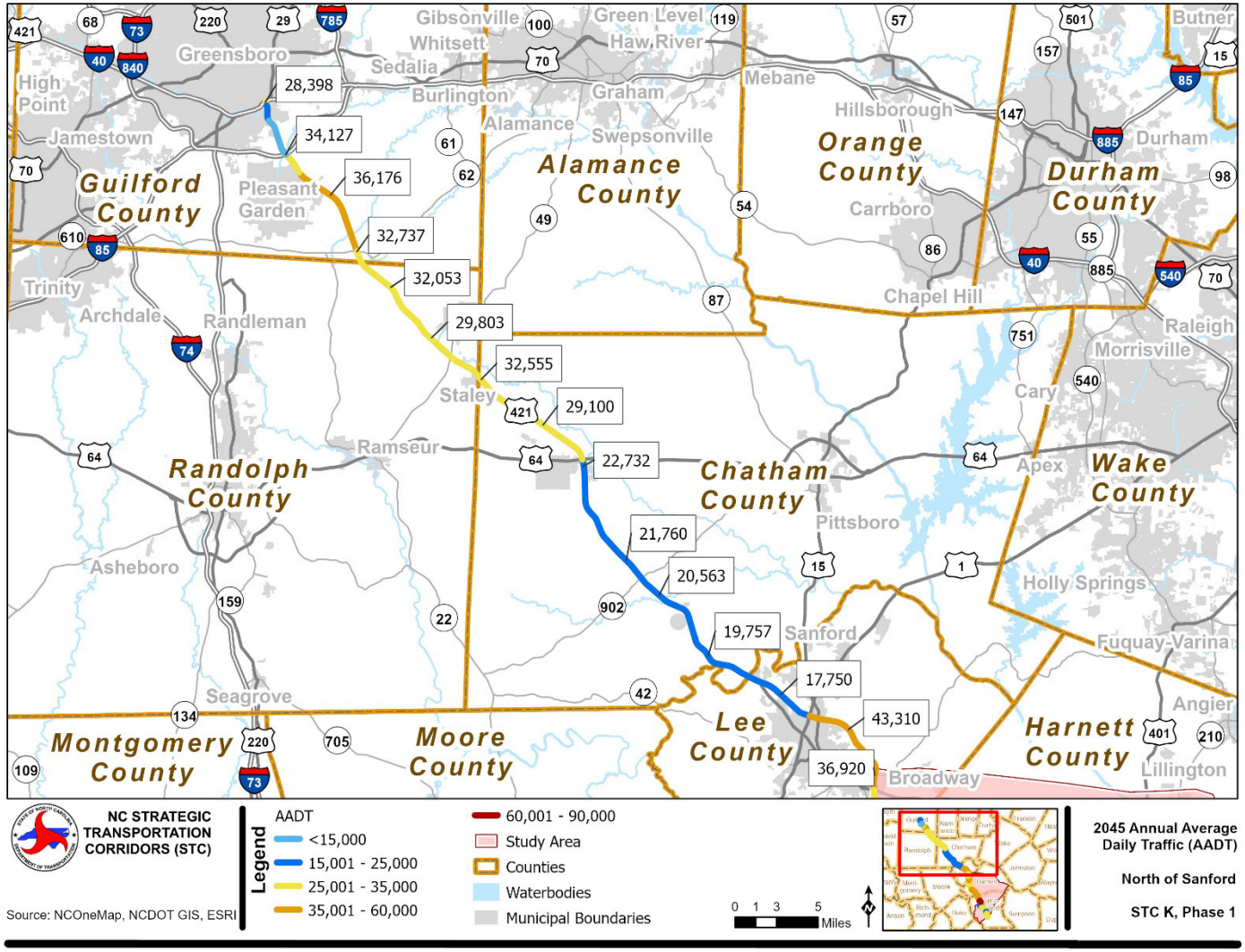
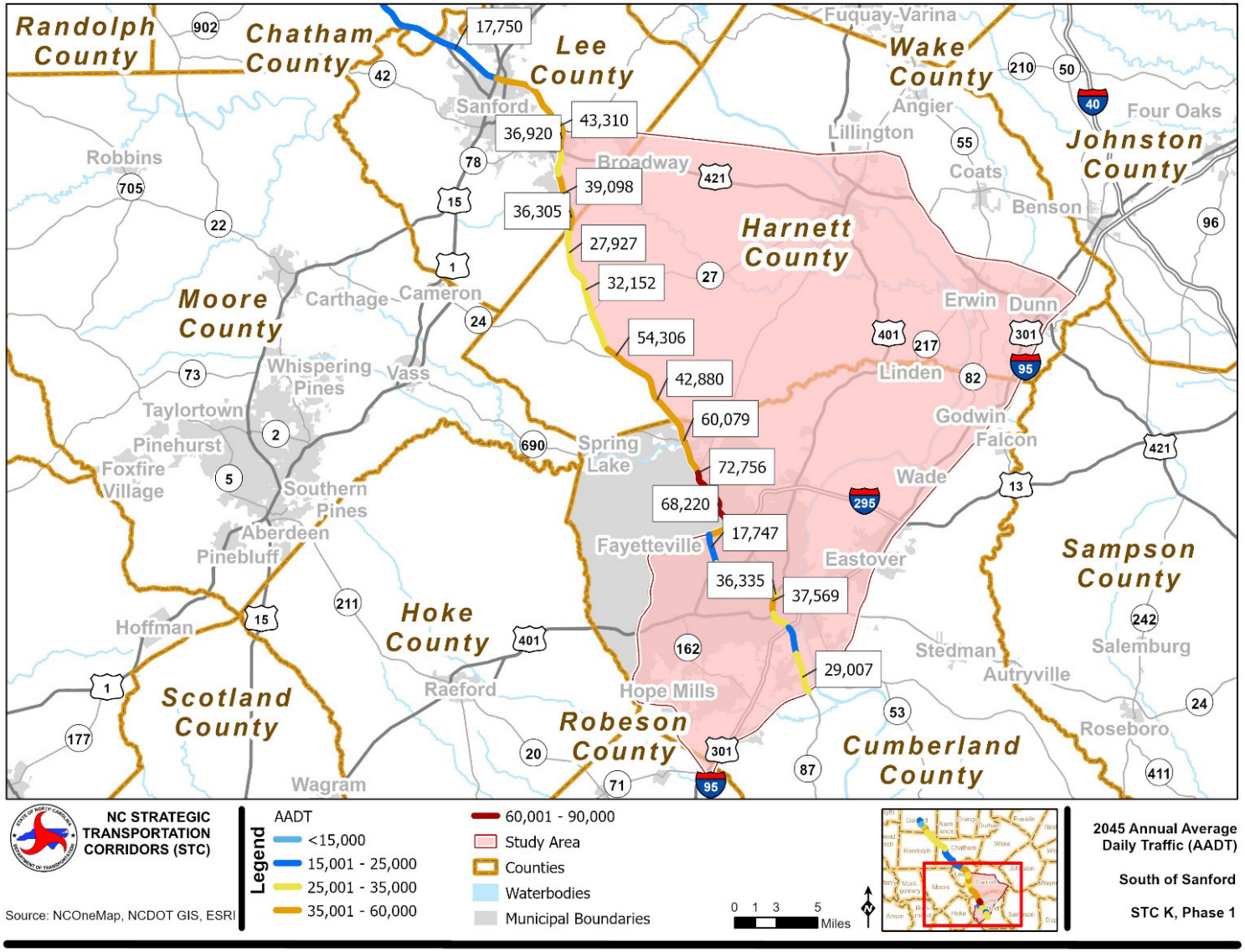


Figure 63. Future Year (2045) AADT Forecasts - South of Sanford



4.3.2.2 Peak-hour Volume-to-Capacity Ratio

The future year 2045 peak-hour V/C ratios were developed using a similar process to existing 2023 V/C ratios. V/C ratios were calculated based on two-way traffic volumes during the peak "design hour" to capture peak conditions along the corridor.

Figure 64 and Figure 65 display the projected peak design hour volume and V/C ratios for the future year 2045 condition.

The key V/C ratio findings are:

- **North of Sanford**:
  - Peak-hour V/C ratios generally remain below 0.5, indicating sufficient capacity with very little congestion.
  - The segment at the northern end of the corridor at the I-85 interchange has a V/C ratio approaching 0.8, which is still below the capacity of the segment. Also, the section between I-85 and NC 62 transitions to a freeway configuration, which indicates higher practical capacity than the values assumed in the NCSTM. This suggests that this segment at I-85 would operate even further below capacity.
- **Sanford Area**:
  - US 421 Bypass: Peak-hour V/C ratios remain under 0.6, indicating no congestion concerns.
  - Beyond the merge of US 421 Bypass and US 421 Business route all the way to Broadway Road, link-level capacities can vary significantly and often indicate congestion.
- **South of Sanford**:
  - Spout Springs to NC 210: This section experiences the highest V/C ratio on the corridor, with the most severe congestion just north of NC 210 in 2045. The 2050 Fayetteville regional model also showed severe congestion on the roadway segments from R. Miller Street to Buffalo Lake Road (SR 1293).
  - South of NC 210: The corridor transitions to a freeway configuration with additional lanes, lowering the V/C ratio to below 0.65.
  - Fayetteville Area (After I-295): Due to lower projected traffic growth in the area, the V/C ratio remains under 0.5, indicating a low risk of congestion. However, the presence of signalized intersections along Bragg Boulevard, between Sycamore Dairy Road and Barrington Cross Street, could result in varying capacities. A more detailed intersection-level analysis would be required to assess the traffic congestion and travel time reliability risks in this section.

4.3.2.3 Corridor-Level Annual Vehicle-Miles-Traveled

The annual VMT for the forecast year 2045 is estimated at 1,191,904,883, which includes both the US 421 Bypass and US 421 Business route near the Sanford area. This represents a 30 percent increase from the existing/baseline 2023 VMT of 914,255,408.

Figure 64. Future Year (2045) Design Volumes and Volume-to-Capacity Ratios - North of Sanford

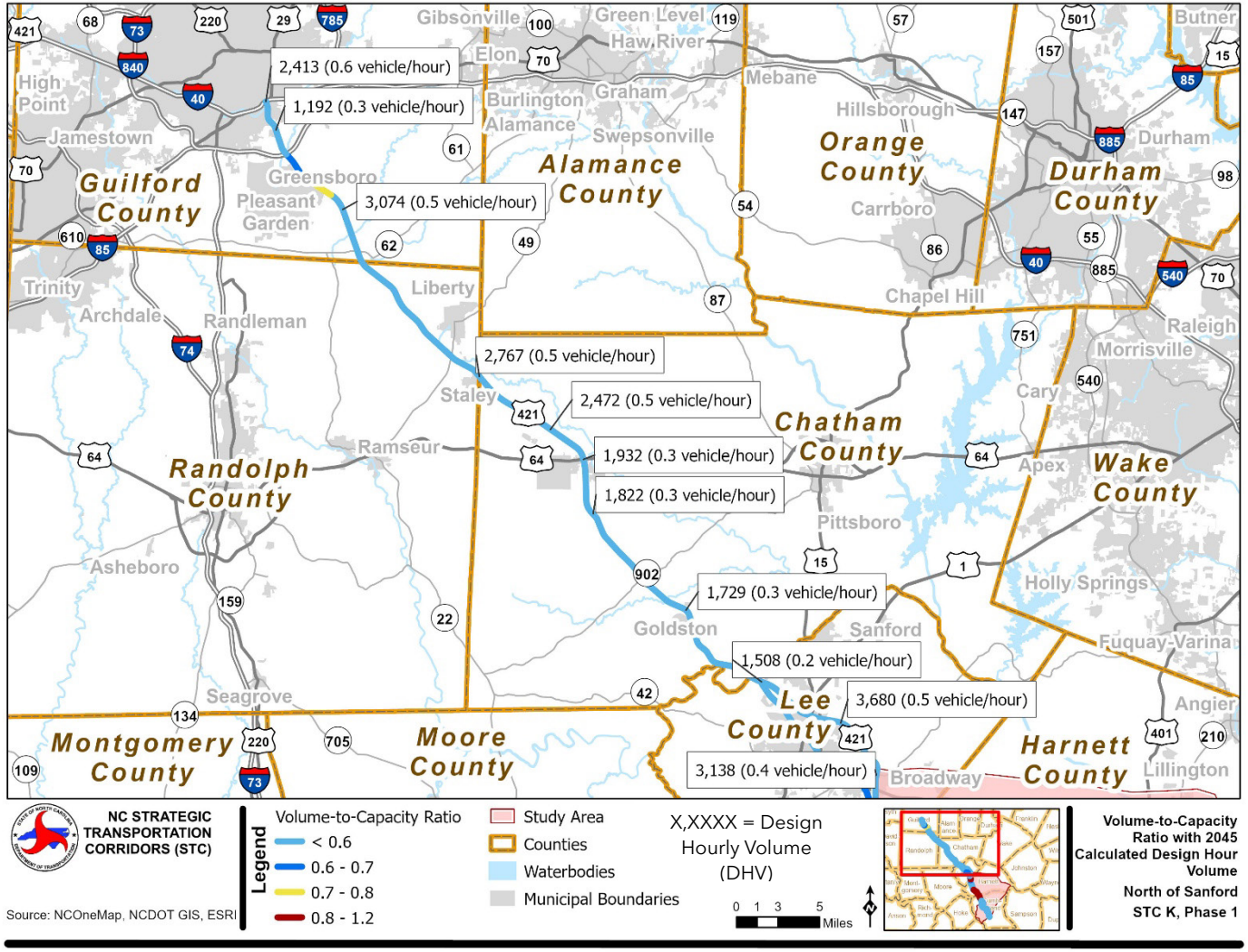
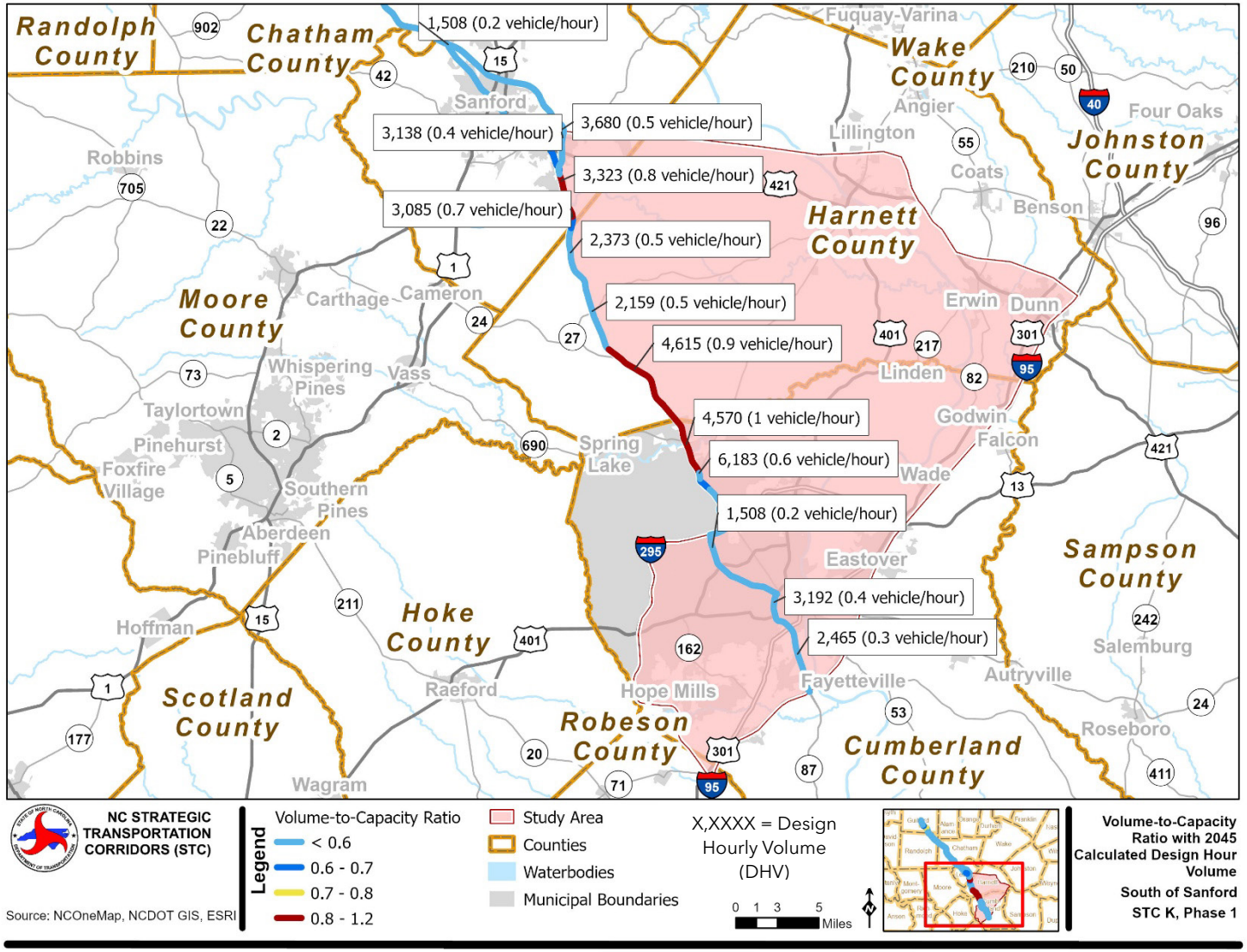


Figure 65. Future Year (2045) Design Volumes and Volume-to-Capacity Ratios - South of Sanford



5. Technology Readiness

In this section, the existing technologies for strategic traffic management and notable gaps along the corridor are inventoried. These technologies serve as communications infrastructure, surveillance, means to receive and distribute traveler information, and traffic management. Applications for safety and mobility were identified to leverage vehicle to infrastructure (V2I) communications and autonomous vehicle performance. Challenges and risk mitigation strategies to improve connected autonomous vehicle (CAV) and other technological infrastructure along the corridor are also discussed.

5.1 Technology Readiness Data Assembly

To assess technology readiness, the study team reviewed and compiled relevant data consisting of the locations of AFCs, alternative fuel corridor interchanges, and intelligent transportation system (ITS) devices such as Dynamic Message Signs (DMS) surrounding and within the STC K Phase 1 study area. The inventory outlines the corridor's existing level of traffic management technologies, where gaps may exist, and any necessary strategies to mitigate risk in deployment of new or additional ITS devices. Data on alternative fuel corridors also provides additional context for existing and planned electric vehicle charger placement as discussed in Section 3.2.6.

5.2 Alternative Fuel Corridor Overview

An overview of existing and planned electric vehicle chargers along the corridor is included in Section 3.2.6. While this overview is limited to electric vehicle chargers built since 2015, it does not include a discussion of chargers built as part of the National Electric Vehicle (NEVI) Program (FHWA 2026). The NEVI Program is a federal funding opportunity introduced within the 2021 Infrastructure Investment and Jobs Act intended to expand the US electric vehicle charging network to include 500,000 chargers by 2030. Funding for this program would be allocated to states for installation of electric vehicle chargers along designated AFCs (FHWA 2025). AFCs are specific national highway system routes where FHWA is working to install additional alternative fuel source infrastructure; these being electric vehicle chargers, hydrogen, propane, and natural gas pumps. AFCs are updated and redesignated each year by FHWA based on nominations from state and local governments. A map of the current AFCs in proximity to STC K can be found in Figure 66 and Figure 67. In addition to proximity to an AFC, NCDOT NEVI site selection includes priorities for a multitude of other amenities such as weather resistance, adequate cell phone service, and access to restrooms.

The North Carolina Electric Vehicle Infrastructure Deployment Plan was adopted in 2022 to build out chargers using the approximately $109 million apportioned to the state through the NEVI Program (NCDOT 2023). The plan is divided into two phases; the first phase dedicated to NEVI-compliant chargers within 1 mile of the current AFCs, and the second phase intended to increase access to electric vehicle chargers predominantly within historically disadvantaged communities. NCDOT has so far awarded funding for the first round of charging station applicants for STC K Phase 1. The location of these award recipients' chargers in proximity to STC K are shown in Figure 66 and Figure 67.

Figure 66. Alternative Fuel Corridors and ITS Devices - North of Sanford

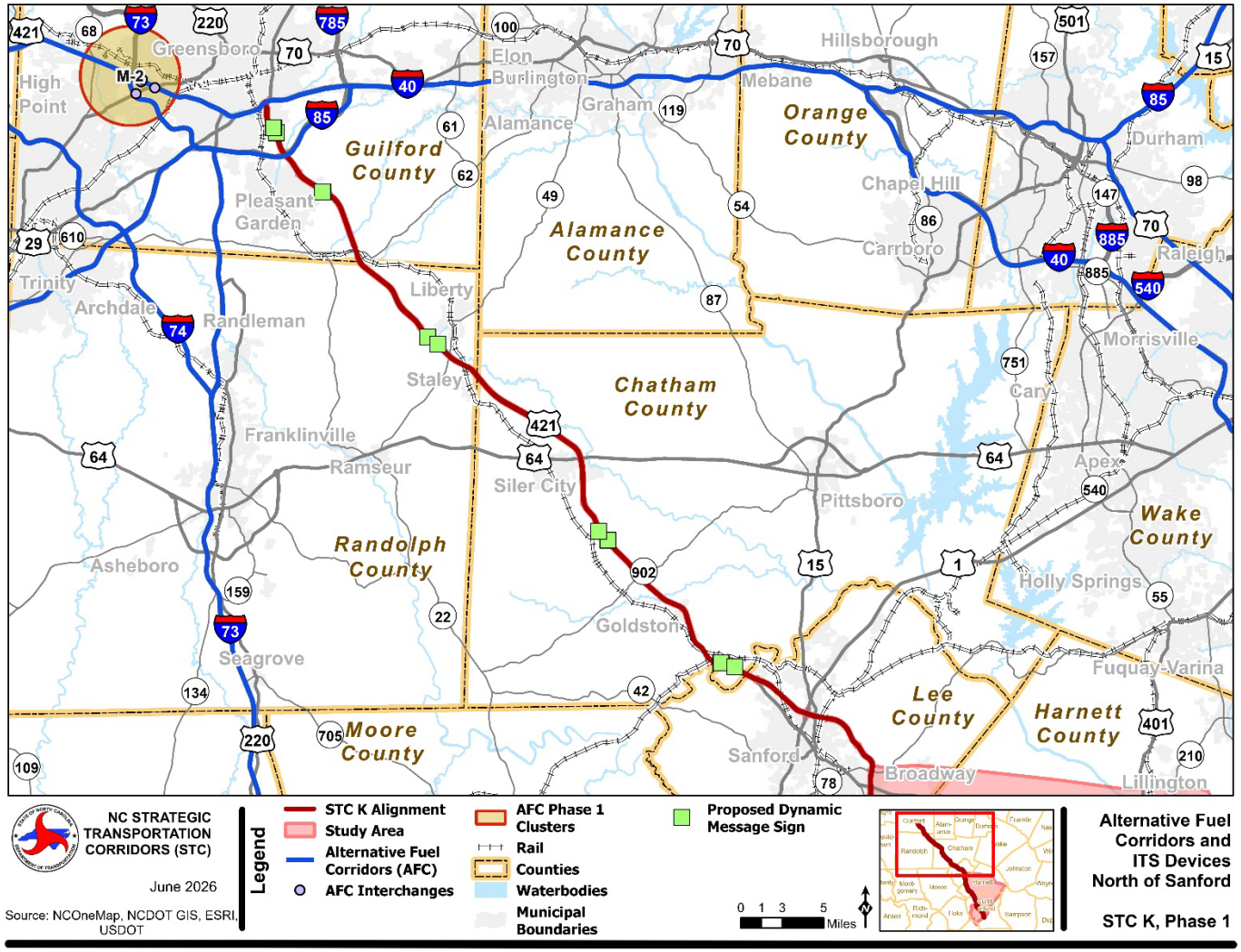
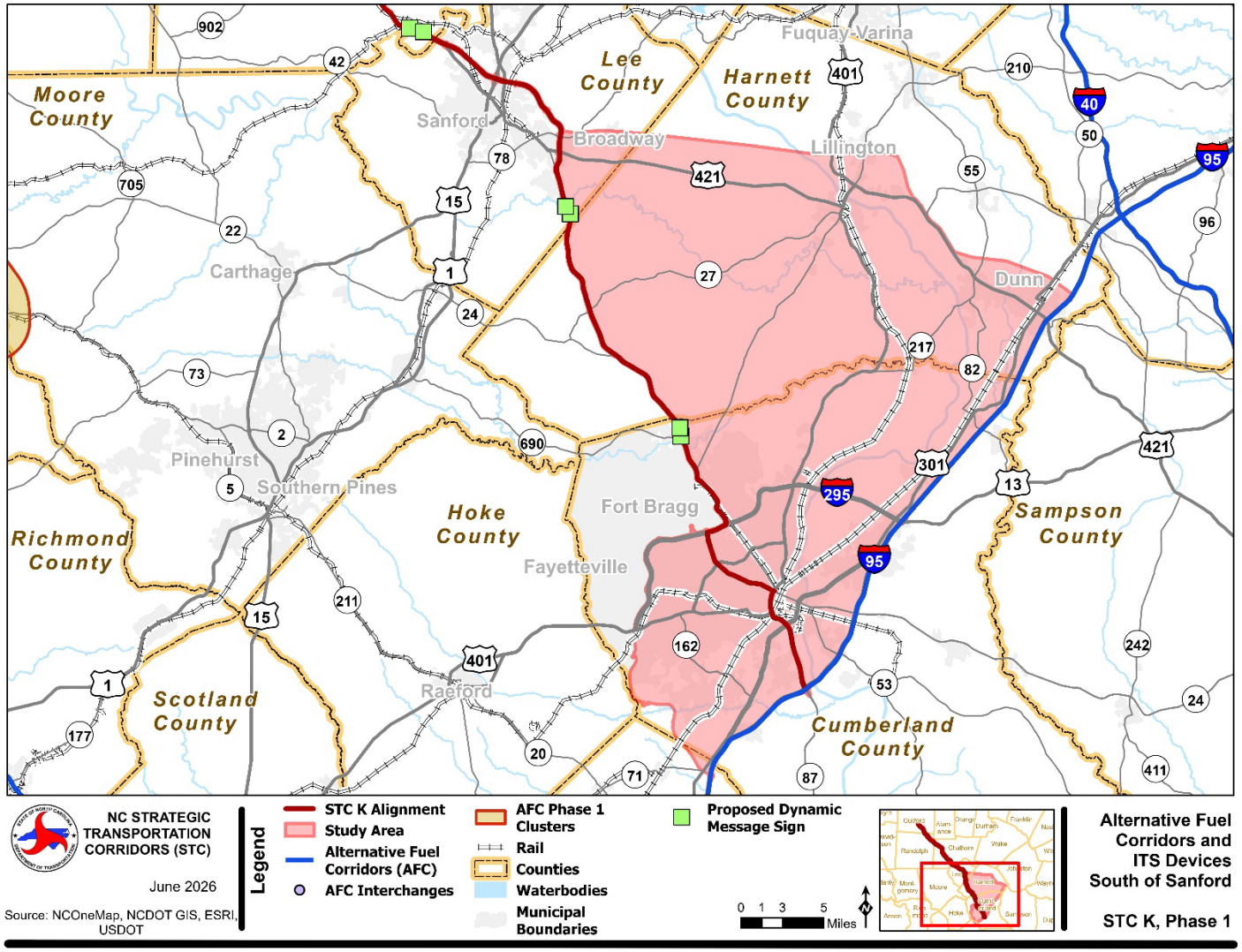


Figure 67. Alternative Fuel Corridors and ITS Devices - South of Sanford



5.3 Intelligent Transportation Systems

ITS devices are installed on or along roadways for the purposes of communications, surveillance, or traffic management (NCDOT 2025). These devices are critical for maintaining mobility in the event of crashes, evacuations, construction, and other events that induce congestion and necessitate detours. While there is currently only broadband and DMS installed along the corridor, this plan describes the additional devices from Table 22 and their proposed placement along the corridor.

Table 22. Intelligent Transportation System Technologies

Technology	Definition
Closed-Circuit Television Camera	A television transmission circuit with a limited number of reception stations and no broadcast facilities.
Dynamic Message Sign	A message board located over or near a road to alert travelers to possible traffic related problems. The message can be updated from a remote location.
Communications Hub	Enclosure used to house a central computer network. It can be controlled from a remote location.
Fiber (Broadband)	A thin filament of glass. An optical waveguide consisting of a core and a cladding that is capable of carrying information in the form of light.

As the corridor develops, additional technologies may be necessary to maintain flow of traffic and freight through the critical STC K corridor.

Data on both existing and proposed ITS devices were received directly from NCDOT's Transportation Mobility and Safety Division. In addition to proposed ITS infrastructure, the data also include the size of broadband fiber that will be installed along the corridor.

5.4 Automated Vehicles

One prospective technology located on the corridor is not a device situated at a fixed position, but instead a type of vehicle traveling along the extent of the network. Automated Vehicles (AVs) use a variety of sensor technologies to navigate roadways, and may not require a driver to operate. While current driver-operated vehicles may have cameras and Global Positioning System sensors on board, automated vehicles make use of additional technologies such as LiDAR, RADAR, infrared sensors, inertial navigation systems, and short-range communications. AV capabilities are graded by the Society of Automotive Engineers' (SAE) Levels of Driving Automation. SAE International Levels 0 through 2 describe automated features operating while the vehicle is being manually driven. Levels 3 and 4 may require intervention of the driver and cannot operate under all circumstances. Level 5, or full automation, is the highest level and describes vehicles that can operate on their own regardless of the external roadway and atmospheric factors.

Automated vehicles have been piloted by NCDOT in a limited capacity with the Connected Autonomous Shuttle Supporting Innovation program (CASSI). CASSI, as well as several other low-speed shuttle programs traveling on predefined routes in parks and campuses around the state, operate at SAE International Level 3. The shuttles require an on-board attendant for certain scenarios, such as driving past intersections with stop signs. There are several regulatory steps that

the state and federal government would have to take to prepare public roadways for AVs such as public education campaigns and provisions in existing laws. The built environment of the road itself would also have to be constructed with considerations for AVs. Once automated vehicles have reached the stage of widespread deployment, freight traffic along STC K could potentially benefit from the designation of automated freight vehicle lanes. As described in the NCDOT Advanced Transportation Mobility Strategic Plan (NCDOT 2024), automated freight vehicles could improve efficiency and safety along highways connecting major intermodal hubs like Wilmington and the Piedmont Triad. These automated vehicles would be able to operate for additional or longer service windows than those piloted by drivers and could circumvent potential future driver shortages.

Operational design domains (ODD) describe the features of roadway elements and other surroundings that AVs must navigate. Table 23 lists ODDs grouped into several broad categories as defined by the National Highway Traffic Safety Administration (NHTSA).

Table 23. Operational Design Domains by Category

Category	Examples
Physical Infrastructure	Roadway types, roadway surfaces, roadway edges, roadway geometry
Operational Constraints	Speed limit, traffic conditions
Objects	Signage, roadway users, non-roadway user obstacles and objects
Connectivity	Vehicles, traffic density information, remote fleet management system, infrastructure sensors and communications
Environmental Conditions	Weather, weather-induced roadway conditions, particulate matter, illumination
Zones	Geo-fencing, traffic management zones, school/construction zones, regions / states, interference zones

Source: NHTSA 2018

While Table 23 includes notable factors beyond human intervention such as weather, the remainder of the section focuses on elements of the physical infrastructure, operational constraints, and zones as they already exist along the STC K alignment.

5.5 Technology Readiness within the Corridor

5.5.1 Alternative Fuel Corridors and Interchanges

While there are no designated AFCs along the STC K alignment, the corridor and study area do intersect with three AFCs. Within Guilford County, the northern end of STC K crosses I-85 and stops at the interchange with I-40. On the southern end, the study area is bounded by I-95. There are no NEVI Phase 1 award electric vehicle charger clusters within the vicinity of STC K, and the nearest charger cluster is located on the western side of Greensboro proper. Each cluster of chargers and AFCs can be found in Figure 66 and Figure 67.

The charging stations along STC K do meet the NEVI Program's requirements of being spaced every 50 miles, and most are within a 1-mile radius of a corridor exit or crossroad. However, the majority of the charging stations would require additional charging ports to meet the minimum of four charging ports, and each site would require adequate lighting, trash cans, site signage, etc. The discussion and maps of existing and proposed electric vehicle chargers along STC K are in Section 3.1.5.

5.5.2 Intelligent Transportation System Devices

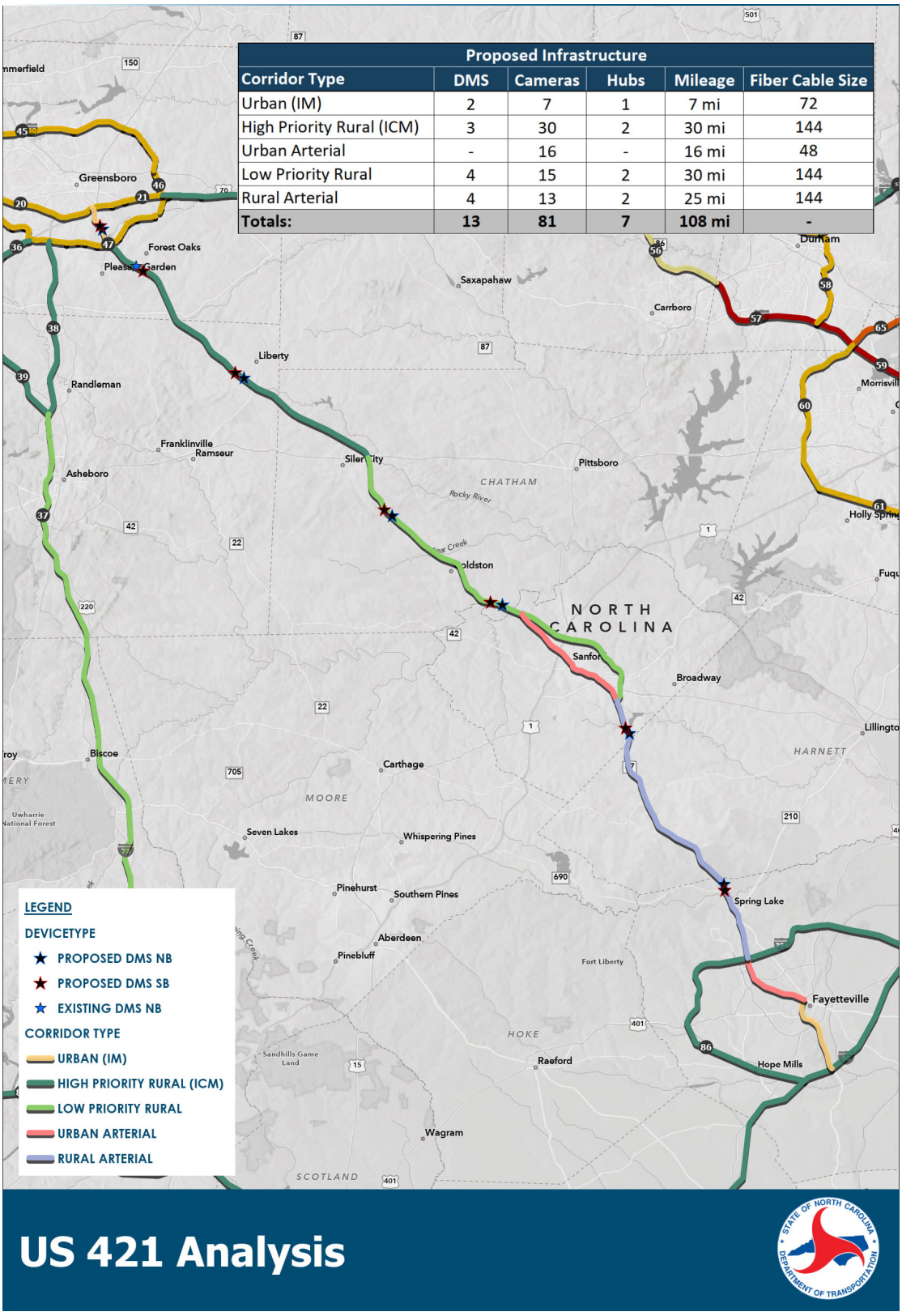
There is a single ITS device currently located along the STC K alignment, and NCDOT plans to install 13 DMSs along the route. One sign will be placed along the southbound/westbound side of US 421 ahead of Hagan Stone Park Road in Pleasant Garden to complement the existing northbound/eastbound sign 3,300 feet up the route. Ten of the other twelve signs will be in pairs offset from intersections along US 421; Edgemont Road south of Greensboro, Troy Estate Road southwest of Liberty, Gilmore Lodge Road/ Buck Gunter Road between Siler City and Goldston, Clarence McKeithen Road northwest of Sanford, and Frank Wicker Road/Traceway Street south of Sanford. The remaining two signs will be on the northern side of Spring Lake. The locations of all proposed signs along the corridor are shown in Figure 66 and Figure 67. More detailed maps of the AFCs and ITS devices and found within the Alternative Fuel Corridors and ITS Devices maps in Appendix B.

NCDOT also plans to install CCTV cameras, communications hubs, and broadband fiber along the corridor. Figure 68 depicts the roadway types by segment within the corridor, and the location of the existing DMS. Not shown in the figure is the existing broadband fiber cable along the urban arterial in Fayetteville. Table 24 lists the quantity of each device and broadband fiber cable size that will be installed by roadway type along the corridor.

Table 24. Proposed ITS Infrastructure on STC K

Corridor Type	DMS	Cameras	Hubs	Length	Fiber Cable Size
Urban	2	7	1	7 miles	72
High Priority Rural	3	30	2	30 miles	144
Urban Arterial	-	16	-	16 miles	48
Low Priority Rural	4	15	2	30 miles	144
Rural Arterial	4	13	2	25 miles	144
Total	**13**	**81**	**7**	**108 miles**	**-**

Figure 68. Proposed ITS Infrastructure



Source: NCDOT 2026, NCDOT ITS Device Map

5.5.2.1 ITS Device Deployment Mitigation Strategies

In the process of installing or deploying ITS infrastructure along the corridor, mitigation strategies should be employed to minimize risk to these technologies exposed to motorists and the elements.

- Sufficient right-of-way should be left around the devices to allow for routine maintenance.
- If possible, CCTV cameras should be installed at higher elevations, such as on embankments.
- DMS cabinets should be placed outside of the clear zone, or behind guardrails.
- NCDOT may need to consider alternative or backup power sources, such as solar, to power the devices.
- Operational strategies should be employed in the event of an evacuation, such as interchanges, extended lane merge, signal coordination, etc.
- A Security Credential Management System (SCMS) should be utilized to ensure integrity and authenticity of data.
- Maintenance for devices and infrastructure should be funded to ensure devices stay capable of providing the situational awareness to the Statewide Transportation Operations Center (STOC).
- Design features such as rumble-strip location, truck lane restrictions (e.g., not on the shoulder), width of paved shoulder, and depth of shoulder pavement must be considered for hard shoulder running and extended merge areas

5.5.3 Operational Design Domains

Although this section is not intended to be a granular analysis of each ODD throughout the corridor, previous sections of the master plan have described many of the factors impacting AV operation. Successful future AV operation would require optimization of ODD throughout the corridor. This can include improved roadway geometry, high-visibility pavement markings/signs, diligent maintenance of roadway features, etc.

5.5.3.1 Physical Infrastructure

In addition to the broad corridor roadway segments depicted in Section 5.5.2, the specific NCDOT-defined functional classes and number of lanes along the corridor are discussed in Section 3.2.1. The bulk of the corridor is a divided four-lane road, with an increase to six lanes along NC 87 in southeast Spout Springs and within the inner I-295 loop in Fayetteville. North of Siler City and within downtown Fayetteville, the corridor is Principal Arterial Freeway/Expressway. South of Siler City the corridor is Other Principal Arterial.

5.5.3.2 Operational Constraints

Traffic conditions are a variable that describe deviations from the typical traffic density, such as increased congestion from crashes and lane closures. Average traffic is outlined through hourly capacity in Section 3.2.1, and AADT and V/C ratios in Section 4.2.7. AADT volume generally increases as the corridor approaches Greensboro and Fayetteville, with volumes reaching as high as 66,500 by Fort Bragg. From Greensboro to Sanford, the corridor has an hourly capacity of 5,000 to 6,000 vehicles per hour and varies from 1,720 to 9,000 vehicles per hour until the I-295 split in Fayetteville. Beyond this point, it increases as the corridor crosses through downtown Fayetteville. Peak-hour V/C ratios are at their highest (0.5 to 0.7) between Broadway and Fort Bragg.

5.5.3.3 Zones

Land use types and their associated attributes, such as employment and population density, also influence AV operation. Beyond their impact on traffic and commuting patterns, land uses designated for high-density residential or downtown areas may expect high levels of pedestrian, cyclist, and other multimodal activity. These increase additional opportunities for conflict on or along roads where AVs are navigating. Section 2.2.6 discusses land use and future growth centers throughout the study area. The interiors of Greensboro, Sanford, and Fayetteville have high concentrations of areas marked for developed high-density zoning in future land use plans. The development of megasites and future growth areas between Staley and I-85 in Guilford County will also influence commuting patterns and residential development in the surrounding areas. Additional information on population density, employment density, commuting patterns, and projected population and employment growth is available throughout Section 4.2 and Section 4.3.

The intersections of the corridor and regional bike and trail routes are shown in Section 3.1.2. These crossings are primarily between Sanford and the border of Randolph and Guilford Counties, a proposed shared-use path to be built along the corridor from US 401 in Fayetteville to the border of Lee and Harnett Counties is visible in the Community Resources maps in Appendix B.

5.5.3.4 Objects

One additional ODD subset along the corridor is intersections and their characteristics. Multiple intersection features such as signalization, number of approaches, geometry, and control type are all included within NCDOT's Traffic Safety Intersection Inventory (NCDOT 2026). Specific intersections, and bicycle-pedestrian intersections, identified by NCDOT's HSIP as hazardous are discussed in Section 3.2.3. These intersections are reported annually but are sparse along the corridor. While there are 7 and 3 total HSIP intersections and bike/pedestrian intersections, respectively, the majority of the latter are within downtown Fayetteville.

6. Performance Measures

Prioritization, evaluation, and scoring mechanisms guided the development of performance measures, which were captured in a performance metrics matrix. The performance matrix enabled the study team to assess the corridor alternatives against these measures and compare the alternatives.

6.1 Performance Measures Objectives

The performance measures and criteria for STC K are based on the following sources:

- FHWA Guidance
- NCDOT STC Guidance
- NCDOT, MPO, and RPO vision and goals
- Stakeholder outreach

These sources were used to select a set of recommended performance metrics that were utilized to analyze alternatives in Section 7. Section 6.2 summarizes the goals, objectives, and metrics from each of the sources listed above, and Section 6.3 summarizes performance metrics used in the corridor alternatives analysis.

6.2 Performance Metric Guidance

Performance metrics and criteria provide a way to measure and compare the transportation effectiveness of various alternatives for the corridor on a quantitative and qualitative basis. Prioritization, evaluation, and scoring mechanisms utilize the performance measures and capture corridor criteria in a performance metrics matrix. The performance matrix enables assessment of the alternatives against these measures, compare/contrast alternatives, and report outcomes. Section 7 identifies broader potential benefits and impacts of each alternative related to environmental issues, which will inform future NEPA processes.

The following section identifies key guidance for developing performance metrics based on federal and state requirements as well as local adopted goals. These performance metrics were used to support the vision and goals of this master plan.

6.2.1 Federal Guidance

Transportation performance management (TPM) was established in May 2016 as part of FHWA's final rulemaking (81 *Federal Register* 34050) as it pertains to the "…development of metropolitan transportation plans (MTP) and programs for urbanized areas, long-range statewide transportation plans and programs, and the congestion management process as well as revisions related to the use of and reliance on planning products developed during the planning process for project development and the environmental review process." The final rulemaking follows the passage of two transportation bills, Moving Ahead for Progress in the 21st Century Act (MAP-21) and the Fixing America's Surface Transportation (FAST) Act, and continued in the Infrastructure Investment and Jobs Act, which emphasized the incorporation of performance-based decision making into the planning process and established target setting for states and MPOs for seven categories. The

federal TPM measures are summarized in Table 25. Environmental factors are not included in this list. NCDOT has established targets and generates reports, which incorporate a narrative of the anticipated effects in its STIP and Statewide Transportation Plan. These targets and reports can be found on the State Performance Dashboard (FHWA 2026).

Table 25. Federal TPM Performance Measures

Goal Area	Goal	Performance Measure
Safety	Achieve a significant reduction in traffic fatalities and serious injuries	• Number of fatalities • Rate of fatalities • Number of serious injuries • Rate of serious injuries per 100 million vehicle miles traveled
Infrastructure Condition	Maintain highway infrastructure assets in a state of good repair	• Percentage of pavements on the interstate system in good condition • Percentage of pavements on the interstate system in poor condition • Percentage of pavements on the non-interstate NHS in good condition • Percentage of pavements on the non-interstate NHS in poor condition • Percentage of NHS bridges classified as in good condition • Percentage of NHS bridges classified as in poor condition
System Reliability	Improve the efficiency of the surface transportation system	• Percentage of person-miles traveled on the interstate that are reliable • Percentage of person-miles traveled on the non-interstate NHS that are reliable
Environmental Sustainability	Enhance the performance of the system while protecting and enhancing the natural environment	• On-road mobile source emissions • Total emissions reduction for applicable criteria pollutants
Congestion Reduction	Achieve a significant congestion reduction on the NHS	• Annual hours of peak-hour excessive delay per capita • Percent of non-single occupancy vehicle (non-single occupancy vehicle) travel
Freight Movement and Economic Vitality	Improve the freight network, strengthen access to national and international trade markets for rural communities	• Interstate truck travel time reliability index
Reduce Project Delivery Delays	Accelerate project completion through eliminating delays and reducing regulatory burdens	• STIP and non-STIP planned projects on schedule

6.2.2 NCDOT Guidance

NCDOT's STC project identifies three broad goals and objectives related to system connectivity, mobility, and economic prosperity (NCDOT 2015). A summary of the STC objectives and goals are provided in Table 26. NCDOT goals synthesized from NCDOT STC guidance, NC Moves 2050, FHWA TPM guidance, and MPO CTPs are summarized in Table 27.

Table 26. STC Objectives and Goals

Objective	Goals
Safety	• Improve safety for all users
System Connectivity: Provide essential connections to national transportation networks critical to interstate commerce and national defense.	• Provide a continuous, consistent network of reliable, higher speed interstate, defense, and major freight routes • Provide functional classification and facility type consistent with those attributes • Have high capacity consistent with speed and reliability objectives
Mobility: Facilitate high volume inter-regional movements of people and goods across the state.	• Serve major inter-regional travel corridors with high levels of service • Move higher volumes of passenger or freight traffic • Provide multiple transportation modes or routes for the opportunity of choice and flexibility in travel or shopping
Economic Prosperity: Support efficiency of transport logistics and economic development throughout the state for economic regions and clusters of existing and emerging activity centers.	• Provide high-quality access to defined activity center clusters and to nearby critical activity centers • Ensure access to at least one strategic corridor for each multi-county region of Tier 1 Economic Development counties.

Table 27. Synthesized Statewide Transportation Planning Goals

Objective	Goals
Safety	To improve safety for all users.
Cohesive and Strategic Planning	To promote the integration of transportation, land use, and policy planning through the cooperation and communication between local and regional agencies.
Mobility	To increase the transportation network's ability to move people and goods locally and regionally.
Multimodal	To promote the ability to travel using a variety of transportation methods, such as walking, biking, and using transit, in addition to personal vehicle.
Security	To enhance a transportation system that provides access to evacuation routes, facilitates disaster response, and protects access to military bases.
Socioeconomic and Quality of Life	To provide transportation options and access to destinations for all user groups regardless of socioeconomic status or physical ability.

6.2.3 Local Goals

Additional goals and performance measures are provided in the CTPs developed by NCDOT in collaboration with RPOs and MPOs and in the MTP documents prepared by MPOs.

The following CTPs and MTPs were reviewed for this study:

- GUAMPO CTP (2020)
- FAMPO/Cumberland County CTP (2023)
- CAMPO MTP (2026)
- Harnett County CTP (2017)
- Burlington-Graham MPO CTP (2022)
- High Point MPO CTP (2026)
- Lee County CTP (2019)
- Randolph County CTP (2013)
- Chatham County CTP (2016)
- Durham-Chapel Hill-Carrboro MPO CTP (2017)
- Pittsboro Municipal CTP (2016)

Out of these 11 CTPs and MTPs that were reviewed, only 2 included identifiable goals (FAMPO/Cumberland County CTP and GUAMPO CTP), as listed in Table 28. Generally, goals identified as part of this review were largely consistent with the goals and objectives identified by NCDOT and FHWA under 23 CFR 134.

Table 28. Goals for FAMPO and GUAMPO

Plan	Goal
FAMPO MTP (2024)	FAMPO identified eight goals: • Ensure a safe, secure, and resilient transportation system • Manage congestion and system reliability • Improve connectivity and accessibility for all modes • Preserve the existing transportation system • Enhance economic development opportunities and competitiveness • Prioritize equitable transportation options • Strengthen relationships with transportation partners • Protect the natural environment and promote public health
FAMPO CMP (2019)	The CMP identified two goals and corresponding strategies for Bragg Boulevard, including: • Improve pedestrian safety and access • Improve and expand transit services

Plan	Goal
GUAMPO 2045 MTP (2026)	GUAMPO identified nine key goals: • Support the economic vitality and quality of life for the metropolitan area, the Triad, and the state • Improve accessibility and mobility for people and freight • Increase the safety and security of the transportation system for all users through the 2019 NC Strategic Highway Safety Plan, Vision Zero Greensboro, and other state and local initiatives • Protect and enhance the natural and human environment • Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight • Expand opportunities for travel choices including public transportation, walking, and bicycling • Promote efficient transportation system management and operations • Emphasize the preservation and maintenance of the existing transportation system • Inclusion and support for national and state goals and performance measures
GUAMPO CMP (2026)	The CMP states that it may support 10 of the goals identified in Title 23 /Chapter 1 / Section 134.
FAMPO/ Cumberland County CTP (2023)	FAMPO/Cumberland County identified five goals: • Focus growth around established municipalities, infrastructure, and strategic nodes • Encourage safe, multimodal transportation options with adequate connectivity • Preserve and enhance environmental features and open space opportunities • Recognize the strategic importance of military installations within and adjacent to the community • Promote economic development growth through transportation and planning means

6.3 Recommended Transportation Performance Metrics

This section summarizes the transportation objectives and performance measures for the study based on federal and state guidance and local goals. The performance metrics were used to analyze and assess future alternatives for STC K along with other environmental and corridor measures. NCSTM Gen 4.5 was utilized to generate the majority of the performance metrics related to congestion, travel times, and VMT. The remaining measures were derived from other sources and discussed qualitatively where data and forecasts were not available. The measures were refined with input from the study team and stakeholders and used to present the alternatives analysis during the public workshops later in the study. Performance measures related to broad project benefits and impacts and cost estimates are not included in the list of transportation measures. Environmental factors were evaluated in the alternatives analysis phase.

Table 29 summarizes the proposed transportation objectives for the study and provides a list of recommended measures and criteria. The results for each measure were to assign a rating in the alternatives scorecard matrix that compared the alternatives.

The travel time metrics listed in Table 29 utilized horizon year (2045) “congested” travel times estimated by the NCSTM model between key O-D points that represent major population centers,

employment sites, activity areas, and destinations along the corridor, including major access points to Fort Bragg, downtown Greensboro and Fayetteville, Sanford, Siler City, megasites within 5 miles of the corridor, the I-95 interchange, and the Port of Wilmington.

Travel times in the model were calculated for all vehicles as the model does not break out speeds by truck or passenger vehicle modes. Volumes assigned to each segment by the model can be broken out by car and truck modes and were used to focus on key freight routes.

Table 29. STC K Traffic/Mobility Performance Measures and Criteria

No.	STC K Phase 1 Objective	STC, FHWA, State Goal	Performance Measure	Performance Criteria
1	Improve safety for all users	Safety	Crash rates	Use Crash Modification Factors (CMFs) and Crash Reduction Factors (CRFs %) from FHWA CMF Clearinghouse to show that the improvements would reduce fatal and serious injury crashes
2	Provide a direct connection for freight and passenger vehicles between Greensboro and the Port of Wilmington	Freight, Mobility, Economic Prosperity	Vehicle travel time (travel time in minutes) from Greensboro to Wilmington	Reduce travel time between Greensboro and Wilmington compared to the horizon year (2045); scoring is based on the size of the reduction
3	Improve corridor efficiency for all users and reduce congestion	System Connectivity, Reliability, Congestion Reduction	V/C ratio, vehicle travel time (minutes)	Reduce V/C ratio by 0.10 and travel times between key O-D pairs along the corridor
4	Reduce rural cut-through traffic and improve air quality by minimizing VMT and vehicle emissions	Environmental, Congestion Reduction, Quality of Life	VMT	Reduce VMT for trips along the corridor and in areas within the study area; scoring is based on the size of the reduction
5	Promote national security by enhancing access for the military and base staff at Fort Bragg	System Connectivity, Security	V/C ratio, vehicle travel time for O-D pairs serving Fort Bragg	Reduce V/C ratio and vehicle travel times for O-D pairs serving Fort Bragg; scoring based on the size of the reduction
6	Provide a direct connection to megasites and major activity centers and destinations	Economic Prosperity	V/C ratio, vehicle travel time for O-D pairs serving megasites and key destinations	Reduce V/C ratio and vehicle travel times for O-D pairs serving megasites and downtown Greensboro, Fayetteville, and Sanford; scoring based on the size of the reduction

No.	STC K Phase 1 Objective	STC, FHWA, State Goal	Performance Measure	Performance Criteria
7	Enhance economic prosperity, development opportunities, and quality of life for residents, workers, and visitors	Cohesive and Strategic Planning, Socioeconomic	Population and employment totals within 2 miles of the corridor	Increase the number of future (2045) residents, jobs, and major destinations that can be accessed within 2 miles of the corridor as measured using a GIS buffer analysis.
8	Enhance pedestrian and bicycle safety and connectivity across the corridor and to regional trails	Multimodal, Safety, Quality of Life	Number of new sidewalk and bike lane connections across the corridor	Increase the number of ped/bike connections across the corridor; scoring is qualitative and based on connectivity to regional trails and local destinations

7. Alternatives Analysis

Although most other NCDOT STC studies do not consider alternative alignments, they are warranted in this study due to extreme vehicular congestion along NC 24/87 within the existing STC K alignment, through the Town of Spring Lake and adjacent to Fort Bragg. To develop new location alternative alignments for the analysis, GIS tools and pre-existing plans were used to create route alignments that would align with local needs and minimize local environmental and community impacts. In addition to these impacts, travel demand models were used to compare the alternatives based on the previously defined performance measures (Chapter 6). Both screening methodologies and model assessments were consistently utilized for each of the alternatives.

7.1 Alternatives Descriptions

The three build alternatives evaluated in the study — the STC K Alignment Improvements, the 421 Connector, and the Eastern Connector —traverse distinct geographic areas. The STC K Alignment Improvements corridor is along the existing STC K alignment within the Fayetteville urbanized area in Cumberland County. The 421 Connector corridor runs east-west along US 421 through Harnett County and integrates a new roadway loop around the north of Lillington and a new roadway north of US 421 in Dunn to connect the US 421 corridor near Sanford to the I-95 corridor near the Johnston County line. The Eastern Connector corridor is located to the east of Spring Lake and Fort Bragg in the Fayetteville region. Note that, with the only differences between alternatives occurring in the southern study area, detailed mapping of some of the alternative data presented in this section do not include northern views, as they do not provide additional data.

7.1.1 No Build Alternative

Along with the three build alternatives, a No Build Alternative was also required to establish baseline conditions and frame of reference to compare to each build alternative. The No Build Alternative was defined as all approved 2026-2033 STIP projects with a committed construction date before 2031 (5 years from the end of the STIP).

7.1.2 STC K Alignment Improvements

The STC K Alignment Improvements alternative includes the existing STC K alignment along NC 24/87 from Sanford to I-295, with the addition of 2026-2035 STIP Project H-0020 (Figure 70). Project H-0020 (funded for preliminary engineering only) would improve capacity of the corridor by adding a lane in each direction from Nursery Road to Manchester Road (going from four lanes to six lanes). As of June 2026, H-0020 is the only approved project along STC K that is within the current STIP. Under this alternative, the remaining portions of the STC K corridor would remain unchanged from the existing corridor alignment. The northern extent of the alternative is shown in Figure 69. The southern extent of the alternative compared to the other two study alternatives is shown in Figure 70. Existing NCDOT typical sections and design speeds of the alternative, with the addition of H-0020, are listed in Table 30.

Figure 69. STC K Alignment Improvements

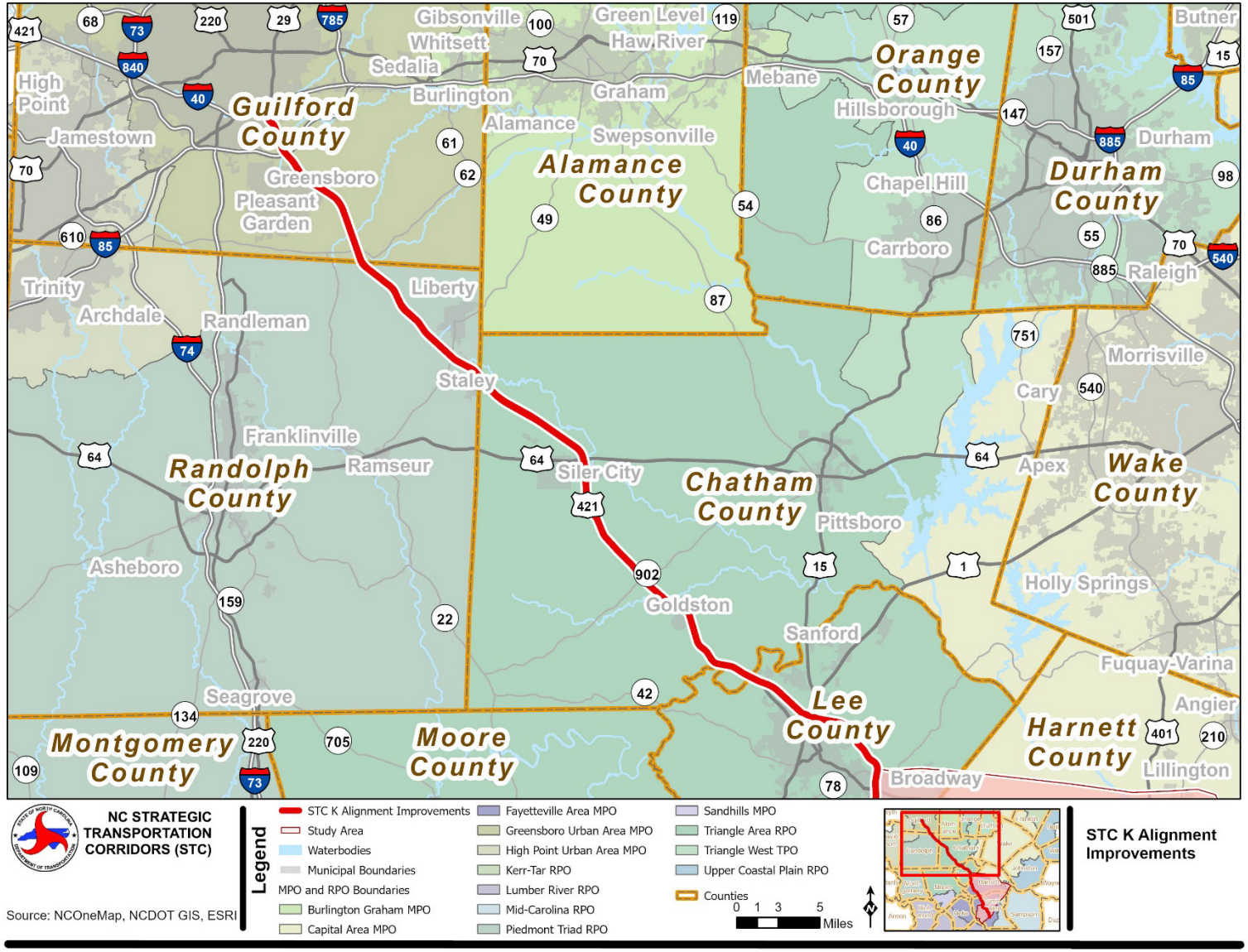


Figure 70. STC K and Alternative Alignments

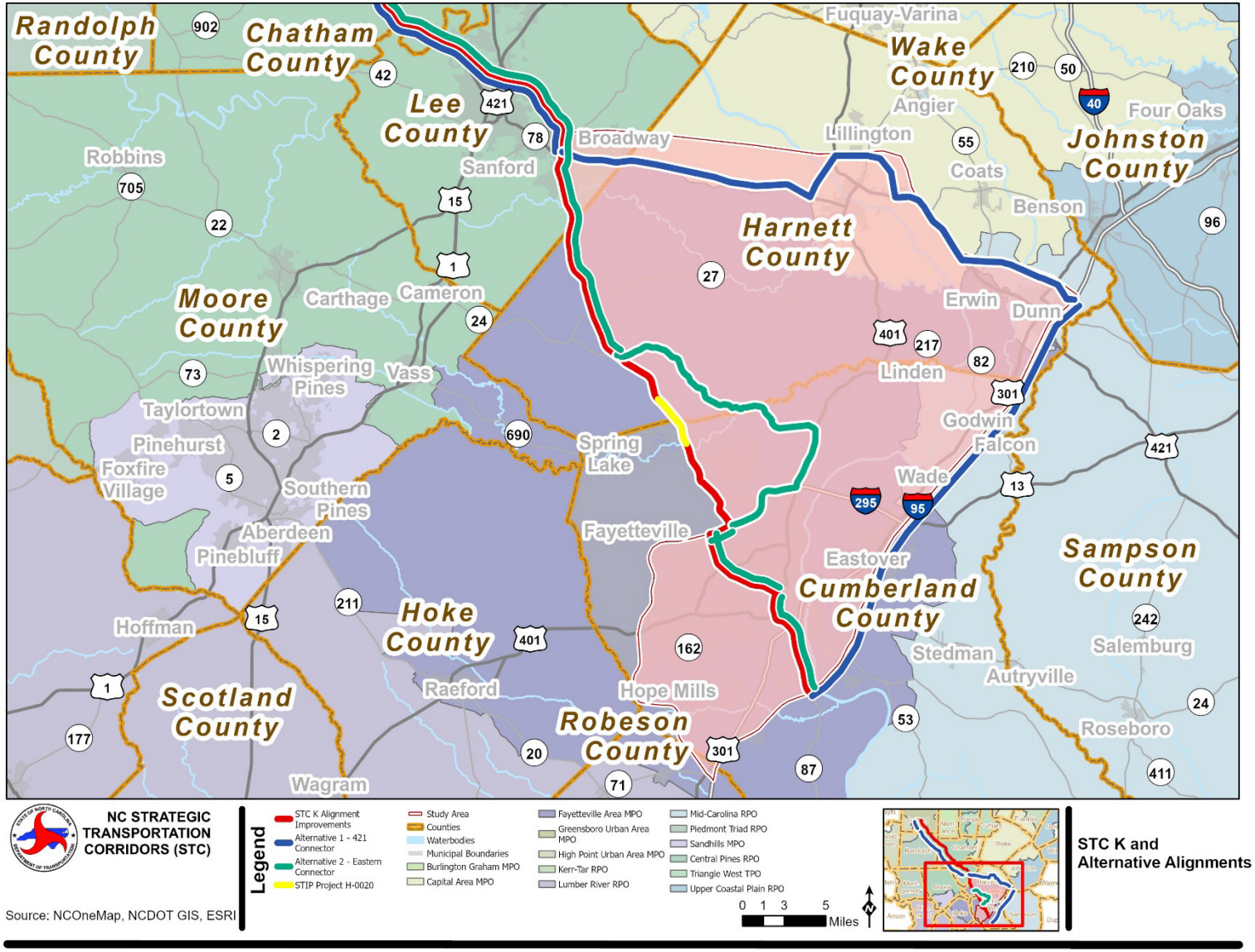


Table 30. STC K Existing Typical Sections and Design Speeds

Roadway	Start	End	Typical Section	Design Speed
Old US 421	I-40	Alamance Church Road	5A	40 [a]
Old US 421	Alamance Church Road	I-85 (Greensboro Urban Loop)	4A	70
US 421	I-85 (Greensboro Urban Loop)	NC 62	4A	70
US 421	NC 62	NC 49	4A	70
US 421	NC 49	US 64	4A	70
US 421	US 64	Sam Fields Road	4A	70
US 421	Sam Fields Road	Cumnock Road	4A	70
Sanford US 421 Bypass	Cumnock Road	US 421 / NC 87 split	4A	70 [a]
NC 87 Bypass and NC 87	US 421	NC 87/NC 24 Interchange	4A and 5A	70
NC 24 / NC 87	NC 87/NC 24 Interchange	Nursery Road	5A	70
NC 24 / NC 87 (with HP-0020)	Nursery Road	Manchester Road	6A	70
NC 24 / NC 87 / NC 210	Manchester Road	Olive Street	5A	40
NC 24 / NC 87 / NC 210	Olive Street	I-295	6D	60
NC 24 / NC 87	I-295	Business 401 / NC 87	6E and 6F	50
Business 401 / NC 87	NC 24 / NC 87	I-95	6D	70

[a] Where no design speed is listed in NCDOT's GIS data, design speed is assumed to be the speed limit + 5 mph.

7.1.3 Alternative 1 – 421 Connector

The 421 Connector alternative consists of improving existing US 421 between Sanford and Dunn as well as constructing new bypasses around Lillington and Dunn. This alternative is intended to alleviate freight traffic through Spring Lake/Fort Bragg. This alternative would connect to the I-95 interchange east of Dunn, shifting the end point of STC K Phase 1 (away from NC 87/ I-95 interchange in south Fayetteville). As shown in Figure 71, the alignment for the 421 Connector was compiled from several different projects listed in two local plans:

- Town of Lillington CTP (2017)
  - H090760 (also listed in SPOT 5.0) – US 421 widening two to four lanes from NC 87 in Sanford to US 401 in Lillington
- Harnett County CTP (2017)
  - R-2609 – US 401 Widening / Lillington Bypass (includes new Cape Fear River crossing)
  - HARN0001-H – Northern Lillington Connector
  - HARN0008H – US 421 Improvements between Lillington and Dunn
  - HARN0010 – US 421 Dunn-Erwin Bypass (Lillington to I-95)

The 421 Connector alternative (Figure 72) is assumed to be a four-lane divided highway with a posted speed limit of 60 miles per hour (mph). Because this alternative is based on preliminary plan alignments, alignment alterations to minimize or avoid environmental and community resources are expected through future studies.

7.1.4 Proposed I-685

A proposed new interstate ("Proposed I-685") has created confusion with the STC K study, given it lies within the STC K study area, overlaps with portions of STC K alternatives, and made the news when local focus group meetings for STC K were being held in early 2025.

Proposed I-685 was created by the Infrastructure Investment and Jobs Act of 2021 as follows:

> SEC. 11514. HIGH PRIORITY CORRIDORS ON THE NATIONAL HIGHWAY SYSTEM. (a) HIGH PRIORITY CORRIDORS —Section 1105(c) of the Intermodal Surface Transportation Efficiency Act of 1991 (Public Law 102–240; 105 Stat. 2032; 133 Stat. 3018) is amended and the following added: 117-58-(92) "United States Route 421 from the interchange with Interstate Route 85 in Greensboro, North Carolina, to the interchange with Interstate Route 95 in Dunn, North Carolina."

The Harnett Horizons 2040 Comprehensive Plan shows I-685 following US 421 to I-95, as does the current (2026-2035) STIP, which references "Proposed I-685" along several portions of US 421 in Guilford, Chatham, Randolph, and Lee Counties. Note that the federal description of I-685 does not include Old US 421 (I-40 to I-85), which is the northernmost portion of the existing STC K alignment, which is the beginning of this study's corridor in Greensboro.

Although a portion of proposed I-685 overlaps with the 421 Connector alternative, each project would have independent facility expectations. STC K does not necessarily need to be a freeway or interstate (with controlled access) to meet the primary project objectives.

Figure 71. Alternative 1 (421 Connector) and Harnett County Local Projects

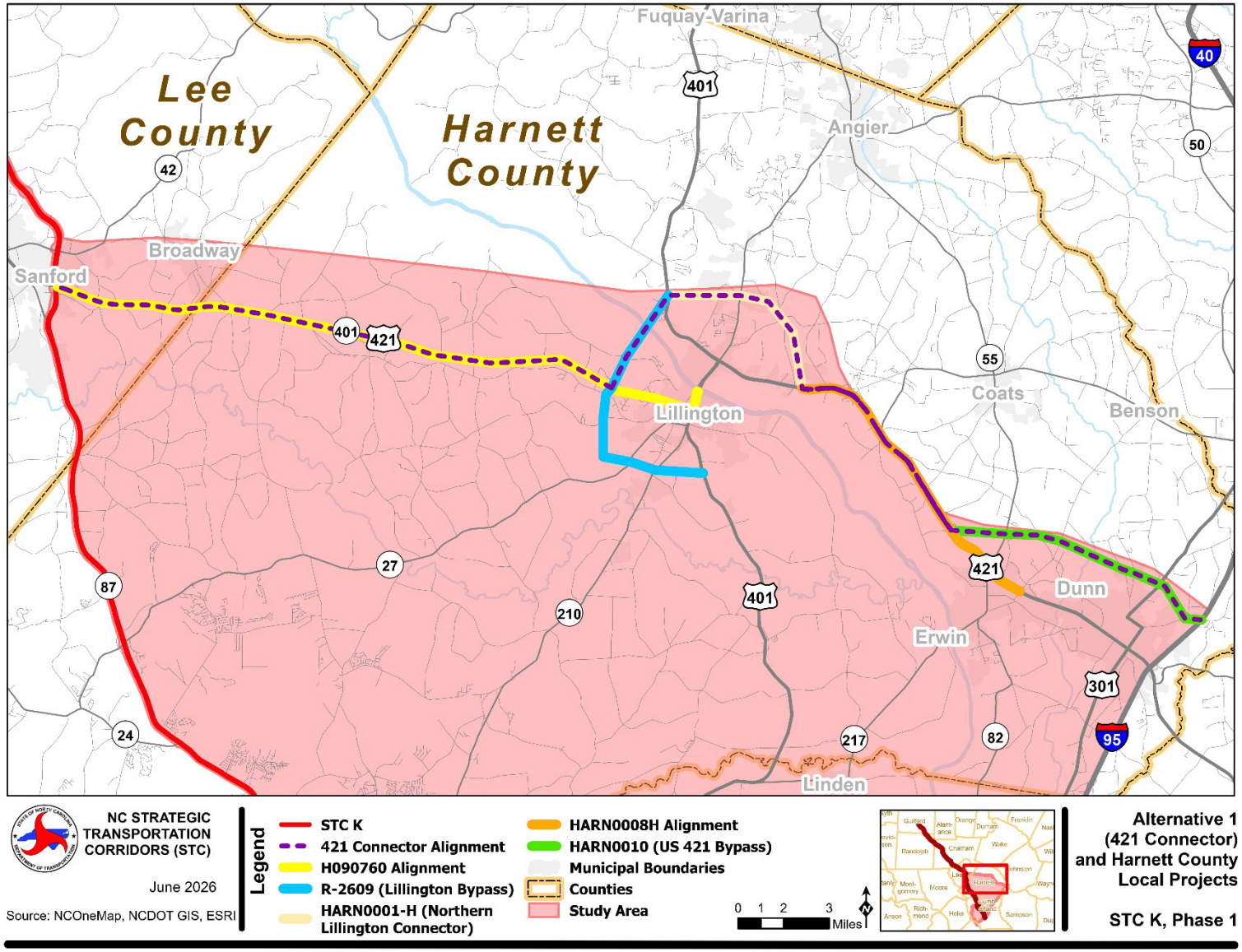
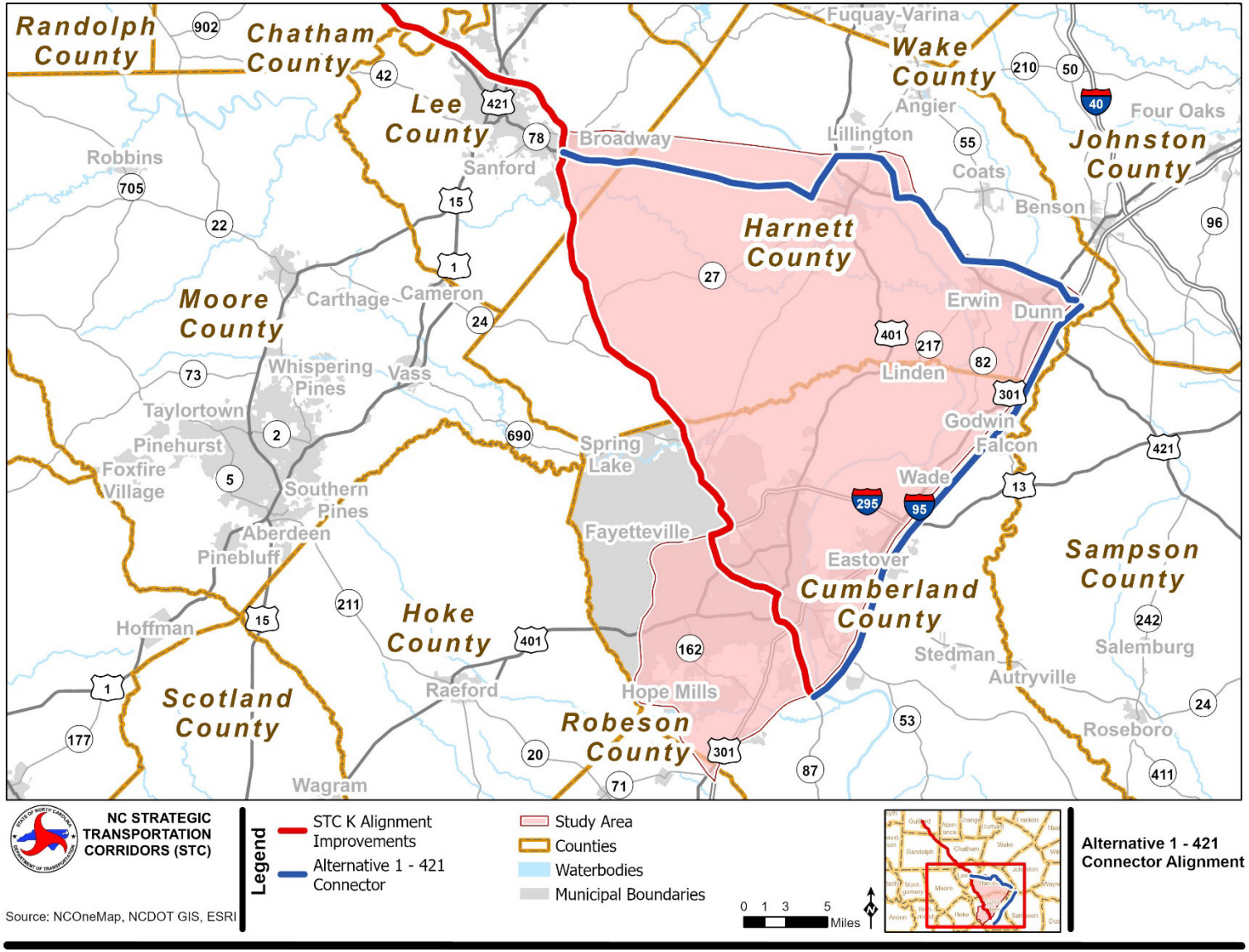


Figure 72. Alternative 1 - 421 Connector Alignment



7.1.5 Alternative 2 – Eastern Connector

The Eastern Connector (Figure 73) was intended to serve as an alternative that would also alleviate congestion along NC 24/87 through Spring Lake and Fort Bragg, but with a much shorter alignment than the 421 Connector alternative. However, the area around this corridor is heavily developed, is adjacent to a military base, and has a multitude of sensitive environmental features. As currently proposed, the Eastern Connector begins at NC 24/87 in Spout Springs and routes east, tying to a few existing roads with some new location segments until connecting to US 401. From there it remains on US 401 then follows south and joins with I-295 where it continues west then connects back to NC 87 (and the existing approved STC K alignment). For the Eastern Connector, traffic and transportation engineers assumed the following design criteria:

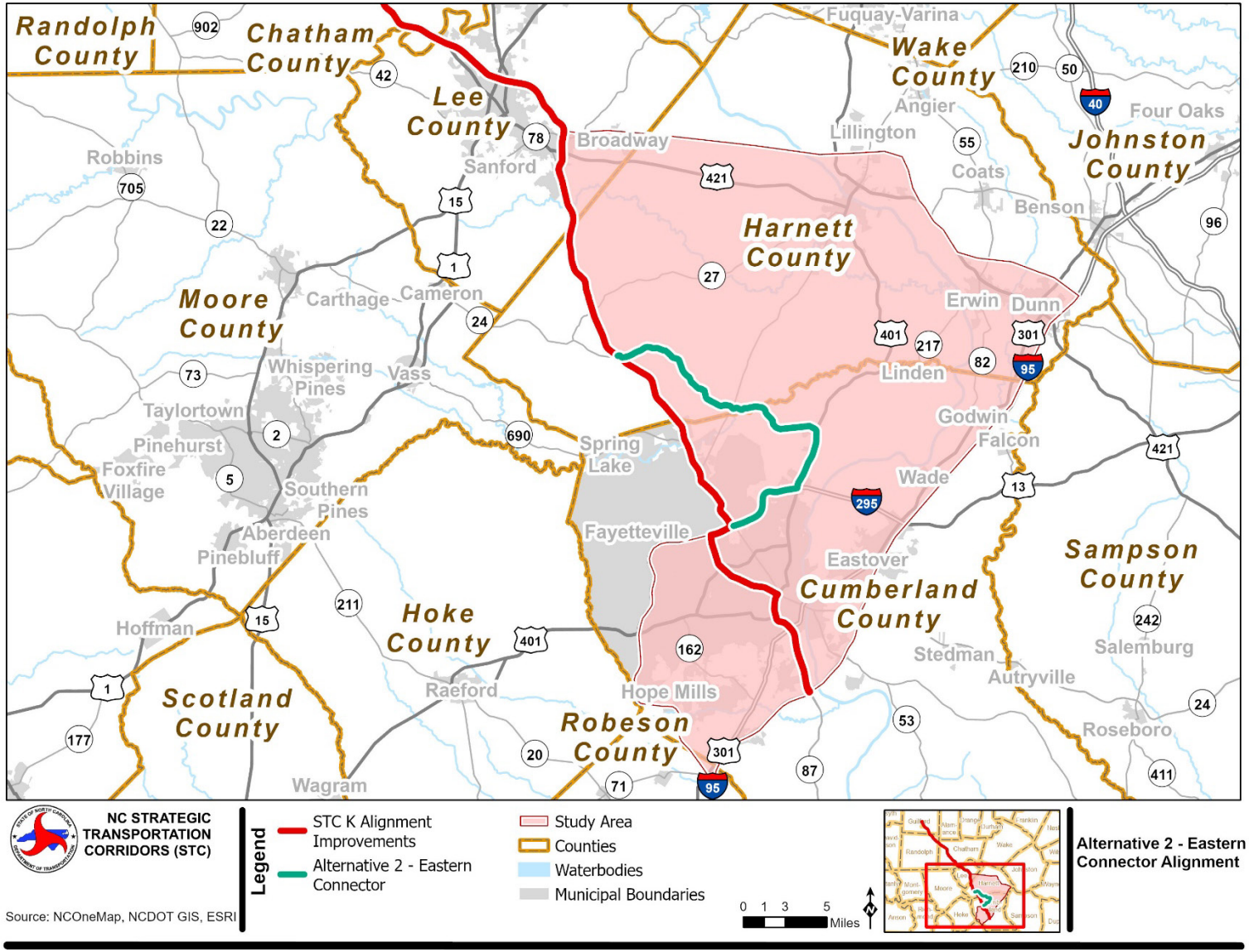
- Spout Springs to John Ryan Road – New location, full access control, 70 mph posted speed, four-lane
- John Ryan Road to Nursery Road – Improve existing, partial/no access control, 45 mph posted, four-lane
- Nursery Road to US 401 – Improve existing, partial/no access control, 55 mph posted, four-lane

The use of existing roadways was deemed preferrable to the corridor being located on all new location, given the amount of sensitive environmental resources in the area and the difficulty of future approvals by regulatory agencies.

Note that a separate engineering analysis was completed to determine whether the Eastern Connector alternative could function with two lanes instead of four lanes to avoid potential impacts to existing uses along the urbanized roadways (most currently at two lanes). The following were the conclusions from that analysis:

- Traffic Diversion:
  - The four-lane scenario diverts a substantial amount of traffic from NC 24 and I-295 across the entire length of the corridor, from the northern end through the southern end.
  - The two-lane scenario has limited traffic diversion benefits, both in geographic extent and magnitude, compared to the four-lane scenario.
- Congestion:
  - The two-lane scenario experiences significant congestion between Spout Springs Road and Overhills Road during the PM peak, with V/C ratios indicating it would be over capacity.
  - The four-lane scenario provides sufficient capacity for 2045 traffic projections, while the two-lane scenario fails to adequately serve peak-period demand.

Figure 73. Alternative 2 - Eastern Connector Alignment



7.1.6 Development of the Eastern Connector

An earlier local project, U-5802, was conceived as an eastern bypass for congestion reduction within Spring Lake and Fort Bragg. However, the alignment would have had significant environmental impacts (primarily to the red-cockaded woodpecker, a federally listed threatened species) and was revised to remain along NC 24/87 from Manchester Road to NC 210 with widening the route from four lanes to six lanes to relieve congestion.

Initial focus group discussions for the STC K Phase 1 Study, held in early 2025 with municipal, county, and local economic development organization representatives (see Section 8.2), yielded a multitude of obstacles posed by keeping the existing STC K alignment along NC 87. Obstacles expressed by the focus group attendees included continuing housing and business development through Spring Lake and conservation easements adjacent to US 421 near Fort Bragg, which would complicate construction along a corridor that has limited space for road widening. Attendees also mentioned the potential need for secondary and side roads for the corridor despite these constraints. Existing high congestion near Fort Bragg and occurrences of flooding throughout Cumberland County were also cited as challenges for the existing STC K alignment. An early recommendation was to widen the last 8 to 12 miles of NC 87 connecting to I-295, allowing it to be a resilient detour route to I-40 in the event of a disaster or emergency response.

Discussions with NCDOT Division 6 and Fort Bragg occurred in March and April 2025 (Section 8.4), and an Eastern Bypass option was initially ruled out to avoid impacts on the habitat of the red-cockaded woodpecker. A bypass beginning near Spout Springs and routing as far west as possible to tie back in to I-295 was requested by NCDOT Division 6. Precedence for a western bypass was demonstrated through a 2019 West Access Study conducted by the base (Fort Bragg 2019), as well as a proposed project (H193239) in the Cumberland County CTP (2023). The western bypass was also preferable to circumvent flooding on NC 690, traffic back-ups on Manchester Road and Vass Road, and the urbanization of NC 210 slowing the transport of military equipment.

In June 2025, however, Fort Bragg representatives cited the western bypass route would not alleviate congestion around Spring Lake, and it would be in proximity to a firing range and other sensitive military uses within the base, making the western bypass no longer a viable option for consideration. They also noted the red-cockaded woodpecker had its status downgraded from endangered to threatened, with a subsequent request to reevaluate the eastern bypass option. The study team then pivoted back to areas to the east of Spring Lake with the goal of finding a path with the fewest impacts.

A GIS corridor optimization tool was used to minimize potential environmental and community impacts of a new Eastern Connector. The features to be avoided (i.e., parks, Fort Bragg, wetlands, natural heritage protected lands, floodplains and flood inundation areas, historic districts, and schools) were loaded into the mapping software. Features were assigned increasing weights from 1 to 5 based on severity of the feature's impact (e.g., libraries rated at 1 [lesser impact] and hospitals rated 5 [greater impact]).

Together, these weights created a cost surface for the new potential Eastern Connector alignments to be generated where each alignment would travel along the area with the least cost, shown in Figure 74. These corridors were also bounded by manually chosen end points along NC 24/87, US 401, and I-295. The longer eastern branch of the corridor output was then modified at a few points to tie the alignment onto existing roads, including Great Dane Lane, Ray Road, and Elliot Farm Road (to use existing roads where possible to avoid human and natural resources where feasible). These existing roads were determined to be feasible by traffic engineers for eventual widening. The northern portion of the corridor routing around the Lexington Plantation housing development in Cameron was pulled in south, closer to the development, in order to avoid local natural resources and the homes along Buffalo Lake Road. These alterations culminated in the finalized Eastern Connector alternative (Figure 74).

Although a portion of Proposed I-685 overlaps with the 421 Connector alternative, each project has independent facility expectations (and possibly independent utility, as defined by NEPA). STC K does not necessarily need to be a freeway or interstate (with controlled access) to meet the primary objectives (Table 29). Also, STC K would serve the primary purpose of facilitating freight traffic from Greensboro to Wilmington with other considerations such as access to Fort Bragg. This study was designed to evaluate only strategic transportation elements under the NCDOT STC Program; therefore, it does not cover all that is needed to evaluate an interstate.

7.2 Transportation Analysis Methodology

This section summarizes the transportation analysis methodology used in the alternatives analysis. The performance metrics shown in Table 29 were used to analyze and assess future alternatives for STC K along with other environmental and corridor measures. NCSTM Gen 4.5 was utilized to generate the majority of the performance metrics related to congestion, travel times, and VMT. The remaining measures were derived from other sources and are discussed qualitatively where data and forecasts are not available. The measures were refined with input from the study team and Corridor Steering Committee (CSC) and were used to present the alternatives analysis results during the public workshops later in the study. Performance measures related to broad project benefits and impacts and cost estimates are not included in the performance measures.

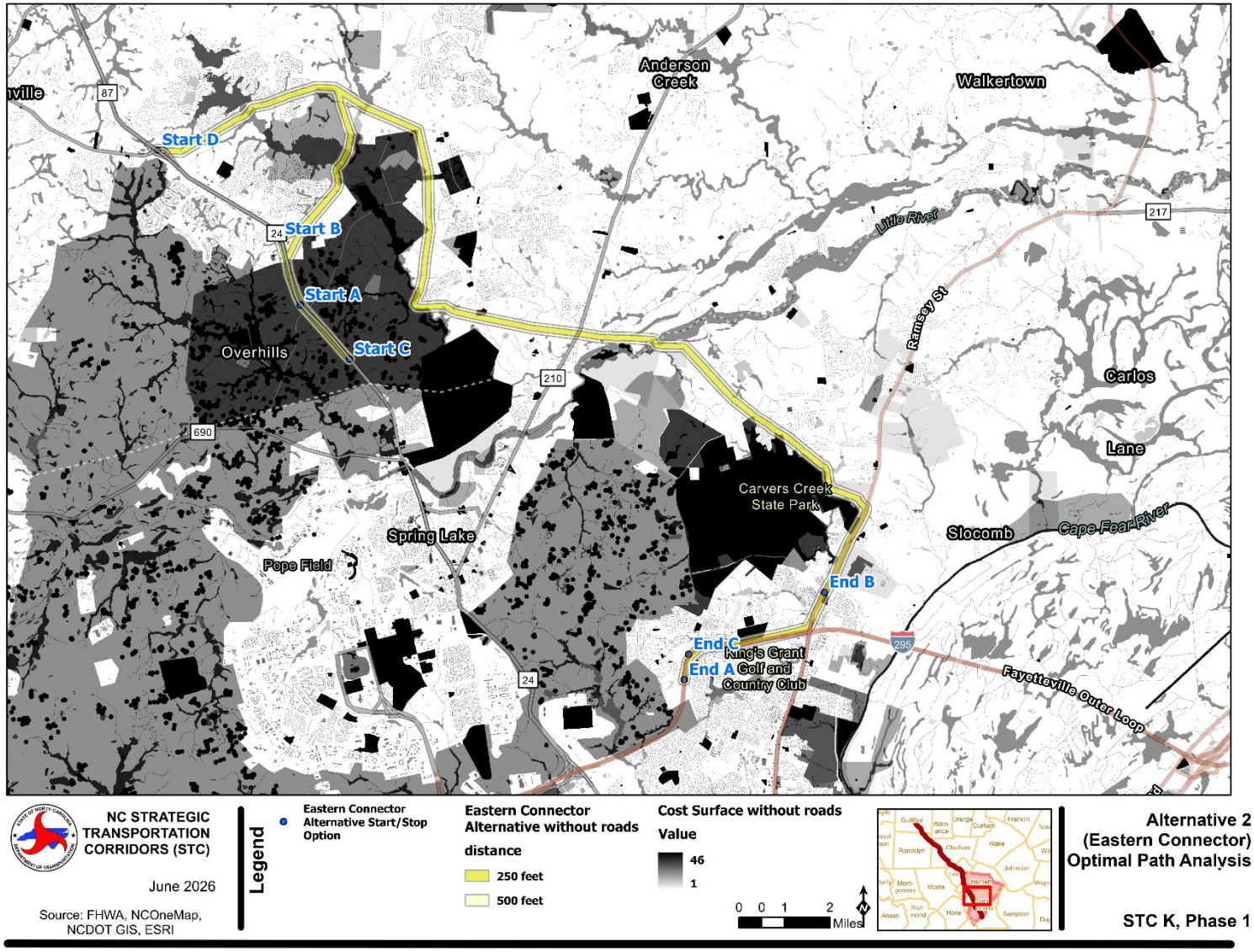
7.2.1 Travel Demand Modeling Metrics

Travel demand modeling-based performance measures for the study were developed using NCSTM Gen4.5. The model was used to evaluate regional traffic patterns, roadway operating conditions, and mobility impacts associated with the alternatives.

A high-level calibration review was performed within the study area to confirm that the model reasonably reflected existing traffic conditions and travel patterns. The calibrated model framework was then used to develop and evaluate multiple forecast scenarios, including the 2023 base year scenario, the 2045 No-Build scenario, and the 2045 build alternatives.

The 2045 No-Build scenario was used as the primary benchmark scenario for evaluating future-year alternative impacts.

Figure 74. Alternative 2 (Eastern Connector) Optimal Path Analysis



Following model execution, raw model assignment outputs were post-processed to improve consistency between modeled traffic volumes and observed traffic counts. This process compared 2023 modeled link-level traffic volumes to available observed traffic count data and developed link-specific adjustment factors to account for differences between modeled and observed conditions. The resulting adjustment factors were subsequently applied to all 2045 scenario outputs to maintain consistency across the alternative analysis process.

The post-processed traffic volumes were then used to develop volume-related performance measures, including traffic diversion analysis, V/C ratio evaluation, and VMT calculations. Additional travel time measures were developed using congested assignment outputs from the travel demand model as described in the following sections.

7.2.1.1 Traffic Diversion

Traffic diversion analysis was conducted to evaluate how each build alternative redistributed traffic throughout the regional transportation network relative to the 2045 No-Build scenario. The analysis was intended to identify roadway segments expected to attract traffic to new or improved facilities, as well as facilities expected to experience reductions in traffic demand due to diverted trips.

Traffic diversion was calculated by comparing post-processed daily traffic volumes between each build alternative scenario and the 2045 No-Build scenario on a link-by-link basis. The diversion value for each roadway segment was computed as the difference in assigned traffic volume between the two scenarios.

Diversion mapping was developed to visually illustrate regional traffic redistribution patterns associated with each alternative. Roadway segments experiencing traffic increases relative to the No-Build scenario were categorized as “Diverted To,” while segments experiencing traffic reductions were categorized as “Diverted From.” To improve readability and focus on meaningful operational changes, roadway segments with diversion volumes below a minimum threshold were de-emphasized in Figure 100 through Figure 102 and traffic diversion figures in Appendix B.

The traffic diversion maps are symbolized using directional color coding and variable line widths proportional to the magnitude of diverted traffic volumes. This approach allowed for identification of major regional diversion corridors, operational shifts between parallel facilities, and changes in access patterns associated with the build alternatives.

Traffic diversion analysis was primarily intended as a visualization and system interpretation tool to support understanding of regional travel pattern changes resulting from the proposed corridor improvements.

7.2.1.2 Vehicle Travel Time

Travel time analysis was conducted to evaluate regional mobility, corridor connectivity, and accessibility impacts associated with the study alternatives. The analysis focused on travel times between selected key O-D pairs representing major population centers, freight generators, megasites, military facilities, regional activity centers, and the Port of Wilmington. Even though the STC K Phase 1 study limits end at I-95, travel time was measured between Greensboro and the Port of Wilmington, consistent with one of the key performance measures – “To provide a direct

interstate connection for freight and passenger vehicles between Greensboro and the Port of Wilmington."

Representative study destinations were identified throughout the corridor and surrounding region, including locations in Greensboro, Sanford, Lillington, Fort Bragg, Fayetteville, Wilmington, and the Port of Wilmington. Multiple subarea locations were included within several regional centers to better capture localized accessibility and directional travel characteristics. For the megasite connectivity performance measure, only megasites located within 2 miles of the STC K alignment were included in the analysis. Figure 75 through Figure 77 illustrate the locations of the selected study destinations used in the travel time analysis north of Sanford, south of Sanford, and in Wilmington, respectively.

Travel times were extracted from congested highway assignment results generated by NCSTM Gen4.5. Separate travel time skims were developed for the AM peak period, midday period, and PM peak period to capture differences in network operating conditions throughout the day.

For each scenario, O-D pair travel time matrices were developed using modeled congested travel times between all selected study destinations. Average travel times were then calculated for selected O-D groupings corresponding to specific study objectives, including:

- Freight movement and Port of Wilmington connectivity
- Regional mobility and corridor efficiency
- Military access to Fort Bragg
- Megasite and economic development connectivity

Depending on the study objective, different subsets of O-D pairs were used to develop the associated performance measures. This approach allowed the analysis to focus on travel patterns most relevant to each study objective while maintaining consistency in the overall methodology.

Comparisons between the 2045 No-Build scenario and build alternatives were used to quantify changes in regional accessibility and mobility performance. Average travel time differences were subsequently summarized and incorporated into the performance measure evaluation framework presented in Section 7.3.

7.2.1.3 Volume-to-Capacity Ratio

V/C ratio analysis was conducted to evaluate roadway operating conditions and relative congestion levels associated with each alternative. V/C ratio represents the relationship between traffic demand and the estimated carrying capacity of a roadway facility and is commonly used as an indicator of roadway congestion and operational stress.

V/C ratios were calculated using post-processed traffic volumes derived from NCSTM Gen4.5 assignment outputs. The post-processing methodology described in Section 7.2.1.1 was applied prior to V/C calculation to improve consistency between modeled traffic volumes and observed traffic count conditions.

Figure 75. Key Destinations - North of Sanford

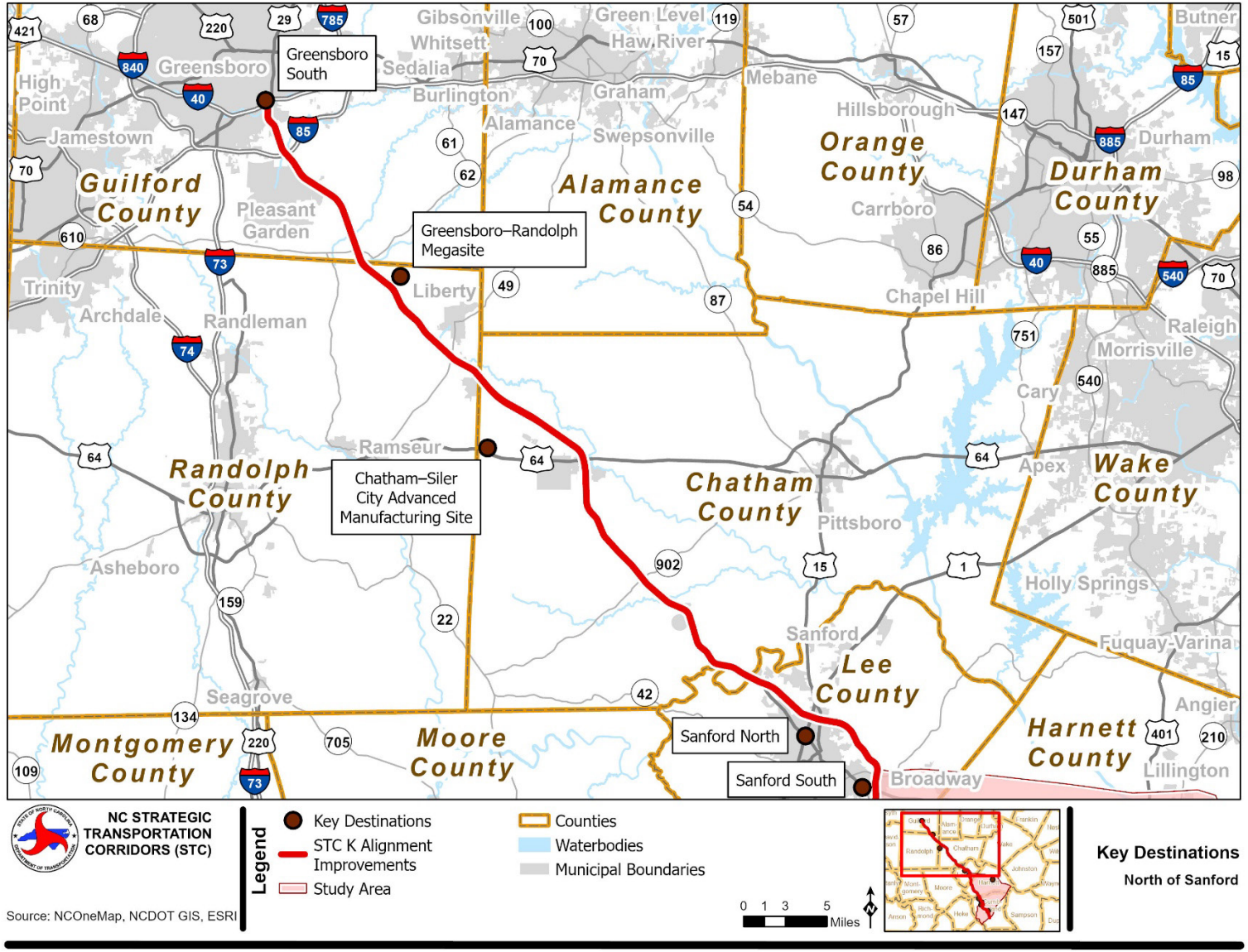


Figure 76. Key Destinations - South of Sanford

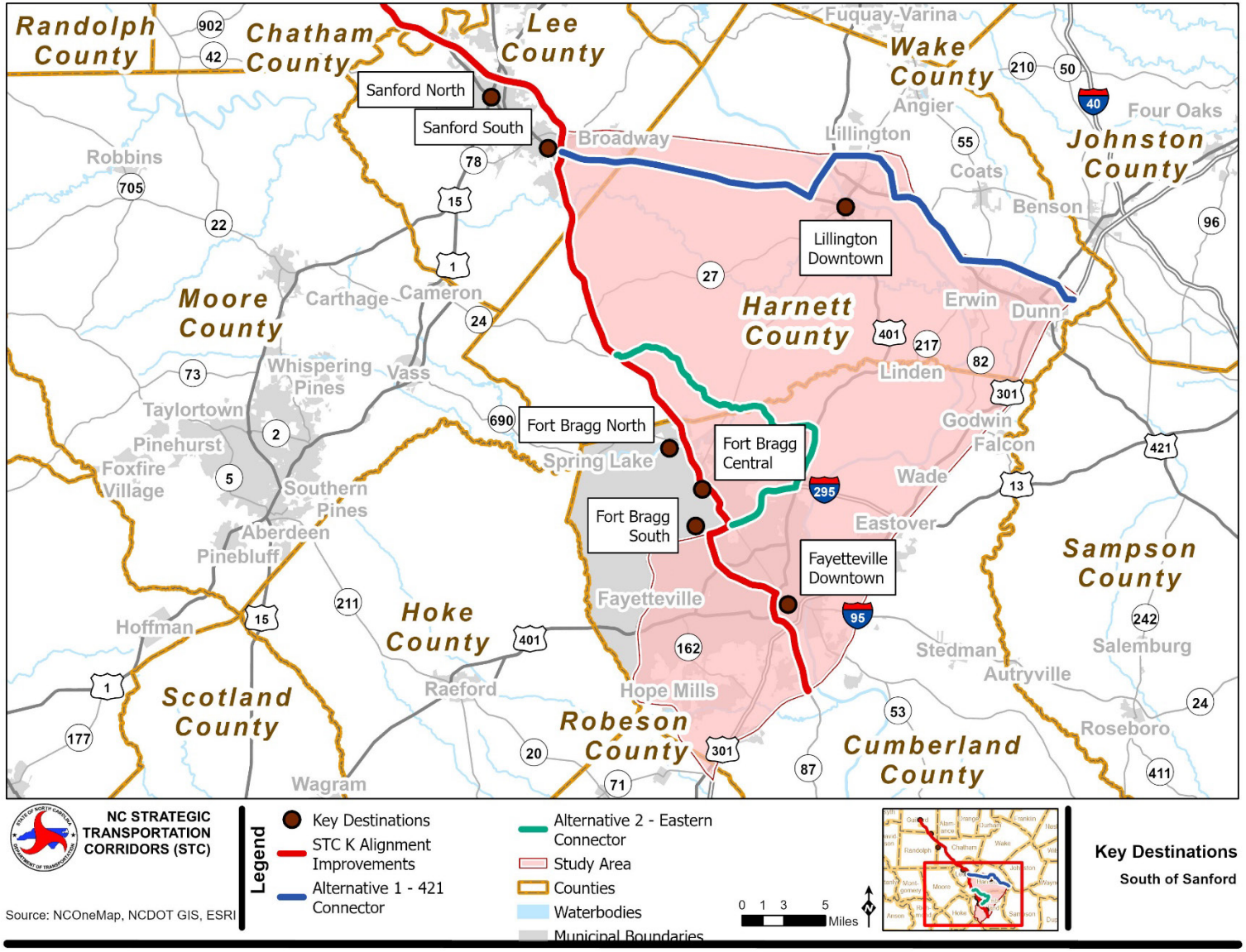
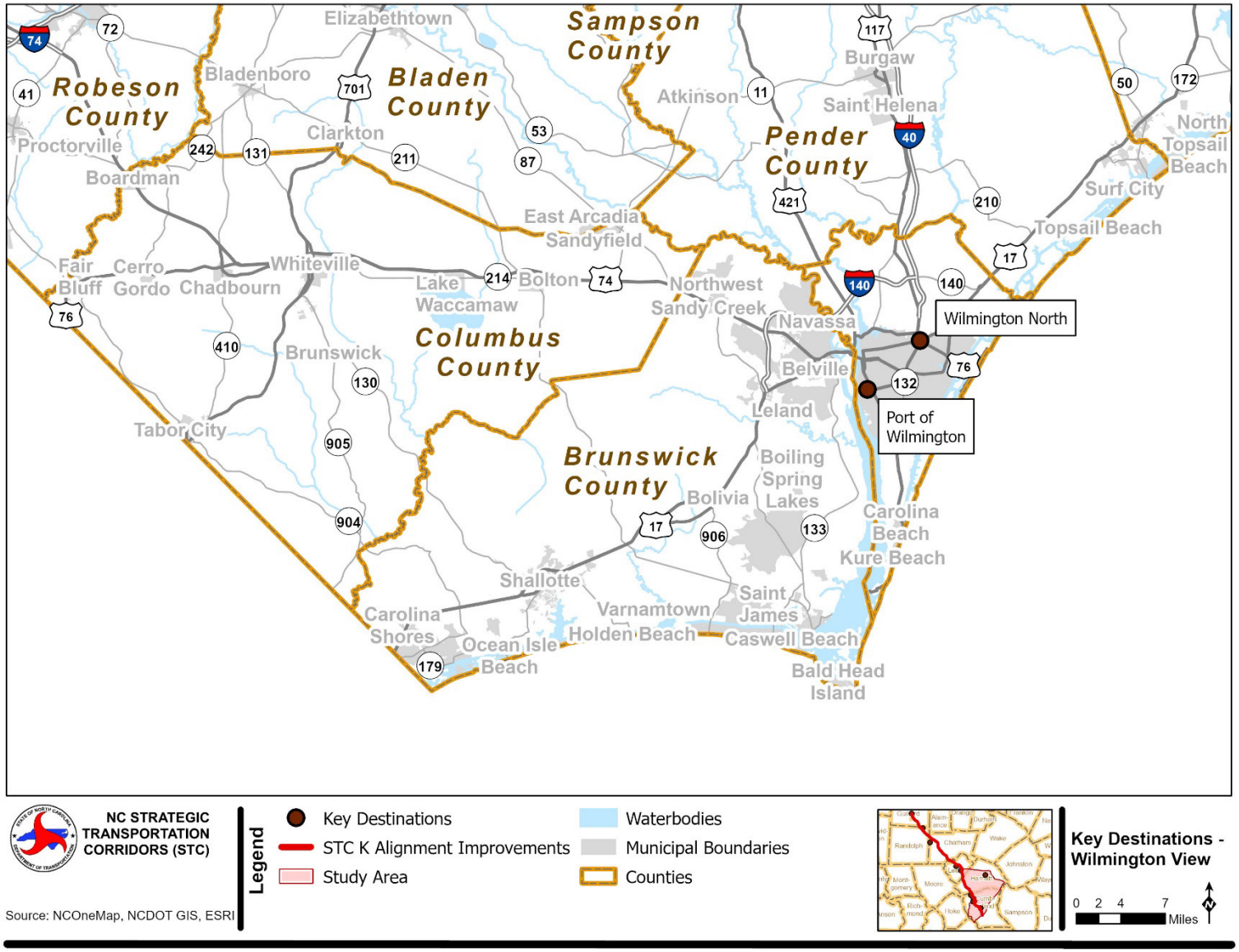


Figure 77. Key Destinations - Wilmington View



Separate V/C analyses were conducted for the AM peak period, midday period, and PM peak period to capture variations in congestion patterns throughout the day. For each analysis period, assigned traffic volumes were compared to coded roadway capacities within the model network to calculate directional link-level V/C ratios.

To support evaluation across different geographic and operational contexts, average V/C ratios were summarized for three different analysis extents:

- Overall study area
- Key regional triangle area generally bounded by Sanford, Benson, and I-295 near Fayetteville
- Key STC K corridor segment generally between Sanford and I-295

This multi-level approach allowed the analysis to evaluate both regional systemwide operational impacts and localized corridor performance associated with the study alternatives.

In addition to summary statistics, link-level V/C ratio mapping was also developed for each scenario and analysis period to support visualization of spatial congestion patterns throughout the study area. The mapping approach utilized color-coded roadway segments representing different V/C ratio ranges, while roadway widths were scaled based on traffic volumes. This visualization methodology assisted in identifying major congestion corridors, operational bottlenecks, and changes in traffic distribution associated with the study alternatives.

Comparisons between the 2045 No-Build alternative and build alternatives were used to quantify changes in roadway operating conditions and congestion levels. The resulting V/C ratio measures were subsequently incorporated into the performance measure evaluation framework presented in Section 7.3.

7.2.1.4 Vehicle Miles Traveled

VMT analysis was conducted to evaluate changes in total vehicle travel associated with each study alternative. VMT was calculated using post-processed traffic volumes from NCSTM Gen4.5 assignment outputs.

For each roadway segment, VMT was calculated by multiplying the post-processed traffic volume by the corresponding segment length. Link-level VMT values were then aggregated to develop total VMT summaries for the overall study area for each scenario.

VMT was calculated for the 2045 No-Build alternative and each build alternative. The build alternative VMT values were then compared to the 2045 No-Build scenario to quantify changes in total vehicle travel throughout the study area. The resulting VMT measures were subsequently incorporated into the performance measure evaluation framework presented in Section 7.3.

7.2.2 Safety Performance Metrics

Safety performance of the study area under future conditions was evaluated using injury crash rates per lane mile to assess the potential safety impacts associated with the No-Build and build alternatives. The analysis excluded the existing STC K alignment north of Sanford because no major corridor alternatives or alignment changes are currently proposed within the section north of

Sanford, and thus, future safety conditions in that section are assumed to remain generally consistent across all scenarios.

To ensure a consistent basis for comparison across scenarios, the same set of corridors within the study area was evaluated for each future scenario, including the southern portion of the existing STC K alignment, the 421 Connector and Eastern Connector, portions of I-95 between US 421 and NC 87, and portions of I-295 between the Eastern Connector and I-95. Figure 78 shows the locations of the selected corridors included in the safety analysis. Although I-95 and I-295 are not directly part of the build alternative alignments, they are included because they are directly connected to the build alternatives and are therefore expected to experience changes in traffic patterns and safety performance under future scenarios.

Expected crash rates were estimated using the Highway Safety Manual predictive methods. Safety performance functions and local calibration factors provided in the NCDOT predictive analysis spreadsheets were applied to estimate predicted crash frequencies for each roadway segment (NCDOT 2026). Traffic volumes from NCSTM Gen4.5 and segment lengths were used for the future scenarios. For segments with proposed changes in cross section under the alternative scenarios, applicable Crash Modification Factors (CMFs) from the NCDOT predictive analysis spreadsheets were applied to account for the potential safety impacts of the changes. In addition, crash proportion tables provided by NCDOT were used to estimate injury crashes from the predicted crashes separately for single- and multi-vehicle crashes, which were then combined.

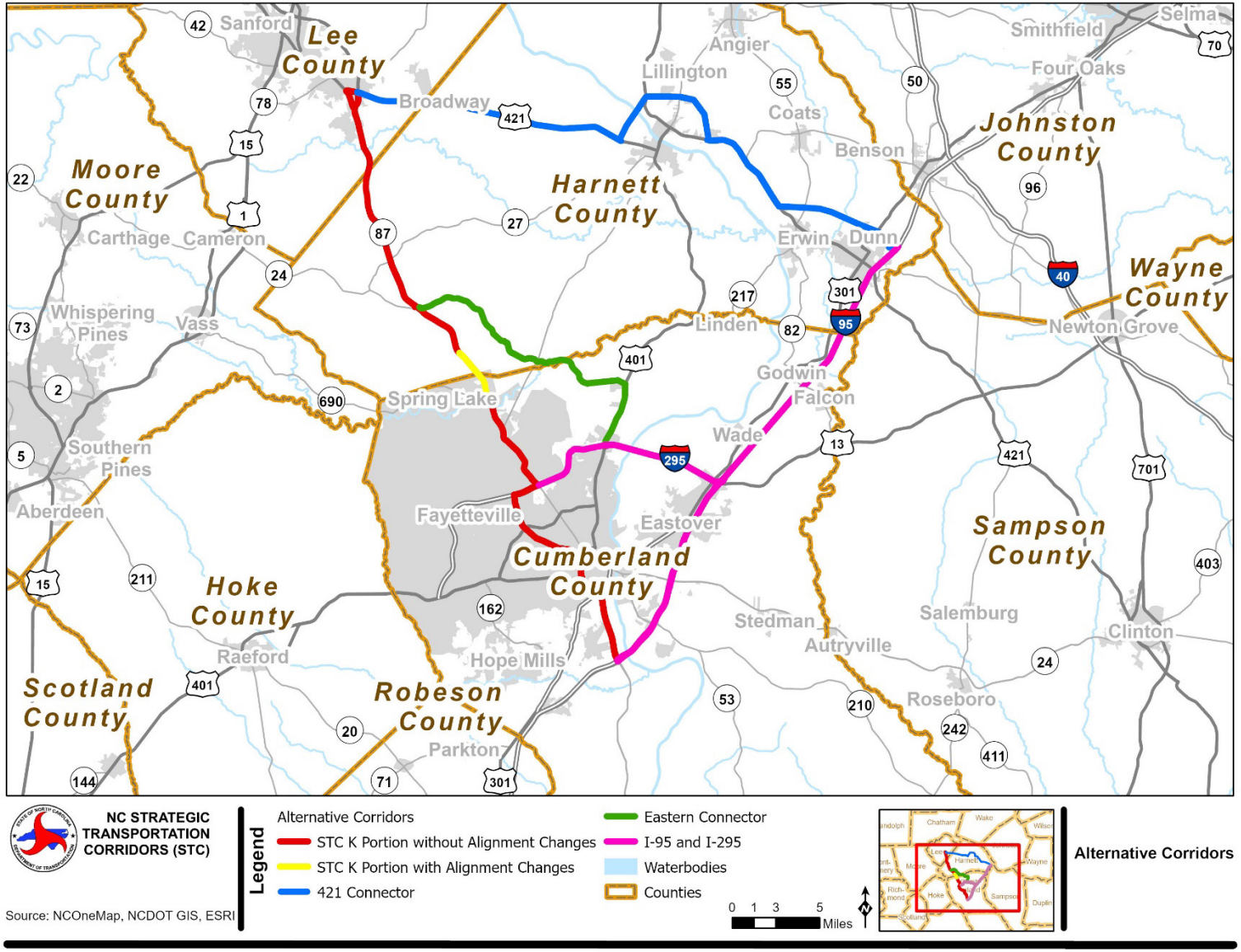
For existing roadway segments, the 2023 crash data provided by NCDOT were combined with safety performance function-predicted crashes using the Empirical Bayes method to estimate expected crashes for existing conditions. The resulting expected crashes were then projected to the 2045 horizon year using the future-year traffic volumes. For new build segments without crash histories, safety performance function-predicted crashes were used to estimate future crash frequencies for the 2045 scenarios.

Crash rates were then calculated for each alternative as the total expected injury crashes per lane mile to account for differences in alternative length and lane configuration. The alternatives were then compared across future scenarios to evaluate the potential safety impacts of each alternative.

7.2.3 Population and Employment

To evaluate the population and employment context of each alternative, a GIS spatial analysis was conducted using TAZ data for both the 2023 base year scenario (existing conditions) and the 2045 future scenario. A 2-mile buffer was generated around each corridor segment centerline and intersected against the TAZ layer; for zones that partially overlapped the buffer, an area-weighted apportionment method was applied to estimate each zone's attributed share of population and jobs. Results are summarized by alternative in the following sections.

Figure 78. Alternative Corridors



7.2.3.1 STC K Alignment Improvements

Table 31 demonstrates the 2-mile buffer around STC K Alignment Improvements with approximately 205,963 residents at a density of 509 persons per square mile, alongside 162,679 jobs at 402 jobs per square mile. By 2045, population is projected to grow to 250,125 (a 21 percent increase), with density rising to 619 persons per square mile — an increase of 110 persons per square mile. Employment is forecast to reach 202,474 (24 percent growth), with employment density increasing to 501 jobs per square mile. These figures reflect the STC K Alignment Improvements' positioning within a highly urbanized and economically active region, underscoring its potential to serve substantial travel demand across the planning horizon.

Table 31. STC K Alignment Improvements Population and Employment (2023 and 2045)

Metric	2023	2045
Population		
Total Population	205,963	250,125
Population Density (persons/square mile)	509	619
Employment		
Total Employment	162,679	202,474
Employment Density (jobs per square mile)	402	501

STC K Alignment Improvements Population Density

Figure 79 and Figure 80 illustrate the 2023 population density along the STC K Alignment Improvements alternative. The alignment of the alternative has the highest population density at the urban endpoint — reaching around 4,000 to 7,000 persons per square mile near the Greensboro urbanized area in Guilford County to the north, and around 2,500 to 4,000 persons per square mile in the Fayetteville urbanized area in Cumberland County to the south. The intervening counties of Randolph, Chatham, and Moore remain predominantly rural, with densities at or below 500 persons per square mile. By 2045 (Figure 81 and Figure 82), this pattern is expected to persist, with overall density along the alignment projected to increase from 509 to 619 persons per square mile. A portion along the alignment in Harnett County from Nursery Road to the Cumberland County line is projected to experience more population growth in 2045.

Figure 79. STC K Alignment Improvements 2023 Population Density - North of Sanford

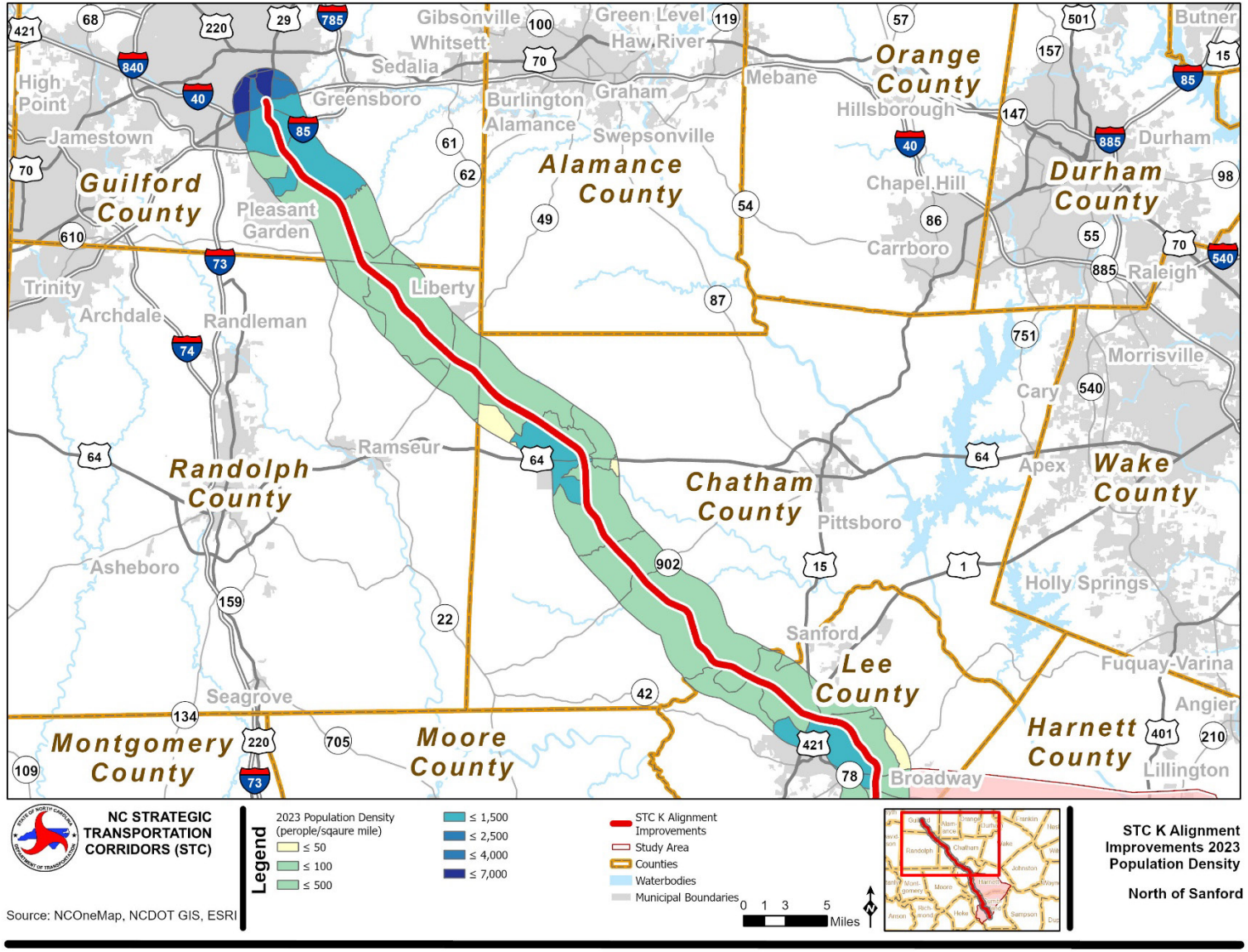


Figure 80. STC K Alignment Improvements 2023 Population Density - South of Sanford

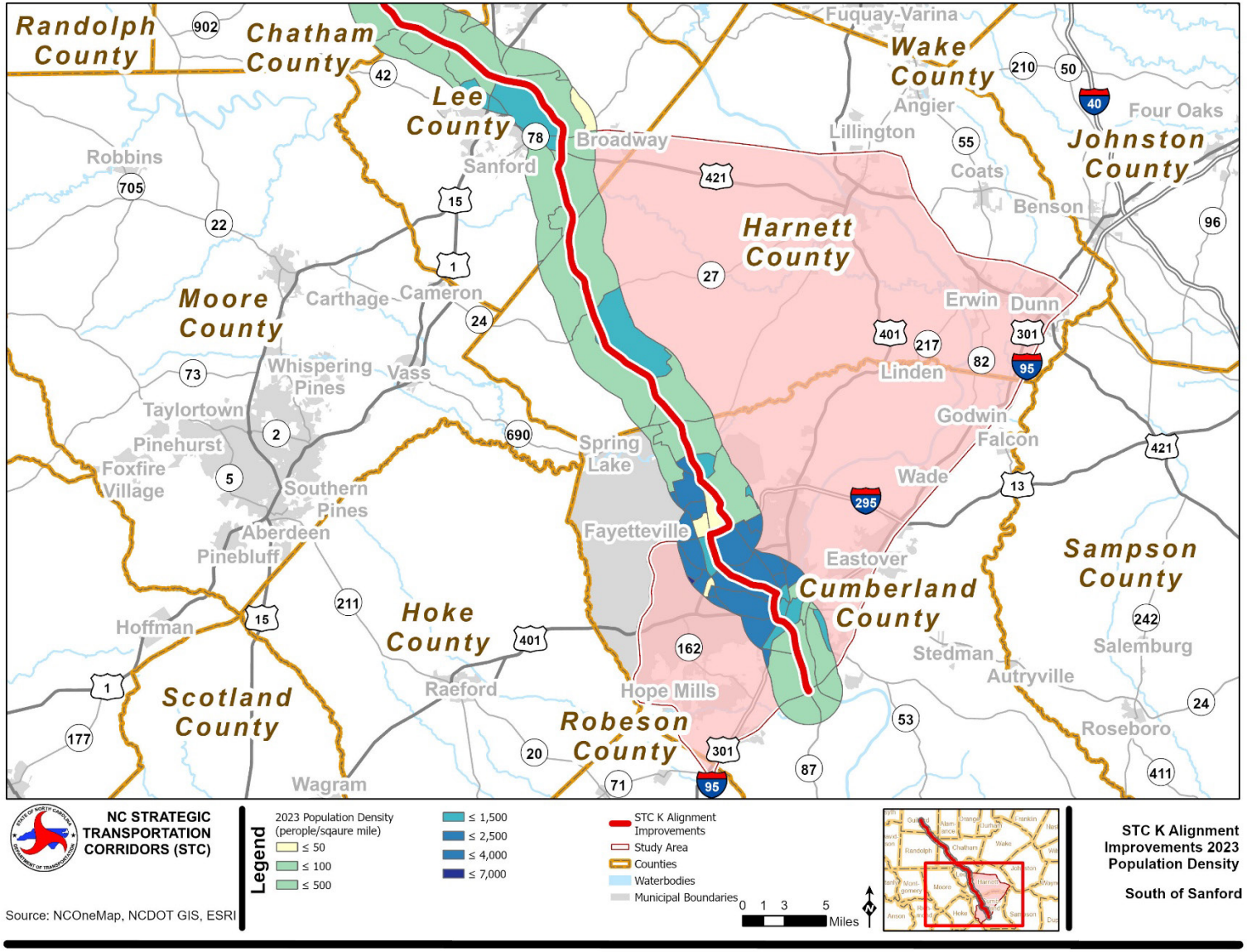


Figure 81. STC K Alignment Improvements 2045 Population Density - North of Sanford

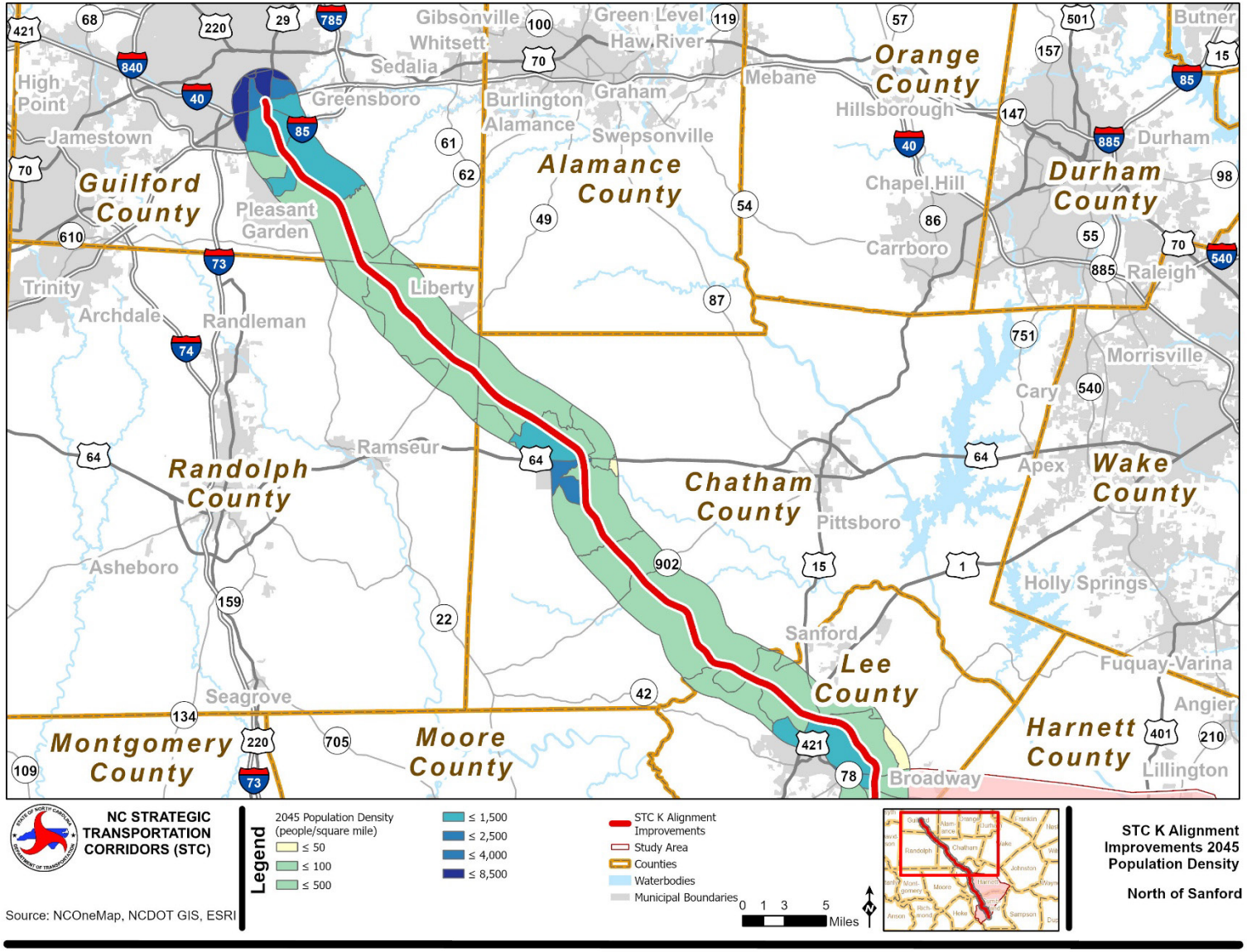
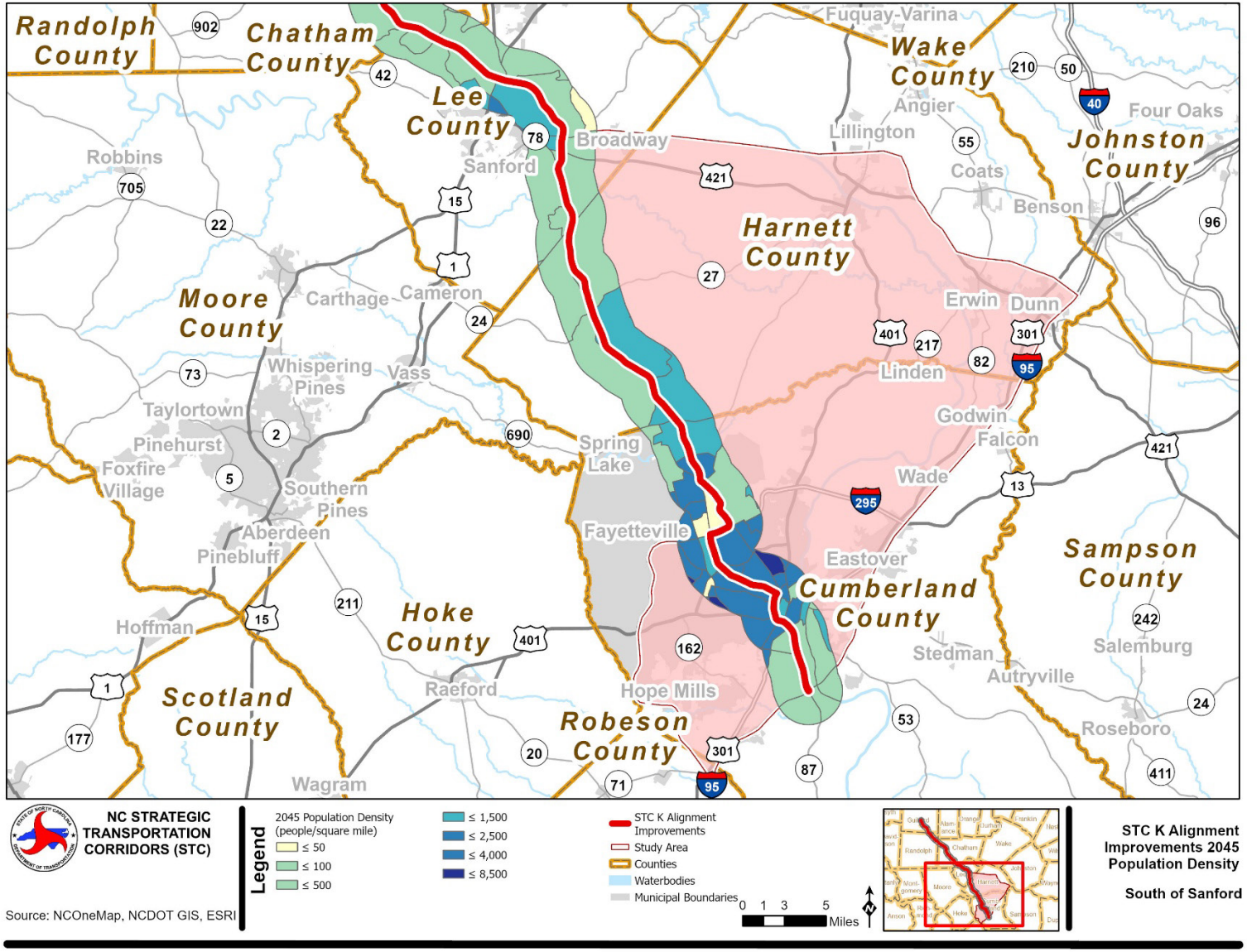


Figure 82. STC K Alignment Improvements 2045 Population Density - South of Sanford



STC K Alignment Improvements Employment Density

As shown in Figure 83 and Figure 84, 2023 employment density along the STC K Alignment Improvements alternative is mostly concentrated at the two urban endpoints, similar to the patterns of population density. The highest density (around 35,000 jobs per square mile) is near the Greensboro employment center in Guilford County to the north. The employment density of 5,000 to 10,000 jobs per square mile is located in Cumberland County around Fayetteville to the south, while the intervening counties of Randolph, Chatham, Moore, and Lee remain predominantly at or below 500 jobs per square mile. By 2045 (Figure 85 and Figure 86), this spatial pattern largely persists, though the maximum density category expands slightly to around 42,000 jobs per square mile at the Guilford County terminus and Cumberland County.

7.2.3.2 Alternative 1 – 421 Connector

Table 32 demonstrates the 2-mile buffer around the 421 Connector capturing approximately 33,269 residents at 262 persons per square mile and 18,110 jobs at 143 jobs per square mile. By 2045, population is projected to reach 46,227 — a 39 percent increase, the highest relative growth rate of the three build alternatives — with density rising to 364 persons per square mile. Employment is forecast to grow to 24,609 (36 percent), with employment density increasing to 194 jobs per square mile.

Table 32. 421 Connector Population and Employment (2023 and 2045)

Metric	2023	2045
Population		
Total Population	33,269	46,277
Population Density (people per square mile)	262	364
Employment		
Total Employment	18,110	24,609
Employment Density (jobs per square mile)	143	194

421 Connector Population Density

As shown in Figure 87, the 2023 population density along the 421 Connector alternative is concentrated within the southern portion of the buffer, where the alignment of the alternative traverses Lee County and the western edge of Harnett County near Sanford, with densities reaching around 450 to 1,000 persons per square mile. The northern portion of the buffer, spanning Lee County toward Sanford, contains a small pocket of low density (around 100 to 150 persons per square mile), while the remainder of the buffer area — including the broader study area extending into Harnett and Cumberland Counties — falls outside the corridor's catchment and remains largely undeveloped. By 2045 (Figure 88), density within the buffer intensifies noticeably, with the same concentrated band along the corridor reaching around 900 to 1,200 persons per square mile.

Figure 83. STC K Alignment Improvements 2023 Employment Density - North of Sanford

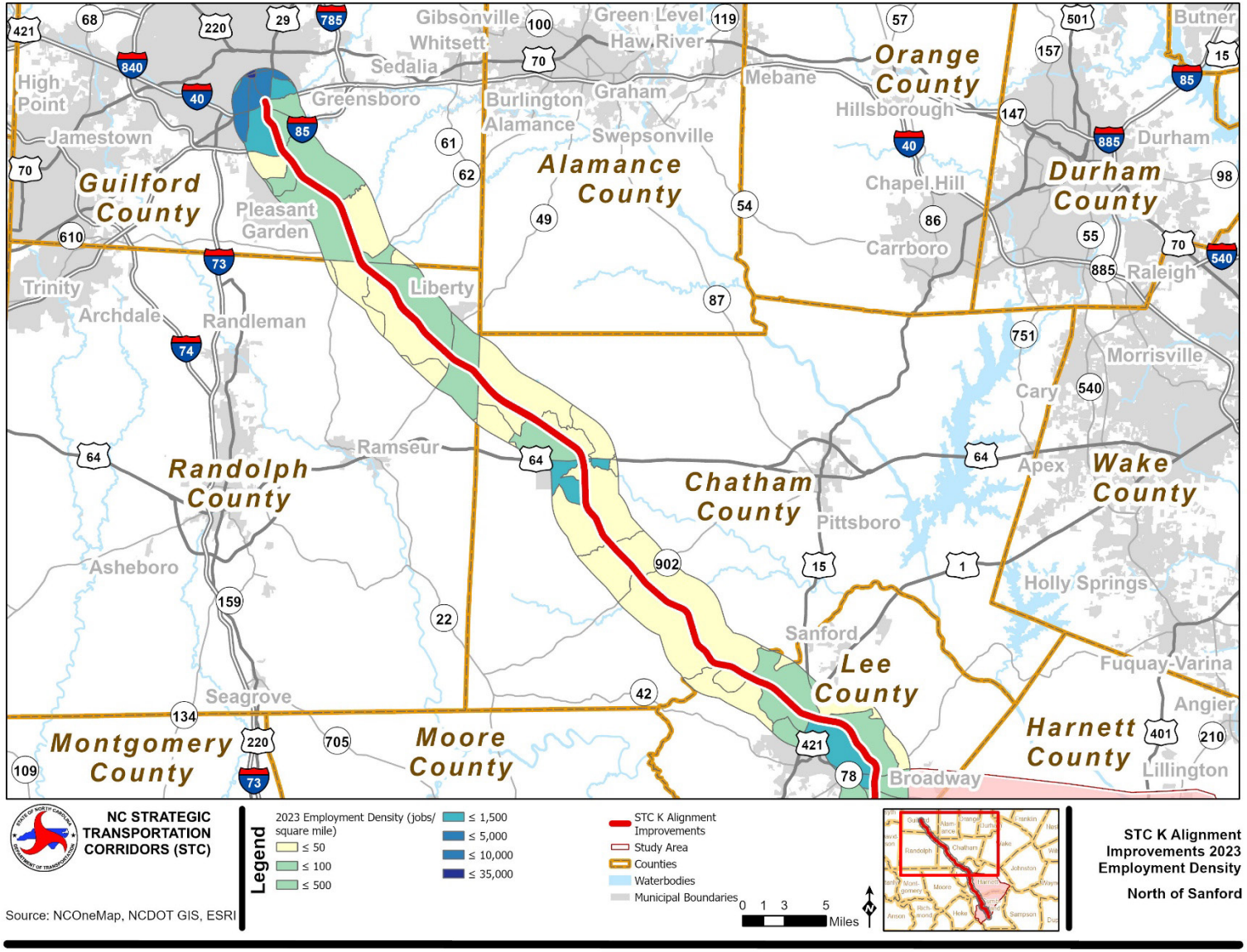


Figure 84. STC K Alignment Improvements 2023 Employment Density - South of Sanford

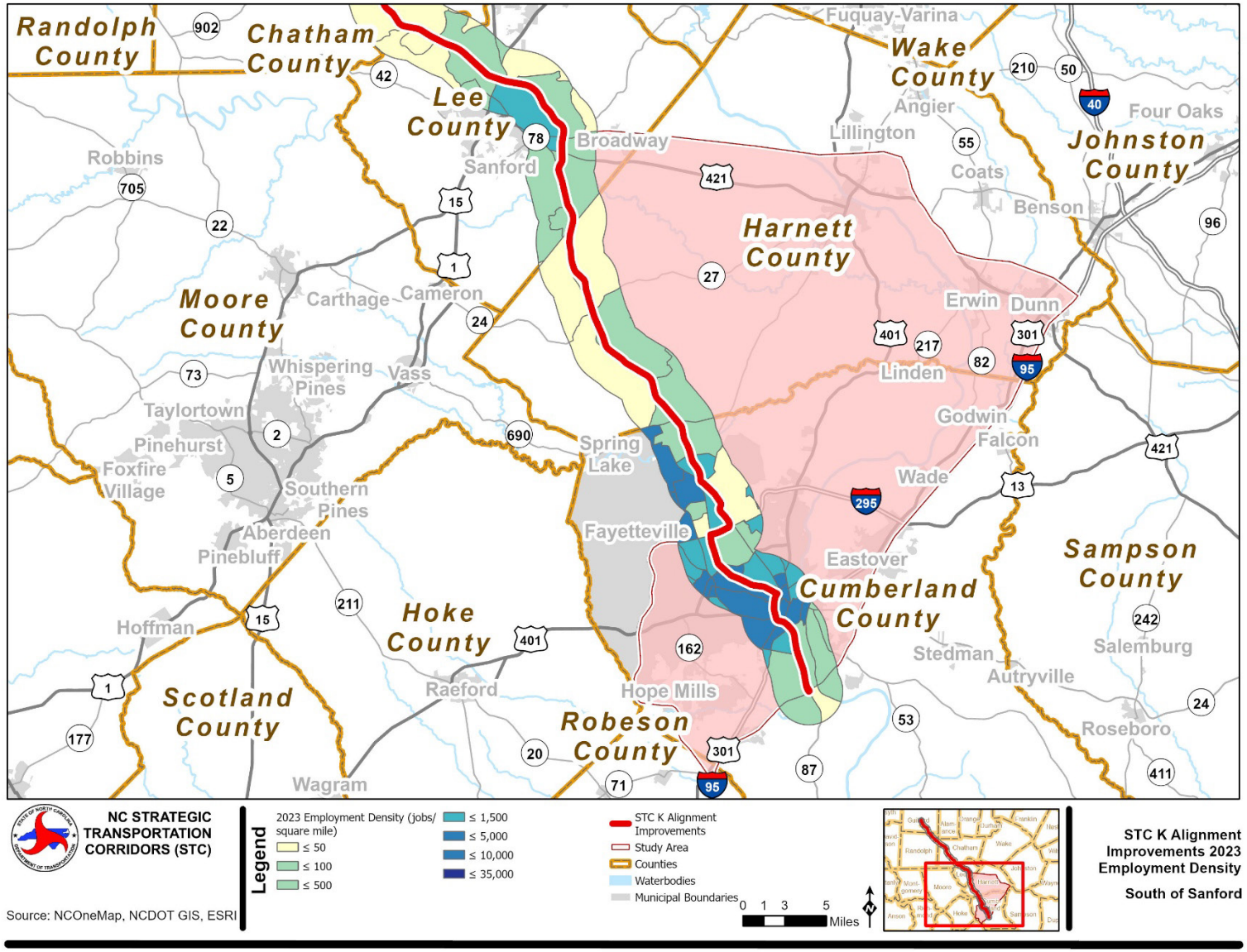


Figure 85. STC K Alignment Improvements 2045 Employment Density - North of Sanford

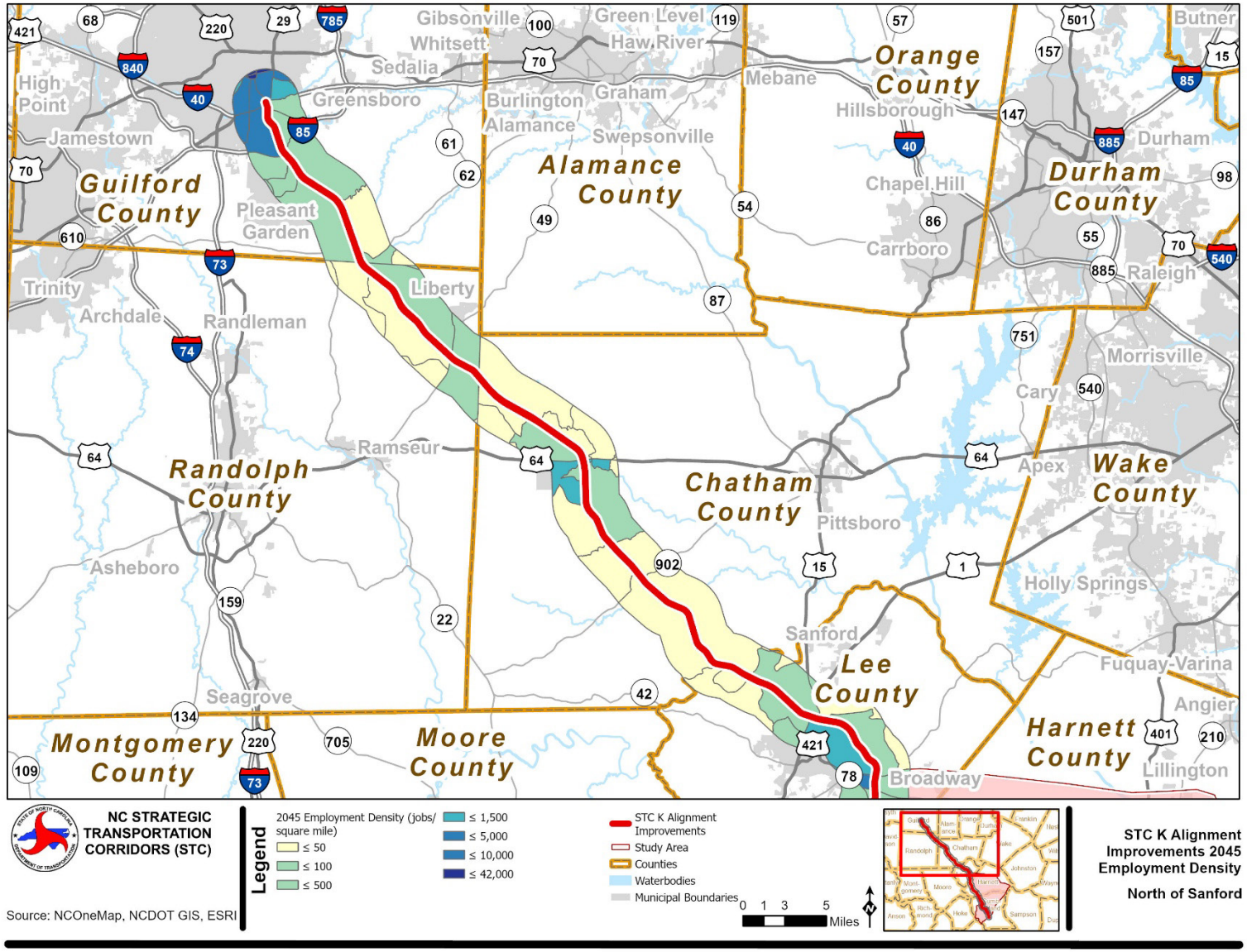


Figure 86. STC K Alignment Improvements 2045 Employment Density - South of Sanford

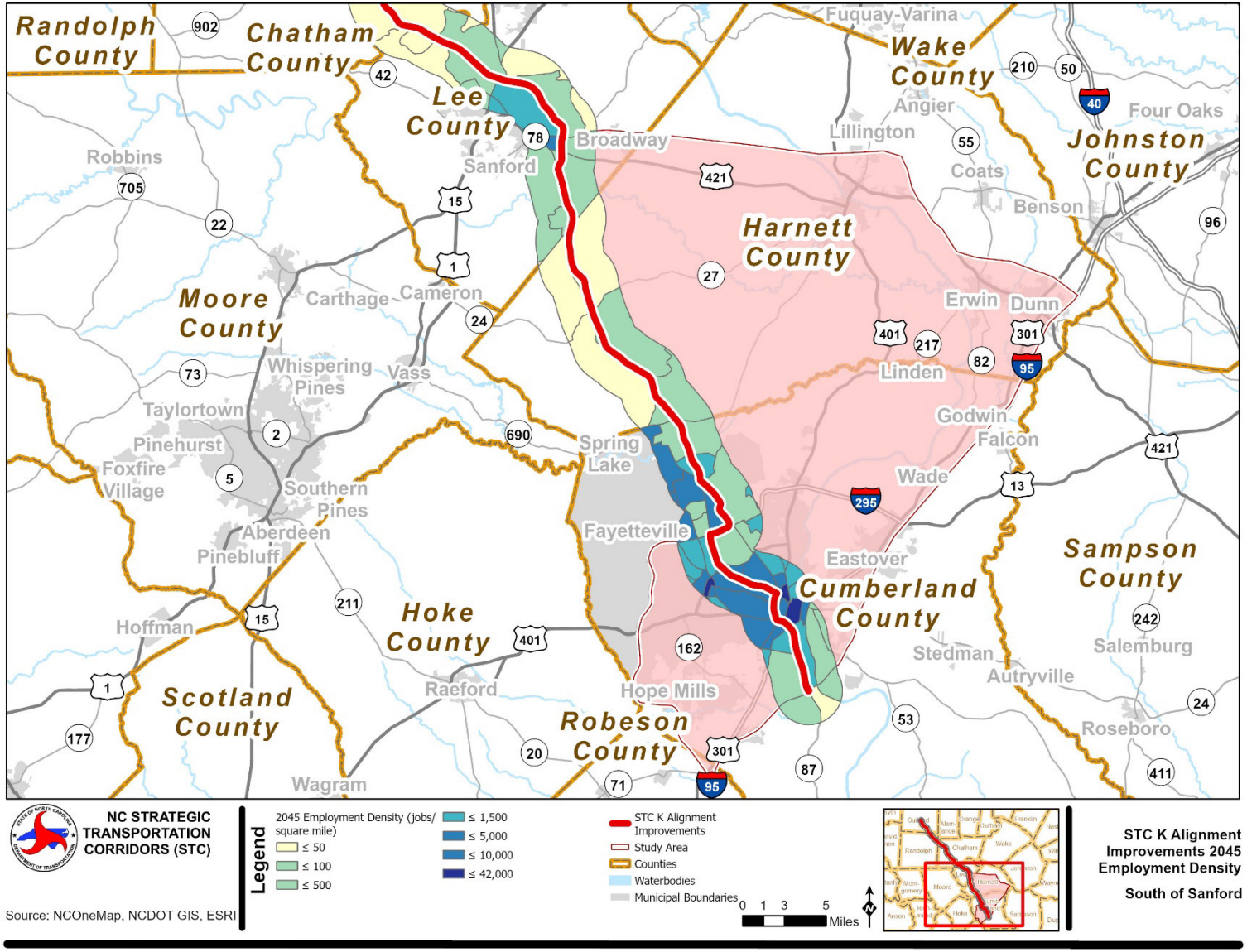


Figure 87. 421 Connector 2023 Population Density

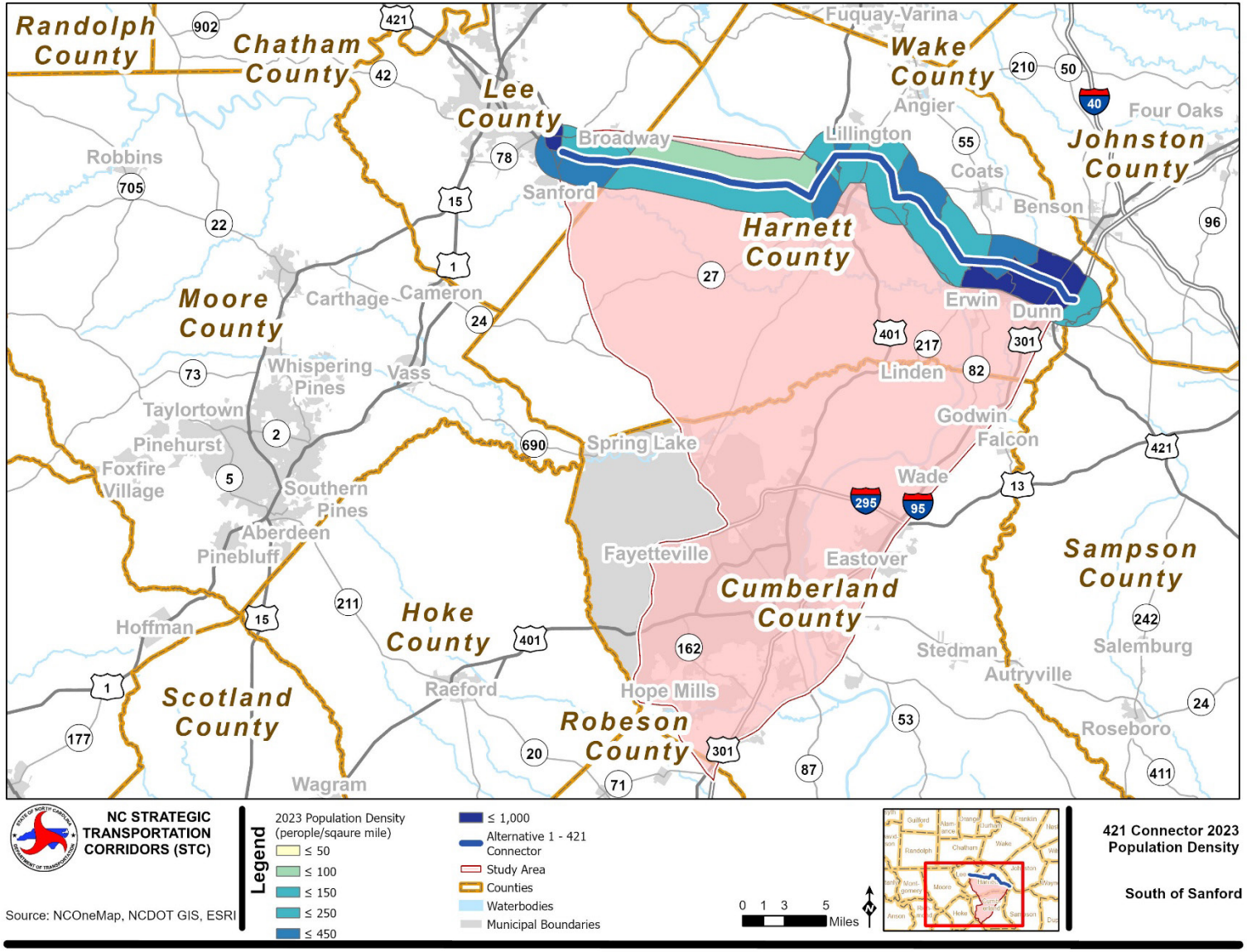
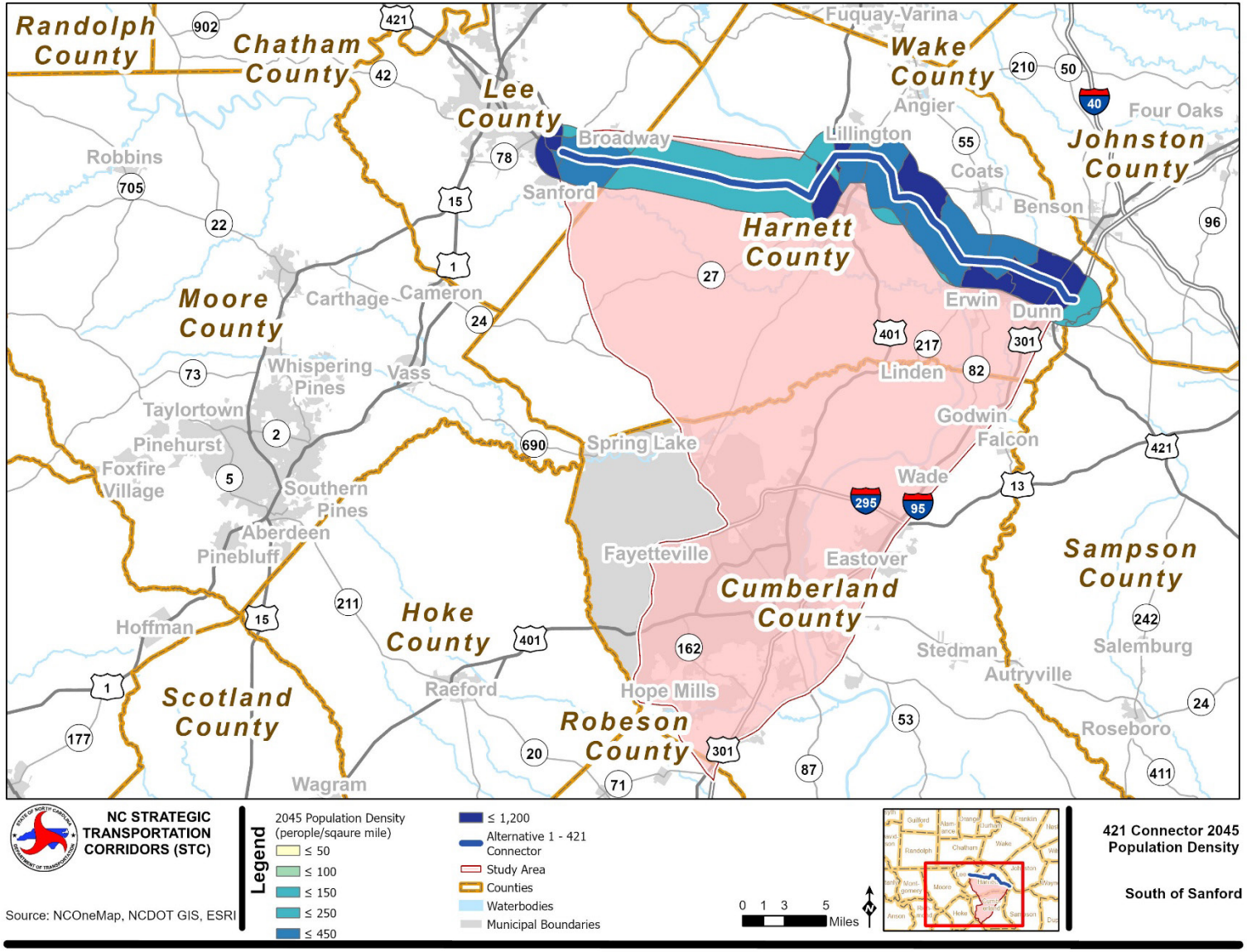


Figure 88. 421 Connector 2045 Population Density



421 Connector Employment Density

As shown in Figure 89, 2023 employment density along the 421 Connector alternative is concentrated within the southern portion of the buffer spanning Lee County and the western edge of Harnett County, with the highest densities reaching around 500 to 1,100 jobs per square mile near the Sanford area. The northern portion of the buffer and the broader alternative alignment through Harnett County remain predominantly around 50 to 100 jobs per square mile, reflecting the largely rural and undeveloped character of this alternative. By 2045 (Figure 90), employment density within the buffer shows modest intensification, with the highest category increasing to around 900 to 1,600 jobs per square mile concentrated in a small node near the eastern terminus of the alternative's alignment.

7.2.3.3 Alternative 2 – Eastern Connector

Table 33 demonstrates the 2-mile buffer around the Eastern Connector capturing approximately 59,063 residents at 574 persons per square mile and 23,711 jobs at 231 jobs per square mile. By 2045, population is projected to grow to 72,092 (22 percent), with density increasing to 701 persons per square mile. Employment is forecast to reach 27,869 (18 percent growth), with employment density rising to 271 jobs per square mile.

Table 33. Eastern Connector Population and Employment (2023 and 2045)

Metric	2023	2045
Population		
Total Population	59,063	72,092
Population Density (people per square mile)	574	701
Employment		
Total Employment	23,711	27,869
Employment Density (jobs per square mile)	231	271

Eastern Connector Population Density

As shown in Figure 91, the 2023 population density along the Eastern Connector alternative is concentrated within a compact buffer centered in Harnett and Cumberland Counties, with the highest densities reaching around 2,000 to 2,700 persons per square mile in the Fayetteville urbanized area near the I-295 interchange in Cumberland County. The northern portion of the buffer in Harnett County shows moderate densities in the 500 to 1,000 range. The alignment of the alternative does not extend into the upper study area, leaving the broader Harnett County study area largely outside the catchment. By 2045 (Figure 92), density within the buffer intensifies throughout, with the Cumberland County concentration reaching around 2,000 to 4,100 persons per square mile and the Harnett County segment also showing increased density, consistent with the Eastern Connector's projected 22 percent population growth.

Figure 89. 421 Connector 2023 Employment Density

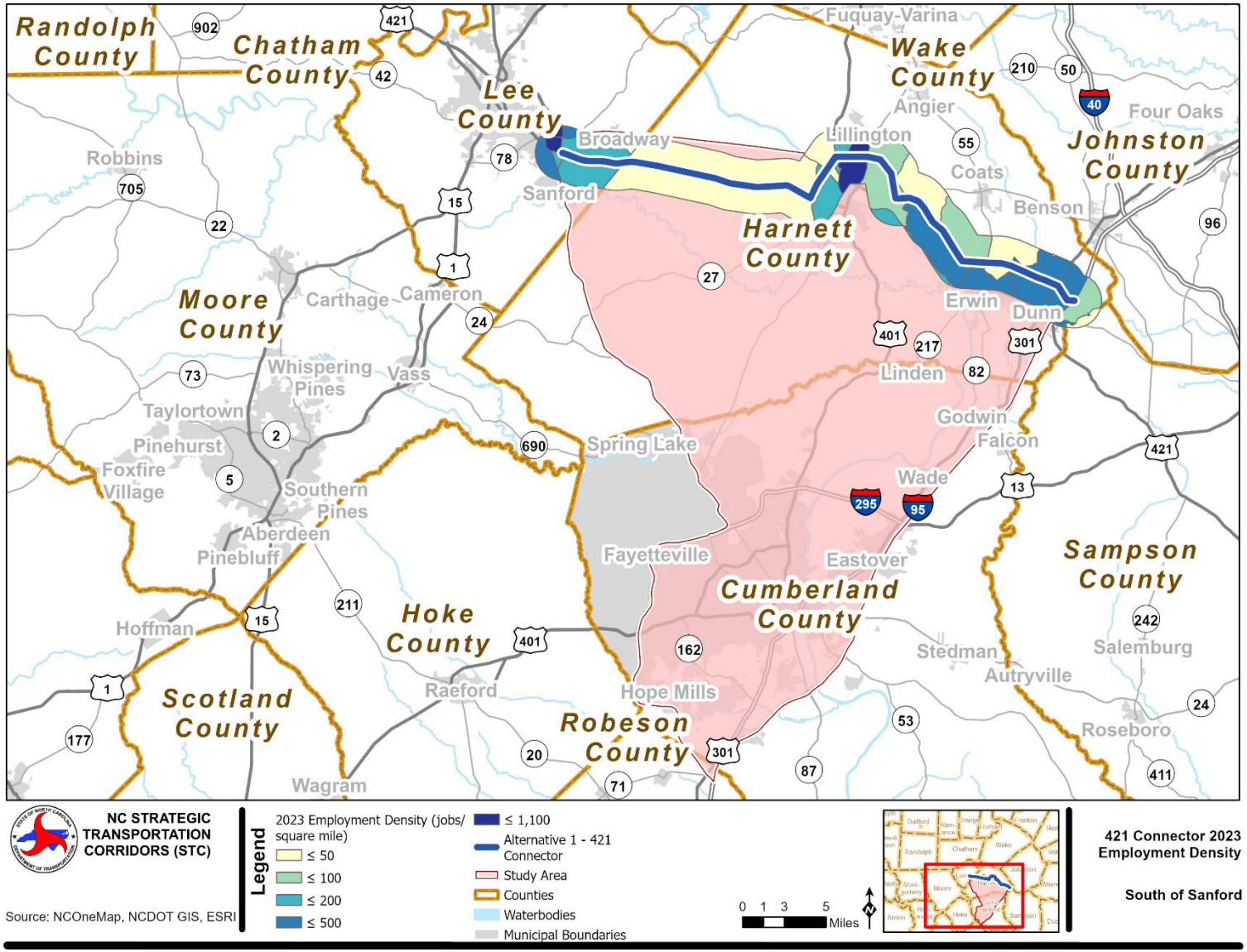


Figure 90. 421 Connector 2045 Employment Density

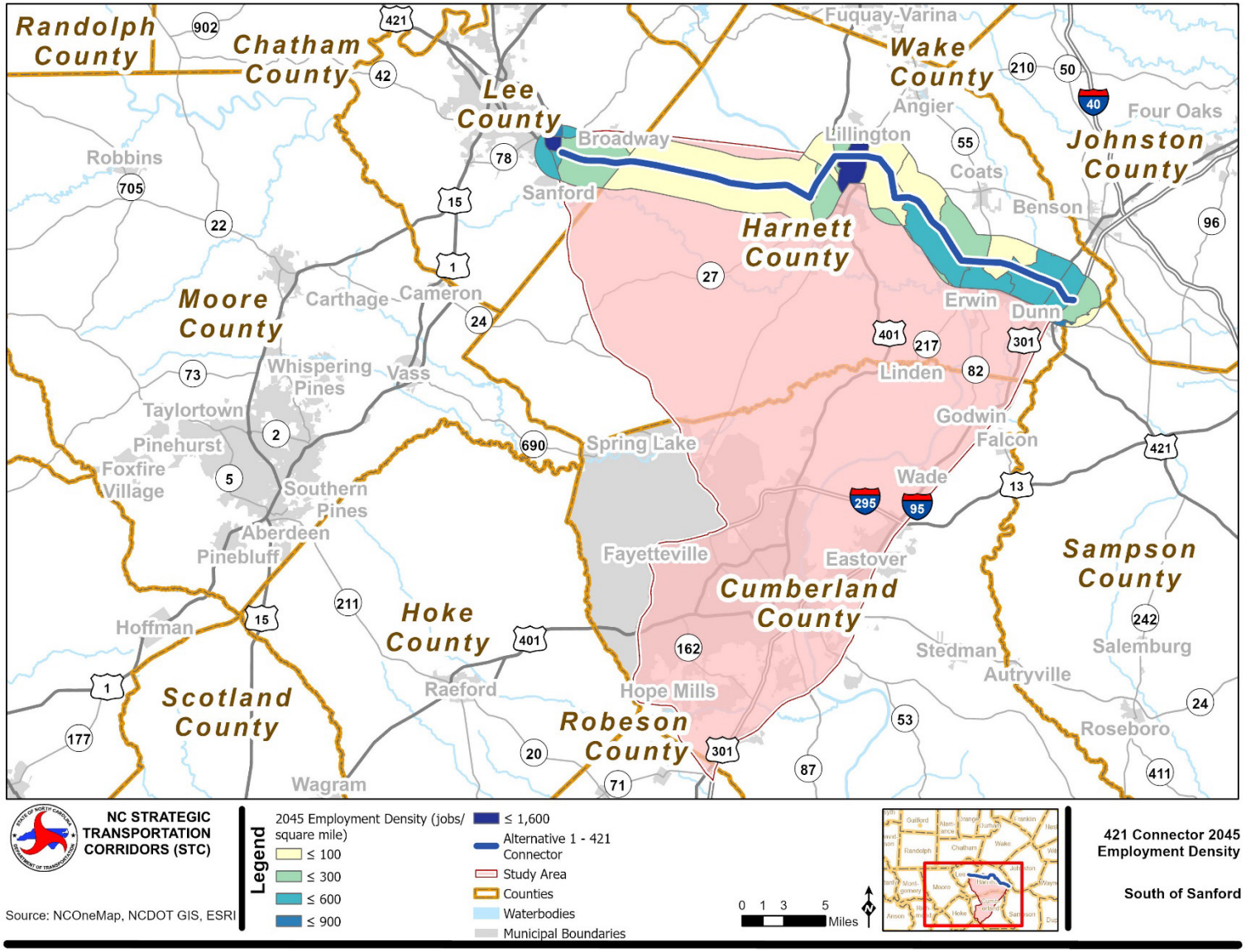


Figure 91. Eastern Connector 2023 Population Density

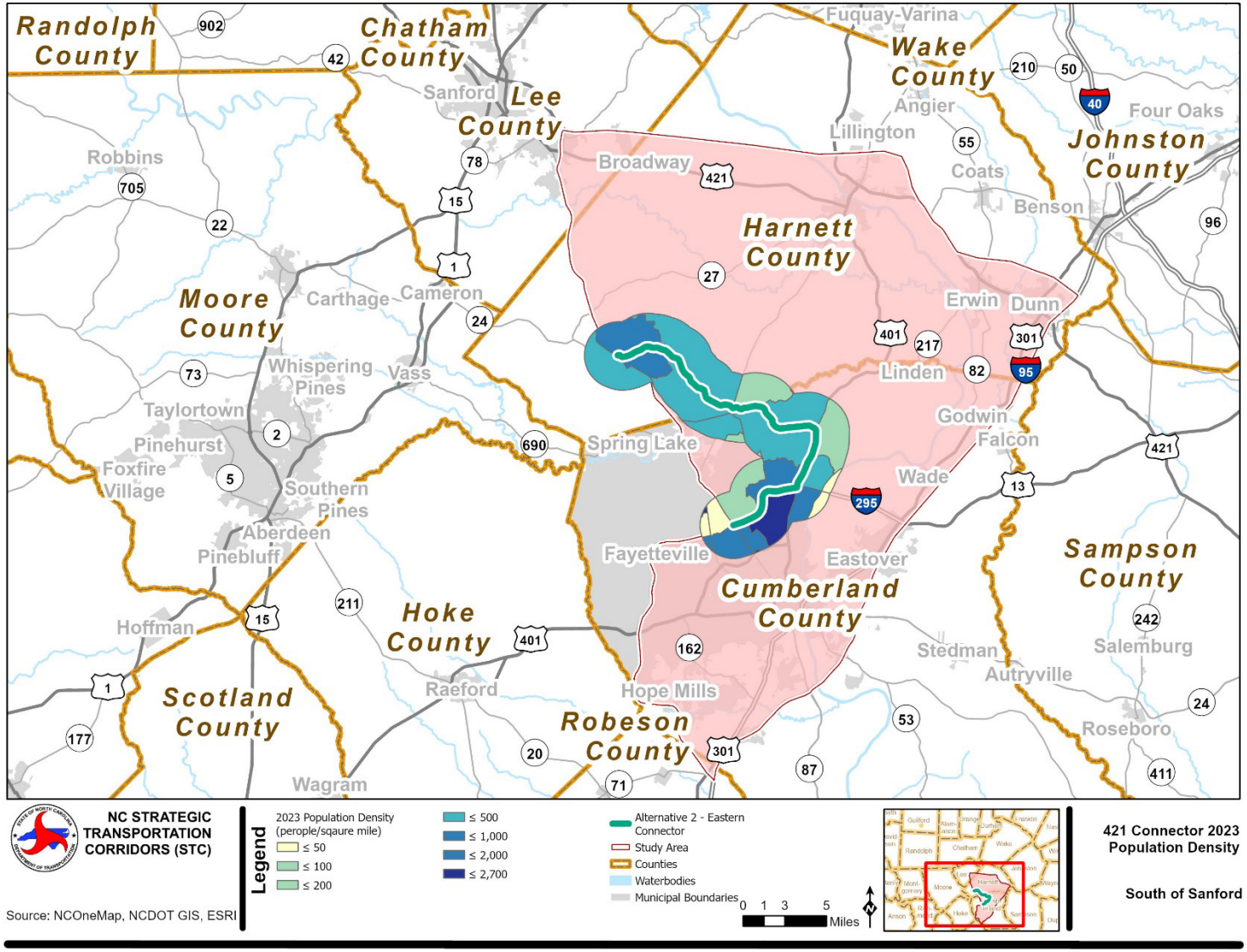
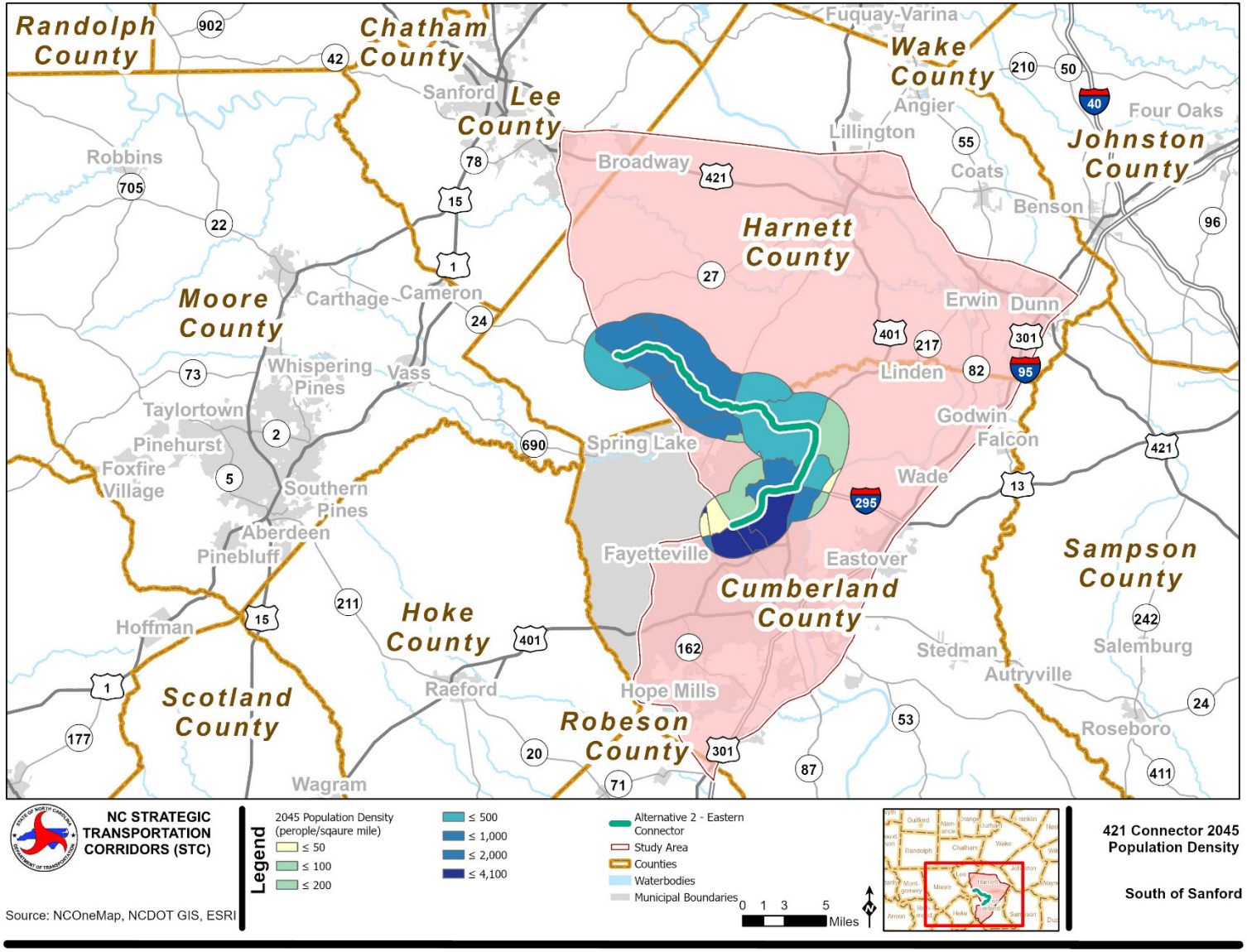


Figure 92. Eastern Connector 2045 Population Density



Eastern Connector Employment Density

As shown in Figure 93, 2023 employment density along the Eastern Connector alternative is concentrated in Cumberland County near the I-295 interchange in the Fayetteville urbanized area, where densities reach around 600 to 1,400 jobs per square mile. The northern portion of the buffer in Harnett County remains largely at or below 100 jobs per square mile, with only modest clustering near the alternative alignment. By 2045 (Figure 94), the Cumberland County employment concentration intensifies further, reaching around 600 to 1,700 jobs per square mile, while the Harnett County segment increases from approximately 20 to 82 jobs per square mile, an increase of roughly 39 percent.

7.2.4 Sidewalk and Bicycle Lane Connections

Bicycle and pedestrian connections were analyzed by performing a spatial analysis to identify locations where the alternatives intersected with existing regional trails. Orthoimagery was used to assess sidewalk connectivity because there was a lack of regionwide sidewalk data. The final performance metrics include the total number of new bicycle and pedestrian connections across each alternative.

7.2.4.1 STC K Alignment Improvements

Along the STC K Alignment Improvements alternative, the alignment crosses or connects to several trails in the surrounding network, including two planned state trails. In Cumberland County, the Equine State Trail is a newly planned facility that intersects the alignment near Bragg Boulevard at Filter Plant Drive within the study area (Figure 95). In Chatham County, the Equine State Trail intersects the corridor again near Clarence McKeithen Road along US 421, also a newly planned facility but located outside the study area boundary (Figure 96). The Deep River State Trail intersects the alignment in both Chatham/Lee and Lee Counties as an existing facility, though both crossings fall outside the study area.

7.2.4.2 Alternative 1 – 421 Connector

Along the 421 Connector, the alternative crosses or connects to two existing trail facilities in Harnett County, both within the study area. As shown in Figure 97, the East Coast Greenway — a state trail — runs along the eastern edge of the study area and intersects the eastern terminus of the 421 Connector alignment in Harnett County, where the alignment meets the trail near the I-95/US 421 area. The Cape Fear River Trail, a regional trail, also intersects the curved portion of the alignment within the study area. No trail facilities intersect the alignment north of Sanford, with the East Coast Greenway remaining well to the east of the alternative's alignment.

Figure 93. Eastern Connector 2023 Employment Density

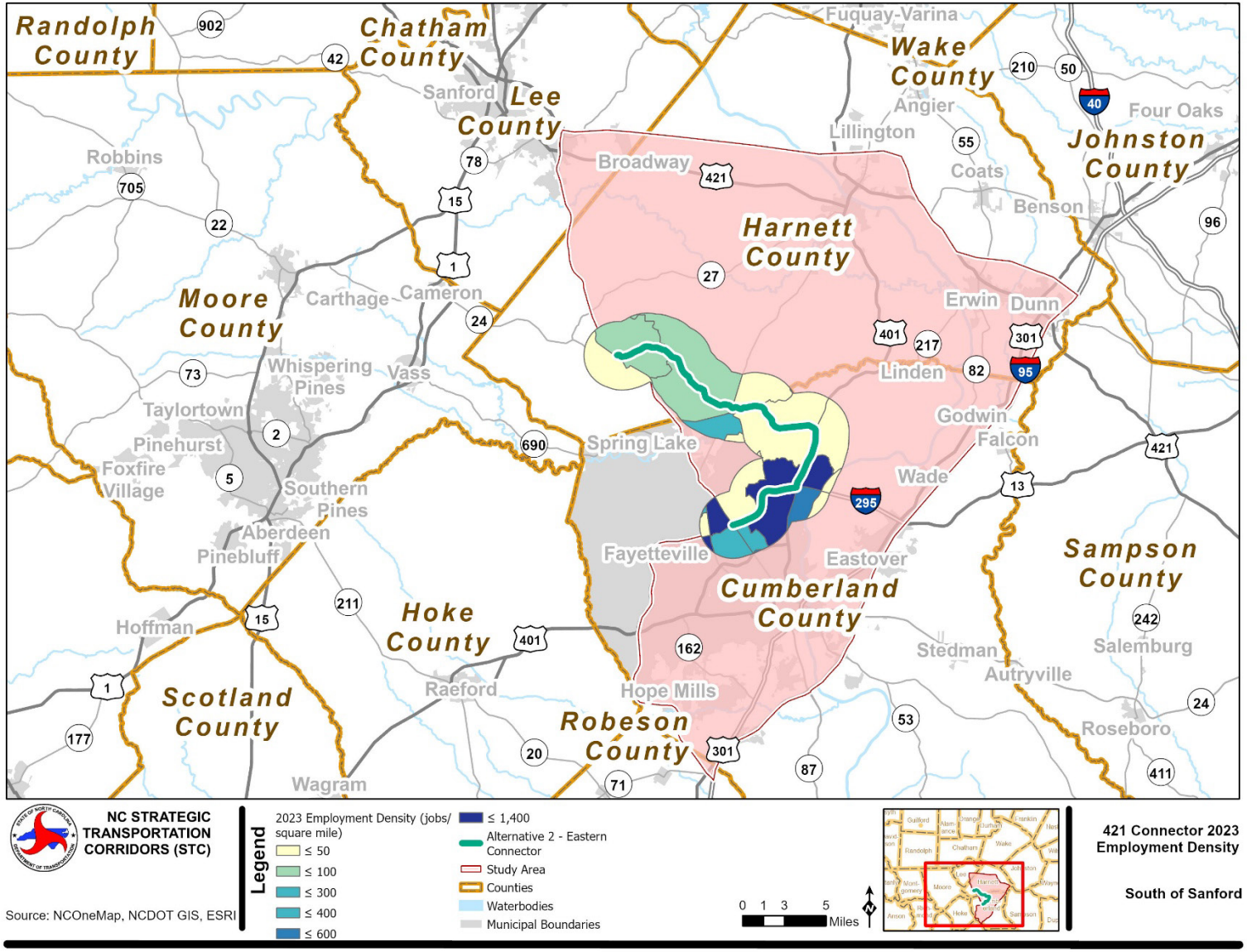


Figure 94. Eastern Connector 2045 Employment Density

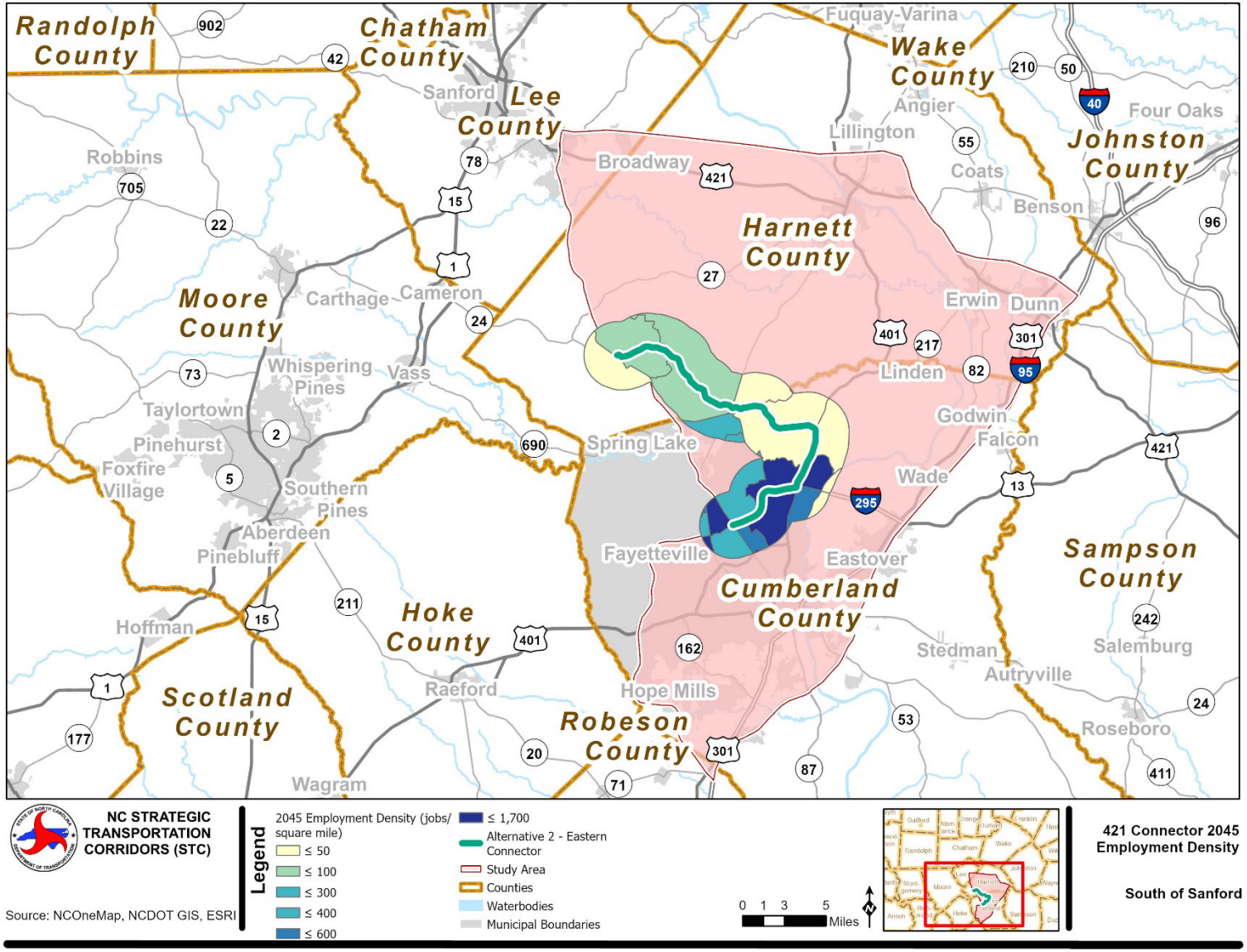


Figure 95. STC K Alignment Improvements Regional Trails - North of Sanford

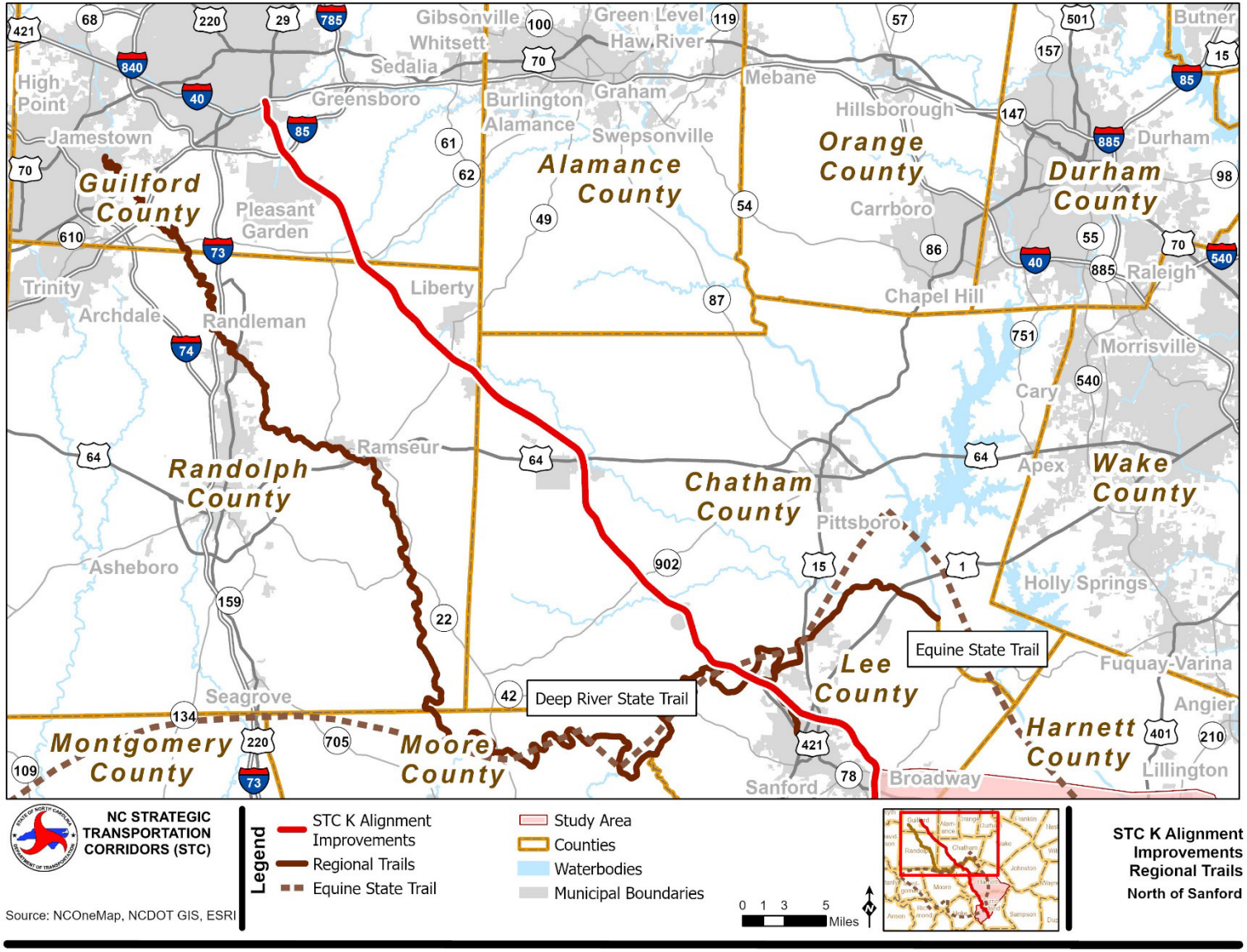


Figure 96. STC K Alignment Improvements Regional Trails - South of Sanford

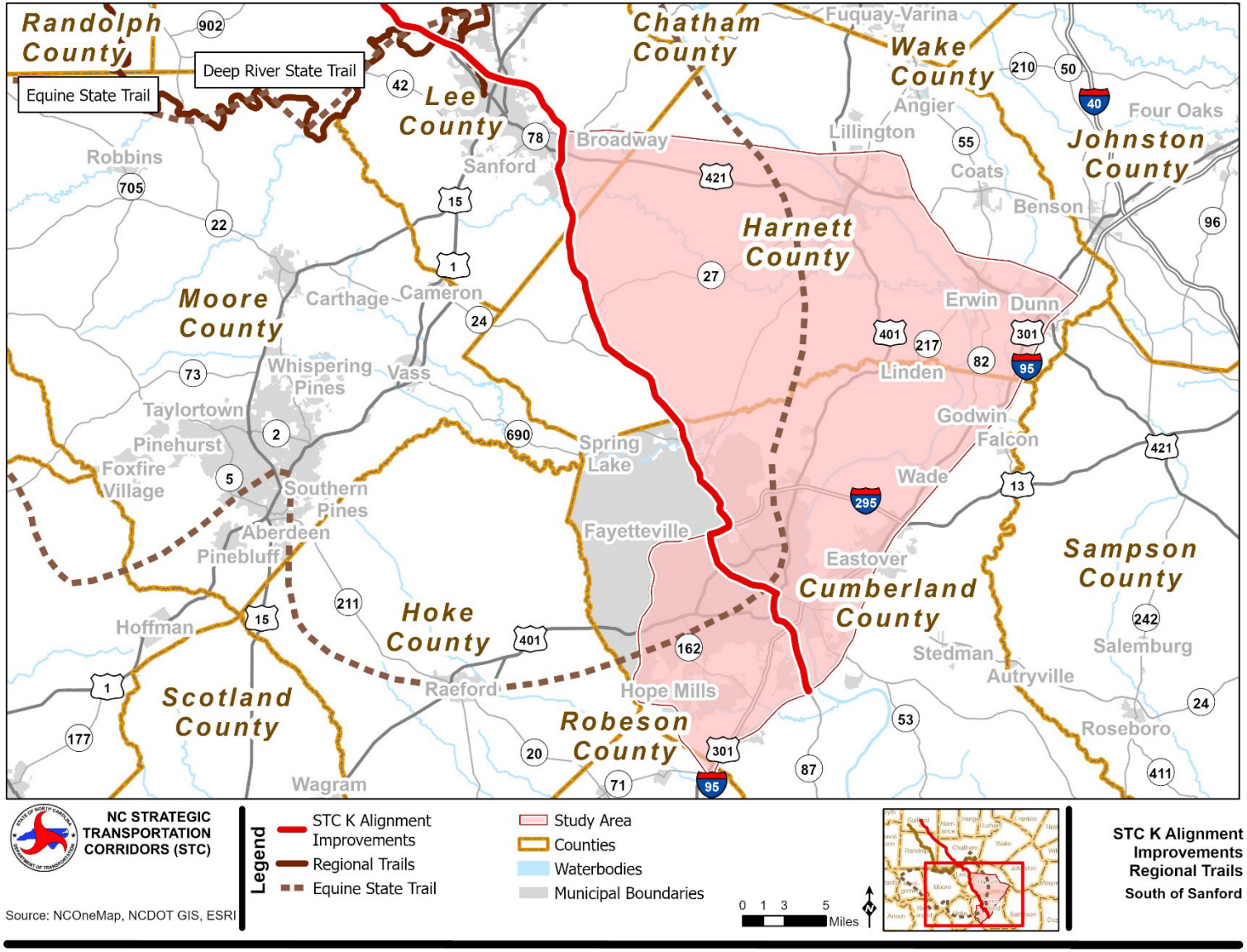
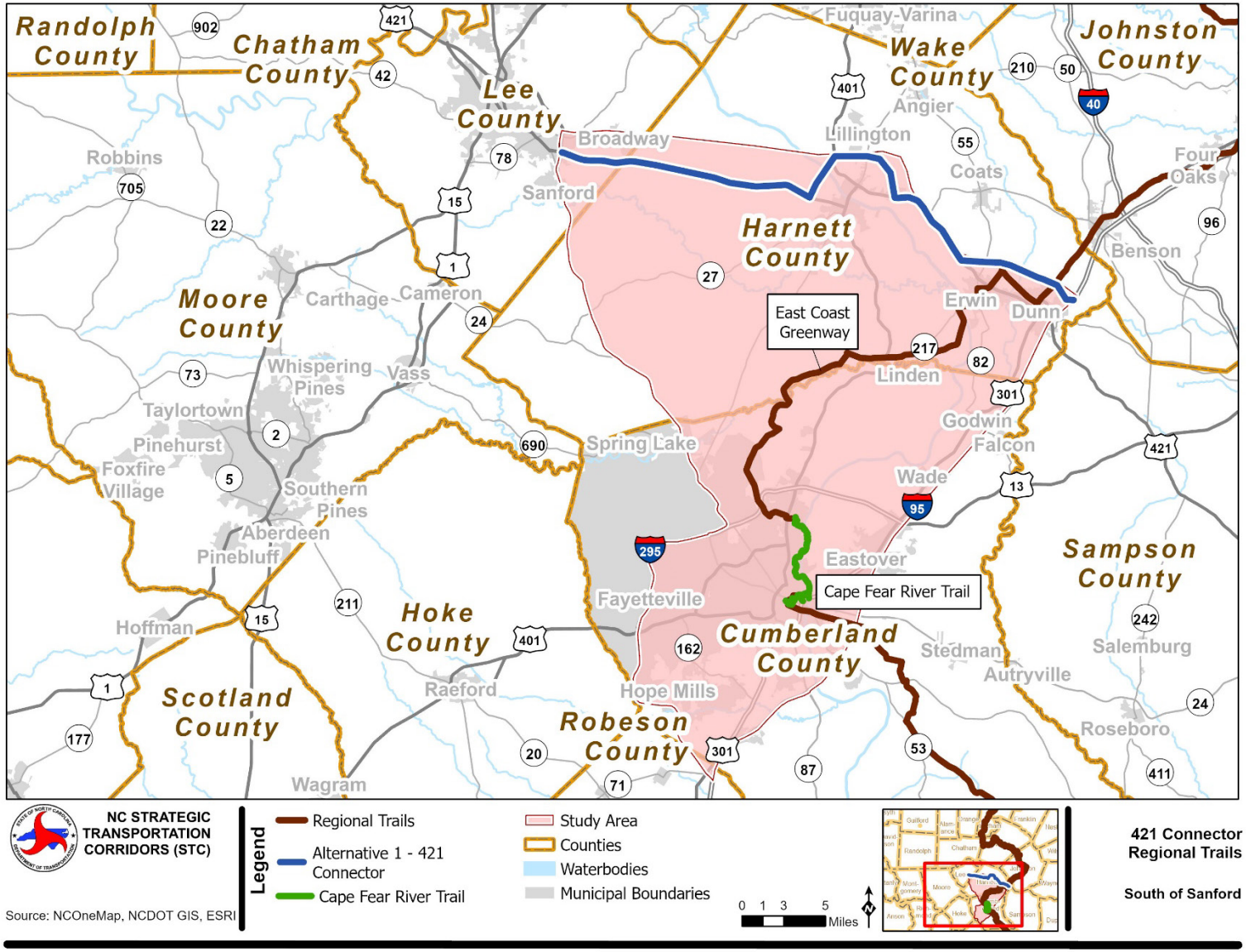


Figure 97. 421 Connector Regional Trails - South of Sanford



7.2.4.3 Alternative 2 – Eastern Connector

Along the Eastern Connector, the alternative's alignment crosses or connects to several trail facilities in Cumberland County, all within the study area. As shown in Figure 98, the East Coast Greenway — a state trail — is the primary regional trail facility in the network, running along the eastern edge of the study area through Johnston County and into Cumberland County. Within the alignment intersect, a new East Coast Greenway state trail connection is proposed along Elliot Farm Road, with an additional interim state trail segment along NC 25A/McArthur Road also present within the study area. A sidewalk connection along Highgrove Drive/Ray Road further intersects the alignment. The East Coast Greenway does not intersect the alignment north of Sanford, remaining to the east of the alternative's alignment throughout.

7.3 Transportation Analysis Findings

This section presents the transportation analysis findings from the alternatives analysis, organized by performance measure. Findings highlight how alternatives compare in terms of travel conditions, system performance, and impacts along the alignment. Table 34 provides a summary of each of the performance measures and their corresponding objectives.

7.3.1 Travel Demand Modeling Findings

This section presents the travel demand modeling findings for the build alternatives. Using the methodology described in Section 7.2, NCSTM Gen4.5 was applied to evaluate future-year traffic conditions, regional mobility impacts, roadway operating conditions, and overall travel activity associated with each alternative scenario. Detailed travel time modeling results are available upon request.

The future-year model includes the existing roadway network plus committed capacity-related STIP projects. The base year for this study was established as 2023; therefore, some of the projects listed below may have been completed since the base year.

- **I-5986A / I-5986B**: Widen I-95 to eight lanes between I-95 Business/US 301 and I-40.
- **U-2519AA / U-2519AB / U-2519BA / U-2519BB / U-2519CA / U-2519CB**: Construct I-295 (Fayetteville Outer Loop) on new location from I-95 in Robeson County to east of Yadkin Road.
- **R-3830**: Improvements to NC 42 and Broadway Road / North Main Street (SR 1579) in the Sanford/Broadway area.
- **U-4403C**: Widen US 401 from US 401 Bypass to north of Slocumb Road.
- **U-4404**: Widen Cliffdale Road from McPherson Church Road to Morganton Road.
- **U-4900**: Add lanes to NC 210 (Murchison Road) between I-295 and US 401 Bypass.

Overall, the alternatives demonstrated varying levels of effectiveness depending on the study objective and geographic focus area. In general, the 421 Connector produced the strongest regional mobility and congestion reduction benefits, while the Eastern Connector demonstrated stronger operational improvements within portions of the Fort Bragg and NC 87 corridor area. The STC K Alignment Improvements alternative generally produced more modest system-wide changes but also resulted in the smallest increase in regional VMT.

Figure 98. Eastern Connector Regional Trails - South of Sanford

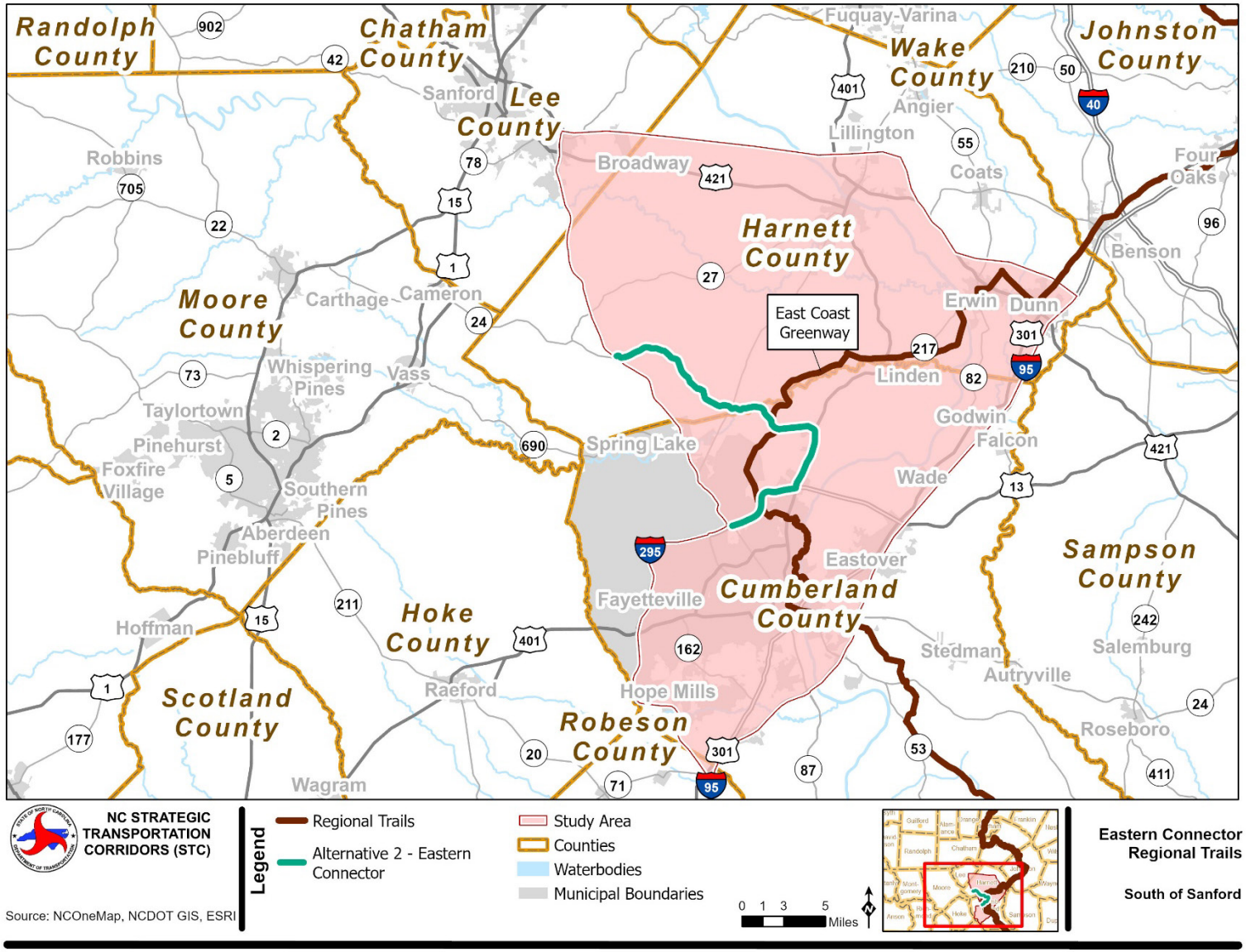


Table 34. Summary of Transportation Findings by Transportation Objective

#	Objective	STC, FHWA, State Goals	Performance Measure	No Build	STC K Alignment Improvements	421 Connector	Eastern Connector
1	Provide a direct interstate connection for freight and passenger vehicles between Greensboro and the Port of Wilmington	Freight, Mobility, Economic Prosperity	Average Travel Time between Greensboro and Wilmington	202.6 minutes	202.6 minutes / −0.00 minute (−0.00%)	200.0 minutes / −2.56 minutes (−1.28%)	202.5 minutes / −0.04 minute (−0.04%)
2	Improve corridor efficiency for all users and reduce congestion	System Connectivity, Reliability, Congestion Reduction	Average peak Study Area V/C Ratio	0.518	0.515 / −0.003 (−0.6%)	0.498 / −0.020 (−4.0%)	0.506 / −0.012 (−2.3%)
			Average peak Key Regional V/C Ratio (Sanford - Benson - I-295 Fayetteville)	0.616	0.607 / −0.009 (−1.4%)	0.539 /−0.077 (−12.4%)	0.583 / −0.033 (−5.4%)
			Average Travel Time between Key Destinations	84.8 minutes	85.0 minutes / −0.41 minute (−0.5%)	80.3 minutes / −4.45 minutes (−5.5%)	83.2 minutes / −1.52 minutes (−1.80%)
3	Reduce rural cut-through traffic and improve air quality by minimizing VMT and vehicle emissions	Environmental, Congestion Reduction, Quality of Life	VMT in Study Area	17,143,584 miles	17,168,698 miles / +25,114 (+0.15%)	17,637,507 miles / +493,923 (+2.88%)	17,285,562 miles / +141,978 (+0.83%)
4	Promote national security by enhancing access for the military and base staff at Fort Bragg	System Connectivity, Security	Average Peak V/C Ratio on NC 87 from south of Sanford to I-295 north of Fayetteville	0.765	0.750 / −0.016 (−2.0%)	0.739 / −0.026 (−3.4%)	0.682 / −0.083 (−10.9%)
			Average travel time for key O-D pairs serving Fort Bragg	62.4 minutes	61.6 minutes / −0.71 minute (−1.2%)	61.9 minutes / −0.41 minute (−0.7%)	60.6 minutes / −1.75 minutes (−2.9%)

#	Objective	STC, FHWA, State Goals	Performance Measure	No Build	STC K Alignment Improvements	421 Connector	Eastern Connector
5	Provide a direct connection to megasites and major activity centers and destinations	Economic Prosperity	Average peak Study Area V/C Ratio	0.518	0.515 / −0.003 (−0.6%)	0.498 / −0.020 (−4.0%)	0.506 / −0.012 (−2.3%)
			Average travel time for key O-D pairs serving megasites	73.8 minutes	73.4 minutes / −0.37 minute (−0.5%)	71.4 minutes / −2.44 minutes (−3.4%)	72.8 minutes / −0.96 minute (−1.3%)
6	Improve safety for all users	Safety [a]	Total Fatal and Serious Injury Crashes (2021-2025) [b]	95	46	134	26
			Annual Fatal and Serious Injury Crashes Per Lane Mile (2021-2025) [b]	0.097	1.608	1.056	0.466
			Expected Injury Crashes (2045)	463.40	467.75 (0.9%)	517.92 (11.8%)	454.60 (−1.9%)
			Expected Injury Crashes Per Lane Mile (2045)	3.18	3.21 (0.9%)	3.20 (0.8%)	2.88 (−9.5%)
7	Enhance economic prosperity, development opportunities, and quality of life for residents, workers, and visitors	Cohesive & Strategic Planning, Socioeconomic	Population within 2 miles of the corridor for 2023 / 2045	--	205,963 / 250,125 (+21%)	33,269 / 46,227 (+39%)	59,063 / 72,092 (+22%)
			Employment within 2 miles of the corridor in 2023 / 2045	--	162,679 / 202,474 (+24%)	18,110 / 24,609 (+36%)	23,711 / 27,869 (+18%)

#	Objective	STC, FHWA, State Goals	Performance Measure	No Build	STC K Alignment Improvements	421 Connector	Eastern Connector
8	Enhance pedestrian and bicycle safety and connectivity across the corridor and to regional trails	Multimodal, Safety, Quality of Life	Number of new sidewalk and bike lane connections across the corridor	--	2	0	1

[a] Scenario roadway design changes for 2045 Build
--STC Alignment Improvements: STIP H-0020 - add one lane in each direction between Nursery Road and Manchester Road
--421 Connector: 4-lane divided highway with a posted speed limit of 60 mph
--Eastern Connector: For new sections, 12-foot paved outside shoulder, 4-foot paved inside shoulder, and 46-foot depressed median
[b] Build / No Build Difference (% Change), except where noted for specific performance measures

7.3.1.1 Traffic Diversion

Traffic diversion analysis was conducted to evaluate how each alternative redistributed traffic throughout the regional transportation network compared to the 2045 No-Build alternative.

STC Alignment Improvements

The STC K Alignment Improvements alternative would produce relatively localized traffic redistribution patterns concentrated primarily within the immediate STC K corridor area (Figure 99). Diversion patterns generally reflect operational improvements along the upgraded corridor segments from Nursery Road to Manchester Road while maintaining similar regional routing patterns as the 2045 No-Build alternative.

421 Connector

The 421 Connector alternative would produce substantial regional traffic diversion effects among the alternatives. Significant volumes of traffic would be diverted onto the 421 Connector alignment east of NC 87 (Figure 100 and Figure 101).

Eastern Connector

The Eastern Connector alternative would produce more concentrated diversion effects east of Fort Bragg. Traffic redistribution would be generally more localized than the 421 Connector alternative but still demonstrates measurable operational impacts on regional routing patterns and access to the Fort Bragg and Fayetteville areas (Figure 102).

7.3.1.2 Travel Time

Travel time analysis was conducted using selected O-D pairs representing major regional activity centers, freight generators, military facilities, megasites, and the Port of Wilmington. The selected key destinations used in the analysis are shown in Figure 75 through Figure 77.

Travel times were evaluated during the AM peak, midday, and PM peak periods using congested travel time skims from the travel demand model. The travel time values presented in this section represent the average of the AM peak, midday, and PM peak period results.

7.3.1.3 Freight and Port Connectivity

The alternatives were evaluated based on their ability to improve regional connectivity between Greensboro and the Port of Wilmington. The 421 Connector produced the greatest improvement, reducing average travel time from 202.6 minutes under the 2045 No-Build alternative to 200.0 minutes, a reduction of approximately 2.56 minutes (1.28 percent).

The Eastern Connector produced a marginal improvement of approximately 0.04 minute (0.04 percent), while the STC K Alignment Improvements alternative showed no measurable change relative to the 2045 No-Build alternative.

Figure 99. Traffic Diversion of STC K Alignment Improvements

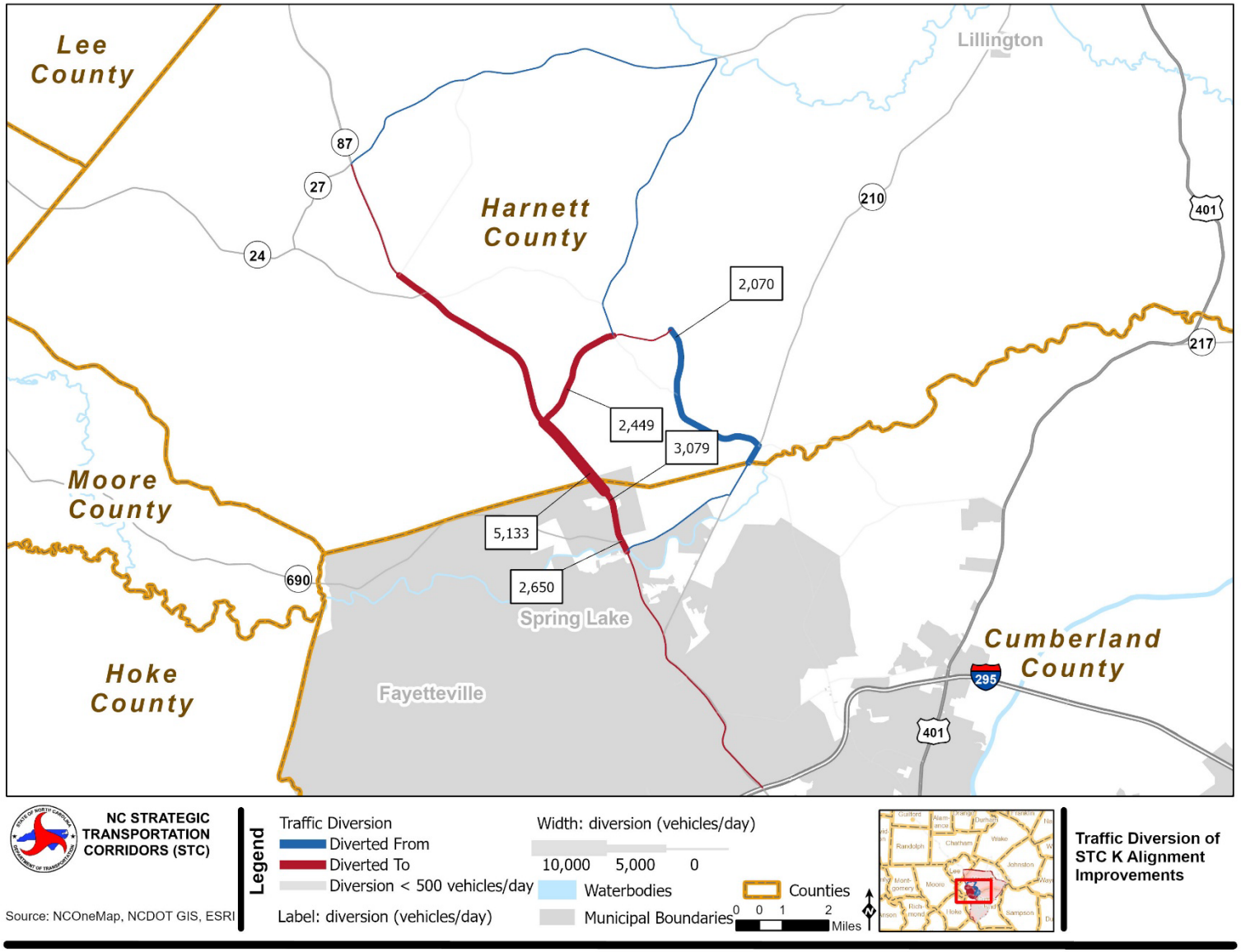


Figure 100. Traffic Diversion of 421 Connector - North of Sanford

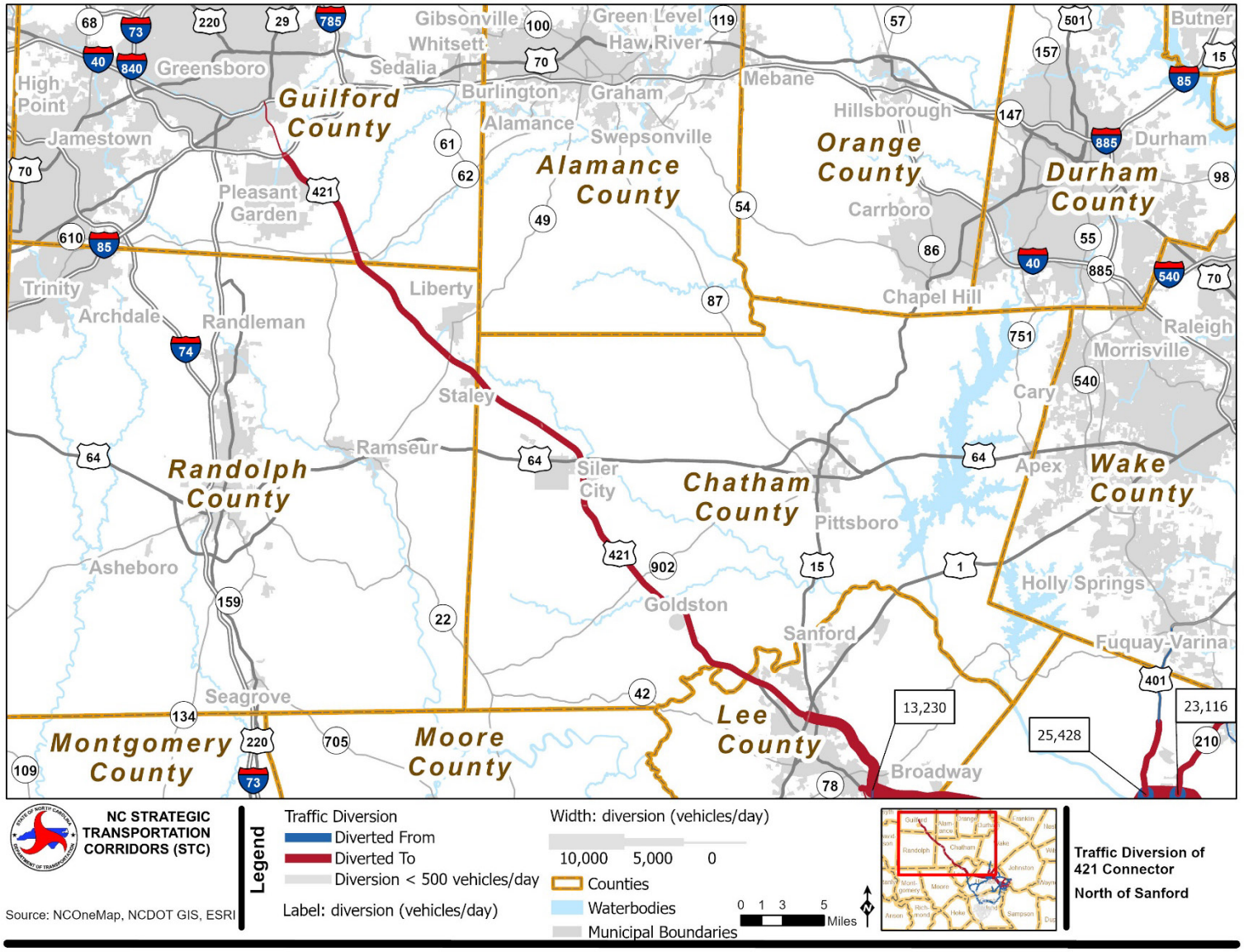


Figure 101. Traffic Diversion of 421 Connector - South of Sanford

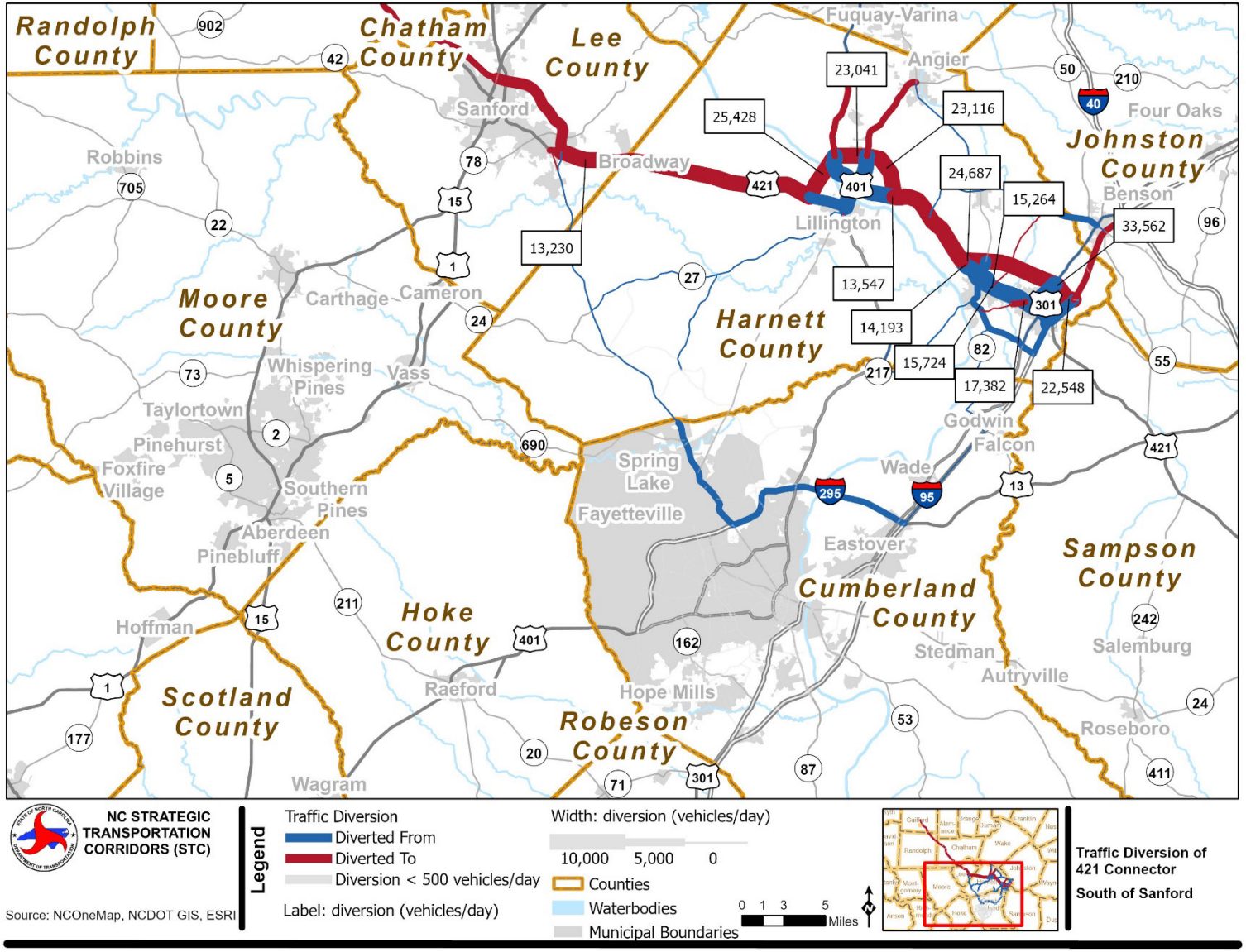
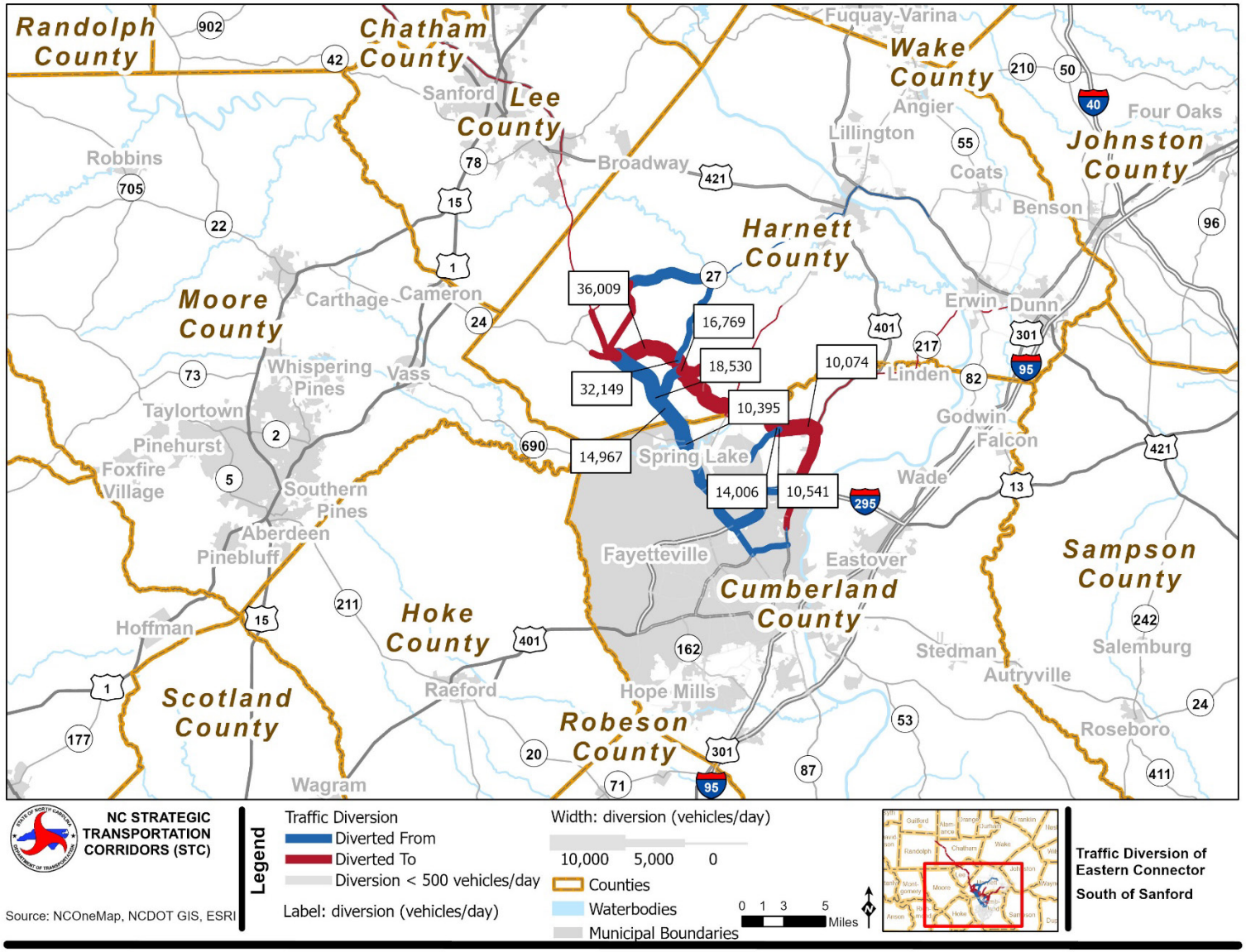


Figure 102. Traffic Diversion of Eastern Connector - South of Sanford



7.3.1.4 Regional Mobility and Corridor Efficiency

Travel time performance between selected key destinations throughout the study area was also evaluated to assess overall regional mobility impacts.

The 421 Connector produced the largest reduction in average travel time between key destinations, reducing average travel time from 84.8 minutes under the 2045 No-Build alternative to 80.3 minutes, a reduction of approximately 4.45 minutes (5.5 percent). The Eastern Connector reduced average travel time by approximately 1.52 minutes (1.8 percent), while the STC K Alignment Improvements alternative reduced average travel time by approximately 0.41 minute (0.5 percent).

7.3.1.5 Fort Bragg Accessibility

Travel time measures associated with key Fort Bragg-serving O-D pairs demonstrated operational improvements under all build alternatives.

The Eastern Connector produced the largest reduction in average Fort Bragg-related travel times, reducing average travel time from 62.4 minutes under the No-Build alternative to 60.6 minutes, a reduction of approximately 1.75 minutes (2.9 percent). The STC K Alignment Improvements alternative reduced average travel time by approximately 0.71 minute (1.2 percent), while the 421 Connector reduced average travel time by approximately 0.41 minute (0.7 percent).

7.3.1.6 Megasite and Economic Development Connectivity

Travel time performance associated with megasite-serving O-D pairs was also evaluated to assess economic development connectivity benefits.

The 421 Connector produced the largest reduction in travel time for megasite-related travel patterns, reducing average travel time from 73.8 minutes under the No-Build alternative to 71.4 minutes, a reduction of approximately 2.44 minutes (3.4 percent). The Eastern Connector reduced average travel time by approximately 0.96 minute (1.3 percent), while the STC K Alignment Improvements alternative reduced average travel time by approximately 0.37 minute (0.5 percent).

7.3.1.7 Volume-to-Capacity Ratio

V/C ratio analysis was conducted to evaluate roadway operating conditions and congestion levels throughout the study area during the AM peak and PM peak periods. Unless otherwise noted, the V/C ratio values presented in this section represent the average of the two peak period results.

Average V/C ratios were evaluated for three geographic analysis extents:

- Overall study area
- Key regional triangle area generally bounded by Sanford, Benson, and I-295
- Key STC K corridor segment generally between Sanford and I-295

Study Area Congestion Conditions

All build alternatives reduced average study area V/C ratios relative to the 2045 No-Build alternative, indicating overall improvements in regional roadway operating conditions.

The 421 Connector produced the greatest reduction in average study area V/C ratio, with an approximate reduction of 4.0 percent. The Eastern Connector reduced the average study area V/C ratio by approximately 2.3 percent, while the STC K Alignment Improvements alternative reduced the average study area V/C ratio by approximately 0.6 percent.

Key Regional Triangle Congestion Conditions

Within the key regional triangle area bounded by Sanford, Benson, and I-295, the 421 Connector produced the most significant congestion reduction benefits among the alternatives.

The 421 Connector reduced the average V/C ratio within the regional triangle area by approximately 12.4 percent. The Eastern Connector reduced the average V/C ratio by approximately 5.4 percent, while the STC K Alignment Improvements alternative reduced the average V/C ratio by approximately 1.4 percent.

Key STC K Corridor Conditions

V/C ratio conditions were also evaluated along major routes between Sanford and I-295. All build alternatives improved operating conditions along the corridor relative to the 2045 No-Build alternative.

The Eastern Connector produced the largest improvement for this measure, reducing the average V/C ratio on NC 87 from south of Sanford to I-295 north of Fayetteville by approximately 10.9 percent. The 421 Connector reduced the average V/C ratio by approximately 3.4 percent, while the STC K Alignment Improvements alternative reduced the average V/C ratio by approximately 2.0 percent.

Figure 103 through Figure 108 show the PM peak V/C ratio maps for the alternatives.

7.3.1.8 Vehicle Miles Traveled

VMT analysis was conducted to evaluate changes in overall regional travel activity associated with the study alternatives. VMT values presented in this section represent total daily study area VMT.

All build alternatives increased total study area VMT relative to the 2045 No-Build alternative, although the magnitude of increase varied substantially by alternative.

The STC K Alignment Improvements alternative produced the smallest increase in study area VMT, increasing total VMT by approximately 25,000 vehicle miles per day, or 0.15 percent. The Eastern Connector increased study area VMT by approximately 142,000 vehicle miles per day, or 0.83 percent. While the 421 Connector produced the largest increase at approximately 494,000 vehicle miles per day, or 2.88 percent.

Overall, the VMT findings indicate that alternatives providing stronger mobility and connectivity benefits also tended to generate larger increases in total regional travel activity.

Figure 103. PM Peak Volume-to-Capacity Ratio of STC K Alignment Improvements - North of Sanford

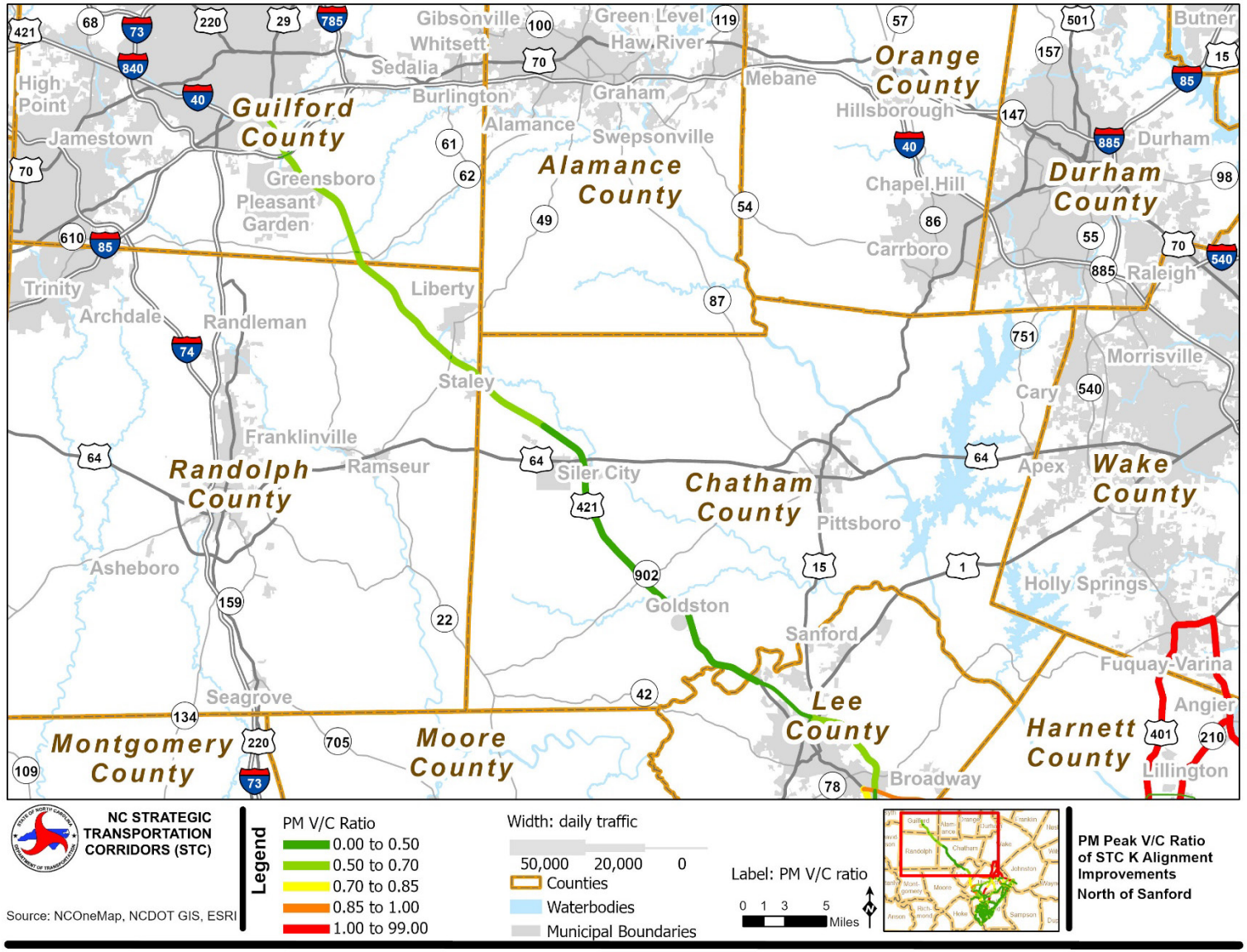


Figure 104. PM Peak Volume-to-Capacity Ratio of STC K Alignment Improvements - South of Sanford

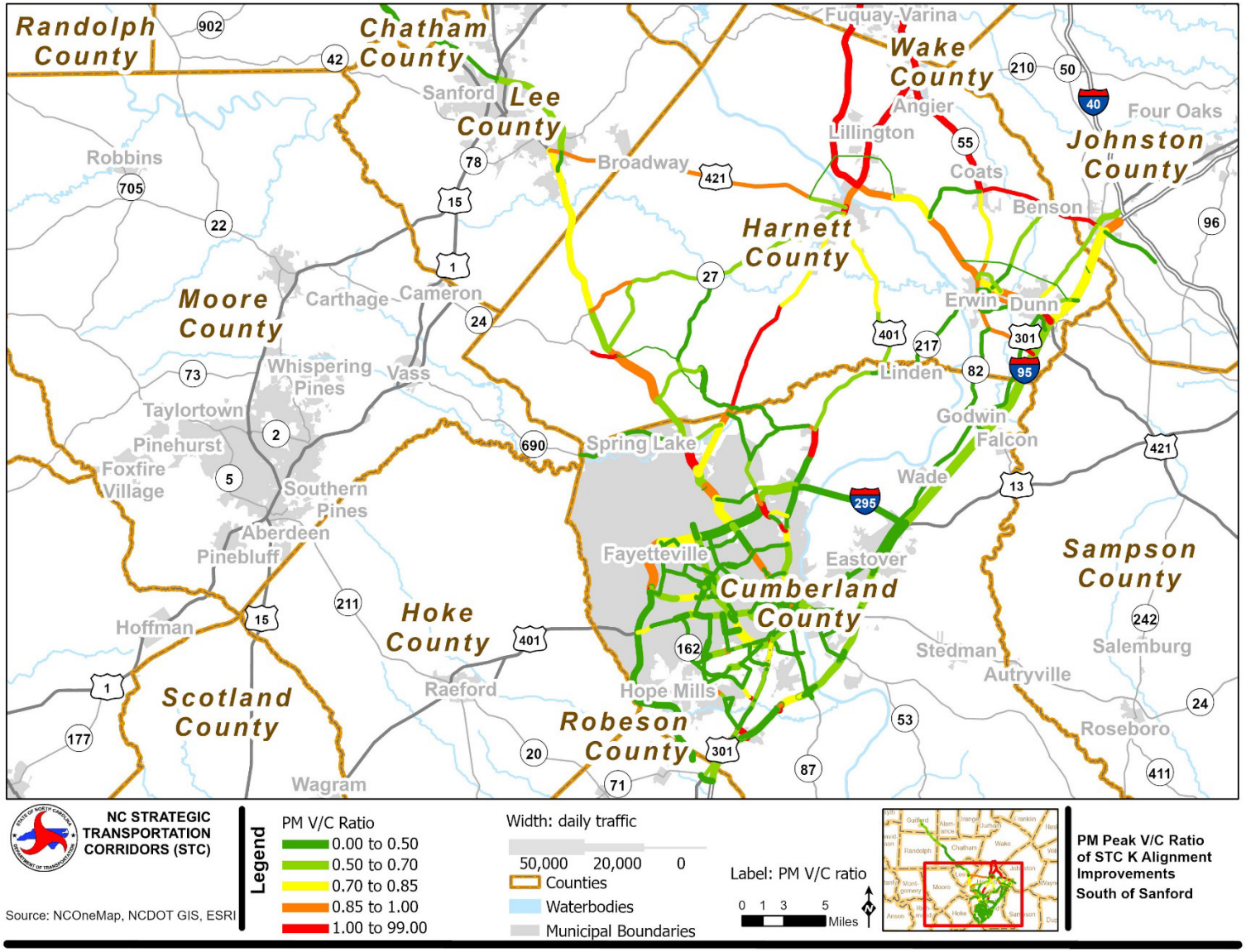


Figure 105. PM Peak Volume-to-Capacity Ratio of 421 Connector - North of Sanford

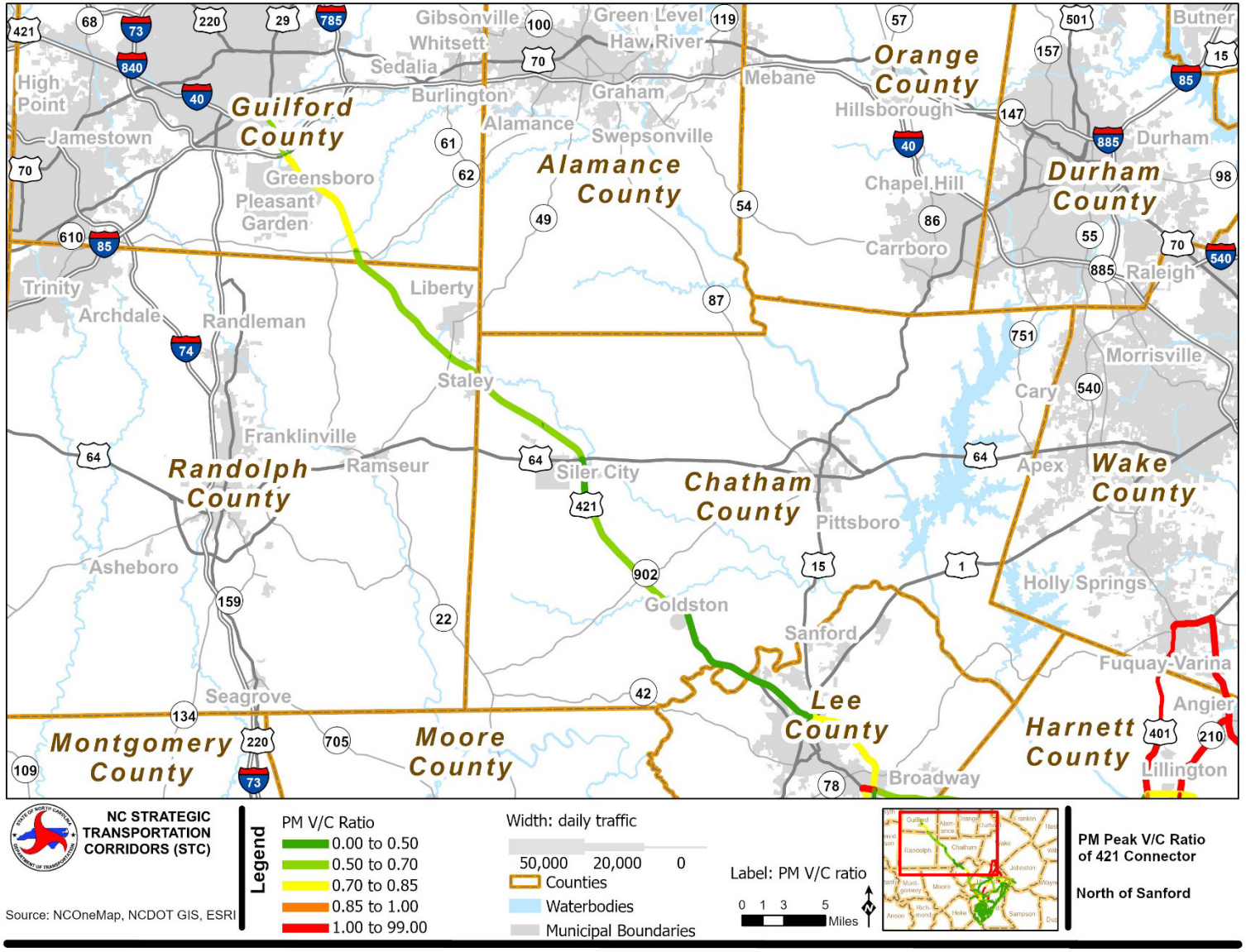


Figure 106. PM Peak Volume-to-Capacity Ratio of 421 Connector - South of Sanford

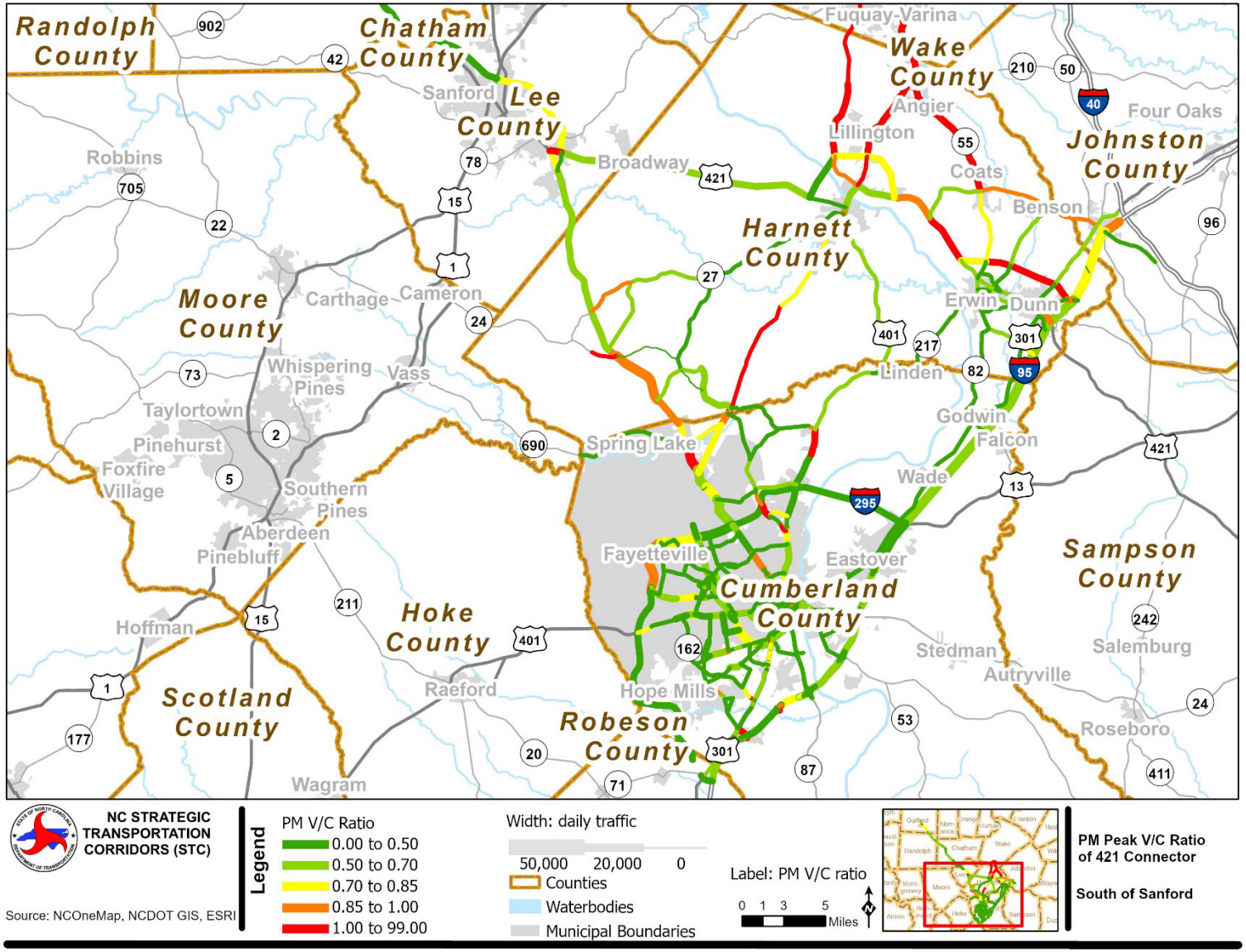


Figure 107. PM Peak Volume-to-Capacity Ratio of Eastern Connector - North of Sanford

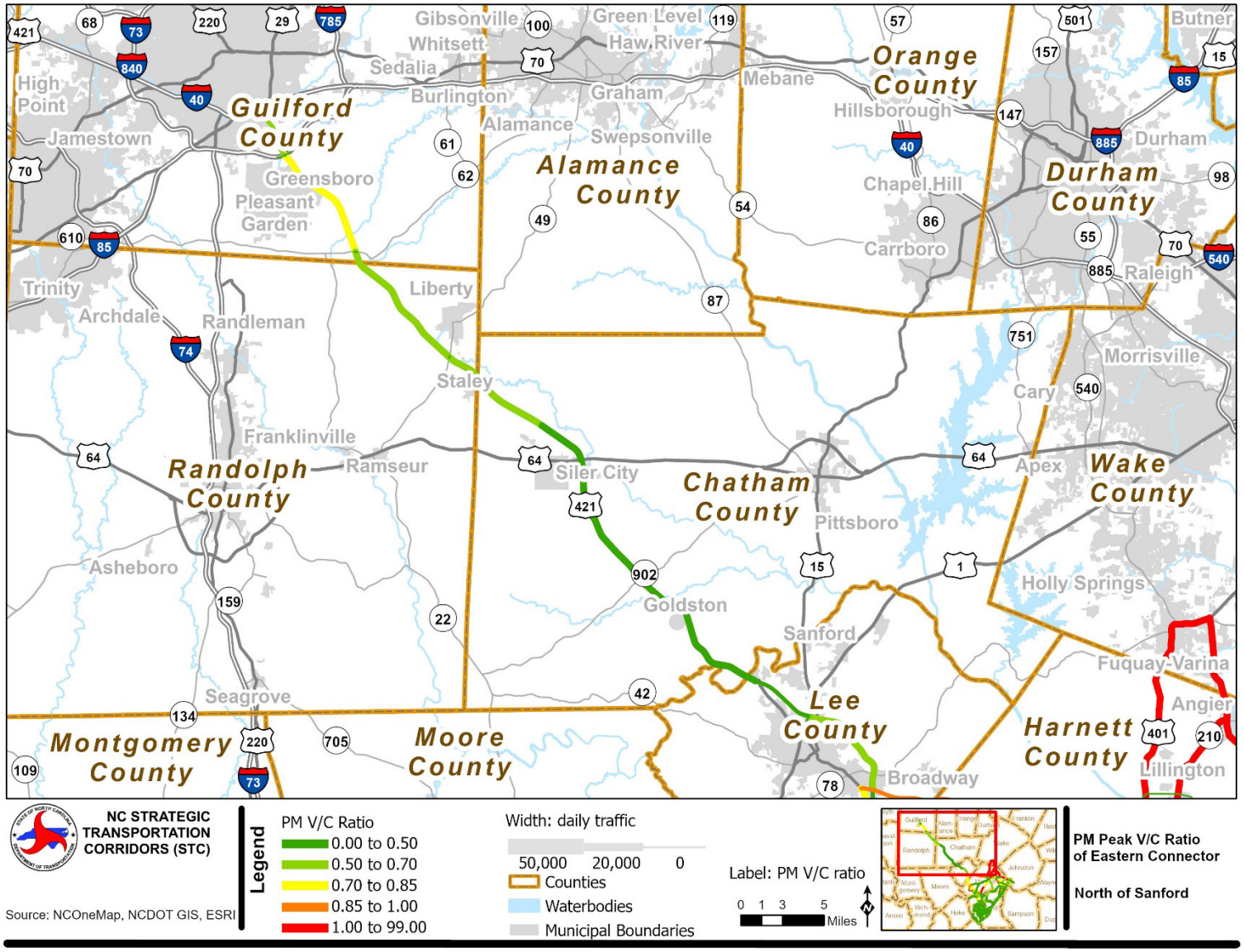
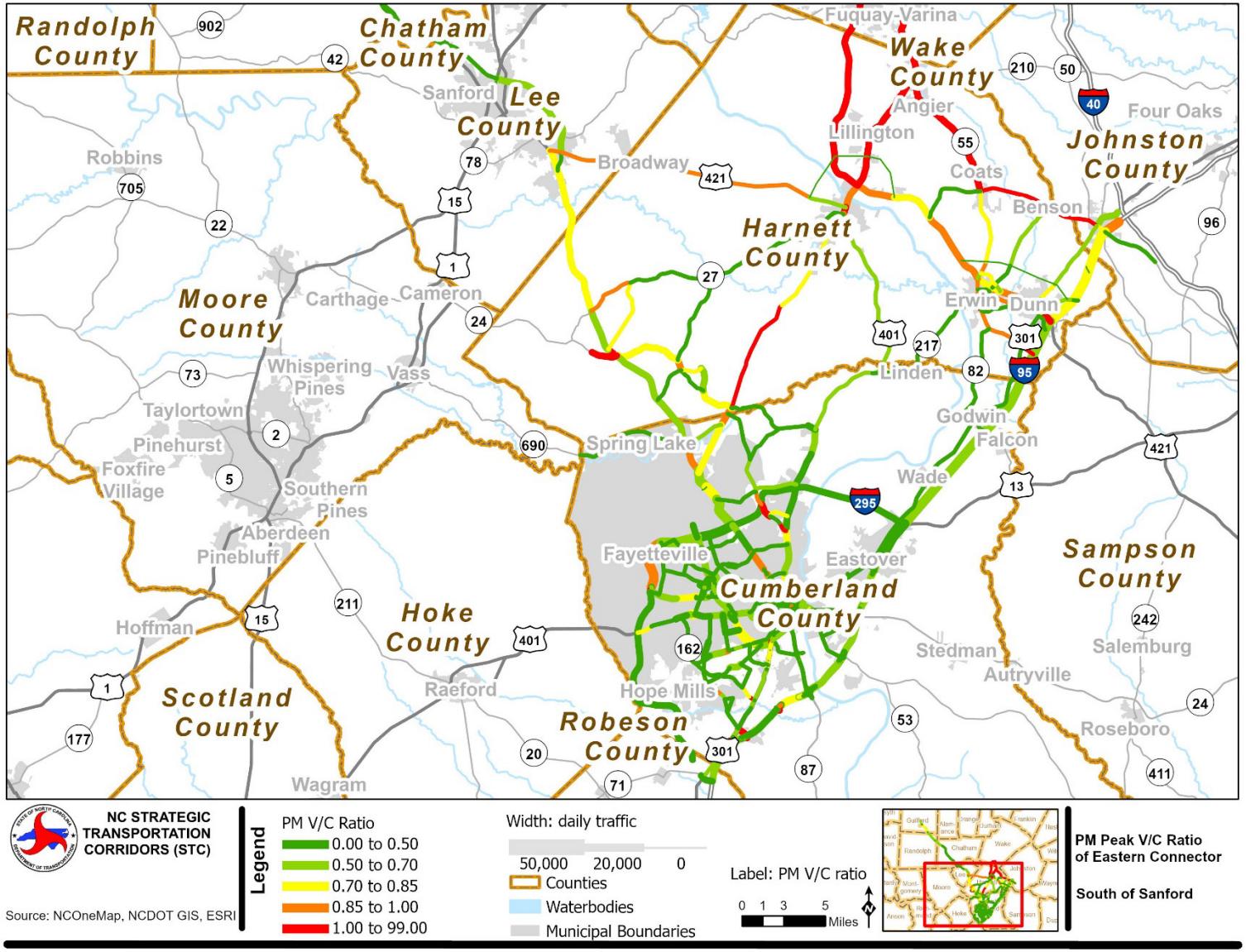


Figure 108. PM Peak Volume-to-Capacity Ratio of Eastern Connector - South of Sanford



7.3.1.9 Overall Transportation Analysis Findings

Overall, the travel demand modeling results indicate that each alternative provides different operational strengths and tradeoffs relative to the study objectives.

The 421 Connector generally produced the strongest regional mobility and congestion reduction benefits among the alternatives. This alternative generated the largest travel time reductions for regional mobility, freight movement, and megasite connectivity measures, while also producing the greatest reductions in study area and regional triangle area V/C ratios. The 421 Connector also produced the most substantial regional traffic diversion effects, indicating strong utilization of the new alignment connection and broader regional routing changes.

The Eastern Connector demonstrated strong performance for several Fort Bragg and NC 87 corridor-related measures. This alternative produced the largest reduction in Fort Bragg-related travel times and the greatest improvement in V/C ratio conditions between Sanford and I-295. Traffic diversion patterns associated with the Eastern Connector were generally more localized than the 421 Connector alternative but still demonstrated measurable operational impacts east of Fort Bragg.

The STC K Alignment Improvements alternative generally produced smaller systemwide operational changes relative to the other two build alternatives. However, this alternative also resulted in the smallest increase in total study area VMT while still providing localized operational improvements along the existing STC K alignment.

Overall, the results demonstrate that the 421 Connector and Eastern Connector alternatives provide greater regional mobility and congestion reduction benefits, while the STC K Alignment Improvements alternative provides more limited but targeted operational improvements with comparatively smaller increases in regional travel activity.

7.3.2 Safety Performance Findings

Expected injury crash rates per mile were estimated for the 2045 future scenario for each alternative to evaluate the potential safety impacts of the corridor alternatives. Table 35 summarizes the expected injury crash rates per mile across the 2045 No-Build and build alternatives.

Overall, the three build alternatives resulted in injury crash rates that were generally comparable to the 2045 No-Build alternative, with overall changes of less than 10 percent. The STC K Alignment Improvements alternative resulted in the largest increase of 0.9 percent in the overall injury crash rate, while the Eastern Connector alternative experienced the highest decrease of −9.5 percent in the overall rate.

At the level of the entire alignment, each alternative generally experienced its largest increase in crash rates under the scenario in which it served as the primary alternative route. The Eastern Connector alternative produced the most significant corridor-level changes, reducing the expected injury crash rate along the STC K alignment by 36.2 percent, while substantially increasing the crash rate along the Eastern Connector itself. Similarly, for the 421 Connector alternative, lower crash rates along the existing STC K alignment and higher crash rates along the 421 Connector were

observed, which may reflect changes in traffic distribution associated with traffic diversion from the existing STC K alignment to the 421 Connector. In contrast, the STC K Alignment Improvements alternative showed relatively minor changes throughout the study area compared to the No-Build alternative.

Although the 421 Connector and Eastern Connector alternatives resulted in increases in expected injury crash rates along their respective alignment, these changes largely reflect the redistribution of traffic onto the new facilities rather than a decline in safety performance. Given that the overall injury crash rates remained relatively similar to the 2045 No-Build alternative, the results suggest that the build alternatives mainly redistributed traffic and associated crash potential throughout the study area without affecting overall network safety performance.

Table 35. Comparison of 2045 Expected Injury Crash Rates by Scenario (per mile)

Corridor	No-Build	STC K Improvements		Alternative 1 - 421 Connector		Alternative 2 - Eastern Connector	
	Crash Rate	Crash Rate	Percent Change vs. No-Build	Crash Rate	Percent Change vs. No-Build	Crash Rate	Percent Change vs. No-Build
Southern portion of STC K without Alignment Improvements (No-Build)	3.77	3.85	2.1%	3.66	−2.9%	3.21	−14.9%
Southern portion of STC K with Alignment Improvements	2.48	2.73	9.7%	2.39	−3.8%	1.58	−36.2%
421 Connector	1.52	1.51	−0.9%	2.62	72.3%	1.49	−1.9%
Eastern Connector	0.99	0.94	−4.4%	0.97	−1.4%	1.39	41.5%
I-95 and I-295 within the Study Area	3.74	3.75	0.1%	3.64	−2.9%	3.74	−0.1%
Overall	3.18	3.21	0.9%	3.20	0.8%	2.88	−9.5%

7.4 Environmental and Community Resource Screening Methodology and Findings

Analysis of the three build alternatives compared their impacts within a 300-foot corridor (150 foot radius) of each of their alignments. For this analysis, impacts were excluded along I-95 and I-295, given these existing facilities are already at least 300 feet in width. The impact analysis for the STC K Alignment Improvements alternative began at the interchange of US 421 and NC 87 in southeast Sanford, where the 421 Connector also begins. The northern half of the existing STC K alignment (north of Sanford) was also not included, as this would remain the same for each of the three alternatives (STC K Alignment Improvements, 421 Connector, and Eastern Connector), and the

point of the study was to determine what potential impacts would be different among the alternatives.

Note that this analysis is a general screening that covers some prominent items that would be considered red flags under NEPA. This analysis is not comprehensive nor is it considered a substitute for a full NEPA review. The screening items included in this section are for general comparative purposes only and just a portion of what would need to be evaluated in detail later under an official NEPA document.

7.4.1 Environmental Resources

Results from the 300-foot buffer environmental resources analysis are listed in Table 36. Detailed maps of the analysis can be found in Appendix B.

7.4.1.1 North Carolina Natural Heritage Program Natural and Managed Areas

North Carolina Natural Heritage Program (NCNHP) Natural Areas are those deemed significant for biodiversity. Each area has a collective value rating and a representation value rating, and the higher of the two values was used for the screening analysis. Only areas rated Exceptional, Very High, and High were included for the analysis. NCNHP Managed Areas are tracts of land protected in the interest of conservation. These areas are graded by the USGS Gap Analysis Project (GAP), and areas of GAP status 1 (Managed for biodiversity - disturbance events proceed or are mimicked) and GAP status 2 (Managed for biodiversity - disturbance events suppressed) were included for the screening, although only GAP status 2 areas were present along any of the three build alternatives.

Among the build alternatives, there was a wide range of natural area coverage. The STC K Alignment Improvements alternative encompassed the greatest area, at 485.6 acres of NCNHP Natural Area, followed by the Eastern Connector at 372.5 acres, and the 421 Connector at 3.6 acres. All three of the alternatives had minimal disturbance of NCNHP Managed Areas with less than 5 acres for each of the alternatives.

7.4.1.2 Known Red-Cockaded Woodpecker Habitat and Critical Habitat

Red-cockaded woodpeckers (*Leuconotopicus borealis*) are a species of bird native to the Carolinas listed as threatened under the Endangered Species Act of 1973. Their populations have been impacted by deforestation of the pines they inhabit, and thus tree-clearing is restricted in areas they are known to inhabit. Data on red-cockaded woodpecker habitat clusters were provided by Fort Bragg; however, the data were limited to the area around the base and Spring Lake. Minimal habitat clusters would be impacted by STC K Alignment Improvements and the Eastern Connector at two and one, respectively. However, the lack of habitat clusters impacted by the 421 Connector would need additional advanced analysis for confirmation.

None of the three build alternatives overlapped with areas deemed critical habitat by USFWS.

Table 36. Environmental Resource Analysis Results (300-ft Wide Corridor)

Resource		Unit	STC Alignment Improvements US 421 Bypass to I-295	Alternative 1 - 421 Connector	Alternative 2 - Eastern Connector
NCNHP Natural Areas	Exceptional	Acres	476.07	3.64	273.44
	Very High	Acres	9.48	0	0
	High	Acres	0	0	99.08
NCNHP Managed Areas	Acres	Acres	1.25	0	3.57
Critical Habitats	Number of Species	Number of Species	0	0	0
Known Red-Cockaded Woodpecker Habitat[a]	Number of Clusters	Number of Clusters	2	0	1
Flood Inundation Points	10-Year	Occurrences	0	0	23
	25-Year	Occurrences	9	0	23
	50-Year	Occurrences	9	0	24
	100-Year	Occurrences	11	0	24
100 Year Floodplain	Acres	Acres	56.38	186.59	55.18
NWI Wetlands	Acres	Acres	92.67	204.15	50.37
Rivers, Streams, Creeks, and Stream Branches	Waterbodies Traversed	Waterbodies Traversed	Barbecue Creek, Carrs Creek, Cypress Creek, Deer Branch, Dry Creek, Gum Swamp, Little Cross Creek, Little River, Mire Branch, Tank Creek, Upper Little River	Black River, Buies Creek, Cape Fear River, Carrs Creek, Dry Creek, East Buies Creek, Fish Creek, Juniper Creek, Neills Creek, Patchet Creek, Stewart Creek, Stony Run, Thorntons Creek, West Buies Creek	Carvers Creek, Little Bridge Branch, Little River, McLeod Creek, Mill Branch, Pistol Branch
Total Alternative Drive Length (US 421/NC 87 in Sanford to NC 87/I-95 in Fayetteville) [b]	Travel Miles	Travel Miles	39.96	65.94	50.78

[a] Red-cockaded woodpecker habitat was only known for areas near Fort Bragg and Spring Lake.

[b] This total alternative length is provided to indicate the different miles needed to drive between the two noted points. However, the impact measurements for each resource shown only cover the dashed areas shown on the respective impact maps. For example, impacts for the 421 Connector were only measured for the extent of US 421 (existing and proposed) between Sanford and Dunn, but the alternative travel length of 65.94 miles includes not just the length of existing and proposed US 421 between Sanford and Dunn, and it includes the distance on I-95 between Dunn and the common travel end point of NC 87/I-95.

7.4.1.3 Flood Inundation Points and 100-Year Floodplain

Flood inundation locations were obtained from NCDOT and include only points for each interval where flooding has occurred along roadways. These occurrences of flooding were infrequent for the STC K Alignment Improvements, with no 10-year flood points and only eleven 100-year flood points. The Eastern Connector had the most inundation occurrences with twenty-three 10-year flood points and twenty-four 100-year flood points. No flooding occurrences were observed with the 421 Connector; however, this is because a large portion of the alternative's alignment crossing floodplains would be on unobserved new location crossing and north of the Cape Fear River.

The opposite trend is observed for overlap of the alternatives with FEMA 100-year floodplain. The 421 Connector covers 186.6 acres of the floodplain, whereas the STC K Alignment Improvements and Eastern Connector cover substantially smaller areas at 56.4 and 55.2 acres, respectively.

7.4.1.4 Wetlands and Streams

The greatest overlap with wetlands was observed along the new alignment segments of the 421 Connector, totaling 204.2 acres. Next was the STC K Alignment Improvements at 92.7 acres and the Eastern Connector at 50.4 acres.

All three of the alternatives would require crossing numerous creeks and stream branches. Between the 421 Connector and Eastern Connector, the Little River, Cape Fear River, and Black River would have to be spanned with new bridges built where they are crossed on new alignment.

7.4.2 Community Resources

Results from the 300-foot buffer community analysis are included in Table 37. The same alignment extents as described at the beginning of this section were used to assess community impacts. Detailed maps of the analysis can be found in Appendix B.

Table 37. Community Resource Analysis Results (300-ft Wide Corridor)

Resource	Unit	STC Alignment Improvements (US 421 Bypass to I-295)	Alternative 1 - 421 Connector	Alternative 2 – Eastern Connector
SHPO National Register Historic Resource Points	Number of Properties	0	1	0
SHPO National Register Historic Districts	Number of Properties	1	0	0
SHPO Local Historic Districts	Number of Properties	0	0	0
Colleges and Universities	Number of Properties	0	1	0
Libraries	Number of Structures / Properties	0 / 0	0 / 0	0 / 0
Emergency Medical Services	Number of Structures / Properties	2 / 2	2 / 2	1 / 1
Law Enforcement	Number of Structures / Properties	0 / 0	0 / 0	0 / 0

Resource	Unit	STC Alignment Improvements (US 421 Bypass to I-295)	Alternative 1 - 421 Connector	Alternative 2 – Eastern Connector
Fire Stations	Number of Structures / Properties	1 / 1	2 / 2	1 / 1
Schools	Number of Structures / Properties	0 / 1	0 / 1	4 / 4
Government Offices	Number of Structures / Properties	1 / 1	0 / 0	1 / 2
Places of Worship	Number of Structures / Properties	5 / 6	7 / 7	6 / 7
Hospitals	Number of Structures / Properties	0 / 0	0 / 0	0 / 0
Structures	Total Number of Structures	550	723	365
Transportation Disadvantage Index	Number of Block Groups that are Transportation Disadvantaged	0	0	0
	Percent of Block Groups that are Transportation Disadvantaged	0	0	0
Environmental Justice Tool	Number of Block Groups with High Concentration of EJ Populations	10	1	0
	Percent of Block Groups with High Concentration of EJ Populations	33%	5%	0%

7.4.2.1 State Historic Preservation Office National Register Historic Resource Points, National Register Historic Districts, and Local Historic Districts

Minimal impacts were observed to properties recognized by the State Historic Preservation Office (SHPO). Only one National Register Historic District (Long Valley Farm) had a small portion of its parcel within the corridor for STC K Alignment Improvements. Similarly, a single National Register Resource Point (James Archibald Campbell House) is within the corridor for the 421 Connector. No Local Historic Districts were impacted by any of the alternatives.

7.4.2.2 Colleges and Universities

There are five campuses included within the study area south of Sanford; however, only Campbell University has an alternative crossing through its campus. The area around the 421 Connector alignment along E. Cornelis Harnett Boulevard covers part of the stadium, several parking lots, and multiple residential buildings.

7.4.2.3 Other Resources

Several critical community features were included in the analysis, including libraries, emergency medical services, law enforcement, fire stations, public and private schools, government offices, places of worship, and hospitals. To account for varying ages of the datasets, each of the categories along each alternative's alignment was checked against Google Maps to ensure the properties were in operation at the time of the report (April 2026). For each of these, impacts were recorded at both the level of the parcel the feature was on, as well as the actual building structure of the feature. Across the three alternatives there were minimal impacts to all these features. The feature category with the most impacts to structure and property was places of worship, due to these being the most numerous of the community features throughout the study area. However, for all the alternatives, fewer than 10 of the properties and structures were within each of the corridor areas.

7.4.2.4 Structures

The total number of buildings within each of the alternative buffer areas was counted. These encompassed buildings of all use types, so both homes and businesses were captured. The highest number of structures, 723, was within the 421 Connector area. This is almost double the lowest amount of 365 found in the area of the Eastern Connector. STC K Alignment Improvements would affect 550 structures.

7.4.2.5 Transportation Index and Environmental Justice

TDI is a measure created by NCDOT that encompasses demographic groups that are more likely to face difficulties in accessing transportation and are more vulnerable to barriers to transportation, including households without access to a personal vehicle, individuals living below the poverty line, people under 15 years of age or older than 65, people with disabilities, and members of racial and ethnic minority groups. A score of 0 to 21 is assigned to each block group, describing the relative proportion of these populations in comparison to the State of North Carolina. Communities along the corridor with a TDI score of 16 or higher would likely face greater difficulties in accessing transportation and are more vulnerable to transportation barriers. None of the alternatives crossed these high scoring TDI block groups.

EJ data are taken from an NCDOT tool to assess equity impacts. It is similar to TDI but is limited to populations of racial and ethnic minorities and individuals living under the poverty line. Each block group is assigned a score from 0 to 12 where a higher score denotes a higher population of these vulnerable groups, and the score is relative to larger geographical divisions. Areas along the STC K alignment with an EJ score of 8 or higher with respect to the state have the greatest concentration of EJ populations. A third of the block groups for the STC Alignment Improvements have a high EJ score, and these are primarily found within southern Sanford and across Spring Lake. The 421 Connector also shares one of these high EJ block groups in Sanford.

7.5 Potential Western Connector Options

In early 2025, NCDOT Division 6 staff suggested that bypass alternatives on the west side of Fort Bragg be studied. As a result, the study area was expanded to the west of Fort Bragg. Between May and October 2025, there was extensive coordination among the study team, NCDOT staff, and Fort

Bragg. Several concepts were discussed, but there were difficulties finding a feasible path due to the numerous resources and protected/military areas. After additional coordination with Fort Bragg and NCDOT leadership in November 2025, the Western Connector options were removed from consideration.

7.6 Alternative Analysis Conclusions and Recommendations

The study team met with the CSC to discuss alternatives being carried forward to analysis in December 2025. A meeting was held with the MPO/RPOs in the southern (alternatives) study area in March 2026. Based on those discussions, a consistent transportation vision for Phase 1 of STC K was developed, but there was no resulting preferred alternative to the existing corridor where alternatives were analyzed. The complexity of local needs and regional needs of connectivity are beyond the scope of an STC Master Plan study. The information in this master plan should be referenced as local and regional transportation plans are developed and findings used to inform decisions along with the public engagement process required during the development of these plans.

If an alternative to the existing STC K Phase 1 alignment is determined to meet local needs better while also meeting regional transportation needs, the STC K can be updated from the existing alignment.

The study team also recommends that any future studies that aim to resolve congestion along NC 24/87 in Spring Lake (with the evaluation of bypass alternatives) include the following:

- Additional data on the presence of red-cockaded woodpeckers (and other protected threatened and endangered species) outside of Fort Bragg properties.
- Travel demand models with more detailed TAZ in and around the Town of Spring Lake, the City of Fayetteville, and Fort Bragg.
- Additional alternatives developed with more detailed traffic, environmental, and community data.
- Direct involvement of local governments including the Town of Spring Lake (in addition to NCDOT and relevant MPO/RPOs).
- Clear distinction of the purpose and goals between STC K and I-685.Additionally, updates should be made to the local MTPs (FAMPO (Cumberland County portion) and CAMPO (Harnett County portion)), and CTPs (Chatham County, Harnett County, Randolph County, and Lee County).

8. Public Involvement Summary

8.1 Agency Involvement

8.1.1 Start of Study

On November 26, 2024, a start of study email was sent to selected state, federal, local, and tribal agencies. The email described the project extent, and the intent of the study to develop and evaluate alignment alternatives for STC K Phase 1 from I-40 in Guilford County to I-95 east of Fayetteville via US 421, NC 24, and NC 87. Recipients were also informed that alternatives would be assessed based on a vision and performance measures supported by local stakeholders.

The agencies contacted, and responses from those that replied to the email, are listed in Table 38.

Table 38. Start of Study Comments Received and Team Responses

Agency	Comment	Team Response
State		
Audubon NC	No Comment Received	N/A
North Carolina Center for Geographic Information and Analysis	No Comment Received	N/A
North Carolina Department of Agriculture and Consumer Services	No Comment Received	N/A
North Carolina Department of Commerce	No Comment Received	N/A
North Carolina Department of Cultural Resources	No Comment Received	N/A
North Carolina Division of Energy, Mineral, and Land Resources	No Comment Received	N/A
North Carolina Department of Agriculture and Consumer Services	No Comment Received	N/A
North Carolina Wildlife Resources Commission	• Concurred with USFWS red-cockaded woodpecker comment and added that construction should be avoided in the Cape Fear River as it's an anadromous fish spawning area and an inland primary nursery area. • Conservation properties in the area include state parks, private conservation lands, and mitigation sites	• Red-cockaded woodpecker data were included in the environmental screening data used for the alternatives analysis. • Properties listed under North Carolina's Natural heritage Program were in the environmental screening data used for the alternatives analysis.
North Carolina Department of Environmental Quality	No Comment Received	N/A
North Carolina Department of Natural and Cultural Resources	No Comment Received	N/A

Agency	Comment	Team Response
North Carolina Division of Public Health	No Comment Received	N/A
North Carolina State Historic Preservation Office	Recommended archaeological survey for any areas that may be affected by ground-disturbing activities.	Data from the SHPO was included in the community screening data used for alternatives analysis.
Local		
Regional Land Use Advisory Commission	No Comment Received	N/A
Federal		
US Army Corps of Engineers	No Comment Received	N/A
US Forest Service	There are no USFS lands in the vicinity of the project.	Comment Noted.
US Department of Agriculture	No Comment Received	N/A
US Fish and Wildlife Service	Potential effects to federally threatened red-cockaded woodpeckers in and around Fort Bragg if clearing or road widening is done.	Red-cockaded woodpecker data were included in the environmental screening data used for the alternatives analysis.
US Environmental Protection Agency	No Comment Received	N/A
Fort Bragg	• There are no known contaminated sites or wells in the study area. • There may be an African American cemetery as shown on historical maps (provided) south of Brinkley Commons, but the cemetery could not be found at the time.	• Comment Noted. • Alternatives were not within these areas.
Tribal		
Catawba Indian Nation Tribal Historic Preservation Office	No Comment Received	N/A
Coharie Tribe	No Comment Received	N/A
Monacan Indian Nation Tribal Office	No Comment Received	N/A

8.1.2 Study Area Update

Another email was sent to state and federal agencies on August 25, 2025, to reflect the expansion of the corridor's study area west of NC 87 encircling Fort Bragg, and north of Erwin to I-95. The map showed two sections of the corridor where the study area was removed to reflect two alignment changes, shifting the corridor from Bragg Boulevard to NC 210, and the removal of the US 421 Business route through Sanford from consideration. Fewer responses were elicited compared to the start of study email, and they are listed in Table 39.

A project update email was also sent to members of the CSC on August 21, 2025. This email contained the same information regarding the study area and alignment changes that was shared with the state and federal agencies.

Table 39. Study Area Update Email Responses

Agency	Comment	Response
US Fish and Wildlife Service	No additional comments.	Comment Noted.
US Forest Service	The expanded study area does not cross USFS land, so no consultation is needed.	Comment Noted.
NC Department of Natural and Cultural Resources	There are no additional managed areas within the expanded study area.	Comment Noted.

8.2 Focus Group Meetings

Three focus group meetings were held in early 2025 to provide background information on the study, its purpose, objectives, and schedule and to provide the opportunity for attendees to provide feedback during and after the meetings. The three meetings were split between local government (city/town and county representatives) north of Sanford, local government representatives south of (and inclusive of) Sanford, and various economic development and conservation groups between Greensboro and Fayetteville. Meetings for each of these groups were hosted on February 7, January 31, and February 6, 2025, respectively.

Attendees during and following the meeting provided suggestions for a route alignment, the locations of several existing and future destinations of interest and megasites, and local and county plans.

- Route Alignment / Improvement:
  - Widening the final 8 to 12 miles of NC 87 to four lanes to provide the region with a more resilient route to Wilmington for emergencies and troop movement.
  - Transition of Old US 421 to interstate quality will require improvements such as removing surface street connections.
- Destinations of Interest / Megasites:
  - Crown Events Center
  - Amazon Fulfillment Distribution Center near I-95 and NC 24
  - Goodyear Tire and Rubber and Anchor Titanium plants north of I-295 and US 401 interchange
  - Toyota Manufacturing site in Liberty
- Plans:
  - Harnett County Comprehensive Plan (2024)
  - Northeast Randolph County Growth Management Plan (2023)

Attendees also noted a host of challenges they anticipated along the corridor or within the study area. These include:

- There is high growth in Lee and Harnett Counties, with 10,000 new units anticipated in Lee County.

- Congestion is high in Spring Lake along NC 24/NC 87 and near Fort Bragg.
- There is limited space for road widening.
- Past hurricanes have caused flooding that made I-40 impassible.
- Attendees expressed uncertainty as to the improvements needed for Old US 421 between I-40 and I-85 to bring roadway to interstate standards.
- There is a low bridge on US 421 in Goldston that causes emergency and freight vehicles to get stuck and forces them to cross through downtown.
- There are properties with conservation easements adjacent to US 421 near Fort Bragg.
- Communicating the potential right-of-way needs along the corridor to developers may be difficult
- There is a site with limited (and illegal) truck parking near Pleasant Garden Road.

8.3 Public Survey

In April 2025 a public Input survey was published and sent to the agencies who had received the Start of Study Letter. MPO/RPO representatives who received the survey link also had the opportunity to distribute the link to residents within their jurisdictions. Within the survey, responders were asked to rank 10 objectives for the corridor, from highest to lowest. After receiving responses from 331 participants from within North Carolina, and 41 responses from other states, the objectives were ranked in the following order:

1. Promote regional connectivity between Greensboro, Fayetteville, and Wilmington
2. Promote a direct interstate connection between Greensboro and I-95
3. Improve corridor efficiency and reduce congestion for all users
4. Improve safety for all users
5. Provide a new bypass around Spring Lake to reduce congestion near Fort Bragg
6. Enhance development opportunities and quality of life for residents, workers, and visitors by improving roadway access to areas along the corridor
7. Provide a direct connection to megasites and major activity centers and destinations
8. Enhance direct access for the military and base staff at Fort Bragg
9. Improve air quality by minimizing VMT and vehicle emissions
10. Enhance pedestrian and bicycle safety and connectivity across the corridor and to regional trails

8.4 Fort Bragg Meetings

Several meetings were held in the spring of 2025 with staff from Fort Bragg and NCDOT Division 6 to discuss the feasibility of a bypass routing along the western side of the base. Summaries of each are presented in the following sections.

8.4.1 March 28, 2025 Meeting

At this meeting, two minor tweaks to the original STC K alignment were presented along with the two potential alternative area locations through Lillington and for the Spring Lake Bypass. The I-685 project was explained, including where the proposed interstate could overlap with STC K, but without the two needing to be the same facility type. A previously completed West Access Study

was shared, with the background that rapid growth in surrounding counties and detouring difficulties during natural disasters prompted evaluation of the western side of the base (Fort Bragg 2019). No solutions had been found for access to the base on the western side that the state and military had agreed with. At the time, NCDOT was also working to improve the intersection of Nursery Road and NC 87 to facilitate the transport of equipment into the base. Roads included within the West Access study were denoted as inaccessible to public through-traffic within the travel demand model.

Ultimately, Fort Bragg personnel recommended scrapping the eastern routes and having the bypass be as far west of the base as possible before connecting back south to I-295 between the Canopy Lane and Cliffdale Road interchanges. In the meanwhile, the base was investigating options such as widening and traffic circles to alleviate southbound NC 24/NC 87 traffic spilling over onto Manchester Road and into Spring Lake.

8.4.2 April 7, 2025 Meeting

More information was provided on the alternatives during this meeting. Two amendments to the baseline STC K alignment were explained; the removal of US 421 Business in Sanford, and the shift from Bragg Boulevard to NC 210 north of I-295. Option 1 was presented as an amalgamation of projects from the 2011 Harnett County CTP to connect Sanford to I-95 via US 421 through Lillington (NCDOT 2013). Additional historical context for the western bypass option was outlined – in 2019, the NC Wildlife Resources Commission recommended the western bypass while the NCDOT Congestion Management unit deemed it inadvisable for Fort Bragg, and the Spring Lake Land Use Plan considered surrounding land uses inopportune for major route development (Cumberland County 2022). Comments from the previous Fort Bragg meeting in March were also discussed.

NCDOT noted that several access control points described in the base's West Access study were being reconsidered, and that a northern portion of I-295 was within the perimeter of the base. The proposal for a western bypass received mixed reception from NCDOT Division 6, with its acceptance contingent on not being so far west as to not resolve traffic congestion around Spring Lake. Consensus was reached by all parties to remove the Eastern Spring Lake Bypass option due to environmental challenges and decreased traffic, and to instead evaluate the Western Spring Lake Bypass option, along with the Lillington Bypass and existing STC K alignment as the other alternatives.

8.4.3 June 6, 2025 Meeting

The final meeting with Fort Bragg reversed the course of the bypass alternative. Fort Bragg cited sensitive equipment and a training firing range in the area, and insufficient resolution of traffic congestion in Spring Lake, as reasons to forego a bypass on the western side of the base. The status of the red-cockaded woodpecker had also been lowered from endangered to threatened, opening the possibility for an option east of the base again. Fort Bragg confirmed they would not approve a western alternative alignment south of NC 690, and Division 6 supported a capacity and congestion analysis of an eastern bypass route.

8.5 NCDOT Division 6 Meetings

Following the meetings with Fort Bragg, two meetings were organized with NCDOT Division 6 to solicit additional feedback on the alternatives and provide additional information as the alternatives were finalized.

8.5.1 February 2026 Division 6 Meeting

A meeting with NCDOT Division 6 staff was held on February 6, 2026, to allow the unit to explain their concerns regarding the Eastern Connector. Their comments and questions on alignment decisions, and the reasonings provided in response, are as follows:

- The existing routes within the Eastern Connector are not suitable for traffic as bypass facilities, many are only two lanes. There was an expectation for the bypass to connect to I-295 between NC 210 and US 401.
    - A dense arrangement of environmental factors and existing developments closer to the east side of Fort Bragg were avoided and were the reason this alignment was not chosen.
    - Beginning the alternative alignment at Spout Springs avoided developments closer to Fort Bragg along NC 24/NC 87.
    - Existing roads could be widened from two lanes to four lanes, and the entire alignment would be a four-lane divided facility.
    - Existing routes are preferable for NEPA approvals when the corridor undergoes project delivery.
    - The corridor would not necessarily need to be a freeway, nor have controlled access.
- The four-lane alternative alignment would have worsened congestion as development increases over time. How were design assumptions assigned?
    - Access control, typical sections, and speed limits were set by traffic engineers and roadway design personnel based on existing land use characteristics and the statewide travel demand model.
- What percent of traffic would be diverted from NC 24 to the new corridor?
    - Using the segment of NC 24 between Nursery Road and Manchester Road as a representative location, traffic on NC 24 is reduced by approximately 3 percent under the US 421 Connector Alternative and 39 percent under the Eastern Connector Alternative, compared with the No-Build scenario.
- Because the main destination in the area is Fort Bragg, there would be less traffic diverted onto the bypass the farther it is from the base.
    - This was plausible, but the bypass would divert traffic not traveling to Fort Bragg.
    - The overall purpose of STC K Phase 1 is for connectivity between Greensboro and Wilmington, which may be counter to the more local objective of base access.
    - In the alternatives comparison methodology, travel time to Fort Bragg is one of the measures. The Eastern Connector would be preferable to the 421 Connector for this measure.

- If the Eastern Connector is chosen as the study's recommended alternative, would other alternates be considered in the future?
  - The recommendation of the STC K Phase 1 study would not prevent future bypass studies, but the Eastern Connector may be cited in future studies.
- A western bypass would make more sense for traveling from Greensboro to Wilmington. The study should re-examine the Spring Lake Bypass on new location closer to NC 24/NC 210.
- Describing the alternative as widening existing routes may be misleading to MPOs and RPOs, and the Division would likely have to mitigate impacts from this alignment.

8.5.2 March 2026 MPO / RPO and Division 6 Alternatives Debrief Meeting

After the Eastern Connector and 421 Connector alternatives were finalized, they were presented to MCRPO, CPRPO, CAMPO, FAMPO, NCDOT Division 6, and NCDOT TPO on March 20, 2026. Attendees had a multitude of questions that were addressed, with the answers including:

- The western alignment was removed following meetings with Fort Bragg and NCDOT Division 6 because the base had deemed this bypass not feasible.
- Confirmation that US 421 and NC 87 are potential options for the future I-685 alignment, so that route could be carried on the original STC K corridor as well as the 421 Connector.
- The Eastern Connector would be carried on US 401, not Honeycutt Road.
- Bridges are needed where the new construction alternatives cross rivers.
- Confirmation that Phase 2 of STC K will begin where Phase 1 ends.
- Public meetings are planned for Fayetteville and two other municipalities based on NCDOT's input.
- MPO and RPO representatives were intended to communicate information from the CSC meetings to their municipality and county partners.
- Cost estimates were not completed as part of the study.
- The alignment for the 421 Connector was derived from projects in the Harnett County CTP.
- Additional studies would be necessary to study congestion reduction in the Spring Lake area.

Critical feedback and recommendations were:

- More public engagement should be done with communities in the study area.
- FAMPO passed a resolution in May 2024 that supported a route to pass through Fayetteville connecting I-295 or I-95.
- NCDOT Division 6 was concerned the Eastern Connector would deviate traffic from Greensboro and Wilmington, and the alternative would not ease congestion in Spring Lake related to traffic in and out of Fort Bragg. A western bypass closer to NC 87 connecting to I-295 between Ramsey Street and McArthur Road would be preferable.
- CAMPO would be willing to facilitate local planning input for the 421 Connector.
- NCDOT Division 6 expressed general concern towards the 421 Connector.

8.6 Corridor Steering Committee Meetings

The CSC is composed of representatives from the following groups/organizations –GUAMPO, MCRPO, CPRPO, CAMPO, PTRPO, FAMPO, FHWA, Fort Bragg, and various NCDOT groups – Division of Planning and Programming, Transportation Planning, Feasibility Studies, Highway Divisions 6, 7 and 8, Office of Strategic Advancement, Integrated Mobility Division, and Rail Division. Given the size of the study and the number of individual local governments involved, the MPOs and RPOs were asked to forward details to their local governments and bring any of their concerns to the CSC.

8.6.1 Kickoff CSC Meetings – September and October 2024

An initial kickoff meeting was held on September 16, 2024, and exclusively included NCDOT staff on the CSC. The full CSC kickoff meeting held on October 7, 2024, covered the same information as the internal kickoff meeting. In this meeting, CSC members were informed of their roles and responsibilities over the course of the study, such as providing recommendations and reviewing the technical memoranda. Conditions that would lead to the removal or replacement of a CSC member were also explained. Like the focus group meetings that would be conducted later, the study's background, objectives, and schedule were presented. Attendees were presented with a detailed schedule milestone outlining CSC meetings and major deliverable over the study's full timeline. Recommendations for schedule adjustments and invitees for the focus group meetings were also solicited.

Feedback from the meeting included updated boundaries for CAMPO and Durham-Chapel Hill-Carrboro (DCHC) MPO. A request was made to create educational materials covering the study timeline and activities for public distribution.

8.6.2 CSC Questionnaire – December 2024

Before the CSC meetings were held with planning organizations along the corridor, a questionnaire was sent to the 59 kickoff meeting invitees on December 9, 2024. The questionnaire was online and available for completion for a month. Responders were asked to review the study's first two technical memoranda prior to filling out the questionnaire, as the set of questions were focused on verifying the accuracy of content within the Baseline Planning and Facility Inventory memoranda. Responses to the questionnaire included MCRPO, CPRPO, and FAMPO boundary updates; megasite and trail additions; several county and local plans; two Fort Bragg access studies; several SPOT project summary documents; and two recommendations for the alignment to follow a bypass around Spout Springs and along US 421 and the Urban Loop through the west side of Greensboro. Roughly a dozen contacts were also suggested for addition to the focus group meeting invite lists.

8.6.3 Individual CSC Meetings – December 2024

Six CSC meetings, one for each of the planning organizations in proximity to the corridor, were held in December 2024. The first two memoranda were provided to invitees before the meeting, allowing opportunities for discussion of the findings during the meetings. Methodology for the development, analysis, and comparison of corridor alternatives was also discussed. Attendees were also informed of the focus group meetings to follow and were asked to provide recommendations for focus group members beyond the invite list assembled up to that point.

Feedback from each meeting is listed in Table 40. The MPO/RPO comments were taken into consideration in developing and evaluating feasible alternatives for the study.

Table 40. Comments from the Individual CSC Meetings

Planning Organization Meeting	Comments
MCRPO	• Recommendation for the corridor to be a bypass, similar to STIP U-5802. • Recommendation for the corridor to be carried on the I-295 outer loop. • Red-cockaded woodpecker and tricolored bats are the most significant environmental concerns in the area around Fort Bragg.
CAMPO	• The boundary for CAMPO has been updated. • Additional information on future land use available from the Central Pines Regional Council and forecasted socioeconomic growth data for Chatham and Lee Counties. • Division 6 stated that Spout Springs needs a bypass, and that the NC 87 entrance to Fort Bragg is closed to through traffic, and traffic instead flows to NC 210. • Lee County is not within the Triangle's TRM model but is instead within Central Pines Regional Council's model.
PTRPO	• There are two unlisted megasites; the Greensboro Randolph site and the Chatham-Siler City Advanced Manufacturing site. • There are several large projects under development in Liberty; however, they are relatively minor in scope. • There are several STIP projects in northeast Randolph County around Liberty and Staley. • Two interchanges are being built near the Liberty megasite. • PTRPO is working on an update to the comprehensive transportation plan. • There is a project in P7 (H191792) that would upgrade the corridor to interstate standards from the Guilford County line to Siler City.
FAMPO	• There's a new megasite at Doc Bennett Road and Airport Road in Hope Mills. • NCDOT Division 6 is installing paved shoulder truck parking areas along interchanges on I-95 as part of a construction project. • I-95 will be expanded to four lanes on both sides to Lumberton. • New major projects in the area would not be expected due to lack of funding in the STIP.
CPRPO	• Boundary changes for CAMPO and DCHC have affected the boundary of CPRPO. • There is a VinFast site in Chatham County west of Holly Springs. • A Disney neighborhood is being developed in Chatham Park near the bypass north of Pittsboro. • Siler City is updating their land use plan. • The US 421 Business route through Sanford should not be reviewed because of the new bypass route in the town. • The classification for the red-cockaded woodpecker may have had its status downgraded to threatened. • There are state trails along the Deep and Haw Rivers in Chatham County.

Planning Organization Meeting	Comments
GUAMPO	• The section of corridor between I-85 and I-40 in Greensboro is Old US 421, not US 421. If the purpose of the study is to convert the corridor to interstate, this segment should be removed. • There is grade separation inside the I-85/I-73 loop planned for the future. • There is a rail corridor between Greensboro and Fayetteville that is currently underutilized but may be used more with the development of the Toyota site. • There should be coordination with the rail division, and the impacts to rail for the alignment along US 421 should be studied. • Open space shown in the future land use map is instead likely agricultural and rural residential.

8.6.4 Vision and Performance Measures CSC Meeting – February 2025

On February 27, 2025, feedback from the three focus group meetings was shared, detailing challenges and alignment suggestions fielded by the local municipalities, counties, and organizations. Relevant CTP and MTP projects along the existing STC corridor alignment from Greensboro to Fayetteville were shared to show where previous plans recommended improvements. High-level corridor segments were discussed, splitting the corridor in three, with the breakpoints at US 64 and US 421 in Siler City, and at the boundary of Chatham and Lee Counties. These segments would be further divided in the future, based upon similar cross sections, travel markets, and major destinations. A list of performance measures was shared based on local (MPO and RPO), state (NCDOT), and federal (FHWA) objectives, with these measures serving as the basis for comparison of corridor alternatives. Attendees were informed that a vision statement would be developed for the study, and that objectives may differ by each segment.

Recommendations received from the meeting included adding access to Fort Bragg via highway and improving economic conditions for vulnerable conditions being added as objectives. Smaller meetings held with the military were advised and scheduled for the future.

8.6.5 Alternative Development – Concepts and Factors CSC Meeting – March 2025

Based on previous discussions, this meeting held on March 21, 2025, discussed the parameters that would be used to create alternatives based on local challenges and land uses. As initiated in the Vision and Performance Measures meeting (Section 8.6.4), further discussion was held concerning the subsegments used to delineate the corridor. The majority of subsegments were within segment C, reflecting various constraints such as access to Fort Bragg and urban use inside the I-295 loop. In response to the mention of I-685 from the previous meeting, the differences between I-685 and STC K were explained, emphasizing that Old US 421 is not included in the former and that the latter does not need to be a freeway or interstate. Two windows for the locations of two alternatives were introduced; one for a bypass through Lillington to I-95, and the other the Spring Lake Bypass, which would require an optimization tool to avoid various environmental resources east of Fort Bragg. Attendees were asked what the break points for the C subsegments should be, and what additional factors should be avoided for the Spring Lake Bypass.

Staff from the city of Fayetteville and NCDOT Division 6 provided context around access limitations to Fort Bragg and requested that the window for the new alternative location be extended west of

Fayetteville. NCDOT shared that Divisions 3 and 6 were planning to meet the following month to discuss a western alternative that would connect to I-295.

8.6.6 Alternative Changes CSC Meeting – May 2025

The key purpose of this meeting held on May 2, 2025, was to share updates on meetings held with the military in the prior several weeks. Meetings with Fort Bragg covered the history of an Eastern Spring Lake Bypass, red-cockaded woodpecker habitat stymieing past STIP projects through the area, additional factors that made a western bypass option preferable, and the recommendation from NCDOT Division 6 to remove the eastern bypass alternative option altogether in favor of a western bypass. These developments necessitated an expansion of the existing study area for the western bypass, while Fort Bragg would simultaneously be evaluating both options.

Few comments were received during this meeting. CAMPO's representatives sought reassurance that the Lillington Bypass would still be under consideration, and other attendees expressed interest in findings from additional meetings with Fort Bragg.

8.6.7 Project Update CSC Email – August 2025

An email was sent on August 21, 2025, that updated the CSC that NCDOT had met with representatives of Fort Bragg in June and July to identify the appropriate limits for evaluating alternatives in the area. The email included a revised map that showed expansion of the study area boundary to the west, around Fort Bragg.

8.6.8 Alternatives Carried Forward CSC Meeting – December 2025

This CSC meeting was held on December 5, 2025. The presentation explained that, although the study was delayed due to prolonged discussions on a potential alternative on the west side of Fort Bragg (which was included to overcome the high concentration of development and natural features on the east side of Fort Bragg), after several meetings with NCDOT Division 6's staff and the military, ultimately the decision was made to continue just with alternatives to the east of Fort Bragg and not on the west side.

This meeting then presented two alternatives to the east of Spring Lake. The 421 Connector (formerly Lillington Bypass) alternative was briefly discussed, with mention of projects from local plans that were compiled for its alignment beginning at the NC 87 / US 421 interchange and terminating at I-95 east of Dunn. A thorough overview of the Eastern Connector (formerly Eastern Bypass) was also presented, beginning with an explanation of Division 6 and Fort Bragg agreeing to forego the western bypass and focus on an eastern bypass option. The GIS Optimal Path tool to decide on the alignment was explained, with a few examples of environmental resources that the generated corridor had weaved between. Several endpoint options had been fed into the tool, and the final alternative began at NC 24/NC 87 in Spout Springs, routing east to US 401, carried on the US route and I-295 until the latter's intersection with NC 210. CSC members were informed that the next meeting would cover results from screening comparisons between the corridors, followed by several public meetings in major cities along the corridor's alignment. Information was also shared by Cumberland County regarding future developments around Elliot Bridge Road and Ramsey Street. Construction of a subdivision, school, and titanium plant were noted for their potential to

have a significant impact on traffic in the area. CAMPO offered their support for community outreach if the 421 Connector was the final recommended alternative of the study.

8.6.9 Alternatives Analysis Results CSC Meeting – May 2026

This CSC meeting, held on May 15, 2026, summarized for the full CSC the discussions/decisions made at the March 2026 meeting with NCDOT Division 6 and the MPO/RPOs in the alternatives area (Section 8.5.2). The remainder of the meeting included detailed discussion of each alternative's design criteria along with results of transportation modeling and environmental red flag evaluations for the three alternatives – Eastern Connector, 421 Connector, and STC K Alignment Improvements. A detailed spreadsheet was provided to CSC members for detailed review. Results were explained for estimated traffic performance measure impacts (now and at the year 2045) along with environmental and community red flag impacts using available GIS data. The results did not provide a preferred alternative for the reasons discussed in Section 7.6.

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